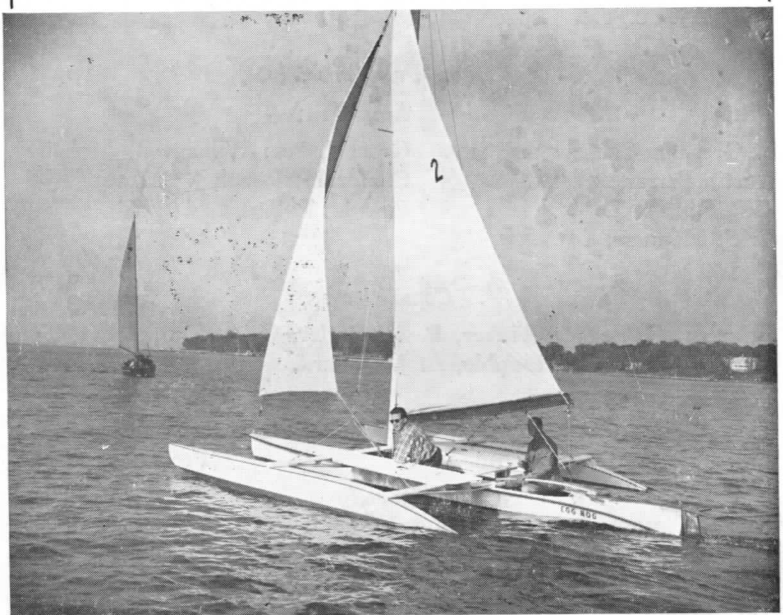
OUTRIGGED CRAFT

A.Y.R.S. PUBLICATION No. 6.



VICTOR TCHETCHET'S "EGG NOGG"

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(Founded June, 1955)

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EDITORIAL

This is the sixth A.Y.R.S. publication and marks the end of the Society's first year of existence. In the first five issues we have given new and unusual information about various aspects of sails and sailing craft. We have not so far been afraid to conjecture new ways of doing things even though the way which springs to mind might not be fully practical. In this number, there has been a review of the work of the Society and of the outrigger craft which have formed such a large part of our interest up to date.

Roland Prout tells me that his firm is at present making a new 16′ 6″ double hulled catamaran in large numbers and it is quite obvious that nearly all sailing centres will soon have large fleets of these craft. However, both the Indonesian and the Micronesian types of craft still await development to the same degree of efficiency before final judgement can be passed on them. Roland is quite prepared to quote a price for a moulded plywood hull of Micronesian type and details of a Bermudian rig for it may be obtained from me by anyone interested, though the design will be published in the next issue.

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THE ANNUAL GENERAL MEETING

The first Annual General Meeting of the Society was held on Saturday, 10th December, 1955 at 123, Cheriton Road, Folkestone. In the back garden were :—

1. The A.Y.R.S. Catamaran. This is one of the Prouts' 18 foot plywood hulls, with at present, a light alloy step ladder for a cross member. This ladder is 12 feet long and has a planing float at either end. These floats are 4 feet long, 1′ 6″ in beam and 8″ deep.

2. Sandy Watson's single outrigger, backwards-forwards craft which was sketched in the publication OUTRIGGERS.

3. The long hull with hydrofoil stabilisers of which there was a photograph and description in HYDROFOILS.

4. A canoe with a "Triangular Squaresail" to demonstrate that this could be trimmed as close to the wind as a jib.

Inside the house the following small models were on view :—

1. A 1″ to the foot model of the A.Y.R.S. hull with a slot arrangement forward of the mast so that different hydrofoils or floats could be easily attached for testing. There were 7 hydrofoil configurations and one pair of floats for it.

2. A double hulled cruising Catamaran made by Owen Dumpleton, showing details of accommodation.

3. A Fijian model of a single outrigger canoe presented by Owen Dumpleton.

4. A hull with automatically operated hydrofoil stabilisers.

5. The A.Y.R.S. wind tunnel.

6. Apparatus for finding the co-efficients of full sized sails.

7. A crank operated dynamo presented by Owen Dumpleton.

8. A wind or water pressure gauge presented by Harold Wiggins.

On arrival, members were shown the electrically operated, automatic steering mechanism most beautifully made by Owen Dumpleton. This is actuated by a photo-electric cell on a special compass. In trials, a motor yacht only deviated 1° from a mean course in a calm sea using this apparatus. It seems to be unusually simple to me, compared to others.

We next took the towing models down to the pond in the adjacent park. Roland Prout brought a hydrofoil craft which towed dramatically and stably at great speeds. The two most successful of the 7 foil configurations mentioned above and the floats were also shown.

At a formal meeting held later, the following committee was elected: N. R. Bangert, Sam Catt, C. N. Davies, Owen Dumpleton, S. E. Hall, Roland Prout, Conrad Rothwell.

Names were then put forward for President and Vice-President. It was agreed that the posts of Editor, Secretary and Treasurer would continue to be held by John Morwood until the Society was on a sounder footing.

The following objectives for the Society were then adopted :—

1. To make full sized and reduced models of all types of outrigger craft to see if a cheap, fast, sailing craft could be produced for yachtsmen.

2. To make hydrofoil craft which are lifted clear of the water by structures running beneath the surface to achieve the greatest possible sailing speeds.

3. To produce a safe, comfortable, fast and cheap cruising boat.

4. To experiment with sails, sail rigs and, if practical, aerofoils to see if any of them are likely to be an improvement on present rigs.

5. To examine new developments in yachting as they appear.

6. To build up a pool of technical information available to members on request.

7. To produce publications every two months. These will describe our experiments and any others of which we learn and also the methods of the development of craft and sails from all over the world in their evolution. We also hope to show how new ideas can be achieved and expressed in any aspect of yachting.

