OUTRIGGERS 1963

A.Y.R.S. PUBLICATION No. 47

The PROUT PROA

CONTENTS

PRICE $1.00 *PRICE 5/-*

THE AMATEUR YACHT RESEARCH SOCIETY

(Founded June 1955)

Presidents:

British:
Lord Brabazon of Tara, G.B.E., M.C., P.C.

American:

New Zealand:
R. L. Stewart.

Vice-Presidents:

British:
R. Gresham-Cooke, C.B.E., M.P.
Austin Farrar, M.I.N.A.

American:
Great Lakes: William R. Mehaffey.
California: Joseph L. Szakacs.
Florida: Robert L. Clarke.

British Committee:

Rogor S. Waddington, *Chairman.*

Lloyd Lamble (*Vice-Chairman*), F. Benyon-Tinker, S. D. Banham, Geo. R. Dibb, Norman Davies, Owen Dumpleton, Michael Henderson, P. Henneker-Heaton, Tom Herbert, John Hogg, A. J. Millard, Pat Morwood.

Secretary-Treasurers:

British:
Woodacres,
Hythe,
Kent.

American:
John Hughes,
50 Moulton Street,
Cambridge, Mass.

French:
Pierre Gutelle
26 Rue Chaudron,
Paris, Xe.

New Zealand:
T. L. Lane,
32 Michaels Ave.,
Auckland, S.E.6.

South African:
Brian Lello,
S.A. Yachting,
58 Burg Street,
Cape Town.

Australian:
Ray Dooris,
43 Clarence Street,
MacQuarie Fields,
Sydney, N.S.W.

A.Y.R.S. Artist:
N. A. Pearce,
14 St. Peters Court,
Beaumont,
Jersey, C.I.

Editor and Publisher:
John Morwood,
Woodacres,
Hythe,
Kent.

