CATAMARANS 1960

A.Y.R.S. PUBLICATION No. 35

"AIKANE"

CONTENTS

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CATAMARANS 1960

The original title of this publication was to have been MULTI-HULLS 1960 and it had been hoped to include accounts of trimarans, outriggers and hydrofoil boats. However, finance is a hard taskmaster and when all the very interesting articles on catamarans had been put together, it was found that we had used up all our space, though this is greater than in other years. We have therefore had to hold over till the future some very pretty designs of trimarans and an account of one flying hydrofoil boat.

We welcome the extremely interesting articles by Rudy Choy and Hugo Myers from the West Coast of the U.S.A. and hope that the deep asymmetric hulls developed so successfully by Rudy Choy and others will get a fuller understanding in future.

We also thank all the kind people who have sent in accounts of their catamarans which make this publication so pleasant.

April, 1961.

EDITORIAL

There have been some changes in the British group. Dr. Norman Davies has resigned from the Vice-Presidency, while still remaining a member. Dr. Davies was a member of the original meeting which produced some organisation from the preliminary gathering of members and has been very helpful with good advice in technical and other matters.

R. Gresham Cooke, C.B.E., M.P., who is well known for his work for the Motor Industry, amongst many other things, was unanimously elected Vice-President in Dr. Davies' place.

Tom Herbert, who also was a member of the original meeting and who has done sterling service for the A.Y.R.S. at a difficult time has also resigned owing to other committments. He is at present revising A.Y.R.S. No. 13 on SELF STEERING for a second edition and would welcome additional information which anyone can send him.

Mrs. Ruth Evans has taken over the post of Hon. Secretary. Her work as " Research Secretary " has been of the utmost value and vision. In order to ease the work of both the Hon. Secretary and Hon. Editor, Mrs. Robson has been appointed " Hon. Membership Secretary " and will keep the list of members and take in subscriptions from now on. She will also be responsible for producing a NEWS SHEET, which will give the news of the British Group which is not suitable for International publication.

A. J. Millard has been elected to membership of the Committee in the place of R. Gresham Cooke.

THE ONE OF A KIND REGATTA OF 1960

The results of this regatta, held at Stokes Bay from 19th-24th September, 1960 are as follows. The table is taken from Yachts and Yachting.

Type	L.O.A.	Beam	Sail Area (sq. ft.)	Designer	No. races sailed Count	Open Results 5	Production Results of	Under 13ft R Results 6	Total Pts. Races
Thai Mk. IV (Racing Rig)	17.8ft.	8.6¼ft.	226	R. MacAlpine-Downie	6	1	1	1	150
Thai Mk. IV (Cruising Rig)	17.8ft.	8.6¾ft.	226	R. MacAlpine-Downie	5	2	2	2	143½
Shearwater III	16.6ft.	7.6ft.	160	R. and F. Prout	6	3	3	3	142
Freedom	18.6ft.	9.4ft.	276.6	D. Robertson	5	4	–	–	135
Cougar Mi. I	18.9ft.	8ft.	207	R. and F. Prout	6	5	4	4	133
Cougar Mk. III	18.9ft.	8ft.	219	R. and F. Prout	6	6	5	5	127
Flying Streak	19.6ft.	8.9ft.	235	F. Montgomery	5	7	–	–	124
Jumpahead	16ft.	7.6ft.	180.27	W. O'Brien	6	8	6	6	119
Flying Cat III	16ft.	7.6ft.	200	F. Montgomery	6	9	7	7	110
Cheetah Cat II	14ft.	6.6ft.	154		5	9	–	8	110
Swift Cat	14ft.	6ft.	120	R. and F. Prout	5	10	8	9	95
Flying Cat II	16ft.	7.6ft.	195	F. Montgomery	4	11	–	10	92
Mercury	15.6ft.	7.6ft.	140.5	W. Prangnell	5	12	–	11	85
Hurricane	20ft.	11.1ft.	299.567	W. O'Brien	6	13	–	–	81
Alley Cat	14.1ft.	6.1ft.	130	J. Bennett	4	14	–	12	77
Flash Cat	20.0¾ft.	7.6½ft.	195.5	A. Burstall	5	15	–	13	76
Flying Cat I (Movable Hulls)	18ft.	7.6ft.	178	F. Montgomery	4	16	–	14	71
Catamanner	14.5ft.	7.2ft.	144	E. Manners	3	17	–	15	54
Jumpahead	16ft.	7.6ft.	190.13	W. O'Brien	2	18	–	16	37
Kittikat	12.6ft.	5.6ft.	115	J. Blundell	2	19	–	17	35
River Cat	12ft.	6.3ft.	121	W. O'Brien	2	20	–	18	29
Snow Goose	36ft.	16ft.	919.5	R. and F. Prout	3	1st			12½
Shamrock	22ft.	12.8ft.	331.78	W. O'Brien	3	2nd			11¼
Golden Miller	20.9ft.	8.6ft.	225	M. Henderson	1	3rd			5

This year, the *THAIS* showed their true speed potential, winning every prize in their class, though the *Shearwater III* came a very close third. The first four boats in most races were the two *THAIS*, Don Robertson's *Freedom* and the *Flying Streak*. *Cougars* came in 3rd in the first race, 4th in the second and 3rd and 4th in the third one.

Though there are considerable differences in shape between all the successful catamarans, this does not appear to be reflected in the race results to any marked extent. Skilful sailing, light weight and perfection of the sails, as usual, won the races. *Freedom's* mainsail did not sit well and she could have done better. Looking again at her lines and sections in A.Y.R.S. No. 22, one must feel that Don Robertson in 1958 launched a boat which will be hard to improve on. It is perhaps noteworthy that Rod MacAlpine-Downie's new 14 ft. catamaran has a much flatter and wider transom than *Thai IV*.

The boomed jib of *Thai Mk. IV* which was called, cryptically, the " Cruising Rig " did not seem to make any real difference to the speed. If jibs of this kind become common, crews may be easier to get. I think there is no more wretched occupation than holding a freezing jibsheet with blue hands while acting as a spray guard for a not too silent helmsman. Roy Bacon tells me that it does not flog when coming about but tends to change tacks with a sudden flop, which is not disagreeable.

Jumpahead did well to finish among the round bilge boats while *Flash Cat*, a modified *Yvonne* 20, failed to shine as well as they do in Australia.

TRENDS IN CATAMARAN DESIGN

by

JOHN MORWOOD

One may consider that the design of small, day sailing catamarans as exemplified by *Freedom* (A.Y.R.S. No. 22) designed by Don Robertson, *Cougar*, *Tigercat* and *Thai IV* are about as good as we are likely to get. The designers of these may strive for improvement but this is unlikely to be more than a few percent.

On the other hand, in larger catamarans, these shallow hulls as exemplified by *Dreamer*, *Flamingo*, *Snow Goose* and others, while fast in smooth water, give a lot of sea motion and tend to be stopped by the ocean waves. At least, that is the main body of reports which have been received, but perhaps it should be expressed as the fact that the deeper hulled catamarans in the Trade Wind areas produce fewer complaints of violent sea motion and they often are faster. The designers who favour the deeper hulls are Woody Brown of Hawaii, Rudy Choy and Warren Seaman of California and Dick Newick of the Virgin Islands among others. *Black Cat* by Erick Manners, described in this publication is of this type too.

Asymmetry. Associated with the concept of deep hulls is that of asymmetry, whose protagonists are Woody Brown, Rudy Choy and Warren Seaman. Dick Newick's hulls are symmetrical. Asymmetry originated in Micronesia and would never have been thought of by any Euro-American for a boat which had to sail equally well on either tack.

It is quite obvious that an asymmetric hull will have a faster flow of water on the side of greater curvature and will produce larger hollows than on the other side. Because the skin resistance increases roughly as the square of the speed of the water flowing past the boat, we can say that the skin resistance of the asymmetrical hull is greater than that of a symmetrical one. Now, all our tank tests of catamaran hulls indicate that a high proportion of the resistance at all speeds is due to skin friction. Therefore, the asymmetric hull will have more resistance than an equally deep symmetric hull, such as *Ay-Ay* by Dick Newick or *Ocelot* by Bob Harris.

Now, while all the protagonists of the asymmetric deep hull will, I think, frankly admit the above argument, they also point out the fact that the asymmetric hull will have a greater ratio of side to head resistance, which any sailing boat needs to get it to windward. This is perfectly true of course, but the other hull when on a level keel must more than neutralize this advantage. It can only be useful, therefore, to have asymmetrical hulls when sailing in strong winds such that the weather hull is nearly lifting out of the water. Now, in all the photographs which are seen of any of the big cats with asymmetrical hulls one cannot remember one where there is any great amount of heeling, let along lifting the weather hull substantially clear of the water. Nor can it be agreed that it would be good practice to sail a big cat this way. One must feel therefore, that the empirical fact that the deep asymmetrically hulled catamarans are faster than *Dreamer* on all courses is due to the deepness of the hulls, their lighter weight, extra sail area (or greater number of sails) or better handling, rather than their asymmetry.

Above Water Asymmetry. One can argue symmetry-asymmetry more or less indefinitely on the above lines but there is no argument whatever against asymmetry *above* the L.W.L. If therefore a catamaran is substantially symmetrical below the L.W.L. and asymmetrical above this line, it may obtain a definite advantage. In this case, the asymmetry will only be brought into play when the catamaran heels and then only on the lee side, which is just what is needed.

Summary. There is quite a strong case for making catamaran hulls deeper in the larger sizes which may be expected to meet ocean waves. The accounts of shallow hulls in such conditions nearly all mention violent pitching, while deeper hulls are generally claimed to be comfortable. No case is seen for the use of asymmetry below the L.W.L. but asymmetry which is only produced when the catamaran heels may be of great value.

BLACK CAT

L.O.A.	27′ 0″	Draught O.A.	1′ 8″
L.W.L.	25′ 6″	Displacement	5,500 lbs.
Beam	15′ 0″	Sail area	350 sq. ft.

Designer : Erick Manners, 93, Ridgeway, Westcliffe-on-Sea, Essex.

Black Cat

This is a handsome-looking catamaran with elegant and useful accommodation for five people. There is 6′ 3″ of headroom in the hulls, beneath the cabin top but there is an air of spaciousness about the accommodation which is very pleasing. Four watertight bulkheads are fitted and a self draining cockpit. A dinghy can be carried in davits.

Hull Design. The hulls are of double skin moulded plywood construction. They are of a rather deep, fine section forward in order to give an easy sea motion and there is slight asymmetry. The after body comes up to a transom and the after sections are shallower than those forward to reduce wetted surface.

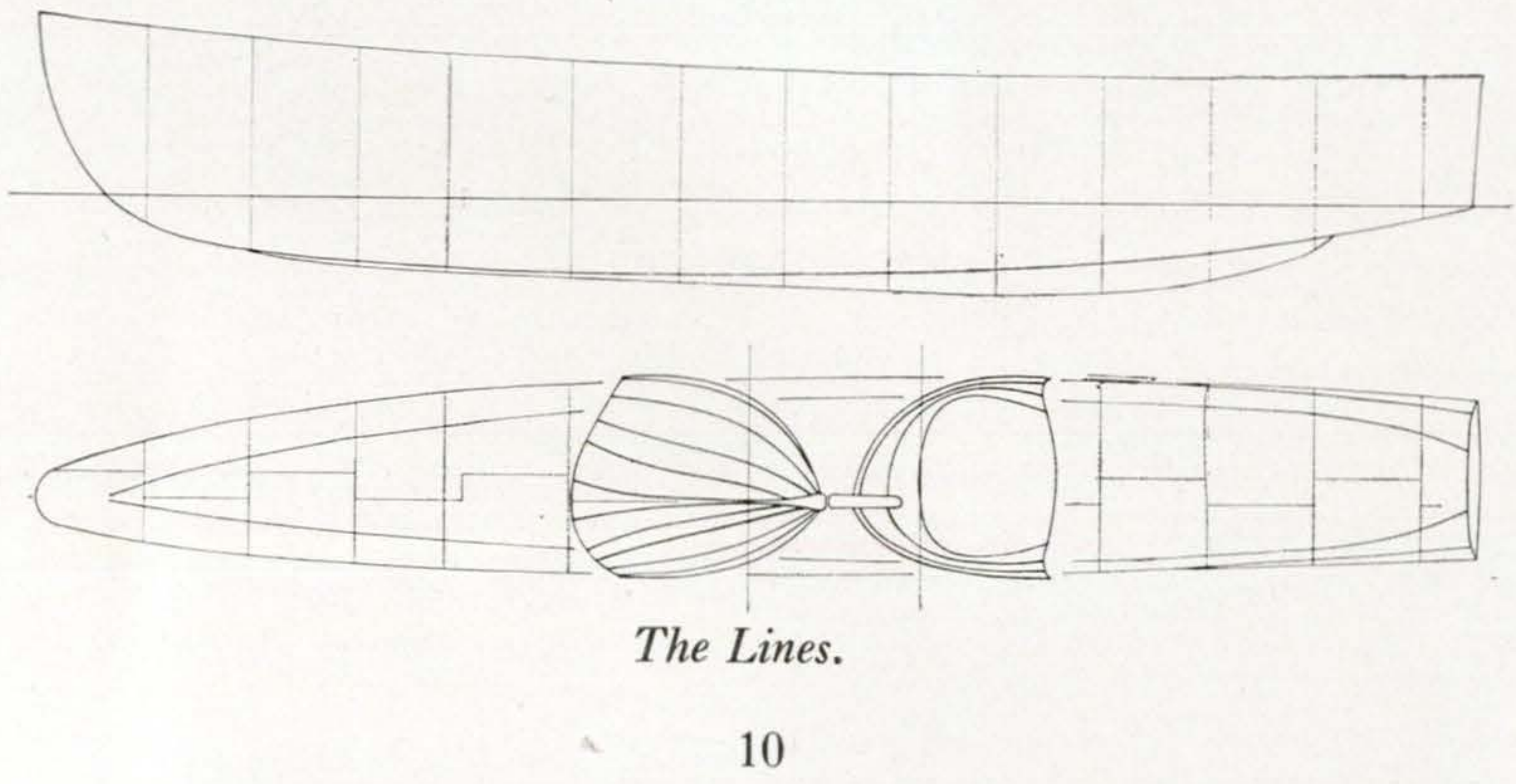
Performance. Designed in 1957 a *Black Cat* appeared for the first time at the recent London Boat Show. During sailing trials speeds up to 9 knots were obtained in a Force 3 breeze under sail Under power an 18 h.p. motor at 3/4 throttle gave a speed of 7 knots. A course of within four points to the wind was obtained when close hauled, which must be regarded as satisfactory for a catamaran without the nuisance of centreboards.

The Lines. These show a hull which is on the shallow side which experience seems to show is faster than the deeper hulls. But, at the same time, the curves of the sections are deepest at the keel which gives the appearance of a deeper hull than is actually the case. The entrance is a shade fuller than with the racing catamarans which is reasonable owing to the lower relative speeds at which a cruising catamaran may be expected to travel and the run ends at a wide flat transom—a feature again of the fastest craft.

There is slight asymmetry which should not slow her to any appreciable extent in light winds while giving some extra windward force when the craft is heeled slightly. The amount of asymmetry shown here (and its execution) appears to be very reasonable and capable of using the feature to its best advantage.

Black Cat was designed in early 1957.

Summary. Black Cat is an elegant standard class catamaran with more accommodation and speed than a single hulled craft of similar overall length. In a lumpy sea with white horses motion both in pitch and roll was easy and the course to windward was excellent. Building plans cost £10 10. 0d.



The Lines.

ASYMMETRY

by

RUDY CHOY

It may be reasonably surmised that the rounded-section symmetrical catamaran may be better than the asymmetric catamaran to windward *in light winds only*. This is the only possible valid conclusion at this time. Since a cruising catamaran must perform well on all courses under all sailable weather conditions, the record substantiates that the asymmetric catamaran has the edge at this time over the symmetric-hulled catamaran in California. Both reaching and running, *Aikane* has decisively defeated *Dreamer*. Also, until there is a race hard to windward in winds above 15 knots between these two catamarans, it is still a guess which one will be the victor. As I said earlier, at higher wind velocities the asymmetric design becomes efficient.

Also, our asymmetric hulls are not as deep as you probably believe. If they are deeper than the symmetrical-section. it is a matter of scant inches. I personally will accept the admitted design penalty of increased wetted surface area in order to gain the advantages of lower transverse wave-making at high speeds, softer riding in open ocean, less yawing, and a much drier ride. All these are qualities which a cruising catamaran should possess.

It has appeared to me that in rougher water the symmetrical hulls developed thus far are capable of bigger wave making and eddy creation than the asymmetric type. They are also wetter and rougher to ride.

It must be realized, in all fairness, however, that *Dreamer* does not have the complement of sails or equipment that *Aikane* has available. It is also possible that she may be heavier than *Aikane*. These factors complicate the issue of asymmetric hull versus symmetric hull.

At the present time in the U.S., the asymmetric catamaran *alone* has a history of successful long-distance ocean passages under very rigorous ocean-racing conditions. In the latest Trans-Pacific crossing, for instance, 3 were partially or totally dismasted, and more than a dozen conventional boats blew out all spinnakers (several lost up to 5 spinnakers) lost both spinnaker poles, cross trees were broken, and deck gear was shattered.

To date, the symmetrical-section catamaran has not demonstrated *by performance* either seaworthiness or sustained high speed under tough ocean-racing (and not cruising) conditions. We anticipate that one will come along soon which will make the long leap from theory to proven performance.

I hasten to add here that your day-racing symmetrical catamarans have certainly proven to be seaworthy and wonderful craft in the rough waters of the North Sea and English Channel. Therefore, their design evolution into sturdy and swift cruising catamarans appear quite certain. The questions that must be solved in design, however, are whether the much greater weight, broader underwater surfaces, large transom sterns, and greatly increased stress loads upon hulls, spars and rigging will inhibit the achievement of superior cruising catamarans equivalent in technical excellence to such day racers as the *Shearwater*.

In this regard, one of the more important problems faced by all catamarans in general is to maintain high speed in up to 45-knot wind and sea conditions while off the wind. We have found that achieving over 20-knot speeds in the open ocean is easy, but that it is difficult to maintain such speeds for any appreciable distances. For instance, the best *average speed* that *Aikane* has done for a measured distance of 30 nautical miles is 21 knots. To hope to maintain this speed for 60, 120 or 240 nautical miles would necessitate unusually steady winds and long seas from crest to crest. On this latter trip from San Pedro to Honolulu. *Aikane* averaged slightly better than 10 knots for the 2400-mile actual distance travelled.

We think it is easier to attain a higher average speed with a larger catamaran since size—up to a point—means more impunity to wind and sea conditions.

Peak speed is a very different matter from average speed. *Aikane's* best peak speed thus far has been over 28 m.p.h. *Waikiki Surf* achieved a peak speed of over 30 m.p.h. in 1955 in a roaring squall. All these speeds were registered in the open ocean under formidable wind and sea conditions.

The longer the course—in increments of 5 nautical miles— the more difficult it is to achieve sustained high speed e.g. It is not difficult to achieve 20 knots over a measured mile. It becomes difficult to sustain this over 5 nautical miles—and the difficulty becomes greater and greater with each additional mile.

If anyone definitely would like to prove that his catamaran or what have you is the fastest thing around, he will succeed in impressing us only if he does so over a measured course timed by a stop watch. Any other method is unreliable. I believe it would be most interesting if some group in England would establish measured 1, 5, 10, 25 and 100 nautical mile courses to be used for speed trials. Should one of your catamarans achieve a higher average speed than anything we have attained over here thus far, this would be a stimulating challenge and great fun for all hands.

SYMMETRICAL AND ASYMMETRICAL HULLS

by

HUGO MYERS

These of us who take perverse pleasure in the pains of sailing catamaran design have agonized over the symmetrical—asymmetrical arguments almost on a continuous basis. Since the costs and problems in boats go up as the cube of the length, the intensity of my suffering during the design and construction of the 43 foot "*Dreamer*" in 1955-56 may be appreciated. Six years of study, sailing, design and construction, and four years of continuous ownership of a large catamaran have pounded some theory and experience into me, and I'm happy to have this opportunity to pass it on to the Amateur Yacht Research Society.

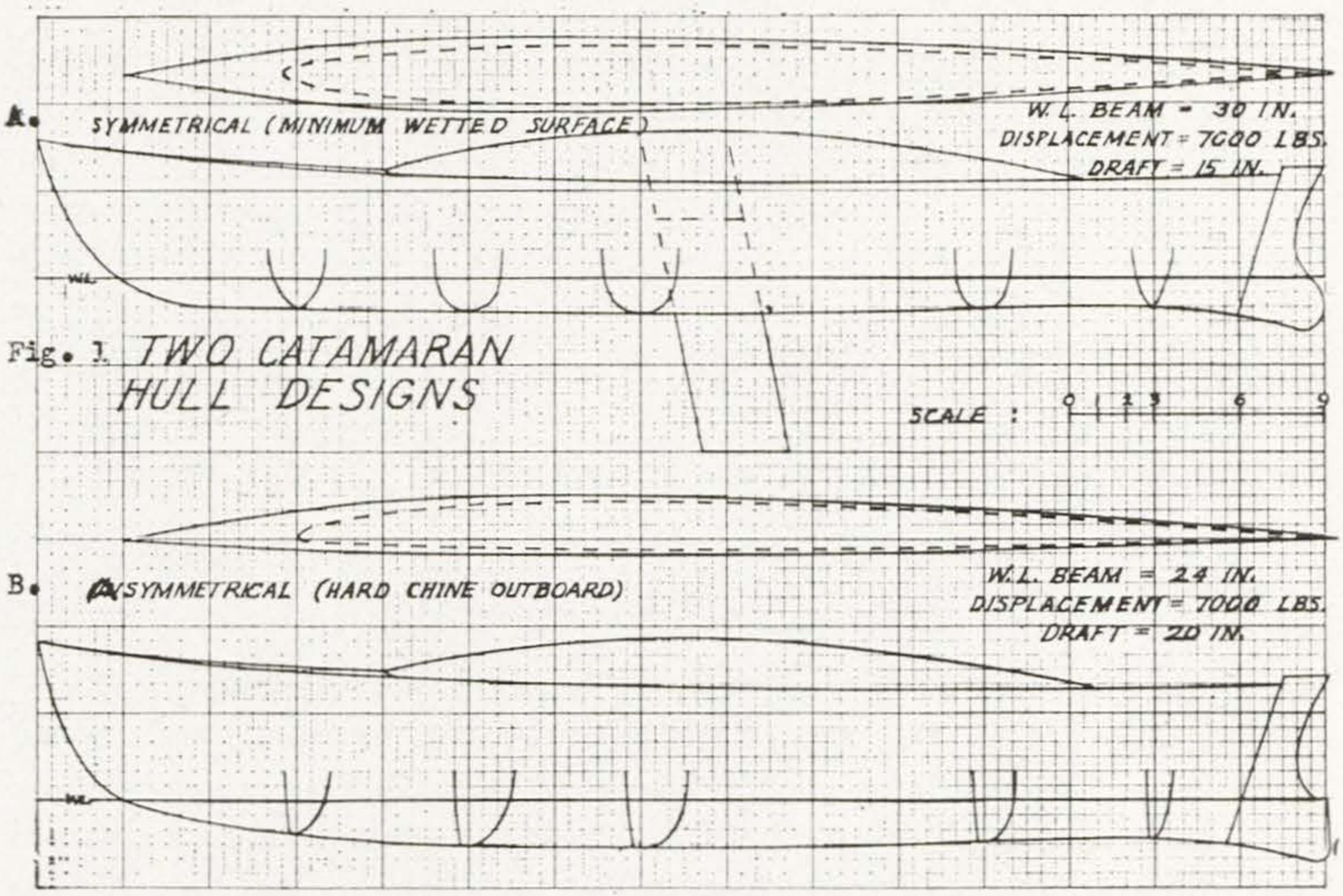


Figure 1 illustrates the type of hulls to be considered. The symmetrical hull is representative of our 33 and 44 foot designs, now being built in the Santa Monica area and Hong Kong. By way of explanation, it should be noted the neither of these shapes is absolutely optimum from the purely drag point of view. There is too much wetted surface area towards the sterns, the rudders are not optimumly shaped, and the hull fullness should probably be further aft. In addition, Fig. 1 B does not represent the latest practice in asymmetrical hull development. The evolution has been toward fuller hulls with small dagger boards.

However, these hulls are approximate sketches of good practice in large cat design. The skeg effect gives good rudder support, resists the tendency to broach in following seas, helps to keep the centre of lateral resistance aft for good helm characteristics, and reduces the damage in the event of striking submerged objects or reefs. The fullness forward of the mid section supports weight and storage forward and tends to reduce lee bow burying. There are many variants; more rocker aft, for better manoeuverability, completely underwater rudders with through-hull rudder posts, and fuller sterns.

To get the analysis off the ground, the major symmetrical cross sections can be approximated by a semicircle, as in Figure 2A. The asymmetrical cross sections can be represented by a quarter-circle, as in Figure 2B, which must then have a radius $\sqrt{2}$ larger in order to carry the same load.

