MULTIHULL DESIGN & CATAMARANS 1966

A.Y.R.S. PUBLICATION No. 59

Lady Helmsman—Photo Catin

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(Founded June, 1955)

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EDITORIAL

January, 1967.

The British A.G.M. This will take place at the Naval and Military Club, 94, Piccadilly, London on January 3rd before the Social meeting on TWIN BILGE KEELS and *not* during the Boat Show, as stated in the October publications.

British Winter Meetings. These will take place at the Naval and Military Club, 94, Piccadilly, London W. at 7 p.m. for 7.30 p.m., the time and place being the same for all dates.

January 3rd. After a film taken by Lord Riverdale of his Eastern Mediterranean Cruise on *BLUEBIRD OF THORNE*, there will be a discussion on TWIN BILGE KEELS, led by Lord Riverdale, David Lewis (*Not* the transatlantic yachtsman) and others.

February 7th, 1967. This will be a technical meeting. John Hogg and Col. Bowden will speak.

March 7th, 1967. This will be on SELF STEERING with designers and others describing their gears and voyages using them.

April 4th, 1967. This will be TRANSATLANTIC CATAMARANS. The speaker will be James Wharram.

The ROUND BRITAIN meeting on October 4th, 1966—the first of this year, was a tremendous success with Derek Kelsall, Bill Berry, Jock Burrow, Mike Ellison, Don Robertson, and Fearon Wilson describing their voyages in *TORIA*, *DINAH*, *TAO*, *IROQUOIS*, *SNOW GOOSE* and *MIRRORCAT*. With the experience accumulated during the race and before by these people, we were able to learn a great deal of the conditions and problems they met. Everyone said that it was the best meeting they had ever been to. We got the whole meeting on tape and a copy will be made available to any British A.Y.R.S. section on receipt of a £2 deposit. Non-member yacht clubs and non-members will be charged £3 with £2 deposit. Overseas groups can buy the tape for £4 ($12.00 U.S.).

On this same tape is the second lecture of our winter series— "A Few Yachting Developments" by Michael Henderson. Each of these meetings lasted for 2 hours (approximately).

Increasing the A.Y.R.S. Membership. So far, the A.Y.R.S. has done very well in membership, increasing steadily year after year. Indeed, when Hetty Tett and I have to cope with all the work concerned with you all, we sometimes feel that the A.Y.R.S. is *too* successful. However, we cannot go back so we must go forward and, if we can *leap forward* in membership, we can get some *paid* assistance, still

keeping the subscription at its present very low figure. The Committee now feel that the time has come for a *massive* recruiting drive to double our membership at least to get over this " hump " as quickly as possible. We therefore ask *every* member to recruit as many members amongst his friends and acquaintances as possible. We have at present about 1,500 members and need from 3,000 to 5,000 to get the benefits of cheaper printing costs per head.

At present, we are advertising the A.Y.R.S. in as many yachting magazines as we can afford and this is bringing results. But the best advertisement is by personal recommendation or letters in the correspondence columns of yachting magazines, referring to articles in the journals, giving the title of the publication, its cost and saying that it is available from Woodacres, Hythe, Kent, England. If many of our members would do this, we would soon become well known.

Gift Subscriptions. Yet another method of increasing membership is by members giving subscriptions to the A.Y.R.S. as Christmas and birthday presents. The value of the gift will be well above its cost.

Regional and Overseas Groups. The Committee is anxious to keep abreast of Regional and Overseas developments so will you please let us know what you are doing and what your problems are. The A.Y.R.S. is not and never has been "local" to any one place. We want to unite workers in every problem throughout the world. If therefore, you want to make contact with other A.Y.R.S. members in your area, or elsewhere, write to us and we will do our outmost to help you.

REGIONAL MEETINGS

BY

LLOYD LAMBLE

The A.Y.R.S. has groups of members meeting together all over the world to the mutual benefit of yachting information and it is hoped that this idea will extend. Two years ago, we tried to force this development by asking for volunteers to organise groups to cover the British Isles, and Ireland.

The initial enthusiasm expressed by a certain number of members to organise local A.Y.R.S. activity has been carried forward in some areas and died away in others. However, the fact that only two or three groups of Regional members have banded together and started discussions and other group activities is two or three more than existed two years ago. This can only be regarded as an advance.

Technical Discussions in Southampton. In the early part of 1965, about half the time of two of your Committee meetings was taken up in purely technical discussions. This was, in principle, successful but, as a number of our most advanced thinkers live in the Southern Counties of England, it has been decided to try to set up a regular series of meetings in Southampton at which matters of a high technical level will be discussed.

These " boffin " meetings will be open to the general membership and friends and it is anticipated that these discussions will be tape-recorded and the tapes made available to Regional Groups, without charge.

The Committee Technical Discussions. The first of these took place on March 27th, 1966 and the two subjects discussed were: (1) Limitations of a Keel Boat's Performance and (2) Bendy Booms. We took this on tape but, as we had not got into the swings of the jargon and technicalities, our more or less extemporaneous speeches could hardly be called epoch-making. The second discussion on " The Horse Power of Sails " was summed up in my article in A.Y.R.S. No. 57.

Members interested in Regional Group activity in Britain should contact Committee Member, Dennis Banham, " Highlands", Blackstone, Redhill, Surrey.

The A.Y.R.S. Burgee. Members are urged to sail under the A.Y.R.S. Burgee and put " A.Y.R.S." on the transoms of their boats.

Binders for A.Y.R.S. Binders. These can be got from Easibind Ltd., Hartley House, 4, Uxbridge Street, London W.8 at a cost of £1 1s. 0d. each, post paid. Each binder takes about 20 publications.

Joyce and Ron Doughty. We frequently get compliments from members on the standard of our publications. This standard has been built up from the rather weak state of the first few publications by members helping us. We would like to mention here the valuable photographs which Joyce and Ron Doughty have consistently taken of boats and meetings, including Weir Wood this year and made freely available to us. Members can get additional copies from them, should they want them at 17, Devonport Road, Shepherds Bush, London, W.12.

Dear John,

I wish to cross swords with both you and Signor Truzzi of Milan regarding correspondence in No. 57 apropos " Spray."

I never fail to be amazed that intelligent men, both within and without the Society, who claim to have the scientific approach, continue

to ignore facts and to perpetuate vested ideas about " Spray." This attitude is as false as that of the anti-Multihull propaganda of the diehards, who continue to tell all who will listen that Multihulls are unseaworthy—that they are not as fast as Monohulls and in general—that they are not really boats at all.

To start with, Slocum made his historic journey at a time when yachtsmen were afraid to venture out of sight of land and for him to have done something which the rest—the 'experts'—were afraid to do, was to produce the taunt that he was a fake. When it became apparent that he had in fact done the journey, the only recourse left for the inshore sailors was to state that his runs etc. were falsified. When it became fairly obvious that his claims could be substantiated, the next excuse was that it was the quality of the sailor and not the Ship that had made the feat possible.

The source of these slanders was the Professional Designer, who had to maintain that the Drawing Board Yacht was in every way superior to a common work boat built by eye by some unknown jobber with no 'scientific' knowledge—despite the fact that the Designed yachts of the day, for the most part, could have not done what " Spray " did.

Slocum, *because* of his superlative seamanship, chose " Spray " because she was ideal for the job he had in mind, whilst he knew (and stated) that fancy boats of the then Designers would have courted disaster on such a journey.

I had an (otherwise) intelligent friend who used to say, after Gagarin made *his* historic journey across the oceans of Space, " I don't believe in Sputniks ! "

The anti *SPRAY* brigade virtually say the same thing.

The proof of the anti *SPRAY* propaganda came when Slocum disappeared without trace. It proved that *SPRAY* was as unseaworthy as they had said. The rollover of *PANDORA* drove the final nail into *SPRAY's* coffin.

Is *SPRAY* then, the only yacht to disappear without a trace ?

Is *PANDORA* the only yacht to roll over ?

The answer to both questions, of course, is " No "—and at least *PANDORA* rolled up again. No 'luckier' than some and more seaworthy than many another in similar circumstances . . . *PUFFIN*, for one.

Referring to Para 3 of Signor Truzzi's letter, I would point out that a divided sail plan would *not* invariably lose to a Monosail—viz Taberley's win in the Trans Atlantic race. I note that Signor Truzzi has a divided rig for his *SPINDRIFT*.

3(a) 36 ft. is *not* large by modern standards. It is *not* unsuitable for economical mass production, as 'one-offs' can be produced in this country for £4—6000; properly rigged, it is *not* more than a single-handed crew could manage comfortably—Slocum did it with pretty old-fashioned gear.

(b) Is covered above.

(c) Her load carrying capacity and steady platform make her ideal as a cruiser, whilst *any* yacht today ought to have a good auxiliary in crowded anchorages.

(d) *SPRAY's* stability may be 'theoretically' poor but she is self-righting from mast on water and *PANDORA* roll-over-and-up, shows that in similar conditions the design is as good if not better than many to say the least.

(e) Length for length it would *not* be difficult to design something faster than *SPRAY*—but not all that much faster—and it would be just as easy to design something a good deal slower. The other points have been dealt with.

So much for Signor Truzzi's letter but that you should agree with him for the most part, I find baffling—particularly, as you know of the many many copies to have sailed the oceans since Slocum and having read Kenneth Slack's manuscript,* you *know* that the basic design of *SPRAY* is that of a comfortable, seaworthy and fairly fast Cruiser, whether sailed by Slocum or not.

That I am pro *SPRAY* is obvious but it is not for romantic reasons; it is because I have searched for many years to find the ideal cruiser and in my opinion, *SPRAY* is the ideal compromise of all that is required of a cruising yacht.

LLOYD LAMBLE.

89 Alexandra Road, London, N.W.8.

Dear Sir,

I enclose my subscription of £1 for the coming year in response to your request in No. 57 A.Y.R.S., and thank you and your colleagues for producing quite the best value for a twenty-shilling sub. that I know !

May I comment on your article on " The Non-Acceptance of Multihulls ? " However right you may be in the psychological implications of our old-fashioned prejudice in favour of the now proven less efficient mono-hulls for cruising, your para 4 contains one doubtful statement: " there is room for all." Imagine the trots at Brightlingsea which accommodate four ordinary yachts abreast, with four trimarans abreast ! Or the Marina at Newhaven full of tris or cats. And have you ever been into that delightful little harbour at

*"*In the Wake of 'The Spray'*"—*K. Slack Rutgers, University Press* $7.50.

Willemstad on the Hollandsch Diep ? Imagine how many cruising tris would get in ! Or Veere or half a dozen other charming and tiny harbours up and down the channel. Room for all ? It can be difficult enough with our present cradles. Heaven help us and the Harbour Masters if we all turn to tris ! Mooring and harbour dues will have to be levied on occupied area rather than LOA. Could this impending revolution be just the tiniest bit anti-social ? It could certainly be much more expensive in running cost. But perhaps in our affluent society in twenty years' time, such things will no longer matter !

Again thank you for your stimulating reports, and their food for our thoughts.

LESLIE J. BLAY.

Ivy Cottage, 57 High Street, Standon, Herts.

TECHNICAL SYMBOLS

At least *one* A.Y.R.S. publication will be " Technical " each year. This means that it will deal with " Yachting figures " and how to take them and how to use them when they have been taken. It is my job as Editor to see that they are capable of being understood by the greatest possible number of members, though I realise that they cannot be understood by *everybody*. This matter is being thrashed out by private correspondence at the moment and will get a formal hearing at our technical meetings in the course of time.

I hope that, finally, we will have a mode of expression which *any ordinary yachtsman*, with a bit of application *can* learn. Most of us will need to study the matter in some detail and even get parts explained to us. But if we do this, our understanding of how a boat sails will improve greatly.

In my opinion, the final mode of expression should be as simple as the " Theory of Flight," as taught to aviators and I will bend all our efforts to achieving this.

Books. At present, there are only three books which you can get to introduce you to the subject which I know of. The first is my own book SAILING AERODYNAMICS—John Morwood (Hart-Davis). Having read that, and it should be available in most public libraries, the next and more difficult book is that by Marchaj—THE THEORY OF SAILING and finally, and perhaps easier than Marchaj's book is HOW SAILBOATS WIN OR LOSE RACES by William Allen Smith (Van Nostrand). If you can understand these three books, you will have no difficulty in following the A.Y.R.S. articles.

The following letter from John Hogg starts the ball rolling in getting general agreement in the matter of symbols, which will be used in all future articles on technical matters.

Dear Sir,

In suggesting the list of symbols which might be adopted by the A.Y.R.S. to help in the exchange of ideas and data I realised there might be some difficulty because although most of these are in general use in this country they are not standardised and they differ in some respects from those in use at various research centres. The volume of yacht research data is rapidly growing and therefore it is very necessary to try to obtain agreement on the terms as far as possible. The A.Y.R.S. is well suited to help in this direction. Fortunately there is in fact quite a fair measure of agreement in the various symbols used at (Mass. Inst. Tec., Southampton University, Nat. Phys. Lab., Saunders-Roe, Stephens Inst.) and it would seem best to propose the set shown rather than construct a new set. This list might be published in the Bulletins for a trial period with the request that authors will adhere to it in their contributions to the Bulletins.

JOHN HOGG.

Parklands, Curdridge, Hampshire.

Yacht Research Symbols Proposed

True Wind Velocity knots	V_T
Apparent Wind Velocity knots	V_A
Velocity of ship, knots	Vs
Angle of Course to apparent wind	β (beta)
Leeway angle (between ships head and course)	λ (lambda)
Angle of ships head to app. wind	$\beta-\lambda$
Angle of ships Course to True Wind.	γ (gamma)
Angle of heel	θ (theta)
Angle of foresail to centre line of ship	δf (delta f)
Angle of mainsail to centre line of ship	δm (delta m)
Coefficient of lift	C_L
Coefficient of Drag	C_D
Driving force	F_R
Heeling force	F_H
Velocity of ship made good to windward, knots	Vmg.

THE WEIR WOOD MEETING 1966

The meeting this year was characterised by pleasant sun-shiny days and an " experimenters' wind "—a gentle breeze which drives a boat but doesn't break anything (and usually fails to make the invented feature work.)

We missed Fred Benyon-Tinker who has organised all the other Weir Wood meetings but he is now involved with " inflatables " in the West of England. He is, however, already organising a local A.Y.R.S. group in Bideford, Devon, and we hope to hear more of his activities soon. He leaves a strong Sussex group behind that is at present in the hands of Eric Scott. It is hoped to have a Sussex and Surrey Group which will include members in the Redhill area, where the future monthly meetings will be held, if local response is strong enough. Dennis Banham organised the meeting this year most excellently.

Unfortunately, a Weir Wood Sailing Club has now appeared so we no longer have the reservoir to ourselves and there are lots of club boats sailing as well as our own. This made identification of the conventional A.Y.R.S. boats difficult so if we have not got all of them mentioned, we hope to be forgiven.

The Boats

Polynesian Single Outriggers (with bow and stern).

(1) Paul Ashford's *TRIPLE SEC*—a single outrigger with Bruce foil.

(2) John Partington's *TABUARIKI*—a canvas canoe converted to single outrigger.

(3) Don Rigg's *GOONRAKER*—a canvas canoe converted to single outrigger.

Proas (sailing equally well backwards as forwards—float always to weather).

(1) Chris Hughes' *KIA KIA*, a copy of the Gilbertese canoe.

(2) Charles Sutherland's boat—a Canadian Canoe with foam-fibreglass float, tied on with bamboo sticks.

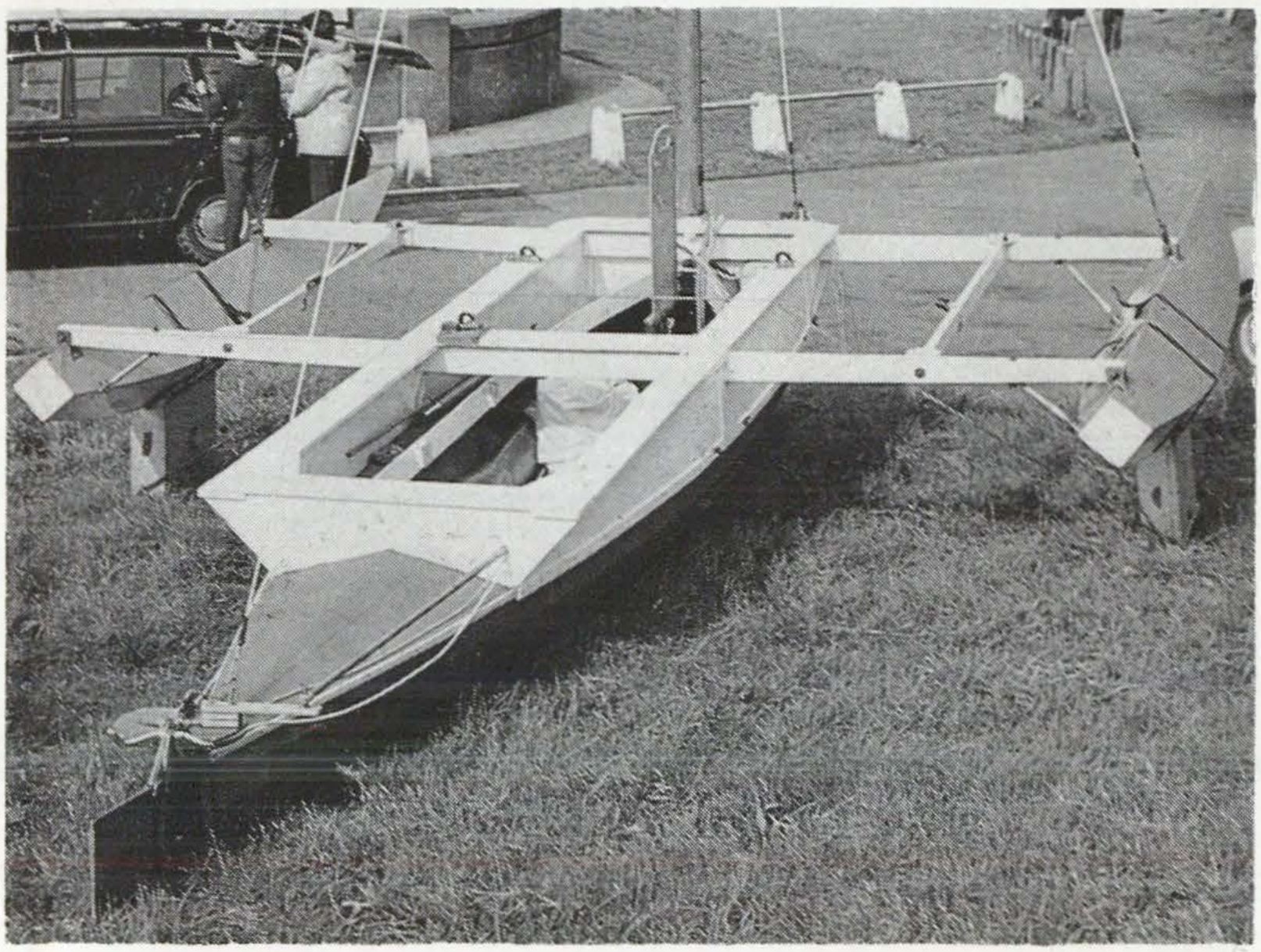
Trimarans.

(1) S/L Anderson's *SHARK* trimaran with transparent Melinex sail. This boat won the multihull trophy at Sheppy on handicap. Andy thinks he has solved the " Melinex problem " with a new variety. (Melinex=Mylar).

Paul Dearling's Clark Hydrofoils

(2) Dennis Banham's *SEA WRAITH* 18 ft. cruising trimaran with a new rig.
(3) Paul Dearling's hydrofoil stabilised canvas canoe—Bruce Clark type as shown on Page 19, A.Y.R.S. No. 56.
(4) Ronald Elliott's trimaran—a canoe with double outriggers.
(5) Andre Kanssen's trimaran with new floats.

Paul Dearling's hydrofoils



Ronald Elliott's trimaran

Charles Bull and Harry Ralph's Catamarans

Catamarans.

(1) Charles Bull's catamaran 12 ft. 6 in. by 6 ft. beam, a home-made boat.

(2) Harry Ralph's catamaran, also home-built to the same design as Bull's.

Dinghies.

(1) George Evans' *ALBACORE.*

(2) Ken Lane's *MIRROR* dinghy.

(3) Eric Millet's *GULL.*

Don Rigg's GOONRAKER

Dennis Banham spent the days, as usual, taking everyone out in his delightful *SEA WRAITH* while Andy sailed his *SHARK* faster than everyone else. I can never get over the feeling that these transparent sails make a boat look ghostly but they are so smooth, they must be efficient.

Chris Hughes, in his proa, sailed back and forth across the lake,

taking the foot of his yard from one end of the boat to the other with great dexterity to change tack. His proa is undoubtedly fast but it is hard to estimate how far up into the wind she is pointing. There did not appear to be any major handling difficulties—perhaps someone will buy the Prout Proa which is still available at Canvey Island, I believe.

All the other boats sailed peacefully around and generally speaking had a very pleasant, if not exciting, day. Paul Dearling's canvas canoe with Clark hydrofoils and 90 sq. ft. of sail instead of the makers'

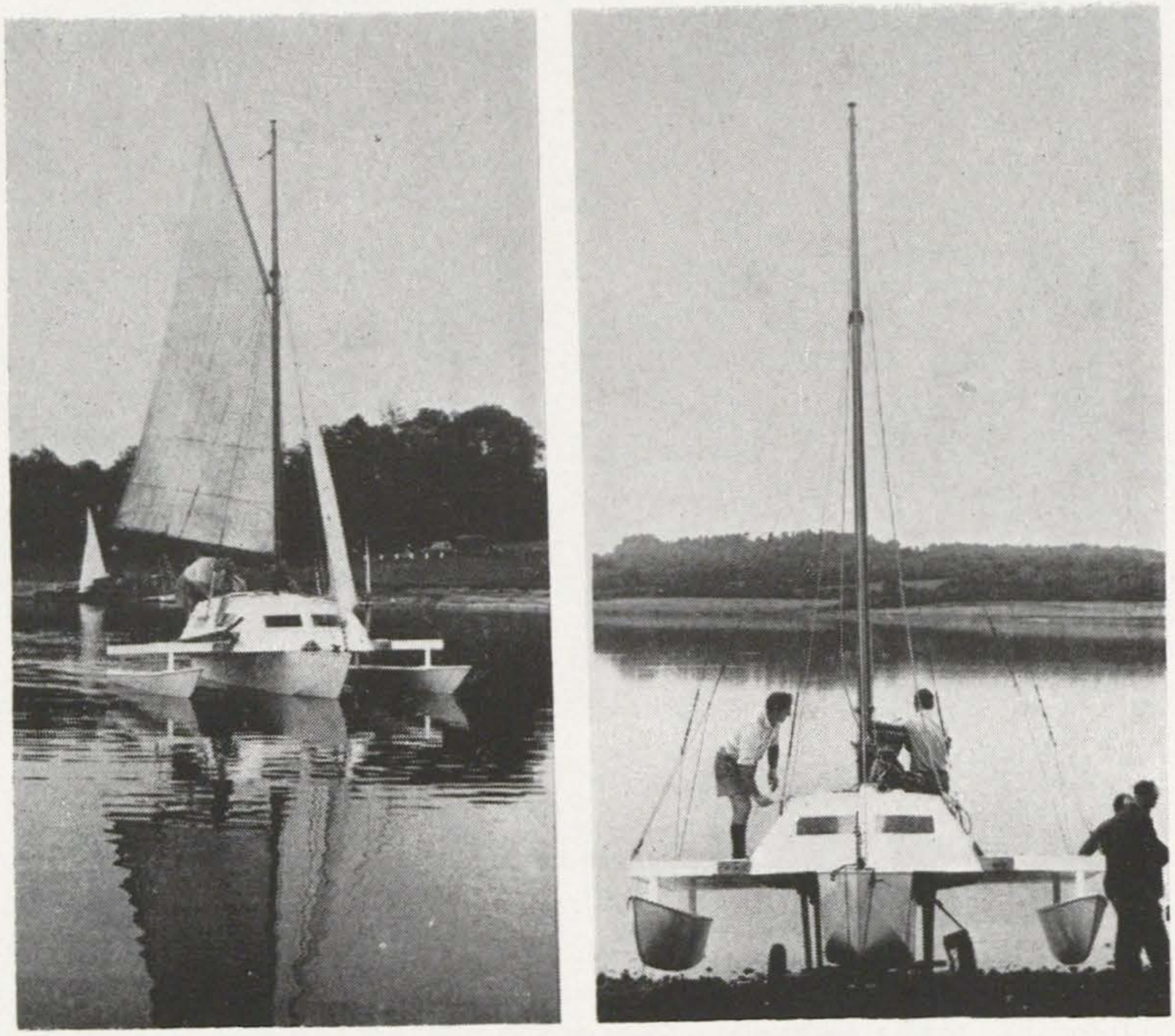
Charles Sutherland's Canoe with outrigger

recommended 15 sq. ft. sailed nicely but was a bit unstable in very light winds. Her stability immediately improved when the sails got a bit of wind.

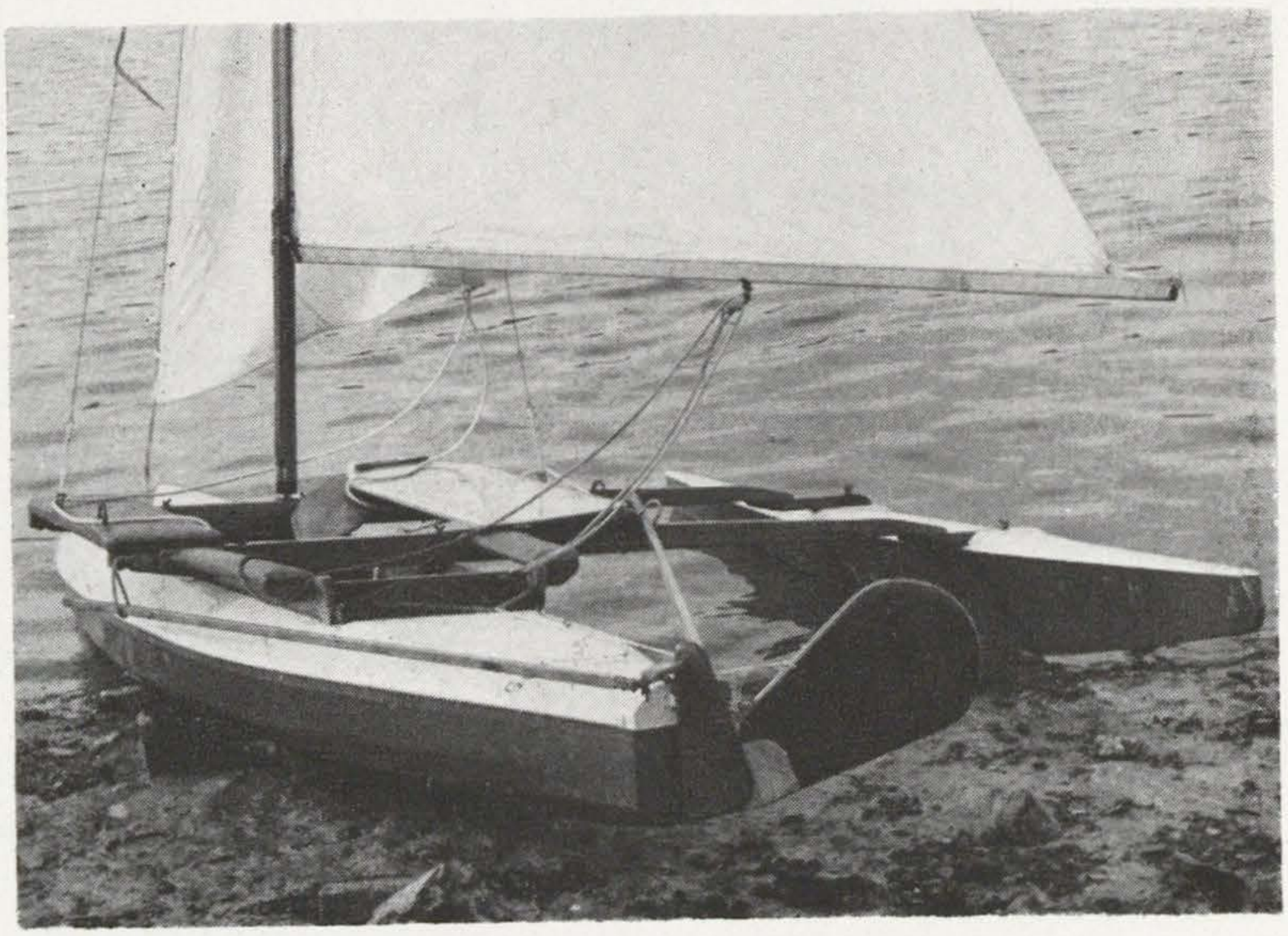
Paul Ashford's *TRIPLE SEC* with Bruce float and foil was very stable indeed in all strengths of wind. The float could be lifted off the water by leaning out and the hydrofoil then cut through the water very nicely but with a good deal of surface " fuss " like the catamaran centreboard put down in the centreline, between the hulls. We feel that this system may well constitute a " breakthrough" and perhaps we shall see it on a single C Class catamaran hull before long, going at