EDITORIAL

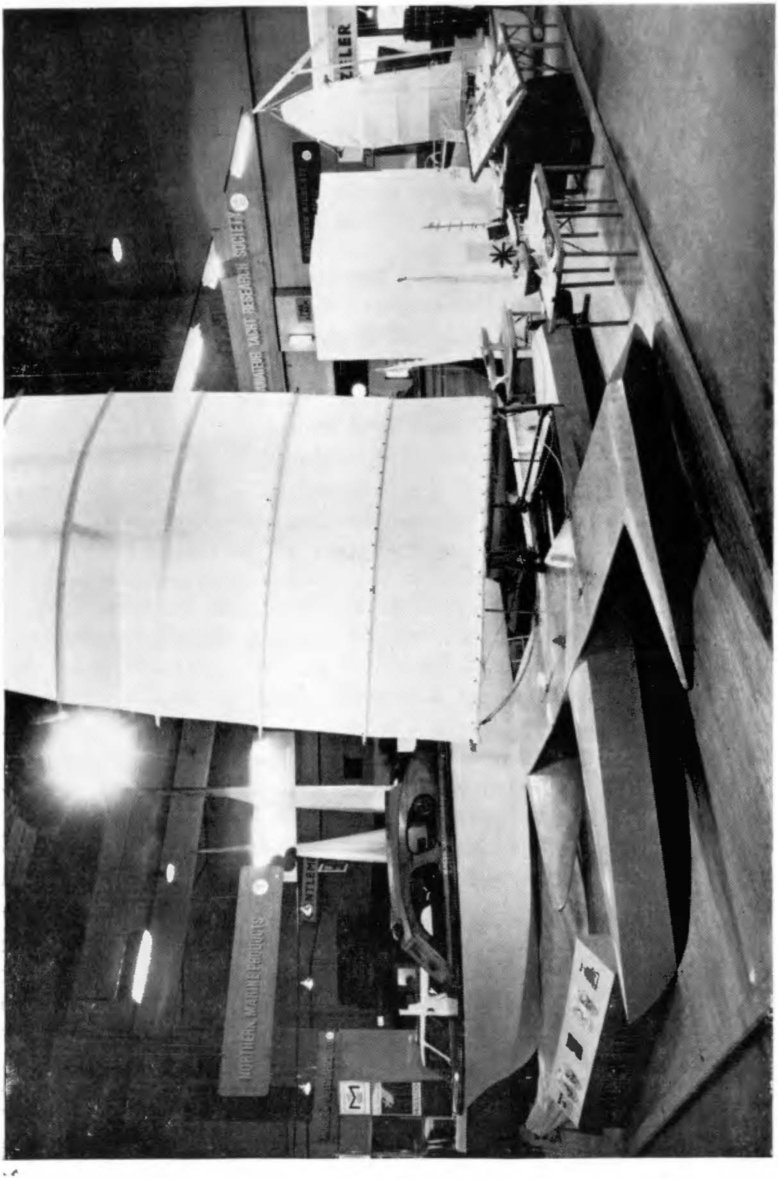
April, 1964

The New Constitution. On the 4th January of this year, the A.Y.R.S. was duly dissolved and the Amateur Yacht Research Society Limited has now taken its place. As far as the publications are concerned, it is not anticipated that there will be any noticeable change but the stage will be set for many other A.Y.R.S. activities which we hope will enhance the value of the Society. However, we hope that the basic value of the A.Y.R.S. in so far as it combines the activities of the theoretician, the inventor (screwball or otherwise), and the practical boatbuilding craftsman (amateur or professional) will be maintained. Throughout our short history, the inventor and the theoretician have been feeding ideas to the practical man who has put them into boats and this process has only just begun to produce its results. In the next ten years, we will see hydrofoil boats and really efficient sails on the water and we may also find other of our ideas being used such as the free-flying kite. It will all be very exciting.

The re-organization of the Constitution of the A.Y.R.S. may not at first sight appear to be a matter of any difficulty but the negotiations which have been necessary to get all the details settled have been pretty extensive. All of this work has been most excellently done by Rogor Waddington, our Chairman, who has been dealing with the matter for 2 years, firstly by studying the organisation and then by getting all the legal formalities correct. Our thanks are due to him for taking on and so successfully carrying out this work.

The Committee Resolution. It was resolved at the Committee Meeting on 23rd February, 1964 that all members of the Amateur Yacht Research Society now dissolved who have paid their fees for the current year of that Society be admitted as members of this Society without payment of further membership fees for the current year and that the Secretary notifies members accordingly. Members are accordingly notified hereby.

A.Y.R.S. Publications. At the time of going to Press all A.Y.R.S. publications are in print, except for Nos. 21, 22, 23, 27, 28 and 29, but Members must realise that back publications run out and have to be reprinted, so that the list of out of print copies is continually varying.


AMATEUR YACHT RESEARCH SOCIETY
NORTHERN MARINE PRODUCTS

THE LONDON BOAT SHOW, 1964

The Boat Show was as usual a great success for the A.Y.R.S. The number of people there was less than other years but we signed on only slightly fewer new members and had a chance to meet all our old friends.

Our exhibits were far more the results of our work than in previous years, George Dibb's trimaran with semi-elliptical squaresail causing more odd expressions on people's faces than anything I have ever seen before. The construction and finish of the craft were both superb and the handiness of the squaresail very evident. The "Floils" will be described in detail later but it can even be seen in the photograph that the squaresail sits better than any sail we have ever seen in our lives. I cannot believe that it can be anything but outstanding.

Paul Ashford's wingsail can be seen in the right of the photograph. This changes tack easily and simply and again was characterised by most excellent workmanship. The mast and gallows at the fore edge of the sail might interfere with its working in practice but the sail itself is very astute indeed.

Ruth Evans model of *Rysa* was made to her usual supreme standard and showed the working of the hydrofoil systems to perfection. As is usual with our unusual exhibits, the general public on the whole had not the elasticity of mind to comprehend the value of the model and I suspect that we will have to wait for a few years till it is tried out at full scale.

Once again, the models of *Pelorus Jack* and the Micronesian Hydrofoil craft were shown with the same dumb incomprehension as last year, even from many of our own members. This merely once more confirms the value of the A.Y.R.S. where original ideas can be kept alive till they become understood.

The two trimaran models by Owen Dumpleton and G. F. H. Singleton, on the other hand, were easily understood and attracted great interest. The full scale *Nimble*, designed by Arthur Piver was on *Cox Marine's* stand downstairs so people felt that the principle worked. Sales were brisk of the Piver trimarans and many will be seen in British sailing waters this year. The Prout 27 foot catamaran built of fibreglass to a high standard also sold well as did the Bill O'Brien catamarans.

Once again, we have to thank the many kind people who helped to man the stand and make the Boat Show such a success for us.

OUTRIGGERS 1963

With the startling exception of George Dibb's trimaran, little progress was made in trimarans last year. The Piver range of craft are only being modified as to accommodation plans but are being built in large numbers all over the world and appear to be giving their owners every satisfaction. Major Chaworth Musters sailed over the Fastnet course with the ocean racers in his *Nimble Plus* but did not do so very well as regards speed in comparison with the conventional boats. According to Arthur Piver, the Pacific is being criss-crossed with his boats in all areas and we wish them well in all their exploits.

Dick Newick has once again made a trimaran using his own float design which is different to the Piver float in having greater initial stability. The only possible objection to this is the possibly greater sea motion but, if these floats are suitable for the West Indies where Dick lives, they are suitable for anywhere and, of course, they should be a little faster than the Piver floats.