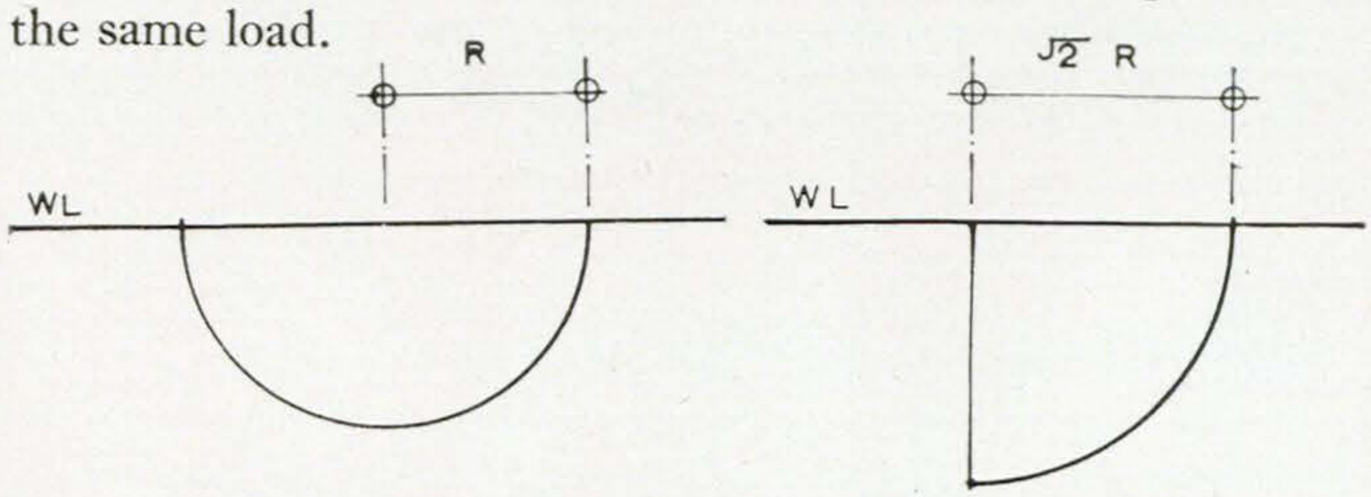


FIG. 2A. *Symmetrical Hull Cross Section* FIG. 2B. *Asymmetrical Hull Cross Section*

$$C_{W_1} = \pi R \qquad C_{W_2} = \sqrt{2}R\left(\frac{\pi}{2} + 1\right)$$

$$C_{W_2} \pm 1{\cdot}16\, C_{W_1}$$

Thus, the wetted surface area of the asymmetrical shape is about 16% greater. Also, the water line beam of the rounded hull, being $\sqrt{2}$ greater, will result in the symmetrical hull planing more readily, or at least getting more dynamic lift. Therefore, intuitively, one would expect that the symmetrical hull would be faster at low and high speeds —due primarily to less wetted surface area, and secondarily to greater dynamic lift.

This in fact seems to be the case, as shown in Fig. 3. These are approximate theoretical curves for sixteen foot hulls of the types shown in Figure 1. The analysis is based on an article by John V. Wehausen entitled "Wave Resistance of Thin Ships," which was presented at the 1956 Symposium on Naval Hydrodynamics. The proceedings were published by the National Academy of Sciences in Washington D.C. This theory was modified slightly as the result of conversations with Dr. Alex Silverleaf, Associate Director of the National Physical (hydrodynamics) Laboratory, London, who is visiting the California Institute of Technology.

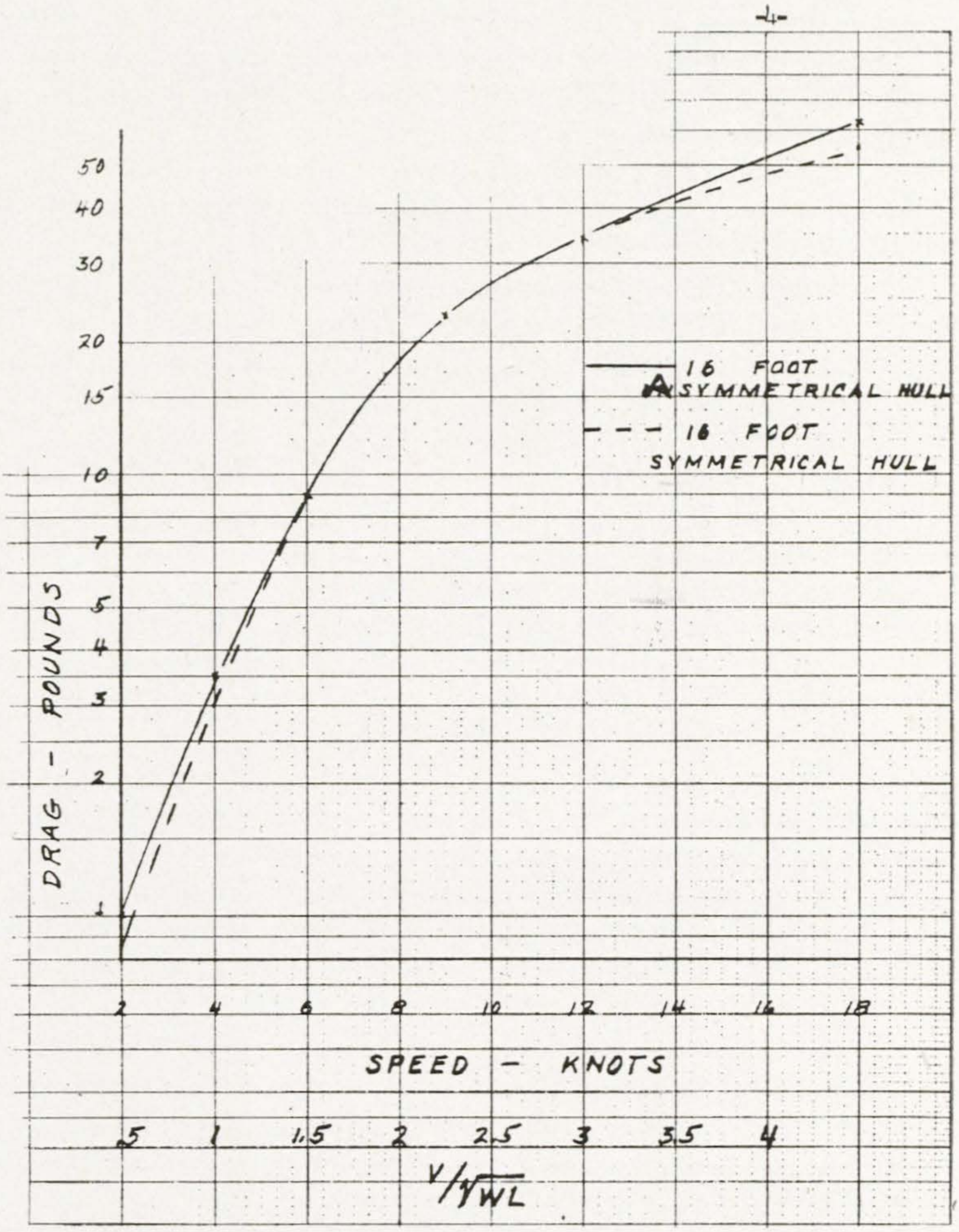


Figure 3 illustrates the fact that at low speeds (less than $1{\cdot}5\sqrt{WL}$) and at high speeds (greater than $3\sqrt{WL}$) the symmetrical hull has about 15% less drag due to the reduced wetted surface area. However, in the speed range from $1.5\sqrt{WL}$ to $3\sqrt{WL}$ the increased wave resistance of the fuller hull compensates for the reduced frictional resistance, and in this range the total drags of the two hull types are approximately equal.

The historical facts bear out these theoretical results in an interesting manner. The Hawaiian (asymmetrical) approach is exemplified by hull shapes approximately similar to those in Figure 1 B. These early boats were designed primarily by Woody Brown, a champion glider pilot, and this analysis indicates that his approach was almost exactly correct for their purposes. For example, the Waikiki Beach cats were designed for commercial operation in strong, steady winds. These boats reach back and forth at speeds averaging ten to fifteen knots.

A glance at Figure 3 shows that a 36 foot WL hull reaches her $1.5\sqrt{WL}$ " hull speed " at 9 knots. " Aikane " averaged about 10 knots in her Transpacific races. Therefore, these boats could do little better reaching and running if they had the most optimum conceivable hull shapes.

However, for small racing catamarans, such as *Tiger and Cougar Cats*, the top speeds are over $5\sqrt{WL}$, and at these speeds the asymmetrical hulls can not compete. This is amply demonstrated here in Southern California by the 18 foot 9 inch *Pacific Cat* (symmetrical, rounded underwater section), which is faster than the larger asymmetrical hulls (with higher ratings) in good winds and protected waters. On the other hand, the larger asymmetrical hulls can take the Pacific Cat under other conditions, such as rough water.

For the really large catamarans an expensive item of information has been provided us by the experience of Kaiser's 100 footer. In this size the hull is almost always operated at speeds below $1.5\sqrt{WL}$, and in this range it is inefficient due to the extra wetted surface area. In addition, the standard problems were greatly magnified ; the hull pitched the props out of the water, made too much leeway, and was unmanoeuverable.

To summarize the results of our theory and experience to date, the asymmetrical hull is probably adequate in sizes from 30 to 60 feet, particularly for reaching, running and cruising. The proponents consider it no more trouble to backwind the jib on every tack than to adjust the boards on every course, and they have saved themselves all the maintenance problems of boards and trunks—in the earlier versions. In addition, they claim that the very lack of manoeuverability they are charged with is an advantage on the open ocean, particularly for spinnaker work.

The properly designed symmetrical hull with boards has the advantage of windward performance and manoeuverability in all sizes, and the small sizes have shown a speed advantage in light or very strong winds and protected waters. Whether this theoretical advantage obtains in the larger sizes remains to be seen. In addition, the fuller hulls have more room inside and bury and pitch less. For these reasons most successful racing catamaran designers today, such as Bob Harris (Tiger Cat) and Roland Prout (Cougar Cat) have adopted the symmetrical configuration.

However, as mentioned earlier, the modern trend in asymmetrical hulls by Rudy Choy and Warren Seaman, Woody Brown and Alfred Kumalii is toward the fuller hulls with boards, but maintaining the outboard chine. The primary reasons for keeping the chine are to maintain some windward performance without boards and superior tracking ability in the long ocean races.

Also, the good practice in large symmetrical hull design is progressing toward fine exits, for reasons of tracking, trim and rudder support. Thus, the relative drags of the two " modern " hull shapes are even closer together than shown in Fig. 3.

I have tried to present the situation fairly, but for a strong argument for the asymmetrical shape one should contact the proponents. The asymmetrical enthusiasts have taken two significant steps in the direction of the opposing view in the last few years. These two steps are (1) beamier hulls, and (2) small dagger boards for racing. Meanwhile, those of us who prefer large, symmetrical hull catamarans have moved in the Hawaiian direction by designing fine exits for better rough water behaviour. Thus, all that is left of the arguments is whether or not to have relatively flat outboard chines. The difference in speed between the two more modern large catamaran hull shapes is probably only a few percent, and similarly, the relative manoeuverabilities have approached each other.

THE BIG CATS

by

HUGO MYERS

An article which originally appeared in the January 1960 *Motor Boating*.

Introduction.

Until recently, most experienced yachtsmen who had any contact at all with catamarans concluded that they were basically ungainly and capsizable, that they had awkward accommodations, poor windward ability, unreliable structural integrity and doubtful manoeuverability — and that for all these reasons they were historically unsuccessful. Sailing cats have richly earned this unfortunate reputation over the past few hundred years because they were usually designed by enthusiastic amateurs who, of necessity, had little experience, poor materials, and a limited understanding of fluid dynamic theory.

In the last few years, however, both small and large catamarans have achieved notable successes. In 1956 in England one of Roland

Prout's 18-foot cats beat all the racing class types by a speed margin of 25 per cent in a rough, windward cross-Channel race, and this success sparked the development of the *Shearwater III* series.

During the next two years the 46 foot *Aikane* broke the course record in the 140-mile, 300-boat Newport, California to Ensenada, Mexico race and beat the fleet twice in the 2225-mile, 40-boat Los Angeles to Honolulu race. In the 1959 Florida One-of-a-Kind series Bill Cox's 17-foot *Tiger Cat* and Prout's 18-foot *Cougar Cat* were first and second out of all the small boat racing classes. Thus experienced designers, with improved hull and sail plans and modern materials have been able to develop some outstanding catamarans.

Here in southern California we have the unique opportunity to compare three seasoned cats in the 43- to 46-foot class which have been sailed extensively during the last three years, and which have significantly different hull shapes, accommodations, and sail plans. These are the 44-foot *Anuinui*, designed and owned by Daniel M. Brown in San Diego ; the 46-foot *Aikane*, designed by Rudy Choy and owned by Ken Murphy of Los Angeles, and the 43-foot *Dreamer* in Santa Monica, designed and partly owned by myself.

ANUINUI

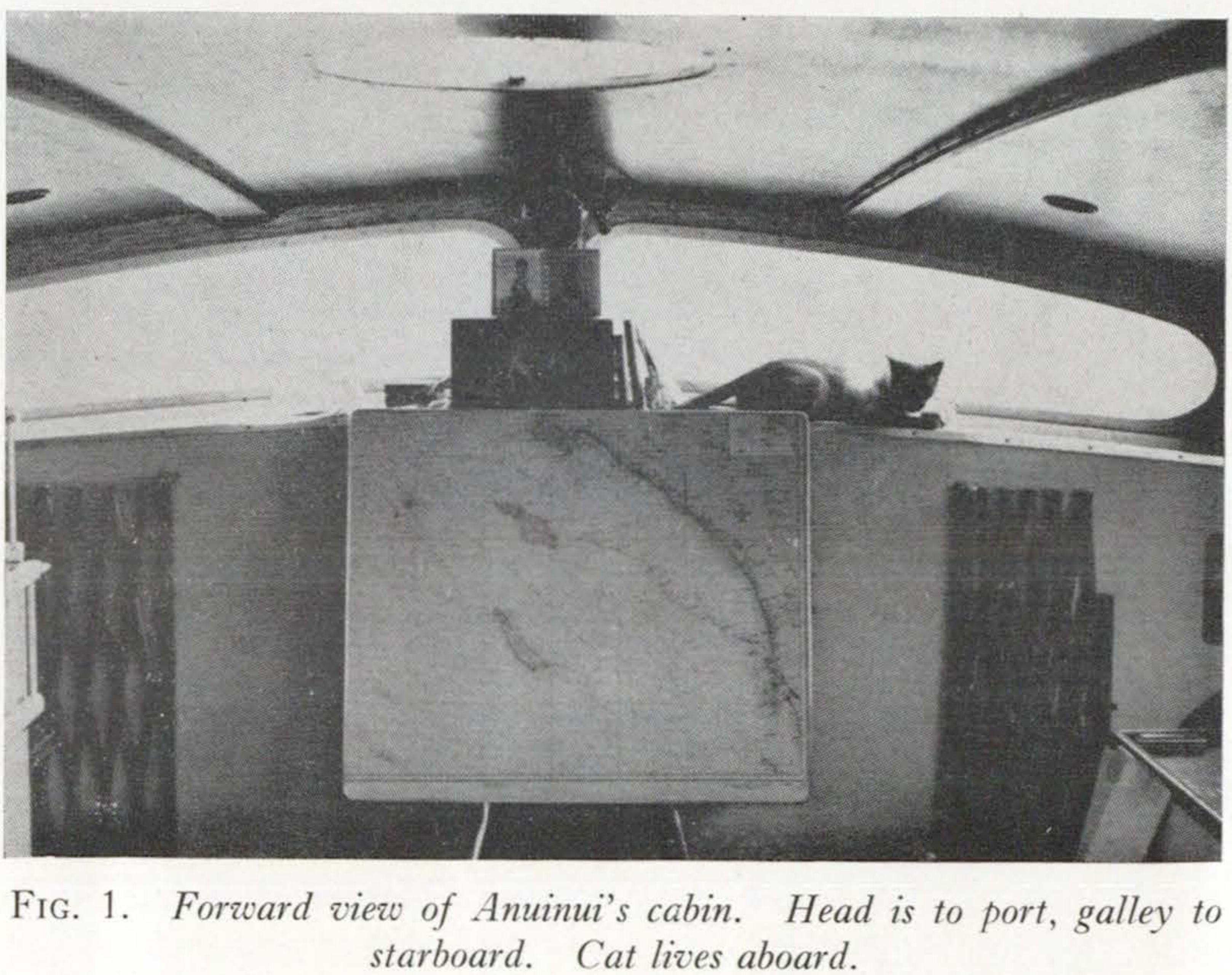


FIG. 1. *Forward view of Anuinui's cabin. Head is to port, galley to starboard. Cat lives aboard.*

ANUINUI

Dan Brown is an oceanographer with the Scripps Institute in La Jolla, California, and is the contented skipper of Anuinui. Dan and his wife and one-year-old son live aboard at the Silvergate Yacht Club in San Diego.

FIG. 2. *Anuinui's colourfully striped sail inspired her name, Hawaiian for "rainbow." She has a short rig with sails Brown can handle himself in any weather. Her waterline length is 32 feet.*

Anuinui is the Hawaiian word for rainbow, so named because of her colourful sails. On close inspection she impressed me as being unusually handsome, seaworthy, and comfortable. From the sailing point of view she is distinguished by her conventional keel hull design and ketch rig.

Naturally, Anuinui is best described in the owner-designer's own words : " . . . My boat was the upshot of experience gained from my earlier cat, the *Lear Cat* which I converted into a cruising cat and first experimented with divided rig and inboard power.

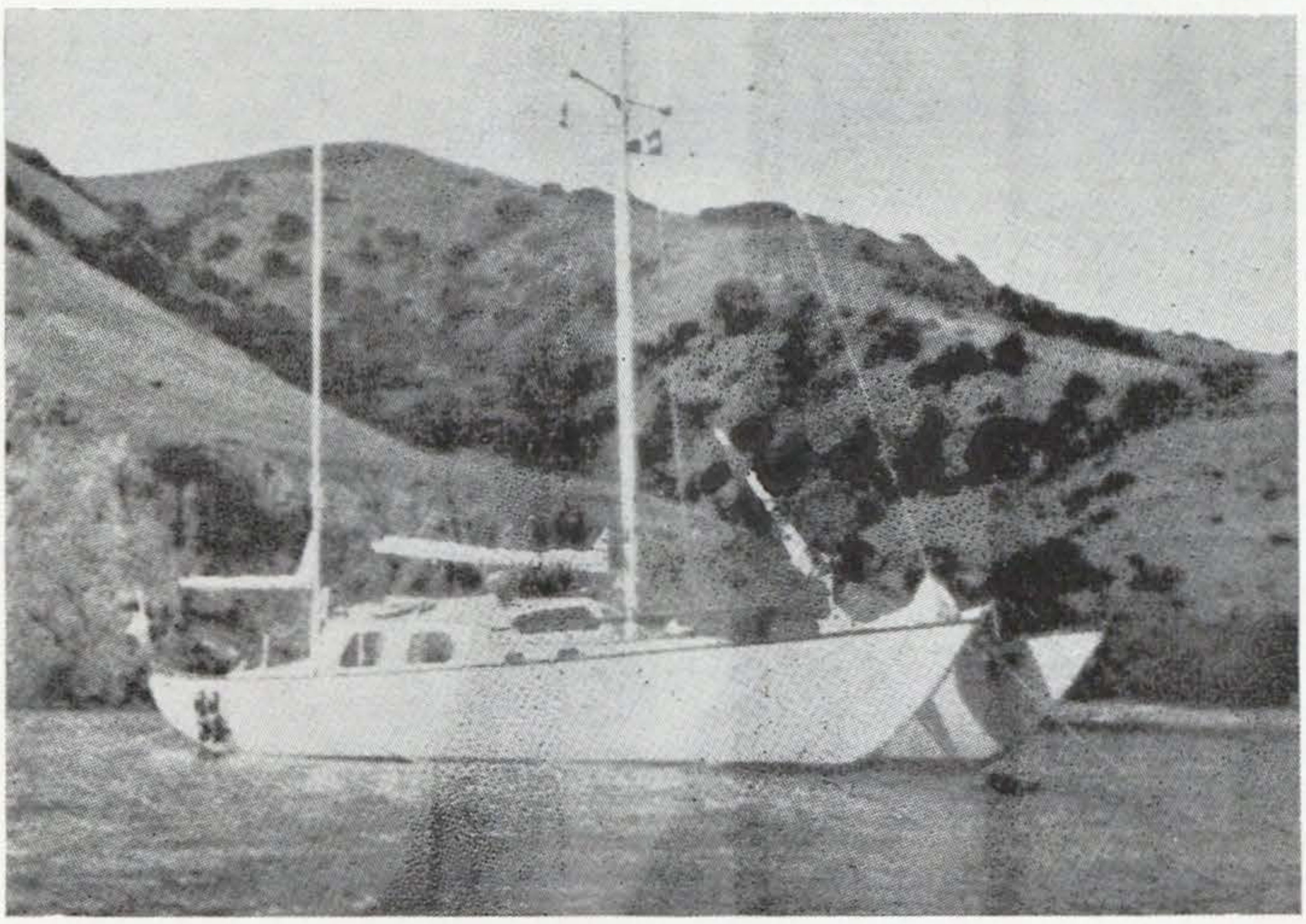


FIG. 3. *Anuinui anchored in Emerald Bay, Catalina. " I wanted the boat to look like a boat," her owner-designer, Dan Brown said, " and to that end I wanted the overhanging ends."*

" I was after three things when I had Anuinui built, and the boat has more than lived up to my expectations. These were (1) Speed —not racing cat speed, but at least the speed of a conventional ocean racer of the same size. The boat's performance has consistenly been that of a PCC or 8 meter, but faster in heavy going. (2) Single handed sailing ability. This meant a short rig with sails I could handle by myself in *any* weather. Obviously a short divided rig is not efficient for racing, but by going to a cat I can have regular racing-boat speed with regular cruising-boat sail area. Along with easy handling was the necessity that the boat be manoeuverable without having to back sails every time you have to tack. I have this too and have to back sails only under fluky light air conditions when I have little steerage way, a condition that plagues all sailboats sooner or later. (3) Room. I wanted roomy comfort and the necessary hull buoyancy to carry the weight that a live-aboard boat would have. Thus, to keep the boat within an economical and handy size, the hulls would have to be much fuller than a racing cat. Therefore I have a 32-foot water line length with a 4-foot water line beam and a $3\frac{1}{2}$foot draft.

" These were the main objectives — speed, room and ease of handling — an impossible combination to achieve in a single hulled boat to the degree that *I* wanted these features. There were also other things that were necessary for a suitable cruising cat, such as reliable inboard power for auxiliary use and for supplying the lighting system. My Atomic 4 does the job nicely, giving me 8 knots with my cruising propeller and 6 knots with my folding racing propeller.

" I wanted the boat to look like a boat, and to that end I wanted the overhanging ends. The $\frac{7}{8}$-inch strip planked hulls make for a low centre of gravity, and the wine glass section shifts the centre of buoyancy enough so that I can come back up from a flat out knock down. I am not non-capsizable, but when I can right myself from a point when the mast hits the water that's good enough for all practical purposes. The heavier hull protects me from temperature changes because of its thickness. The heavier hull also makes the boat much quieter inside and the overall weight eliminates the perpetual bouncing of the light racing cat when anchored in exposed coves . . . "

Anuinui has a relatively conventional cockpit. The view forward is achieved through the wide cabin windows, shown in Fig. 1. A bunk and passageway to the head is directly to port, and there are settee berths just below the picture. The galley, complete with gas refrigerator and all the necessities for year around living aboard is directly to starboard. The dining-navigation table is folded against the forward bulkhead, and that's a real live cat living aboard this gracious catamaran !

The photographs of Anuinui (Fig. 2 and 3) illustrate how successful Dan has been in achieving a " boat that looks like a boat."