Andre Kanssen's Trimaran

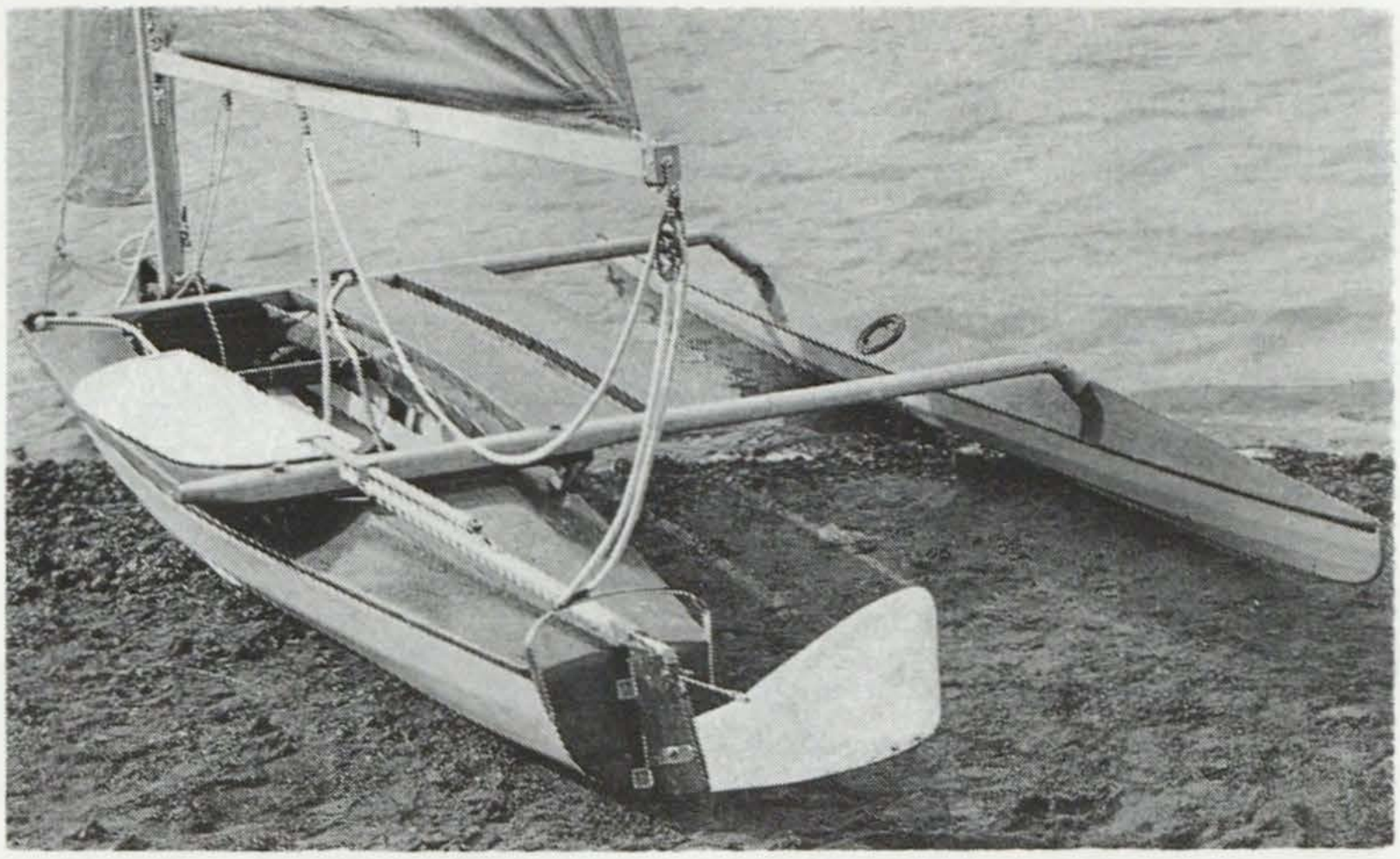
Ronald Elliott's Trimaran



Dennis Banham's SEA WRAITH



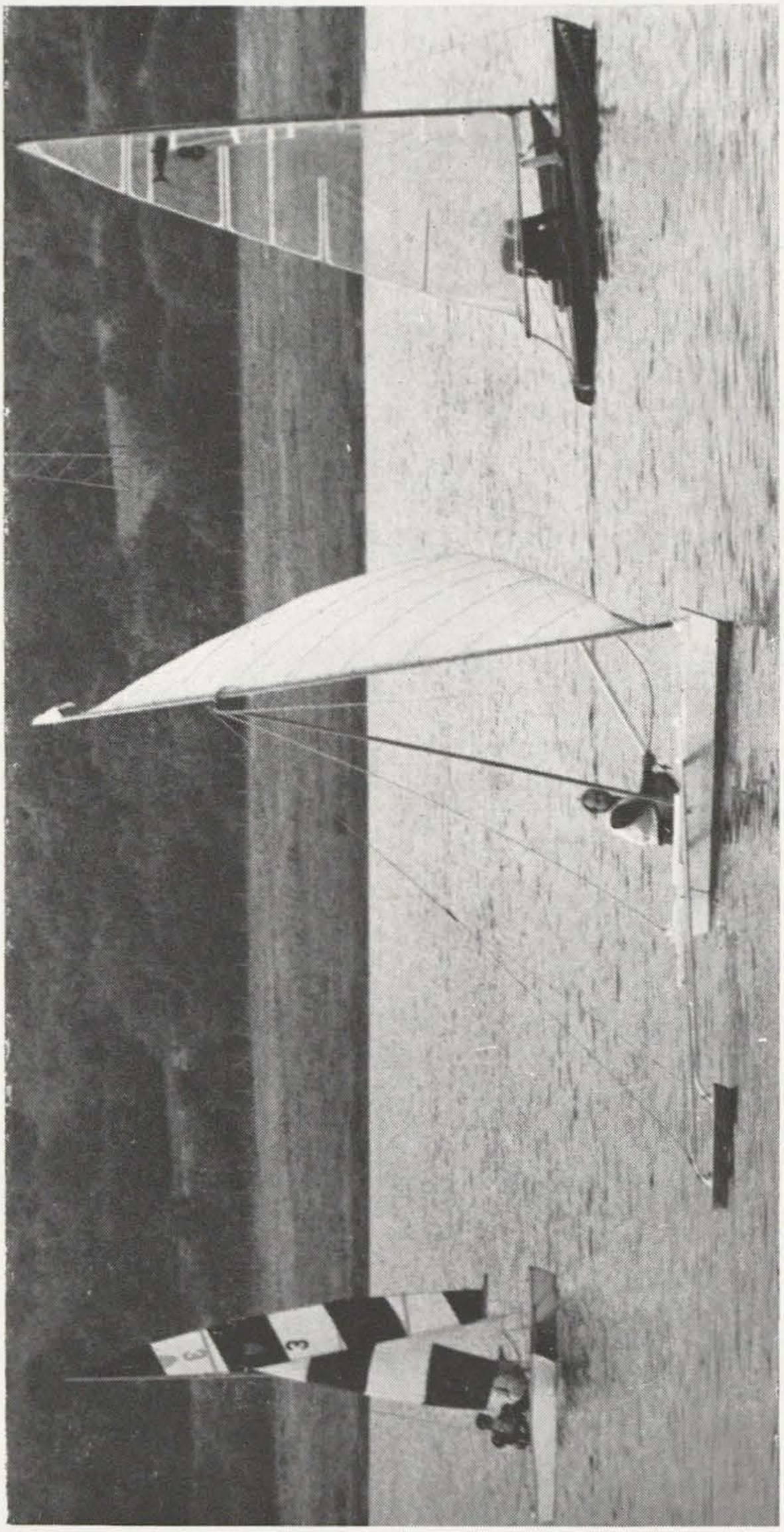
Don Rigg's GOONRAKER



John Partington's TABUARIK I

fantastic speeds. In view of the surface " fuss ", however, there may a case to use a low aspect-ratio hydrofoil, possibly of a plan form of an equilateral triangle of 5 ft. sides. This would have a buoyancy of 80 lbs. It would give the dynamic lift and depression needed with a buoyancy for balancing in light winds.

Paul Ashford's TRIPLE SEC—BRUCE foil



Chris Hughes' KIAKIA—Shark Trimaran

The main thing was that we all enjoyed ourselves. We saw some interesting boats and had pleasant sails.

Our thanks are due to Dennis Banham for all the trouble he took to organise the meeting and to Weir Wood Sailing Club for decontaminating our boats so expeditiously—a process which was necessary to prevent our boats from carrying in some disease of trout.

FIRST WORLD MULTIHULL REGATTA

BY

R. L. ANDREWS

Victor Tchetchet is a great poineer of multihull design and development, and he is Commodore of the International Multihull Boat Racing Union, so that it was fitting and appropriate that the first world multihull regatta was held on western Long Island Sound near Victor's home on September 22nd-24th, 1966. The boats were raced in two main divisions—cruisers and day racers.

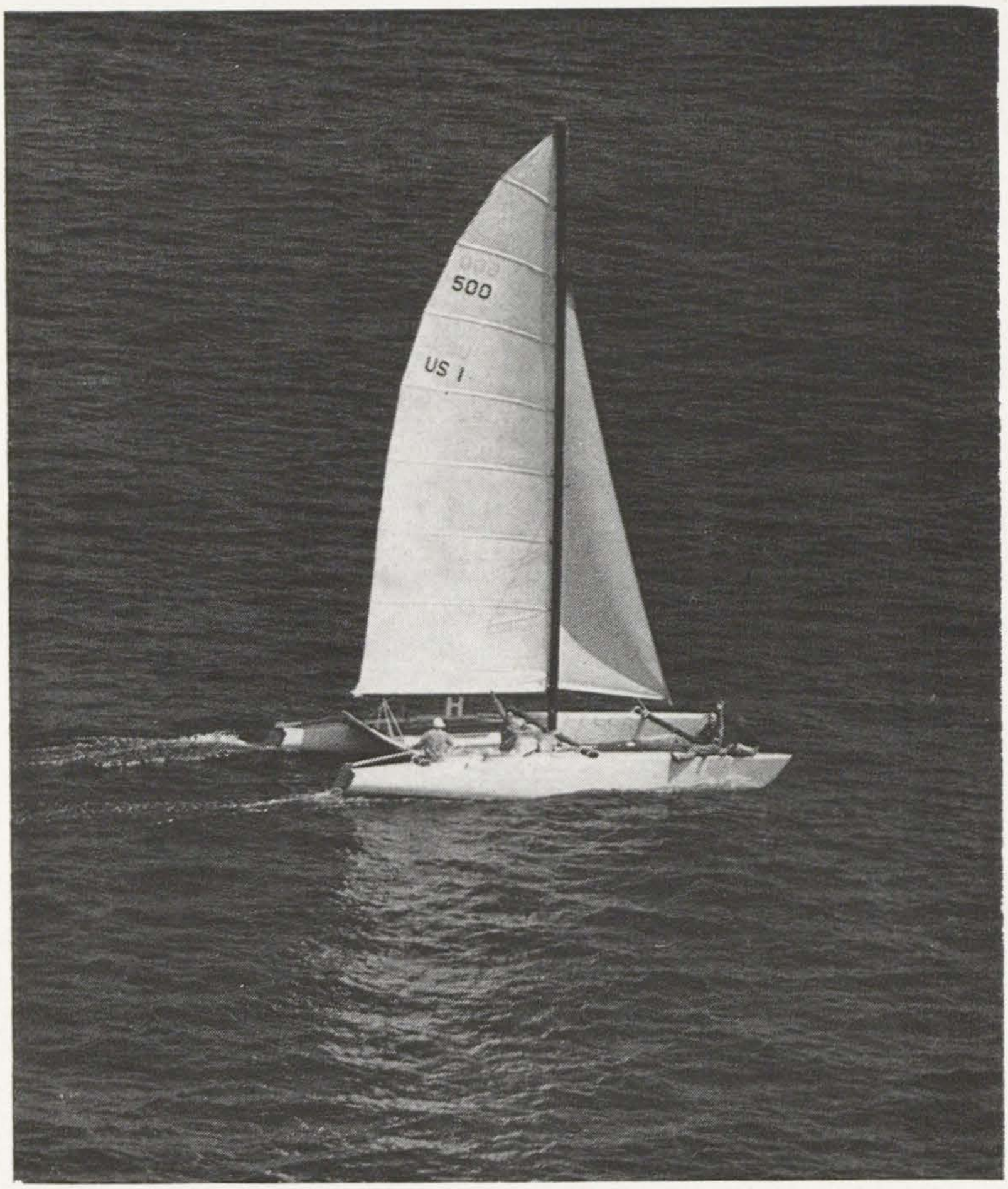
The general winner for the fastest elapsed time was *WILDWIND*, a very large and powerful day racer of 32 ft. length with twin symmetrical hulls and trampoline deck, carrying 500 ft. of sail in a sloop rig. In the strong winds prevailing, she simply flew. Her owner and skipper is Harry Bourgeoise of Altadena, Cal.

Arthur Piver and his *STILLETO* just ran away with the race in the cruising division, finishing about one and three-quarter hours before the next boat over a 21 mile course ! She was rather higher out of the water than the *STARTLED FAUN*, built to the same lines, which participated in the Round Britain race. A long second to Arthur was J. P. Harvey with a Piver *NIMBLE*. All the multihull cruisers however, stood to their canvas very well in the stiff wind, while conventional craft around of their size were well snugged down.

The winner among the day racers—practically all catamarans—was Walt Hall with his *SHEARWATER IV*—on corrected time. Behind him came Skip Banks with a Hubbard "*B*" *LION* and then John Wilson in a *THAI MARK IV*. In the smaller "A" cat division a Hubbard "*A*" *LION* sailed by Greer Ellis took a first, followed by Dennis Posey in a cat of his own design, and then Jerry White in a design by B. Lustrom. These little cats and their intrepid skippers made quite a picture flying along in a great froth; probably some of them never sailed faster than on the final reach to the finish !

Unfortunately not all the craft escaped unscathed. There were a few capsizes and lost sticks, and a quite unusual flip after the finish by Pete Schweers with his "C" cat *COBRA*. Coming into the wind with sails down and his wing mast athwartships, Pete thus came aback—the *COBRA* reared up—and over backwards she went !

The steady strong wind throughout the regatta perhaps kept many local craft home but the picture one remembers is of flying sails backlit in the autumn sun and sleek hulls afroth all going at a wild clip for this first international multihull regatta in the waters where Victor Tchetchet first sailed his twin and triple hulled creations years ago—coining the word " trimaran " for those of Indonesian inspiration.



WILDWIND—A " D " CLASS CATAMARAN

L.O.A.	32 ft.	Weight	1375 lbs.
Beam	16 ft.	Sail area	500 sq. ft.

Designer: Bob Reese.

Owners: Norm Reese and Harry Bourgeois, Balboa Yacht Club.

The biggest news in America this year is the exciting new " D " Class catamaran *WILDWIND*. She has been first to finish in every race she entered this year, including the 120 mile Ensenada race, in which she beat the other cats by over four hours. She also beat all the racing cats in Victor Tchetchet's First World Multihull Regatta.

WILDWIND is demountable in two hours, has a trampoline bridge deck, one bunk in each hull, daggerboards and a rotating mast. Probably the most interesting structural development is her " Rabbits ears," the twelve fibreglass collars which the three aluminium cross members fit into. The strands of glass are dispersed and resined (glued) against the hull sides so the strains are well distributed.

WILDWIND is generally 10% to 15% faster than the biggest West Coast ocean racers, including *AIKANE*, *PATTY CAT*, and so on.

(Information sent by Hugo Myers, 8011 Yorktown Avenue, Los Angeles, California.)

THE INTERNATIONAL CATAMARAN CHALLENGE

LADY HELMSMAN, the British boat, beat *GAMECOCK* from America by four races to two (1966). *LADY HELMSMAN* was sailed by Reg White of Sail Craft, who built her, and John Osborn, *GAMECOCK* by Bob Shields and Jim Bonney while George Patterson, her designer and part owner was there to supervise things.

The races this year were notable for the first use of una rigged wingsail masts without jibs and the structural failures associated with their weight in both boats. *LADY HELMSMAN* broke her fore beam in the first two races while *GAMECOCK's* mainbeam worked loose in one hull, allowing water to get in and the hulls to wring. These " teething troubles " with wing masts, due to their weight were almost inevitable but it was unfortunate that they should have occurred in this series.

First Race. A strong wind, 15 knots gusting to 20 knots, against the flood tide produced a short, very lumpy sea which must have tested the construction of both boats to the utmost. *LADY HELMSMAN*, pointing higher and footing faster than *GAMECOCK*, on the first beat reached the weather mark 60 seconds ahead and picked up another 6 seconds on the downwind leg to the second mark. She thus had clearly proved herself faster by the time the forebeam collapsed. *GAMECOCK* then finished the course to win the race.

Second Race. The winds were lighter and the sea calmer. The pattern of the first race was repeated almost completely, *LADY HELMSMAN* again building up a lead of one minute at the first mark and increasing it till the forebeam again broke, *GAMECOCK* sailing round to win.

Third Race. As nothing broke in either boat, they sailed around the course with *LADY HELMSMAN* continuously increasing her

GAMECOCK

lead, to win by 7 minutes and 12 seconds, or about 2 miles in distance. The boats in this race were thus averaging about 17 miles per hour.

Fifth Race. Before this race, *GAMECOCK's* mainbeam fault had been corrected and the individual forestay to each bow replaced by the single stay and bridle she had used in the States. More flow was put into the sail as well. The result of these changes was a faster boat but not fast enough to beat *LADY HELMSMAN*, though the lead

had been cut to under a minute, when *GAMECOCK's* main halliard parted, being frayed through between the sail head and the halliard lock which (when working) takes half the compression strain from the mast. *LADY HELMSMAN* finished the course to win.

Sixth Race. Again there were light winds and again nothing broke in either boat. This race was the closest in the series but this was more apparent than real because *LADY HELMSMAN* had built up a lead of two minutes at first. *GAMECOCK* then reduced this to one minute, while a wind-shift allowed her to finish only 34 seconds behind.

Summary. The races were unsatisfactory due to the breakages but *LADY HELMSMAN* was undoubtedly a far faster boat than *GAMECOCK* and the final score of 4 to 2 did not reflect her superiority at all.

THE REASON FOR *LADY HELMSMAN's WIN*

BY

JACK KNIGHTS

By courtesy of the Editor, YACHTS & YACHTING

Although it is possible to list the factors which contributed to *LADY HELMSMAN's* win, it's not such a simple matter to assess their relative importance. At this stage too it's impossible to guess how much she was helped along by the new graphite preparation on her underbody which her sponsors, Helmsman Paints, will soon be marketing. One thing is certain though, she felt very smooth and smoothness is a quality to be aimed at.

What we do know is that *LADY HELMSMAN* was at least one hundred lbs. lighter than *GAMECOCK*. This must have had a favourable effect even if twenty pounds or so might justifiably have been squandered on more substantial crossbeams. Each time, so far, the Americans have brought over a heavier glass fibre boat and we have successfully defended with a lighter, wooden one. Any decade now, the penny may drop. Perhaps it has dropped already—Bob Shiels said afterwards that had their boat been built over here by Sail Craft it would have been 100 lbs. lighter. " We respect your craftsmanship " he said, whilst lamenting that over there they have lost the art of building with tree wood.

On the other side, *GAMECOCK* must be given full marks for her engineering. She was the best tied-together " C " Class catamaran that I have yet seen. In particular her pitched deckbeams, substantial dolphin striker and wires, all tidily faired, seemed much superior to *LADY HELMSMAN's* rule-of-thumb arrangements.

GAMECOCK's running trim was suspect. She seemed to me to have too much rocker in her keel profile forward and had too much buoyancy in her chest. Consequently, in spite of having plumb bows to get the most of the permitted maximum length, she was, as often as not, sailing along with several feet of her bows waving around in the air. By contrast, *LADY HELMSMAN*, starting off with less waterline length, ended up with more actual running length. *GAMECOCK's* plumb bows didn't help her pitching and pitching is a growing problem with the development of taller, bigger and heavier wing masts.

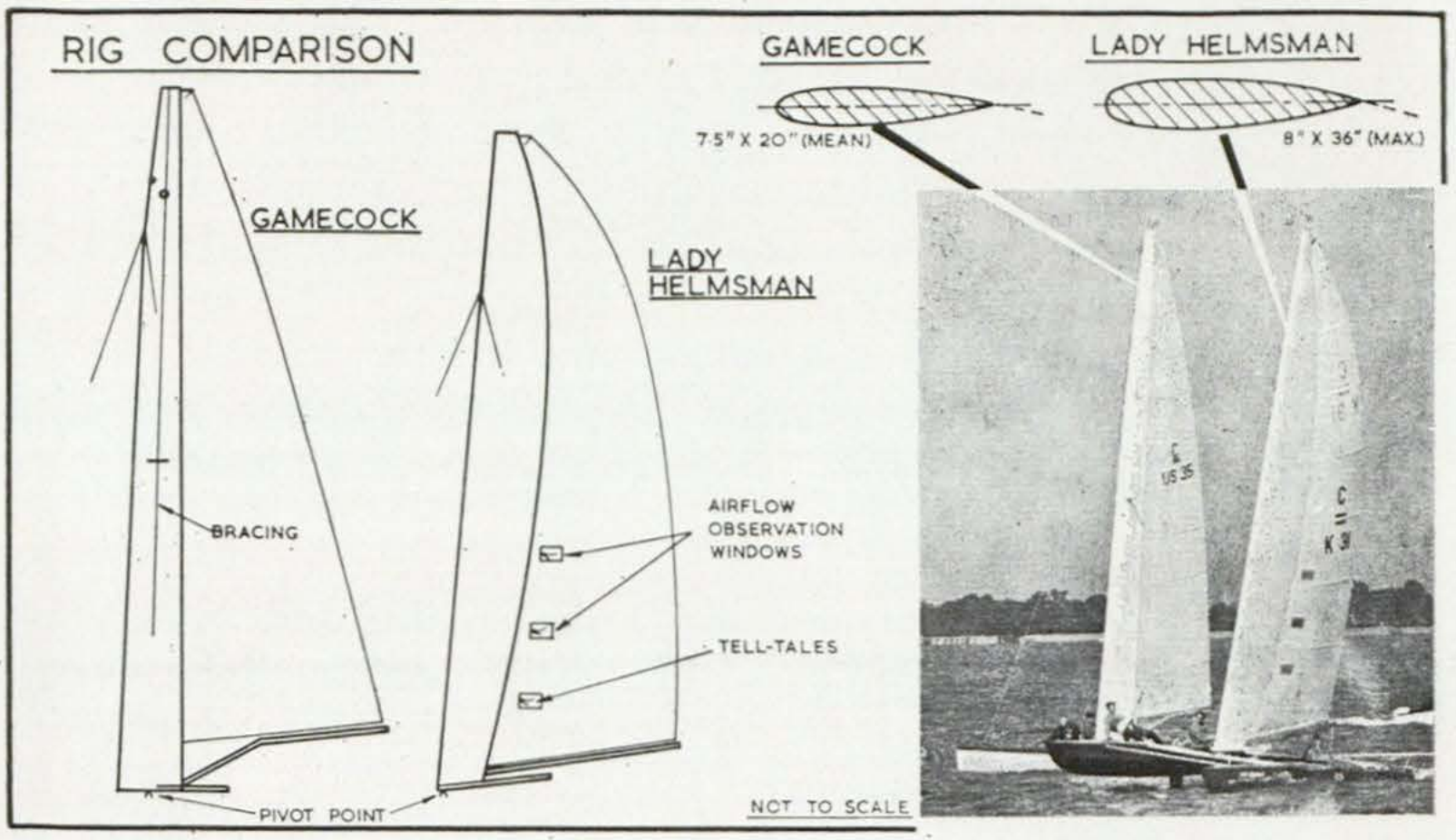
LADY HELMSMAN had a younger crew, but for the purposes of this match, a more experienced and, I think, skilful one. Reg White has now been concerned with four of the defences and John Osborn with two. Reg. gets better all the time, adding judgment and tactical assurance to his inbuilt coolness. John does everything as if his life depended upon it. The pair were tacking *LADY HELMSMAN* far quicker than any " C " Class cat has ever been tacked before, sometimes quicker than a *FLYING DUTCHMAN*. This hardly made a difference in this series, but there were times when *LADY HELMSMAN* slipped out from under *GAMECOCK* because of it.

Jim Bonney and Bob Shiels didn't help their chances by arriving too late to learn the water before the first race. White usually outgunned Shiels at the start and once you are behind in tidal waters, behind a man who knows the waters, that is, any departure from his course is almost always a mistake.

To my mind neither Shiels nor Bonney got as much out of their boat, beating and reaching, as White, who was always sniffing out the freeing puff almost before it struck.

The rigs may well have been the biggest factor of all. *LADY HELMSMAN's* big fat wing spar was so radical that when he first saw it, George Patterson could only scratch his head and wonder. Its shape was dictated by tests conducted by its designer, Austin " Clarence " Farrar after model tests in the Southampton University wind tunnel and elsewhere. It is based on two concepts. First that the best slow speed aerofoil is much thicker and blunter in the nose than the aerofoils in current aircraft, second, that by tapering the after edge to match the sail leech much of the sail twist could be eliminated and the mast blended with the soft sail.

LADY HELMSMAN's rig was also a foot or two shorter than *GAMECOCK's* with far more sail round and a less tapering headboard. Farrar believes, with many, that the narrow top of the conventional Bermudian sail does very little work.



GAMECOCK's wing sail was hardly less thick, athwart, than *LANE HELMSMAN's*, but very much less blunt. It was taller and narrower and had more rigging to support it, including two sets of diamonds. There was hardly any round to the leech. The very heavy, stretch-free sail had been cut very flat by Hard Sails and was said to be less elastic than the main of a twelve metre. Though there were many devices for increasing flow it didn't once look as full as *LADY HELMSMAN's*. *GAMECOCK* had an unusually powerful wire and rope mainsheet arrangement even for a class notable for powerful sheets. I thought there were times when they over did things, trussing her up too tightly, flattening the sail out too much. These boats are so flexible that you can go on pulling, but you only twist up the weather bow or overload the middle of the bridge deck.

LADY HELMSMAN's rig seemed at its best close reaching. The blunt leading edge may very well be less critical of angle of attack than a sharper one and thus more tolerant of small wind changes which cannot be met by the helmsman with his sheet or tiller and thus more practically effective.

LADY HELMSMAN's rig will obviously be copied, but how much further can it be developed ? Will the spar get progressively wider and the sail narrower ? Will it get fatter and fatter too ? Will it be worth experimenting with a still lower rig and helping weight, windage and pitching ? The theoretical advantages of high aspect ratio do not seem, as yet, to be borne out in practice. *LADY HELMSMAN*

used two "Seahorse" mains whilst *GAMECOCK* seemed to stick to the Hard one all through. *LADY HELMSMAN* has windows in her sail just aft of the spar through which her helmsman can see lengths of wool on the lee side. His aim is to keep these streaming evenly aft. When they hang down, or suck out, the all important flow over the lee side is breaking down.

One thing more should be said about the victorious British boat. She is to the same basic *HELLCAT* hull design which Rod Macalpine-Downie gave the first cup winner in 1961 and which has been guarding the trophy for us ever since.

She seems at the moment—but this may be a matter of rigging, sailing and such—to be faster than the plumb-ended new design which Rod got out for Wills this year and nobody has yet been able to make significant improvements to this six-year-old design.

LADY HELMSMAN

BY

JOHN MORWOOD

The Hull. This year, Rod MacAlpine-Downie designed *WILLS VENTURERS II* and *III* for Excel boats to build. Reg White, in Sailcraft was therefore left without a new design of " C " Class catamaran so he modified the *HELLCAT III's* mould to give it a knuckle forward, instead of external spray deflectors and built *LADY HELMSMAN* which, apart from the knuckle, is identical to *EMMA HAMILTON.*

As with *EMMA*, the bow sections are very fine with a 30° V (approximately) keel angle about 2 ft. from the forward end of the waterline. This broadens with approximately straight waterlines to the semi-circular maximum section. The afterbody gives the general impression of rising semi-circles of only slightly smaller radii.

The " Slicing " Bow. It is an interesting conjecture to weigh the slicing bow of narrow V sections against the round bottoms of semi-cricles. One would think that the narrow bow would pitch more and have more wetted surface and hence running resistance. But, when there is any lateral sail force and hence leeway, the fine bow might control the water flow and direct it back along the hull in a more fore and aft direction, thus decreasing resistance. Perhaps, it is thus the fore end of a low aspect ratio keel—a subject which is more fully discussed in a later article. It is from such small inferences that design improvements come and each possibility should be carefully thought about by " C " Class designers.

The Cockpit. This is absolutely flat from the outside gunwale of one hull to the outside gunwale of the other, thus giving the smoothest airflow over it and the least possibility of holding water. The trampoline is, of course, attached to the inside gunwales and the fore and aft alloy tubes. A bow tube is used to take the compression strain of the forestay span and to prevent wringing between the hulls.

The Rig. This is dealt with more fully in the next article but its weight was such as to cause failure in the main beam in the first two races of the International Catamaran Challenge against *GAMECOCK*. The wing mast was supported by only three stays without any jumper struts at all. The forestay was attached to a wire span between the bows of the hulls.

LADY HELMSMAN's WINGSAIL

Sailcraft built the wing to the designs and construction plan of Austin Farrar and *SEAHORSE* made the sails (of which there are four for different purposes) under his careful supervision. The wing is of fairly orthodox aircraft type of plywood over formers on a main spar. The first wing made, using a very thin ply skin weighed about 120 lbs. but it was thought that the risk of fingers sticking through it was too great and the one actually used in the trials weighed 148 lbs. with a thicker skin. The weight of the wing is thus far from negligible and undoubtedly a search will be instituted to get the weight down without making it too vulnerable. As already stated, the mast is held aloft by three stays only, the forestay going via a span to both bows.

The plan form of the wing was an idea of Austin Farrar's, based on the discovery of General Parham that an absolutely twistless sail could be obtained by using a curved mast with the concavity to windward. The very convex curve of the trailing edge of the wing produces the same effect as the bent mast rigs of General Parham but in a far handier fashion. Not only did Austin Farrar develop this idea but he made models of it and took them to Southampton University where they were tested in the wind tunnel until he found the best wing and sail shape for windward performance. He was also able to scale up the models to full size still keeping the shapes he wanted.

On the first sailing trials, a wishbone boom was used to take all the twist out of the sail and this gave an excellent performance but was rather hard to use as the optimum angle of attack was too delicate and some few degrees of twist were then deliberately allowed to appear to make handling easier.

At the foot of wingsails, there has to be some way of fixing the boom at a definite angle to the wing and this sail uses a backwards

projecting flat board on the wing whose angle to the boom is controlled by a four part purchase which leads to either side of the board and is held there by jamb cleats. The control between mast and sail is therefore a " fine " adjustment and the angle is set to give a fair flow from the wing onto the sail. The flexibility of the sail allows it to flick from one tack to the other by compressing the battens but it goes naturally to the correct angle as set by the four part purchase.

Conclusion. *LADY HELMSMAN's* wingsail has no twist, a semi-elliptical chord-length distribution and controllable flow. It should therefore be capable of giving the best possible windward performance and performance on a close reach, I do not feel myself able to comment on Jack Knight's point about the thickness of the wing's leading edge. It is hard to say how much of *LADY HELMSMAN's* success against other British boats as well as against *GAMECOCK* is due to her wingsail but I think that it was the final touch in an otherwise excellent boat.

THE EVOLUTION OF WINGSAILS

BY

MAJ.-GEN. H. J. PARHAM

I thought up the bent mast rig in December, 1947 and the 'lobster claw' rig (i.e., the ply covered aerofoil mast, preceding a twistless fabric trailing portion) in 1947 or 1948 and have sailed, mainly with the former ever since, day in, day out. The 'lobster claw' was clearly the better sail, the bent mast the more practical and more easily scaled up.

My finances and engineering facility (and ability) precluded my making any large rigs of either pattern but as early as 1948, I—an aeroplance pilot by instinct—had proved to my complete satisfaction that a sail was a 'wing stuck up on end' and that all attempts to argue otherwise were futile. This being accepted, one was forced to conclude that for fast windward work, the 'clean' low drag, unflapped monoplane was what was wanted. Experiments (full scale) to show whether 'wind gradient' could make twist desirable proved that it could not, and in fact, any serious degree of twist was bound to be wrong.

