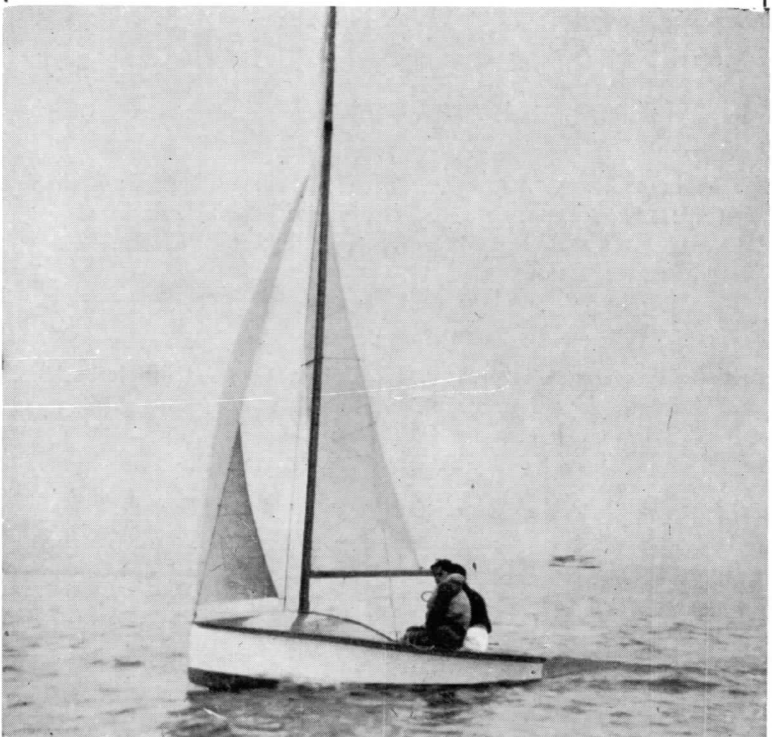
DINGHY DESIGN

A.Y.R.S. PUBLICATION No. 8.



DARING

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EDITORIAL

The results of the Cross Channel Dinghy Race have been an absolute triumph for the Prout Catamaran hull. In a strong south wind of 20 to 30 miles per hour and a lumpy sea, the Catamarans, Endeavour (Sailed by Ken Pearce and his son) and Shearwater III (sailed by the Prout Brothers) led the fleet of dinghys from Folkestone to Boulogne arriving 40 minutes before the next boat Jolly Soo, a Jolly Boat (sailed by Michael Pruett). It was almost a dead beat from Folkestone to the Varne Light vessel and hard on the wind for the rest of the way.

The average speed of Endeavour was 6 knots in the direct line but she was fitted with a speedometer and this was usually reading 12 knots, though just before arriving at Boulogne, the sheets could be eased a bit and the speed shot up to 16 knots.

In both Catamarans, the sheets were cleated throughout the race and Endeavour was such a dry craft that Ken did not even get his feet wet.

This publication describes the steps of the design of a dinghy by Bill O'Brien and it should be of value to anyone thinking of taking up yacht design as an amateur. A dinghy such as this would be a useful first step because the design could be followed by the construction of the craft by the designer himself when he would find out just how his thoughts and lines were transferred from the drawing board to actuality. Daring is a fast dinghy of chine construction and is the logical outcome of the change in dinghy design first introduced by Uffa Fox. Uffa, it will be remembered, changed the bow sections of dinghys from a U to a V and insisted that they were sailed as upright as possible. His dinghys were heavy, by modern standards, so it was necessary for them to be of round bilge construction. Modern plywoods, using waterproof glue, have now enabled construction to be lighter still and have allowed the lower edge of the transom to be almost horizontal. In Daring, Bill O'Brien has almost produced a craft of hydroplane characteristics as power boat designers understand it. The main genius of the design, however, is in keeping the chines out of the water which, though the craft is not quite so stable, produces a much more smooth water flow with less resistance.

The bouyancy arrangement of Daring should be compulsory for all dinghys. Nowadays, dinghys are going farther and farther into open water. The Cross Channel and other open water races encourage this use of the dinghy and, unless all dinghys made in future

A Safe Capsize

are capable of floating on their side without filling with water and will right themselves, there will be a constant drain on the lives of our young dinghy sailors. Bouyancy is not enough. It must be bouyancy of this kind with a pronounced flare at the gunwale. During the Cross Channel Race, a Hornet capsized at the Varne L.V. Even with the assistance of an escort vessel, it was not possible to bale it out till the mast was removed. A tired and wet crew without assistance could easily have been drowned. With bouyancy of the type described here, the Hornet mentioned above would easily have arrived at Boulogne.

Electronics are playing a growing part in our daily lives. The two articles on the subject will help members to appreciate how they can help yachtsmen. Transistors are new but will become more important as time goes on. Therefore, the sooner we know about them the better.

The other articles, especially D. R. Robertson's on his hydrofoils, are of great interest and for these and all the others which members have taken so much trouble to prepare and write, we must thank the authors most sincerely.

On behalf of the A.Y.R.S. a stand has been applied for at the next Boat Show at Olympia, London, in January 1957. It is to be hoped that as many members as possible will come to the stand for a chat and that several will be prepared to stand by in relays for the whole time. We intend to display the models we have already, and hope that members will bring their models of unusual craft and rigs to add to the collection. Not all the designs in the A.Y.R.S. collection have as yet been modelled so, if any member would like to make these, he would indeed be giving us all a great service.

ENTERTAINING ESSEX A.Y.R.S. MEETINGS

Since the Essex branch of the A.Y.R.S. was formed by Erick J. Manners, there have been three very interesting meetings at the Adult Section of the Municipal College, Southend-on-Sea, up to the time of going to press. Erick is a naval architect and a marine engineer and is Tutor of Seamanship at this College.

Members at the A.Y.R.S. Essex Meeting

The guest speaker for the first meeting was Roland Prout, who gave an informative and entertaining account of the origin and sailing of Catamarans. His account of his personal experiences in sailing the craft he had developed so successfully was of tremendous interest to all present.

The second meeting had Ken Pearce, who won the "Fastest Boat" race at Cowes last year and the Cross Channel Race this year, as the guest speaker. His talk was on the subject of "Yacht Racing."

At the third meeting Dr. C. N. Davies demonstrated three modern canoe building methods. The account of the method of "developed plywood surfaces" would be useful to anyone wishing to make a large cruising Catamaran or Outrigged Craft.

Exhibits were shown at these meetings which ranged from fascinating little models of traditional and contemporary outriggers up to modern plastic craft and a 20-foot racing canoe. These received an enthusiastic reception.

At future meetings of the Essex branch, it is intended to cover most aspects of small craft. Members who are interested in attending future meetings are invited to write, enclosing a S.A.E., to E. J. Manners, 93, Ridgeway, Westcliff, Essex.