The Dibb "Floils." As compared with the Piver floats and those of Dick Newick, George Dibb's "Floils" may constitute a complete "breakthrough" in trimaran design. These "Floils" take their origin from the traditional floats of Madagascar and Dar es Salaam and were first modernised by Erick Manners in his *Trifoil* design shown in A.Y.R.S. No. 36 *Floats, Foils and Fluid Flows.* The principle here is that dynamic lift is achieved from the under side of a toed-in float with dihedral but of low aspect ratio. I cannot believe that any worth while lift is achieved from negative pressure on the upper surface. What George Dibb has done is to increase the aspect ratio to reduce wetted surface and increase the dynamic lift. The result is a buoyant shape capable of dynamic lift which has not yet been driven under the surface, though the lift from floatation is only 250 lbs.

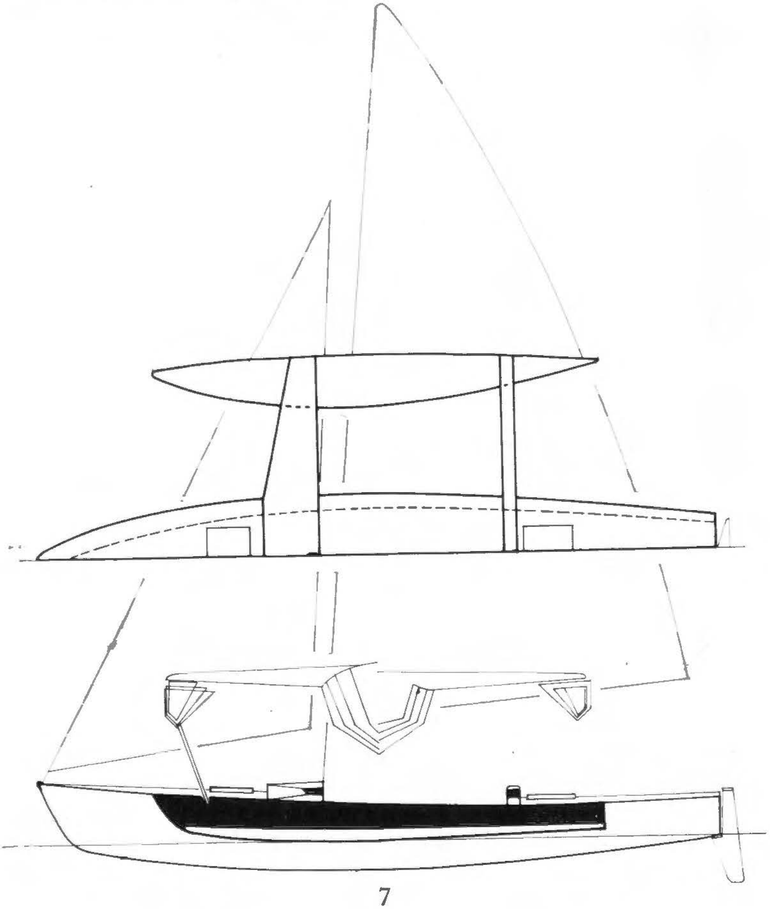
The Construction. Each "Floil" consists of a sheet of plywood set at 45° of dihedral and 3° of toe-in, the first angle being decided upon with Martin Ryle's *Avocet* in mind. On the inner surface of each plywood sheet polystyrene foam is built on, giving thickness and buoyancy. The polystyrene was then shaped by eye to a fair streamlined shape with a sharp entrance and covered with glass cloth and epoxy resin. Each "Floil" only weighs some 25 lbs. George has kindly let the A.Y.R.S. sail his boat this winter at Weir Wood reservoir and we hope to get the feel not only of his "Floils" but also of his ingenious squaresail.

Wind Tunnel Tests of a Semi-Elliptical Squaresail. Paul Spens, now of Southampton University, was much taken by George Dibb's squaresail at the Boat Show. George is now going to make a model suitable for the Southampton wind tunnel and Paul will run it through to compare it with the Dragon sails which have been fairly fully investigated. These tests, which will be done with various amounts of flow in the sail should be very interesting indeed.

24 FOOT NEWICK TRIMARAN

L.O.A. 24 ft. 0 in.	Ama (float) L.O.A. 18 ft. 0 in.
Beam 14 ft. 0 in.	Ama buoyancy 1,100 lbs.
Draught 1ft 0 in.	Beam main hull on W.L. 3 ft. 3 in.
Draught foils 3 ft. 0 in.	Sail Area 275 sq. ft.
Displacement 1,400 lbs.	Weight 1,000 lbs.