BELINDA ANN has now sailed on over 1,000 days during her 10 years and more of life—always with the bent mast rig and scores of people have seen her and remarked on her good performance with her small sail area (72 sq. ft.).

In the last few years, several " C " Class catamarans have used the 'lobster claw' rig, starting with George Patterson's *SPRINTER*. I have

always felt, when studying these rigs, that they had one serious defect in that the vitally important leeside curve was not really 'fair', because the curve of the 'lobster claw' mast was not continued smoothly into the fabric trailing portion, due to the twist which was inevitably present with a stayed mast. *LADY HELMSMAN's* rig goes very near to achieving a smooth curve, though it does not do so entirely. My abilities were not equal to thinking up a *simple* way of scaling either of my two sail conceptions up to the 300 sq. ft. of an International " C " Class cat.

Here it was that Austin Farrar came in with a stroke of great insight and made a design which combined 'lobster claw' and 'bent mast' rigs into one. The result is *LADY HELMSMAN's* rig.

GAMECOCK

BY

JOHN MORWOOD

GAMECOCK was designed by George Patterson and has an excellent hull shape for speed in smooth water. A vertical stem and transom make use of the full 25 ft. allowed, while a more blunt entry than with *LADY HELMSMAN* (hence saving wetted surface) fairs into the semi-circular maximum section.

The one feature of her design which is remarkable is that the maximum section is forward of midships, resulting in long, straight buttock lines like those of a dinghy. This feature could only have been used either with the idea of decreasing the hydrodynamic resistance or of pushing the centre of buoyancy forward to prevent nose diving. As a result of all our studies, I don't think the hydrodynamic resistance would be improved by such a shape because in general, the stern wave of catamarans is of such little value in pushing against the quarters and would in any case, be balanced by the " suck-down " from the hull bulging so markedly. However, from my observation of the performance of these " C " Class hulls, the shape does not appear to be as critical as the weight, and I think that *GAMECOCK's* hull design is as fast as *LADY HELMSMAN's*, except for the forward buoyancy which raised the stems out of the water.

Pitching. There was no doubt, however, that *GAMECOCK* pitched more than *LADY HELMSMAN* in lightish going in the Thames estuary. This appears to be a serious source of resistance in all boats and undoubtedly, this pitching was due to the full forebody.

The Rig. George Patterson was the man who first made the wingsail a racing boat's rig in his *SPRINTER* and the wingsail on *GAMECOCK* was excellently engineered—more or less on ice-boat lines. However, the gadgetry was heavy and a bit complicated. It was perhaps unfortunate for him that Austin Farrar had already had so much experience in wingsail masts and sails, most of which were never adopted.

THE BRITISH ELIMINATION TRIALS FOR THE DEFENDER

Eleven "C" Class catamarans took part in the British Championships held during International Catamaran Week at Sheppey. The final order was :-

(1.) *THUNDER II* sailed by Terry Pearce and Rodney Marsh.

(2.) *MANTA C.* John Mazzotti and Peter Shaw.

(3.) *LADY HELMSMAN.* Reg White and John Osborn.

(4.) *WILLS VENTURER II.* (5.) *WILLS VENTURER I.* (6.) *KITTY.* (7.) *MISS SENIOR SERVICE.* (8.) *WILLS VENTURER III.* (9.) *NELL GWYNNE.* (10.) *EMMA HAMILTON.* (11.) *THUNDER I.*

The first three and *MISS SENIOR SERVICE*, helmed by Neil Coster, were selected for the final trials at Thorpe Bay to decide on the defender of the International Trophy.

The early part of the week's trials was indecisive but slowly *LADY HELMSMAN* seemed to be improving on *THUNDER II*, beating her by 2 seconds and 4 seconds on Friday 28th August. The next day, with a stronger wind, the lead was 1 minute 20 seconds and 2 minutes 15 seconds.

As a result of the racing at Sheppey and these final trials, the selection committee decided that *LADY HELMSMAN* was continously improving in relation to *THUNDER II* and they therefore felt that she was the better boat. It must have been a great disappointment for *THUNDER's* crew who had so decisevely won the European Championships at Hayling Island as well as the British Championships and also to their great friends in *MANTA C* who had come second in these events. It was the superb qualities of both these boats which allowed *LADY HELMSMAN* to be raced in the "Little America Cup" in such a high state of tune.

THUNDER II, owned and designed by Rodney Marsh was written up in A.Y.R.S. No. 54 CATAMARANS 1965. John Mazzotti's *MANTA C*, sloop rigged the previous year was modified to an aerofoil masted UNA rig for this season.

THE AMERICAN 1966 " C " CAT SELECTION SERIES'

BY

ED. F. COTTER

Author of the International Book of Catamarans and Trimarans
(CROWN)

When this appears in print, George Patterson's wing-mast " C " class catamaran, *GAMECOCK*, will have journeyed to England and met the best of the British cats at Thorpe Bay, and the fate of the " Little Americas Cup " will have been decided for another year.

This account deals with how and why this 25 ft. twin-hulled craft came to be the U.S. representative for the sixth running of these International matches, dominated since inception by the British. Thus, we are permitted a backward glance, beginning in the spring of 1966, when U.S. " C " cat design and construction activity was mounting to fever pitch.

In May, the Hubbard's unveiled *ALLIANCE*, " C " cat No. 37, designed for Van Allan Clark, owner of the well remembered *BEVERLY*. At the Sea Cliff Y.C. regatta, now a spring multi-hull classic, *ALLIANCE* won top honors, showing her transoms to a mixed bag of older designs.

She had a multitude of new features, ranging from new hull shape to wing-mast with dual track upon which were mounted twin mainsails, each with full battens. These sails were designed to press together, but give some thickness to the airfoil section. New Jersey boatbuilder Bill Kier constructed the hulls, and Mead Gougeon, the trimaran wizard of the 1966 Yachting One-of-a-kind at St. Petersburg, Fla., was signed on to build the mast.

At the next test, Bayside Y.C.'s annual catamaran regatta on June 4 and 5, *HYDRO-GEN*, entry No. 2, appeared. She was newly constructed, with *ALLIANCE* hulls, from the same mold and builder, but with a different type wing-mast, a single mainsail, and other modifications by her owner, John Sangmeister, a Jersey Shore E scow sailor. Launched for the first time just before race time, she never got going, as *ALLIANCE* racked up another victory. This fleet included a *HELLCAT* design sailed by Steve Richardson and Gougeon's fabulous trimaran with Bob Smith at the tiller.

Meanwhile, George Patterson was nervously awaiting delivery of his new design, sponsored by Dave Siddons and to be skippered by Bob Shiels. Being third in line at the same builder's plant didn't help the ulcer department, but *GAMECOCK*, " C " cat No. 35, a second generation single sail wing-mast configuration, seemed to be worth waiting for.

Delivered in time for a few days of tune-up sailing, she made her debut in mid-July at the North American Multi-hull Championships, hosted by the Stamford Y.C. on Long Island Sound. Here, she swept every race, one by a margin of over 12 minutes. *ALLIANCE* and *HYDRO-GEN* weren't close.

But these were sailed in typical summertime Long Island Sound doldrums. The selection committee's work was just beginning. This group consisting of Ev. Morris, Ed. Cotter and Vin Rheinberger, had at this point noted that all three boats were looking better than " last year's " designs. *HYDRO-GEN* was improving race-by-race with the addition of Bill Cox to her advisory group. And while *GAME-COCK* demonstrated superior qualities in light airs, *ALLIANCE* closed the gap as the breeze increased. Thus, the stage was set for a fight to the finish on the following weekend at Narragansett Bay, noted for dependably strong sailing winds.

Host club, the East Greenwich (R.1.) Y.C. foresightedly provided a 14 ft. wide ramp for launching the big cats, and a well checked-out committee to provide essential services. Excellent weather prevailed. The breeze co-operated nicely, ranging from light to moderate on Saturday morning, on up to a spirited sailing breeze as the day pro-gressed, but the contenders had problems. Sailing now in a large open area with no interference from other classes, and with accurately constructed courses, ($1\frac{1}{4}$ mile beat, $1\frac{1}{4}$ mile right angle reach, then back to the starting marker for a windward-leeward lap) tactics, maneuvera-bility and dependability of gear and fittings came to the fore. And, as the chop and the wind built up, these were accentuated.

Bob Shiels at the helm of *GAMECOCK*, reaffirmed her light weather capability, to the evident satisfaction of George Patterson, her crew. Then, as the wind strengthened, *HYDRO-GEN*, skippered by owner John Sangmeister, with builder Bill Kier as crew, lost her mast while matched against *ALLIANCE* sailed by Van Allen Clark and crewed by Jerry Hubbard.

This casualty began as the mainsail began to pull out of the mast slot at the tack. Sangmeister, at that point elected to continue, as the slot seemed to hold after a a few feet of sail separated from the mast. All at once, after rounding on to the second beat, the sail pulled out to the mast truck, becoming, in effect, a masthead spinnaker. The

wing-mast, stressed for a balanced load throughout its length, snapped in two half way up. This seemed to be a good point to break for lunch, and all hands returned to the clubhouse.

After chow, *ALLIANCE* and *GAMECOCK* returned to the fray, but this time in the inner bay, as the wind and the waves had become a bit wilder. Rooster tails flying, *GAMECOCK* earned the next race, after a seesaw battle, showing fine maneuverability between tacks and excellent reaching speeds. In the next race *ALLIANCE* took an early lead but *GAMECOCK* passed her and opened out. Then, on a high speed reach, *GAMECOCK's* mast was observed to oscillate rapidly while the mainsail eased. *ALLIANCE* rapidly closed the distance and passed the obviously disabled *GAMECOCK*, which withdrew. Racing was discontinued for the day.

Later investigation brought out that *GAMECOCK's* mainsheet fittings had progressively failed in the heavier going. These had been fabricated from a three year old alloy with inferior tensile strength. Meanwhile, *HYDRO-GEN* was definitely out of the running, with no replacement mast in her inventory. Hurried efforts early Sunday a.m. by a local machine shop produced replacement fittings for *GAMECOCK* but on the trip out to the starting line, Shiels and Patterson became concerned about a bent mast tang, caused the day before by the wildly gyrating mast. Deciding discretion must rule (wing-masts cost about $800.) they returned to the beach.

ALLIANCE was on the line and raring to go so the committee put her through her paces alone, around a triangular course, clocking her at the finish with an average speed of 14 knots. After a huddle, it was ruled by the selection committee, that while *ALLIANCE* was the sole survivor, she was not the fastest boat, *GAMECOCK* having been beaten only by her own equipment failures.

With the agreement of the competitors a re-sail was scheduled for two weeks later at the same place, giving time for repairs, improvements and more handling experience.

Assembling again at the East Greenwich Y.C. on August 5th, all contenders were operable. In the interim, the other two cats adopted the semi-circular mainsheet traveler originally sported by *GAMECOCK*. This development, the committee noted, could equalize the handling ability of all boats and give a better gauge of hull and rig performance in the aggregate.

A fine day of racing was accomplished on Saturday. *ALLIANCE* and *GAMECOCK* started it off in a light easterly, and with the lead changing hands several times, *GAMECOCK* finished 29 seconds ahead. (*HYDRO-GEN* as standby boat, under the rules sailed the course on a not-to-interfere basis.)

Next match was between *HYDRO-GEN* and *ALLIANCE*, with the latter taking it by the wide margin of 5 minutes 10 seconds, as *GAMECOCK* showed her friskiness by working out on both boats, then returning, playing a cat and mouse game as standby boat.

In the third race, all three were started on a long beat in a fading southeast wind. *GAMECOCK* was first around by one minute, 53 seconds in the glassy going. As the boats headed north the beginnings of a fresh southerly were evident behind them. The breeze caught up, and on a spirited reach to the finish *GAMECOCK* held on to a 35 second lead over *ALLIANCE* and was one minute and 22 seconds ahead of *HYDRO-GEN*.

The final match race for the day saw *GAMECOCK* take the lead at the first mark by 40 seconds over *ALLIANCE* and gradually increase the margin to 8 minutes 42 seconds at the finish in a good wind.

Sunday morning the boats were blessed with a full-fledged southerly at the outset. In the lead-off contest *ALLIANCE* easily defeated *HYDRO-GEN* by one minute 7 seconds. Then *ALLIANCE* and *GAMECOCK* squared off. Van Allen Clark took the lead at the start, but Shiels was not to be denied on the wind and led by 11 seconds at the turn. Clark forged into the lead on the reach rounding the next mark 35 seconds ahead, but again faded downwind, trailing by 18 seconds at the leeward mark. Then Shiels, rounding too quickly, was trapped in stays, Clark drove through and finished the windward thrash 25 seconds in the lead only to lose it again on the downwind slide to the finish, as *GAMECOCK*, showing superb downwind tacking ability, went on to win by 47 seconds.

With the southerly now up to rail down velocity (for monohulls) all three boats were called to start. Shiels took the gun with the others in close pursuit. *ALLIANCE* led by ten seconds at the windward mark, as the absence of " beef " on *GAMECOCK's* trapeze began to tell, but her 130 lb. designer doggedly stuck it out.

HYDRO-GEN was fading fast and, even with Bill Cox now at the helm, looked to be out of contention. On the reach *GAMECOCK* dropped another 8 seconds as *ALLIANCE* revelled in the heavy going, rooster tails flying.

At the leeward mark *GAMECOCK* closed to within 8 seconds then suddenly withdrew, with Shiels announcing that one dagger-board had been sheared off on the reaching leg. Then in came *HYDRO-GEN* with both boards wiped away at the keel line. Later it was explained that if the windward board is not raised immediately at the beginning of a high speed reach, the intermittent slap of water along the lower tip (as the windward hull rises out of the water) sets up

enormous stresses. This can cause the board literally to tear in two along the keel line.

The above turn of events brought the series to an abrupt end. But the selection committee had seen enough, and as the fleet returned to the East Greenwich Y.C., the final report was being written.

Once ashore, Ev. Morris thanked participants and committee members and announced the selection of *GAMECOCK* to the assemblage.

She was picked, he explained, for her " wide range of superior performance, including exceptional close windedness, marked superiority in downwind tacking angles and on all points of sailing in the lower wind ranges."

Her weaknesses were also explored. These were; too light a crew for winds over 12 knots, occasional tactical shortcomings and minor equipment failures, all of which the committee felt were "susceptible to correction" before the matches in England. The committee was also strong in its recommendation that *GAMECOCK's* afterguard be strengthened by " a reserve helmsman and a crew of wide experience in major catamaran competition."

GAMECOCK, probably the last word in a wing-mast " C " cat (at least in the U.S.), is the culmination of 20 years of multihull work by George Patterson. Previously second best twice with *SPRINTER* his first " C " cat, Patterson feels that the 1966 record of *GAMECOCK* is a vindication of his efforts as a multihull innovator. Bob Shiels, her skipper in the trials, has only praise for the craft, saying " She has that extra drive to get us out of a tight spot or to make up lost ground.

THE LENGTH OF " C " CLASS CATAMARANS

BY

JOHN MORWOOD

I have done my best to evaluate every Challenger and Defender of the International Trophy since the Series started by looking at the boats and discussing them with people such as John Fisk, Austin Farrar, Roland Prout and, of course, there are the many letters which come daily dealing with catamaran design of one type or another.

Looking back on all these " C " Class catamarans, none so far except for the 1966 *GAMECOCK*, has tried to use all the 25 ft. they are allowed in length. All the British boats have been designed by Rod MacAlpine-Downie and have had a very fine entry and about 2 ft. of overhanging bow. I guess that they have sailed on an effective length of about 21 ft. *QUEST II* (Cunningham) from Australia was

faster than the Defender *EMMA HAMILTON* in 1965 and, with its canoe stern, was again sailing on a length of about 21 ft. though the hull was 25 ft. in overall length. *GAMECOCK* (George Patterson), with her rather full forebody, may however, have been using slightly more than the 25 ft. of her overall length.

It is my opinion at the moment that the sailing length of these " C " Class catamarans is not a very critical factor in their speeds in racing. If the catamaran is designed to sail on a shorter length, wetted surface is saved while the extra length is valuable in the higher speed range above 10 knots.

Length and Pitching. In the short seas of the Thames Estuary, small catamarans pitch violently while even the " C " Class pitch a bit and this adds enormously to resistance. The longer boat will obviously pitch less than the shorter one and this, according to John Fisk, increases the speed of the boat at even 3 knots. In a bobble of sea, *WILLS VENTURER III*, (Rod MacAlpine-Downie), with vertical stem and thus using 25 ft. of sailing length, noticeably pitches less than the boats with overhangs forward and increases speed relatively, whereas in a smooth sea, the boats of effectively shorter length go faster. It was quite evident that *GAMECOCK* pitched more than *LADY HELMSMAN* in the light going, possibly because of the fullness of her forebody.

In strong winds, pitching may be less of a problem because of the momentum of the boat and the press of the sail.

Designing for Minimum Pitching. The first factor for minimum pitch is therefore maximum length which in turn abolishes the overhang forward which also induces pitching. A fine bow and forebody will also pitch less than a full or flared forebody.

Pitch is caused by two factors. The first is the extra buoyancy when entering a sea which causes the bow to rise. The less this is, the less will the bow rise. The second factor is fineness low down at the bow which allows the bow to dig when it has fallen from its rise. The cure here lies in a relatively wide base to the forefoot such as would be found with a small semi-circle or right angled V chine foreward. It is perhaps noteworthy that *QUEST II* and Don Robertson's *FREEDOM* had this kind of forebody and both were extremely fast.

Conclusion. Minimum pitch is obtained by designing for the maximum sailing length, having vertical topsides with a fine bow and using deminishing semi-circles from the maximum section to the stem or running these off into a right angled V in the first 2 or 3 feet, rounding the corners at the chines to prevent turbulence.

THE FLOW OF SAILS

In the International Catamaran Challenge, *GAMECOCK* used a flatter sail than *LADY HELMSMAN*. It was a beautiful sail made by Hard in the U.S. Perhaps, however, the sail might have been more suited to monohulls which often have to throw away sail force and do this most efficiently by having sails flatter than the optimum.

According to my calculations, the sail force to windward is still increasing when the flow is increased up to 1 in 7 and some early *HELLCATS* had very large flows in their mainsails—as much as 1 in 6 and even more. It is not known how these large flows would work on wingsails but the flow of sails should have more thought than it has had up to now.

CATAMARAN AND TRIMARAN HULL DESIGN

BY

JOHN MORWOOD

The A.Y.R.S. has been studying catamarans and trimarans for eleven years now. Because I am their Editor, I have been lucky enough to see an enormous number of hull designs and tank tests and have always tried to see why one hull was better than another.

Wetted Surface. On sailing in the very first of the Prout series, *SHEARWATER I*, I realised that the waves produced by this narrow hull were small and this made the major cause of resistance wetted surface. This is still my opinion and some recent tests carried out on 10 ft. models at the Taylor Model Basin in the U.S.A. now confirm that two thirds of the resistance is due to wetted surface and their test speeds went up to values which would be 20 knots for a 16 ft. boat or 25 knots for a 25 ft. boat.

Reducing Wetted Surface. The underwater section with the least wetted perimeter is a semi-circle and the fastest catamarans and trimarans use this section for their largest section. All underwater sections forward of the largest section can also be semi-circles of reducing size but, although this was used for Don Robertson's catamaran *FREEDOM*, which was a very fast cat, it has not been used since to my knowledge.

The next way in which wetted surface can be reduced is by putting the buoyancy more at the ends of the boat by having a fuller bow and a submerged transom. The full bow, as in *SHEARWATER III*, tends to pound a bit but goes fast all the same. The submerged transom as in Michael Henderson's *PETANQUE* or the Hubbard brother's A, *B* or *C LIONS* trails a burbling mass of eddies at low speeds which

sounds bad but in fact has less resistance. Submerged transoms tend to slow the boat when putting about so the procedure cannot be overdone.

Wetted Surface on Heeling. Not only do we have to consider the wetted surface of the hulls sailing upright but we also have to think of the wetted surface when almost flying a hull and at intermediate states. I have worked out the wetted perimeter of two hull sections at various angles of heel for 1. semi-circles based on the waterline; 2. for semi-circles which would only immerse to the L.W.L. when flying a hull; 3. right angled V's; 4. box sections and 5. sections like the small end of an egg, which were developed by the Ancient Romans for their sewers. The least general wetted perimeter occurred with two semi-circles based on the L.W.L. on an even keel.

Wave Making Resistance. The only concession to wave making resistance which is needed in catamaran or trimaran hull design is a flattening of the floor aft. However, many designers simply raise the maximum section and seem to suffer no obvious penalty. I think, however, that the resistance is likely to be fractionally increased.

Length to Beam Ratios. For heavily loaded cruising catamarans or trimarans, a length to beam ratio of 8 : 1 seems to give the least resistance according to tank tests carried out by Edmond Bruce but where the weight is small as in racing craft, a ratio of 12 : 1 is better.

Placing the Greatest Section. This is placed at station 14 out of 20 stations in the Taylor Model basin series and Michael Henderson places *PETANQUE'S* section similarly.

Overdeveloped Catamarans. Where the class rules produce great lightness in weight and great length, as in the " C " Class catamarans, the length to beam ratio becomes excessive. It then becomes more than 12 : 1 and the principles of design alter. There is now no point in pushing the buoyancy to the ends of the hull and fine bows and sterns become possible. It is for this reason that the Cunningham's *YVONNE* and *QUEST* are such fast craft. However, it is also possible that shorter, and hence lighter catamarans with transoms as in Rod MacAlpine-Downie's *HELLCAT* could be faster.

Catamarans and Planing. It is quite obvious from all the tank tests and even from the above that catamarans never plane. The sailor thinks they do because their attitude is similar but what happens is that, at a critical speed, the bow wave comes far enough aft to float the hull up higher and this reduces wetted surface with an increase in speed.

Trimaran Floats. All the foregoing principles of the design of catamaran and trimaran main hulls also apply to trimaran floats. If the trimaran is large and both floats are placed high so that the weather float is always flying, even at moorings, it is moreover perfectly satisfactory. In Derek Kelsall's trimaran *TORIA* before the Round Britain Race of 1966, the few degrees of heel were not noticeable in the dock but at open moorings, the boat would flop from one float to another, which could be disturbing. Light racing trimarans, which would be kept on a beach would also benefit from this type of float.

My own earliest floats were of square section set on edge to give a right angled V. In his development days, Arthur Piver tried this shape out on his *NUGGET* and, though Jim Brown sailed 2,000 miles down the American west coast with this craft, both he and Arthur decided that the sea motion was uncomfortable, due to sudden lurchings. As a result, all the subsequent Piver designs have had floats with narrow V's, rather less than 60°. This improves the motion but increases the wetted surface and hence slows the boat.

Variations in Catamaran and Trimaran Design. Many designers in the past and at present have designed hulls which are either deeper or shallower than the semi-circle at the maximum section.

Those designing deep hulls claim that it abolishes the need for the centreboard. But in the end, extra lateral resistance is needed. They also claim that the sea motion is more kindly. This it may well be but narrow round bilge hulls tend to " Hobby horse " which is not so pleasant and the narrow hulls give small accomodation and extra wetted surface. The origen of the deep hull was the study of the traditional Micronesian hull which was asymmetrical but asymmetry is no longer thought by most to be of value with catamaran hulls. The modern exponents of the deep hull are Rudy Choy, with his partners Seaman and Kumulai. Their recent craft by attention to light weight and almost semi-cicrular hull section can be very fast indeed and have a very seakindly motion. They are delightful craft.

The shallow hull has some hydrodynamic principles to support it but, as wetted surface is so all important, it would not ordinarily be used for any purely racing multihull. However, it gives extra accomodation and quite a lot of stability so it is used by Hedly Nicol in his series and, in the most extreme form, by Dean Kennedy in America. The wide hull used by these two designers in their trimarans, allows the floats to be smaller in size and hence lighter. Dean Kennedy's trimaran is like a huge dinghy with small outboard floats but, in my opinion, has been taken a little too far because I think the extra sail area needed to drive the large hull requires larger floats to prevent the

knock-down gust of wind. Hedley Nico appears to have a more conservative proportion.

Simple Constructional Methods. The best multihulls must, of course, be made of moulded plywood which is time consuming for the amateur. This, in the first place, caused the adoption of the right angled V main section and chined construction. This type of multihull is fairly satisfactory and goes well through not as fast as the round bilge type. It almost has enough lateral resistance to sail nicely to windward but most types need boards to pivot on when putting about. Boards or fins on the floats are not always as satisfactory as a centreboard with trimarans, though they often are in the small sizes and usually are in the large sizes.

Developed plywood has proved utterly satisfactory in John Mazzotti's *MANTA* series. Plywood sheets are cut out to a certain shape, joined at the keel and pulled up into a catamaran hull. This seems to me to be the ideal method for the amateur as framing is reduced to the minimum. Erick Manners and I were early experimenters in this field but our boats have not had the success of the *MANTAS*.

The modified box section is also a cheap method of construction and easy to make. This took its origin from the modern Polynesians who no longer have trees to make dugouts or the time or incliniation to do so. Instead, they use planks and thus developed the box section for the main hull of their outriggers. Before the importance of wetted surface was realised, many Westerners used this section and, with Marine plywood, it was undoubtedly fast in the right circumstances, as shown by that great pioneer Victor Tchetchet. At the present time, James Wharram, in his delightfully conceived catamarans is one of the few designers to use it but, by using a plank for the bottom, he can round it off somewhat and thus have a cheaply constructed boat. For instance, the 38 ft. trimaran which he produced for the Round Britain Race was alleged to cost only £500.

Light Weight. The resistance of all multihulls is due to wetted surface in the main and designers must always keep this in mind. But possibly the greatest cause of wetted surface is weight. Therefore, other things being equal, the race will always go to the lightest boat and this accounts for apparent exceptions to the design features which I have given above. For example, the trimaran which the Gougeon brothers took the YACHTING One-of-a-kind races at St. Petersburg in America in 1966 was by far the fastest boat there, though the hull and fioat sections were rounded right angled V's. However, the floats were made of 3-32 inch total thickness without any ribs or reinforcements and the main hull was in proportion. The cross beams appear to be

fantastically light, too, so the boat weight was very small indeed, thus reducing the wetted surface more than most people realise. If of the usual construction, this boat might have been of only average performance, though the whole concept is most excellent. We know, too, of several other race winning boats whose speed was only due to the most careful pruning of weight, whose main effect was to reduce the wetted surface. Therefore, the most careful attention to weight must be paid by any multihull designer.

Windage. It was an early observation with catamarans that windage was of the utmost importance when going to windward and when putting about. Lattice cross beams, for example, though light, ruined the windward performance which improved when the lattive was streamlined with plywood. The Gougeon brothers' trimaran might have been even more successful, if they had used light alloy poles instead of their lighter built-up cross arms.

Conclusion. I have tried in this article to state all the things which would allow a designer to design a multihull for any purpose. I trust that I will be forgiven for any omissions and that the supporters for designs other than those I consider best will at least realise on what I base my opinions. Members of the A.Y.R.S. who have regularly read our publications will have seen these concepts slowly developing and being argued throughout the years. Many of the relevant publications are still in print and may be still got.

LOW ASPECT RATIO KEELS ON MULTIHULLS

So far, we have not heard of any trials of our suggestion of last year of trying low aspect ratio keels on a catamaran fitted as a temporary measure to vertical boards which would be pushed up into the centreboard slots from below.

The arguments in the favour of low aspect ratio keels on multihulls are: 1. In the Cross, Macouilliard and Nicol trimarans, they work very well indeed. The latest converts in the cruising field are the Prouts in their *SEA RANGER*, 45 ft. catamaran and they are most enthusiastic. 2. Keels are very sensitive to Reynolds Number, which means either more speed or more fore and aft length because both of these have less resistance and greater lateral resistance. This was an experimental finding by Bill Mehaffey and others but this can be converted into a " traditional argument " as follows :

Sailing boats nearly always travel with some amount of leeway. This means that water is flowing underneath the hull and eddying on

the weather wide. If now, a low aspect ratio keel is put below a hull, it constrains the water flow on the lee side to run more fore and aft and, when the water flows underneath it, producing eddies, these are kept away from the hull, thus descreasing its resistance.

The only argument in favour of centreboards is that they work better in dinghies because they have higher reactive forces on them. This could be outweighed in the case of the narrow hulls of catamarans and trimarans by low aspect ratio keels producing higher reactive forces on the hulls.

The Design of Low Aspect Ratio Keels. Taking into account the above arguments tank tests on deep keeled single hulled yachts and the profile of the American traditional boat—the New Haven Sharpie, I guess that the best shape is as follows :

(1) The keel starts at the lower end of the stem or the fore end of the L.W.L. and sweeps back in a convex curve to its greatest depth which is where it abruptly finishes.

(2) The keel finishes at 60% of the L.W.L. from the fore end.