DESIGNING DARING

by BILL O'BRIEN

Length:	14′ 3″	Draught ex C.B.	7″
		with C.B.	4′ 1″
Beam:	4′ 8″	Weight (total)	571 lbs.
with flare:	5′ 6″	Sail Area:	150 sq. ft.

Daring is a hard chine racing dinghy designed at the request of the younger members of the Weston Sailing Club, Southampton. They wanted a light, fast, cheap and easy-to-build-at-home dinghy. It had to need the same skill in handling as the "505" or 14ft. International, and for safety, there had to be bouyancy compartments and a self drainer to allow for righting after a capsize and "Sailing on."

FIG. 1

The hard chine was, of course, the obvious choice for amateur building quite apart from my personal view that the possibilities of chine have not been fully explored. I think that the chine hull is, in many respects, superior to the round bilged boat especially in the higher speed range because of its ability to climb over the bow wave and skim the surface like a surf board. In true planing, only the bottom of the hull should be in contact with the water. With a round bilged dinghy, there is a tendency for the water to curl up around the bilge. This increases wetted area. Chines throw the water clear after it has given the hull its lift. Fig. 1 shows these two water flows.

The original sharpie was completely flat transversely but had a rocker to the keel in a fore and aft direction like a river punt. About the turn of the century, rise of floor was added to the rocker and from this type have sprung all the sharpie and chine boats such as Snipes, 12 sq. metres, International Stars, Tornados, Hornets, etc. which we have today.

The general rule in the design of chine sailing dinghys has been to alter the rise of floor as little as possible between stem and transom, the chines in some cases running well below the designed water line. The object of this is to alter the water flow as little as possible and to give a good planing run. It undoubtedly achieves this but I do believe that, if the chines are kept half an inch *above* the water line and as straight as possible, the sections can be *twisted* to a dead flat section aft. The V sections usually found in the run of chine dinghys allow the flow to escape at the sides. Greater dynamic lift is obtained by having a flatter floor to force the flow downwards to prevent this escape.

It is my opinion that, when a dinghy planes, conditions are *not* similar to those on the under surface of an aerofoil or a hydrofoil but are akin to snow or ice skiing where the surface is incompressible. I consider that the "Planing area ratio" or ratio of beam to length when in the planing attitude should be not less than 1 to 2 and not

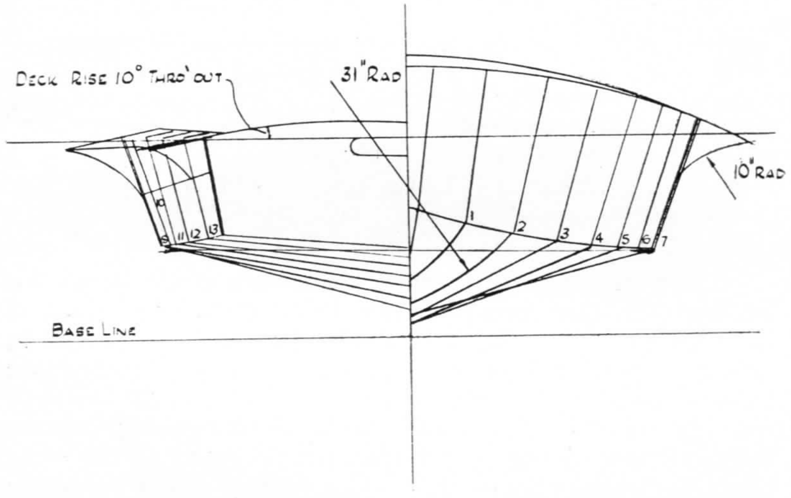


FIG. 2

more than 1 to 3. I think the best loading is 28 lbs. per square foot and the best angle of attack to lie between 2° and 5°, though this will vary with the speed and the dynamic lift obtained thereby. The usual comment of onlookers, when Daring is planing is: "Is it necessary to trim so much by the stern that some four feet of keel are showing forward? . . . Although it looks unusual, it is necessary to maintain the designed "Angle of attack" and a spirit level is built into the floor to let the helmsman trim to the best angle. This angle also decreases wetted area, which is important.

Daring's Profile. To get the maximum speed under all conditions from a given length and weight of boat, both the stem and transom had to be vertical. The only feature of the profile which had to be settled, therefore, was the keel shape and a simple streamlined shape was chosen rather like the upper surface of an aeroplane wing with its greatest depth well forward of amidships.

The Plan Shape. The first thing to be settled was the angle of entry at the bows. To do this, I cut a piece of duralumin 1 inch wide by 9 inches long and folded it up the middle to form a V. This was then placed on a knife edge under a steady flow from the tap of the kitchen sink whose velocity I had previously found to be between 16 and 20 feet per second. The entry was rather rounded with a V of 60° and the water splattered both from the tip and sides, but when the flow was reduced to about 8 feet per second, the disturbance and resistance was negligible. The next test piece was of aluminium of the same size but it was possible to get a knife edge entry on it. By trial and error, I found the most satisfactory angle which would suit the 4 foot waterline beam was 46° (or 23° on either side of the centre line). A point worthy of note in these tests was that cutting about an eight of an inch from one side caused the water flow to tilt the metal completely over to that side, although the small area taken away was not enough to upset the gravitational balance. This points to the necessity for great care in construction about the stem. It would appear that a few extra coats of paint on one side would have a marked effect at high speed. Also, tilting the test piece in the water flow so as to give the effect of a raked stem shows that the water is forced downwards by a raked stem, giving lift to the bows and, of course, a finer entry angle is obtained.

Total Weight. All Daring's principal dimensions had now been settled so it was possible to draw out a set of plans from which to work out the total weight. Using $\frac{1}{4}$ inch marine plywood for the skin and $\frac{1}{8}$ inch plywood for the deck and the other scantling figures which are given in the detailed plans, the hull weight came out at 180 lbs., which is about 45 lbs. lighter than the International 14 foot dinghy. The mast, boom, rigging, fittings and sails for 150 square feet weigh approximately 40 lbs. The rudder, centreplate and tiller weigh about 15 lbs. The crew weight allowed for was 336 lbs. making the total weight about 571 lbs., though 565 lbs. was found to be better all round on trials.