Designer, builder and owner: Dick Newick, Box 159, Christiansted, St. Croix U.S. Virgin Islands.

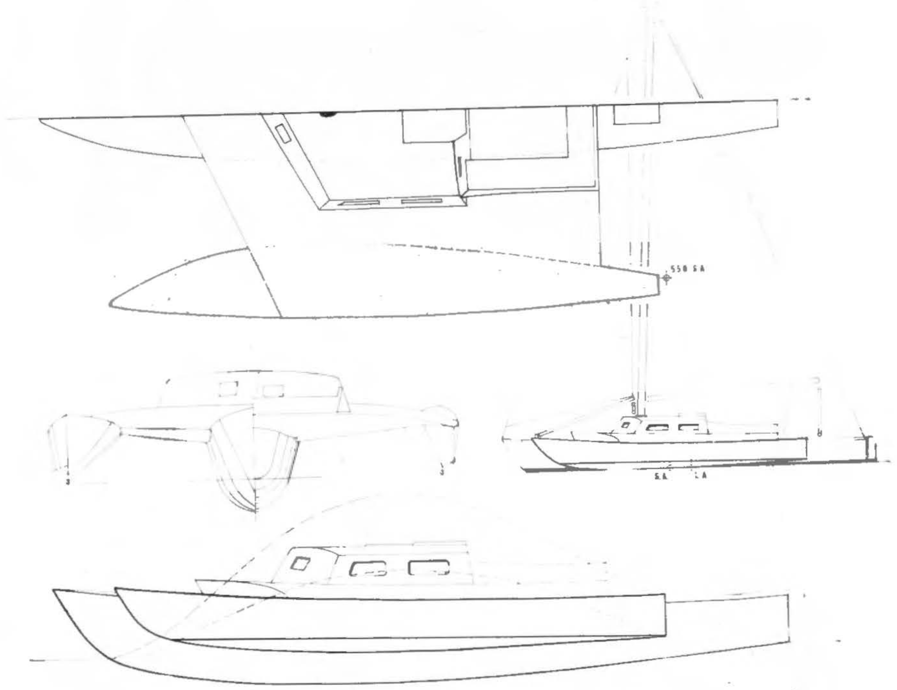


Newick 24 *footer.*

The drawing and photo show my new 24 foot trimaran. She has not yet been thoroughly tested under all conditions, but she usually beats our 32 footer *Trine* except in heavy going to windward. Twenty knots has already been reached and should be considerably exceeded in short bursts.

If speed were the only consideration, she would have had more overall beam and a less beamy centre hull. This boat was designed to carry up to five people but certainly three is a good number.

Correspondence with the A.Y.R.S., Maclear and Harris, Erick Manners, William Prior and Martin Ryle was helpful in developing this design. The Amas (floats) are similar to Manners' which seem



36 foot Newick trimaran

fine for a larger craft but I would like to try a shorter and higher ama in such a small boat where crew weight could keep them clear of the water until the hydrofoil takes hold.

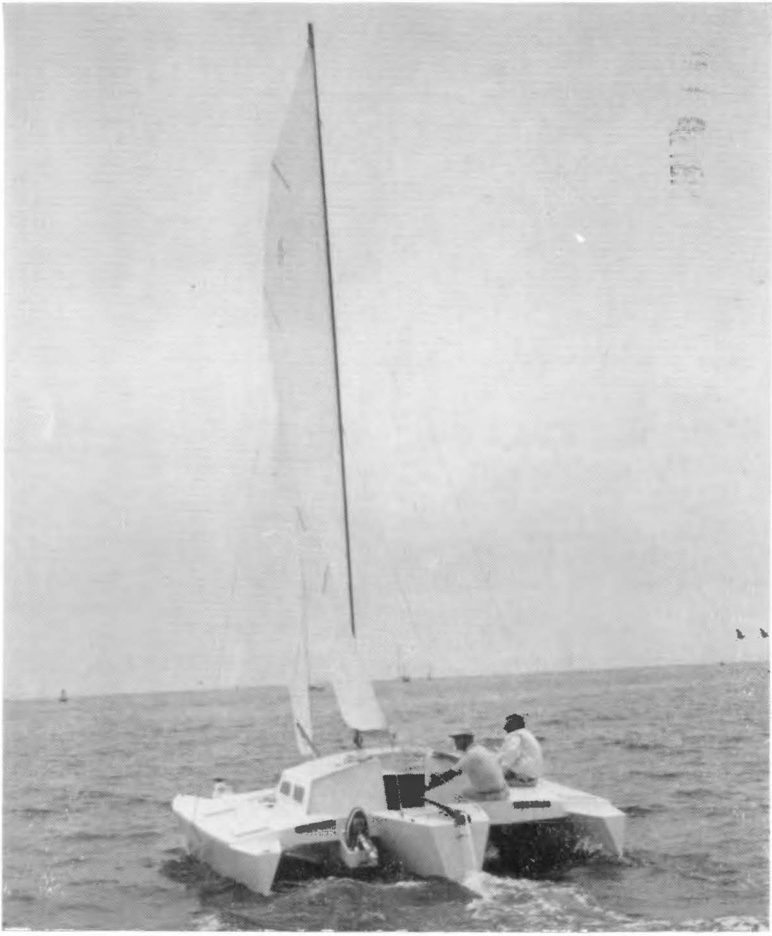
The foils are immersed 36 in., 1 1/16 inch thick and 11½ inches wide. They have 3° of toe-in and 27° of slope from the vertical which seems to work well. However, different angles might be better. A 36 inch long foil is needed at low speeds but several made of oak and fibre-glassed Douglas fir have broken so I will now go to metal construction.