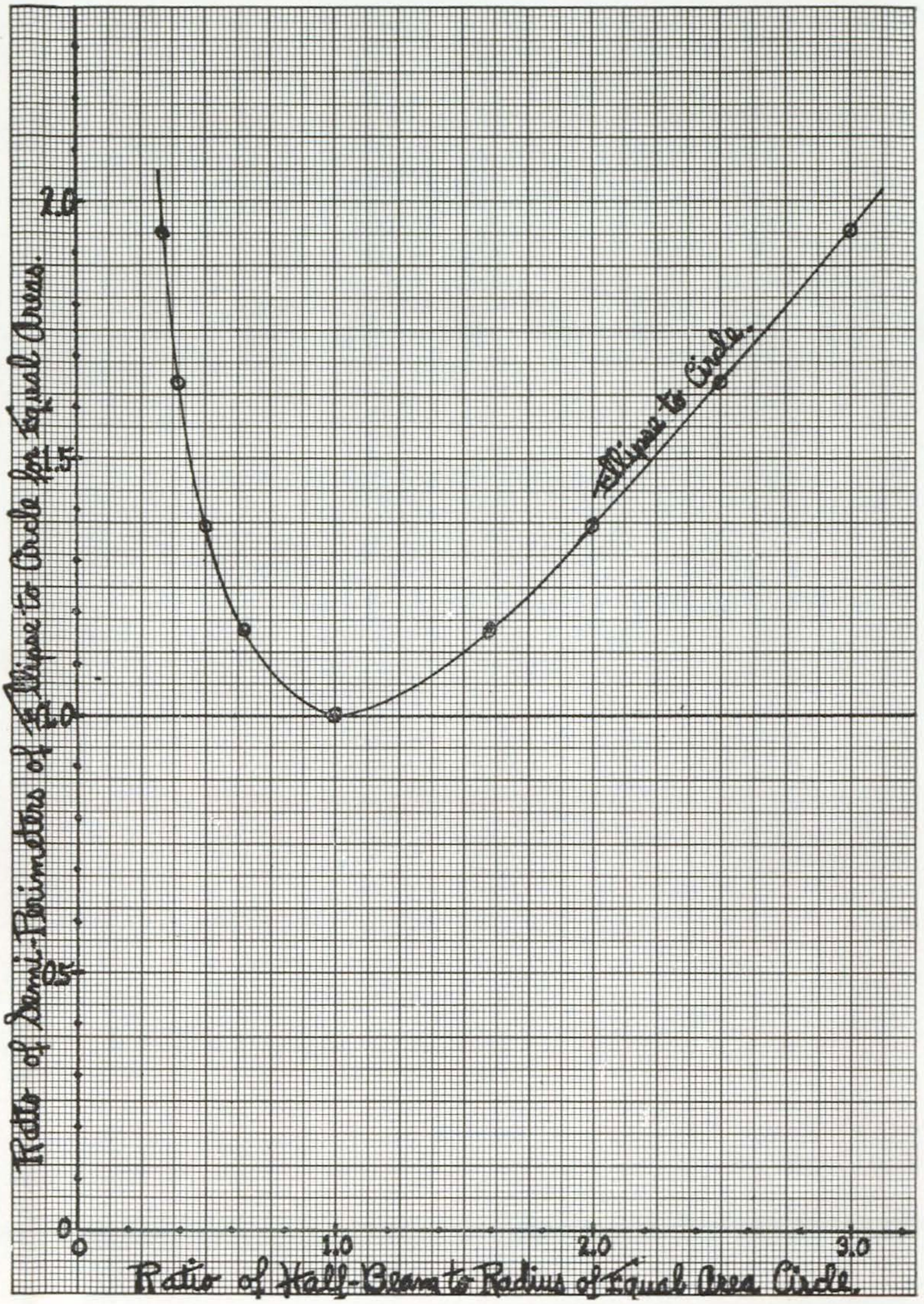
(3) At each point along its length, the fin is as deep as the hull below the L.W.L. when the hull beam to immersed depth is 4 : 1 and half that amount when the immersed section is a semi-circle, though I may be wrong in this last figure.

(4) The bottom of the keel might need to have sharp edges to throw the eddies away from the hull.

A practical example of this may help. A *SHEARWATER III*, for a test, would need to have a plank 10 ft. long and shaped to an "edge-set" triangle with the after end some 3 inches wide and faired off to a point. Some keels of roughly this shape have the after end vertical, some slope it forward and some slope it aft. No guidance on this can be given.

SHALLOW AND DEEP CATAMARAN AND TRIMARAN HULLS

I think we all agree that wetted surface is the greatest cause of resistance of cat and tri hulls. However, Rudy Choy in the C/S/K catamarans and Hedly Nicol in his trimarans depart from the semi-circular main section. Choy uses a deep semi-ellipse while Nicol uses a shallow one. It is therefore interesting to see what is lost by these two designers in the way of wetted surface by this departure. Having forgotten the relevant mathematics myself, I asked Edmond Bruce to work out the figures for me and these follow.


Ratio of Semi-Perimeters of Ellipse to Circle for Equal Areas
2.0
1.5
1.0
0.5
0
0
1.0
2.0
3.0
Ellipse to Circle.
Ratio of Half-Beam to Radius of Equal Area Circle.

The Shallow Ellipse. From Bruce's graph, if the half beam-is 2 and hence the draft is $\frac{1}{2}$, making a beam-depth ratio of 8 : 1, the wetted perimeter is increased by 37%. If the half-beam is 1.5 and the draft 2/3 making a beam-depth ratio of $4\frac{1}{2}$, the increase of wetted perimeter is $12\frac{1}{2}$%. If the half-beam is $\sqrt{2}$ and the depth $1\sqrt{2}$, making a beam-depth ratio of 4, the increase in wetted perimeter is 10%. If all the sections were of the same shape, thus increasing the overall wetted surface by 10%, the speed would be reduced by about 5% which I think would be tolerable for a cruiser.

The Deep Ellipse. If the half-beam is reduced to 0.7, increasing the depth to 1.414, giving a beam-depth ratio of 1.0, the wetted perimeter is increased by $12\frac{1}{2}$%. This would reduce the speed by over 5%.

Conclusion. Deep ellipses increase wetted perimeter more than shallow ellipses. We know that they are hydrodynamically less efficient for speed in smooth water. Their only value is their greater seakindliness. The accommodation in the hull with a shallow ellipse master section is, of course, greater.

Dear Dr. Morwood,

I have just returned from Massachuesetts which included a most pleasant visit at the home of Henry Morss and trips aboard his instrumented tri-maran *COQUI.* Your letter of 11-8-66, which inquired about the perimeter of ellipses, was waiting for me upon my return.

Let us assume that the wetted perimeter of a cross-section of a hull is a semi-ellipse. One semi-axis of this ellipse, which will be called " a " is half the beam while the other "b" is the depth.

In altering the shape of a hull's cross-section. the under-water area must remain the same if the hull's buoyancy is not to be disturbed. This underwater area is $\frac{\pi}{2} \cdot a \cdot b$ for a semi-ellipse. The limiting case is a semi-circle where, $r=a=b$ or the semi-area is $\frac{\pi r^2}{2}$ which is familiar.

To keep the elliptical semi-area constant, $a \cdot b$ must remain constant. Then, $a \cdot b = r^2$ is constant if a semi-circle of radius r is the reference area. Then, $b = \frac{r^2}{a}$.

Now the perimeter of an ellipse can be best expressed by an infinite power series. I suppose that many non-mathematical readers will not like this. For those that do, the semi-perimeter is equal to :

$$P_{\frac{1}{2}} = \frac{\pi}{2}\left(a+b\right)\left[1+\frac{1}{4}\left(\frac{a-b}{a+b}\right)^2+\frac{1}{64}\left(\frac{a-b}{a+b}\right)^4+\cdots\right].$$

For the constant area, substitute b into $\frac{r^2}{a}$ This gives :

$$P_{\frac{1}{2}} = \frac{\pi}{2}\left(a+\frac{r^2}{a}\right)\left[1+\frac{1}{4}\left(\frac{a-\frac{r^2}{a}}{a+\frac{r^2}{a}}\right)^2+\frac{1}{64}\left(\frac{a-\frac{r^2}{a}}{a+\frac{r^2}{a}}\right)^4+\cdots\right].$$

Attached is a graph of the solution of this equation.

I do not suppose that this is the kind of a letter that you would consider appropriate for A.Y.R.S. publication. Possibly the curve alone could be published with an appropriate discussion of the subject matter you have in mind.

EDMOND BRUCE.

Lewis Cove, Hance Road, Fair Haven, New Jersey, U.S.A.
August 25, 1966

MULTIHULL SAFETY

BY JOHN MORWOOD

All multihulls can capsize. Thames barges and Dutch Botters have been capsized and many a square rigged ship has been rolled over in the " Roaring forties " and sent to the bottom. We may therefore take it as axiomatic that all capsizeable boats will be capsized sometime by someone.

All ballasted boats will eventually sink. Time ravages everything even polyester resin and fibreglass. Boats run aground and hit rocks, causing minor failures which will eventually add up to unseaworthiness. Ballasted keels, which have been tugging at the garboards for thousands of miles of open ocean will eventually tear them loose. Inside ballast is safer, according to Peter Tangvald and this seems reasonable.

The comparison between mono- and multi-hulls is open. " You pay your money and you make your choice." We are only concerned with multihulls here. The facts are these, excluding light racing types :

(1) As yet, to my knowledge, no trimaran with one exception, has ever capsized in deep water. They have been capsized when crossing harbour bars at low water with high, steep breaking seas. They have been capsized when run aground. Hedly Nicol's

VAGABOND was found with a hole in the bottom and is therefore assumed to have got into shallows. The exception was one of Dean Kennedy's smaller cruising boats which capsized on Lake Superior and it will be remembered that his trimarans are like large dinghies with small floats—very small in comparison with, for example, Piver's.

(2) Twenty foot catamarans capsize with fair ease, especially if lightly built and loaded. I don't know of any cruising types now on the market. James Wharram did, however, cross the Atlantic in a *very* heavily loaded 20 ft. catamaran with 200 ft. of sail.

(3) Two catamarans about 30 ft. long were rolled over in Auckland Harbour one afternoon two years ago and the same summer a similar American one went over. Mike Ellison, sailing *IROQUOIS* Round Britain, usually held his mainsheet in his hand, while in *TAO* of the same length, the sheet was always tied. Don Robertson, in the 36 ft. *SNOW GOOSE*, with lots of experience, described the race as " taking a bit of a chance." He has lifted a hull several times (mostly deliberately) and knows *SNOW GOOSE* as well as anyone can know a catamaran.

(4) In our model races, all the multi-hulls capsized, but the catamarans went over before the trimarans.

The Reasons. Trimarans have greater beam and less sail area than catamarans and this is the reason for their greater immunity to capsize. There are many more trimarans sailing about the oceans than catamarans.

Summary. No multihull is probably safe under twenty-four feet in length. Trimarans seem at the present time to be safe from that length upwards.

A *very* experienced sailor and crew can sail a lightly loaded 30 ft. catamaran with fair immunity to capsize. If heavily laden, a 30 ft. catamaran could probably be sailed across an ocean by an experienced crew. It is not to be recommended, however.

An experienced sailor and crew can probably sail a 36 ft. catamaran with over a ton weight of stores across an ocean. Rudy Choy, as stated later, carries about 3,000 lbs. of stores in his catamarans to Hawaii.

Catamarans above 40 ft. in length are quite safe, unless very lightly loaded.

Conclusion. Overall lengths are given for the " safe " sizes of trimarans and catamarans. They may have to be revised on later information which I hope A.Y.R.S. members will *not* be in a position to supply.

I.Y.R.U. *HELLCAT III* S

L.O.A.	25 ft.	Maximum draft	6 ins.
Beam	12 & 14 ft.	Sail area	285 sq. ft.

Designer: Rod MacAlpine-Downie.
Builders: Sail Craft Ltd., Waterside, Brightlingsea, Essex, England.
Price complete with sails: £1,225. Hulls: £107 10s. 0d.

This boat is the *LADY HELMSMAN* type so no comment is needed.

THE *A LION* CATAMARAN

L.O.A.	18 ft.	Beam	7 ft. 6 ins.

Sail area 150 sq. ft. (including spars)

Designers: D. & J. Hubbard.
Builders: Sail Craft Ltd., Waterside, Brightlingsea, Essex, England.

This boat made an enormous impact when it came out in the U.S.A. It will be remembered that its larger sister the *C LION* competed for the "Little America's Cup" in 1962. Outstanding winner of both the U.S.A. and R.Y.A. One-of-a-kind series in 1964, it led the field in catamaran design in that year and set the trend towards the UNA rig on the "C" Class. The hulls are mainly of glass fibre, with aluminium beams and trampoline floor giving an all up weight, including spars and rigging of around 300 lbs., thus enabling launching and general handling with the minimum of effort.

YACHTING WORLD CATAMARAN

L.O.A.	15 ft. 6 ins.	Max. draft	2 ft. 10 ins.
Beam	7 ft.	Sail area	175 sq. ft.

Designer: Rod MacAlpine Downie.
Builders: Sail Craft Ltd., Waterside, Brightlingsea, Essex, England.
Price complete: £311. Hulls in all stages of completion available as well as other parts.

Sponsored by the YACHTING WORLD, this little cat has had a good popularity. Naturally, the performance is not as fast as with the larger catamarans and her fibreglass construction is just a bit heavier than wood but she has no mean turn of speed and is the right size for trailing about the country.

Conclusion. The YACHTING WORLD Catamaran is a delightful catamaran for class racing and for day sailing.

SHARK CATAMARAN

L.O.A.	20 ft.	Max. Draft	3 ft. 5 ins.
Beam	10ft.	Sail area	260 sq. ft.
Weight	350 lbs.	,, ,, B Class	222 sq. ft.

Designer: Rod MacAlpine Downie.
Builders: Sail Craft Ltd., Waterside, Brightlingsea, Essex, England.

The *SHARK* is a B Class catamaran when it carries 222 sq. ft. of sail or it can be a One Design with 260 sq. ft. It is virtually an enlarged *THAI Mk. IV* by the same designer but the extra size gives extra speed and usefulness. The cockpit is hinged down the centreline so that both hulls and halves of the cockpit fold *downwards*, thus giving sailing strength with easy trailerability. One prototype was trailed over 6,000 miles through Canada and the U.S. and won every event in which she was entered, including all three races of the President's Cup at Washington. The other prototype had an equally successful season in England and won everything open to her, including the " B " Class R.Y.A. One-of-a-kind series.

Revolving centreboards are used instead of the more usual and less robust dagger boards and there is ample stowage space in four compartments in the main beam, as well as hull stowages through rear hatches.

IROQUOIS

L.O.A.	30 ft.	Draft	11 ins.
L.W.L.	26 ft. 6 ins.	,, (boards down)	4 ft. 6 ins.
Beam	13 ft.	Displacement	2 tons
		Sail area: 396 sq. ft.	

Designer: Rod MacAlpine Downie
Builders: Sail Craft Ltd., Waterside, Brightlingsea, Essex, England.

A production *IROQUOIS* was sailed in the Round Britain Race in 1966 by Mike Ellison and his brother. Some interior furniture was, however, removed to compensate for the extra 50 fathoms of chain which the rules required. She came in third on elapsed time and first on corrected time, thus proving herself a very fast boat when pressed. The only modification, apart from the removal of the furniture, was a provision of a mast head Genoa for extremely light conditions.

IROQUOIS was not designed for more than the usual coastal cruising and it is noteworthy that the very experienced Mike Ellison held the mainsheet in his hand for much of the race and also shifted the heavy weights into the weather hull. One doesn't therefore recommend *IROQUOIS* to be driven at full throttle in ocean cruising.

IROQUOIS

She is more for the man who wants a boat which can really be driven hard for short periods and can make fast passages across the English Channel. She has without doubt proved her seaworthiness in the Round Britain Race and was one of the few boats which did not suffer any damage whatever. This in itself is a recommendation for the quality of the construction of the craft.

IROQUOIS is a really handsome boat with an outstanding performance. She has high speeds if lightly loaded and manoeuvres easily on her twin centreboards. The cabin is well ventilated with all round visibility.

Construction. All exterior surfaces are moulded in glass fibre but for added strength, the bridge deck, superstructure and decks are made by the new method of sandwiching end grain balsa wood between layers of glass fibre.

Summary. *IROQUOIS* is a delightful cruiser for cross-channel and longshore voyages.

KATINKA

L.O.A.	15 ft. 11 ins.	Beam	7 ft. 3 ins.
L.W.L.	15 ft. 5 ins.	Weight about	418 lbs.

Sail area: 188.37 sq. ft.

Designer: J. C. Eisinga, v. Kinschotstraat, 166, Delft, Holland.

Members may remember the very sophisticated and well thought out design of *KATINKA* in A.R.Y.S. No. 50. Two boats have now been built to the design in fibreglass, one in Zandvoort on the Dutch coast and the other at Fluessen, a large lake in Friesland, and they have sailed enough fully to appreciate their qualities.

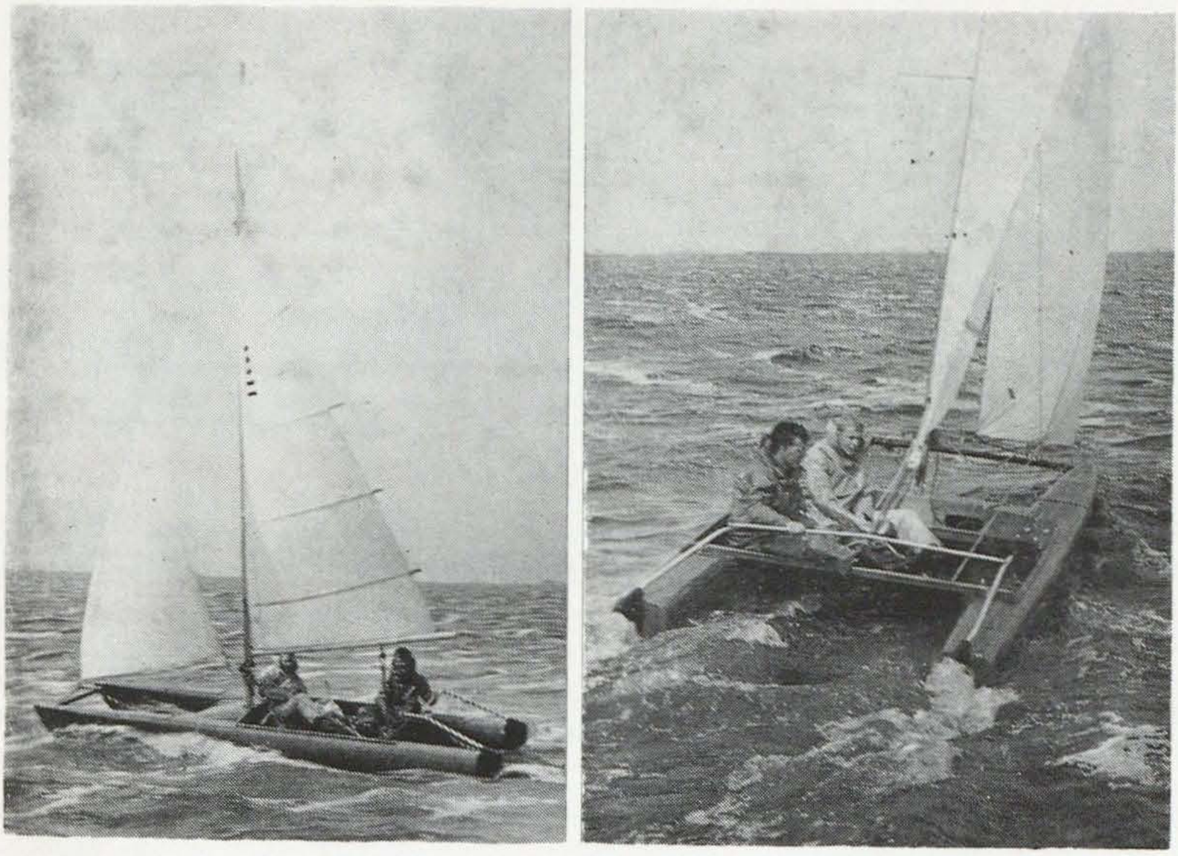
Speed. No other catamarans seem to be available in Holland to race against but pacing with a motor boat whose speeds had been checked, *KATINKA* did 19 knots in a windforce 5-6.

Manoeuverability. This is very good, the reason being given as the hydrofoil profile of the centreboards and rudder, which is balanced.

Dry Sailing. The boat sails very dry and spray deflectors were not necessary. The water which comes over is mostly caught by the coaming and there are enough drain holes to clear the cockpit quickly from what gets there. The reason for the dryness is given as the rounding of the deck and hull with flush hatches.

For Future Construction. To make the boat cheaper, all the woodwork will be replaced by fibreglass which is stronger and may abolish the need for the fore tube. The forebeam which supports the mast is now made of sandwich construction.

Cost. f4500 (about £450).



KATINKA

KATINKA

PROUTS *OCEAN RANGER*

L.O.A.	45 ft.	Headroom (Hull)	6 ft. 2 ins.
L.W.L.	42 ft.	,, (Deckhouse)	5 ft. 4 ins.
Max. Beam	20 ft.	Draft	2ft. 9 ins.
Hull Beam	6 ft.	Mast height	48 ft. 6 ins.
,,	L.W.L. 4ft. 6 ins.	Sail area (with Genoa)	1010 sq. ft.
		Displacement 6 tons	

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

This design is characterised by rounded decks and hence low windage and, I think, an improved appearance. There is, of course, an increase in headroom in the hulls as a result which can be of great importance to the taller man.

The second, and more exciting feature of the design is the use of low aspect keels with, it is claimed, an improved windward and reaching performance. These keels are 20 ft. long and 2 ft. deep and thick enough to carry 75 gallons of water in each. They are attached by careful fairing into the hulls which have a waterline beam of 4 ft. 6 ins. and a draft of only 9 ins. This is a greater waterline beam to depth ratio than would ever be used for a purely racing craft but it does give very roomy accommodation in the hulls at only slight sacrifice of speed (or increase of sail area).

Construction. This is in fibre-glass. All the features of the modern yacht are present and pleasantly arranged.

CRUISING TRIALS FOR NEW PROUT 45 FT. *OCEAN RANGER*

During the month of July daiiy trials and finally a cruise from Canvey to the River Blackwater and back completed the trials with the new Prout all glass fibre 45 ft. *OCEAN RANGER.*

The trials proved highly successful, and the boat proved herself to be an extremely fast well balanced and exceptional sailing boat.

All conditions were encountered from light force 1 to 2 winds to force 7.

The *OCEAN RANGER* which is claimed to be the largest ail glass catamaran in the world weighs approximately six tons and is built for comfort, strength and tough sea going seaworthiness, rather than speed. Her apparent exceptional speed comes as something of a bonus for the Prout Brothers design though of course with 45 ft. overall length and 1010 sq. ft. of sail very good multi-hull speeds were expected.

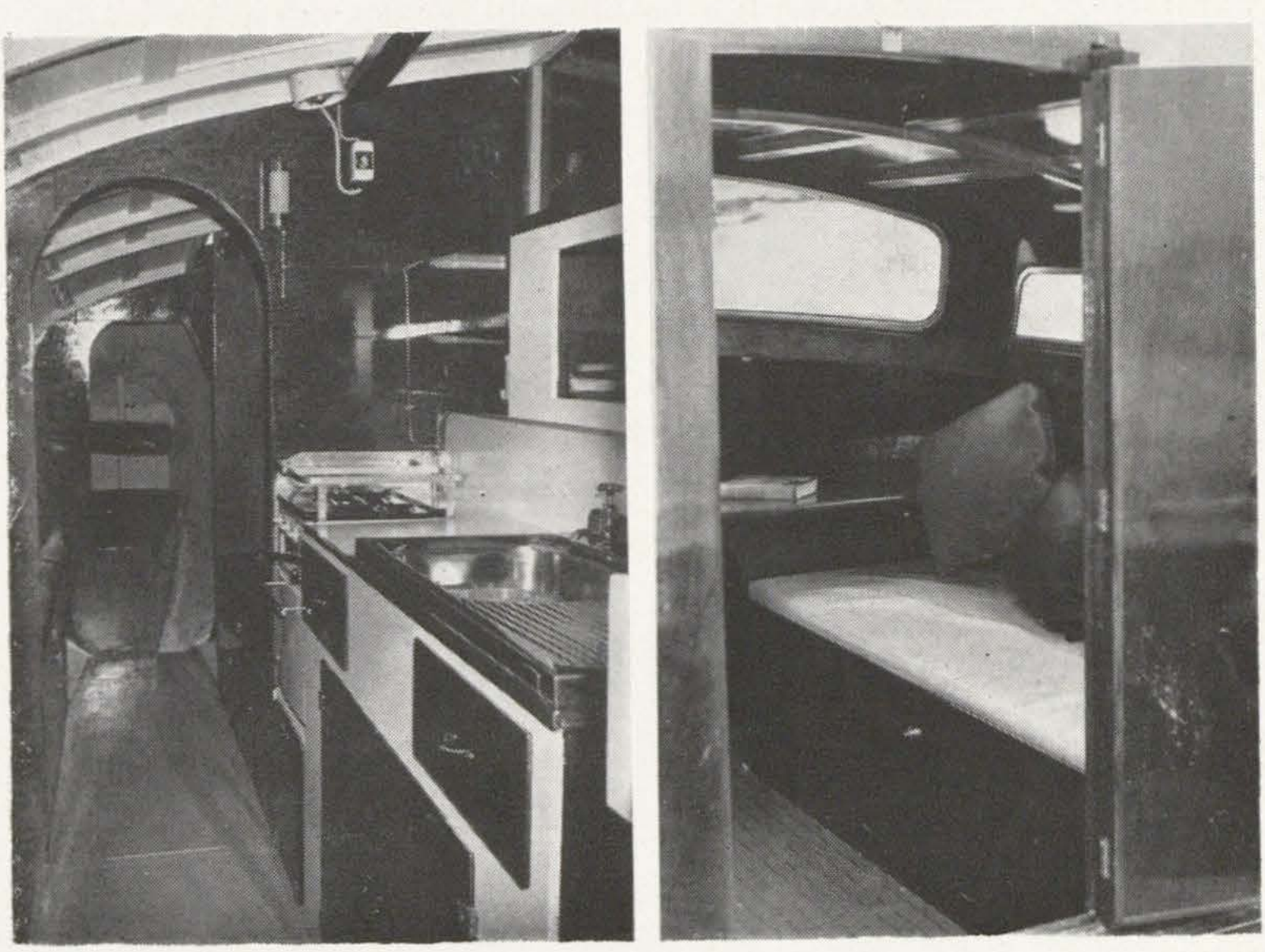
Perhaps the greatest feature apparent from the two weeks trials is

Prout's SEA RANGER—45ft. Catamaran

the crafts exceptional performance to windward and an easily obtainable speed of 9 to 11 knots in winds of only 10 to 12 m.p.h.

The ability to point very high is attributed to cleanness of design reducing windage to a minimum and the 2 ft. deep and 20 ft. long keels moulded into each hull, which replaces the centreboards previously fitted to Prout's large Cruisers.

The keels give the boat a 2 ft. 9 ins. draft, but the inconvenience of this slightly greater draft is more than compensated for by the fine directional steadiness the keels give and the extra space it allows in the



SEARANGER—Galley and Bridge Deckhouse

cabins. A 75 gal. water tank is built into each keel under the cabin floor.

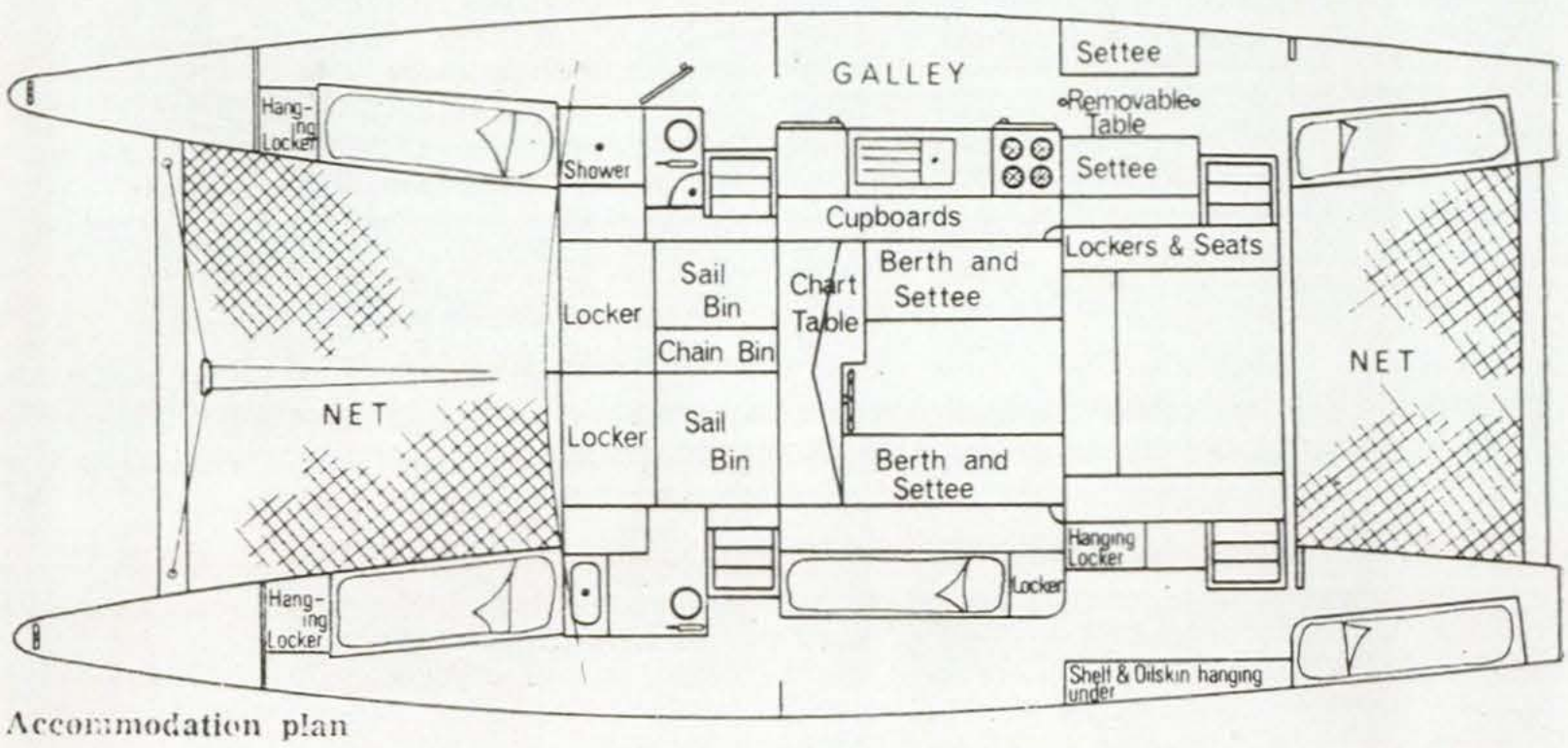
During trials in the stronger winds, speeds of 16 to 18 knots were attained in force six, with full main and working jib. Quite obviously the boat has far greater potential speed than this, and over 20 knots can be expected in certain conditions.

Auxiliary power is by a 50 h.p. Penta electric start outboard motor with remote controls near the steering position, and handlnig and control under motor is excellent. Cruising motoring speed with this motor is approximately 8 knots.

The builders and her owner Dr. Pugh are more than delighted with the fine performance this boat is showing and it is certain that many passages in complete comfort can be expected at an average speed exceeding 10 knots.

Her strength and weight give this craft tremendous power and stability, and in force 6-7 gusts experienced in early trials the *OCEAN RANGER* heeled little more than 2 or 3 degrees with tremendous reserve of stability left. The total beam is 20 ft.

The cabin accommodation in the hulls consists of six berths in separate cabins, two good sized wash rooms each fitted with a toilet, and in the starboard hull a large galley with oven, cooker, refrigerator, large household size stainless steel sink and ample cupboard and locker space. Also in this hull is a six people dining area with more lockers, setee and book shelf above.



Accommodation plan

SEA RANGER'S Accommodation plan

The bridge deck has a large cockpit with seats and lockers, the central cabin measuring 8 ft. x 8 ft. has a chart table, two settee berths and inside steering wheel. Large windows in this cabin allow for all round clear vision of the whole boat and ahead, so there is no need to move outside to take sights and watch the heading of the boat.