Bouyancy. In the absence of a Planimeter, Simpson's rule was

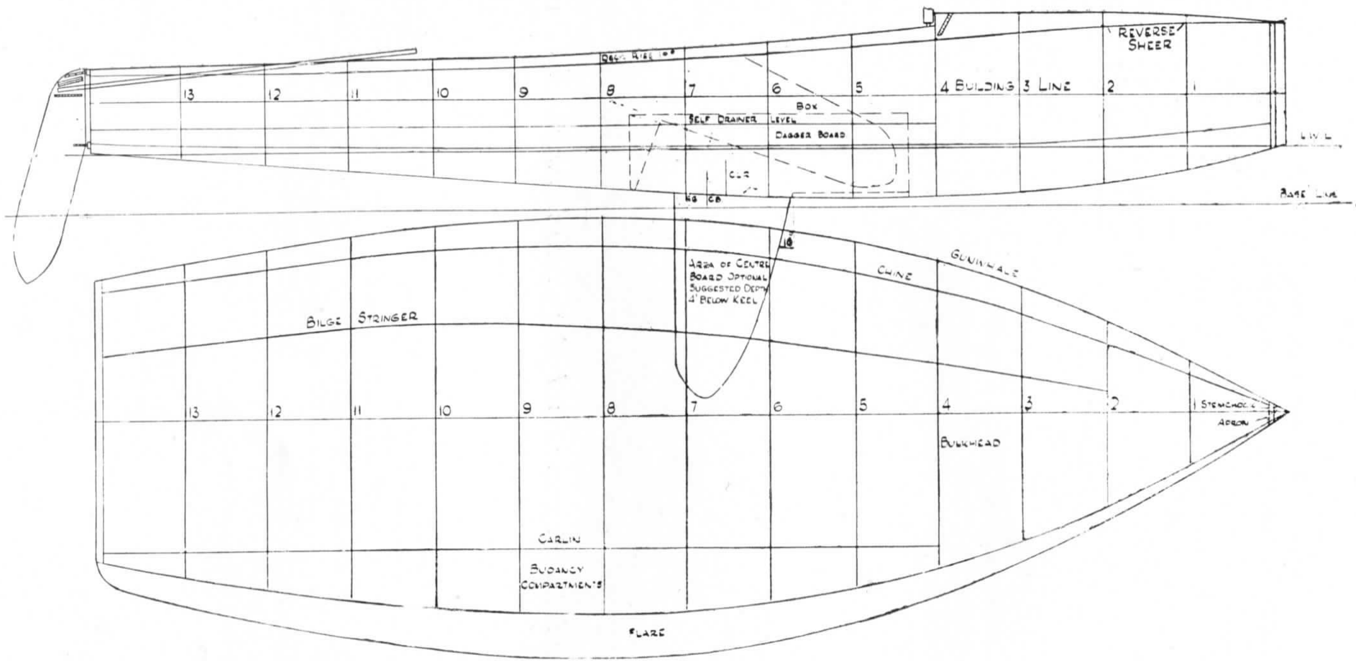

REVERSE SHEER
4 BUILDING 3 LINE
BOX
SELF DRAINER LEVEL
DAGGER BOARD
L.W.L.
BASE LINE
CLR
CB
AREA OF CENTRE BOARD OPTIONAL SUGGESTED DEPTH 4' BELOW KEEL
CHINE
GUNWHALE
BILGE STRINGER
BULKHEAD
CARLIN
BUOYANCY COMPARTMENTS
FLARE
APRON
13
12
11
10
9
8
7
6
5
4
3
2
1

FIG. 3

used to calculate the bouyancy. This rule is : Divide the base into any number of equal parts taking care that the number of the ordinates is odd, viz. 7, 9, 11 etc., as in Fig. 2.

Let V = Distance apart of the ordinates.
S = Sum of lengths of even ordinates, 2, 4, 6 etc.
E = Sum of lengths of odd ordinates 1, 3, 5 etc.
e = Sum of lengths of end ordinates C and B.

Then A, area of figure = V/3 (e + 4E + 2S).

When calculating Daring's displacement, I found it more convenient to divide the hull into feet. Because of the triangular shape of

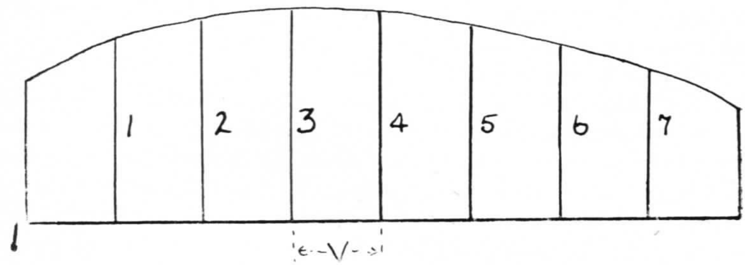


FIG. 4

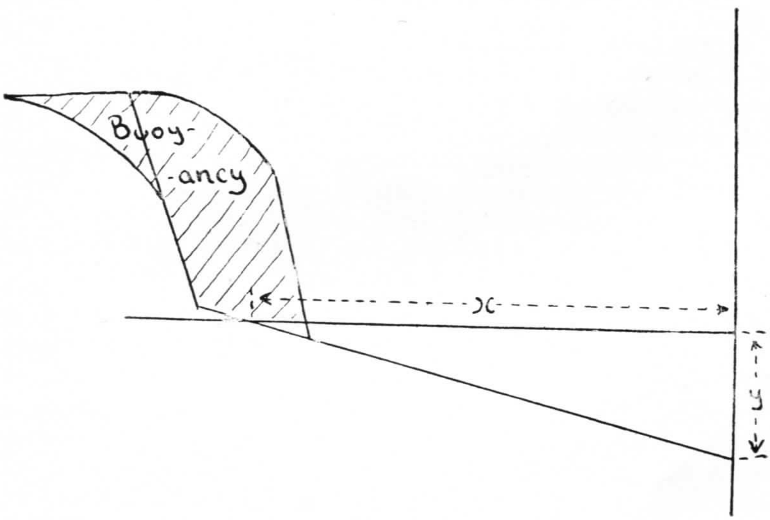


FIG. 5
Note the Disposition of Buoyancy

the underwater half section, the area of each whole underwater section was a simple product of the waterline beam, the x dimension of Fig. 3 and the depth of the section, the y dimension of Fig. 3. By Simpson's rule, these areas were added to give the displacement volume which was converted into cubic feet and multiplied by 64.2 to give the displacement in lbs. of sea water.

The displacement must equal the total weight which is more or less fixed in the case of a dinghy so the lines of Daring were altered till the two figures corresponded.

The Centre of Gravity. It is important that the weight be concentrated in the centre of a boat and the ends kept as light as possible so every effort should be made to keep the C.G. near the middle ordinate. The practical method of finding the C.G. is to suspend the hull from an overhead beam with the mast, centre board, rudder, etc. in position. If one waits to do this, however, it will be too late to make any alterations if the C.G. is too far out of position. The only way to find the position of this centre, therefore, is to calculate the moments of each item in the boat about the midship section. For example, the mast at section 4 weighs 20 lbs. and therefore, has a moment of 60 foot pounds around section 7. Similarly, each individual item can either be weighed or its cubic capacity calculated and therefore its weight found and the moment calculated. This method is well worth the trouble in the initial stages of a design.