It was generally agreed that the publications should contain members' letters, that as many designs should be published as possible such as the River Trading Design in OUTRIGGERS and that there should be a section devoted to the examination of new ideas in yachting.

It was agreed that subscriptions should be payable on October 1st, each year, current subscriptions to be adjusted on October 1st this year. The subscription is to remain at 15/- and $2.50 per annum.

This meeting was followed by tea, cocktails and informal discussion. This last was mainly centred on the possible future and improvements in various types of outrigger craft. The meeting, which began at 2.30 p.m. faded to its close at midnight.

THE PROUT DOUBLE HULLED CATAMARAN

In this essay, there are all the classical features of invention. Firstly, we have a man with a background of skill and materials, Roland Prout, who with his brother, runs a family firm making the well known Prout folding canoes and boats. Because of the family interest in these canoes, both Roland and his brother Francis became powerful and expert canoeists and, eventually, both of them achieved Olympic status, being in the British Olympic team of 1953.

In simple physical sports, intense training is enough to win races but where the sport needs an instrument as is the case with canoeing, that instrument must be of the most superb quality, if one is competing for international events. Naturally, therefore, both the Prout brothers became expert judges of what makes for speed in racing canoes and which type had the least resistance.

The family firm soon began to manufacture racing canoes among its other craft and, when the new casein glues were released for civilian use after the war, the firm began to make hulls of cold moulded, bonded plywood built up around a male mould of the canoe's shape. In this construction, three skins of mahogany veneers are laid on the mould, the inner two being diagonal and the outside one fore and aft. Between each layer is a film of the glue. When the hull is in place on the mould, a large bag is drawn over both so as to enclose them completely. The neck of the bag is closed and the air is exhausted from it to give a partial vacuum of 12 lbs. to the square foot. Atmospheric pressure then presses the three layers of wood together till the glue sets hard. By this method, it is possible to get a firm, continuous and strong hull which is much lighter in weight than that produced by any other method of boatbuilding.

The background for the Prouts' development of the double hulled Catamaran was therefore a range of canoe hulls of extreme lightness and strength which they were making commercially. Roland Prout, having a family background of invention and doubtless knowing of previous Catamarans, was able to realise that his light canoe hulls were ideal for such a craft but, with the caution of the traditional inventor, it was not until 1947 that he made his first experiment. This caution and delay often seem to be found with successful experiments for example, Uffa Fox's planing dinghys, Watts's steam engines, etc.

In 1947, Roland, helped by his brother, joined two of their canvas Esquimeaux Kayaks by planks of wood. These Kayaks had been designed for "Rolling" which is the Esquimeaux feat of capsizing, then by using the paddle, turning completely upside down and rolling over to break the surface again on the opposite side having made a complete circle *under* the Kayak. The sections of the craft were therefore fairly well rounded so as not to be too stable. This produced a craft with a small wetted surface.

The weight of this first Catamaran was about 150 lbs. including the mast and rigging. The hulls were 16′ 6″ long, 20″ beam and they were spaced so that the outside beam was 6′ 6″. A midline rudder and dagger board completed the craft. The sail was a single lugsail. This craft sailed quite well but was not exceptionally fast. It went to windward and came about but was slow in stays. Considered on its own, the experiment was encouraging and showed that the objections to the double hulled Catamaran were not inherent in the craft but could be due to faulty design.

It was not until 1949 that the second Catamaran was made. Perhaps again it needed a period of thought for all the facts which the first test had produced to assemble themselves for a second trial. This time, two of the racing Kayak hulls were joined by a bamboo frame and platform, a dagger board and a central rudder being again used.

The weight of this craft was 80 lbs. complete with a lugsail and the jib of a fourteen foot International dinghy. The hulls were 17 feet long and 16″ wide and spaced so the outside beam was 7 feet. This boat was very fast on a reach and also went quite fast to windward being comparable to the faster types of dinghys for speed. It came about but was rather slow in stays. Owing to the bamboo construction the hulls worked separately in the waves.

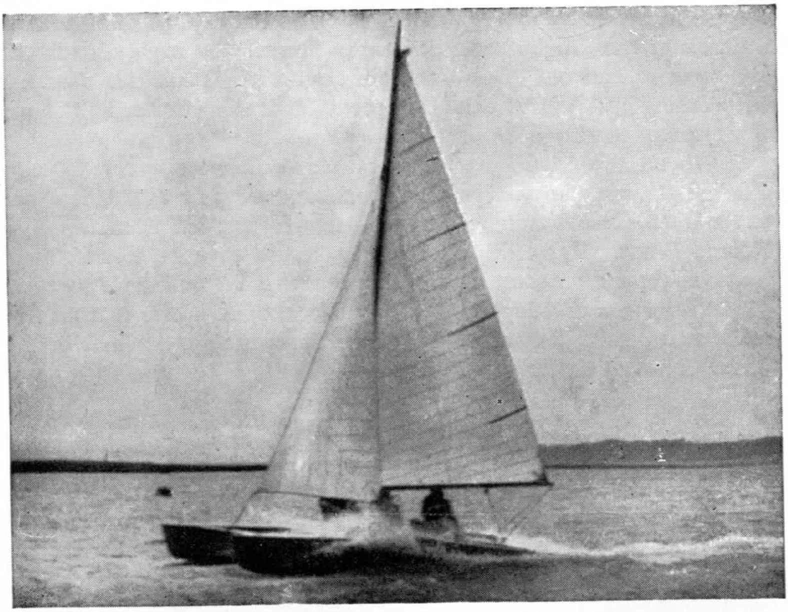
The third experiment was in 1954 when "Shearwater I" was made. The mould for this had also been designed for making racing Kayak hulls but the sections were almost semicircular to get the greatest possible paddling speeds, and as a result, they were rather unstable as Kayaks but ideal for a Catamaran. The hulls were 17′ 6″ long by 10″ waterline beam and were spaced to give an outside beam of 10 ft. The freeboard was built up by flat plywood to put the gunwale 1′ 6″ above the water. A normal centreboard, rudder and Bermudian rig of 145 square feet were used. The weight was 380 lbs.