A self steering vane is fitted and although it is only the same size as it fitted to Prout's smaller Cruisers, it has proved just as effective owing to the light balance of the tiller.

Forward and aft between aluminium beams which are located at the extreme ends of the craft, there is a strong net giving approximately 12 ft. x 10 ft. working area fore and aft. On the aft net a 10 ft. dinghy can easily be stowed.

The mast is an International alloy spar 48 ft. high, and stayed with twin forestays and twin backstays, top side stays and fixed lower stays instead of runners.

Hull beam at the waterline is approximately 4 ft. 6 ins. on a waterline length of approximately 42 ft. Hull beam inside cabins at 3 ft. above floor level is 6 ft. and headroom in central and fore cabins just under 7 ft.

The completed craft including sails fitted out with the best quality fittings is in the region of £11,000.

Two things seem to have been apparent from this new design.

(1) The wider beam hulls do not seem to have detracted from a fast performance.

(2) The long shallow keels seem to give a better windward performance, and certainly a better reaching performance than the centreboards fitted to previous Cruisers.

Ed: One of these hulls would be excellent for a trimaran.

VIVA CATAMARAN A 15 FT. 9 IN. SAILER

Single Handed Racer. Two Person Knockabout.

Length	15 ft. 9 ins.	Weight	275 lbs.
Beam	7 ft. 6 ins.	Sail area	150 sq. ft.

Designer Ralf Flood, 3883 Sunbeam Drive, L.A.65, California.

The first question usually asked regarding a small catamaran day-sailer is—how does she go? Well, the day *VIVA* was launched she competed in a seventeen-mile coastal race involving twenty-one larger multi-hulls and over fifty of the top racing-cruising single hull craft under fifty feet. *VIVA* finished eighteenth, boat for boat. Since then, she has competed in many races and has never been beaten by any sailer of similar size and sail area.

VIVA's light weight and tall una rig make her an excellent performer in light winds, but she can really take it in rough water too, as her inboard appendage hulls (see fig. B) lift her over the chop and prevent excessive bow dive. Roller reefing of the sail is provided to cope with strong winds.

VIVA qualifies within the International " A " Class Catamaran Design Rules, and we can assure you she won't leave you trailing the fleet.

Construction is extra simple and the materials are utilized so efficiently that *VIVA* can cost you less than $550 to build, including aluminium spars, dacron sail, stainless hardware and trailer . . .

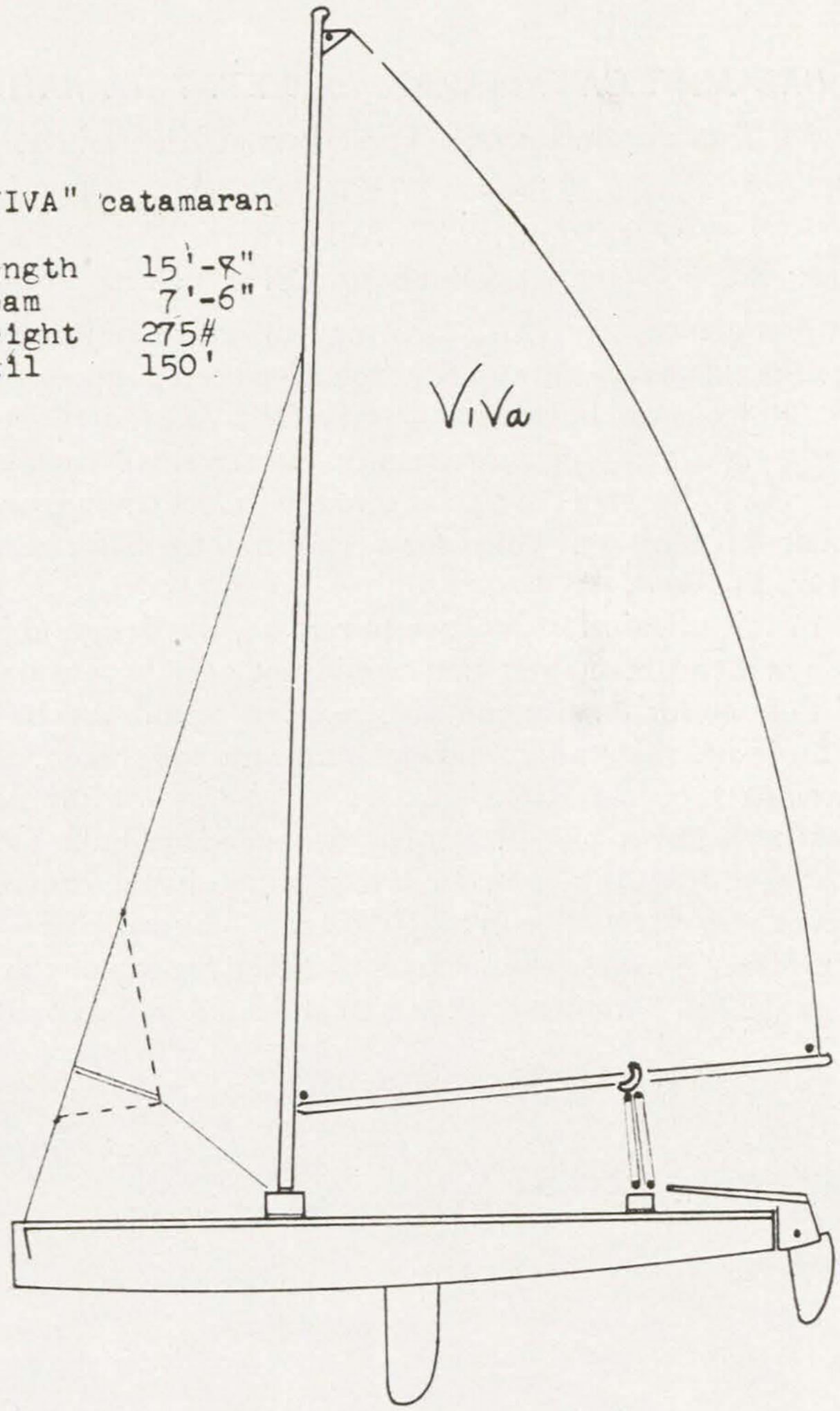
VIVA Catamaran

The bare hulls for the boat shown sailing were built in three days by a cabinet maker.

The optional 3 sq. ft. sail, snapped into place and sheeted with a single line secured to the centreline of the boat is installed on windy days to help the boat tack. The rudders can be swept back a little on windy days so the stern can be 'rowed' through the eye of the wind if the boat fails to come about. These features along with the ones mentioned above have fairly well solved the problems of a una rigged class " A " sailer.

"VIVA" catamaran

length	15'-8"
beam	7'-6"
weight	275#
sail	150'



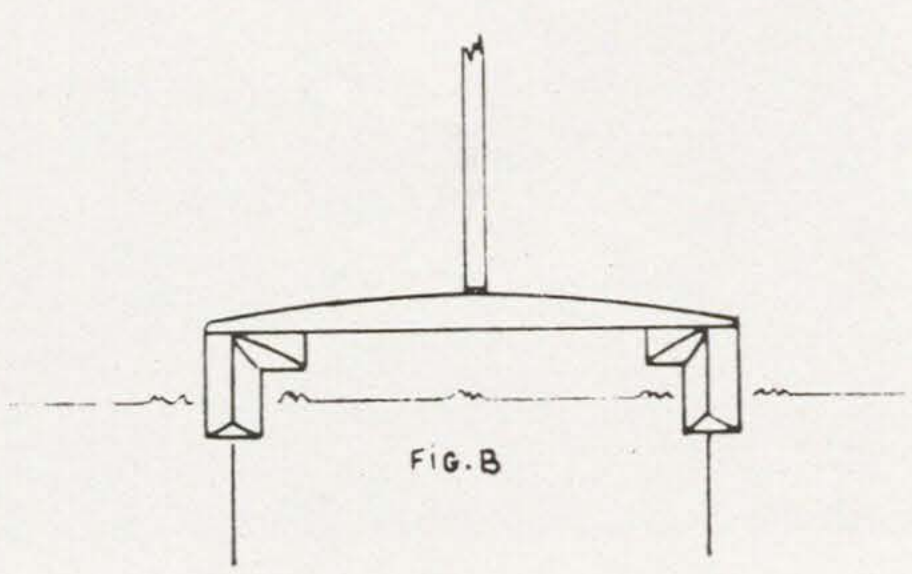


FIG. B

DEL MAR CATAMARAN A 19 FT. 7 IN. SAILER

Two Person Racer, Three Person Knockabout

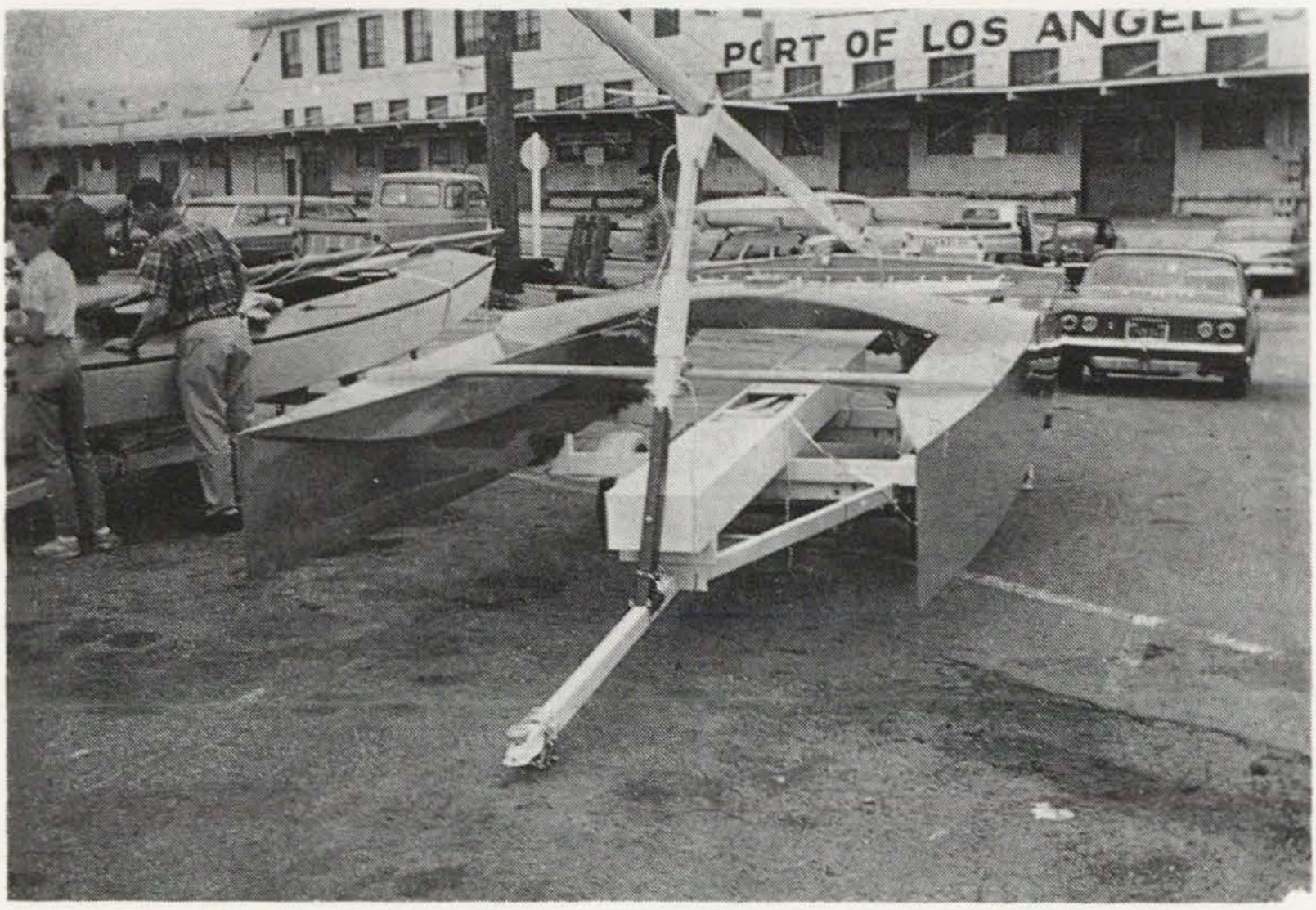
Length	19 ft. 7 ins.	Weight	440 lbs.
Beam	7 ft. 10 ins.	Sail area	235 sq. ft.

Designer: Ralph Flood, 3883 Sunbeam Drive, L.A.65, California.

At first glance, the *DEL MAR* may appear to be just another one of the many catamaran daysailers which have been popping up in recent years. But looks can be deceiving as the *DEL MAR* is the result of the designer's eight years of experience in racing small catamarans. In addition, the hulls were developed through model testing, and a prototype boat was built and sailed for several months before the building plans were finalized.

With this practical experience to rely on, the design objective was to produce a two-man racer that would not only have a performance second to none for its size and sail area, but would also be extremely easy to build and cost under $900 including sails and trailer . All of these objectives have been realized.

Special features are: The inboard appendage hulls (see Fig. A) which have proved to be a major breakthrough in the control of spray and prevention of bow-dive in rough water. The sail plan employs the most modern rig developments such as roller furling of the jib, roller reefing of the full-battened mainsail, rotating aluminium mast, etc.



DEL MAR on trailer

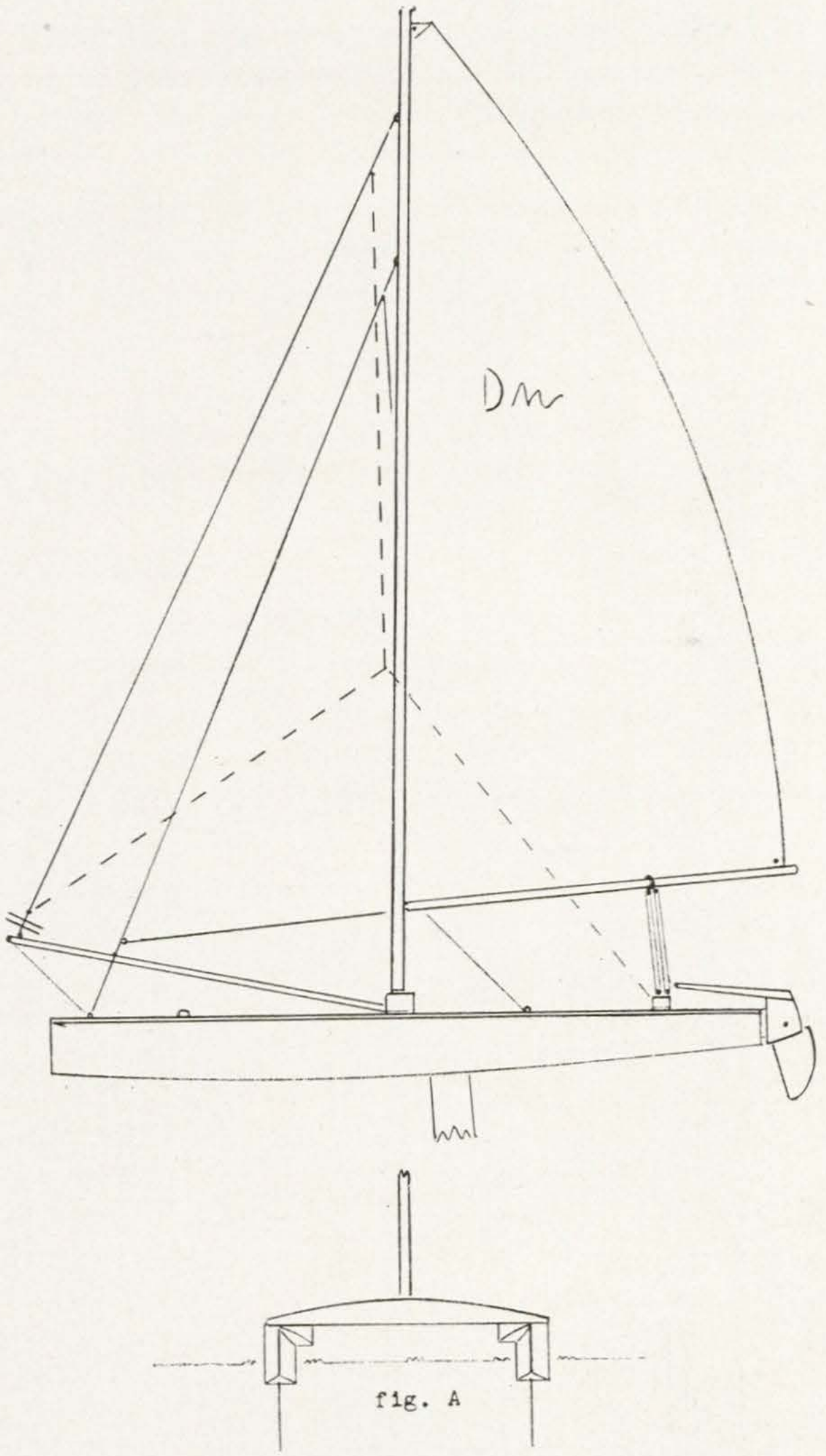


fig. A

The *DEL MAR* is a true one-design class boat with the added advantage of qualifying under the International " B " Class Catamaran Design Rule. She is so simple to build that her construction takes less than one-half the time required for most daysailers of similar size.

The boat shown on its trailer was built in less than 5 weeks by the owner who worked only part time on the project.

What has been proved with the *VIVA* and *DEL MAR* is that the simplest hull shape possible, correctly proportioned, can perform on a par with the best commercially built racing sailers of similar size and sail area.

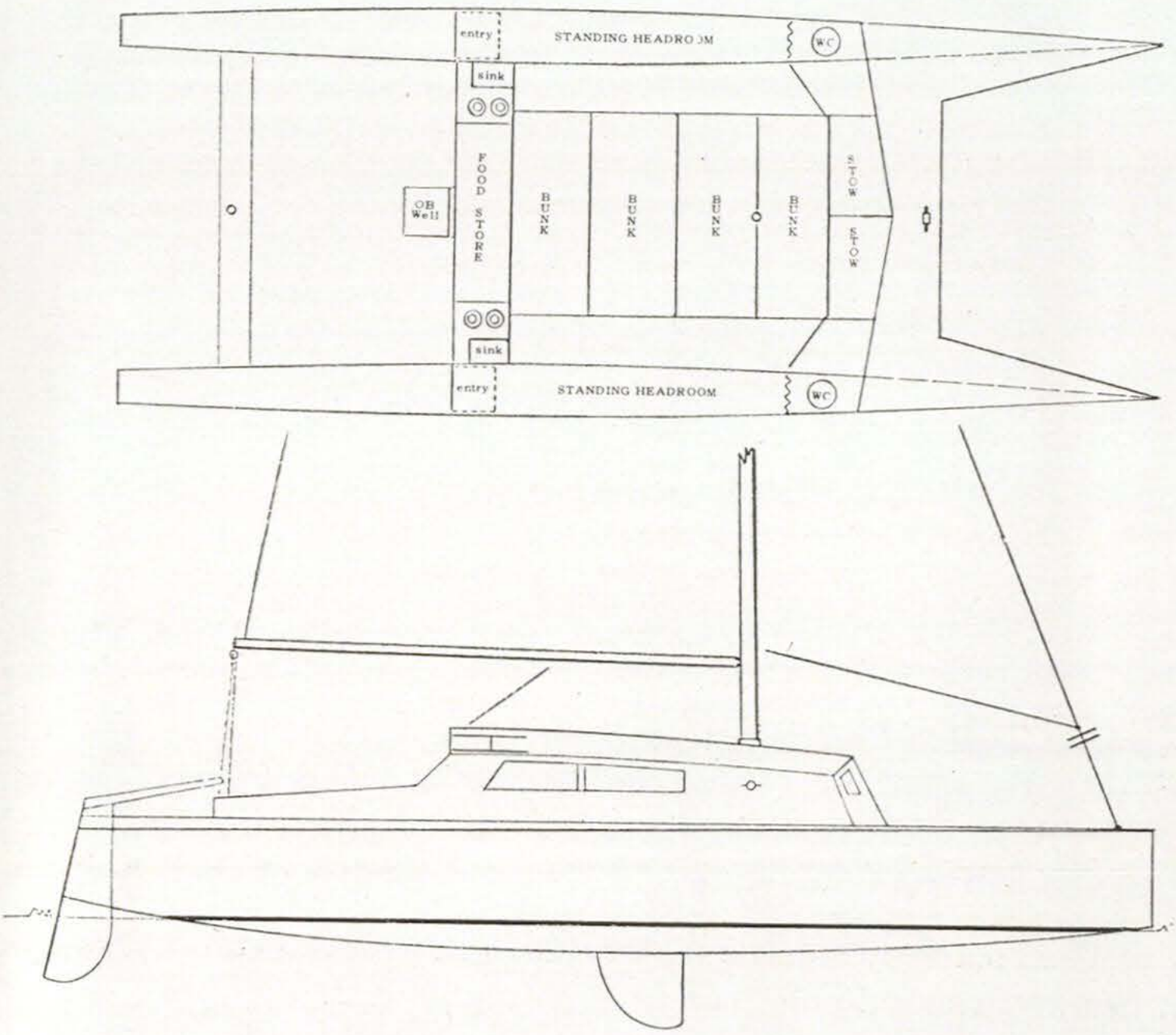
The sail shown with tracer lines is optional and is used for reaching and tacking down wind in light winds. A roller furling system is used making the handling of this sail a snap compared to a spinnaker system.

VOLADOR (FLYING FISH). A 31 FT CATAMARAN CABIN SLOOP

L.O.A.	31 ft.	Weight	2300 lbs.
Beam	12 ft.	Sail area	350 sq. ft.

Designer: Ralph Flood, 3883, Sunbeam Drive, L.A.65, California.

The design objectives in developing the *VOLADOR* were simply to make available a cabin sailer that would out perform most cruising sailers under 40 ft., be exceptionally easy to build and low in cost.



To qualify the performance objective, an extensive study of race result data was made. This data indicated that the Catamaran (double hull) type boat usually out performs other boats of similar size. This kind of boat can cost less to build than a quality ballasted keel boat; and since the Catamaran hull configuration is a comparatively easy shape to build, the double hull boat was then selected as the type of craft which could best meet the design objectives.

The *VOLADOR* design stresses easy handling and is especially suited for the skipper who likes to spend a comfortable weekend cruising around the local Islands or just day-sailing along the coast.

Special features are: standing headroom in both hulls for the length of the cabin; two heads with curtain partitions for privacy; cabin accommodations arranged so that the crew weight is always properly distributed for best sailing trim; a sail plan employing roller furling of the jib allowing this sail to be completely controlled from the cockpit, and a mainsail fitted with roller reefing to cope with strong wind conditions.

THE *DEL REY TRI-CAT* A 38 FT. CRUISING SAILER.

Length	38 ft. 6 ins.	Weight	7800 lbs.
Beam	18 ft. 3 ins.	Sail area	750 sq. ft.

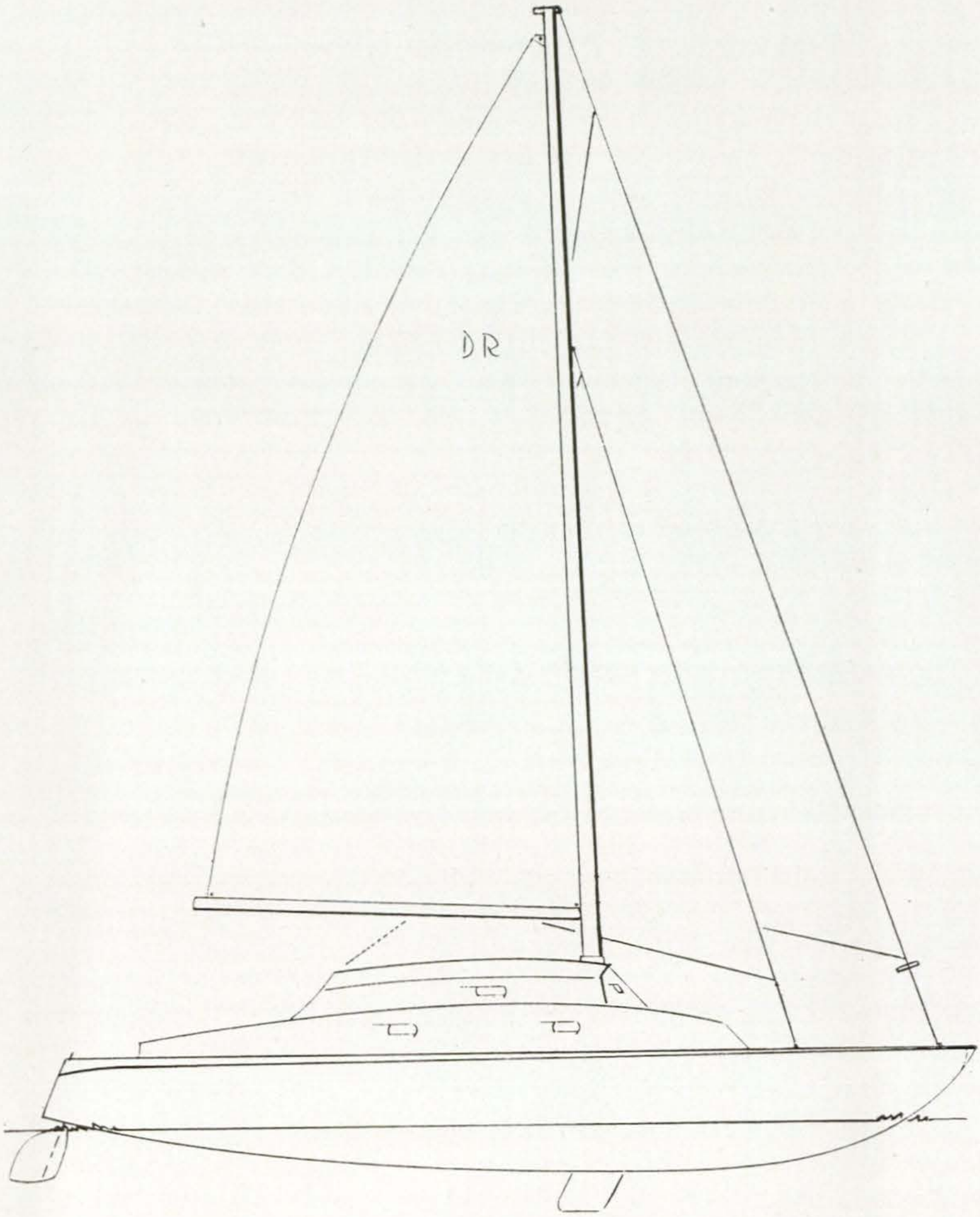
Designer: Ralph Flood, 3883 Sunbeam Drive, L.A.65, California.

It took several years of multi-hull design research to produce the *TRI-CAT* concept. The best features of the trimaran, catamaran and single hull were combined to achieve this.

The designer's observation of multihull development since 1953 has led to the conclusion that the catamaran (double hull) configuration out performs all other hull types; and this conclusion is substantiated by the vast majority of race result data.

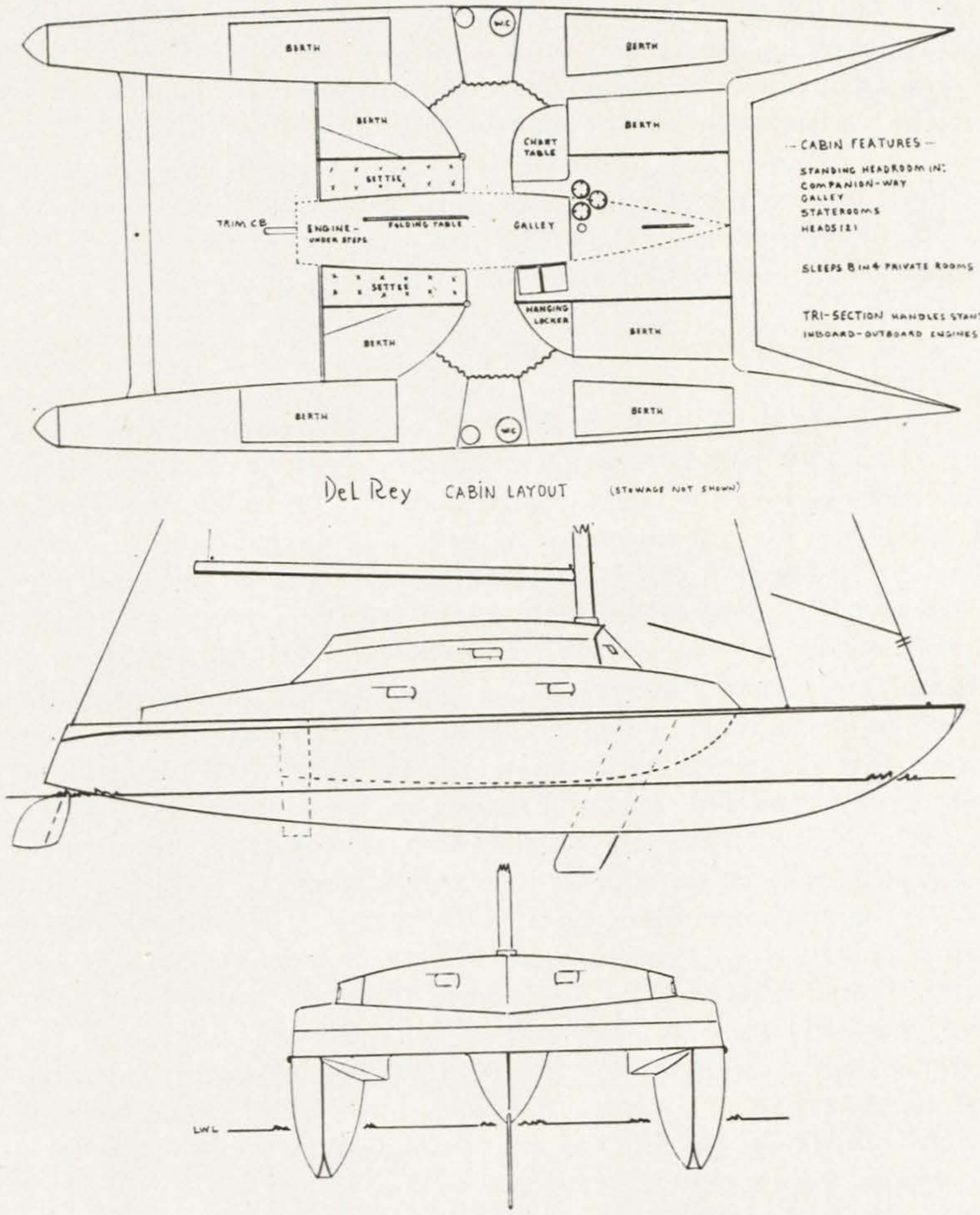
In addition to the superior performance, catamarans in the 30-40 ft. length range have potentially more interior living space (as illustrated) and obviously a great deal more cockpit space than other types of sailers. Prior to the introduction of the *TRI-CAT* design concept, the problem of achieving sufficient headroom in the catamarans' central cabin section has been a difficult one. Previous attempts to lower the cabin height for the purpose of reducing weight and windage has usually resulted in a stoop and crawl-in situation.