The Centre of Bouyancy. The C.B. has to be forward of the C.G. and the distance forward will vary with the amount of sail area carried, the resultant thrust of which will depress the bow. The hull is already conveniently divided into equal parts and the areas of these parts are known. Finding the centre of bouyancy is therefore simply a case of taking the moments of the areas about the C.G. at station 7. An excess should appear in the forward sections. This excess can then be divided by the total area of all the sections and the resultant figure will give the distance of the C.B. forward of station 7.

Stability. No sailing dinghy will give of its best if allowed to heel more than 10°, so the stability of the craft depends absolutely on the weight and agility of the crew.

Flare. Five inches of flare was fitted to the gunwales to give light crews extra sitting out power and to keep the boat dry by throwing down the spray. I do not agree with some articles in which it has been stated that, if a boat with flare heels, the wind gets under the flare and helps a capsize. Between the water surface and approximately 10 feet above, the air is not flowing in layers but is tumbling and rolling so its pressure force is not very great. "Coronet," a world beater and the excellent "505" Class have proved the value of flare on fast dinghys.

Sail Area. The maximum sail area which a crew of two can "carry" in comfort is about 150 square feet with 100 square feet or less in the mainsail. Daring's main is 94 sq. ft. The foresail is 42 sq. ft. and the Genoa Jib is 56 sq. ft.

Heeling Moment. The heeling moment depends on the depth of the centre board as well as on the height of the sail plan. A high aspect ratio sail plan (3 to 1 has been proved ideal) and a high aspect ratio centre board are desirable but, in the case of the centre board, care should be taken not to go to extremes, 3′ 6″ below the keel and a root chord of 18 inches were thought to be enough.

The Centre of Effort. The C. of E. is found by finding the geometrical centres of both sails in a sail plan drawing. These two centres are joined by a line and the C. of E. is a point on this line such that the moments of each sail around it are equal. This point is projected downwards so that it can be located with repsect to the C.L.R. (Centre of Lateral Resistance). To achieve good balance the, C. of E. must be forward of the C.L.R. by a "lead" of between 5% and 10% of the L.W.L. The percentage of lead will alter with the strength of the wind and the angle of the course to the wind direction and, because of this variation, the centre board in Daring is adjustable in a fore and aft direction between station 5 and station 8.

The Centre of Lateral Resistance. To obtain this centre, the under water profile, centre board and ⅓rd rudder area were drawn to scale on a piece of duralumin, cut out and then balanced on a knife edge. The C.L.R. was found to be 6 inches aft of station 6 and 8 inches aft of the C. of E.

Designing Tools. A piece of metal large enough to accommodate ⅛th scale was used for the design. Engineer's layout was considered more accurate than the usual pencilled drawing. By use of spring dividers in conjunction with a Vernier gauge, or at least a good engineer's rule, dimensional errors should not exceed 0.020 inch so that, on the full sized craft, the error will not be greater than 0.160 inch Tables of offsets and angle projections were used. Thin strips of duralumin approximately 1 inch in width are quite suitable as battens. They can be bent to the required curve and "ducks" are not needed to hold them in place.

The Half Model. A half model is a necessity, the dimensions to be taken from preliminary drawings.

Data. Details concerning the timbers to be used (i.e. weight, fibre stress, density, grain deviation and annular rings to the inch) should be to hand as I attach great importance to the necessity of stressing each item of construction, using a safety factor of 3, taking off an ounce where possible to keep the weight down and the efficiency up.

Performance. During trials against the Hornet, 14ft. International and Swordfish, Daring proved just equal "on the wind" but planed considerably faster than all three.

Bouyancy Test. This test, in accordance with the rules, is a capsize on one side for 30 minutes followed by a capsize of the other side for 30 minutes. When finally righted, unaided "baling" should not be necessary.

A DIRECTION FINDING AERIAL

by Owen Dumpleton

A D.F. loop aerial is a simple and useful addition to any yacht's radio receiver. There are many radio-beacons around the coasts where most yachtsmen sail, usually situated in lighthouses or lightships. They operate on frequencies between 287 and 310 kilocycles per second or 1045 to 967 meters, that is, at the short end of the Long Wave band on most radio sets.

Quite useful information as to the yacht's position can be obtained in fog or poor visibility when using a very simple home made loop, although it must never be forgotten that all such devices are aids only to navigation and are to be used to supplement ordinary dead reckoning, not to supplant it.

A simple but quite effective loop can be made on a frame consisting of a wooden cross, the wire being wound into a square coil over the ends of the cross. One arm may be extended to form a pivot but the writer has used a loop suspended in the cabin skylight by a fish hook swivel. As a rough guide, a loop 12 inches square needs about 15 to 20 turns. Perfect electrical balance depends on the set and the feeder or wire connecting the loop to the aerial and earth sockets and it is worth while to try adding and removing turns to get the best sensitivity.

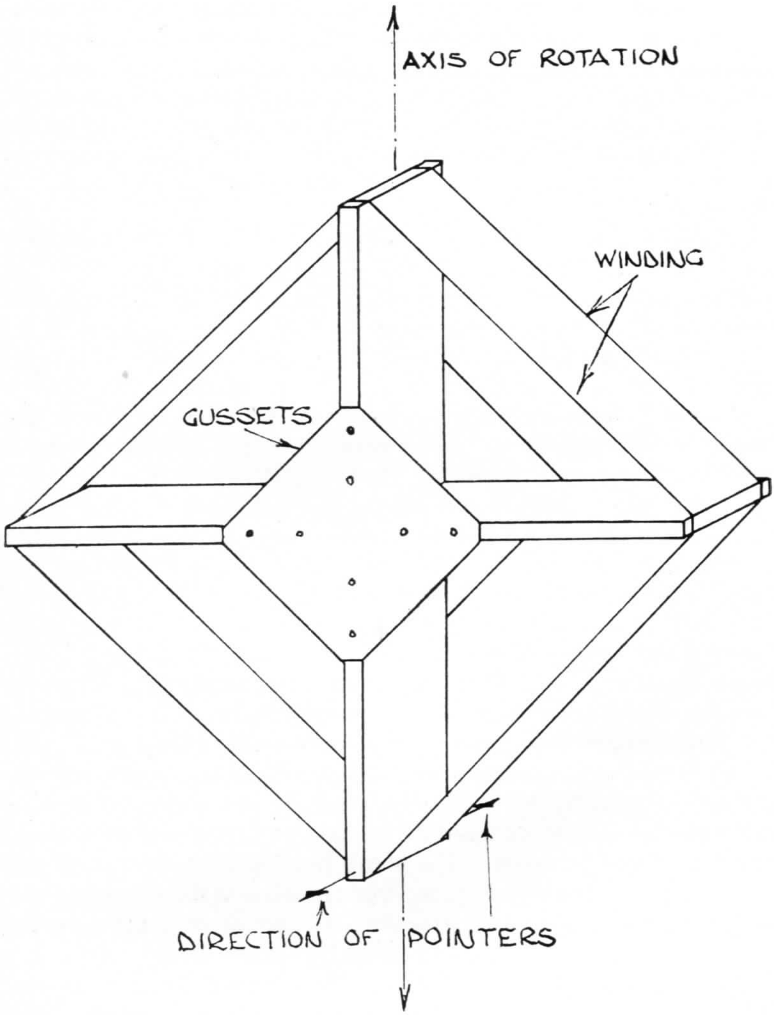


FIG. 6

The long-wave broadcasting stations may be used for this purpose. It is best to use the weakest station available for making adjustments. The matching is not very critical, however, and need deter no A.Y.R.S. member who feels inclined to experiment with the gadget. The main aerial must, of course, be disconnected when the loop is in use.