AIKANE

Whereas *Anuinui* was designed for permanent living aboard, *Aikane* (Fig. 4 and 5) was designed to be an ocean racing machine. She has a relatively narrow deck house so that the big genoa can be sheeted in flat, and the lovely curves of the deck serve the functions

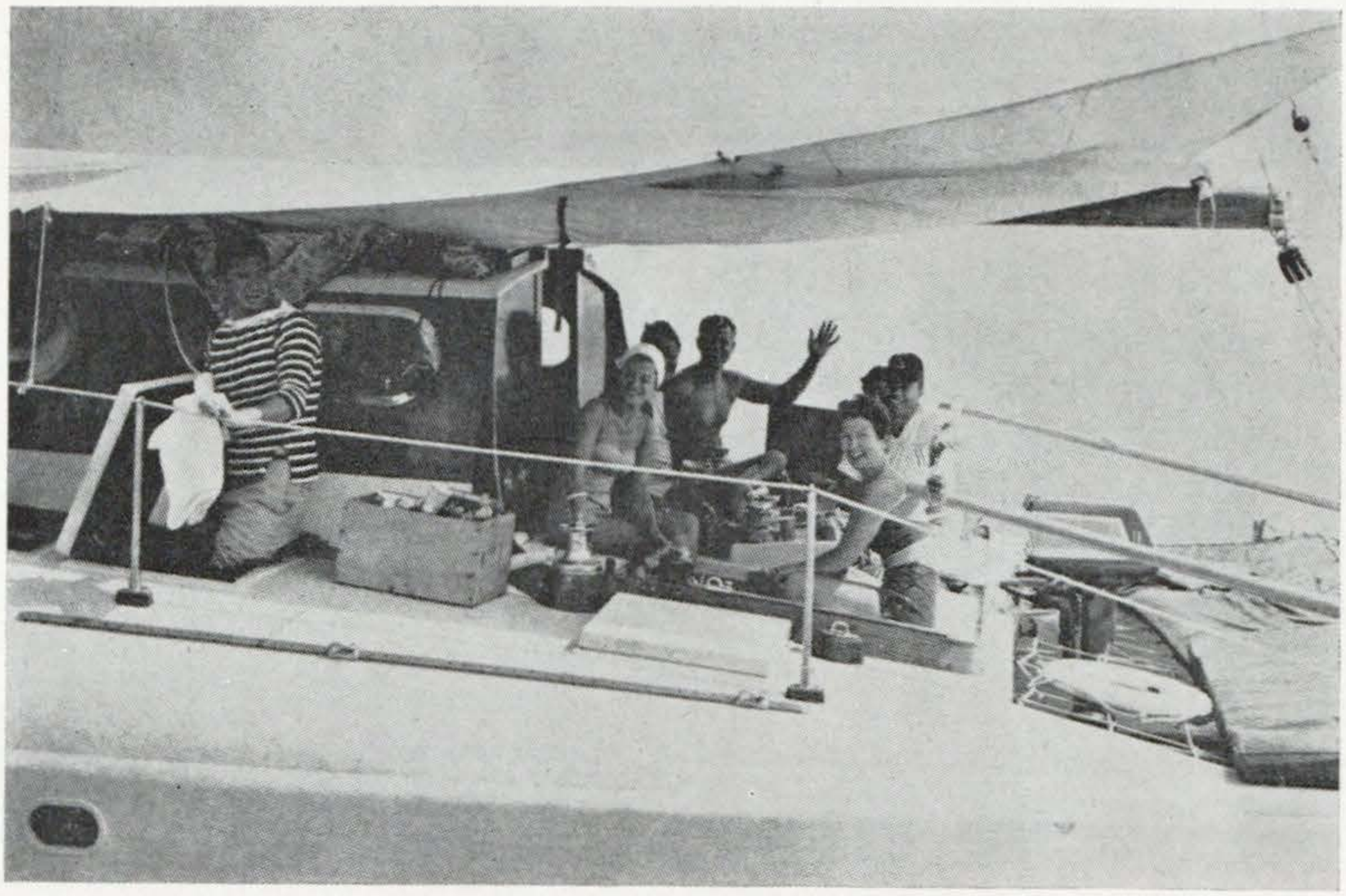


FIG. 4. *Luau aboard Aikane. She has a 54-foot mast, with roller reefing, and carries a 2025-square foot spinnaker.*

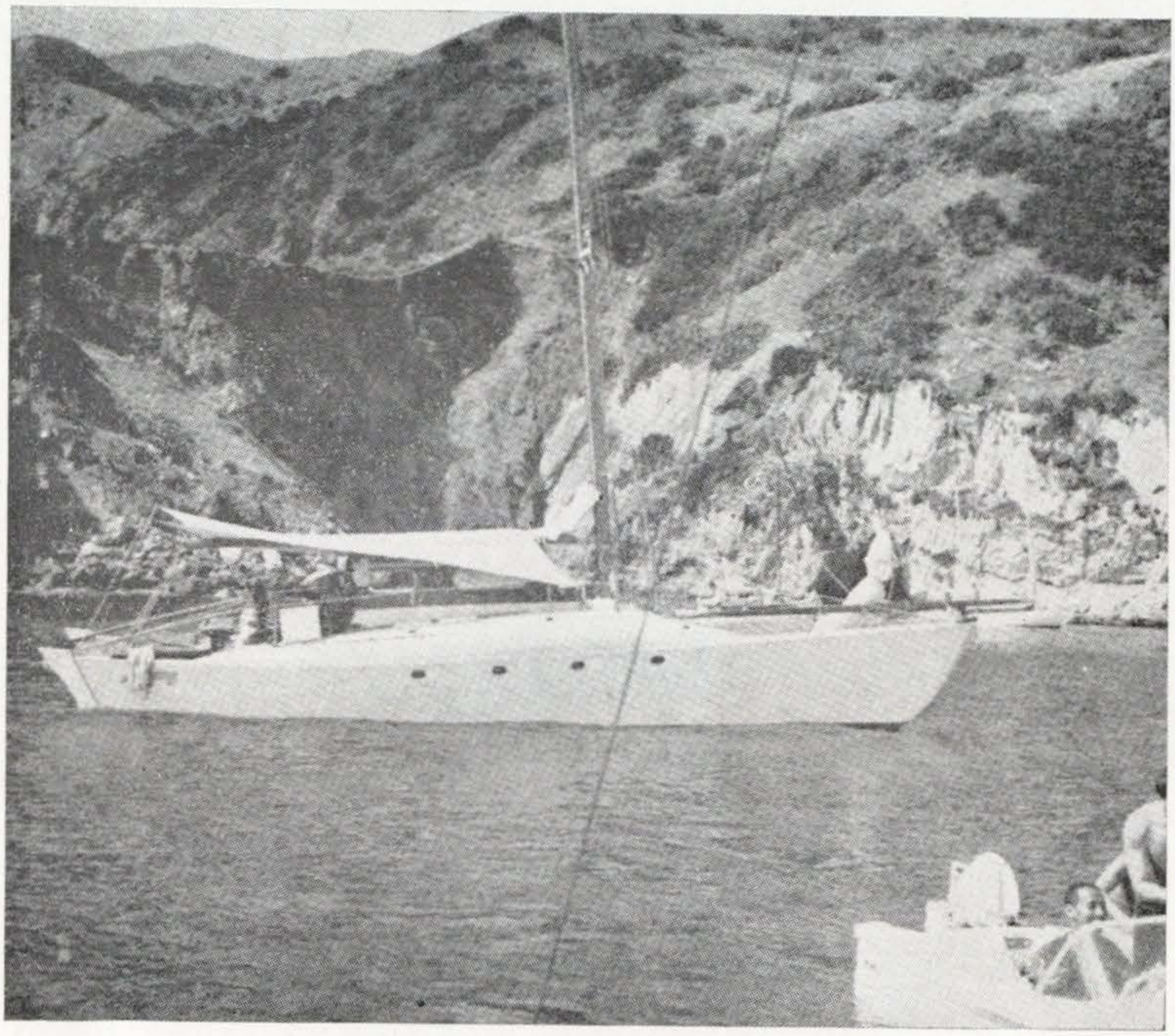


FIG. 5. *Aikane has extremely sharp and graceful hull lines, fuller in the forward sections in order to reduce the catamaran tendency to bury the slim bows. Hulls are flat outboard, curved inboard.*

of 7-foot headroom in the hulls, reduced windage, and beauty. Aikane's hulls have about six feet of freeboard at the bows.

Since Rudy and I have both written articles on Aikane (Motor Boating, January, 1958) I am limiting myself here to only a few shots taken at Parson's Cove, Catalina recently. Fig. 5, with the boom cover up and sail bag hanging over the life line doesn't really do her justice, but Aikane is the world's most beautiful catamaran. I feel qualified to judge because of my worldwide contacts through foreign magazines, correspondence and some travel. Her crew reported that the sail bag couldn't be removed because someone was in it.

Fig. 4 shows the cockpit arrangements with Ken Murphy (striped shirt) and his lovely wife Joan (white head scarf) entertaining aboard. Rudy Choy is beside Joan and partially hidden by her.

DREAMER

The third largest active cat in southern California is the 43-foot *Dreamer* (Figs. 6, 7, 8). Her special virtues are stability, deck area, and

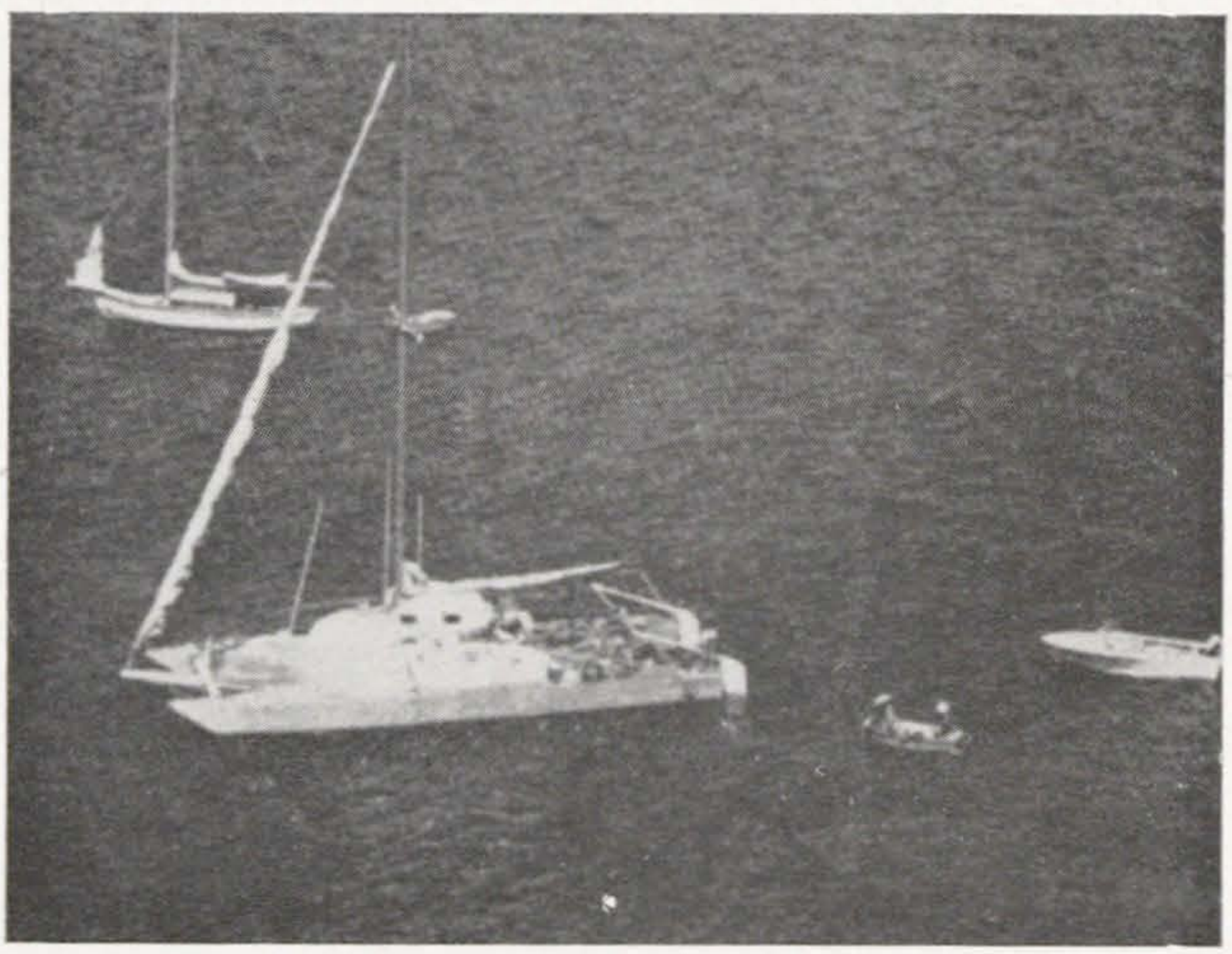


FIG. 6. *Dreamer carries three tenders. Here at Parsons' Cove, one's off to starboard, one's approaching off the port quarter and the third's nestled on Dreamer's forward net.*

speed to windward. Her stability results mostly from her 18-foot beam and her flared symmetrical hulls, which give her great reserve buoyancy and carrying capacity.

Over the Labor Day weekend at Parson's Cove, Catalina, Dreamer carried, fed and slept 14 people for three days. She also carried two dinghys and towed a 16-foot runabout. Dreamer and her three tenders are shown in Fig. 6. One of the dinghys is on the forward net, and Hal Seyle, another member of the syndicate, is approaching in the second dinghy with his date.

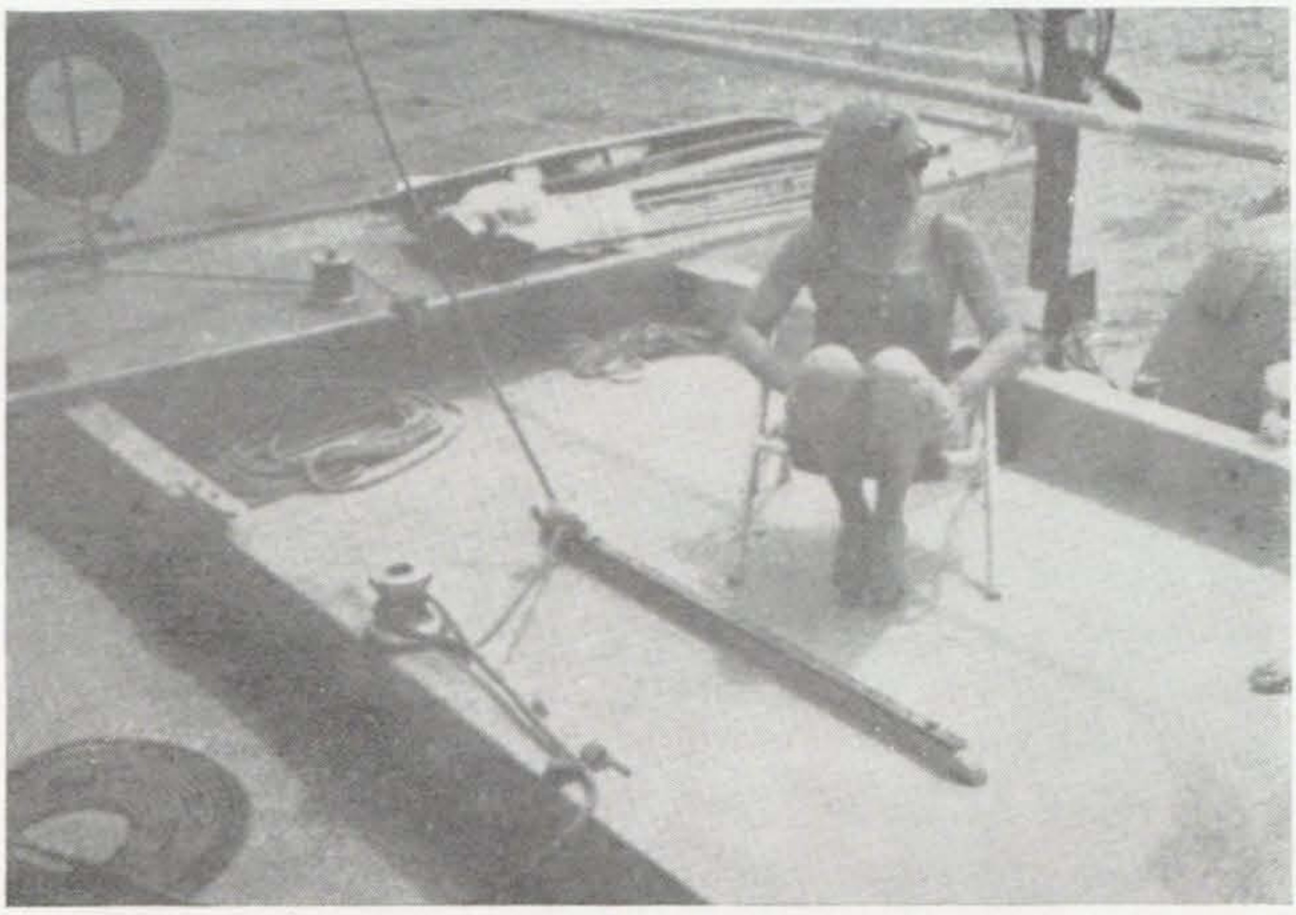


FIG. 7. *Sue Robbins relaxes on Dreamer's spacious* (12' x 12') " *cockpit* " *during recent return trip to Santa Monica.*

In Fig. 7 the " cockpit " area, about 12 by 12 feet, is gracefully modelled by Sue Robbins on the return trip to Santa Monica. This area is used for barbeques on the habachis and outdoor sleeping for six under the boom cover. Our deck chairs and casual stowage of water skis and temporary gear always surprise single hull sailors, but these are the benefits of deck area and stability.

Dreamer's speed to windward is the result of her dagger boards and Watts racing genoa jib. The dagger board's favourable aspect ratio (depth/chord) provides efficient lift at low angles of attack just as does an airplane wing. Thus, when beating there is reliable manoeuverability and little leeway even under unfavourable conditions. Off the wind the boards are raised to reduce the overall wetted surface area.

COMPARISONS

Varied as the differences are in these three catamarans, they have certain fundamentals in common. First, they are second or third generation designs. Dan Brown had considerable experience with the 35-foot *Lear Cat* before he designed Anuinui. Rudy sailed the 38-foot *Manu Kai* extensively and helped build and sail the 40-foot *Waikiki Surf* from Hawaii to Los Angeles before designing *Aikane*. I studied catamaran theory and sailed with Prof. Arthur Locke, former head of the aeronautics department at Wayne University, in his 35-foot *Tweedledee-Tweedledum*.

Second, Dan, Rudy and I have professional backgrounds which contribute to our design experience. Dan is a oceanographer, Rudy studied boatbuilding and built a conventional 35-foot sailboat with Alfred Kumalii in Honolulu. I have two degrees in engineering and one in applied mathematics.

Third, good catamarans are not cheap, and the reverse is also true. Anuinui with all her cruising accommodations and expensive

FIG. 8. *The 43-foot Dreamer, third largest active cat in southern California, has flared symmetrical hulls and 18-foot beam, giving her great reserve buoyancy and carrying capacity (she recently carried, fed and slept fourteen people for three days). Her dagger boards and Watts racing jib give her good speed to windward.*

construction, and Aikane with her 10 racing sails and improvements would both cost over $40,000 to build today. Dreamer, with her completely fibreglassed hulls, epoxy decks, stainless-steel rigging and dacron sails would cost perhaps £30,000. Actually, Dreamer was built by members of the venture, and her materials investment to date is around $14,000.

Finally, after several years of operation, no boat is better than her owner's care. Anuinui is one of the saltiest, most seaworthy and shipshape craft around. Ken keeps Aikane in top notch racing shape. And I must confess that what success Dreamer has enjoyed has been mostly due to the gang, who have suffered through our pains as well as our pleasures.

In actual racing here in 1959 Aikane has been faster than Dreamer off the wind, and *vice versa* on the windward legs. Neither Ken nor I consider these results the final word, however. Ken plans to use a bigger genoa next year, and we hope it's feasible to put a big patch in our second hand spinnaker, to at least bring it up to the size of Ken's middle spinnaker. The Aikanes, the Dreamers and big cats, generally will profit from the competition, but only Ken Watts, sailmaker, will be able to measure the profit in dollars and cents.

As far as the future is concerned, Rudy Choy and Warren Seaman have designed, and Warren is building a 56-footer with twin diesels and probably hot and cold running wahinis.* Bruce Ewing and I have designed a 44-footer for a customer in Santa Monica with four single and two double berths in four private staterooms, two settee berths in the lounge, two heads and full headroom all around.

Because capsizing is a problem a few facts should be considered. First, as catamarans increase in size the righting moment (weight times beam) increases approximately as the fourth power of the length whereas the overturning moment (sail area times wind pressure times the height of the centre of effort) increases as the third power of the length. Therefore the ratio of the righting to the capsizing moment increases approximately linearly with increasing hull length.

Thus, it takes about twice the wind pressure to capsize a 40-foot cat when compared with a 20-footer. Since the catamarans described here are over $2\frac{1}{2}$ times as long as the small racing classes, about that ratio of wind pressures would be required to capsize them.

The second fact to remember, however, is that regardless of the size of the boat, wood, line, cloth and metal do not increase in inherent strength. Since the forces increase as the second or third power of the length, the usual situation in Aikane's and Dreamer's experience

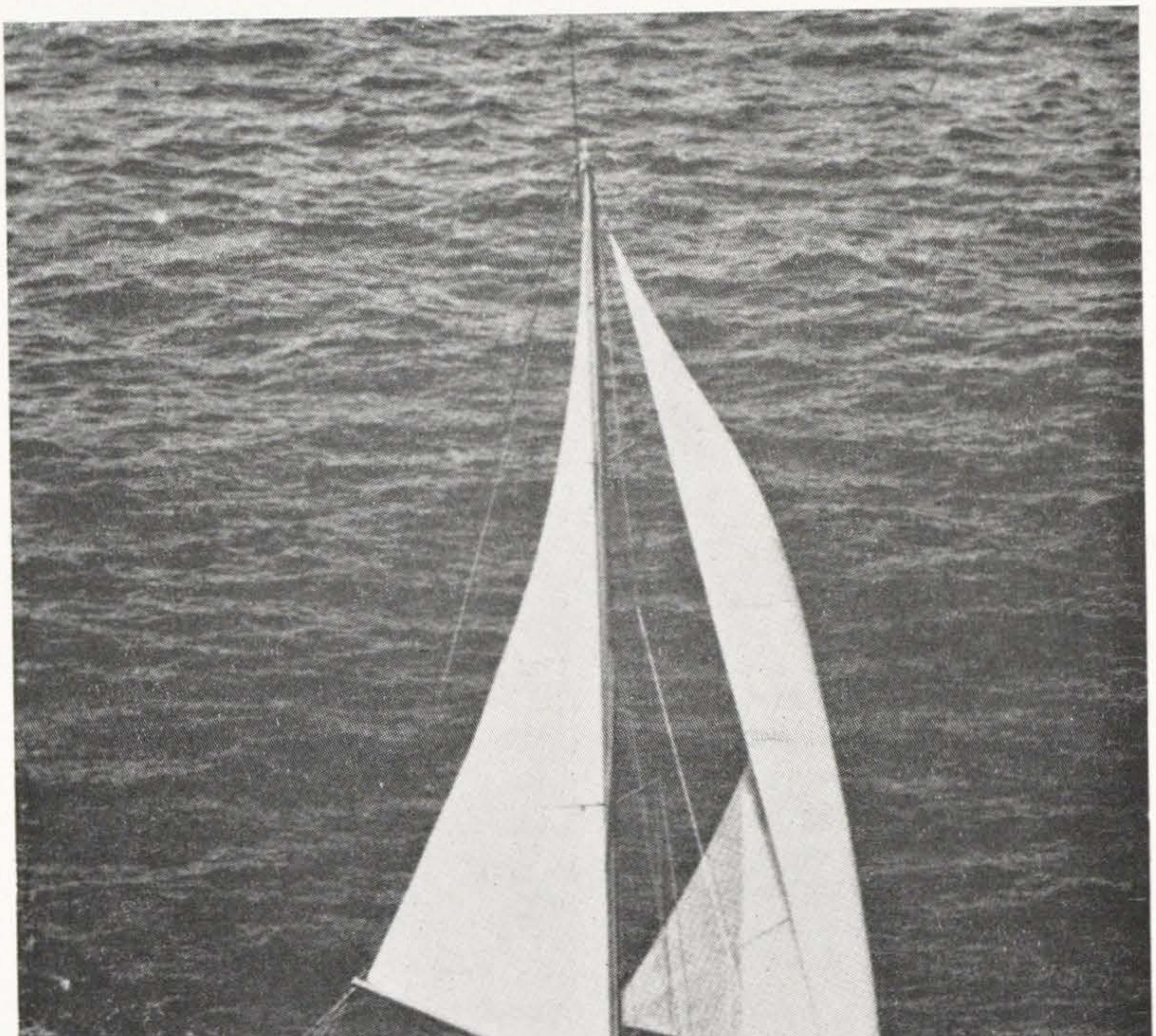


FIG. 9. *Aikane was designed to be an ocean racing boat. Her deckhouse is narrow so that the big genoa can be sheeted in flat. There is 7-foot headroom in the hulls.*

is that something else starts to go before the capsizing wind force is reached.

A third consideration is that although a few 40-foot day sailors have flipped in the past few years I have not heard of any of the larger, heavier cats going over. Thus actual practice substantiates the theory.

A fourth argument is that the pots should quit swearing at the kettles. The worst boat accidents, in order of their seriousness, are (1) sinking, because it often involves loss of life and boat ; (2) fire, which often results in loss of boat and personal injury, and (3) capsizing, which normally involves some damage and exposure. Good catamarans are usually superior in the first two regards, because they can't sink, and fires or explosions are frequently due to dirty bilges and gas fumes in the hull. Many cats have their gas tanks in the wing section where any fumes or leaks cannot be trapped.

Finally, there are several ways to cure the capsizing problem. Dan Brown's approach is one, and he has actually tested it by having a crane pull him over. Good sailing is another, as Rudy has pointed out. I favour a small (3 cubic feet) streamlined styrofoam float at the top of the mast which would serve the three functions of wind vane, radar reflector (enclosed), and safety device. This float would be augumented by two small egg-shaped ones at the spreaders which would also prevent serious genoa chafe. I am recommending this solution on our 44-foot plans, but we have not installed it on Dreamer simply because of the lack of any necessity for doing so.

CONCLUSION

I feel that the catamaran's success rests on speed, and to that end I would like to try to design the world's fastest sailboat—to windward or leeward under any conditions. To my engineering mind this means two centre- or dagger boards for best windward performance and semicircular underwater sections for minimum wetted surface area off the wind. Such a boat, incorporating years of big catamaran design and sailing experience, *combined* with excellent construction and great racing ability, could do the job, just as the small cats are beating all the other small classes.

If you would like further information from Dan Brown, his address is Silvergate Yacht Club, Shelter Island, 990 Yacht Harbor Dr., San Diego, Cal. If you are interested in further details about Aikane, or would like to discuss other big cat possibilities, Rudy Choy would like to hear from you. His address is 4357 Oxford Lane, College Park, Costa Mesa, Cal. Finally, if you are interested in Dreamer, or fast, big, centre-board cat designs, I would welcome your correspondence. My address is 1700 Main St., Santa Monica, Cal.

DREAMER

by

BRUCE EWING

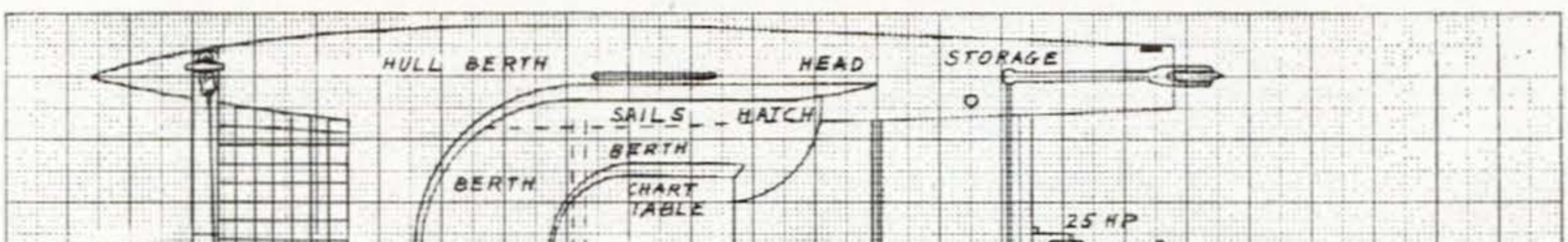
L.O.A. 43′	Displacement approx. 10,000 lbs.
Beam 18′	Headroom (cabin) 6′ 6″
Draught 2′	Sail area 800 sq. ft.
	Genoa 800 sq. ft.

Designer : Hugo Myers 1700 Main St., Santa Monica, California.

Dreamer

This boat was the product of six guys who decided to help an inland lake sailor build his first boat. He was taking the advice of a friend of his who said, " If you want a big boat, don't waste time with small ones." This boat was built primarily because none of us really had any idea how large a job it was to build a 43′ boat in a vacant lot. None of us had been ocean sailing before but we had a feeling we would like it. After a year and a half of weekend labour we launched Dreamer Thanksgiving Day, 1956.

Dreamer has proven to be a successful cruising catamaran for seven neophytes to learn how to handle a large craft in the ocean. Last summer Dreamer came into her own as a racing catamaran with the help of a large overlapping genoa. We entered two races and gained first place on a handicap basis in both. We proved to ourselves the apparent superiority of the symmetrical rounded bottom hulls with centreboards over the asymmetrical hulls without centreboards on a beat to windward. Our proving board being the well known " *Aikane* " (46′ Hawaiian design by Rudy Choy). Dreamer definitely showed her superiority to *Aikane* in beating to windward in both races. In a twenty-five mile race, the first half of which was a beat to windward, the other half being a broad reach, we crossed the finish line about twenty feet ahead of *Aikane*. On the reach *Aikane* proved to be slightly faster than *Dreamer*.



Dreamer

Dreamer is very seaworthy and extremely durable due to her relatively heavy construction. Even at her fastest speed of about eighteen miles per hour, Dreamer has never lifted her windward hull out of water.