The plan of a 36 foot trimaran show a boat which is being built in Christiansted. She is based on *Trine* with seagoing speed the primary consideration.

24 FOOT CROSS TRIMARAN

L.O.A. 24 ft. 0 in. Sail Area 240 sq. ft. Beam 14 ft. 0 in.
Designer & Owner: Norman Cross, 4326 Ashton, San Diego, California.
Builders: Norman Cross and Frank Peragninini.

This trimaran was designed and built in some 3 months. The

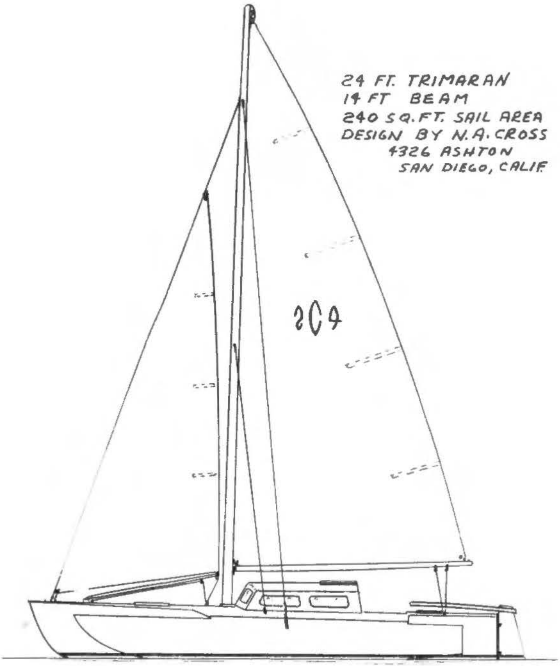


24 *foot Cross trimaran.*

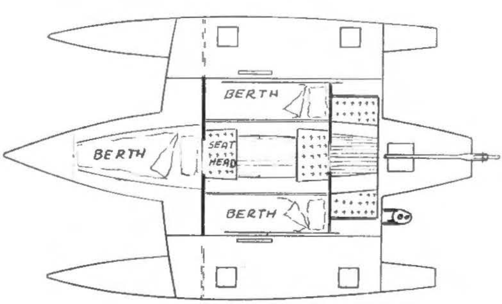
main difference from Piver's *Nugget* lies in the underwater section with its underwater chines placed on a semicircle whose diameter is the waterline beam. This gives 9% less wetted surface than the right angled V but requires slightly larger boards.

Accommodation. There are berths for three people, one forward and two in the main cabin which has $4\frac{1}{2}$ feet of headroom.

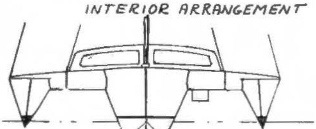
Construction. The hulls are $\frac{1}{4}$ inch plywood with 3/8th inch thickness on the deck, all external surfaces being fibreglassed, with two coats below the waterline. The mast is 30 feet long, of fir. At