The theory of the loop is that when one side is nearer the transmitter, it gets the wave slightly before the other side so that current flows instantaneously up the near side and then down the far side and vice versa. When the loop is square on to the transmitter, however, the induced current tries to flow up both sides at once and then down both sides so, of course, it cancels out. Thus, when the loop is turned so that its axis is in a direct line with the transmitter, the signal will disappear.

Although some information can be obtained merely by looking at the loop, for serious work it is best to fit pointers and a scale. The pointers go in line with the main axis of the coil and the scale is graduated from 0° to 360° and may either be fixed with 0° in line with the ship's head or the scale may be rotated over another scale so as to agree with the compass. The latter arrangement, which is used in some commercially produced sets for yachts saves mental arithmetic but wastes time, expecially in bad weather when it is difficult to steer a good course.

Most people using a loop for the first time tend to rotate it too slowly. This is a mistake as the zero or minimum point is then more difficult to detect. The loop should be spun boldly round until the "dip" is heard (or seen on the tuning meter or magic eye), then turned back and forth over the zero point. A mean reading is then taken between the nearest points at which the signal can be heard . The loop is then rotated by 180° and the process is repeated. The reciprocal bearings should come within a degree or so of 180° apart. If they do not, the loop is probably asymmetrical and should be corrected.

The operator should practise taking readings quickly as the steady note provided by the beacon is usually of less than 30 seconds duration and in that half minute, at least two, and preferably four, bearings should be taken. The ship's heading by compass and the relative bearing (i.e. loop scale reading) are taken at the same time and added together. The sum (less 360°, if necessary) is the compass bearing of the beacon from the ship or its reciprocal.

The signal transmitted usually consists of the code letters (as shown in the nautical almanac or radio beacon chart) repeated four times, a long dash of 20 to 30 seconds, the code letters twice, then five seconds or so of silence. Often a group of up to six stations operates on the same wavelength, one in each minute of a six-minute cycle.

It is advisable to calibrate the loop by going to where you can see the lighthouse and comparing the radio bearings with visual bearings but this is not essential and if bearings are taken of three or four stations, calibration defects will usually show up the size of the "Cocked hat."

For a yacht with a lot of metal work near the aerial, it is often worth while to have the loop enclosed in a metal tube. This tube may be made to any mechanically sound design but must have an electrical break such as an insulating flanged joint. Otherwise, the induced currents will imply flow back and forth around the tube and not be picked up by the wire at all. The enclosing tube is earthed at any one point and has the effect of producing a sharper zero point, but it also makes the matching more critical.

The wire should be fairly heavy and stranded, and should be plastic or silk insulated. Rubber introduces losses, especially if worn or wet.

When the radio being used has high impedence aerial input connections, it is necessary either to use a matching transformer or greatly to increase the number of turns in the loop and use a high impedance feeder.

TRANSISTORS

by Tom Herbert.

Transistors are briefly pure germanium or silicon crystals with impurities deliberately added to change them from insulators to semi-conductors. The impurities are elements from column 3 or 5 of the periodic table of elements (germanium and silicon are from column 4). These impurities have an excess or deficit of electrons and upset the electrical stability of the crystal.

The crystals can be grown by slowly pulling a small crystal out of the molten germanium or silicon. The impurities are added to the molten germanium or silicon as the crystal is formed so that the different parts of the crystal have different electrical properites . By this means the crystal can be made to act in many ways like a thermionic valve.

A most promising development of these semi-conductors is a simple silicon junction which is very sensitive to light and has the same action as a photoelectric cell, only more sensitive. A number of these junctions connected together and exposed to sunlight produce a fair amount of electrical energy. As an example, about 2 square feet of area of these cells will produce enough power to run quite a powerful transistor radio.

The transistors at present commercially available are rather sensitive to changes in temperature but portable radios for receiving *local* stations are available. It is possible to design a set covering long and medium waves which would be suitable for coastal cruising. It would run for about 30 hours on a small H.T. battery of 22 volts. None of the transistors available are capable of amplifying the higher frequencies (over 2 megacycles) so that a short wave set will have to await the availability of improved types.

The present cost of these transistors are from 20/- upwards. The ones needed for a yacht radio are probably 2 or 3 pounds apiece. Special coils and condensors are needed for transistor circuits and these are now available. Prices of transistors and circuit components are expected to drop as demand and production techniques improve. In a year or two, I believe that transistors capable of working at the higher frequencies will be available and prices will be at a reasonable level.

A most useful booklet giving simple theory and experimental circuits which would be useful to anyone wishing to experiment is "Transistors and Crystal Diodes" by B. R. Bettridge published by Norman Price Ltd., London, price 5/-.

SOME HYDROFOIL EXPERIMENTS

by D. R. Robertson.

In the summer of 1955 an attempt was made to get the highest possible speed from a 15 foot sailing canoe. The hull, which weighed 105 lbs., had been fitted with outriggers (30 lbs. each) the previous summer but, although these gave good results, it was thought that if they could be held clear of the water with hydrofoils, an improved performance would result.

The sketches show the three hydrofoil configurations which were tested :—

A. The boat handled normally both close hauled and reaching with relatively little change of rudder balance. By bearing away in gusts of 15 to 20 m.p.h., the bow would lift about 2 feet. There was a lot of spray but not much increase of speed. With any reduction of wind speed, the bow dropped and resistance at low speeds was heavy.

B. With this type of foil, it was hoped that the lee float would be lifted clear and that the main hull would plane. At a wind speed of 15 m.p.h., the lee float did lift out and momentarily there was a very considerable increase of speed and obviously much less resistance. However, as the lee float lifted higher, the weather float touched the water and this immediately stopped the boat and it fell off the plane. This rising and falling of the float and foil could be repeated over and over.