The *TRI-CAT* concept not only makes possible a low profile catamaran without sacrificing headroom but also permits the use of standard inboard and outboard engines where previously an awkward long shaft outboard has been the only practical auxiliary power.



DEL REY TRI-CAT

Normally, the *TRI-CAT* centre hull is entirely above the water's surface but when an occasional large wave does build up under the bridge deck over a ton of additional buoyancy is provided by this hull to cope with the situation. A centreboard to increase sailing efficiency can be installed if desired without obstructing interior accommodations and without the danger of water leakage into the hulls.



Del Rey CABIN LAYOUT (STOWAGE NOT SHOWN)

Another outstanding *TRI-CAT* feature is the appendages incorporated onto the inboard side of the main hulls. These appendages help lift the bows over awkward seas, control spray, and permit easier access into the staterooms and heads.

The *DEL REY* was given a cutter type rig (double foresails) as this rig is not only more seaworthy in strong winds than the masthead single foresail rig, but is more efficient on the reaching points of sailing as well. The *DEL REY's* masthead staysail utilizes a roller furling

system which permits the crew to increase or decrease sail area instantly by merely pulling on a line led to the cockpit.

The *DEL RAY's* accommodations include eight permanent berths in four private staterooms. Add to this the craft's superior ocean going performance and you have a boat equivalent to a larger, high-performance single hull craft costing several times as much to build.

You'll be a decade ahead of the fleet with a *DEL REY TRI-CAT*. Building materials and basic equipment cost approximately $5,700.

Dear Sir,

For some years I have read with great interest the publications of A.Y.R.S., to which I owe many important suggestions as to the design and construction of several cruiser-catamarans. I take this opportunity of thanking you very sincerely for your interesting articles. In my country the design of this sort of boat has not yet been favoured.

I myself am only an amateur and my medical profession does not allow me to spend much time on this hobby. For the construction I use plywood and my designs are, of course, simple in order to enable me to build the boat without outside help. Nevertheless I flatter myself that my latest construction, the *HIMP-HAMP II*, will be considered a good and successful catamaran, for at all races in the last years in which we have taken part, within or outside of competitions our boat has proved superior to other competitors.

At the race round Heligoland, this spring, e.g. we were the fastest ship of this regatta by two minutes, held till now by *ASHANTI IV*. Furthermore we have made long-distance cruises of thousands of miles every year and were awarded medals by the cruiser-section of the German Sailing Society. We achieved all this without any damage in spite of very rough sailing. Enclosed you will find some photos of *HIMP-HAMP II*: she has a length of about 42 ft., 39 ft. water-level, in breadth 16½ft., draft 55/130 cm., canvas 55 qm. Material:ply - wood (Sperrholz-Leimbauweise).

In Germany reservations of conservative sailors against multi-hulls are especially vehement. That is why I was specially interested in your article in No. 57 " The Non-Acceptance of Multihulls." I am, however, not of your opinion, that it is a sort of law, that people are emotionally attached to the type of boat in which occurred their first real enjoyment of sailing, to the rest of their lives. I rather think it a mark of backwardness if a person is unable to adapt his personal taste to the ever changing progress of practicability. For sailing which, like all technical activities, depends for best possible effect on the mastering of physical laws can, on no account be subject to merely aesthetic

Dr. Peterson's HIMP HAMP II

considerations. Those who think so had better look at the sport from some spot on the coast or better still on the TV screen.

I know from personal experience and many multihull sailors who used to sail in single-hull boats (Kielboot), have meanwhile realised that aesthetic points of view are of secondary importance and can only be useful to perfect the look of a boat, but technical and practical considerations must always rank first. We must, in the first line, thoroughly study the technical side of the construction, improvements as to the look of things to come later.

This seems to me to be the actual problem: most single-hull sailors are badly informed and uninterested as to the technical questions of sailing. They find it easier to ignore the existence of multihull boats, as single-hull sailors are in the majority and, as you know, the majority is always right. But this is evidently pure nonsense. I, for myself, admit that I have always admired the beauty of a fine single-hull boat or a comfortable Dutch flat-bottom yacht (Flachboden-Yacht). Each type has its advantages and its defects, sailing will always be a compromise.

The sailing in multi-hull boats is an additional way of sailing which offers great excitement and perfection to the sportsman, and certainly not a discrimination of conservative types of boats. The Dutch flat-bottom yachts existed before the single-hull boats and their number is still on the increase. The Dutch flat-bottom yachts resemble the catamarans in principle, but the latter have lately raised their bottom in

HIMP HAMP II

the middle above the water level, thus diminishing resistance considerably and improving its sailing capacity.

No one has ever dreamed of depreciating the value of flat-bottom yachts, but multihull boats have often been the target of ironical remarks and even of latent and frequently open hostilities. In this case nothing but patience will help. Sailors must show goodfellowship and must be ready to help each other to understand. The main thing is sailing, however rough the weather and the breeze may be, taking part in all regattas whether admitted or outside competition, not with a view to winning prizes, but to obtaining respect. Respect cannot be withheld if a boat is always first, however difficult conditions may be.

DR. PETERSEN.

Leer (Ostfriesland), Germany.

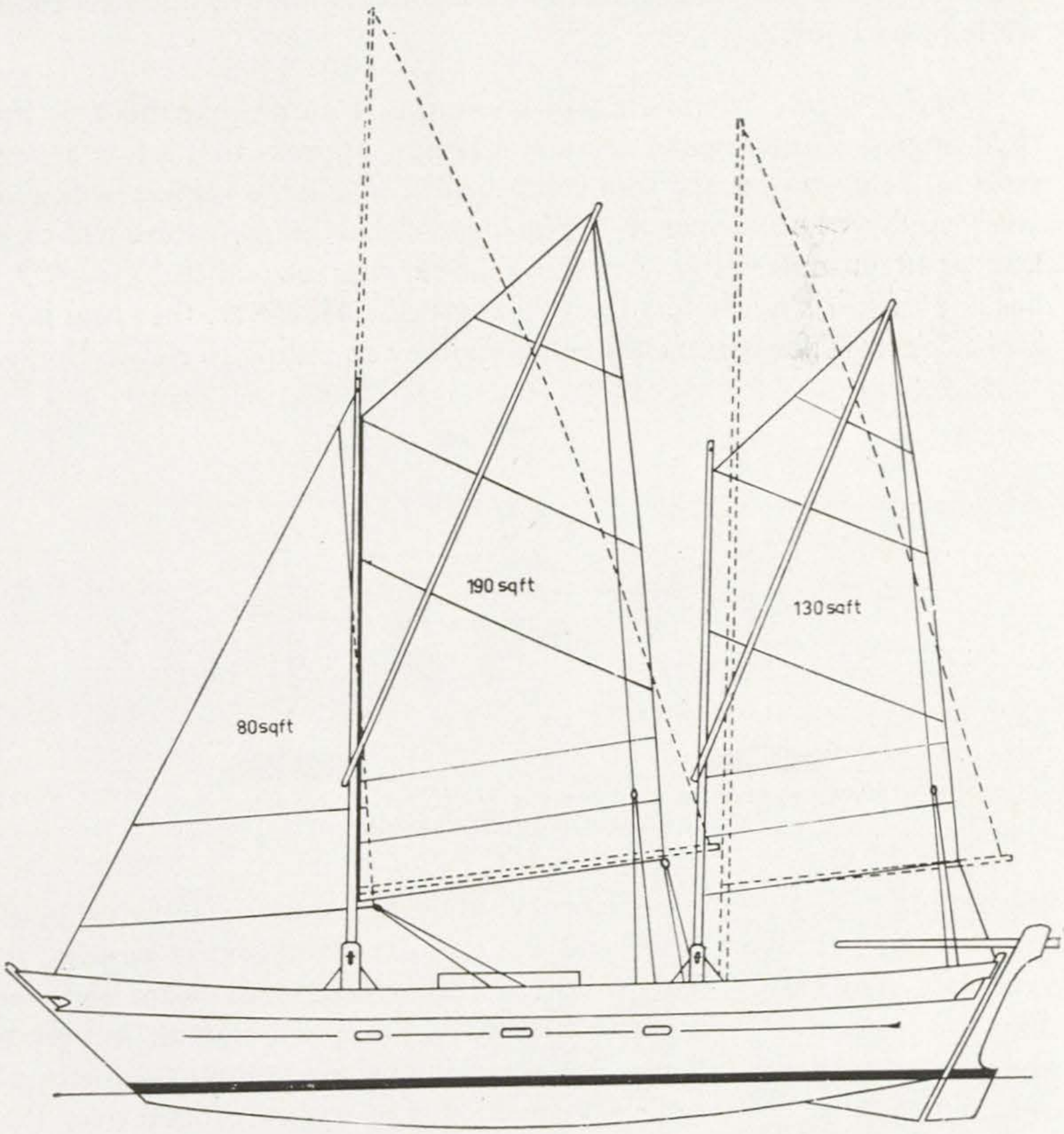
THE *TANGAROA* DESIGN

L.O.A.	34 ft.	Draft	1 ft. 6 ins.
L.W.L.	28 ft. 6 ins.	Weight	3000 lbs.
Beam O.A.	15 ft. 6 ins.	Load capacity	2000-3000 g.
Beam hull	5 ft. 6 ins.	Sail area	400 sq. ft.

Designer: James Wharram, S.C. Rongo, Poste-restante, Deganwy, N. Wales.

Jim Wharram was an early friend of the A.Y.R.S. While voyaging in his first catamaran, also called *TANGAROA*, from England to the West Indies, he met one of our earliest members, Signor Perez in

Portugal and learned of us. He and I then had a long correspondence which I made into an article and used in A.Y.R.S. No. 21 OCEAN CRUISING (now alas out of print). Unfortunately, Jim took exception to our earlier editorial policy and we lost contact, though he in the meantime had built another catamaran *RONGO* in which he has sailed three times across the Atlantic, which made him the catamaran



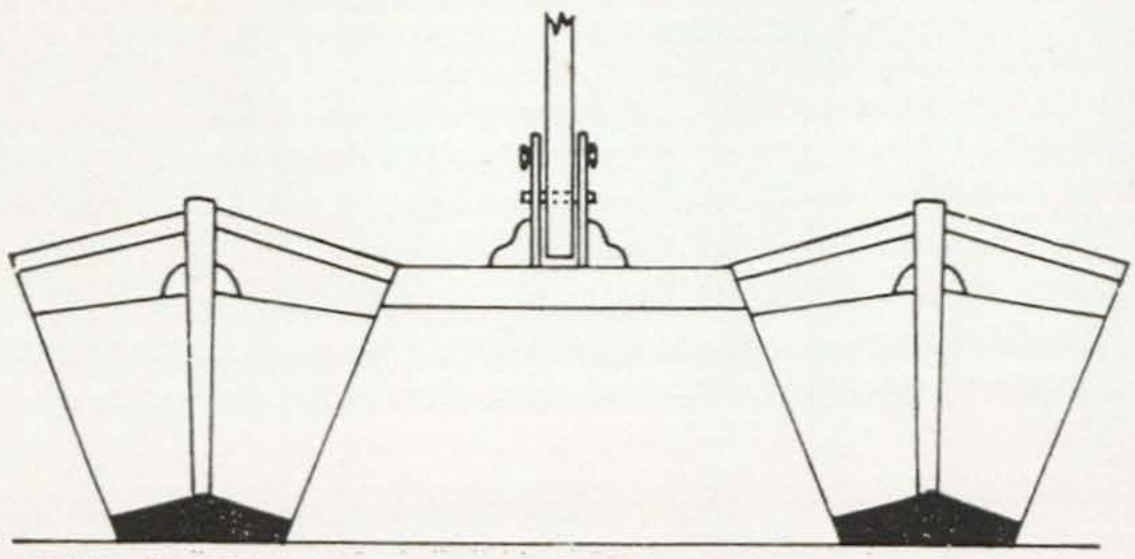
Sailplan SEACRAFT, January,

pioneer of the Western Ocean. Now, having patched up our rather technical quarrel, we have pleasure in publishing this design of a completely new *TANGAROA* which has appeared in the Australian magazine SEACRAFT.

The Overall Design. This catamaran is genuinely a twin hulled craft. Two identical, long narrow hulls are tied together with four

6 inch by 3 inch cross beams which are decked but have no " house " built on them. All the accommoda'ion is therefore in the hulls for sea-going while in harbour, a spacious tent can be erected for cool living in the Tropics or lounging space in cooler waters. He therefore achieves the best of both worlds at the minimum expense. There is the best and safest sea-going catamaran with the least windage for windward work while there is far more accomodation with full headroom while in harbour.

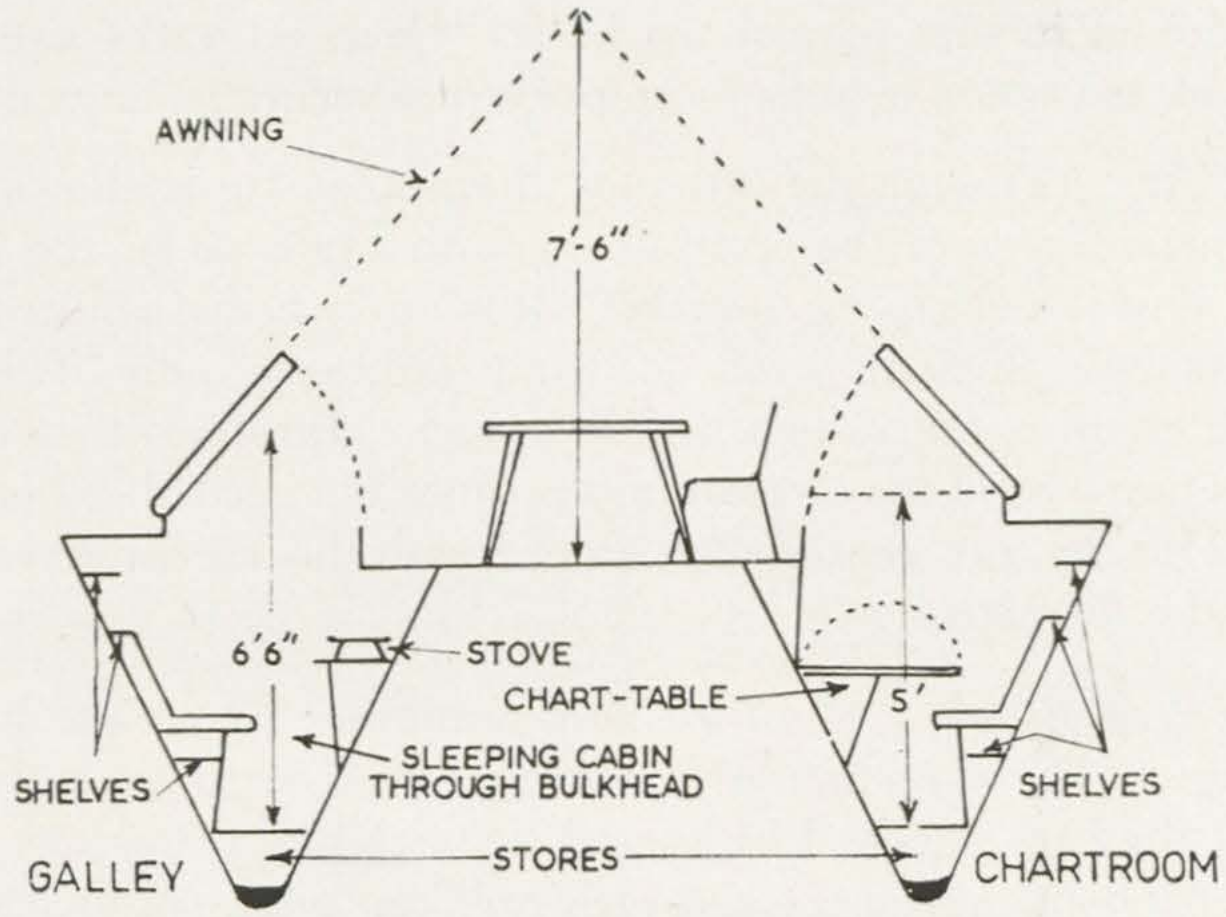
Hull Design. Members will know that I an am exponent of the right angled V underwater section. It now appears that a low aspect ratio fin keel, as opposed to a centreboard, on such a section will give good windward performance. The logic of this design feature will then lead us to an underwater V of less than 90 degrees and *TANGAROA* has a V of just slightly less than 60 degrees. However, the combined keel-keelson is about 6 inches wide, giving a rounding to the section at



NOTE : PLATFORM HIGH OFF THE SEA TO AVOID POUNDING
NO DECK CABIN REDUCES WINDAGE

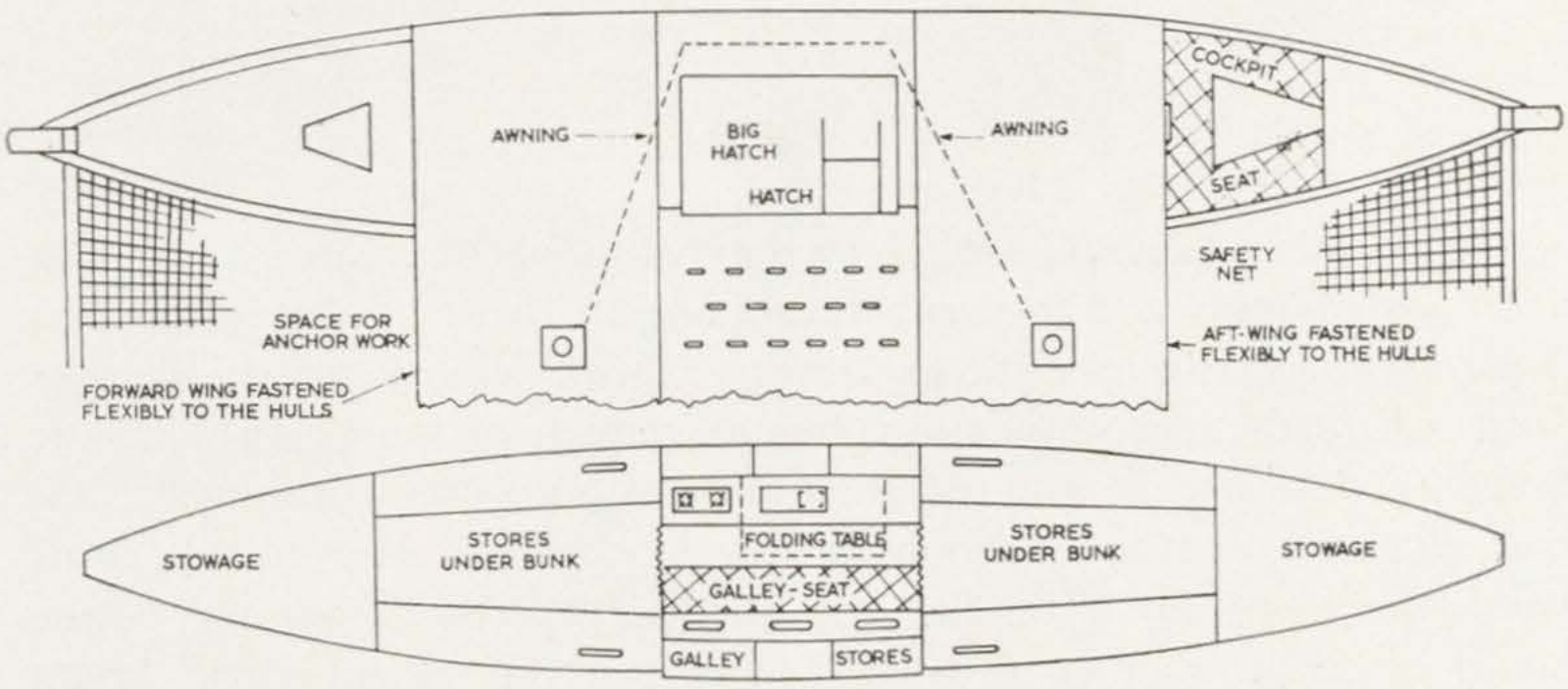
the bottom. The even rounded curve of the keel line fore and aft should let the boat put about easily and the skeg aft should make steering in quarterly seas easy. With a hull waterline length to beam ratio of 14 : 1, a transom should not be necessary, for speed, though Jim gives the reason for this as follows: " A sea-going catamaran must sometimes ride out a gale. The best way to do this is with a drogue over the stern. The transom stern is very dangerous under such conditions, as the owners of transom-sterned catamarans will find out." It is not necessary for us to deal with this time-honoured argument here of transomed versus canoe sterns as it is not relevant. Peter Tangvald gives the opposite viewpoint in SOLO CRUISING, for those interested.

Cockpits. The cockpits are not self-draining. In really bad gales, the unused one is " hatched " over. Standing in the other cockpit with a "poncho" over, blocks it up like a paddling canoe. The water-



tight bulkheads will stop any serious flooding. A canvas footwell can also be used. All this saves difficult, watertight cockpit building.

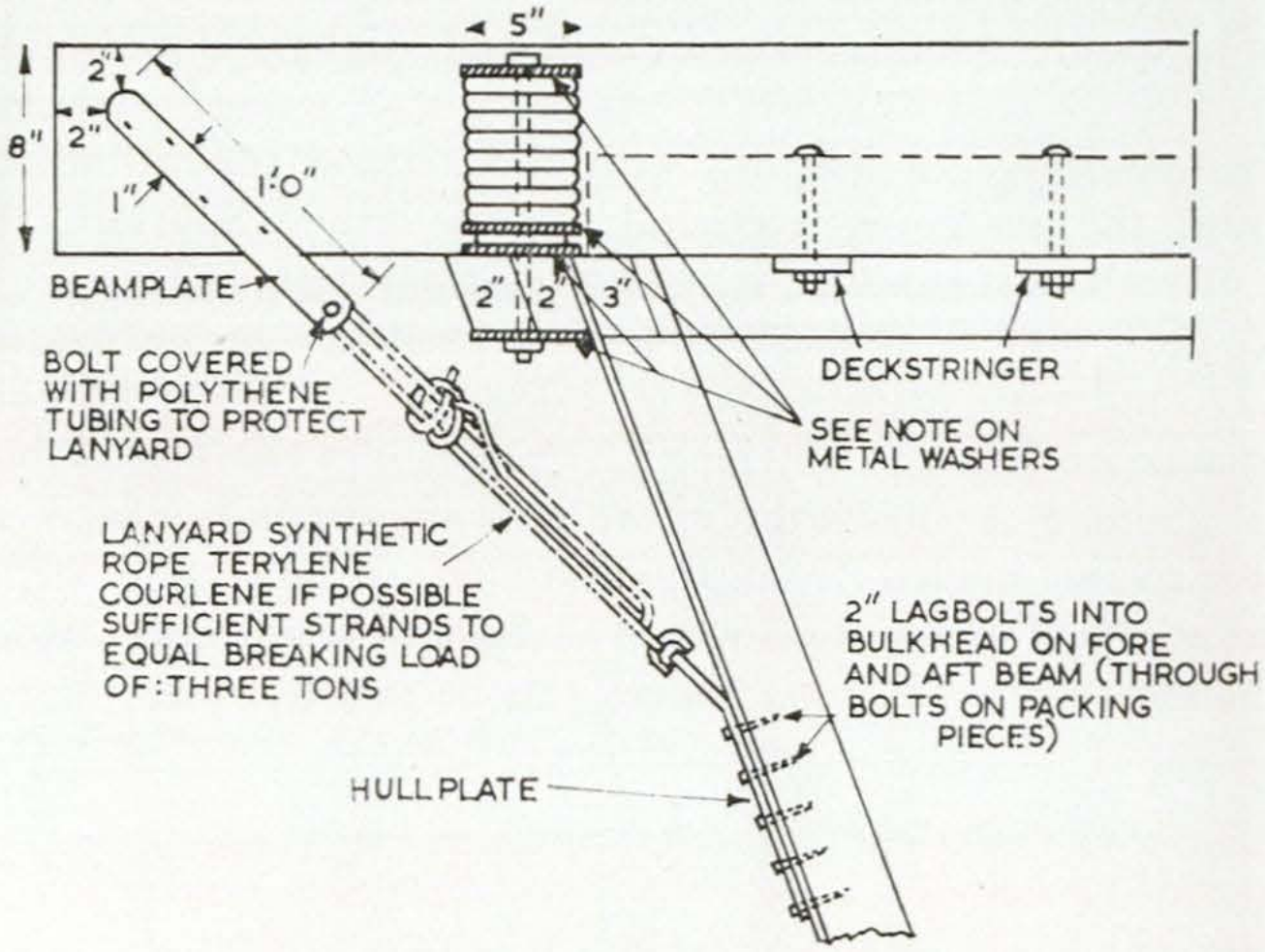
Accomodation. In keeping with the general philosophy of this catamaran, the sea-going accomodation is rather Spartan. In the middle of each hull is a 6 ft. length of seating, with galley and dining table to port while the chart table and head are to starboard. An alternative and more private head is in one bow. Fore and aft of these living spaces are 7 ft. bunks which fill the beam of the narrow hull and are thus about 3 ft. in width. Fore and aft of the bunks is storage space which is divided from them by water tight bulkheads. In harbour in the Tropics, one would sleep and live in the deck tent. Large hatches over the living spaces can be raised under the tent for



full headroom in that part of the hulls. Deep bulwarks and netting fore and aft between the hulls must give a nice secure feeling on deck.

The Rig. Though the orthodox Bermudian rig is shown dotted, Jim Wahrram prefers the spritsail rig with brails as in the Thames barge. This is a cheap rig to make. It is easily furled and reefed and is surprisingly efficient, even to windward, especially if boomed, though a boom is not shown in this design. Jim feels that with the wide sheeting base of the catamaran, a boom is not needed. I made and sailed a 25 ft. by 9 ft. centreboard cruiser with this rig for several years and found it delightful.

The Cross Beams. These are four in number, each 6 ins. by 3 ins., set on edge. These, on their own, will give some flexibility between the hulls but they are attached by special bolts and lanyards to encourage this independent movement and each hull can pitch six inches out of line in heavy weather.



Summary. *TANGAROA* is the result of 12 years of thinking about catamarans and four ocean crossing in them. The result is an ocean sailing machine of the greatest possible safety, security and speed with adequate accommodation though not luxurious. In harbour, however, with her awning set, she blossoms out into a comfortable and cool palace with full headroom in the deckhouse. Her cost to build would be less than £600 Sterling and her speeds across the oceans could be an average of 6-8 knots with peak speeds of 10-15 knots.

These were the speeds achieved by Jim in his Trans-Atlantic crossings in his *RONGO* of similar design. A *TANGAROA* could be professionally built for about £1,500.

Dear John,

My 45 ft. catamaran *ORO* is one which will interest many people. Two are at present being built. This autumn, I will begin one for my own use. Each winter, I intend to sail out to the West Indies to charter, sailing back in the spring to look over the " Polynesian Catamaran " Builders. It will be a good life.

At the moment, all my energy is going on the *TIKI ROA*, a 38 ft. boat which I am building to race around Britain this year.

As you know, I always put seaworthiness and load carrying ability above speed. In *TIKI ROA*, I put speed equal to seaworthiness. With short hops of 300 miles, I don't have to worry about loads.

TIKI ROA will cost me about £350 so I don't have to win to arouse interest. It has a lot of ideas which will start up arguments. As it is a new venture for me, I will as I always do, keep the details to myself until I have tested them out.

JIM WHARRAM.

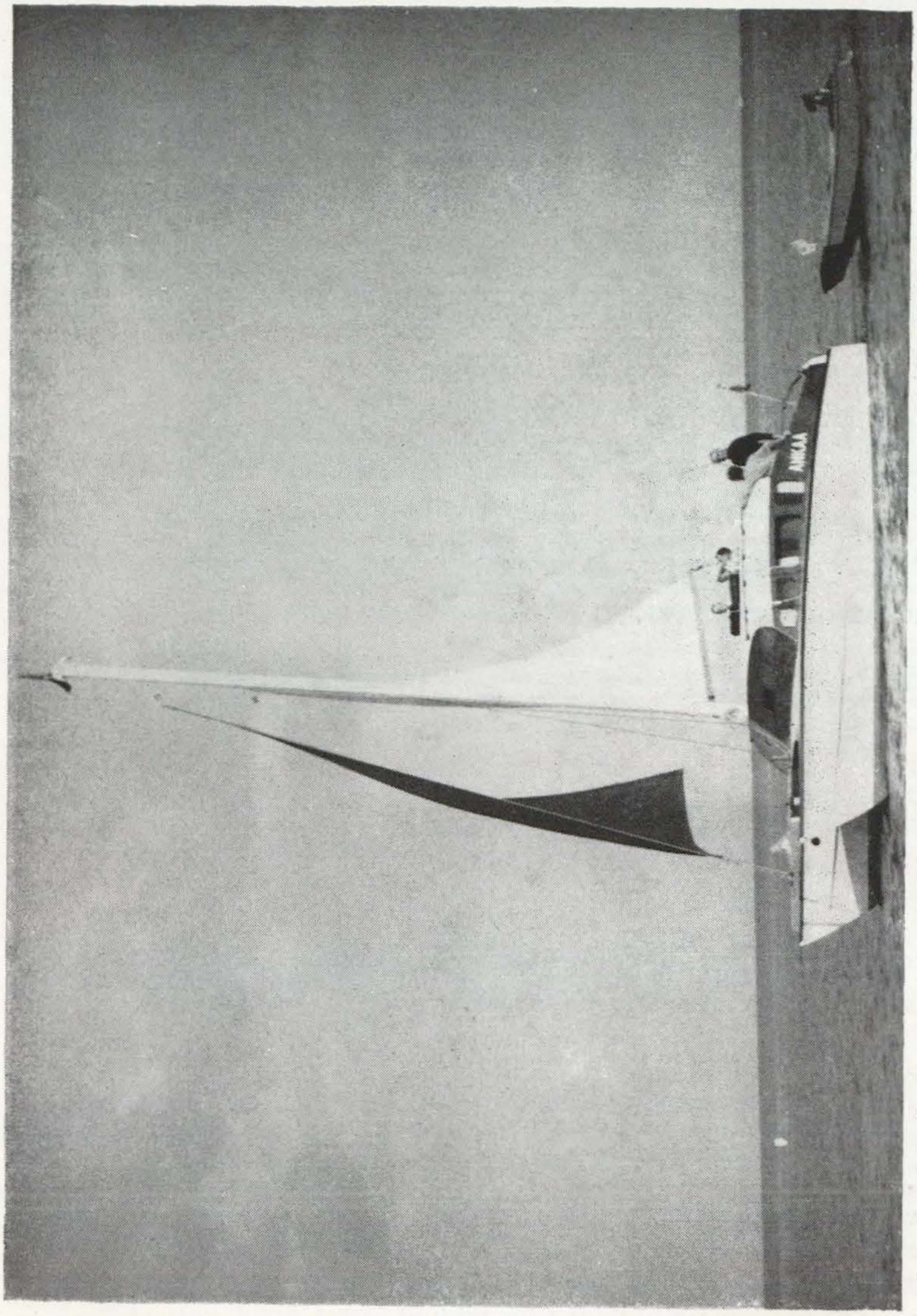
Catamaran *Rongo*, Poste restante, Deganwy, N. Wales.