"Shearwater I" gives a very fast ride and has gone at 20 knots at its best. She is also an excellent sea boat, slicing through the waves without slowing down very much and without bringing much water aboard. At first, she tended to bury the lee bow when close hauled in strong winds but this was cured by bringing the rig back into the boat. Like her forerunners, she doesn't fail to come about but is still just a little slower in stays than other boats. She carries strong weather helm when the plate is up but is balanced with it down.

SHEARWATER I.

She will beat to windward without any plate at all. Both bow and stern posts are in the water when floating.

"Shearwater I" was such a success that it was decided to design and make a mould especially for the hulls of "Shearwater II." It was thought that with beamier and hence flatter hulls she would be faster and with more rocker, she would come about better. The almost semicircular sections were again used and the buoyancy was spread out rather more towards the ends to save a little on wetted surface and to prevent the less bow from burying. The length of the hulls is 18 feet with a waterline beam of 14″ and a draught of 6″. They are spaced so that the overall beam is 9′ 6″. The sail area is 170 square feet and the total weight is 500 lbs. without crew.



SHEARWATER II AT SPEED.

"Shearwater II," which was launched in 1955, is better than "Shearwater I" on an average racing course by about 4 to 6 minutes in the hour. When reaching, however, especially in rather lumpy water the speeds are very similar. She is not quite so dry because she has a little more beam forward than the earlier craft but very little water comes aboard when travelling at the speeds of a normal planing dinghy. "Shearwater II" has been timed at 21 knots but has done better than that on occasions, Roland estimating 25 knots.

Compared to other dinghys, "Shearwater II" is very fast indeed. On an average racing course, she can give the Thames Estuary One Design 18 foot dinghy 15 minutes in the hour and still beat her handsomely. She sails fastest on a close reach but is still faster than the

T.E.O.D. to windward. She puts about quite as easily as other normal boats and has been timed from tack to tack at 12 seconds, which is very fast indeed.

In all, "Shearwater II" is an ideal sail boat. The large cockpit, 9 feet square approximately, makes it very comfortable as a family man's day boat and it is quite possible to put up a canvas cabin for sleeping. The firm way she sits on the water at all speeds is ideal for the man who no longer feels he wants to sail in the uncomfortable attitude of the dinghy sailor in strong breeze. It is possible to lift the weather hull out of the water in strong winds but this does not help sailing and it is best the ease the sheet if the weather hull shows any signs of coming off.

Whether we like it or not, the Catamaran has come to stay. Looked at from the viewpoint of comfort, safety or speed, it is far superior to normal craft in the form to which it has been taken by Roland Prout. For cruising or racing, it will soon be seen in great numbers around the coast .It would appear that the hulls have got to be of the sections and shape described No one has so far managed to make a successful Catamaran with chine hulls though this may yet be done. Never tie your sheet, however.

THREE DOUBLE HULLED CRAFT

by ROBERT B. HARRIS

In 1948, I designed "Naramatac," a twenty-five foot length overall Catamaran. I was searching for a day sailer which, though not necessarily a speed demon, would easily go by other boats of her size,

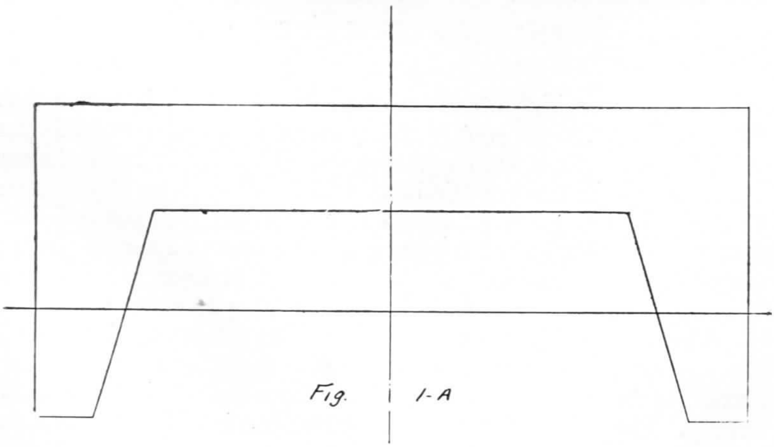
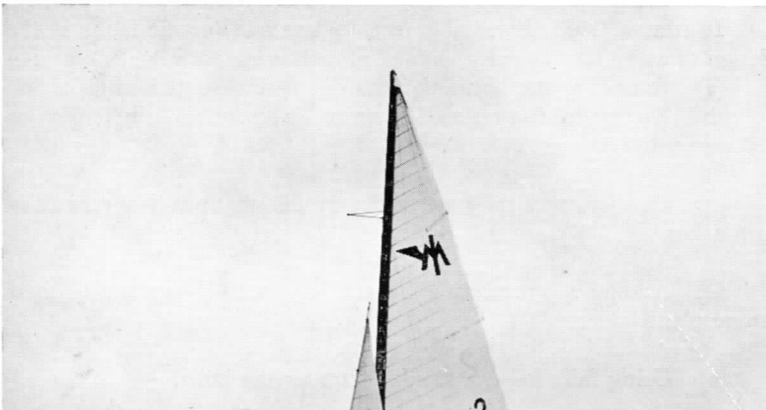


Fig. 1-A

would manoeuvre well and go to windward. I also paid some attention to making her easy to build with thoughts for the home builder. The deep, narrow, flat-bottomed sections (see Fig. 1A) of "Naramatac" were certainly easy to build but only in a fresh breeze would she really



BOB HARRIS'S CATAMARAN.

go well to windward, manoeuvre and come anywhere near being faster that other boats of her length. In light breezes, she was slow, would not go well to windwards and manoeuvred poorly. At good speed in a chop, the flat bottoms pounded. However, the underside of the wing seemed at a good height above the datum water line because green water seldom hit there. Briefly stated, "Naramatac" was too heavily constructed, lacked stability to carry enough sail and had too much wetted surface. Manoeuvreability was bad on account of the hulls being too deep in general, particularly aft.