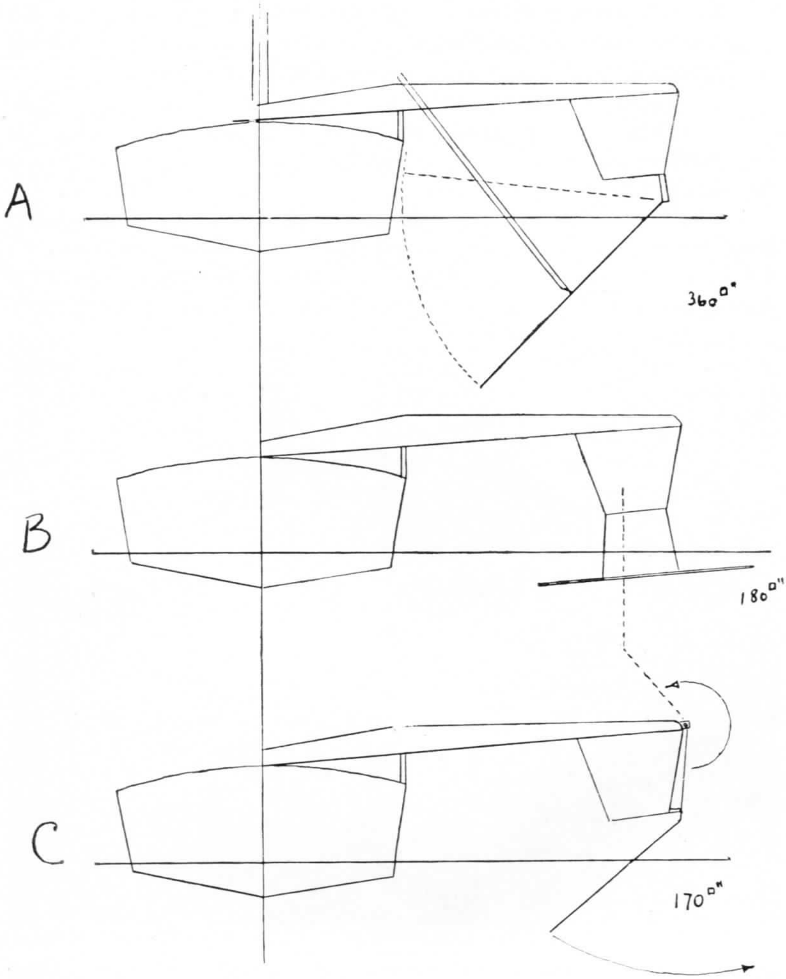


FIG. 7

C. This was the "cleanest" and the easiest to retract for launching. Unfortunately, in a heavy wind there did not seem to be any appreciable difference in speed with or without the hydrofoil in use. It was possible that either (1) the foil area was too small, (2) the angle of attack (5°) was insufficient or (3) the foil section was too crude. This was a flat plate bent to a small curve. These could have been altered if the experiments had been continued.

By this time, the writer had come to the conclusion that the experiments were not going to prove as successful as had been hoped. The practical disadvantages of foils were found to be :—

1. Vulnerable when launching.

2. Difficult to lock in position if retractable, even with the minimum of way on.

3. A "messy" looking boat.

Apart from these snags, it was realised that with a really fast boat, the wind is always ahead and the boat is sailing close hauled. Under these conditions, the foils, which were designed to reduce the water resistance by giving lift, were more of a hinderance than an asset.

It was therefore considered that more could be gained by attempting to reduce water resistance in other ways, for instance: very light weight, long thin hulls (catamaran) or possibly by getting lift instead of a downward thrust from the sails.

It is not suggested that the experiments described were in any way conclusive. In fact photographs have been printed showing hydrofoil boats clear of the water and if anyone would like to have the boat for further experiments, they are welcome to it a low price. It really is quite suitable for foil experiments as it has good lateral stability and yet is very light and strong.

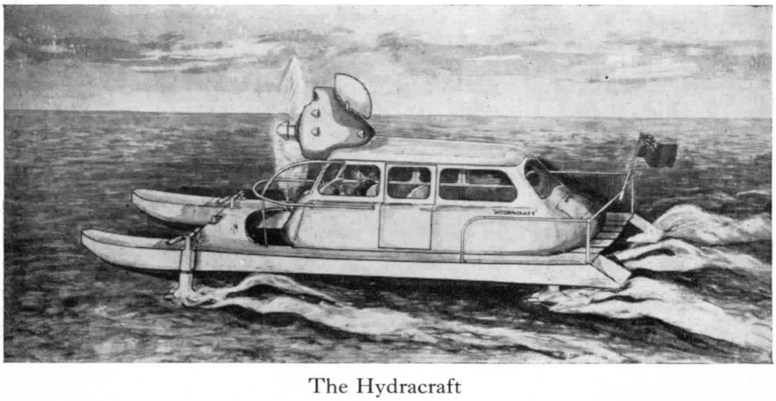
THE HYDROCRAFT

by E. J. MANNERS

Sailing I find of unequalled recreational value and, under wind power alone, I have never sailed so fast as in the latest Prout Catamaran. But, in spite of the fine achievement of these racing machines, they are still displacement vessels. If we want to sail even faster, we must break the barrier we insist on creating by ploughing through the water. We should aim to avoid breaking the surface tension by sailing on top of the water.

It is my view that yachting includes both sail and power driven craft and the A.Y.R.S. should embrace both fields. My conviction is that, for real speed, using either propellant, we need to get the main passenger carrying hull airborne whilst supporting it on small "underwater" wings, the main hull and supports being buoyant for static floatation. This article illustrates a power driven cabin yacht of the future to achieve this efficient state of speed and, apart from the economics, there is no need for this future to be too far distant.

Apart from small models, I have tried out Aquafoil experimental boats of a test pilot carrying size and can say that a dynamic lift component becomes evident at very low speeds. My illustration shows a Hydracraft form of motor cruiser capable of continual fast car speeds



The Hydracraft

without difficulty. The passengers sit in the all-round view cabin and the helmsman simply touches the self-starter button and steers.

The boat is shown riding on two fore wing surfaces with the main wing aft. The biscaph and tricameral hulls, set at a slight dehedral, could be several feet out of the water at speed. Rams may be noted for draught and incidence adjustment. Years ago, before jet propulsion was fitted to a speedboat, I carried out some jet experiments and came to the conclusion that it is the best propellant for record speeds. But for the cruising boat shown I prefer the airscrew engine with silenced exhaust. At anchor, the top of the coach roof may be raised for headroom, with plastic surrounds and blinds, providing all the facilities of the cabin cruiser.

This design may be modified for use as a sailing boat though I have other designs for wind driven aquafoils. Rather than a few isolated experiments relying on fickle wind power alone, I should personally like to see a concerted effort to produce an efficient power driven aquafoil, before modifying it to sail. I feel such fast pwer craft would be invaluable to the Navy and that unbelievably exciting sport lies ahead for the pioneers interested.