Dear Sir,

When I designed my catamaran *ANKAA* I studied all available copies of A.Y.R.S. publications to get ideas for construction, rig and interior layout. I finally decided that the chine type of hull would be suitable for an amateur builder and that low aspect ratio fin keels: rather than bilge keels or centreboards, would be the answer to the leeway problem.

Centreboards are out for me as my boat only floats for two hours either side of high water and I have an aversion to centreboard cases full of mud ! Fixed keels on the other hand need no attention and enable the boat to take the ground in a level attitude which; apart from keeping the hull clear of the odd rock, makes life aboard most comfortable.

The catamaran is 23 ft. 5 ins. L.O.A. x 12 ft. 6 ins. Beam. Hull W.L. is 21 ft. 9 ins. x 3 ft. 0 ins. and the draft is 2 ft. The fin keels are 2 ins. thick and 9 ft. 0 ins. long with a straight bottom edge. They vary in depth from 11 ins. aft to 6 ins. amidships and 7 ins. forward; with an area of 4 sq. ft. each. They are very strong and give a nice feeling of security when taking the ground. The last point is the cost; I was quoted £35 each for alloy bilge keels ! The wood fins cost £3 10s. 0d. each !



ANKAA

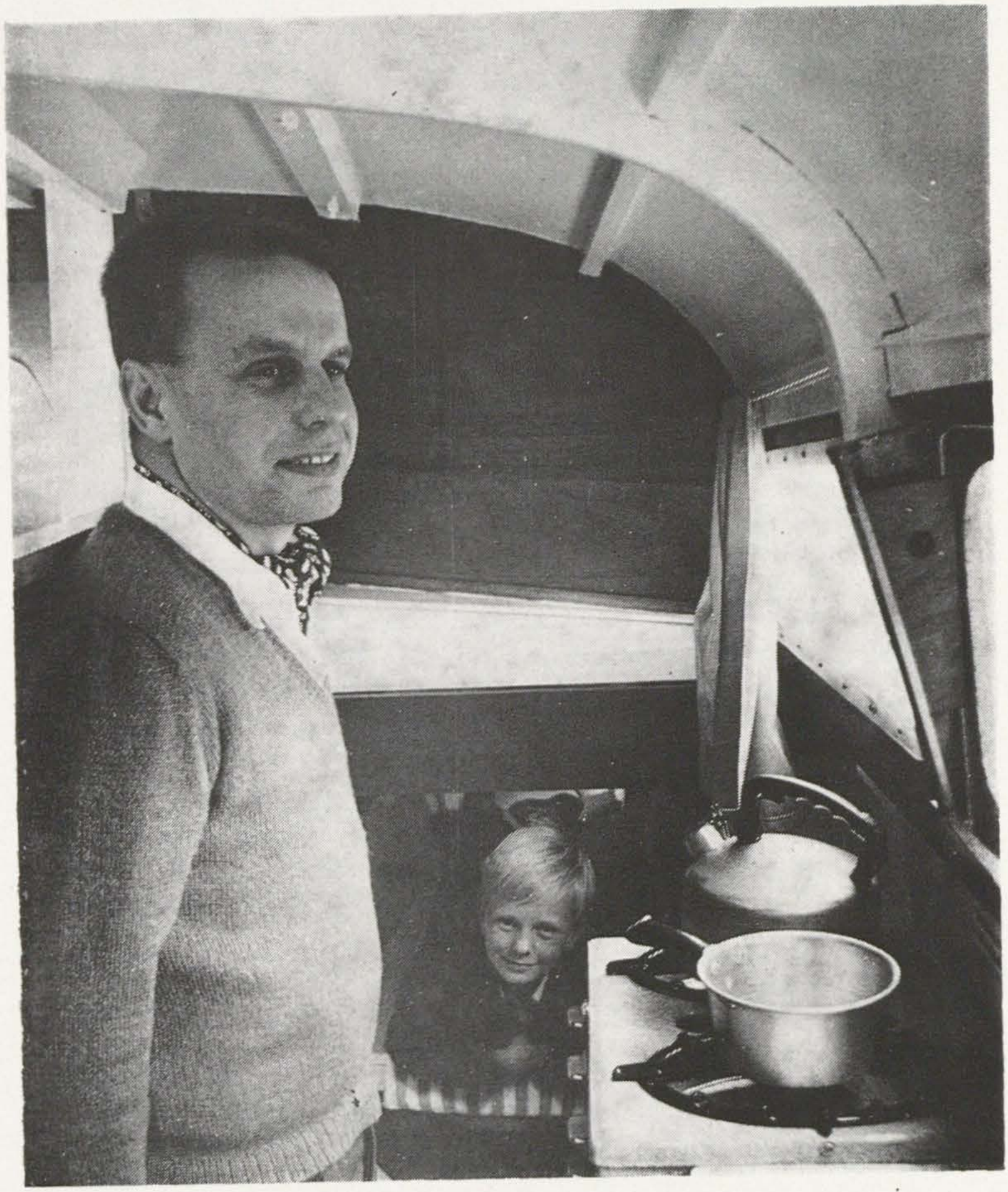
As for the handling qualities, I have no complaints: but as we have only sailed for about 36 hours total it is a bit premature to make a reliable statement on the efficiency of the keels. From observations when sailing the boat I think that leeway is negligible and we find that the length of the keels helps the catamaran keep a nice straight course with the helm lashed. Rudder action is light and positive but at high speeds it needs a firm hand to bring the boat about. I anticipated difficulty in going about but this was not the case provided that the jib was made to back before hardening in on the other tack.

We have only had one opportunity to sail with a similar catamaran and this was a well known 8 metre without keels. Although we were over hauling her tacking down Chichester Harbour the outcome was not determined as the other catamaran started her engine !

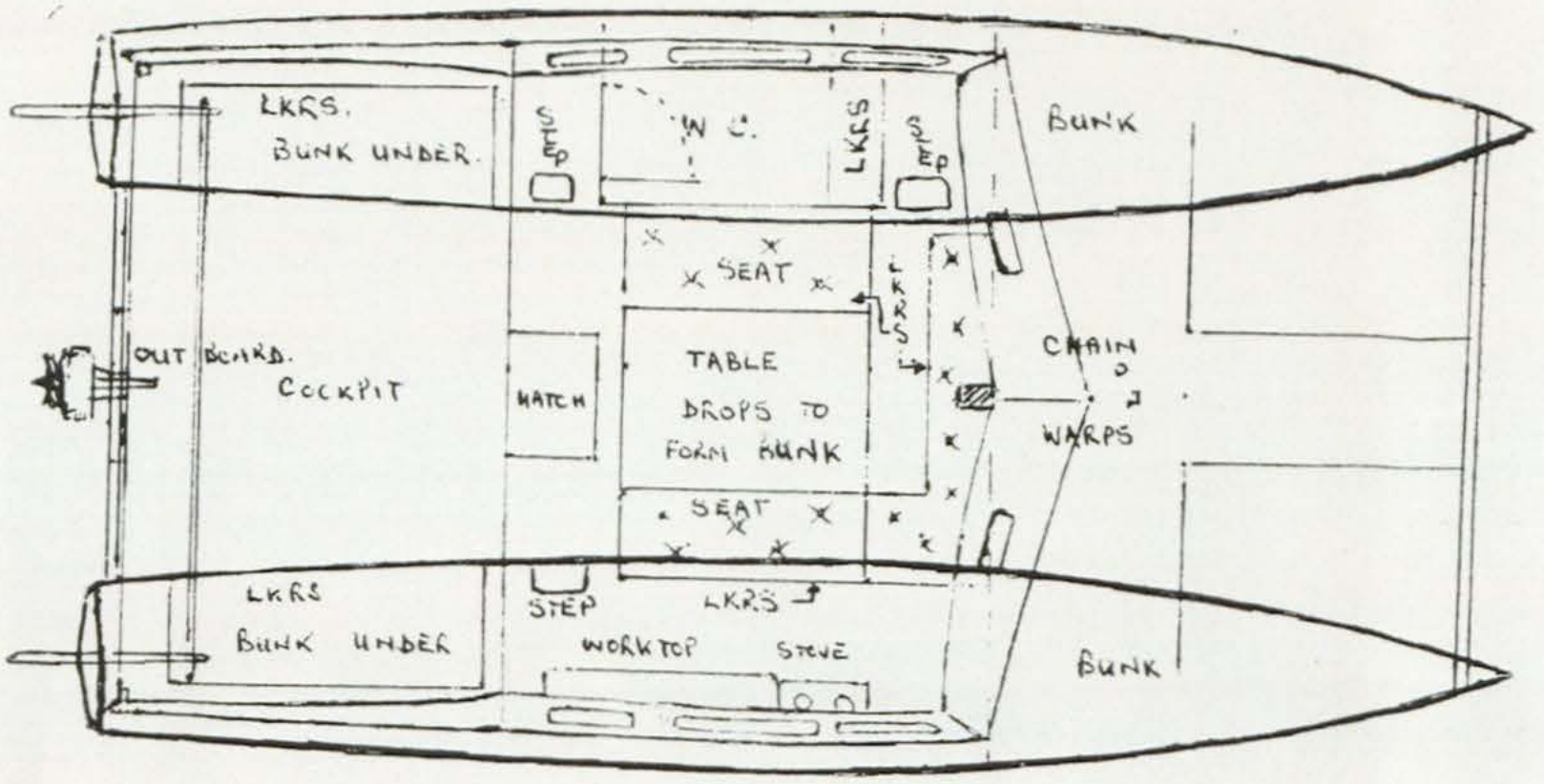
The sail area at present totals 227 sq. ft. and the sails are second hand. This area is on the small side and I feel that another 100 sq. ft. could easily be carried in the jib.

An exact record was kept of each hour worked and in twelve months of single handed blood, sweat and tears I worked 1200 hours and this includes 50 hours to build a 10 ft. 3 ins. pram dinghy.

$\frac{1}{4}$" TO 1'-0"



ANKAA—galley



CRUISING CATAMARAN LOA. 23'-5"

ANKAA—Accommodation plan

A breakdown of costs and quantities may be of interest. Most people seem to be reluctant to quote costs for feat that when it comes time to sell, they won't make a profit. I am not selling so here goes :—

	£	s.	d.
Perspex	7	0	0
Sails (second hand)	18	0	0
Glass cloth and resin	30	0	0
Galvanised ½ in. bolts	15	0	0
Fastenings	25	0	0
Engine	53	0	0
Waterloo Toilet..	30	0	0
Wood, glue, paint	373	0	0
Rigging, cooker, dinghy	16	0	0
Cooker	11	0	0
Dinghy	19	0	0
Total	597	0	0

To sum up, I am more than satisfied with the results of the exercise and now have a 36 ft. 0 ins. design on the board, this time with asymetric hulls and low aspect ratio fin keels.

D. D. SOULSBY.
24, Lambourne Close, Furnace Green, Crawley, Sussex.

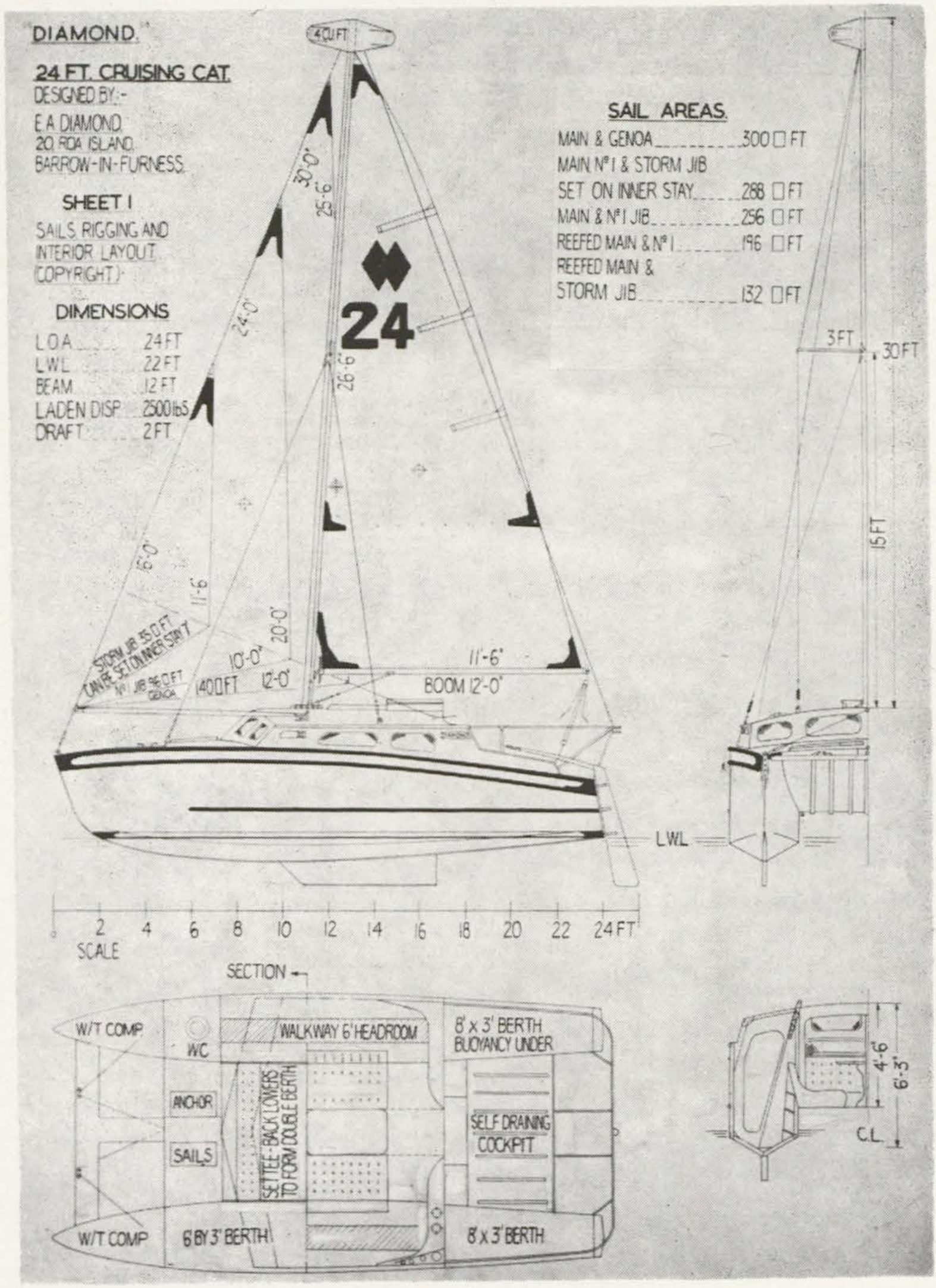


Fig. 10

86, she beat the second boat which was also a multihull by 19 minutes and was about an hour and a half ahead of the first keelboat.

Isolated bursts of speed have been estimated at 18 knots without cruising gear aboard, though her best authentic speed by speedometer was 12 knots on a dead run. In gale conditions (30 to 35 knots by

Ventimeter) she was reefed right down, and went to windward at 6-7 knots without fuss. Under normal conditions she comes about readily, but in rough water it was necessary to sail her round sheeting in as she turned. The bridge deck is only one foot above water but little slamming occurs except in short steep seas.

In flat calm conditions she makes just 5 knots with a Cresent 4 outboard (70 c.c.), but this is not sufficient power to drive her against winds stronger than force 4. The ideal motor would be about 10 h.p., which would give 8 knots in a calm and sufficient power to manouvre in gale conditions.

Five permanent berths are shown on the drawings, and seven could sleep comfortably with a slight rearrangement. It is felt however that this number would be reasonable for weekending only. For serious cruising a crew of three plus all their gear would be about right, while for ocean passages two persons plus the food and water necessary would just about fill the boat comfortably. As with all multihulls, overloading will reduce the seaworthiness and performance of the boat, and a sense of weight consciousness should be developed.

Both the *DIAMOND* 24 and the *SHEERCAT* 20 have been designed for amateur construction. Plans and further details are available from P. Patterson, Soutergate, Kirkby-in-Furness, Lancs.

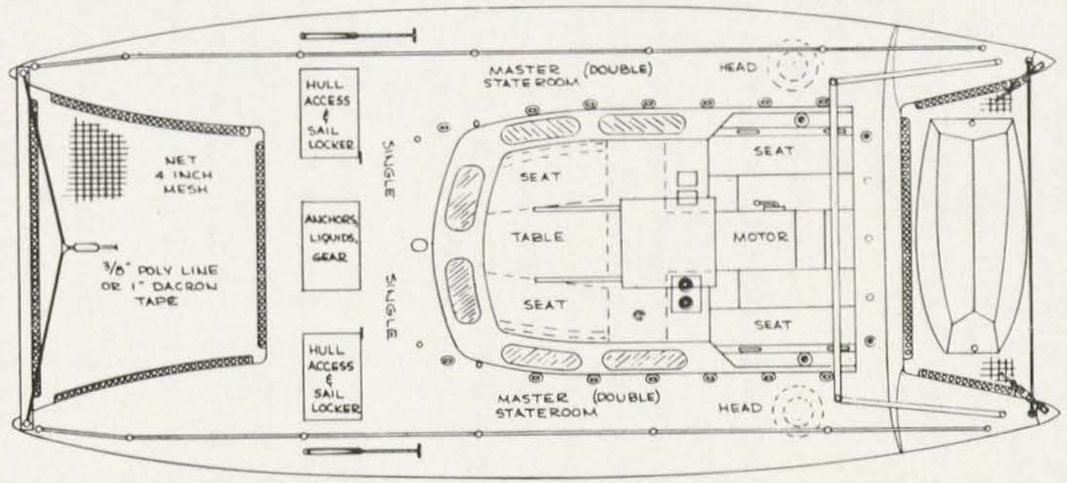
MYERS 36 FT. CATAMARAN

Designed by: Hugo Myers, 8011, Yorktown Avenue, Los Angeles, California, U.S.A.

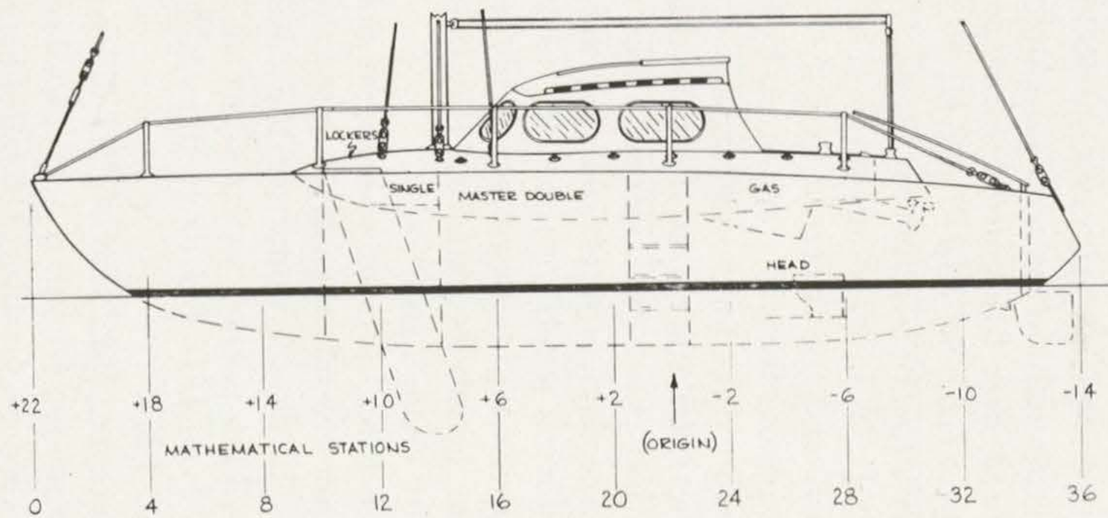
Members will remember a very pretty catamaran designed by Hugo Myers and written up in A.Y.R.S. No. 46 page 25, called *WIND-SONG*. This is a 36 ft. catamaran but the plans have now been completely revised for improved combinations of seaworthiness, speed and comfort. For example, the wing now clears 2½ ft. for comfortable performance in rough seas.

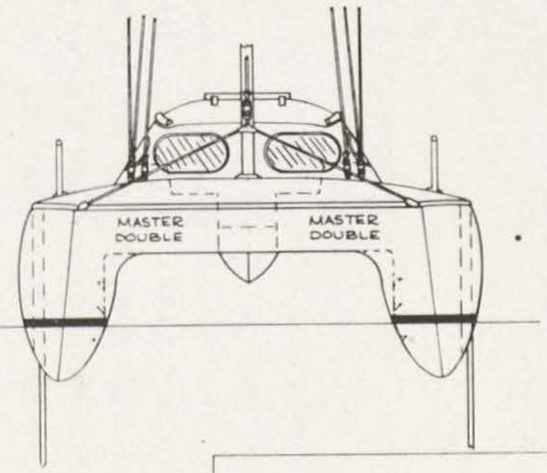
The revised accomodation plan is shown in the opposite page.

Hugo Myers has also sent me a treatise called: THEORY OF SAILING —WITH APPLICATIONS TO MODERN CATAMARANS. This is extremely interesting, giving the performance figures for several of the West Coast catamarans namely, *PATTYCAT II*, *WINDSONG* and Hugo's 46 ft. catamaran *EUNIKE*. Those versed in an easy reading of mathematics will find them of great interest while we in the A.Y.R.S. hope that this information can eventually be expressed in terms which will be suitable for our publications.



NOTES:
ENGINE: 18 TO 40 HP WITH 20 INCHES OF EXTENSIONS.
WINCHES: GENOA #5 OR #6
MAIN #3 OR #5
HEADROOM: 6' 3" IN HULLS
5' IN CABIN, WITH HATCH CLOSED.





36 FOOT CATAMARAN
ACCOMODATIONS PLAN
Myers Catamarans
8011 YORKTOWN AVE.
LOS ANGELES, 90045
(213) 6455269
DRAWN B CARBONE
DATE 3-31-66
SCALE 1"=2'
SHEET 2

CATAMARANS BY C/S/K

RUDY CHOY, WARREN SEAMAN, ALFRED KUMALAE
2602 Newport Boulevard, Newport Beach, California, U.S.A.

Part of : NEWSLETTER NO. 3.

Second Biennial Trans-Pacific Catamaran Race. Experts agree that the ultimate test of any seaworthy yacht, regardless of type, is a long-distance race in the open ocean. An ocean-racing multi-hull has to anticipate and resolve the formidable problems and stresses raised by unprecedented high speed in rough waters while heavily loaded with food, water, equipment, sails, etc. Each Trans-Pacific entry is ladened with approximately 3,000 lbs. of pure " ballast " on the day of departure. Though most craft can cruise with the winds in reasonable safety, the same cannot be said for a yacht choosing to duel against other yachts of similar purpose and movitation. For this reason, the best racers quite often are attractive cruising boats since their tougher qualities mean superior sea-worthiness, durability and safety. Such uncompromising competition hastens development.

There were five entries in the 2nd Biennial " Trans-Cat " Race, as follows: *GLASS SLIPPER II:* 50 ft. l.o.a., *PATTYCAT II:* 44 ft. l.o.a., *WORLD CAT:* 44 ft. l.o.a., *IMI LOA:* 43 ft. l.o.a., and *TRI STAR:* 41 ft. l.o.a. (trimaran). The four catamarans were designed by C/S/K and the trimaran by Ed Hortsmann. Though efforts were made to encourage trimaran entries by Piver and others, these invitations were declined for unknown reasons.

The 1966 Race was the most interesting Trans-Pacific crossing anyone has every experienced. The range of winds and seas varied from three days of unprecedented flat calm in mid-ocean to tumbling seas and fresh winds for the first two days and the final three days. In fact, I have never felt stronger winds or seen more confused and steeper seas than the last day out from Hawaii in prior Trans-Pac crossings. It was quite challenging.

The three days of unseasonal doldrums in mid ocean and light breezes on several other days caused the slowest " Trans-Cat " crossing to date: 12 days 7 hours for the 2,450 nautical miles actual distance sailed. This passage is far short of *AIKANE's* 9 days 22 hours in 1959 or even *IMI LOA's* 10 days 10 hours in a so-called year of light winds in 1964.

However, *PATTYCAT II* did post a new all-time Trans-Pacific noon-to-noon 24-hour run. Two days away from the finish line she sailed a record-smashing 316 miles for an average speed of slightly more than 13.1 knots for 24 hours. If the seas had been less rough, she could have easily exceeded 350 miles, but sails were reduced the last 10 hours of the 24-hour span. Next time !

All entries reported numerous eccasions when sustained spurts exceeded 15 knots for hourly periods as well as surge speeds between 20-to-25 knots during the terminal 48-hours. The first three yachts across the finish line all logged several 24-hour runs in excess of 260 nautical miles.

The reception at Waikiki was unforgettable. Three hours after *PATTYCAT II* surfed across the finish line *GLASS SLIPPER II* boomed over under taut spinnaker stretched by a 30-knot Trade to take first, corrected time. Exuberant wives, girl friends, families, friends and many spectators provided a unique and hectic Hawaiian *Aloha* for all hands only seconds after both yachts were towed through a channel in the reef onto Waikiki Beach in front of the Outrigger Canoe Club. Fragrant flower *Leis*, sweet kisses, warm embraces, soft words: life was beautiful ! Gallons of refreshing, tropical *Mai-Tais* sloshed down gritty throats. *Mai-Tai*—meaning " good " —a sweet rum drink drowning a spear of fresh pineapple, frosty with clinking ice and topped with an orchid blossom. The party scrambled from boat-to-shore-the *Hau* Terrace of the Outrigger Club and lasted for many hours while the cats floated bow-on to the beach in the traditional Polynesian manner. We lounged in utter contentment looking out on a dark sea shimmering in the starlight, our faculties absorbing the sensuous enchantments of a tropical evening. What a dramatic change from endless motion, salt-air and boat handling to firm ground, a scented nightwind from the mountains, and just plain-and-simple nothing to do ! Only a sailor who has raced over a great ocean of the world, disciplined to a routine of purposeful, driving, can fully appreciate the undiluted luxury of senses reeling to the fragrance and euphoria of a Polynesian night. Crew members can hardly wait for the next race two years from July, 1966. " No other race like it in the world," all agreed emphatically.

IMI LOA crossed the finish line 26 hours later to be followed the next evening by *TRI-STAR* and *WORLD CAT*. The last two yachts crossed swords the entire distance across the Pacific, with first the sloop-rigged *TRI-STAR* sliding ahead and then the ketch-rigged *WORLD CAT* duelling within sight. They finished within two hours of each other, just in time for *TRI-STAR* to receive the second, corrected time, trophy at the Presentation Dinner. As Commodore Cliff Spencer of Waikiki Yacht Club said, " This Race has arrived ! " Other Co-Sponsors were: Outrigger Canoe Club, Seal Beach Yacht Club and Ocean Racing Catamaran Association.

Conclusion. The basic concept of the catamaran reaches back over a millenium to the heritage and great navigational feats of the ancient Polynesians. They ventured the vast wind swept waters of the

Pacific when nearly all mankind approached water only to bathe once a year. Their Odyssean voyages are hidden in the mists and myths of antiquity. There is no question, however, that these ancestral vessels sailed 2,400 nautical miles between enchanted Tahiti and beautiful Hawaii, 2,300 miles between " Motherland " Raiatea and snow-capped New Zealand, and an equal distance to mysterious Easter Island, as well as the scores of major islands lying within this " Polynesian triangle." The ingrained inner resources of their leaders sustained them in times of peril and trial. No Coast Guard, no radio telephone, no weather stations, limited resources and no " Batman." We pay tribute once once more to their strength, their skill and their fortitude.

The modern seagoing catamaran has a contemporary history of less than 19 years from the time Woody Brown and Alfred Kumalae of C/S/K designed and built the famous *MANUKAI* of Waikiki. The first hesitant step to explore the feasibility of modern ocean going was taken by the 40 ft. *WAIKIKI SURF* in 1955. Covered with controversy and scorned by some monohullers, the *SURF* nevertheless made a successful trip to California and return with a creditable fifth across in the 1955 Trans-Pacific Race.

Apprehensive of even the slightest failure, Ken Murphy's brand new 46 ft. *AIKANE* finally showed the potential inherent within proper catamaran design. In the first year of racing, *AIKANE* swept to a new record in the 1957 Newport-Ensenada Race, won (unofficially) the Trans-Pacific (repeated again in 1959) and was unbeatable for the next several years. She added to her laurels with a record-breaking 10,000-miles cruising " pilgrimage " to Tahiti and return in 1961. Crew members soon discovered that Polynesian " swingers " were less interested in their reverance than their virility.

In the intervening growth years, hard lessons sailors and designers can learn only in the open sea and from experience were applied to a whole family of ocean racing and cruising catamarans with reasonable success. However, since progress is neither inevitable nor assured without setbacks in any mortal field, some " overshoots " were made sometimes, particularly in the frame scantlings of the high-performance light-displacement ocean racers, *PATTYCAT II* and *ALLEZ-CAT*. In 1964, both craft experienced several broken frames in rough, beam, breaking seas at high speed on the first biennial multi-hull race to Hawaii. They returned embarrassed to port while cruising catamaran *IMI LOA* continued on to Hawaii without problems. With lances broken, partners C/S/K looked Quixotic.

It is best not to dwell on the criticism and condemnation from would-be prophets and self-appointed magistrates of yachting. We can overlook the misplaced intolerance of monohullers. We find it much

more difficult to understand those multi-hull apostles who have 20/20 vision in jackass hindsight. To these divinities we say, " expose yourself and hazard a contribution to the cause by going to sea ! "

It appeared that 17 years of continuous development had been overpowered by one fragile mistake. We were sustained by such independents as Dr. John Pursell of *PATTYCAT II.* Al Stresen-Reuter of *PAPA NUI*, Jack Swart of *IMUA* !, Vic Stern of *IMI LOA*, Bob Jones of *ALLEZ-CAT*, Jay Johnson and Chuck Gardner of *GLASS SLIPPER II*, Jim Arness and others. Their faith may have been vindicated when C/S/K-designed catamarans came through in the 1966 " Trans-Cat " under conditions which were worse, at times, than the preceding race. We're smiling, we have learned, we won't forget, and we are appreciative beyond words.