Her accommodations are not the best that a 43′ catamaran can offer but she serves from six to fourteen people regularly each weekend during the summer when sailing to Catalina Island, a distance of thirty-two miles from homeport. She has made this passage a number of times in under four hours. Dreamer has two bunks forward in the hulls and sleeps six more on the broad decks within the cabin. When there is a crowd on board the broad decks of the cockpit will hold four more under a canvas stretched over the boom. The head is located aft in the starboard hull and storage in the aft section of the port hull. A galley and navigation equipment are located in the cabin. Auxiliary power is a twenty-five horsepower outboard which will push her along at eight miles per hour. This is enough speed for a sailboat under power but more horsepower would improve the safety margin in manoeuvering in a high wind due to the excessive windage of a catamaran. I would therefore recommend a more powerful motor for a boat of this size.

Dreamer's construction is one half inch plywood, fibreglass-covered throughout. The hulls are connected by three inch by twelve inch hollow beams spaced six feet apart. The hulls are an approximation of a rounded bottom being flat ten inches across on the bottom, then rising to an angle of forty-five degrees to the vertical for ten inches and continuing to the sheer line at an eighteen degree angle to the vertical. This gives a symmetrical hull with a large amount of reserve bouyancy.

The centreboards are constructed of solid douglas fir each board having approximately fifteen square feet of area. With her boards down Dreamer can point with the best of the conventional craft. Her ability to come about is very good owing to a rise both fore and aft in the keel and the centreboards acting as a pivot.

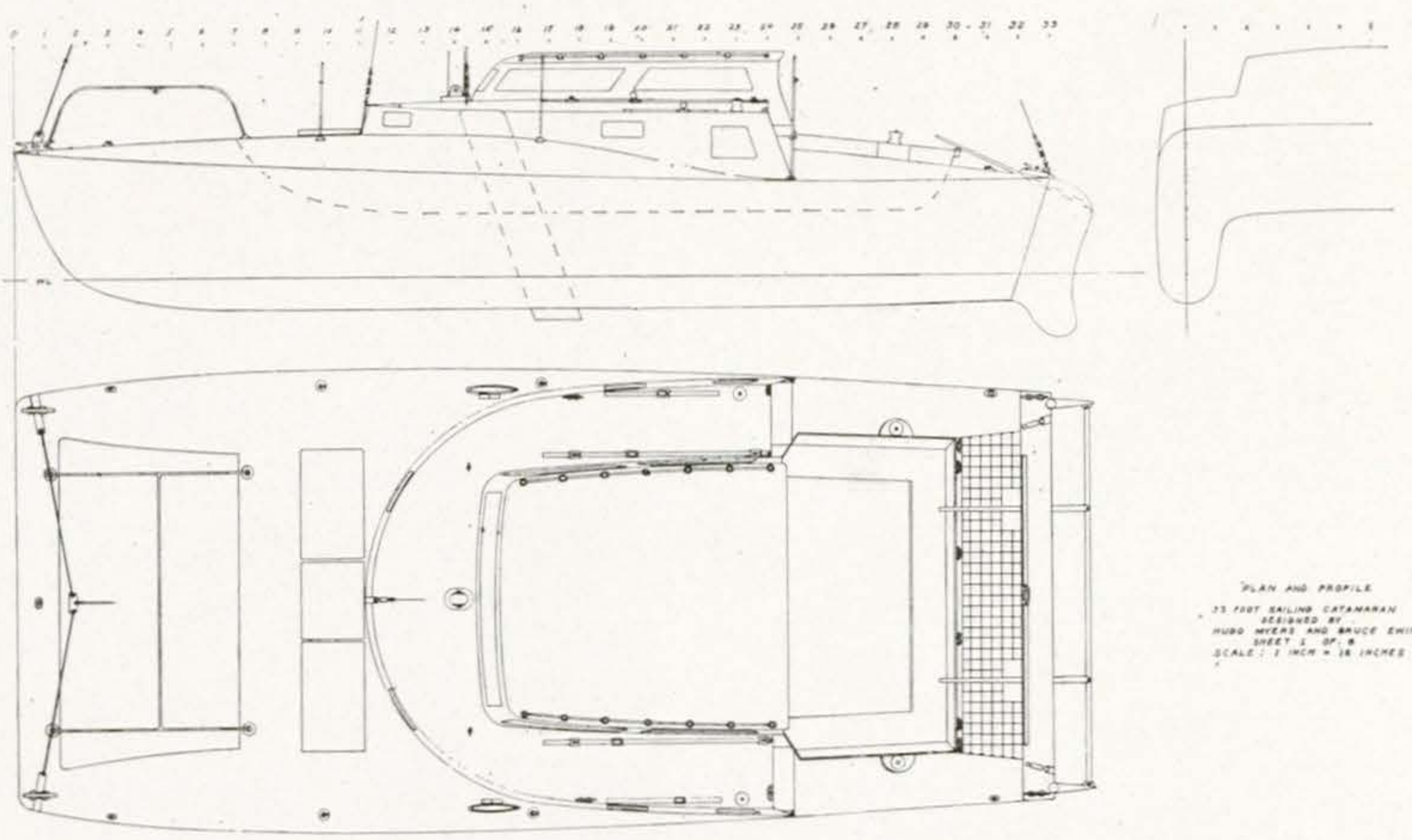
You might be interested to know the outcome of seven people owning one boat. The results have been highly successful owing to a joint ownership agreement which we all signed and adhere to. The boat is operated not on a friendship basis, although we all are very good friends, but on a business basis. We have a schedule of use in proportion to our percentage of ownership. We have a treasurer who collects monthly maintenance fees which are again based on the percentage of ownership. We heartily recommend this to those who would like to have a boat a bit larger than they can afford. It would have been impossible for any of us to own Dreamer alone and in fact we wouldn't want to. The problems involved in owning such a large craft make it a burden instead of a pleasure for one individual. Dreamer is being used every weekend of the year. With a boat this is good because she is not being neglected. Small repair jobs are done and she is assured a cleaning once a week.

The designer of Dreamer, Hugo Myers, and myself have taken

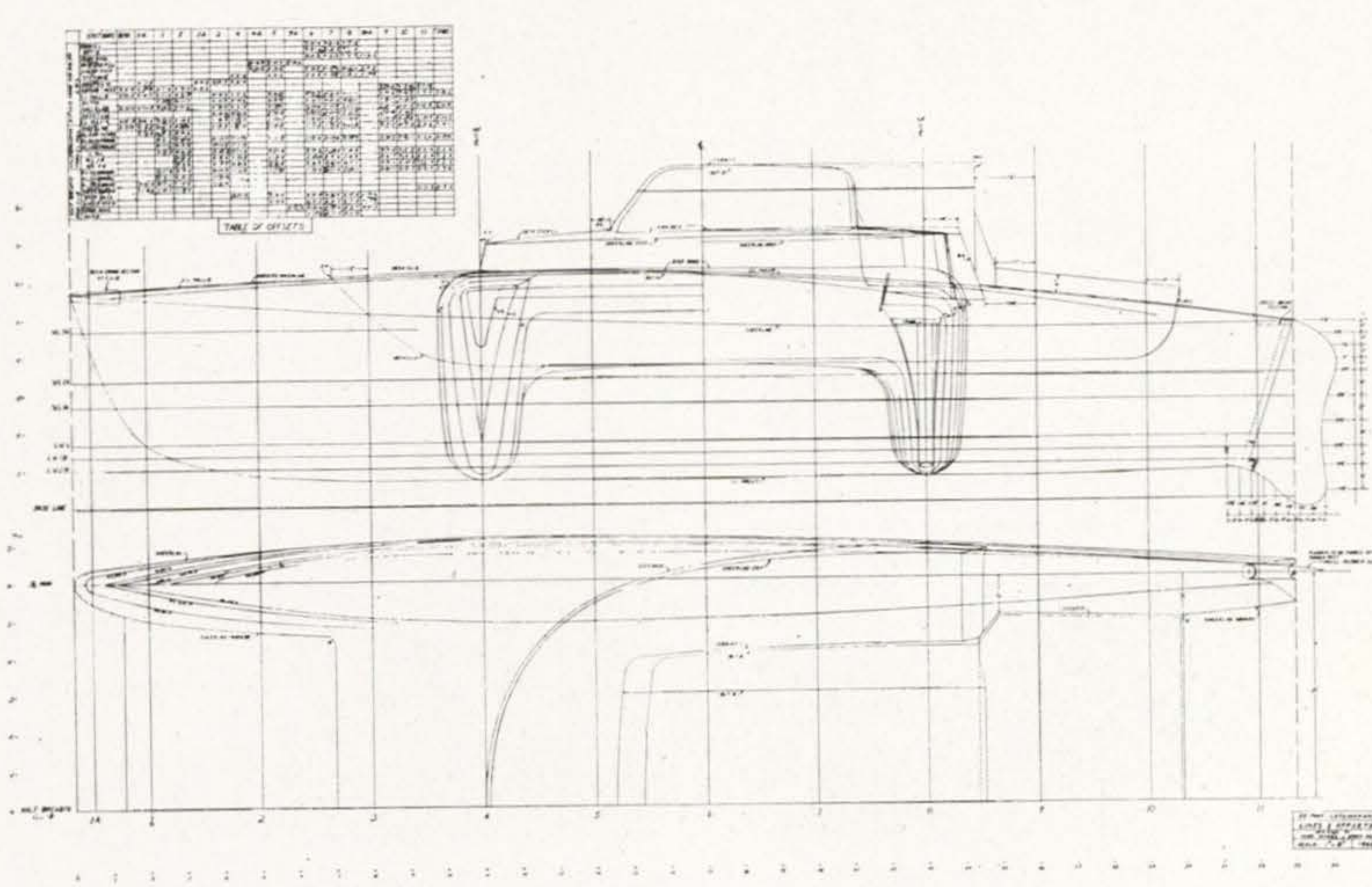
Symmetry

the lessons of experience from Dreamer and have recently completed the design of a forty four foot catamaran for a client in Santa Monica, California. We expect this new design to be superior to our first boat in all respects. At the present time we are concentrating our efforts on a 33 foot cruiser-racer design for another client.

SYMMETRY 33 FOOT CATAMARAN DESIGN



Symmetry 33 *ft.*



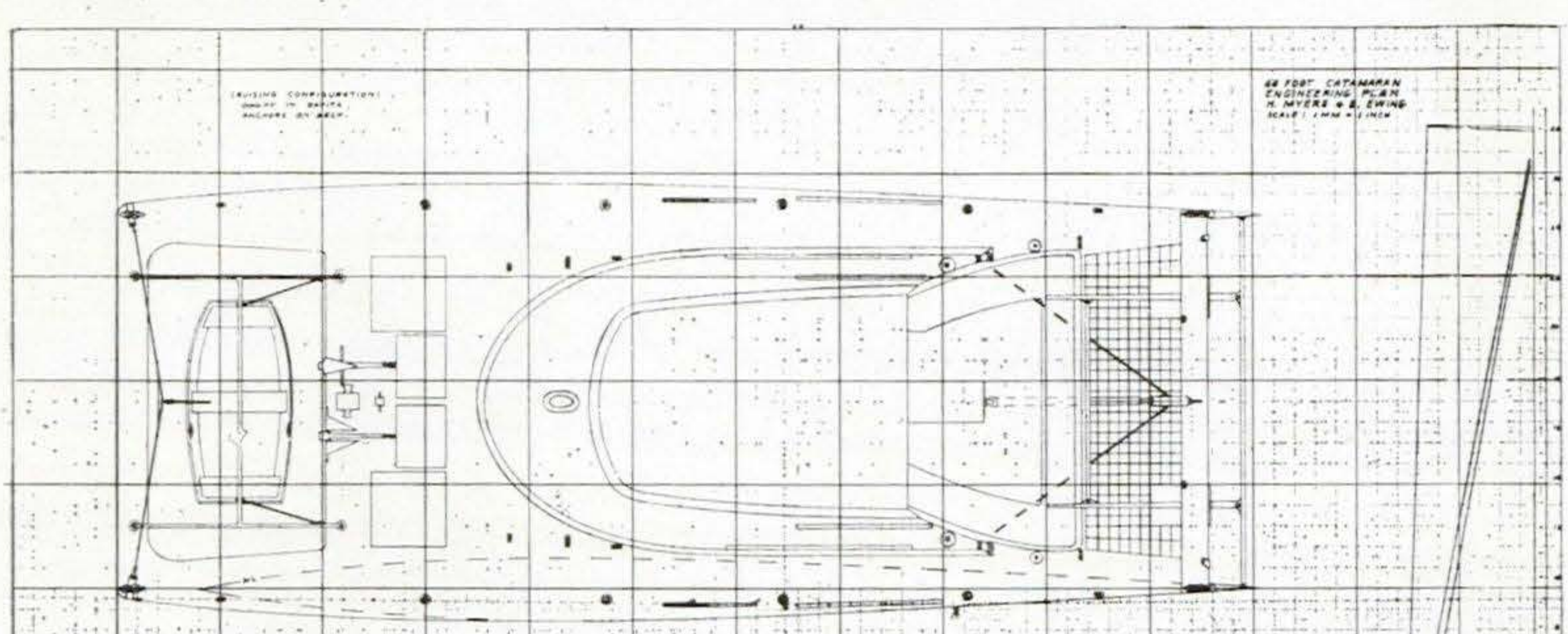
Symmetry—Lines and Sections

SYMMETRY 33 FOOT CATAMARAN DESIGN

All we have of this design by Hugo Myers and Bruce Ewing is the drawing and photographs we show. One must agree that the cabin top blends very nicely into the hull, while allowing good sheeting for the Genoa. The gallows arrangement between the hulls forward is for the dinghy.

44 FOOT CATAMARAN DESIGN

This design is also by Hugo Myers and Bruce Ewing and shows a craft of greater beauty than *Dreamer* but with canoe sterns to the hulls and revolving centreboards, instead of daggers. The canoe



Myers-Ewing 44 *ft. Catamaran*

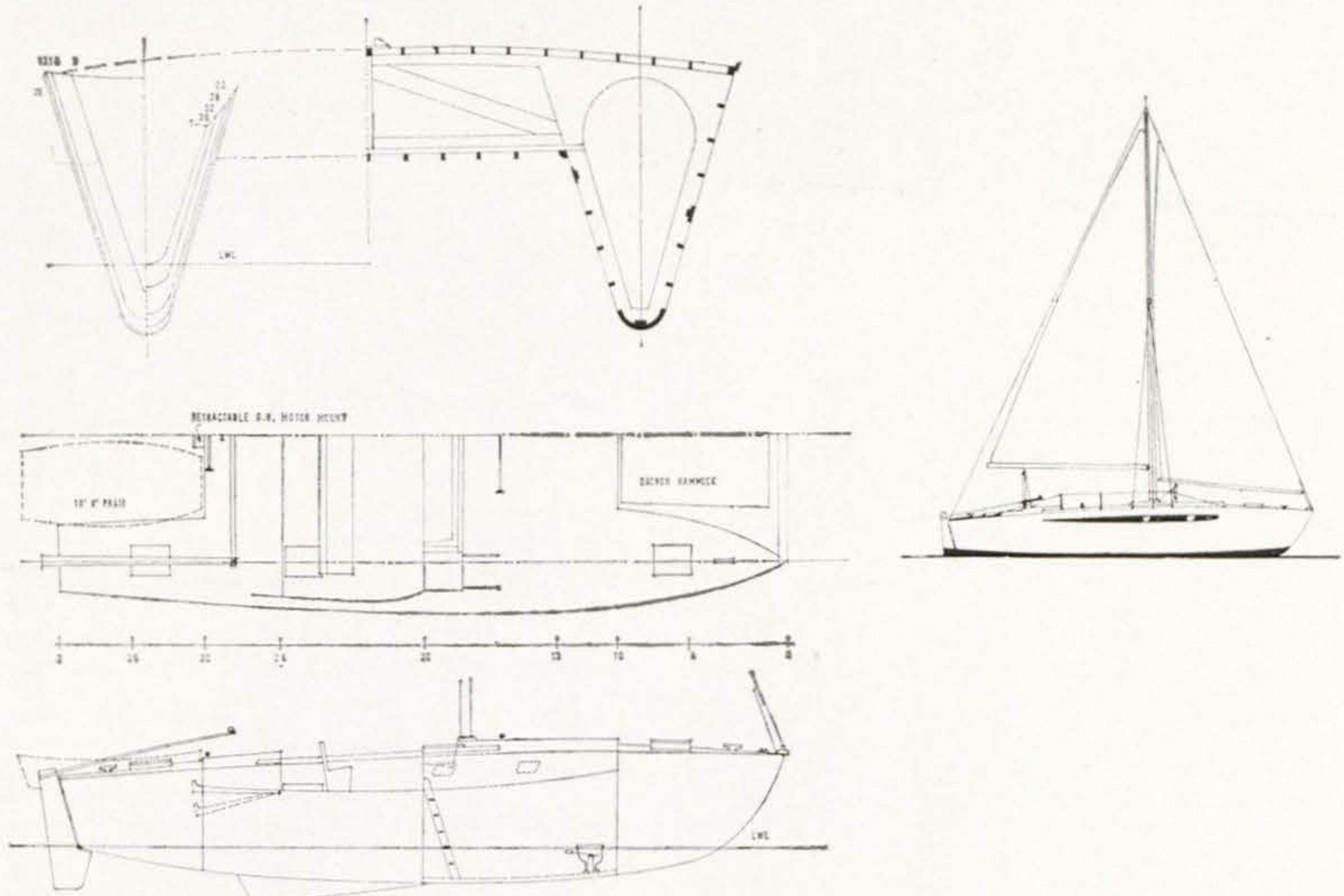
sterns are believed by the designers to give greater " tracking " ability which is certainly true at the lower speeds but has yet to be proved when travelling really fast.

AY-AY

L.O.A. 39′ 10″
L.W.L. 35′ 6″
Beam 19′ 10″
Draft 3′ 0″

Sail Area 580 sq. ft.
Displacement 6,000 lbs.
Passengers 16 to 20
Crew 2

Designer, builder and Skipper : Dick Newick.



This catamaran was first described by us in CATAMARANS 1958 (22). We now have the plans and sections and some information.

The boat is designed for average force 4 to 5 winds with a steep chop in the open sea. After three years service, the only changes would be a lowering of the freeboard, having a vertical transom and adding 20% more sail area.

As built, however, the boat is very comfortable and safe. She can average 10 knots reaching in a force 4 breeze which must be considered good with her heavy displacement and small sail area.

Summary. A symmetrically hulled deep catamaran is shown which has a good sea motion and a reasonable turn of speed.

THE PACIFIC CATAMARAN

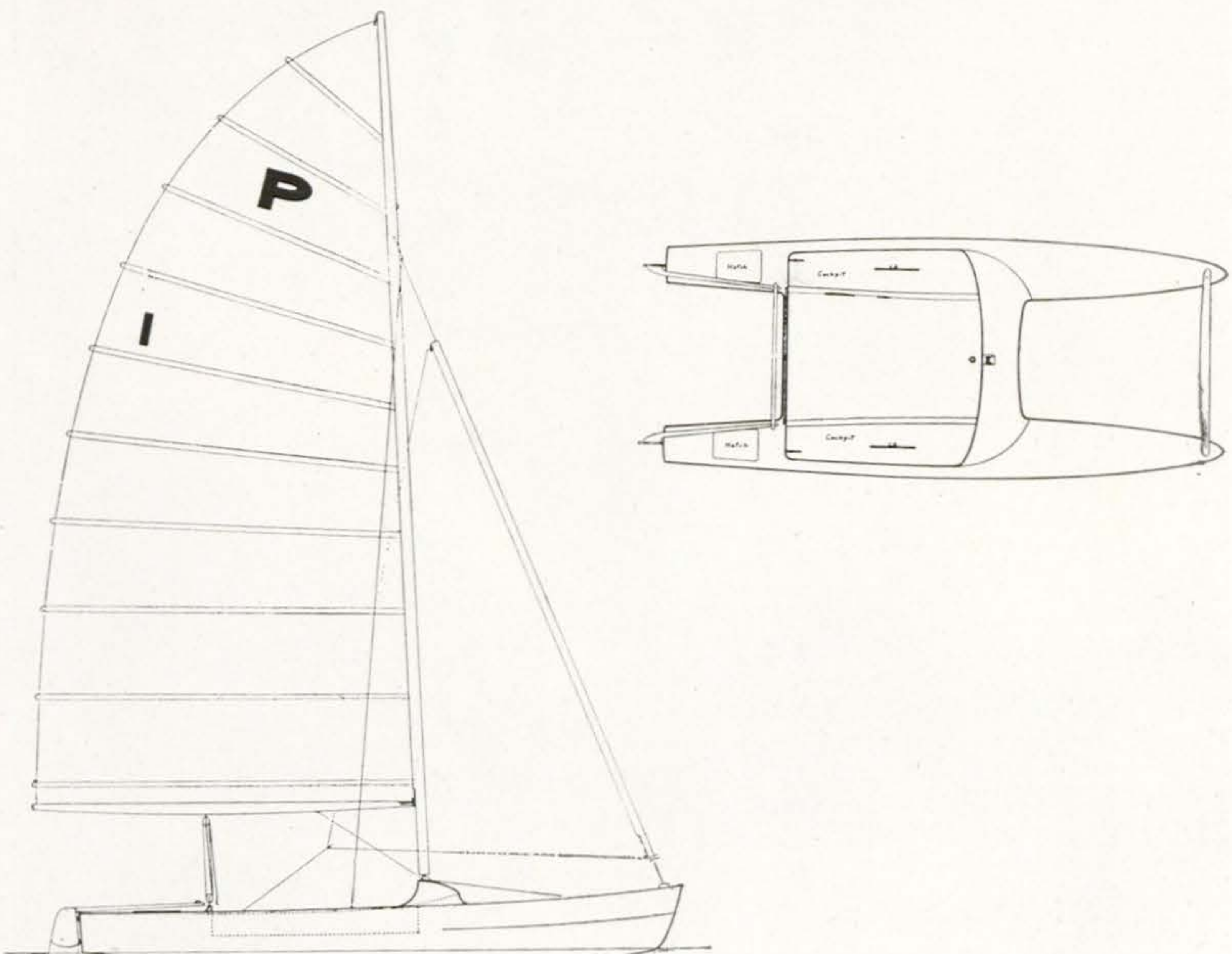
L.O.A. 18′ 9″ Beam 7′ 11″
L.W.L. 17′ 10″ Weight 540 lbs.
Sail Area 256 sq. ft. (actual)

Designer : Carter Pyle. Builders : Newport Fibreglass Boats, Box 1741, Newport Beach, California.

Pacific Cat

Apart from leading the fleet of large and very large yachts in the Newport to Ensenada race, we know little of this catamaran. We have been told that " it is best in its class—a terrific performer." It is highly thought of by Rudy Choy and the makers claim a speed " . . . in excess of 20 knots."

The main features of the design are firstly that the greatest section is farther forward than usual, the centreboards are farther aft than is the British practice but in the same relative position as Seymour



Pacific Cat

Paul's *Wildcat* and there are footwells, each 6½ feet long, which are presumably self draining and allow the crew to sail in a sitting position. There are six watertight compartments with access hatches to each hull for storage and 900 lbs. of styrofoam buoyancy.

Pacific Cat was first amongst the smaller cats in the last Pt. Firmin Race and in the open catamaran class of *CBYC's* Thanksgiving Regatta. She appears therefore to be a craft of exceptional merit.

THE AERO-CAT

L.O.A. 12′ 7″	Draft (board up) 6″
L.W.L. 11′ 3″	Draft (board down) 2′ 6″
Beam 7′ 7″	Sail Area 115 sq. ft.

Designer : Walter Bloemhard. Builders : Aero-Nautical, Garfield Ave., Copiague, L.I., N.Y. Price (complete with sail etc.), $1,388.

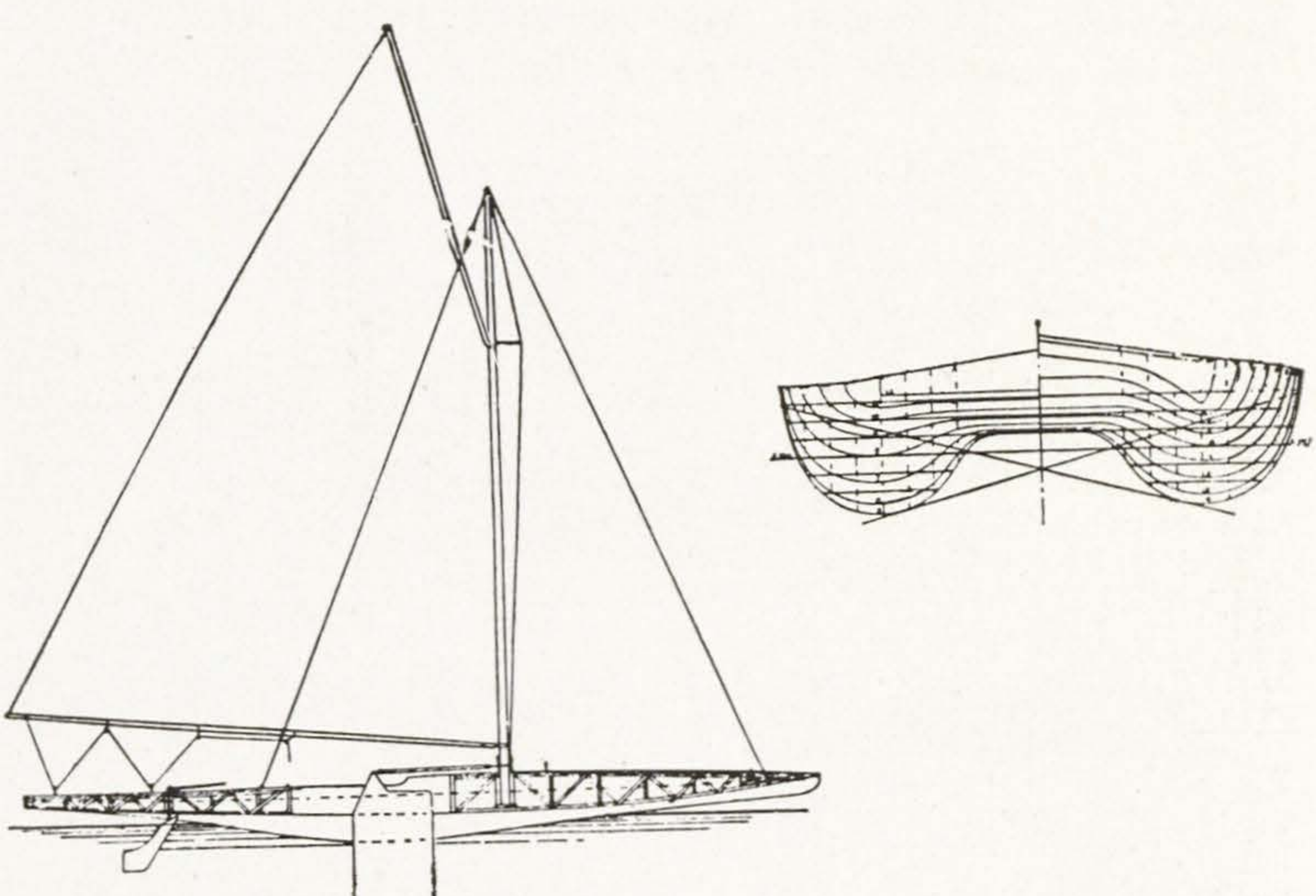
Aerocat

This little catamaran with its large beam should meet a need because of its easy trailering and light weight. It is made of fibreglass and has a deep cockpit which should suit the family man for weekend sailing. It is hardly possible for the craft to capsize but, should this happen, buoyancy is built into the top panel of the sail so that the mast cannot go under.