In March, 1953, I was able to eliminate most of the faults in the design of an 18 foot overall moulded fibreglass Catamaran sloop by :—

(a) Rounding the bottoms, thus decreasing wetted surface.

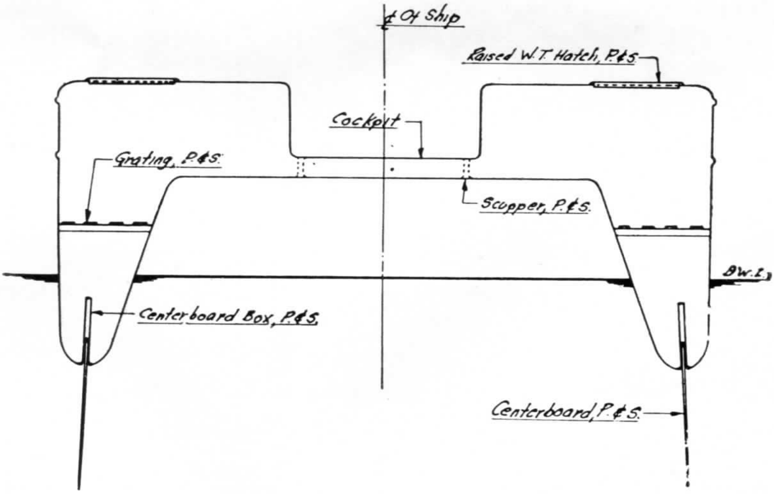
(b) Increasing the ratio of beam to length of each hull again to reduce wetted surface.

(c) Cutting away the underwater profile aft to reduce resistance to turning.

(d) Adding a centreboard in each hull to make a more efficient lateral plane.

(e) Using fully balanced rudders under the hulls.

and (f) Increasing overall beam to increase sail carrying power.



All of these changes worked to advantage with the exception of the rudders which put up a terrible fuss at the boundary plane. At last, we had a Catamaran which would go to windward well at all times and come about ninty per cent. as well as a single hull. Unfortunately, the construction by hand lay-up of fibreglass proved much too heavy. The resultant added wetted surface and displacement again ruined the light weather performance but, even so, it was better than in "Naramatac."

It would seem thaτ all we had to do now to improve the breed is to reduce the weight, move the rudders back to the unbalanced condition and increase their aspect ratio slightly. For beaching, the rudder blades will be pinned and completely cable operated. When going off the wind, much wetted area may be saved by lifting them slightly. The construction of a new Catamaran with all these changes is now underway. Launching should be in March, 1956, at which time a further report will be made to the A.Y.R.S.

OUTRIGGER EXPERIMENTS

The following is a list of some experiments with outrigger craft It is obviously far from complete. For instance, there are some 200 Catamarans racing off Barcelona whose ancestry is not known. If anyone knows of any other trials, therefore, it would be greatly appreciated if he would send the details to the Editor.

1. 17th Century. Sir Wm. Petty. The "Experiment," Cigar-shaped hulls.
2. 1873. H. Melling, Liverpool. 30′, 2′ 6″, 1′ 6″, Inboard sides flat.
3. 1876. N. G. Herreshoff. 30′, 1′ 6″, Spaced 15′.
4. 1898. "Proa" described in the "Rudder."
5. 1908. Victor Tchetchet. Kiev, 2 Kayak hulls.
6. 1920. Irishman, Cork. Split 16′ dinghy, Inboard sides flat.
7. 1937. Eric de Bisachop, French. 25′, Voyage: Honolulu to France.
8. 1938. Sir William Acland's Proa.
9. 1944. Victor Tchetchet. Double hulls.
10. 1945. Victor Tchetchet. Indonesian type: "Trimaran."
11. 1946. Woody Brown. 40′, Round sections, Inboard sides flat.
12. 1946. John Chartres. "Jean-Marie," Nigeria. 18′, 1′ 6″ 7′ 6″, 350 lb.
13. 1947. Roland Prout's trial Catamaran.

14. 1948. Robert Harris. "Naramatac," Box sections.

15. 1948. M. Christiaen, French. "Copula," 46.7′, 5′, 17.75′.

16. 1950. E. V. Wagner, Poole. 23′, Inboard sides flat.

17. 1951. Arthur Locke. "Tweedledum and Tweedledee" 35′. Flat side out.

18. 1952. "Lear Cat" Box sectioned hulls.

19. 1954. Robert Harris. 18′O.A., 15′L.W.L., W.L. beam 10″ Beam 7′ 6″.

20. 1954. Roland Prout. "Shearwater I"

21. 1954. Tothill. "Ebb and Flo." 40′.

22. 1954. Commander Fawcett. 40′ Indonesian.

23. 1955. Roland Prout. "Shearwater II."

Many of these trials were failures to produce a satisfactory sailing craft. The causes of failures are as follows :—

1. *Too much wetted surface.* The several trials with boats split up the centre is remarkable till one reads the accounts of the Micronesian craft by Dampier and others of the early Navigators. The Micronesian idea was, of course, misinterpreted by the craft with the inboard sides flat. Both this construction and deep box sections have too much wetted surface. This made the craft slow in light breezes.

2. *Bad manoeuvreability.* The long, flat underwater vertical surface of the split boat type of Catamaran or of the deep chined sharpie hull gives immense stability in their direction of travel. This makes them very difficult to get about, especially in light winds when they are slow.