Newsletter No. 3 is dedicated to these gentlemen in a spirit of humility and gratefulness.

Dear Sir,

Now that I have made the aquaintance of A.Y.R.S., after many years' familiarity with the boating magazines from Los Angeles to Nisha-Nisha-Novgorod . . . oops . . . Gorki, I must express my admiration for this ingenous venture which seems to be characterised by some of the most grotesque and some of the noblest craft that ever put to sea.

I hope that the A.Y.R.S. will continue to view these tenuous, intuitive concepts of enthusiasts whose thinking has not become crystalised by professional rigour, or cowed by commercial interests.

I am aware that many professionals take one look at some of the things in A.Y.R.S. and say " Oh, that's old hat." But the salient point is that none of these professionals have had the vision, or the courage, to implement them. Though the patent offices bulge with the morbid secretions of men who have had communion with the world of phenomena; the highly educated who haven't the slightest capacity for discerning their economic practicality are more numerous than the desert sands, and as remarkable only for being equally unremarkable. The present state of powered hydrofoil craft amply illustrate the intuitional poverty of modern technicians—or robots. Some military research craft display the most impertinent *foil-juttings* ever perpetrated in the realm of Him and fish. But, of course, technicians and engineers have to live, and companies must survive.

It is amusing to contemplate the development of hull forms in the various localities. Last century the English hull form was characterised by the Brixham trawler—deep V, and slender; and the American hull form was characterised by the Gloucester Fishermen—beamy, and shallow draughted. Now, however, with regard to cruising catamarans

hulls, the converse tendency seems evident. The English cruising hull seems rather beamy compared to the long, slender American hull.

The proportioning of the hulls in relation to the span of the bridge is indeed a paradoxical design problem. Ideally, the hulls should be as far apart as twice the length of the L.W.L., and at the best compromise they are at a quarter of this distance.

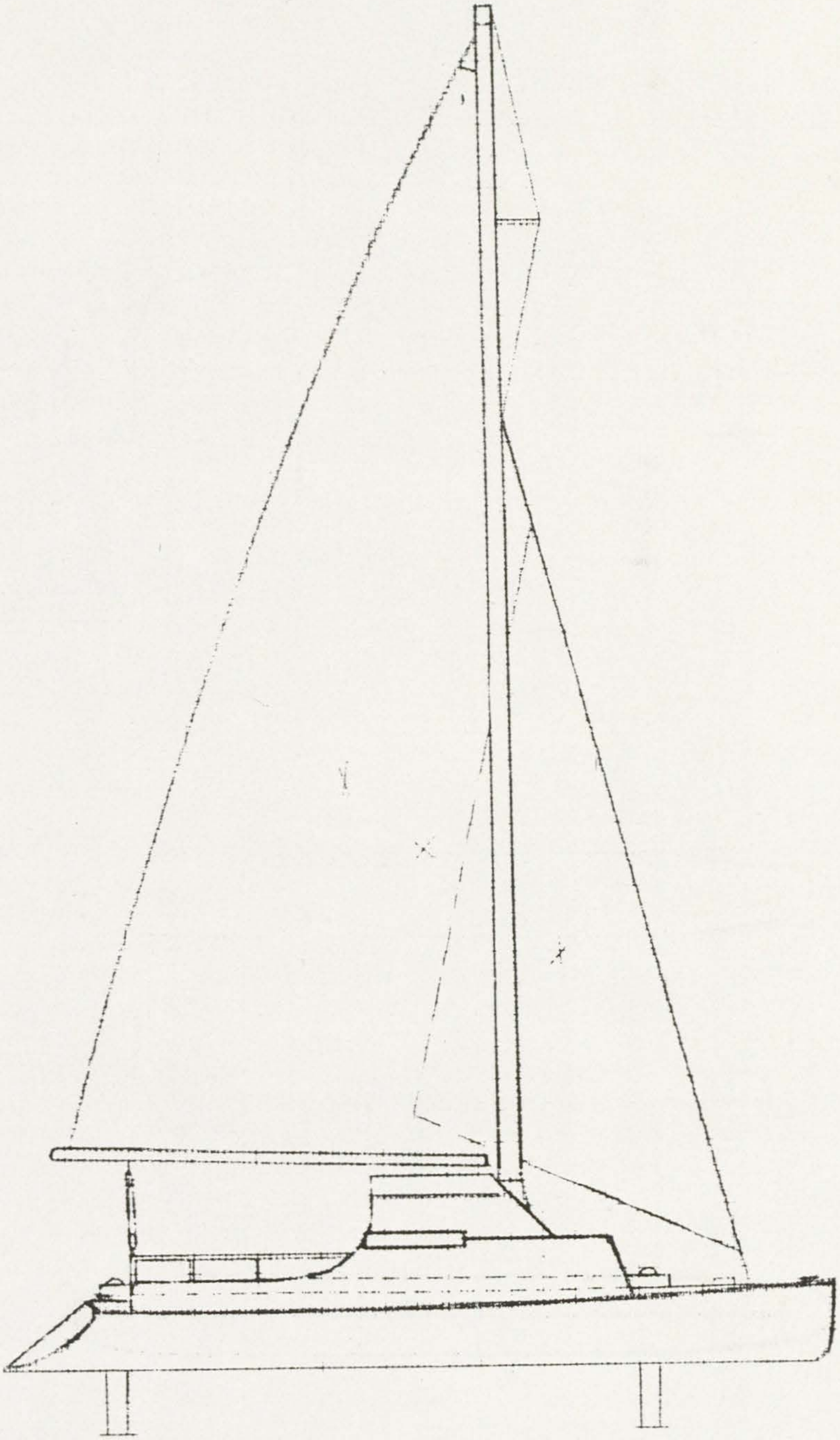
The resistance due to interference of the velocity potentials of the two hulls is a second-order magnitude, but not insignificant. But, because twin-hull sailing craft draw relatively little water the velocity potentials tend to dissipate in the surface waves. Here it is interesting to note that the velox wave system of a catamaran configuration vanishes over the horizon, whereas a sea-sled would utilize it.

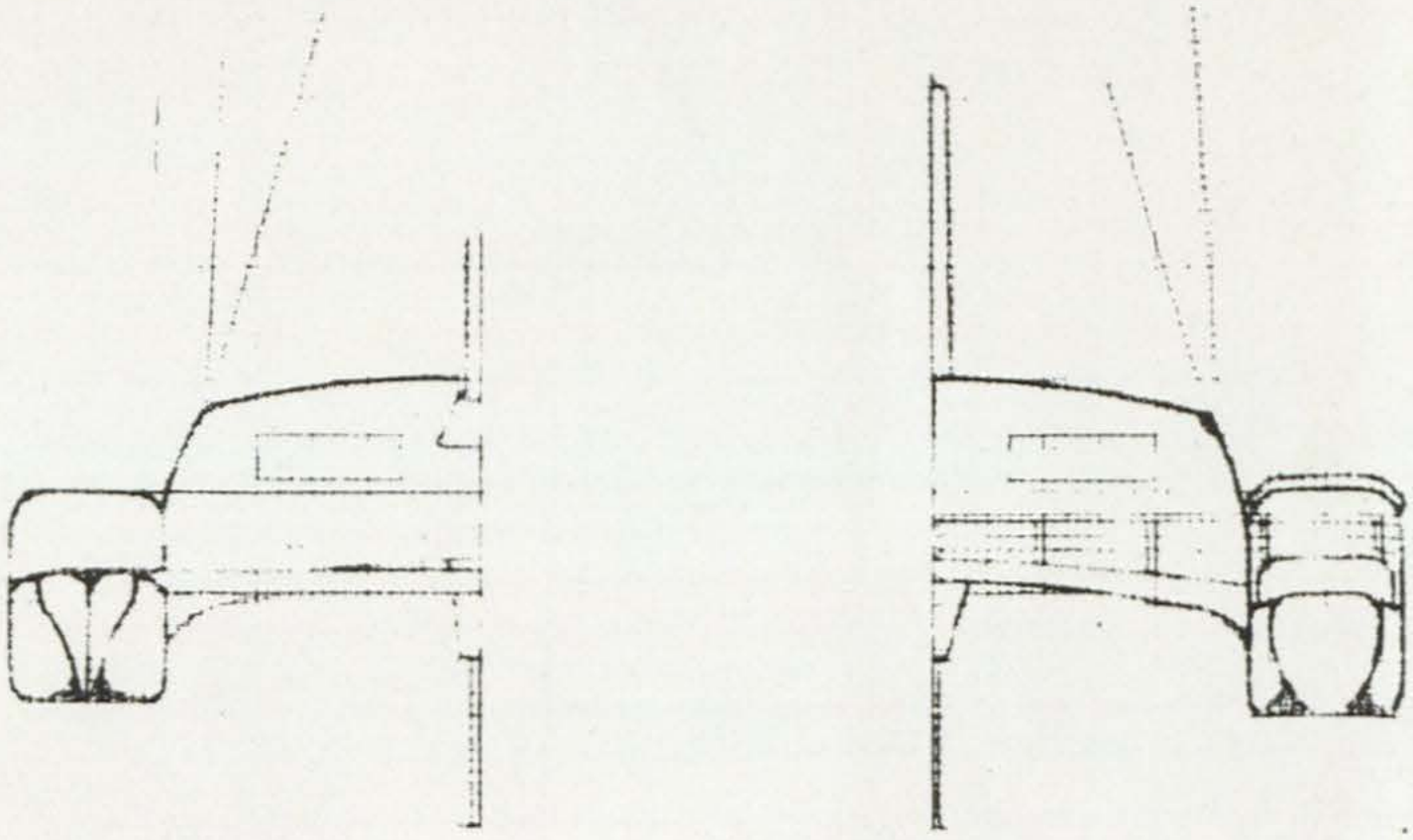
Some designers object that when the hulls are relatively far apart the lee bow tends to bore in a seaway. This is undoubtedly because many designs, through the auspices of marineply, are designed with the hope that under some conditions they will plane. But even if they never plane, the potential of a fluid is a sure thing and the bows of these craft, designed to cleave the water ever so finely, are dynamically inadequate to buck the craft when the chops get going. There is only one way in which to anticipate, and encounter, the moments of waves in such a situation, and this is by providing a sufficient reserve of surface-inertia moment; and to do this without bulky wave-throwing is tantamount to a very long slender bow, or, alternatively, a *Hook-up*. (Hook feeler-arm and foil.)

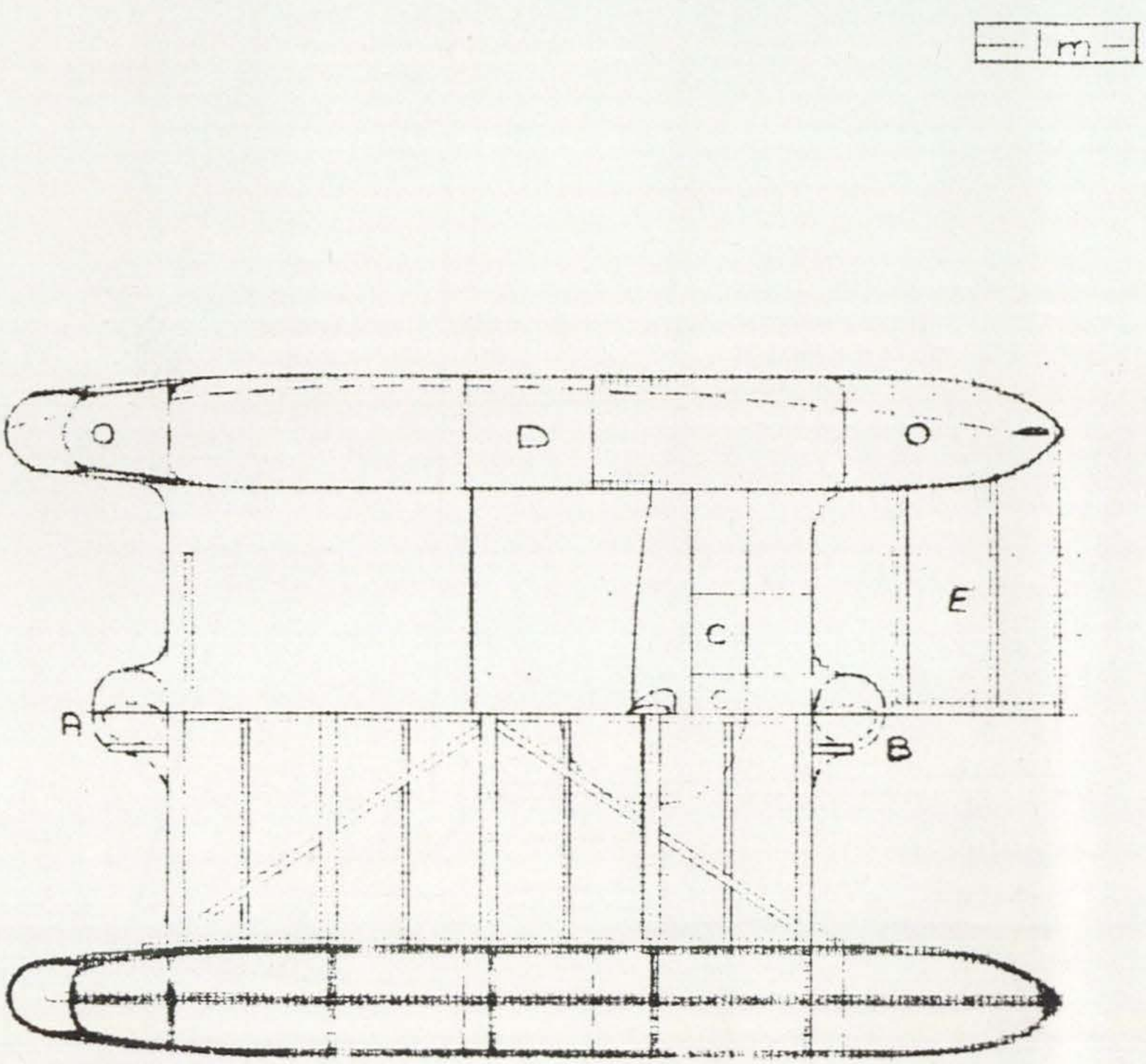
In an article shortly to be published by Hovering Craft & Hydrofoil, in conjunction with one of my more full-blooded designs, I propose the Hook stability method, but with a simple hydraulic connection to telescoping foil end-sections on the main foil. I rather fancy the dynamical possibilities of a foil section moving out to countenance instability moments, thus increasing the projected foil area in the heeling direction. It would seem to obtain the required stability moment with less drag and with little risk of cavitation and separation. A telescoping foil section would require less filtering of the feeler-arm impulses than will a flap. Mechanically it would be a mere question of fitting the end-section to the foil proper, one over the other, like a sleeve.

I include copies of drawings of a proposed design, the purpose of which was to produce a light week-end cruiser that also would be suitable for coast-crawling in holidays. The lines have been developed for about a ton all-up; and so that either hull will comfortably take 70% of the weight.

The construction is all of marineply except the hulls, which are to be strip-planked with two layers of polypropylene cloth in polyester






1m
D
E
C
A
B

resin on the outside. When the hulls are turned, frames are screwed into place and all unevenness filled out with low-density plastics before one coating of polypropylene is laid in resin on the inside.

The rudders are placed as shown at A and B. They are not retractable, but fold up when kicked, or they hit something. The differential tie-up is simple and is adjustable so that they also function as centreboards. They are fenced, and plated at the bottom to prevent the induced velocities doing their stuff.

The bins shown at C, should be equally devoted to Carlsbergs and Tuborgs—that's only fair, if not used for halyards etc.

Each hull will accommodate two sleepers on air mattresses.

With regard to polypropylene cloth versus glass fibre cloth it must be mentioned that polypropylene is 60% lighter and that at this weight ratio it is about four times as strong at impact. In the U.S.A. the price is about the same for 4 oz. plain weave versus 10 oz. plain weave.

KAJ JØRGENSEN.
Taarbaek Strandvej 34 A, Klampenborg, Denmark.

1976 AND ALL THAT

BY

PETER WATKINSON

8, Chelwood Place, Leeds 8.

Exhausted, I lay on the beach at Filey, and just a trifle disappointed, too. For the past four years, my 16 ft. catamaran, *CAT O' TWO TAILS*, which was to my own design and construction, had experienced the one major fault of all prototypes—it was just too heavy.

Despite careful calculations at the design stage of estimated weights of materials, screws, fittings etc., plus the handling refinement of two launching hull bogies (which pull up like fenders when afloat)—it was proving too much for single handed launching.

By the time my son and I had a sea trip and dismantled the bi-pole mast, sail, twin rudders, cross beams and packed the twin hulls and gear, the recent pleasure was a lost memory. The cynics will interject here to say " So much for dismantleable cats ! "

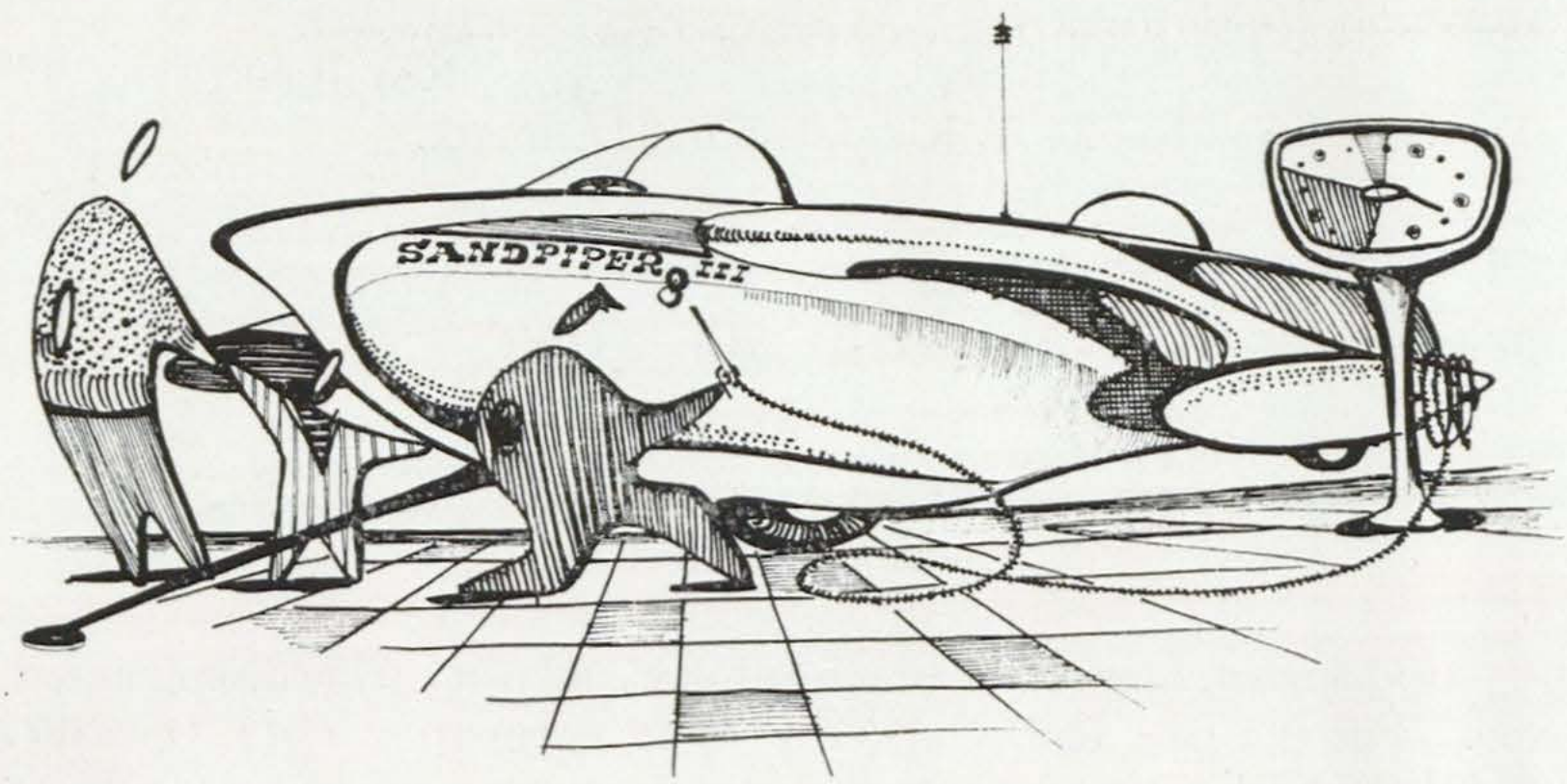
The previous year in desperation, I had fetched my sharpest tenon saw during the winter lay-up and sliced 2 feet off the hull length and then compensated this by flattening the rear hulls and widening the transoms to re-coup some-lost displacement. The result was, alas, a negligible saving in deadweight and a loss in performance and

seaworthiness. Six months hobby-time wasted and an inevitable hernia destined for sometime in the future.

Dreamily, I observed the local fishermen manhandling their " Cobles " for the tractor-haul up the Coble landing, whilst further along the bay towards the Brigg, fellow members of the Filey S.C. were pulling their *ENTERPRISES* and *OSPREYS* along the beach and up to the cliff-side berthing area.

A holiday-maker's transistor plays " . . . you sweet inflatable you." No; that's not the solution. I query to myself as I dose off in the hot sun.

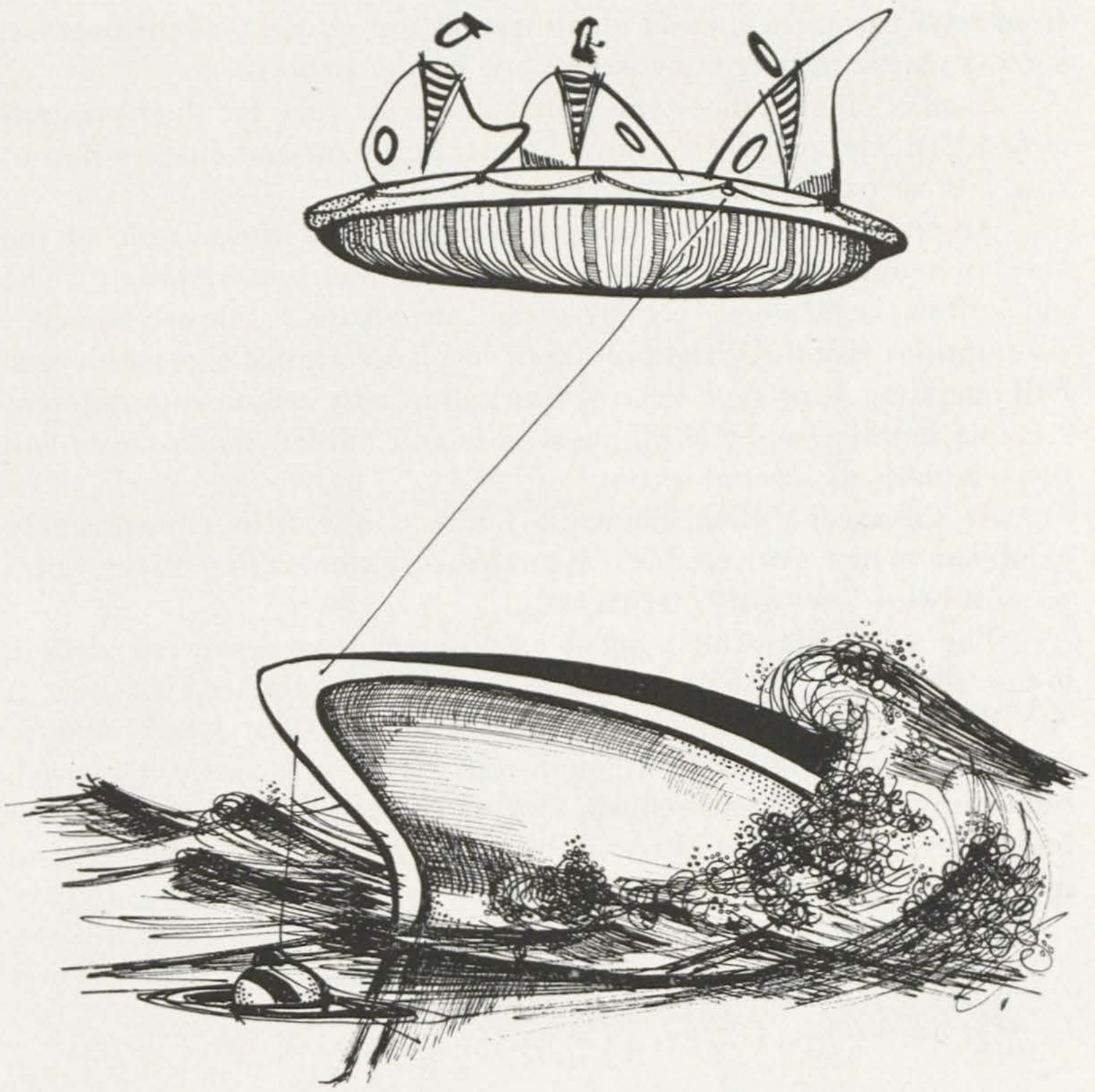
—My dream of future boating is both visionary and enlightening, the year is 1976 and small craft are now very advanced, sleek moulded fibreglass cat. and tri. hulls everywhere in quantity. Cars towing their boats behind by means of integral trailer wheels with nylon bushes



"Topping-up" with "lighter than air" buoyancy

built in the hulls, pull up at smart petrol stations, and, in a similar way to inflating tyre pressures, they are filling or topping up their hulls with proprietary commercial " lighter than air " buoyancy gas. A small pressure guage is installed flush in each hull and the pressure selected depends purely on the payload to be carried that trip. A simple chart shows that if 6 people are going aboard, a certain pressure is needed.

The Era of the Weightless Hull is with us now. What a transformation ! All the " humpy " taken out of boating and sailing in small craft. Weighted keels and manually controlled centreboards are no longer used. Keel ballast is now achieved by a sea-cock which automatically fills the hull base compartment with sea water when the craft is afloat. The reverse happens when the craft is back on shore.



Shipwreck—1976

By ingenious yet simple design, whenever weight is required for stability, water is used and rejected.

Inflatables are popular to a degree and enjoy the same new buoyancy advantage as rigid hulls, but insurance is high for them. But the rigid streamlined plastic hull is the main basic craft. Up to date refinements like hydraulic hydrofoils and sponsons, mini-jet and outboard power units are now backed by the whole field of the motor car accessory firms.

Survival apparatus, too, has radically changed. In the unlikely event of a boat listing badly due to a punctured hull or a sea crash, then the main deck is released as a slow rising ejector seat which floats up about 25 ft. in the air. The crew sit there on their magic carpet, tied by an umbelical nylon rope to their damaged craft below and, free

from wave turbulence, await identification and rescue. If the boat has sunk, a plastic marker buoy is dropped by the airborne crew.

Smaller single canoe-type craft have an air yoke for their presumably active one man crew, which lifts its occupant and enables him to row with air paddles any reasonable distance.

Amphibious craft and hovercraft remain the prerogative of the very rich due to their high and expensive fuel consumption. The old craft of the 60's now seem by-gone " stringbags " " do-it-yourself " contraptions, like the Wright brothers' bi-planes against supersonic jets. Self operating Vane type steering gears allow easy sailing with different reefable highly simplified elliptical sails and hidden mono-masts and bi-pole masts of aerofoil section.

At this year's Boat Show in January, one firm enterprisingly exhibited a new convertable ice/sand/road/water sailing yacht, ultra popular with " with-it " teenagers.

The most interesting point to an observer from a previous decade is that all current small craft designs strongly echo the trends shown in A.Y.R.S. pioneering publications of the late 1950's and early 1960's. Sail plans and multihulls, although now technically vastly improved, beautifully executed and refined, lacking the earlier crudity, show the undoubted influence of these enthusiastic amateurs, the pioneers of modern sailing and boating in the 1970's.

AMATEUR BOAT BUILDING SOCIETY IS FORMED

A new organization for amateur boat builders has been formed with the aim of co-ordinating the interests and activities of the thousands of "back yard" yachtsmen throught the world. The group plans to catalog hundreds of available plans, commission new designs especially for amateur building in both sail and power and in all materials, and serve as a clearing house for technical questions and information of value to the amateur builder. Other goals include the establishment of local clubs with central building facilities in order to move the amateur from the back yard into heated, lighted, well equipped shops. A monthly publication reports on boating activities of special interest to the amateur and carrys building plans of several boats.

For further information write: International Amateur Boat Building Society, 1535 W. Farwell Ave., Chicago, Ill. 60626.

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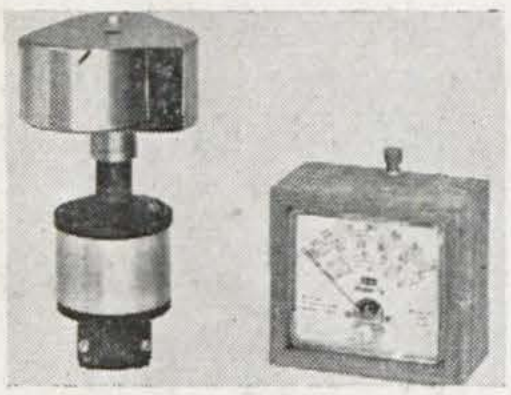

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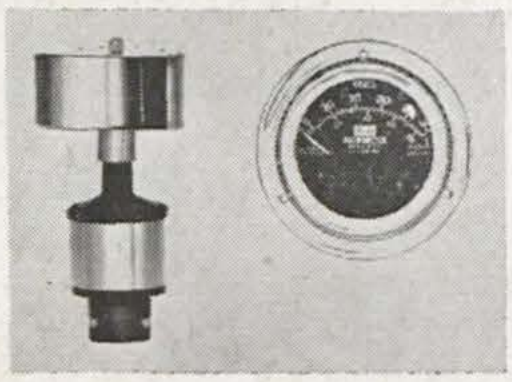

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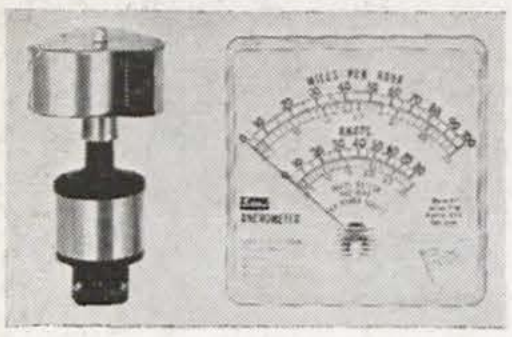

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