Walter Bloemhard has given a top speed of 10 knots for her but, with a high sail area to weight and wetted surface, the light wind performance should be good, too.

DOMINION

At the turn of last century, large racing scows were much in favour in North America and with every reason as they are still the fastest single hulled sailing craft in calm water. At that time, there was considerable rivalry between the Canadians and Americans in sailing and the yacht *Dominion* was produced by the Canadians to compete in the scow class.



Dominion

The drawing shows the main features of the *Dominion* which was far faster than any of the orthodox scows and it will be seen that she was, in fact, a catamaran of rigid construction as opposed to those which had been made by Nat Herreshoff years before, which were flexible.

As was the custom of the time, the scow rules were immediately changed to ban all such " freaks " in future and one more successful hindering of yacht development had taken place.

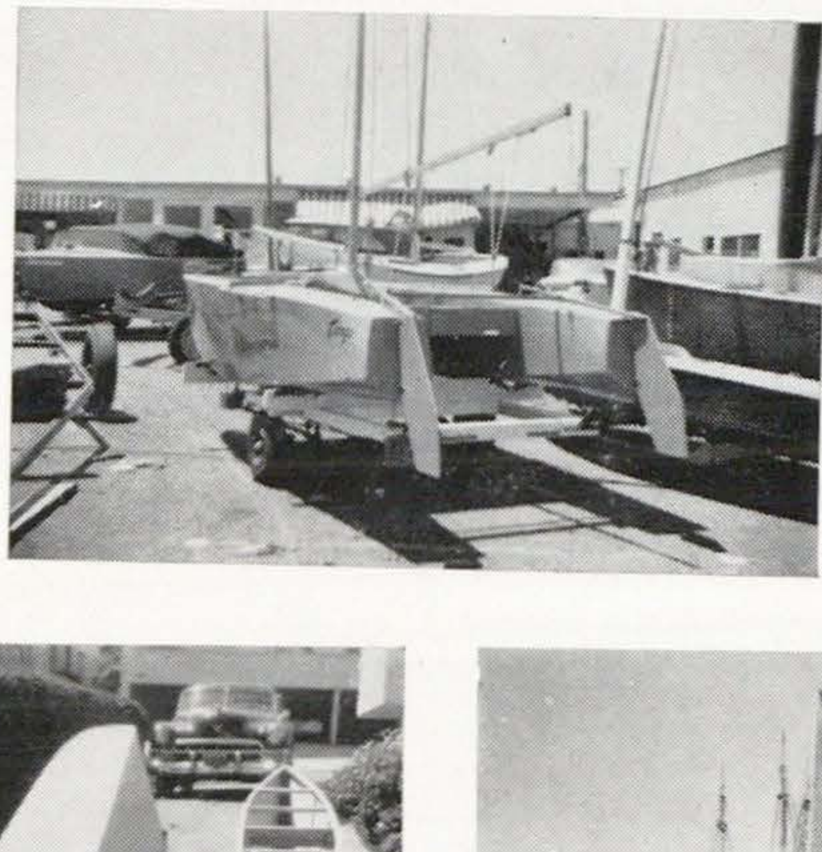
TANGO

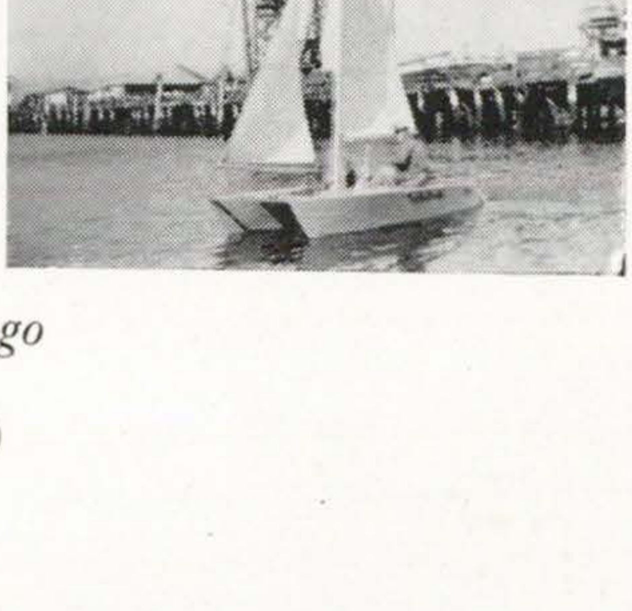
L.O.A. 12′ 0″ — Weight 210 lbs.
Beam 6′ 0″ — Sail area 90 sq. ft.

Designer, owner and builder ; Wm. M. Harris, 2732 23rd Ave., Oakland 6, California. Cost in materials : $266.00.

I previously built a power cat for rough water use and it was a great success. I used it a lot for fishing and cruising the bays and delta-rivers area. The wife and children enjoyed it because of its extreme comfort, dryness and its ability to seat the family and friends in safety.

By OBC safe H.P. rating, it would take up to 160 h.p. outboard but my 35 EDE Johnson gave a nice easy going 18-21 m.p.h. which was plenty for rough waters. I missed sailing, though, and sold her.





Tango

During the winter (1958-1959), I built a 12 ft. prototype and sailed it for two months. After a number of modifications "*Tango*" appeared.

She really is a little " dreamboat " and the most manoeuverable cat I know of. Sailing out of a new, popular yacht harbour with a large number of small boats called for a versatile and highly manoeuverable boat. Thanks to A.Y.R.S. articles along with my experience with seven cats, I got good results. As will be noted, *Tango* is deep-chested with rocker which gives lift forward and easy exit aft. The deep chest is at the pivot point and offers a lot of lateral resistance, except to turning. The cat comes about positively in ghosting airs or in strong winds and chop.

Construction uses only two light frames in each hull and $\frac{1}{4}$ inch AA EXT. ply with 6 oz. fibreglass cloth and Isothalio resin. About 35 lbs. could have been saved by 3/16th inch plywood but the cost would have been greater.

I trailered the boat down to Wilmington for the start of the Trans-Pacific race on July 4th and had the pleasure of meeting Ralph Flood of Los Angeles. Ralph sailed *Tango* with me all day. We covered about 18 or 20 miles of ocean and then sailed in by Los Angeles Lighthouse to tangle with some of the hot boats off Cabrillo Beach. It was blowing 25-35 m.h.p. off the beach as usual, sweeping down off Pt. Fermin. We were neck and neck with that " hot " pram bowed " *South Easter* " and holding our own when a powerful gust dismasted us. Computed later, our mast had a compression loading up to 1300 lbs. and let go mid way to the mast tangs. With our new mast, we now use a diamond and spreader to support this area. Thanks to stepping the mast on the top of the main beam, there was no damage to boat or sails. The lower half popped right out of the socket. At the end of the day's sail, Ralph Flood could see no known faults except, of course, an improved mast rig. He likes the aluminium extrusion mast. He found *Tango* to be surprisingly dry, fast and very responsive.

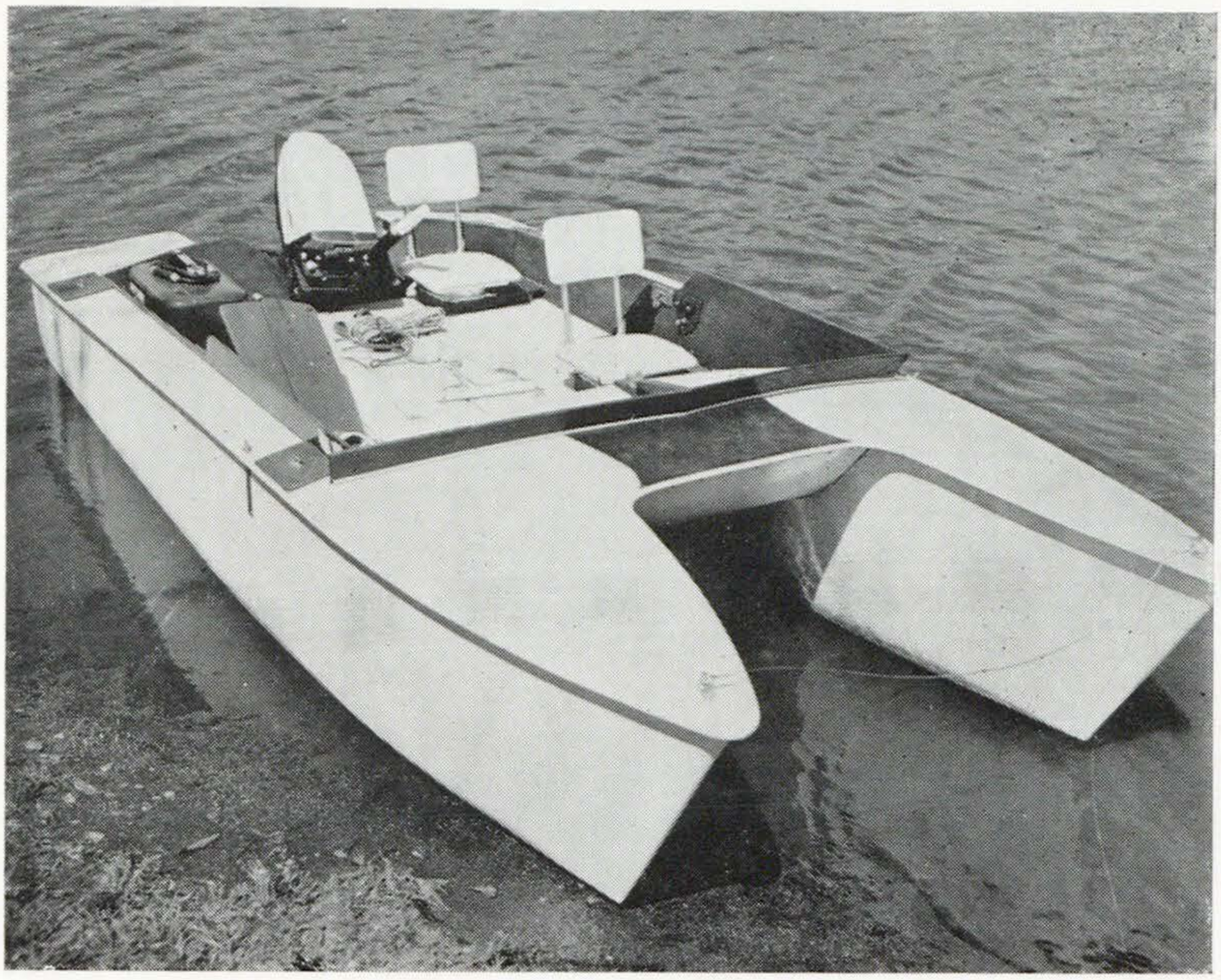
TIKI

L.O.A. 12′ 1″	Weight 215 lbs.
L.W.L. 10′ 3″	Displacement 575 lbs.
Beam 6′ 4″	Sail Area 104 sq. ft.

Designer : Robert B. Harris.

Builders : Catamaran Corporation of America, 2324 Summit Street, Kansas City 8, Missouri.

Prices : Sailing version $1500.00. Swivel chairs : $15.00 each.



Tiki. Power version

This craft is described in A.Y.R.S. No. 22, since when it has achieved considerable popularity. We show here the motoring version which can pull skiers at 18-20 miles an hour with 25 horsepower engine.

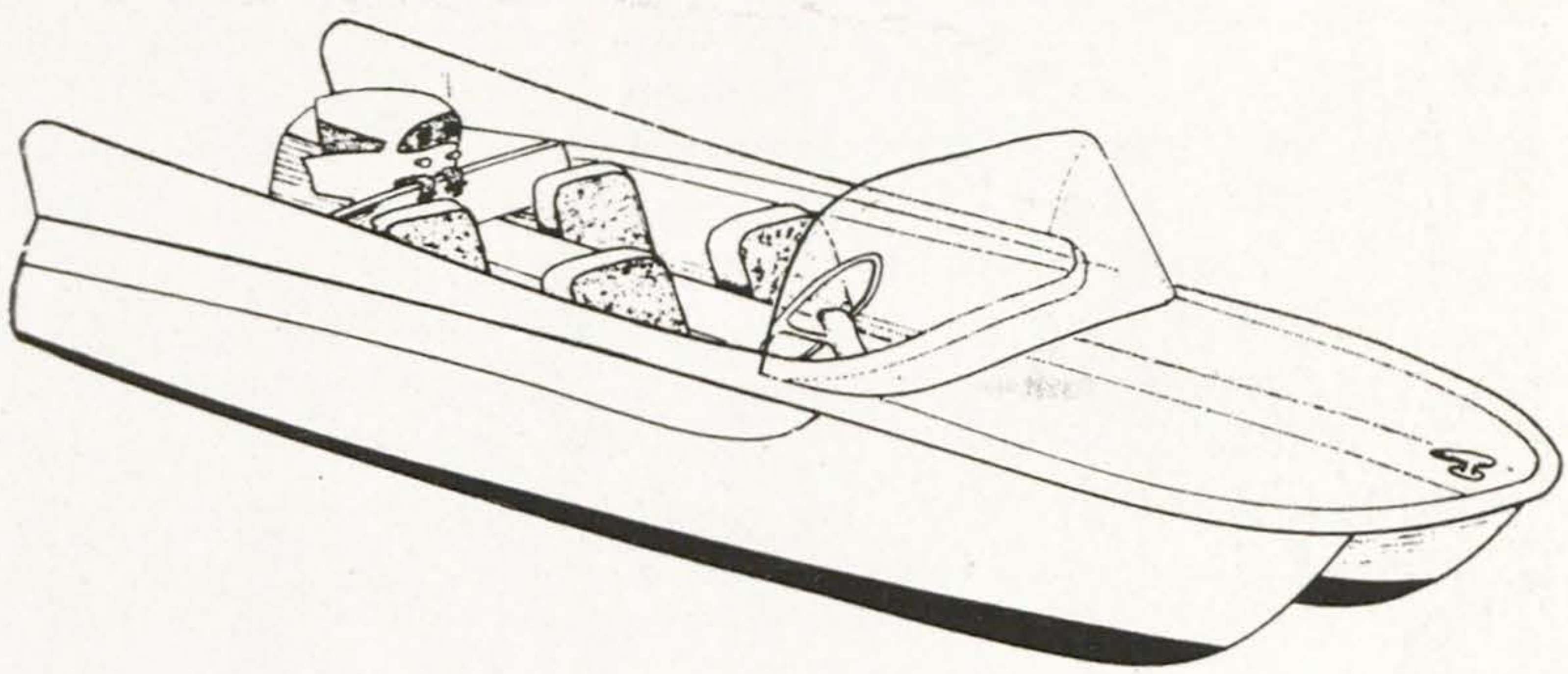
A BRITISH POWER CATAMARAN

Length O.A. 14′ 6″	Draught 6″
Waterline length 12′ 6″	Seats 4
Beam 6′ 6″	Horse Power 5 to 50

Designer : Erick J. Manners, A.M.B.I.M., 93, Ridgeway, Westcliffe-on-Sea, Essex.

What is believed to be the first British catamaran speedboat to be produced commercially was designed by Erick J. Manners and one of these was exhibited the year before last at the 1959-60 Earls Court Boat Show. There are a number of reasons for a twin hull arrangement as a motor launch. In any orthodox single hull motorboat, during forward motion, the bows have to separate the water as the bottom of the boat passes over it. Consequently the water is already in a disturbed turbulent state by the time it reaches the propeller which can no longer thrust against ' unspoiled water '. In the powered catamaran, the propeller reacts in the ' clean ' solid water flowing down between the spaced hulls.

The transom of the bridge deck on which the outboard motor clamps is 2′ 6″ forward of the hull transoms. This gives an internal well effect without attendant leakage troubles. The after tipping moment is also less, and the motor can be tilted up out of the water without protruding aft and getting in the way of everything. This



Erick Manners' Power Catamaran

is a much safer arrangement when water ski-ing. It has the hydrodynamic advantage of keeping the gravitational centre further forward and provides less lurch in steering normally created by the fierce propeller slipstream of a rotational outboard.

The twin hulls give improved directional stability. In banking for quick turns, skidding is almost obviated compared to the slip of the smooth single bottom boat. The divided hulls offer less bounce and slamming in a seaway while to some extent the central wing tends to act as a shock absorber reacting upon a resilient air cushion to provide a smoother ride. Except for fast higher powered installations this designer does not advocate the low central wing tunnel because it noisily slaps the wave tops at lower speeds, and jars the occupants.

Other assets are the extra lateral stability factor of the twin hull configuration providing a safer boat at rest. As in a sailing catamaran, quick and excess movement tends to be neutralized by one hull partly cancelling out different forces the twin hull is experiencing. Besides reducing pitch and roll, at speed, the slender twin hulls tend to induce less drag in the water rather like the twin blades of a sledge on hard ice offer less resistance than a flat bottomed toboggan on soft snow.

The present design is arranged sports car fashion providing full legroom seating. Seats face forward and the after sheer-line is fish-tail style as popularized by present big car trends.

The 14′ 6″ size Power Cat seats four and can be trailed behind a medium size car. This model can be used for towing skiers if a high horse power outboard motor is used. It is a distinct advantage that skiers can more safely take off from and come up, to either the port or starboard transom out of the way of the inboard recessed motor.

Unlike sailing ' cats ' in the Power Ski-Cat it is practical to extend the spacious fore deck close to the stemheads. The craft are exceptionally dry in use and do not produce a steep wash. The mid wing deck makes a fine stable fishing platform.

From these observations it is possible, subject to correct design, that the double hull boat for power use will make as great a contribution to improved efficiency as its sailing counterpart has already achieved.

Erick J. Manners can supply sets of drawings for amateurs to make the Power Catamaran Speedboat. These cost £6. 6. 0d. for the 14′ 6″ size including Royalty, Registration and official racing number. The boat is particularly simple to construct from marine ply using ordinary hand tools costing no more than £5 new. All materials to build the boat can cost under £50. At present the designer is engaged on a commission for a much larger power cat.

TWO EXPERIMENTAL CATAMARANS

by

William E. Glenn

Indian Kill Road, Scotia 2, N.Y.7.

SPINDRIFT

L.O.A. 9′ 6″ + 18″ buoyant rudders	Draft 7″
L.W.L. 9′ 6″ + 18″ buoyant rudders	Sail Area 65 sq. ft.
Hull beams 1′ 3″	Displacement 100 lbs.
Beam 4′ 6″	

MOBY DICK

L.O.A. 24′ + 4′ buoyant rudders	Draft 18″
L.W.L. 22′ + 4′ buoyant rudders	Draft Hull 8″
Hull beams 19″	Displacement 1,100 lbs.
Beam 8′	Sail area, wings closed, 320 sq. ft.
Freeboard 2′ 2″	Sail area, wings open, 510 sq. ft.
	Mast height above deck 30 ft.

In the past two years I have built two experimental catamarans : Spindrift in the spring of 1958 and Moby Dick in the spring of 1959. A number of novel features were incorporated in their design—some successful and some unsuccessful. I will try to evaluate the performance and construction techniques of these two boats.

CONSTRUCTION

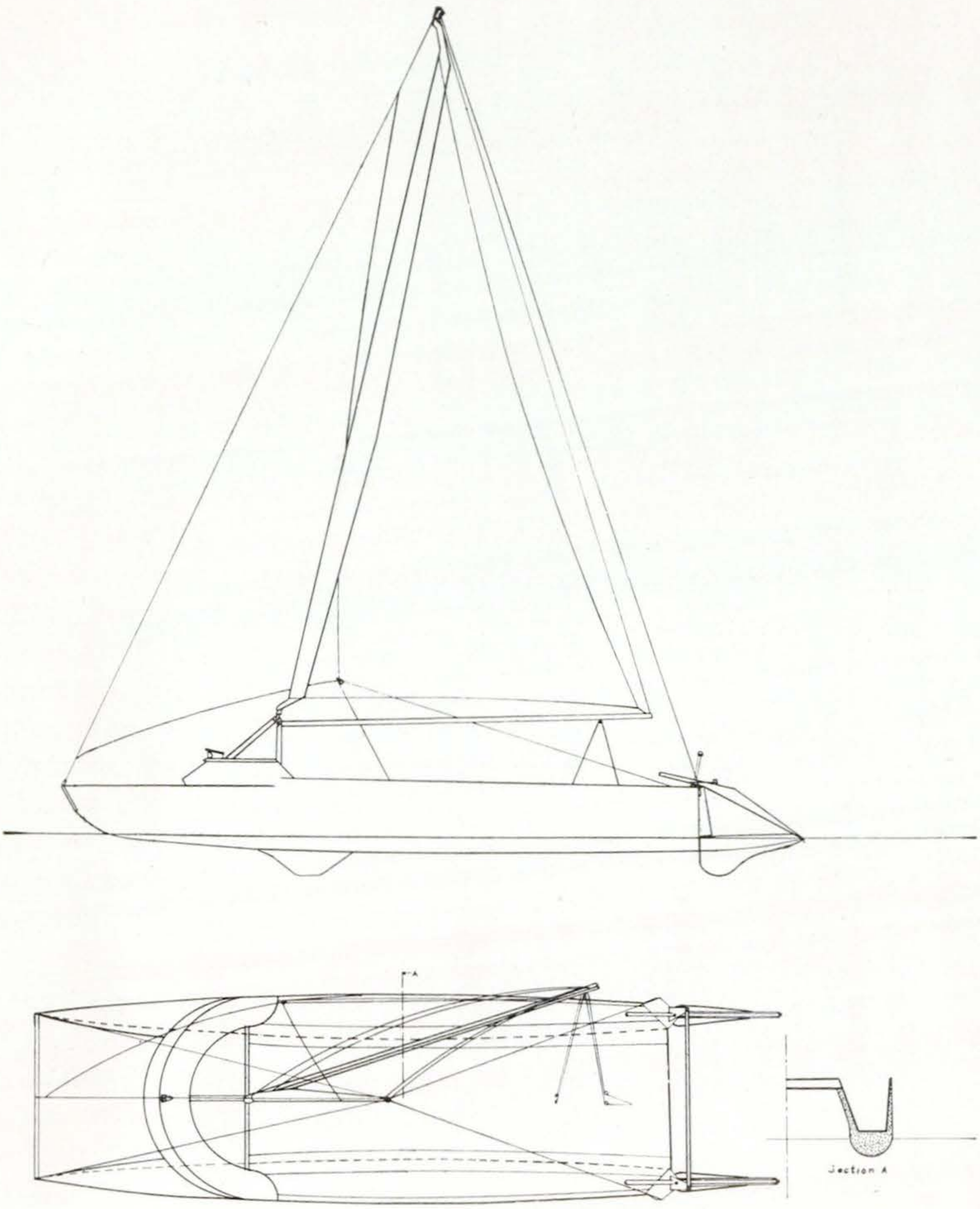
Spindrift was made of styrofoam panels cut with a hot wire, glued together with epoxy resin and then shaped with a saw, rasp, sandpaper, etc. It was then covered with glass cloth and epoxy resin. Wood inserts were placed in the foam where fittings were to be screwed. One layer of glass cloth was sufficient for the bottom and two layers for the deck surface. This type of construction is light and extremely rigid. The hull has about 1,000 lbs. of buoyancy, even when fully submerged. A puncture in the outer hull does nothing since the pores of the foam are not connected. It took only three week-ends to construct, shape, and cover the hull

This was a very successful type of construction except that the compound curves of the hulls should not have been made by gluing panels together. It would have been cheaper, much lighter, and a smoother surface if the hulls had been shaped out of solid styrofoam logs and these glued to styrofoam panels for the wing bridge. Styrofoam logs are available about 2 feet in diameter and almost any length. The foam weighs only about 1.2 pounds per cubic foot. If you plan to use this type of construction in a boat, use a foam thickness of one inch per foot of span of a panel.

Styrofoam must be glued and surfaced using solvent-free epoxy resin rather than polyester resin. Polyester resin or epoxy with a solvent in it will dissolve the foam. Epoxy resins are more expensive but have better adhesion and will not hydrolize as polyester resins eventually will.

The second boat, *Moby Dick* was constructed of urethane foam, $\frac{1}{4}''$ marine plywood, glass cloth and polyester resin. The theory was that I would make a mould, foam rigid urethane foam in place and then cover this with polyester resin (which will not dissolve the urethane foam). Urethane foam can be foamed in a mould to a density of about 2 pounds per cubic foot. It is more expensive than the styrofoam, but the cost of the polyester resin is less.

The deck and inner surface of the boat was made of $\frac{1}{4}''$ plywood, and the hulls were foamed upside down on top of this. The foam bonds to the plywood when it hardens, and this provides a very impact-



Moby Dick

resistant deck. The mold was made of plywood covered with sheets of polyethyline as a mold release.

Although I made a successful boat this way, the technique was much less successful than the styrofoam-epoxy combination for the following reasons :

(1) In panels less than about 8″ thick the density of the final foam is much higher than that quoted by the manufacturer. It can

easily be 10 pounds per cubic foot. This rasises the cost and weight of the boat no end.

(2) I found that the fumes from the foam although almost oderless are extremely irritating to the lungs. An activated charcoal respirator had to be worn to do the foaming.

(3) As the foam starts to solidify it continues to expand and will develop 10 pounds per square inch pressure, which will explode almost any mould an amateur can construct. This resulted in a need to reshape the hull after it was moulded.