3. *Sharpie Construction.* There is an area of skin near the chine of a sharpie where the water flow is not simply from fore to aft. In this construction, when the chine is below the surface, the water has to flow inwards or outwards across it and this produces a swirling mass of eddies which absorb a lot of power and cause resistance. In the case of the long narrow hull of a Catamaran which is of chined sharpie construction, a very high proportion of the skin is covered by this eddying flow and hence the resistance is much greater for each square foot of area than with a round bilged type. Long flat surfaces with a sharp angle below behave similarly. For example, Sandy Watson's Micronesian type of outrigger craft which is shown in OUTRIGGERS has a swirling mass of eddies on the weather quarter from this cause.

So far, there has not to my knowledge been a thoroughly good sharpie double hulled craft. Some of the type have been fast when the breezes are strong but they must be slow in light winds and in stays relative to a craft with semicircular sections. However, Bill O'Brien has produced plans for a double hulled sharpie craft which are the best I have so far seen. The chines are on the waterline and will therefore not swirl the water if the craft is kept on an even keel. There is good rocker on the keels with the greatest depth forwards of midships so she will come about better than the others and there is a long flat run to the transom which just lips the water so true planing may occur, possibly making for higher top speeds. It has been doubted if a long narrow hull can plane. The argument is that the aspect ratio of beam to length is so low that there can be no hydrodynamic resemblance to the conditions occurring on the lower surface of a hydrofoil. In my opinion, however, the behaviour of water skis is evidence to the contrary. Bill O'Brien's design is now being built and will be launched in the Spring.

CATAMARAN CALCULATIONS

Some calculations on the speeds of the three main types of Outrigger craft may be of interest. Their value is, of course, open to question but practical experience seems to confirm them.

The speeds of boats depend mainly on two ratios if the other features of design are of equal merit. The first of these is the Power-Weight ratio and the second is the Power-Wetted surface ratio. In the case of sailing craft, the Power is proportional to the sail area so the first calculations are connected with the amount of sail which the various types of outrigger craft can carry. To do this, we naturally have to find out what is the righting moment at the point of capsize. This will then equal the capsizing moment of the sails and give us the relative amounts of sail area for the three types.

The heeling moment of the sails is proportional to $(\text{Sail Area})^{3/2}$, which simply means that if we double the sail area, for example, we have slightly more than twice the heeling moment because we have increased the height of the centre of effort. Therefore, the righting moment is proportional to $(\text{Sail Area})^{3/2}$. Now, if we take "Shearwater II" as an example of a craft with a reasonable amount of sail area, we can work out the sail area of the other two types of outrigger in square feet. In all cases, I have assumed the effective beam to be 10 feet for ease of calculation.

The result of my sums are as follows :—

"SHEARWATER II"

Righting Moment.	Weight: Craft 500 lbs. Crew 300 lbs.
Hull. Crew.	Sail Area: 170 sq. ft.
500 × 5 + 300 × 10 = 5,500 ft. lbs.	*Sail Area/Weight :* 0.2125 *sq. ft. per lb.*

INDONESIAN CRAFT

Righting Moment.	Weight : Craft 150 lbs. Crew 150 lbs.
Float. Crew.	Sail Area : (Calculated) : 75 sq. ft.
170 × 5 + 150 × 5 = 1,600 ft. lbs.	*Sail Area/Weight :* 0.2487 *sq. ft. per lb.*

MICRONESIAN CRAFT

Righting Moment.	Weight : Craft 130 lbs. Crew 150 lbs.
Float. Crew	Sail Area (Calculated) : 85 sq. ft.
40 × 10 + 150 × 10 = 1,900 ft. lbs.	*Sail Area/Weight :* 0.303 *sq. ft. per lb.*

From these calculations, therefore, the Micronesian craft shows by far the best figures followed by the Indonesian. The double hulled type is the worst. As regards wetted surface, it is apparent that the ratio of Sail Area to wetted surface is greatest in the Micronesian craft. The Indonesian and double hulled types are about equal with perhaps a slight superiority to the double hulls. In practice, however, several features alter these calculations. These are :—

1. A crew of two people used with both the Indonesian and Micronesian craft would greatly increase sail carrying power.

2. The burying of the lee float of the Indonesian craft would be likely to keep it from getting the relative performance calculated.

3. A centreboard is necessary with the double hulled types of normal size. Owing to the asymmetrical floats of the Indonesian and the asymmetrical hulls of the Micronesian craft, the centreboards can be much smaller and thus wetted surface can be saved.

CONCLUSIONS. On the calculations, the Micronesian canoe should be by far the fastest of the outrigger craft. The Indonesian craft should be the next and the double hulled craft, the slowest. It is worth noting that at the regattas of the International Multihulled Boat Racing Association, a society which has been going for 10 years in Long Island, U.S.A., the Indonesian craft which they call "Trimarans" are proving faster than the double hulled type.

CATAMARAN COMFORT

The main feature about this type of craft is the fact that they sail upright. All three types can be capsized but they can all be given much more stability than normal boats and, for this reason, capsizes are very rare. I have not heard of any at all for the double hulled type, if one excepts the Hereshoff craft capsizing stern over bows, a feat which cannot happen with the Prout hulls because they lift at the bows at speed.

The Double Hulled. Owing to the large cockpit, this type is very comfortable indeed. In "Shearwater II" the cockpit is about 9 feet square and gives a great feeling of space. A large tent can be put up on this boat and, when this is done, it makes the perfect "Camping Cruiser."

The Indonesian. This gives the same comfortable upright ride as does the double hulled craft. Accommodation is, in my design, limited to the narrow hull and the narrow cross member. It is, in my personal opinion, quite comparable to the accommodation of a dinghy of the same length because I never seem to notice the floor of a dinghy. In Victor Tchetchet's design, however, the cockpit is spread out on either side of the main hull so that it is as big as Prout's.