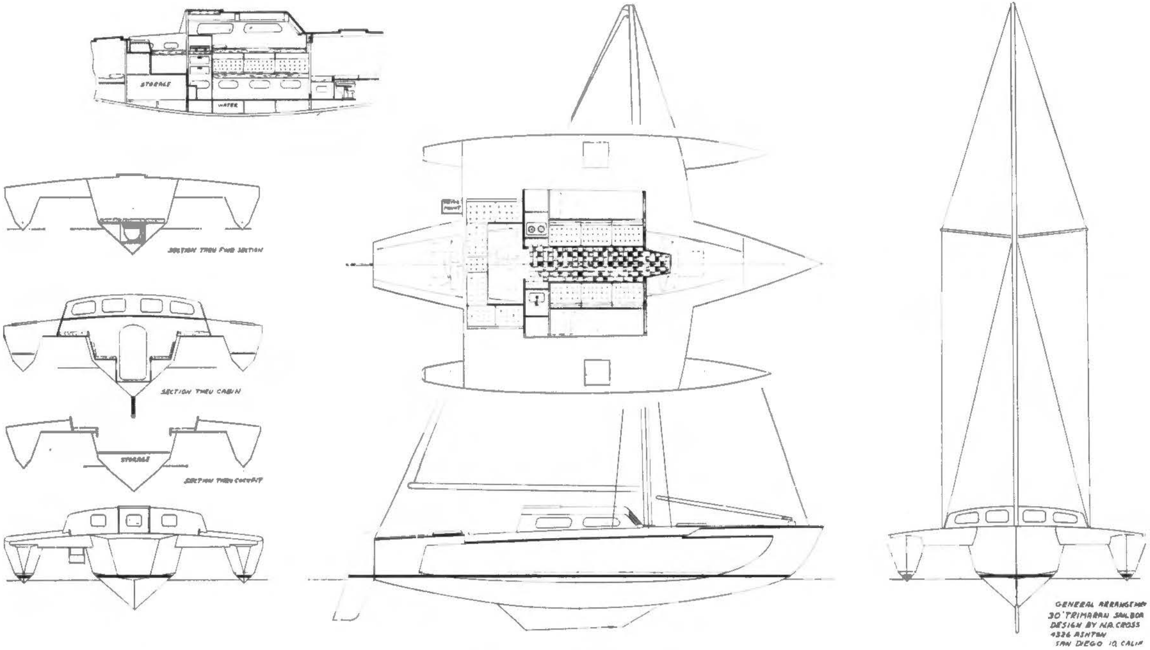


SIDE PROFILE



INTERIOR ARRANGEMENT





Cross 30 foot trimaran.

present, two dagger boards are used with boxes in the wings between the main hull and the floats. However, the boat is sailed in an area where there is a lot of kelp which the boards catch and Norman intends to try a fin keel to see if this will be generally easier.

Sailing Tests. Coming about is easy and she is responsive to the helm. A great many people have sailed in her and have been very impressed. She has averaged 6 knots in a trip up the coast and has done 12 m.p.h. on the speedometer. She has been sailed every weekend and during Norman's vacation since she was launched and he has never felt that he should shorten sail. The underwater section seems to work well.

The fin keel of about 8 square feet has now been added and the boat sails better and she points with the best. The speedometer is reading slow as checked over a mile course. The estimated best speed is 15 knots.

Norman has also designed 30 foot and 36 foot trimarans. The 36 footer is now being built.

MORILD

L.O.A. 23 ft. 0 in.	Floats L.O.A. 18 ft. 0 in.
L.W.L. 21 ft. 6 in.	Floats L.W.L. 12 ft. 0 in.
Beam O.A. 13 ft. 0 in.	Displacement 1,200 lbs.
Beam centre hull 7 ft. 0 in.	Sail area 240 sq. ft.
Beam centre hull W.L. 3 ft. 0 in.	Weight engine and jet 160 lbs.

Designer: Bob Harrelson, P.O. Box 2293, Corpus Christi, Texas.
Owner: Helge Ingeberg, Eiksveien 52, Oslo, 7, Norway.

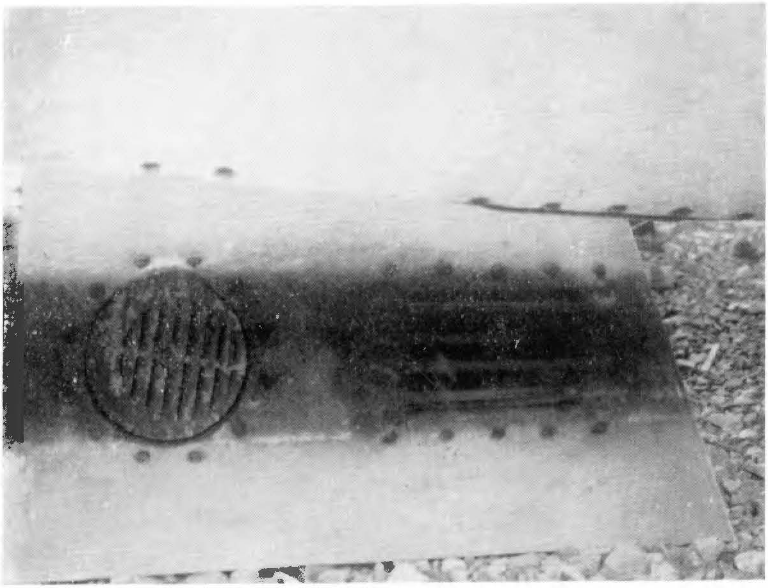
Members will remember the *Trident* design of Bob Harrelson in publication No. 43, *Trimarans* 1963, with a right angled V centre hull being carried up to the accommodation. This design seems at first sight to be the logical one for trimarans but there have been several complaints about its performance. The first of these is a tendency to drag up excessive waves and the second is a tendency to bang in a seaway as described by A. F. Madlener in A.Y.R.S. No. 44. Arthur Piver tried this type but discarded it. The present description is of such a trimaran which is giving her owner a lot of satisfaction. She was, however, only launched last year and we hope to have a more mature assessment later, when instruments have been installed.