Even with all of the unexpected difficulties it only took six weekends to pour, shape and cover the hull for Moby Dick.

After sailing Moby Dick for a year I decided to change the hull shapes somewhat. The accompanying diagram shows the design after the changes. This is a very easy thing to do. I simply sawed off the part I wanted to change, glued on styrofoam (cut from a log), re-shaped it, and then covered this part with glass cloth and epoxy resin.

The mast of Moby Dick is constructed like an airplane wing. It has tear-shaped formers as ribs covered with an 1/8″ birch plywood skin and this covered with glass cloth and epoxy resin. It weighs about 75 pounds and is 27 feet long. Since I am using a " twin wings " rig this must span the entire 27 feet without support except at the peak and foot. The mast is 6″ wide and 12″ deep at its widest point, which gives it quite adequate strength. It is pivoted on an axis ahead of its front surface so that it will " feather " with respect to the sail.

The two booms are pivoted just below the mast pivot on a tripod 3 feet above the deck. The sail is loose-footed and wraps double around the mast, being attached to the mast only at the peak and foot. It's sail is made of 1.5 mil mylar film. This is glued together with DuPont 46971 adhesive.

PERFORMANCE

Spindrift was an asymmetrical hull design with a rather flat bottom. It used a mast aft rig (a jib with no main). The rudders were buoyant and were simply a steerable continuation of the hull. The sail rig was very satisfactory. The hulls had very little resistance to side slip and consequently would not work well to windward even with a small leeboard. The steering was fairly responsive for a catamaran.

Moby Dick has symmetrical hulls. The submerged cross-section was approximately a semi-cricle everywhere along its length. It has fixed keels and works to windward quite well.

Last year the rudders were under the stern and constructed with a fixed and movable element like an airplane rudder. With this arrangement it was very difficult to come about. This year I have constructed buoyant rudders (as shown in the accompanying figure) which were very successful on Spindrift. This increases both the effective rudder area and waterline length. This arrangement allows one to use some hull wetted surface as much needed rudder area.

The twin-wings rig is terrific if you are sailing where the wind velocity is very variable. With the wings open it is essentially a spinnaker, except it is under better control. The boat will sail very nicely on a broad reach with the wings open. With the wings closed the wrap-around sail reduces the mast turbulence and increases the efficiency of the main.

In heavy weather the boat will sail very nicely on the jib alone. The shift in center of effort doesn't seem to effect the steering appreciably.

The clear mylar main has several advantages : you can see where you are going. you can see the jib through the main, and the material is very strong, light and very inexpensive. It took only one day to make a 380 square foot sail.

There are two disadvantages to a mylar main : when the main luffs it makes an awful noise, and although it is easy to patch, it is subject to puncturing on sharp objects. I punctured it every time the boat was dismasted last year.

Most catamarans don't have ultimate stability—this one has so far. It simply breaks its stays (1,200 lb. test steel) and dismasts itself rather than capsize. This happened three times last year. Since the mast is stayed only at the top and swivels at the bottom, this doesn't hurt anything. Since there are four stays, the mast can only fall sideways if it breaks one. It only takes about an hour to hoist the mast back up again. I would rather hoist the mast than try to right the boat. It would certainly be preferable, however, to have this process under better control—such as an automatic stay release when the boat heels by 45°.

One nice feature of Moby Dick is that the hulls are solid foam from slightly above the water line to the bottom. There are two drain plugs in the stern to allow any water that gets in the boat to run out.

P.S.—After writing this article I noticed in A.Y.R.S. Publication No. 28 that David Jeffrey built a catamaran by the same technique as Spindrift at about the same time. His description of the technique is very good. I notice that his curing temperature was 60° for the epoxy resin with a curing time of two days. Before making Spindrift I made a number of test samples cured at various temperatures and found that the strength was considerably higher at higher curing temperatures. If the epoxy is spread on the surface in the shade and the boat then carried into bright sunlight the curing time is only about an hour and the strength is higher.

A CATAMARAN DESIGN

by

C. T. Black,

Constantia Flower Farm, Doordrift Rd., Constantia, S. Africa.

L.O.A. 37′ 10″ Weight 4,500 lbs.
Sail Area 600 sq. ft.

The drawings show the catamaran which I am at present building. The boat is of a round hull section very similar to the *Shearwater III* up to the water line. The main difference is the sheer and the quite pronounced flare to the bows. The construction is to be completely of Fibreglass with the exception of bulkheads and internal fittings.

Two wells are provided in the hulls to take two 5 h.p. *Seagull* outboards with the large hydroplane prop which I estimate will give a speed of around seven knots, for getting in and out of harbour. The lower ends of the wells close when the outboards are lifted by sliding hatches.

Owing to the Fibreglass construction, it is not necessary to deck the boat right across the two hulls which means that one can utilize the hulls as passage ways. This allows for considerable accommodation There is a main cabin which measures 9′ by 6′ and has 5′ 10″ of head-room. The hulls are then used as passage ways with the owner's cabin on the port side which has a double bunk, plenty of lockers, wash-basin, head and shower. On the starboard side are a galley, double bunk and two pipe cots as well as a head and plenty of locker space. This has all been made possible by the strong girder construction which is incorporated as the cabin top which is also of Fibreglass. This girder bridge joins the two hulls and also forms a very strong base for the stepping of the mast.

It looks to me as if Fibreglass construction is the only way to get very strong construction with a light boat, which is very important. It has taken me six months of work to make the male moulds and Frank Lawrence is at present making the female moulds in Fibreglass. Lawrence has had considerable experience in this work so his help is greatly appreciated.

Flying Streak

One of the things we had discovered was that what we thought was the best shape and size for a hull could be made by wrapping a single 2 ft. wide flat sheet of ply on to simple triangular frames, thus making an easy, cheap construction for amateurs.

Very little is known at present about the best hull shape for catamarans and whereas nearly all the English and American developments had been on the basis of fairly narrow rounded hulls, each having the right buoyancy to share the total load on both hulls, my own theory had always been based on the idea that each hull should be able to support the whole load on one hull efficiently.

In the past year or two, several designers seem to be coming to the same conclusion and hull beams (L.W.L.) have grown from 14″ to 22″ or more.

As a result of the experimental Kittiwake we designed the " Flying Cat " which is now produced by Hobbies Ltd., of Dereham, Norfolk and distributed in U.S.A. and Canada by O'Day.

The " Flying Cats," although very few were being sailed in England, have proved very successful indeed during 1960 and in almost every race against other " cats " of the same size, has beaten them decisively.

During the 1960 " one of a Kind " Races, an ordinary run of the mill " Flying Cat " sailed by an amateur, did well even against the super fast special Shearwater sailed by a crack champion helmsman and also beat the more ordinary craft of the same size.

We also sailed a " Flying Streak " completed only two days before the " One of a Kind " races and although we had not time to tune the boat, it beat all comers except Thai IV and Freedom.

We have now developed a number of other sizes, details of which are given, all of which should prove fast for their respective size.

CATAMARAN DESIGNING FOR BEGINEERS

by

A Beginner (F. M. Montgomery)

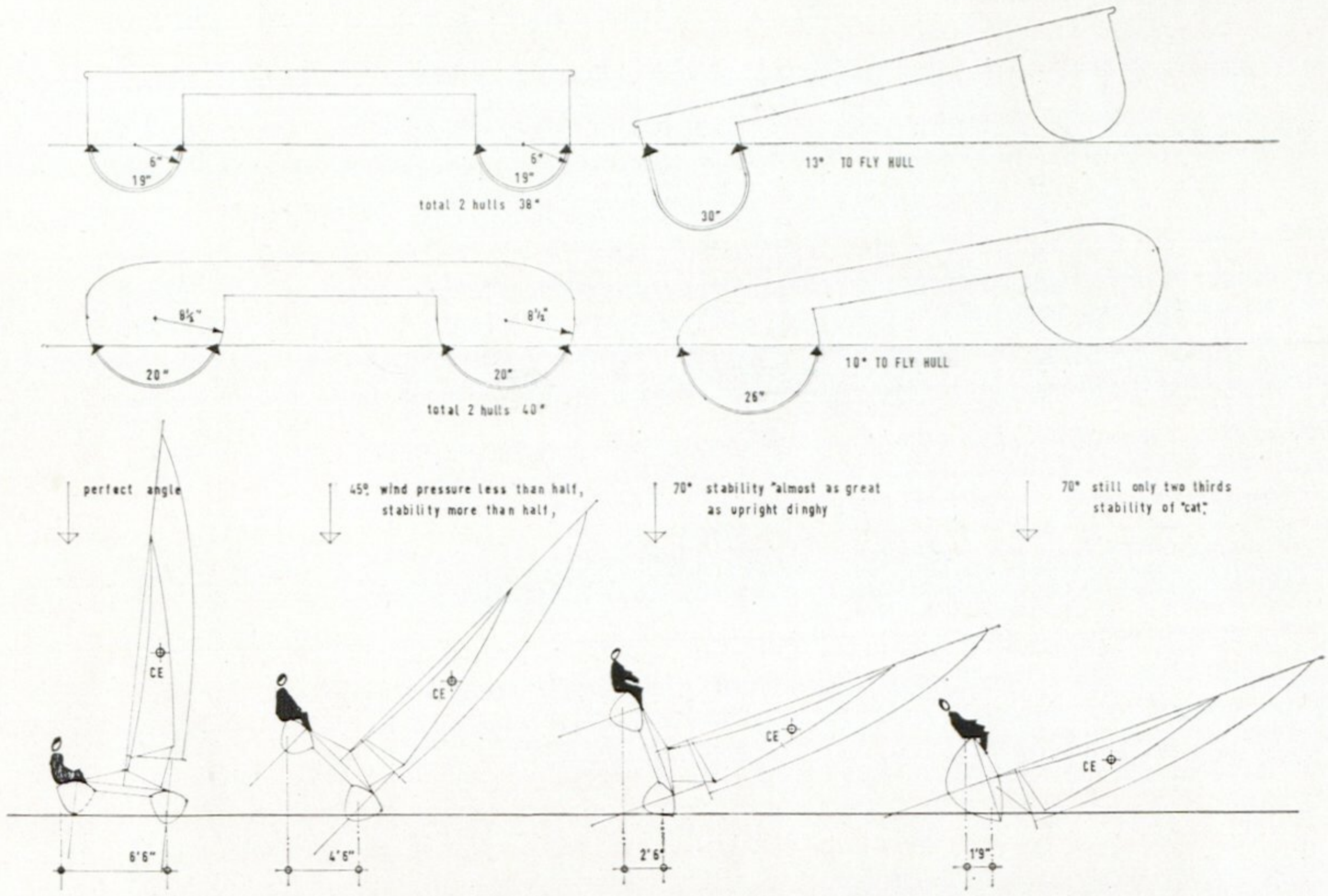
During the 50's the modern catamaran was re-born and like many others, the author started experimenting with different hull shapes. Early designs, were in effect, two canoe shaped hulls lashed together with a bridge and although there are now nearly a hundred known designs, most are not much progressed from that stage. It is safe to say that catamaran design is still in its infancy and there is much to learn.

Nine designers out of ten seem to believe that a catamaran should be sailed upright and they design their hulls to be efficient in shape when the load is shared by both hulls. That means that for the popular 16 ft. size with an all-up load of say 600 lb. with crew of two, each hull is designed to be ideally " immersed " with a load of say 400 lb. and as a result, these craft slow down when one hull lifts.

We believe that each hull should be designed to take the total load efficiently.

The reason a catamaran is faster than a single huller is that it can take more sail area because of its greater initial stability and, therefore, the designer should try to get as much sail area on as he can.

If you take a given boat and you find that it will only take say 170 sq. ft. without constantly heeling on to one hull, then it means that it is possible for the same craft to take more sail if it is allowed to heel. This is because a sail at an angle of say 10 degrees presents a reduced area to the horizontal direction of the wind and also the wind is slightly deflected so the sail area can be increased to say 200 sq. ft. for maximum efficiency provided the hulls are correctly designed as far as buoyancy is concerned. The old-fashioned theory that you



should sail a catamaran upright to gain maximum efficiency from the sail is, of course, nonsense, unless you are merely trying to combat a handicap system worked on sail area. Such handicap systems of course, retard progress.

We see then that if a catamaran *can* be sailed upright all the time, it is undercanvassed and, therefore, inefficient as far as a racing craft is concerned. It is also of some interest to note that if you take a semi-circle of 12 inches diameter (113 sq. ins. for two) which is about what you need for a 16 ft. hull bearing a load of 300 lb. and you compare it with a semi-circle of 17 inches diameter (113 sq. inches for one) which is what you need for a 600 lb. load, you find that the skin surface of two of the small hulls is considerably greater at 37.7 inches than the skin surface of the single larger hull at 26.7 inches, so there is a reduction in skin friction for the larger hull. (26.7 is about 30% smaller than 37.7). Conversely when two of the larger 17 inch diameter hulls are sharing the load the water line drops reducing the immersed amount by some 7 inches and the total length of the two arcs is about 40.3 inches. (About 7% worse off than the smaller hulls at their best).

There is of course, therefore, slight disadvantage when the larger hull boat is on two hulls but as efficiency is much more important as speed increases, it is far better to be at maximum efficiency when going fast than when going slowly. Also, the craft with the larger sail area, possible with the wider hulls, has the advatange in light airs and when running before the wind—the only conditions when the " cat " has to be on two hulls.

Another interesting point is often mis-stated by " cat " experts. They argue that a " cat " has maximum stability just as one hull is lifting. Of course, if you apply simple static arithmetic this is correct as the righting force is at maximum. In practice, however, it seems that the horizontal force of the wind on the sail decreases at about the same rate as the mechanical righting force of the boat and crews weight decreases. This is because of the reduced effective sail area presented and the effect of the wind striking the sail at an angle, as mentioned earlier. However, another factor comes into it. As the craft heels, it increasingly " blankets " the force of the wind on the lower part of the sail. It is common-place for a catamaran to lift to 70 degrees or more and come back quite happily and I have, several times, seen a " cat " touch its mast tip in the water and come back without stopping sailing. One important detail of design, however, is that the helm and crew should have good positive foot rests and toe straps and that the seat deck should be so shaped that crew and helm can sit comfortably with the craft at a steep angle, otherwise there is every likelihood that they will land in the sail.

The practice of sailing on one hull whenever possible suggests that the hulls should be outwardly inclined to be at maximum efficiency and we have made several craft with this feature during the past five years. The idea does seem to work but we have never had an opportunity of testing two boats together that were identical except for the set of the hulls and so we do not know exactly how much difference there may be. One interesting and as yet unexplained fact is that a " cat " will point several degrees higher on the wind the moment it is sailing on one hull than when sailing on two. Has anyone got the answer to this ?

Summing up, therefore, we are convinced that as progress in hull design is made, it will be in the direction of a " cat " that sails on one hull whenever possible. (i.e. In a steady breeze strong enough to reach a boat speed of 5-6 knots and upwards). It must never be forgotten, of course, that the increase of speed possible from differences in hull shape and design can only be small by comparison with the differences possible with better sail design. Almost nothing appears to be known about sail design for " cats " at present, but the A.Y.R.S. may soon be able to help with its wind tunnel and one leading sail manufacturer announced at the 1961 London Boat Show that they are building the " first " wind tunnel in the world for sail testing. It may be within a few years something will be known about sail design which will confound most of the present day " experts " many of whom hold wildly contradictory theories.

NEW " CAT " CONSTRUCTION FOR AMATEURS

During the past six years F. M. Montgomery and his son Jon who live in Sark in the Channel Isles, have been developing what is now an impressive range of twin hulled craft of two distinct kinds. Very fast racing catamarans and new types known as skeenas which are in effect, catamarans fully decked from stem to stern.

Scale model tests were followed by numerous experimental boats until the best lines were evolved. The resulting hull designs differ considerably from the most contemporary " cats." Each hull has the correct buoyancy to support the whole weight of craft and crew, very fine entry, and V shape amidships growing to a flat U at the transom.

Perhaps the most interesting feature is that the hulls are made from flat sheets of marine ply on spruce frames but look like moulded hulls. Thus, construction is easier and cheaper for the amateur than from pre-moulded hulls. Transport economy of kits is a further advantage especially for overseas.

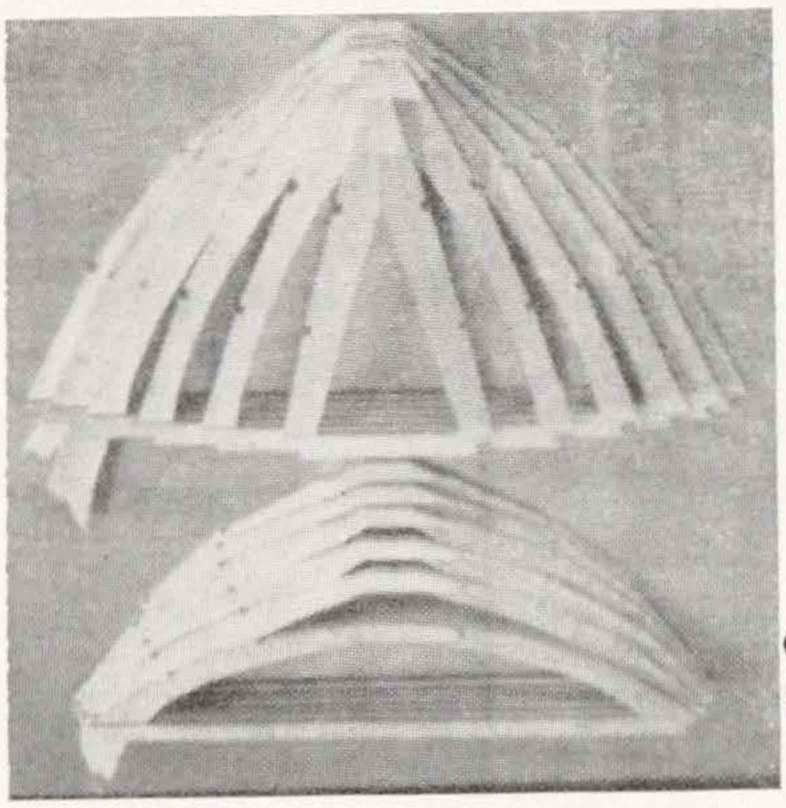
The extreme simplicity can be seen from photographs yet beauty of line and styling give a professional appearance while efficiency for high performance sailing has not been sacrificed.

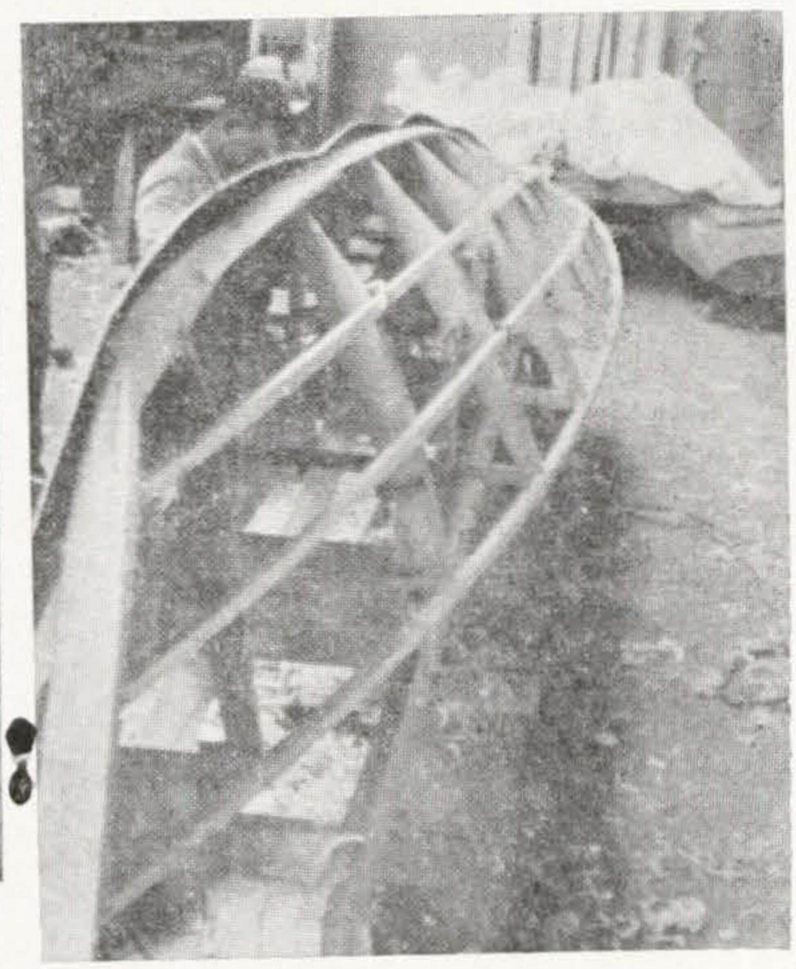
The detailed methods used show great ingenuity throughout, for saving work and yet obtaining perfect joints. The hull jig consists of two planks slotted at each frame position. Three taut lines set with a spirit level give alignment, obviating the necessity for a level floor.

When the frames, transom, stem and centreboard box, which are supplied prefabricated, have been placed in the jig the hog, gunwales and stringers are glued on and give the correct shape to the hull without the necessity to take any dimensions. Each side of a hull is made from a single sheet of flat ply 2 ft. wide, twisted on to the frames and glued with cascomite " one shot," waterproof marine glue. Only best quality marine ply is used. Made in special lengths up to 23 ft. 9 ins. to suit the length of each craft. It is supplied by Thames Plywood Ltd.

The curved seat decks are supported by stringers and the bridge, which is cleverly designed to resist torsional stresses, extends across the gunwales to ensure a very rigid though light structure of the craft as a whole, a factor which, no doubt, contributes to the high performance.

As the hulls are formed with a single unbroken sheet of ply on rigid frames, a perfect " varnish " finish is easily obtained. This is not always the case with chine type hulls which often must be painted to conceal joints filled with stopper. The " varnish " chosen is a clear polyurethane lacquer as this has many advantages. It dries very fast, even at low temperature, and does not bloom even in humid





Left—Hull frames in kit form. *Right*—Glueing a side. Initial bulges soon disappear as more clamps and screws are added. The slight stressing of the skin gives rigidity. It takes about 45 mins. for two people and should, therefore, be done in a temperature not exceeding 60-65 degrees F. to ensure perfect glue joint.

atmosphere. Three coats can be applied in a day. Lastly, it can be brushed or sprayed so that the amateur has virtually none of the problems of ordinary varnishes which demand exacting conditions, great patience and endless drying time. The surface hardness gives longer life and it does not craze even though left in the sun throughout the season. When after several seasons, touching up is required, no tedious stripping is necessary.

Swivelling light alloy masts have been specially developed by Mr. Ken Pearce who has been an enthusiastic pioneer in the catamaran field for many years and these are fitted as standard.

Mr. L. Readman of Ready Craft Ltd., has co-operated with the designers in adapting his light alloy detachable lifting rudders and these are now available as standard fittings.

Although only the highest quality equipment is included as standard, the prices of the complete craft are very competitive.

Fully battened racing terylene sails by Seahorse Sails Ltd., as seen in the photographs, are standard.

The sailing qualities of the " Flying " range of catamarans are exceptional. They sail well on one hull if the wind is strong enough, they point high and go about easily owing to their flattish transom which seems to allow them to slide round like a dinghy.

All " cats," of course, go very much faster in a blow than single hull boats but some come to grief in light airs. Not so the " Flying " series, which seem to be able to outpace single hull craft of their own size even in the lightest weather.

It will be surprising indeed if these boats do not increase in popularity both in England and abroad during the next few years. The " Flying Cat " is already in quantity production by Hobbies Ltd. of Dereham, Norfolk, who are already exporting to U.S.A. and Canada. Arrangements are being made for other firms to produce other models in England and overseas countries and in the meanwhile, Catty Sark Boats of Sark, Channel Isles are making small quantities and training manufacturers and kit assemblers.

N.P. Individuals wanting craft for the coming season should lose no time in placing their orders and firms wishing to have manufacturing licences in England or elsewhere, or to assemble kits should write to Catty Sark Boats, Sark, Channel Isles.