The Micronesian. This again gives a comfortable upright ride but it is traditional in this type to sail with the outrigger float just off the water so capsizes occur even with the experienced native sailors. It is quite easy to right again, however, and the natives think nothing of a capsize. Accommodation consists of a large flat area of deck connecting the main hull to the float as well as that in the main hull. It is therefore almost as large as with the double hulled craft and like it, could be provided with a tent for sleeping.

Larger Sizes. (40 *foot hulls*).

The Double Hulled. In these larger sizes, sleeping accommodation can be put in the hulls themselves and the "Bridge" can house a saloon as in the Hawaiian Catamaran "Waikiki Surf." Such a bridge looks very unusual to our eyes at present with its high dome-shaped cabin top so we would call it "ugly." The saloon of the French Catamaran "Copula" is much more blended with the hulls, however, and looks more conventional. In this size, the double hulled craft has far too much stability for open water work and, as far as can be seen, the motion is extremely violent.

The Indonesian. With a 40 foot hull, all the accommodation would be inside it which would give full headroom quite easily but the beam would probably be small for most people. Using the spring attachment for the floats as described in OUTRIGGERS, the motion of the craft could be made as easy as one wished and it would stand a chance of being a more seaworthy boat. With fixed floats, the motion would be as violent as with the double hulled type.

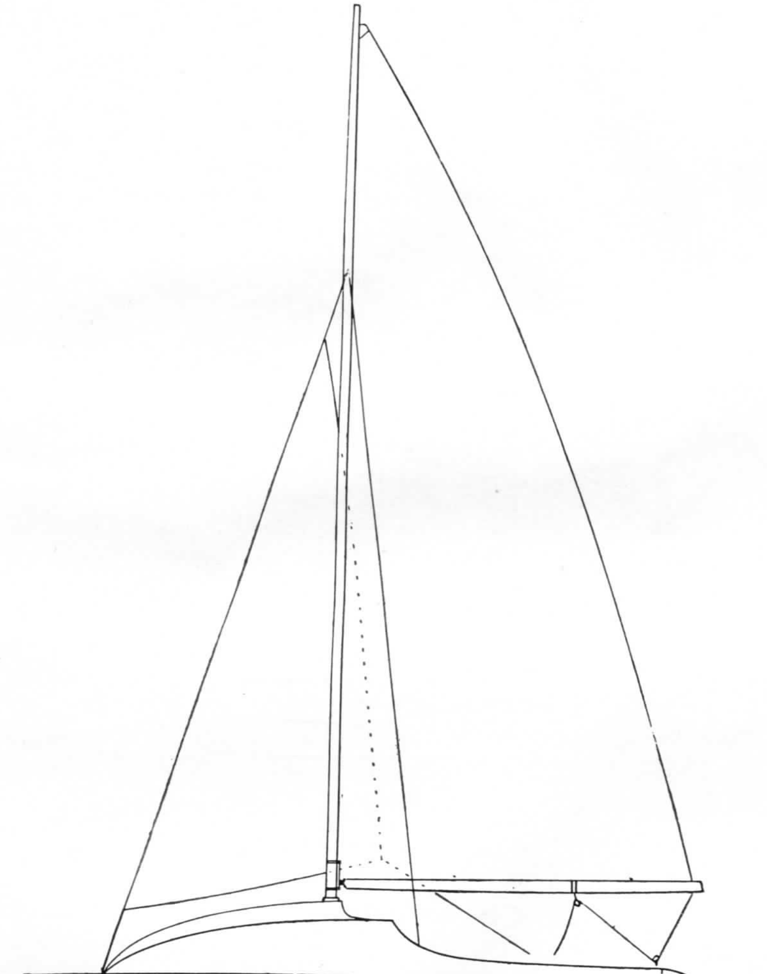
The Micronesian. Accommodation here could be a combination of space in the hull and a structure on the outrigger cross beam. I think that the factors which apply to the double hulled type also apply in this case. Certainly, the deep water characteristics would be similar. However, with a fin and bulb keel to make the craft self righting and an outrigger float which was just less dense than the water, a safe cruising craft would result which would be far more efficient than the modern ocean racer. Sandy Watson and I have worked out a variety of the Bermudian rig for this type which will be described in the next publication.

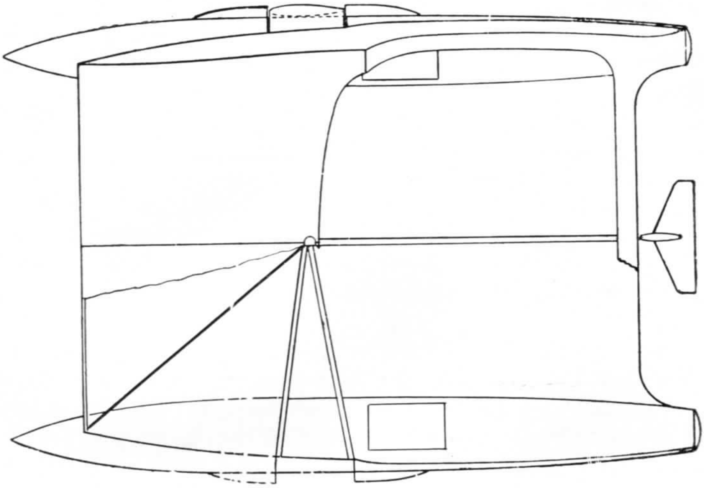
A CATAFOIL DESIGN

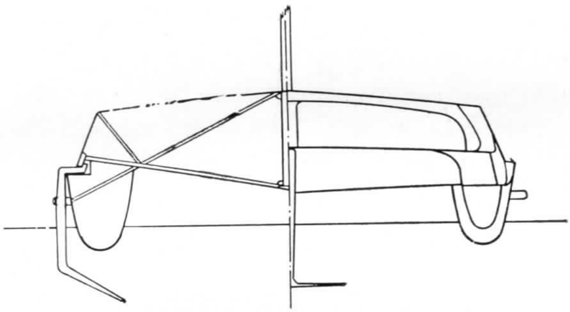
by OWEN DUMPLETON

The accompanying plans show a design which was inspired by the Hydrofoil demonstrations at the Annual General Meeting of the A.Y.R.S. It is based on two standard "Shearwater II" 18 feet hulls.