Morild is more or less the same design as *Trident* but the floats are deeper and have a much sharper V than in the previous design. The cabin stretches from side to side of the overall beam, thus giving a great deal of room inside which is useful with a small family.

Morild

Sea Behaviour. The sails were delivered on June 22nd and *Morild* was sailed often throughout the rest of the summer in winds of all strengths. In two long letters from Mr. Ingeberg, there have been no complaints of banging on the floats or wings by seas, though this point was not specifically looked for.

The Engine. The surest way to kill the speed of a multihull is to put in a large, heavy engine and drag a propellor behind one. This



Morild's Jet unit from below.

can generally be guaranteed to transform a lively responsive craft into a wallowing pig. Mr. Ingeberg has dealt with this problem by using a 3 B.H.P. Yanmar fresh water cooled diesel coupled by Vee-belt drive to a 6 in. Gill *underwater* jet unit which can be turned 360°. Total weight is 160 lbs. The photograph shows the parts underwater which only consist of the water intake through a grid. The sailing resistance of this is very small in comparison with a propellor (and its struts) even if of the feathering type. A 3 hour run showed a speed of 4.7 knots with the jet unit absorbing 2.1 h.p. 5.5 knots are expected at 3 B.H.P. which is the continuous rating of the engine.

Pub. 74 p. 115-116

Trim—foils retracted.

TRIM

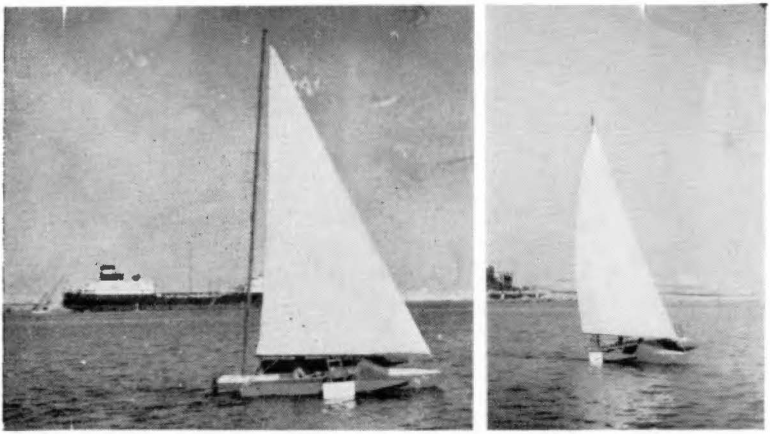
L.O.A. 16 ft. 0 in.
L.W.L. 15 ft. 9 in.
B.O.A. 11 ft. 0 in.
B. Main Hull 2 ft.
Draft Main Hull 8 in.

Floats
L.O.A. 11 ft. 0 in.
Beam 13 in.
Cross-section Square 9 in x 9 in.
Sail Area 150 sq. ft.

Owner and Builder: Albert J. Felice, 91 Sanctuory Road, Zabbar, Malta, G.C.

In 1960 I read about and joined the A.Y.R.S., the idea being to improve my three year old hard chined Catamaran. In the back number Catamaran Developments I read about Lord Brabazon's clean entry genoa, instead of a main end jib. I also fell in love with Parang, the Morwood hydrofoil trimaran, but I preferred a rounded bottom and longer floats. The finished plans looked like a Morwood-Brabazon with Felice flavour. TRIM is my third multi-Hull and my first really successful one, thanks to the A.Y.R.S.

I chose the mast-aft rig for its efficiency and for its cheapness. It is little different from the Mediterranean Lateen and I had it made for only seventeen pounds including the cost of the cotton.



Trim foil vertical.

The Hull is 2 ft. wide, with almost semicircular bottom, 7½ in. deep. It is so made that the five millimetre plywood can be bent easily.