SNAP

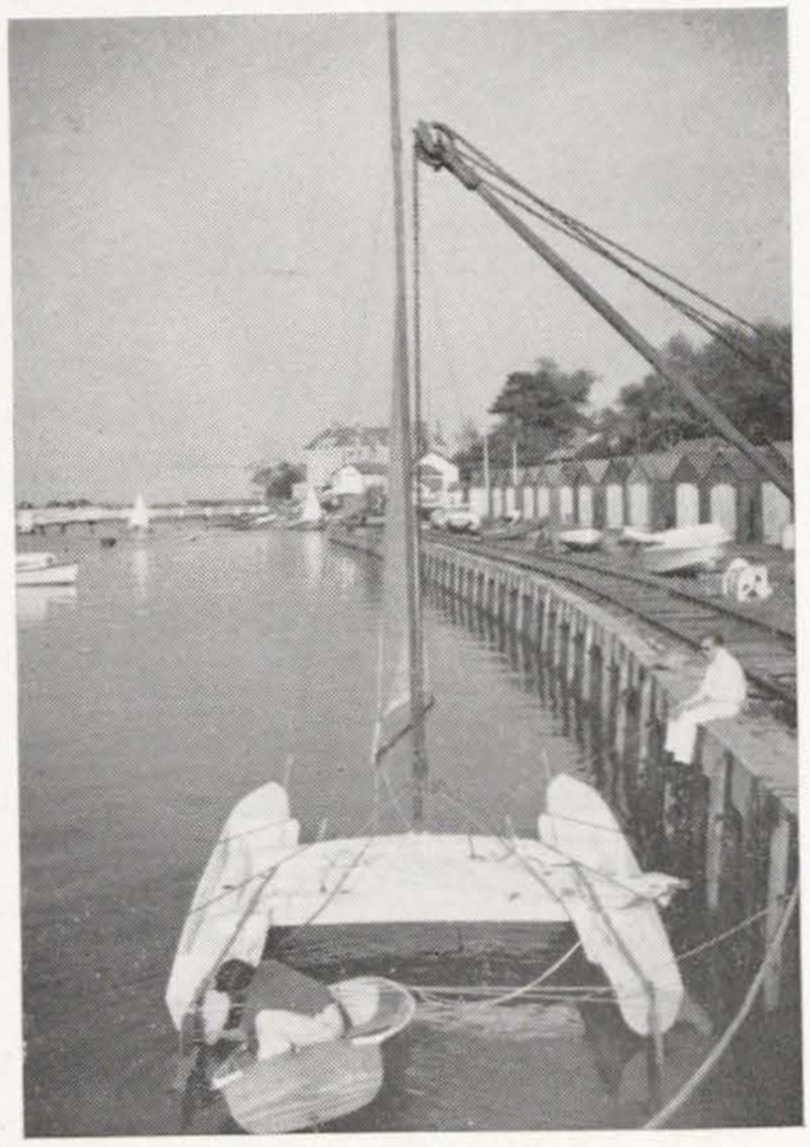
by

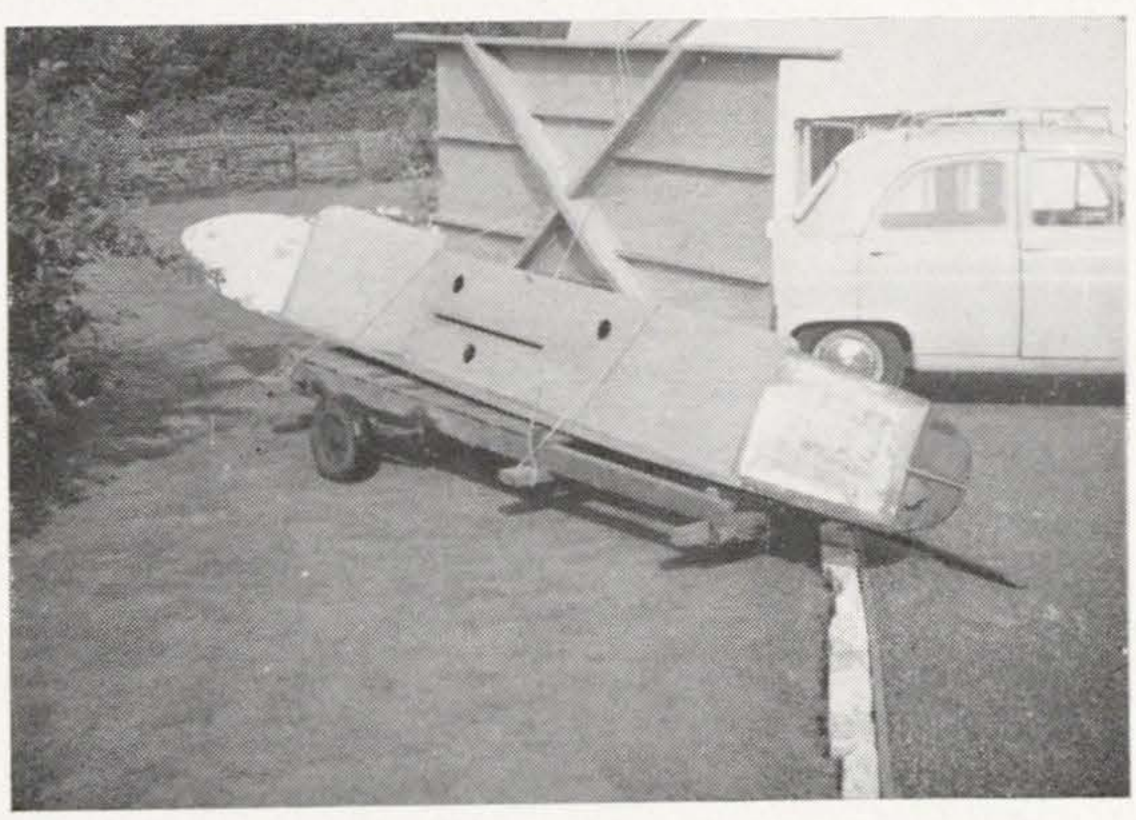
P. V. MacKinnon

Snap was described in A.Y.R.S. publication No. 28 by Don Robertson her original owner. It may be of interest to record that she now has a new bridge deck and new centreboards and has undergone other minor changes.

When I acquired her, I decided first that 9 ft. 6 ins. beam was impossibly incovenient ashore and particularly on the road. Secondly, her existing bridge deck was too heavy. Thirdly, her centreplates were too small.

After much thought, the solution adopted was to make the hulls easily demountable from an entirely new bridge deck. Each is attached by three bolts only, but in addition, the bridge deck beams rest on top of each hull and the upward pull of the shrouds on the hulls tend to keep the hull and bridge deck together.





Snap

For ease of transport, the fore and aft dimension of the bridge deck was kept down to 5 feet. This of course allows its athwartships dimension to be unlimited by transport considerations. It was in fact chosen to suit the sheet of plywood available and the resulting beam of the whole catamaran is 11 ft. 6 ins. an increase of 2 feet on her original size. But when taken apart for the road, the greatest width is 5 feet and the greatest single weight is under one hundredweight.

The front spar of the bridge deck carries the mast, and is an I section spruce beam 4 ins. wide, 10 ins. deep in the centre and with web and flanges 1 in. thick. There is also a rear spar and two beams arranged as an X bracing between the spars. The purpose of the X is to resist torsional displacements of the ends of the bridge. The deck on which the crew sit and walk is glued to the undersides of the spars and X bracing.

Each hull is decked (with hatchways for access to the bridge fixing and centre-plate bolts). The floor of the bridge just overlaps and rests on the decking of each hull. The centreboard slots now appear through the deck of each hull.

The centreboards are of $\frac{5}{8}''$ plywood and are arranged as sectors of circles, so that the slot is always fully occupied even when the board is down (as in the 12 sq. m. sharpie). When fully down, the exposed area of each below the hull is about 4 sq. ft. A larger area could have been provided by fitting dagger boards but I like to feel that the board will come up by itself when it hits the bottom.

The rudders are unaltered ; being the very efficient metal-bladed lifting rudders made by Donald Robertson. As an experiment, before making the new " track rod " which was necessary on account of the wider spacing of the hulls, I tried connecting the tillers with a wire and joining the after edges of the two rudder stocks with a stretched nylon cord. This seems to give perfectly adequate control ; the wire falls a bit slack when the windward tiller is put hard down to come about, but the ship turns round as she just should. When bearing away, the case when both rudders may be needed, the wire is, of course, in tension. I have not yet tried to come about from the position where the windward hull is out of the water but I expect it will be advisable to let it down first.

From the front spar, each hull projects forward about 8 feet and they are nearly 8 feet apart. Over this open space, the jib is set on a boom. The pivot point of the boom is held down by a pair of wires led one to each bow. These wires are attached by snap hooks to eyes on the inside of each bow, and to lower the jib, these hooks are undone, after starting the halyard. When sailing single-handed, it is of course necessary to undo the hooks one after the other, walking around the boat to get to the second. The jib and boom then swing aft and are lowered onto the bridge. Setting the jib when afloat is the reverse process.

The jib halyard returns down the luff through a sheave at the tack and is cleated near the back end of the boom where it can be reached from the bridge. To hold up the mast when no jib is set, there are two forestays one to each bow, which take little weight when the jib halyard is set up hard.

The total sail area is unchanged. Probably it will be slightly increased when new sails are bought but *Snap*, as rebuilt, was intended to be a single-handed pleasure boat. Such short experience as I have had makes me think she fulfils this purpose admirably, though she carries four comfortably if required to do so.

In moderate winds, the most comfortable way to sail her with a crew of two has proved to be by sitting one on each side, the windward one taking over the steering on each tack while the other moves to about the centre of the bridge.

It appears from this experiment that there need be no limit to the beam of a catamaran. Obviously, it is useless to make the thwartships stability greater than the fore and aft stability, but the idea emerges that a really wide catamaran needs only a crew of one who could steer from an enclosed cockpit in the centre, with a very great reduction in windage compared with the usual arrangement of a crew of two sitting to windward.

PROUT 19 FT. CABIN CATAMARAN

L.O.A. 19′	Cockpit 3′ 4″ by 8′ 9″ by 1′
Beam 9′	Headroom 4′ 9″ (roof up)
Weight approx. 800 lbs.	Sail area 220 sq. ft.

Designers : Prout Brothers. Builders : G. Prout & Sons, Ltd., The Point, Canvey Island, Essex. Price with sails, cushions but no stove : £670.

This boat is designed to sleep a family of four. It has a lift-up cabin top (which takes only 30 seconds to put up) to reduce weight and windage when sailing and her performance is equal to that of a *Shearwater III* which speaks for itself. Her appearance under sail is pleasing and her small draught and general manoeuverability make her an an ideal family cruiser.

Hull Design. The run is flatter than the original *Shearwater* so manoeuverability will be good—apart from the value of the extra weight and size which helps in any case.

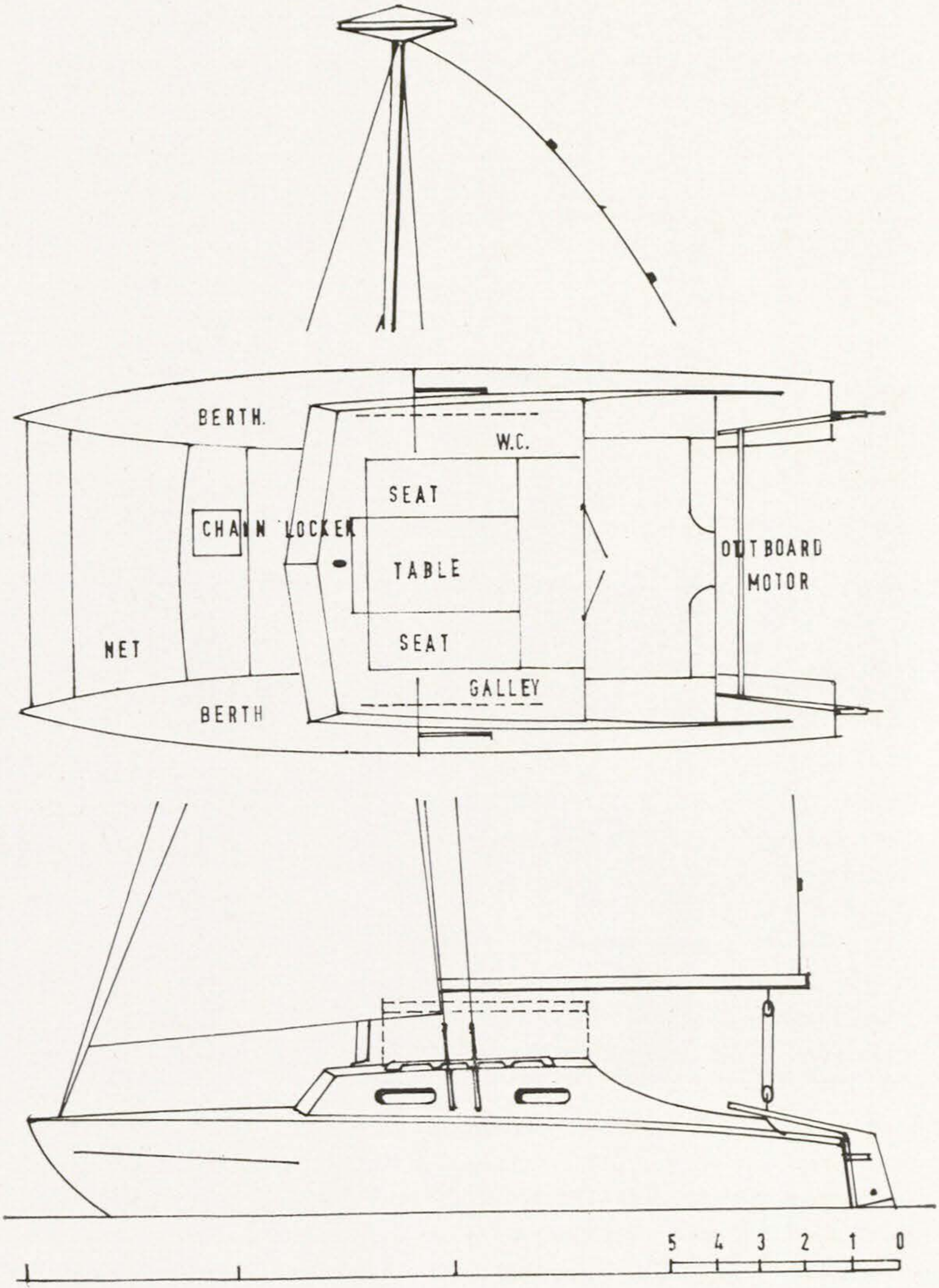
Construction : The hulls are 3/8th inch moulded plywood with BSS 1088 marine plywood, silver spruce and hardwoods elsewhere. There are substantial oak skids, protected by brass for grounding. The rudders are of the lifting type with light alloy blades. All the decks are non-slip and handrails are provided for going forward.

Prout 19 *ft. Cruiser*

Auxiliary. A 3 to 5 h.p. outboard motor gives ample power and this size of motor can be easily stored out of the way in the after part of one of the hulls.

The Possibility of Capsize. A capsize with this craft should be extremely unlikely. The greater beam and weight as compared to a *Shearwater III* will make this a very difficult feat to accomplish but, naturally, it is an eventuality which should be kept in mind, both by sailors and builders. Prouts have very wisely used a " Henderson " float at the masthead to prevent the craft going upside down and have designed the craft so that she only draws 6-8 inches when on her side which puts the cabin door as much as 3 feet above the water level. In the event of a capsize, the mast will find its way to windward and, with the aid of the crew, or by the method suggested in this publication by V. E. Needham, the craft can be righted.

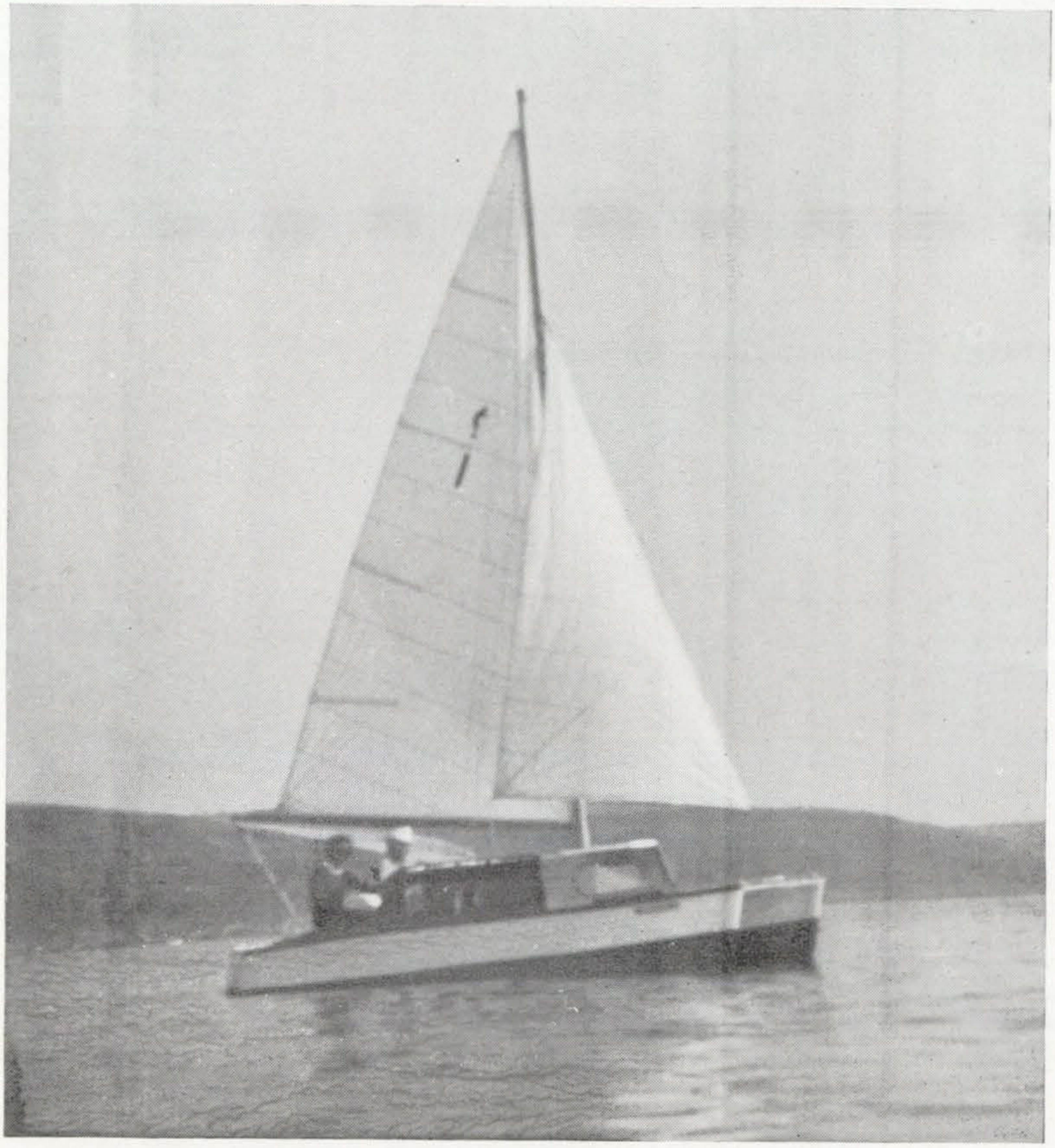
Summary. A four berth cruising catamaran is described which is being sold at a price many people can afford to pay. An extensive cruise has already been made in rough weather of all kinds along the English Channel and to France with favourable reports of behaviour.



GENEVIEVE II

L.O.A. 16′ 0″	Draft 8″
Beam 7′ 1½″	Draft with C.B. 3′ 6″
Weight 800 lbs.	Sail area :

Designer owners and builder : W. F. Metcalf, 1, Holywell Road, Playing Place, Truro, Cornwall.

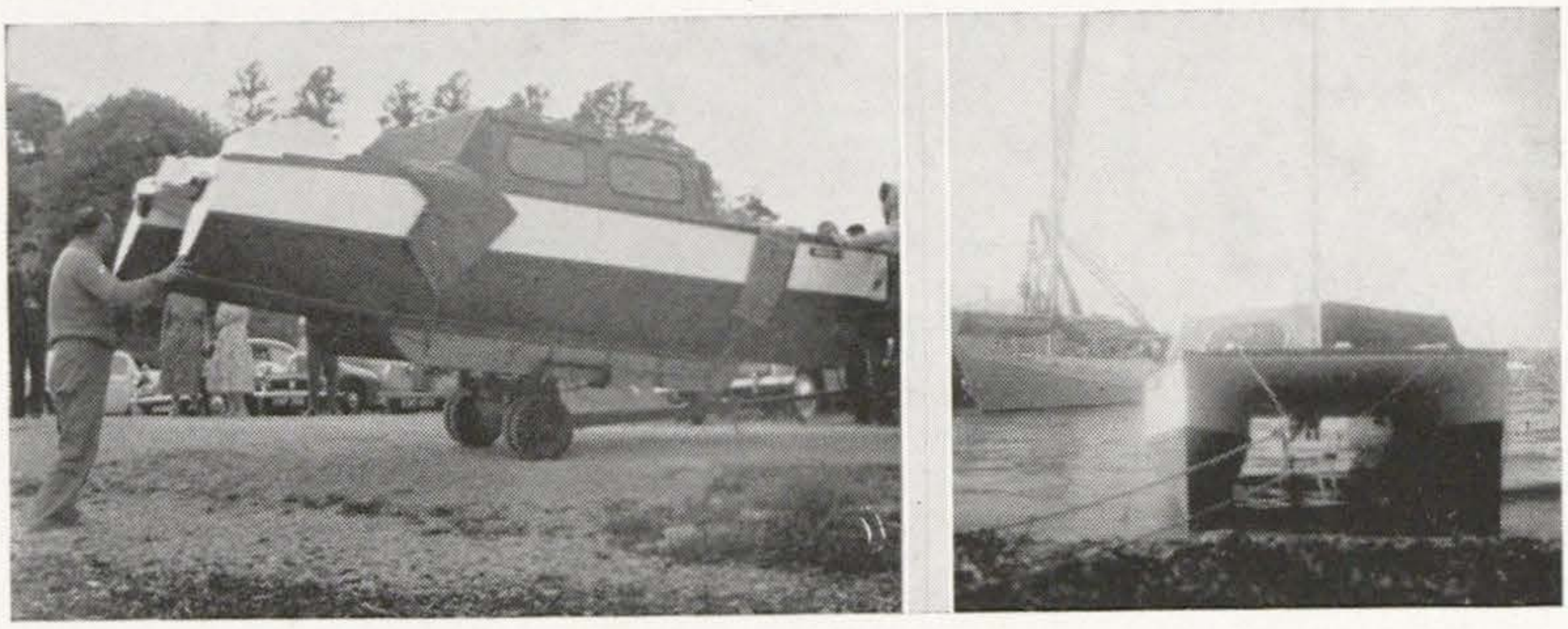


Genevieve II

Genevieve II was made by trial and error so no real plans were made, as such, just rough working drawings.

She is a very dry, extremely comfortable boat to sail and, with her weight, reasonably fast. I made her of double skin 3 mm. marine ply with fibreglass sheathing below the water line. She sails best on a reach but also runs well. She goes about quite well, too, and is not often caught in stays.

The bunks are in the hulls and are most comfortable, being 6 ft. 3 in. by 2 ft. The halyards are internal of nylon rope and the centreboard is also operated through the mast step up into the cabin, a system which works very well, all lines being operated from the open cockpit.



Genevieve II

The hatchway aft is to accommodate the auxiliary, a 4 h.p. Seagull. *Genevieve II* has wheel steering which serves well under power but is not good enough to sail by, so this winter, I shall arrange tiller steering to the twin rudders.

SKI-CAT

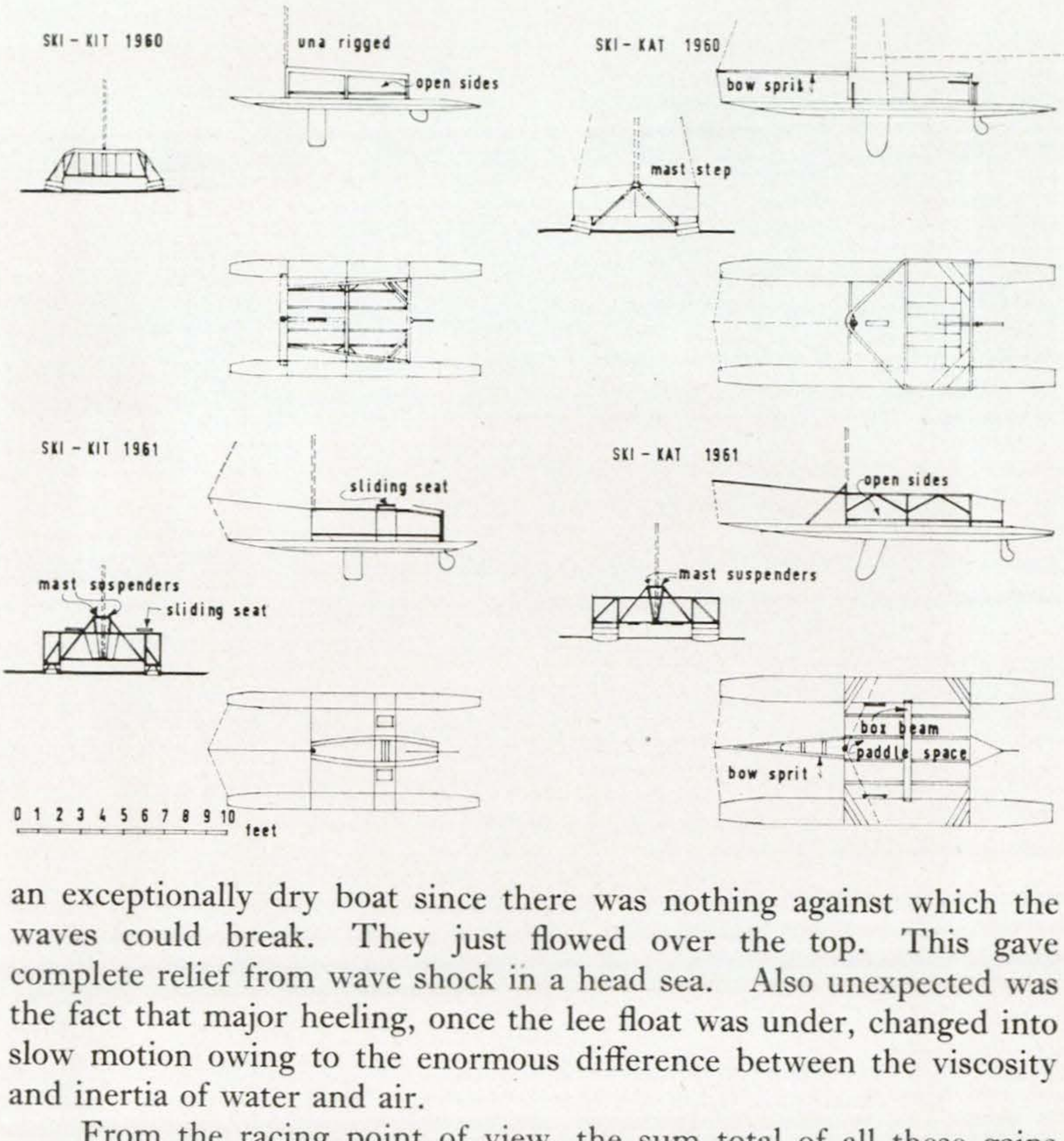
A LOW BUOYANCY CATAMARAN (L.B.C.)

by

JULIAN ALLEN, A.M.I.C.E., 3, Kenystyle, Penally, Tenby, Pembs.

A low buoyancy cat is one which has a surplus buoyancy of something less than 100% when under full load. It was conceived originally to be a cat which was totally immune from capsize. This follows for three reasons, the chief being that, since a single float is unable to bear the total load, a heavy gust will send it under while the windward one, because it cannot leave the water, cannot offer the under belly of the bridge deck as a second target to the wind. Whereas, with an orthodox cat, the weight of the mast increasingly assists capsize, with the *Ski-Cat*, its buoyancy increasingly resists capsize. In the first case, the point of " no return " is a certainty, in the second case, it can never be reached. In actual practice, the overwhelming weight of the wind is spent before reaching a list of 45°.

The first objective having easily been reached, other gains, both expected and unexpected appeared. Obviously, there is a considerable saving in cost, weight and bulk. Less wetted area, wave-making and windage follow. Unexpectedly, the low freeboard of 3 inches gave



an exceptionally dry boat since there was nothing against which the waves could break. They just flowed over the top. This gave complete relief from wave shock in a head sea. Also unexpected was the fact that major heeling, once the lee float was under, changed into slow motion owing to the enormous difference between the viscosity and inertia of water and air.