The hulls are firmly bound by a light framework of hollow struts which are covered above and below by plywood. The bridge is exceptionally high to give extra strength for the same weight. It is my intention to make a scale model for testing in a wind tunnel with a view to deciding just how high one can build the superstructure. It is quite possible that it might be possible to raise it enough to include some Spartan accommodation.







On either side of the hulls are two angled leeboards set at an angle of incidence which, with a T foil at the stern, could lift the hulls off the water to convert the craft into a hydrofoil boat. The forward foils are of the triangular plan form which maintaines a constant aspect ratio whatever the immersion and they are clamped in position when sailing.

For gravity balance, the leeboards-foils could not be any further aft and their position as shown would imply a certain amount of the lateral thrust being taken by the rudder. As shown by Tothill, this is liable to cause rudder "Stall" when bearing away at low speeds.

It would therefore be as well to leave provision for moving the mast further forward a few inches or possibly for fitting a bowsprit, although she might do as she is and would, I think, be better balanced when on the foils.

THE A.Y.R.S. HYDROFOIL EXPERIMENT OF 1956

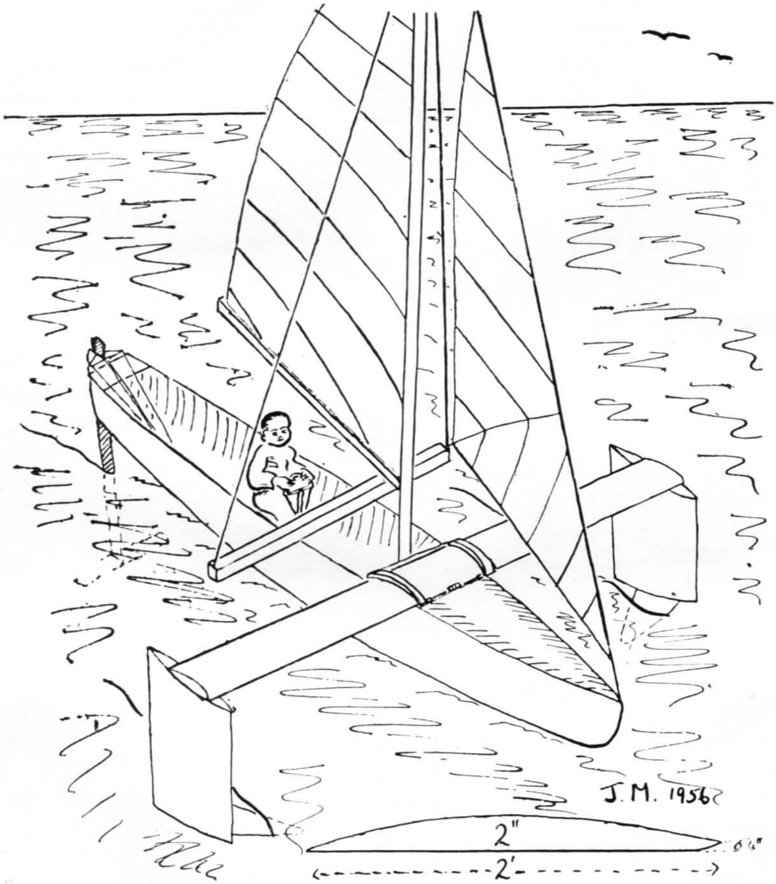
The drawing shows the system of Float-hydrofoils which is being put on the A.Y.R.S. hull by the Prouts of Canvey Island. It should almost be ready for launching by the time this publication is received.

The cross member is made of a sheet of plywood rolled into an aerofoil section over one or more cross beams. The wind should give a certain amount of lift from it when close hauled. From the model experiments, a beam of 14 feet is thought to be enough.

The floats in the original design were 3 feet long by 4½ inches thick. The Prout brothers think that this is not big enough and are increasing them slightly all round. They reach to 1 foot below the bottom of the hull. Their lower edges slope upwards towards the front at an angle of 7° to give an angle of attack to the foils of approximately 5°. The lower surfaces are flat, and though I originally had them horizontal in the side to side direction, the Prouts suggest sloping them up in line with the lower surfaces of the foils. This not only makes for easier construction but it may help to prevent a slight jerk which appears in the model when the lower surfaces of the floats break the surface of the water. The float section is the same up and down its length with the greatest beam in the middle. It is pointed fore and aft.

The forward foils are triangular in plan form to keep the aspect ratio the same at all amounts of immersion and are set to the Baker angle of dihedral of 40°. Our first trial will be with foils 2 feet long and 1 foot 4 inches in fore and aft length at the top. From the available information, this should give us enough lift to make the craft foil borne at 8 knots if its weight is 350 lbs. complete. The wing tips are rounded to prevent some of the end losses of the triangular plan form. A certain amount of experiment with the foils may be necessary to get the best size and shape. For instance, the shape should give us the equivalent of an aspect ratio of 6 : 1 because we only have to suffer one set of wing tip losses but an increased aspect ratio might be better.

The foil section is shown on the drawing. The upper surface is an arc of a circle. The lower surface is flat but it is "Relieved" at the fore edge by a rise of 1/60th of the chord. The thickness is 1/12th of the chord but may, apparently, be 1/10th without losing very much, if anything.



The stern foil is a simple T foil connected to a "Joy stick" to give rudder and incidence control by a Prout modification of the mechanism used on the "Hurricane" aircraft. The model does not need incidence control but it might help in getting the full sized craft foil borne. We are starting with a stern foil 3 feet in span by 6 inches in chord which is probably too big.