A SPEEDOMETER

by MAJOR-GENERAL PARHAM, C.B., D.S.O.

I have a very satisfactory speedometer, made mostly from scraps which is shoved down the dagger board case just ahead of the dagger plate and has its orifice some 12 inches below the L.W.L. The internal

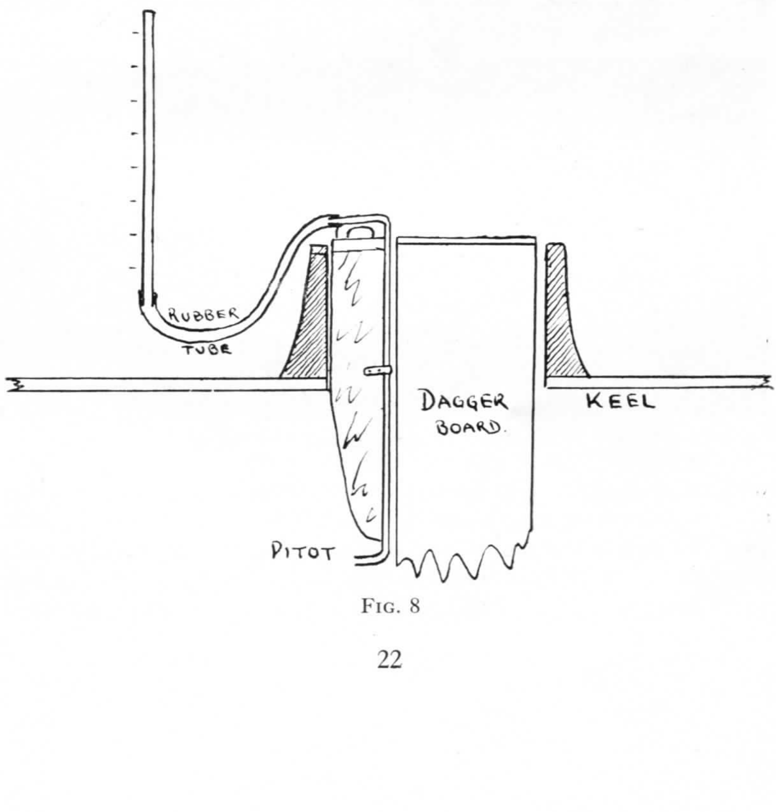


FIG. 8

diameter of the pilot tube is $\frac{3}{8}$ inch. It is connected by a length of rubber gas pipe to a double length of steam boiler water gauge glass tubing, set vertically in the boat.

This speedometer is sensitive and steady in reasonably smooth water. It reads from 4 to 9 m.p.h. and on a taller hull (or a catamaran) could read higher speeds because one could have longer lengths of glass tube. Professor Locke of Wayne University, Detroit, very kindly had a similar pitot rig calibrated for me and these are the figures for the height of the column of water above the L.W.L.

4	m.p.h.	5.5	inches
5	,,	9.0	,,
6	,,	13.0	,,
7	,,	17.0	,,
8	,,	21.5	,,
9	,,	26.0	,,

A VARIABLE FLOW BOOM

by Derek W. Norfolk

The sketch shows the boom arrangement. I propose to use it on my canoe dinghy with a new sail to be cut with a flat flow. The first boom of this kind which I made for my other boat, I found to be very

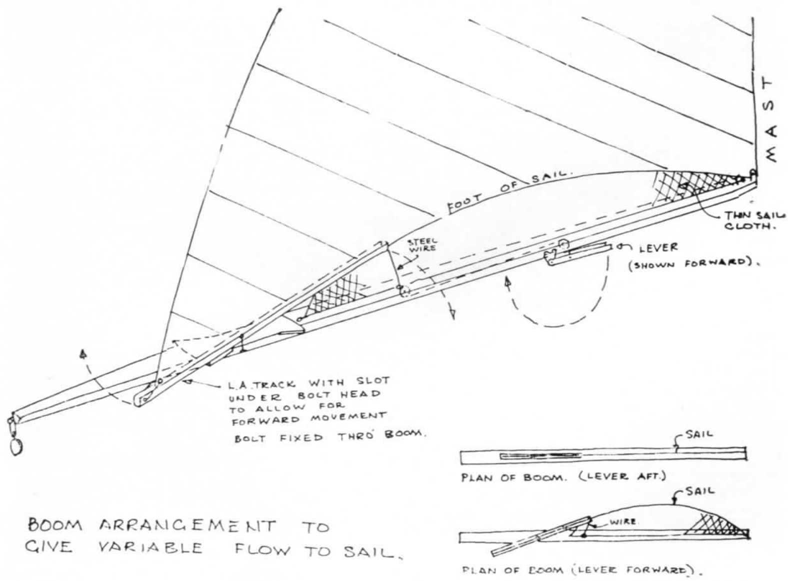


Fig. 9

useful in light winds and with beam winds but I did not give enough track movement. The new one will have a maximum track angle of about 16° and I hope to make it lighter than the other.

With this arrangement of boom, it is hoped to avoid the drawbacks of the loose footed sail and at the same time maintain the advantage of being able to control the amount of curvature. When the lever is released, the track moves forward and turns in line with the natural curve of the sail. The amount of curvature is best controlled by limiting the length of the slot by an adjustable stop.

The thin cross cut material between the sail foot and the boom is to prevent the air on the windward side of the sail from escaping too easily around to the leeward side.

Weight is the main trouble with most schemes of this kind, but, by using $\frac{1}{8}$ inch plywood and light alloy metal parts, it is hoped that the increase in weight of the boom will not be more than 25%.

LETTERS

I capsized my catamaran, "Hawaiian Princes" 40 feet long by 15 feet beam and draught 30 inches last Easter Sunday. This craft is not to be confused with "Hawaiian Queen," a 55 foot "Cat" also built by Creger for DON "The Beachcomber" in Honolulu.

There was a local storm with gusts perhaps of 30-40 m.p.h. The jib and main were both sheeted in close and over she went. Fortunately, she floated on her side.

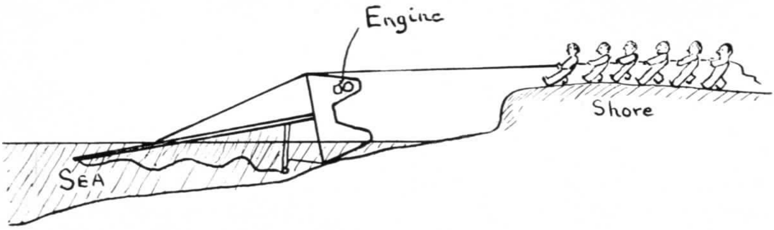


FIG. 10

She was pulled in to the beach, the 52 foot mast was dropped off by unscrewing the turnbuckles and she was pulled back on her feet by six men on a line ashore from the upper hull, as shown in the sketch.