From the racing point of view, the sum total of all these gains looks bad for the present day cats. Let us look for the snags.

So far, after a season's experience with *Ski-Kit*, a 12 foot single hander, and *Ski-Cat*, a 16 footer, I have found no snags that are physical. The real snags are psychological. To novice and expert alike, the craft looks unseaworthy ; more like a floating bedstead than a boat. Minds brought up on BUILT IN BUOYANCY are alarmed to learn that the craft is actually invited to sail half drowned. The plea that surplus buoyancy can be a danger (a fact taken for granted by every clipper skipper) is scorned, as is its connection with freedom from capsize. Ship building tradition has grown through centuries of making vessels mainly for cargo carrying and our experts engaged to design craft for speed, still stick religiously to the ship shape developed for cargo. Anyone who thinks differently must expect to be scorned by the herd.

The *Ski-Kat* is designed with the critical load of 300 lbs. This means that, with a crew weight below 300 lbs. she will fly a hull as usual. With a crew weight between 300 and 600 lbs. she will dip her lee hull. Naturally, in light weather she prefers a light crew and in heavy weather she prefers a heavy one. But, even in heavy weather, the times she completely submerges a float are rare and this carries none of the anxieties of float flying. The float goes down with so little fuss that the crew may have to warn the helmsman " Lee float down," if he is looking out for gusts to windward.

To find out if the crew is " light " or " heavy," let them stand outboard on one float and try to jerk the other float off the water. If they succeed, then they are " light." If they only push their own float under, they are " heavy " and cannot capsize.

Summary. The low bouyancy *Ski-Kat* gives a bumper crop of gains at a cost of less than nothing. I will gladly provide structural details to anyone who can see sense in my designs.

GENETTES I AND II

by

V. E. Needham,

69, *Gertrude Rd., West Bridgford, Nottingham.*

L.O.A. 12′ 6″	Maximum beam of hulls 18″ (Deck)
Beam 6′ 6″	Chine 5′ 9″ from bows 16″
Draught 8″	Hull beam at transom (chine) 14″
L.W.L. 12′ 3″	(deck) 16″
Draught with C.B's 24″	Sail area 107 sq. ft.

Genette I whose statistics are given above was designed with the following features in mind :

Easy manoeuverability for river use but also good stability for occasionally estuary and coastal sailing.

High Performance but compatible with the first feature and simple construction.

Easy Transportation. We are about 100 miles from the nearest attractive bit of sea.

Cheap and simple construction.

Genette II

The hulls are single chine symmetrical form with 3/16th thick hard quality light alloy dagger boards. The board casings were given a forward slope of 15° and stainless steel rollers were placed at the points of friction so that the boards would knock up on grounding. This worked quite well until the rollers wore notches in the boards towards the end of the season.

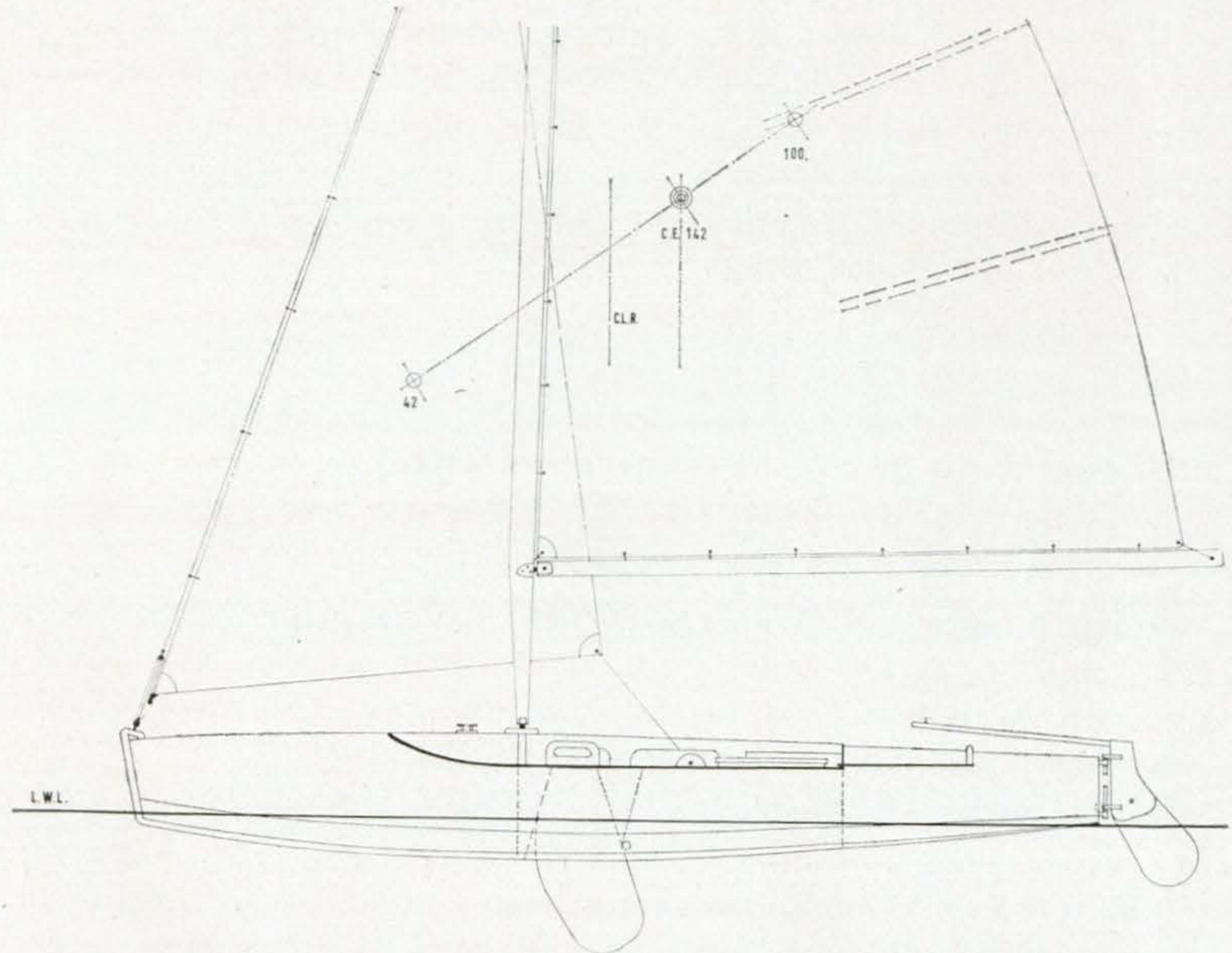
The keels had $5\frac{1}{2}$ inches of rocker, including beaching keels which taper from 1 inch at the centre to $\frac{1}{2}$ inch at the ends. The floors rose 4 inches at the centre and 2 inches at the transoms and the chines dipped 3 inches at the centre when laden.

Steering. Twin rudders with $\frac{3}{16}$ inch thick hard quality alloy, knockup blades and Ackermann linkage.

Construction. Softwood and $\frac{1}{4}$ inch mahogany plywood B.S.S. 1203 W.B.P. for decks and bottoms. 3/16th inch plywood for sides. Total cost of materials was £72. All fittings except shackles and screws were home made. Cotton sails by Jeckell cost £22.

Performance. In light winds, the speed was disappointing, even when sailed solo. Pointing was fairly good. In moderate winds, she was still a bit slow compared with racing dinghies but she always gave an enjoyable sail being safe and easily handled. In strong winds, close hauled sailing was quite good except in a short pitching sea which would rob her of a lot of way. Reaching was very good. Speeds in excess of 12 knots were quickly achieved but the boat was also very wet. A plume of water, arching up over the foredeck, fell almost into the centre of the bridge deck at maximum speed. So much water came aboard that we had to heave to and tear off the rubber flaps from the 3 inch by 5 inch scuppers before they could cope with it. The weather bow also threw up water to the discomfort of the crew. Running in strong winds was fast and dry, the boat surfing on the waves for quite long periods.

Handling was easy at all times, once the technique of going about was mastered. The Ackermann steering worked well but *Genette I* still could not be put about like a racing dinghy which spins on its bilges and we were caught in stays many times in the early days. However, when we had learned not to be savage with the tiller, sheet in the mainsail till we passed through the eye of the wind and to get the jib in quickly, no further difficulty was experienced and often we found that headway was gained by sailing about, rather than by putting about. *Genette I* carried a fair amount of weather helm and would luff up quickly. The knock up rudder blades had a trick of rising almost to the horizontal at high speed but enough area was left in the water to retain control.



General criticism at the end of the first season. 1. Light wind performance ; poor. 2. Too wet on a fast reach. 3. Overweight (although trailing was good). The weight was 270 lbs. rigged. 4. Not enough sail. 5. Not enough room on the bridge deck. It was found that, when on a fast reach, the live weight could not be moved far enough aft, and, in consequence, the lee bow was forced down further than need be, making the cat wetter.

It was decided that extra length and more sail area were clearly indicated and, during the following winter, *Genette I* modified into *Genette II* as follows :

1. The hulls were extended at the sterns to be 14 ft. 3 ins. overall. Draught is much the same, the added buoyancy cancelling out the added weight, approximately.

2. The bridge deck was extended a further 1 ft. 9 ins. aft. The forward end of the extension lapped over the previous cockpit deck with a 1 inch clearance and wood spacing blocks. The gaps between the blocks act as additional scuppers, water being actually sucked out by the venturi effect of the tunnel between the hulls. Extra louvered scuppers were also fitted at the lower corners of the bridge deck.

3. Spray deflectors were added at the bows.

4. The dagger boards were angled backwards so that they would coincide with the new centre of lateral resistance of a larger sail plan. Although the boards are not quite in the ideal position, they are not seriously detrimental to handling.

5. The mast and boom were modified to take either the old suit of sails or a new terylene suit of 142 sq. ft. (Main 100 sq. ft.)

Observations after a season's sailing. Light wind performance is much improved. Close hauled speed and pointing is good. Reaching is good but below force 2 *Genette II* still cannot beat a good racing dinghy either reaching or close hauled. On the run, she holds her own with most. In moderate winds, she is generally satisfactory on all points of sailing.

Planing (cat interpretation) commences on the reach at about force $3\frac{1}{2}$. With wind at force 4/6, *Genette* is a delight to sail and now that it is possible to get the live weight further aft she is much drier. The spray deflectors also help considerably. On the reach with winds of force 6 or 7, a speed of 14 knots was logged on the river Trent where the high banks give a poor wind flow. Salt water speeds were always markedly better, due, it is thought to the better wind flow and increased buoyancy. The extra length has improved the behaviour in a short pitching sea. Speeds of 16 knots are thought to have been attained. Manoeuverability has not been impaired by the added length. She handles well in all circumstances.

The new mast. This is of an aerofoil section and swivels. It adopts an angle of 155° to the boom by stops on the gooseneck and the turning is actuated by a wire connecting the main sheet traveller to a lever at the foot of the mast (see photograph).

The hulls are divided into three watertight compartments, drained by separate pipes to plugs at the transom. The centre compartment of each hull has a hatch on the bridge deck.

The forward stretcher bar is of flat section 1 inch by 4 inches and angled up at 12° to give lift if the bows " sound." On the odd occasion when this stretcher has caught the top of a wave, a comforting lift was clearly felt.

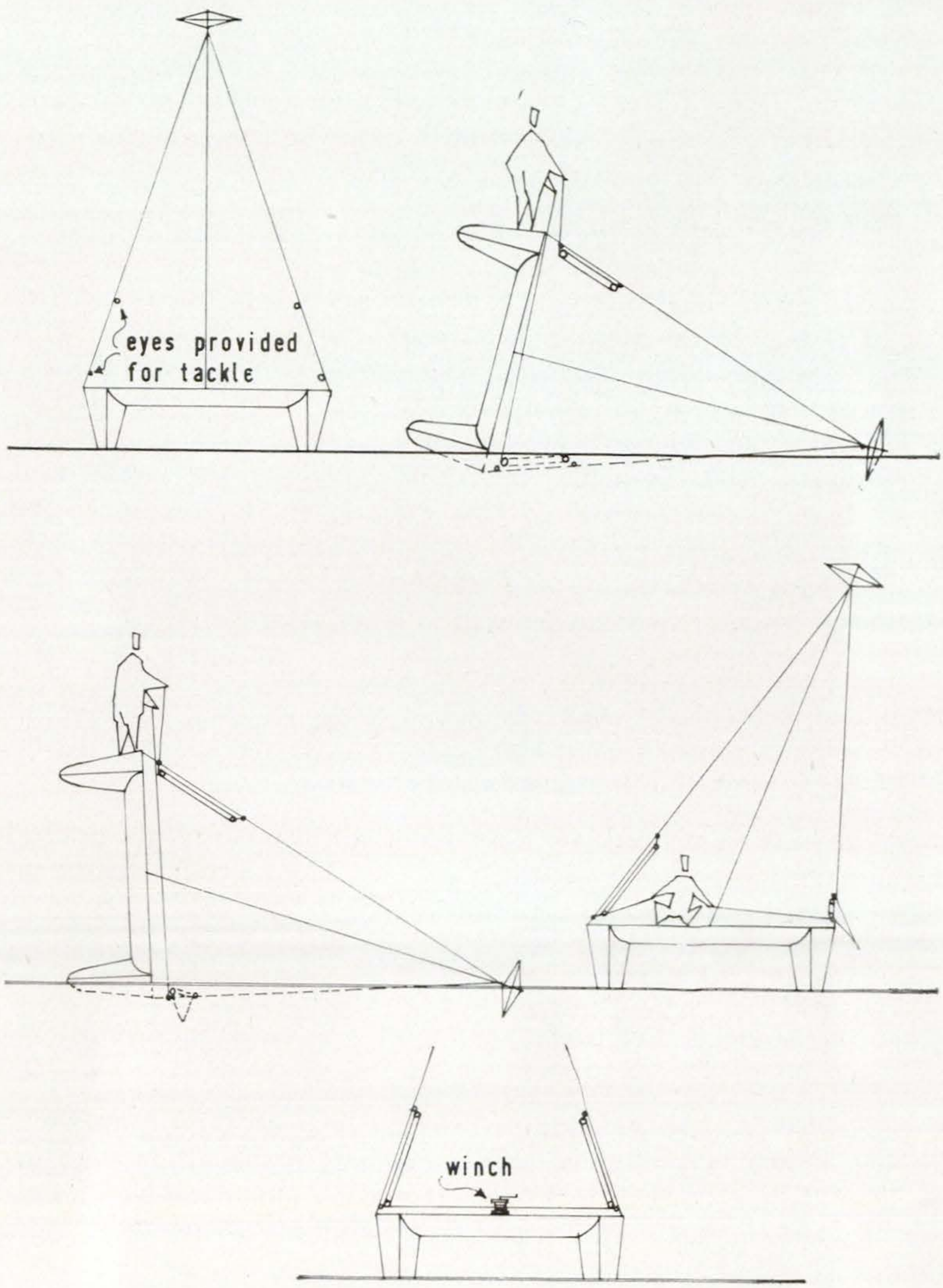
Finale. We have found in *Genette* a source of tremendous enjoyment which I think reaches its climax in the exhilaration experienced when " switch-back " planing over a long swell with a little bit of white on top. The cost of the modification was : Sails £35, Materials, £7.

A CATAMARAN RIGHTING METHOD

by

V. E. Needham

The five drawings show how even a large capsized catamaran can be righted by her crew using two tackles and a masthead float of the Henderson type.



Two eyes are let into the shrouds at the appropriate height above the chainplates and two tackles are kept in an accessible place on deck. In the event of a capsize, the tackles are attached to the eyes and the chainplates and the falls of both are brought to the uppermost hull. The upper shroud is then detached from its chainplate and the lower tackle is hauled in while the upper tackle is payed out until the masthead float heaves the craft upright. The mast is then re-aligned and the shroud re-shackled.

With larger catamarans, flexible wires could be permanently shackled to the upper eyes, led through blocks on the chainplates and taken to a winch amidships which would take in one while letting out the other. In a capsize with this, the weather shroud would be unshackled and the winch would right the boat and re-align the mast.

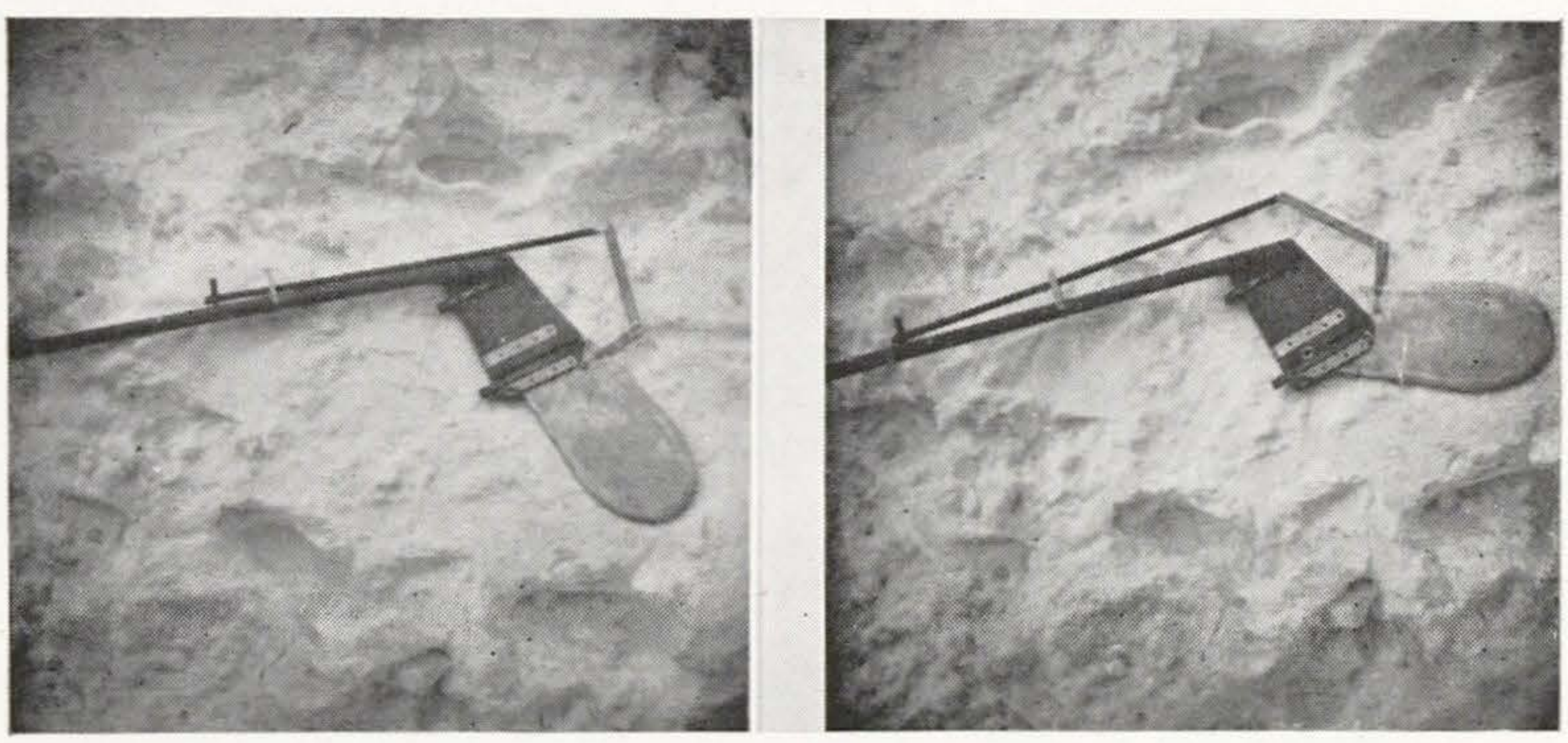
SHEARWATER IV

by

WALT HALL,

222, *North Grenada Street*, *Arlington*, 3, *Va*,. *U.S.A.*

The SW IV is a SW III with Tiger-Cat mainsail dimensions except that the main is 23′ x 10′ instead of 23′ x 11′ (153°′ plus jib). Standard SW III hoist of 19′ is maintained at the reef points, but an extra 40°′ is available for light and average winds. Shrouds meet 19′ up the 25′ 9″ mast and jib dimensions are optional. A second cross-beam on the extreme bows carries the headstay or luffspar. A 17′ jib luff has proved the maximum practical length with 8′ on the foot recommended.



Walt Hall's Rudders for Shearwater IV

Double 15″ dagger boards in 30″ slots centred 30″ aft the mast, of either $\frac{1}{4}$″ aluminium or 3/32″ stainless steel, allow precise helm trimming. Boards project 18″ below hulls and were cut to this length by experiment. The forward edge is rounded with a 15″ radius. Hatches are installed on deck when double boards are used. The SW IV sails best with both boards down on all but runs, when both are raised.

Rudder blades are moved up or down with lever arms. Drag is reduced and pointing is improved with the weather blade up. Blades are SW III size and shape of 3/16 aluminium or 3/32″ stainless steel, but with the weather blade fully raised, neither is ever lowered more than 45°.

To perform as both a SW III and IV a SW owner needs 4′ spliced onto the mast, a 40°′ reefable panel added to the foot of the main, and a beam bolted to the top of stems or wedged under the most forward gunwale strips.

With full sail we have found the other prominent larger catamarans in trouble trying to stay with us in regatta racing in winds up to 20 knots. Comparison of sail area to weight ratios readily explains this. Above 20 knots we reef to a SW III mainsail and that performance is well known.

Shearwater now has the speed, size, light weight and all weather performance regatta skippers want. It may soon become the Snipe of the multihulls.

Shearwater IV's won 1st and 2nd in the Baltimore Yacht Club annual regatta in 1960. One also won the annual Gunston Cove Race 14 miles from Fort Belvior to Alexandrie up the Potomac on 31st May, 1960 on both elapsed and corrected time.

The photographs show the rudders of *Cherinda II*, described in A.Y.R.S. No. 22.

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Flying Fish	17. 4	7.10	220	242	260	48	21/23	19
Flying Crest	18.10	7.10	220	252	295	55	22/24	20
Flying Spray	18.10	9. 6	250	265	309	60	23/25	20
Flying Streak	19. 6	9. 6	260	285	328	65	24/26	22
Flying Skee	21. 6	10. 4	285	326	362	75	26/29	24
F. Skee Cruiser	21. 6	10. 4	260	370	462	100	35/40	30
Flying Rocket	23. 8	12. 0	295	376	430	90	29/33	25
F. Rocket Cruiser	23. 8	12. 0	280	422	530	120	38/44	30

For further details see opposite page or write Catty Sark Boats.

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Export kits are less long parts such as stringers and keel, easily cut locally. This reduces shipping costs still further.

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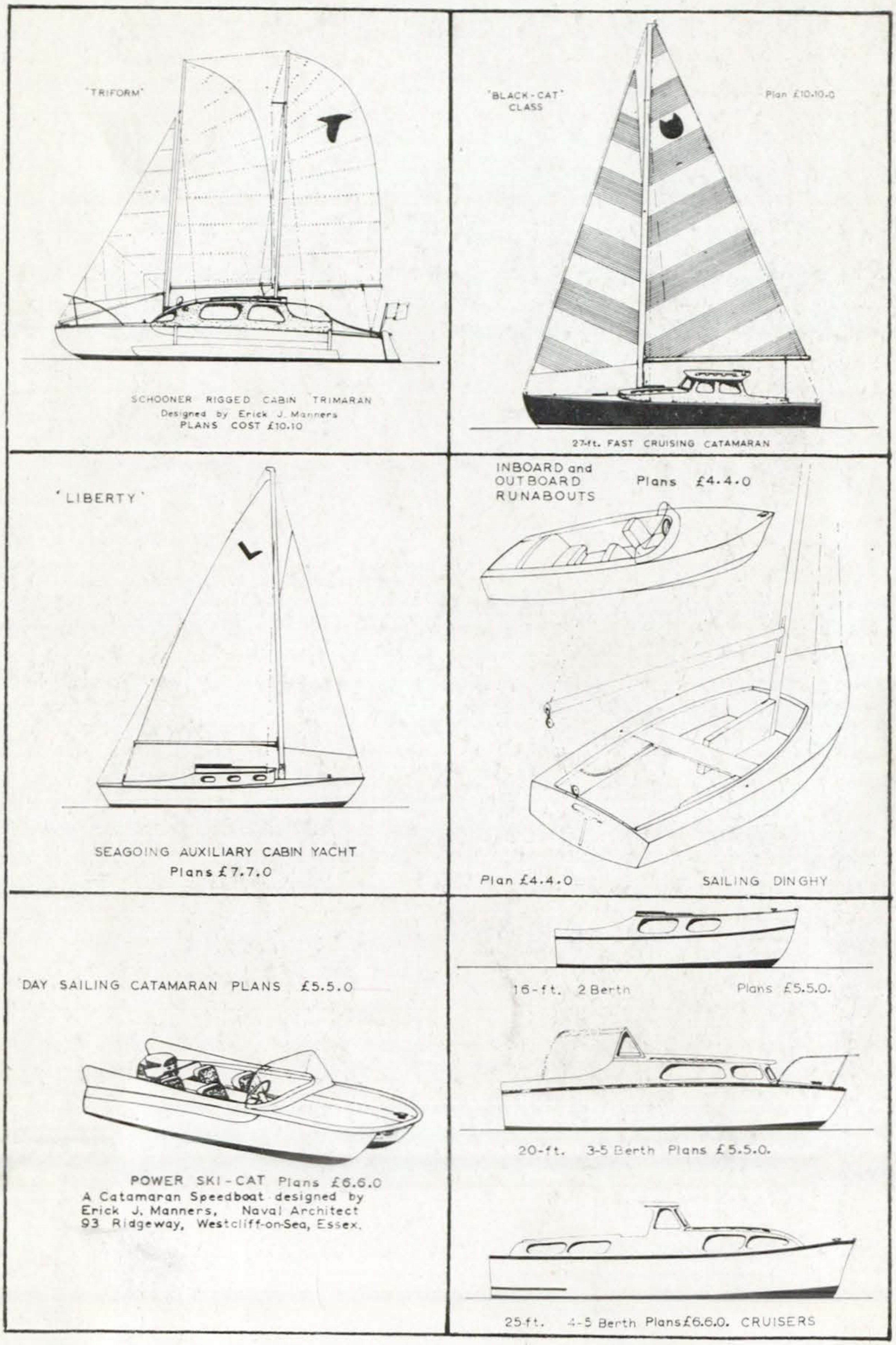

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