Towing tests on the model show that at low speeds, stability is due to floatation. As the speed rises, the lower surfaces of the floats start to plane which they should also do when cut up to the 40° angle of the foils. Eventually, the craft is entirely foil borne.

When coming into shallow water, the two bars across the "Wing" can be swung back and the wing can then be twisted forwards on the hinges at its leading edge, lifting the foils and floats up enough to save them from damage but still allowing them to be used for stability. The stern foil can be sloped back by a similar mechanism to that used with outboard motors.

Owing to the considerable modification of my original plans and their intepretation in terms of constructional detail by Roland and Francis Prout, the final designs of the completed craft must be considered to belong to the three of us.

WRITING FOR THE A.Y.R.S.

It is not hard to write for the A.Y.R.S. There are only a few simple rules to think of and any idea can be put into a readable form.

The art of writing is in lighting up in the mind of the reader the same idea which we have ourselves. The first rule of writing is therefore to write only on subjects which we know and, if this is our first and only rule, we can write well enough as a result of our natural abilities to put over most ideas.

Secondly, we must use simple words. Many best selling books have been studied to find out in what way they differ from others. In all cases, the word to word meaning could be understood by a child of twelve years of age though he could not catch the subtle, background ideas. Writing can be studied in terms of what is called the "Fog Index" which is a figure which becomes larger when the words are difficult to understand and the sentences are long. Using this index, Somerset Maugham, for example, scores about 8 points whereas the lowest figure scored by a National Newspaper is 9.9. Therefore, to write clearly, it is better to use simple and short words rather than those which are complex and long. Anglo-Saxon words are more easily understood than those of Norman descent.

Believe it or not, there are *six* senses. The extra sense is that from our muscles and joints which the experts call "Muscular Sensation" and this sense is very important to the practical man of all callings. When writing for the A.Y.R.S., it is very important to tell how to *work* the device you are describing as well as how it looks. The reader of a novel likes the author to play on *all* of his senses and a similar style of writing should be used in telling the story of a cruise but, for the purposes of the A.Y.R.S., the main line of the writing should be concerned with sight and this extra sense of muscular sensation. If you look at a group of yachtsmen talking about boats, you will often see them moving their hands on an imaginary tiller or trimming an imaginary sheet. These actions indicate that they are thinking in terms of muscular movement as well as in terms of sight.

Some time ago, a request was made in the Editorial for articles on the ideas of A.Y.R.S. members. The response was small. Since then, I have been studying members' letters and I have discovered that many people have pictures in their minds of developments which they have created and they can feel in their minds how their rigs or devices can be worked but I think that they often do not believe that they can express in words the muscular sensation which they know would result. Perhaps my personal method may help such people.

When writing for the A.Y.R.S., I have found it best to draw the thing I am writing about and put the sketch in front of me. I then find that I can describe its working more easily and I can describe those things in the structure which I do not feel are well enough shown by the sketch. This really means that I put myself in the place of someone who is trying to build the article from the sketch.

I use a typwriter to write with because I happen to have one. I find that, because I have had no training in its use, I write much more slowly with it than the rate at which ideas come into my mind. This, I think, is a great help because it allows the ideas to develop much more fully before they are committed to words. It is also a help to see the writing in much the same form in which it will appear when it is in print.

In my experience, I have found that I very seldom can write anything at one sitting so that it can then be published. I write it out first making sure that all the ideas which I want to express are in the material but I do not care very much if they are in the best order and follow each other neatly. As I go along, however, I generally keep a pen beside me to correct words and small phrases which I may have put in a cumbersome way. After I have finished my first draught, I read it all over carefully, putting the paragraphs in their logical sequence, simplify the words and often make two sentences where one was before. It is then ready for a second typing.

I usually read the second draught of an article out loud to see how it sounds. This will generally give me a few more improvements which will be corrected and it can be typed again in its final form. I often find that it is useful to leave a gap of a few days between each typing when the article sits in my top drawer. I may read it over occasionally, adding new ideas as they occur to me and trying to get the words to flow as simply as possible.

The best article planning I have ever done is to jot down on a piece of paper the several points I wish to make and go through them one after the other. However, I find that new ideas often come to mind as I write and they may refer back to a previous paragraph. When this happens, I may jot them down on my piece of paper and when I have finished the paragraph I am working on, I put them down and, with a series of arrows, indicate where they should be put in the next draught.

Another point to remember in writing for the A.Y.R.S. is that the Society is world wide and has members not only in all the English speaking countries but it also has members whose native language is not English. It is better for that reason not to use any phrase which could be described as "Slang." Few of us speak a language which would look well if written down exactly as we use the words. It is easier for the reader if the patterns of the words are those which he has met before and this applies as much to the English speaking reader as it does to peoples of other languages. For the same reason, one should be sure that people of all nationalities will be able to understand what one is writing about. For example, a reference to a Yorkshire Keel or an American "Bugeye" needs to be enlarged. References to craft which have been well described in these publications can be by name only.

I started this article by saying that it is necessary to know what you are writing about. That remark must know be modified. It is *not* necessary to know *everything* about the subject. The perfectionist yachtsman never puts to sea. The perfectionist author never has the pleasure of seeing his work in print. It is enough to know just a *little* more than *most* of your readers. There will be perfectionists among them who will know more than you but who will not put their ideas in print in case they make a mistake. This type of man will get pleasure from picking out any mistakes you make so you will make him happy. It is very likely that people who know as much as you do will find something new in what you write and so they will be pleased with your article and the novice to your material will enjoy it all with the enjoyment which comes from entering any new field of discovery. He will feel like Captain Cook, Isaac Newton or Michael Faraday. It is a poor article indeed which does not please. If the idea or the experiment is new, it will be published in an A.Y.R.S. booklet.

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