There was practically no damage and she is sailing again now.

Guildford E. Dean,

2660 Canon Street, San Diego, 6, California, U.S.A.

I have a rudder problem I hope the A.Y.R.S. can advise me on. Our 14 foot sailing dinghy (Rhodes Bantam design) had her rudder smashed while sailing last fall and the replacement vibrates except at low or high speeds. The new rudder is made from one piece of wood and is a full 1 inch thick. The original rudder was made up of two pieces and was a little thinner. Can any A.Y.R.S. member advise me as to the cause of this condition and give me a foil shape (cross section) I should change to? This boat planes in winds of about 20 m.p.h. and the vibration must slow the boat as well as being unpleasant.

Norman G. Brendel,

65, Massapequa Avenue, Massapequa, New York.

Sir,

I am a "Cat" enthusiast and own a self-designed and built 24 footer. She is very fast off the wind like most "Cats' and I have won numerous trophies in the open class competitions but, as she is comparatively under-rigged and heavily canvassed (8 oz.), she has to have a 15 to 20 mile an hour breeze to win around a triangular course.

There is considerable interest in "Cats" in the Miami area and there is one here, sail driven, which takes out day sailing parties. It is 72 foot long, 24 feet beam and carries 80 people without crowding.

CHARLES R. LYNCH,

97, S. Poinciana Building, Miami Springs, Florida, U.S.A.

Sir,

I have conducted some model experiments and have succeeded in producing a model catamaran which becomes foil borne on combined angled and ladder foils. Now, I have been considering making a sailing boat of the type made by Sam Catt and yourself (described in HYDROFOILS). However, I feel that a more natural control system for the foils could be arranged on the lines of the attached sketch. This system is that used for elevons in many aircraft and would give lift and roll control with instinctive motions analagous to flying an aircraft.

I have in mind a craft using one drop tank as hull with a single man crew sitting inside it. There would be the control column as I have just described it for the foils; the rudder would be controlled by a foot bar, leaving one hand free to manage sheets. Can anyone in

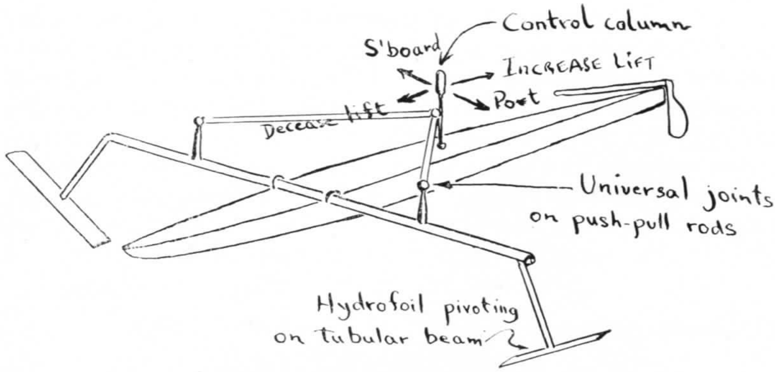


FIG. 11

the A.Y.R.S. give me any experience in respect to the sail area which might be carried by such craft, if it would be feasible to sail it at all?

If I can be of any use to club members on problems relating to aerodynamics (even foils in water to my mind come in this category), I will be glad to cast in my oar on their behalf.

ALAN V. COLES,

227, Gloucester Road, Bishopston, Bristol, 7.

Sir,

You may be interested in the proposed hull construction of a new trimaran I am making. The hull is framed up with very light timbers and ribbands in the normal manner, but instead of using plywood for the covering, I am laying a thickness of 10 oz. canvas over the hull skeleton and saturating it with one of the standard fibreglassing resins. Then I will follow it with a standard fibreglass coat. As a result of a sample section, the weight should only be ½ to ¾ that of equal strength plywood with the added advantage of having its colour in it and needing no caulking or other sealing. I used the fibreglass on a lateen rigged sailing surf board I made two years ago and was so pleased at the way it stood up under punishment on beaching that I had to work out a way to incorporate it in the next boat.

JOHN WESNAY WARD,

7635, Herschel Avenue, La Jolla, California.

Sir,

I would be glad of comments on the accompanying sail plan. The mast might be a problem and also the sail weight.

PAUL RICHARDS.

2, Chorcliffe House, Chorley, Lancashire.

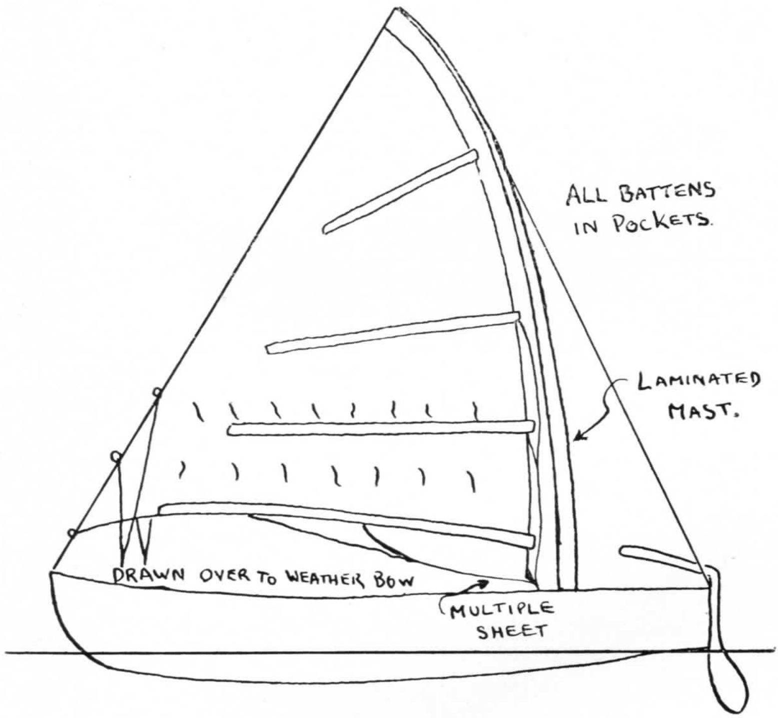


FIG. 12

Sir,

I would like to say how very good and thought provoking I found the last A.Y.R.S. publication on OUTRIGGED CRAFT.

May I make a suggestion regarding the Micronesian type? The originals were, I think, designed for inter-island passages in a region of Trade Winds. The "going about" problem was therefore non-existent. This does *not* apply in the crowded estuaries of England.

I suggest that to obviate this and to make possible the use of existing moulded Catamaran hulls (which are not similar both ends), one should try one of these hulls stabilised by *one* shorter hull. It should be possible to sail quite well with the smaller hull to leeward and yet have the brilliant performance promised by the Micronesian craft when it is to windward.

MAJ-GEN. H. J. PARHAM.

Hyntle Place, Hintlesham.

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