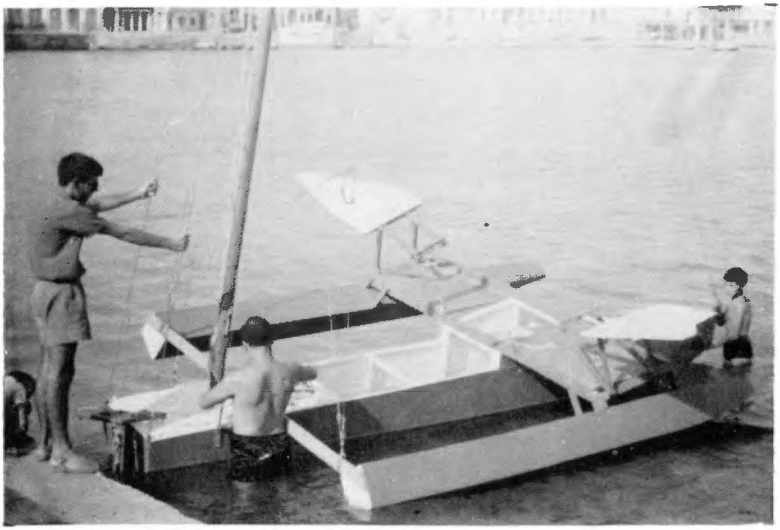
The floats are box shaped as in Parang, but have asymmetric prows which give some dynamic lift when tilted. They are designed to be clear of the water when horizontal.

The wing is two feet wide, but the foil cross beam is 8 inches above the level of the deck and the hind one is 4 inches. To make comfortable seating for the crew, a plywood sheet is stretched along the bottom of the first cross beam to the top of the second. This necessitated a sloping cockpit hatch which lessens wind resistance and gives a dry ride. Also because of the mast's position, another cross beam had to be attached at the back to strengthen the floats and attach stays.

The rudder is a normal lifting one but with a T-shaped tiller. To this are attached two ropes leading to wooden loops worn in the helmsman's feet and leaving the hands free.

The hydrofoils resemble Parang's but they are more swept back and are attached by double brackets. These hydrofoils work well in strong winds but in lighter ones they make a lot of lee-way. It may be that when the craft is tilted the angle of attack is increased.

The 26 ft. mast is of solid spruce, made from splicing two ex-navy masts. It works well, but an aluminium one would be much lighter but prohibitively expensive.



Trim.

The boom is along the back of the sail and so gives a good clean flow with almost no boom eddy. When other craft have to back the jib, all I have to do is to push the boom forward to one side and the craft promptly turns the other way. The flow of the sail can be adjusted simply by trimming the sheets. When before the wind, however, a wisker-pole has to be used. Sometimes I wonder if a highly roached main sail may not be better, because of the larger sail area possible.

The craft is fast and dry, much faster than the dingies. However I never reached the fantastic speeds which are claimed for a Shearwater probably due to the smaller sail area and more wind resistance.

Allycat

ALLYCAT

BY BILL WAUGH

29 Glenaldon Road, Streatham, London, S.W.16.

Allycat, built in a first floor flat in Paddington last winter, is a light trimaran built of $\frac{1}{4}$ in. and $\frac{3}{16}$in. marine ply, 18 foot long with 8 foot outriggers set 11 ft. 6 in. apart. She carries a 63 sq. ft. mainsail and a 55 sq. ft. genoa jib on a 19 foot mast. She also has a 27 sq. ft. jib for heavier weather. She was designed as a cheap light fast cruising boat for fairly sheltered waters, such as Coniston where she has been sailing last summer. The centre hull is of a very simple form, with a narrow flat bottom of maximum width 18 in. flaring out to a maximum beam of 3 ft. at deck level. The skin of the hull is $\frac{1}{4}$ in. marine ply without ribs, producing a light, neat hull of quite adequate strength.

The hull has a fine bow and a raked triangular transom stern. The vee-shaped deck is of $\frac{3}{16}$ in. marine ply, with the minimum of beams to allow for easy storage of gear, and with two oval cockpits having moulded coamings. Steering is by means of an outboard rudder operated by a push-pull rod. Originally, as seen in the photograph, the outrigger assembly had not been designed with sufficient attention to the effects of a beam sea. Under these conditions, the differing direction of surface water flow on different parts of the waves causes a large force which tries to move the outrigger in and out relative to the main hull, and under these conditions, the leeward end of the crosspieces could be seen to flex. I have since boxed in the outboard sections of the crosspieces with $\frac{3}{16}$ in. ply and they are now much stronger, although they have a bit more weight and wind resistance.

The outriggers were bolted to the crosspieces through curved pieces of oak, which proved on one windy day, not to be strong enough. They have been replaced by much heavier plywood pieces, which however are not curved, so the outriggers are now vertical instead of being at an angle. The outriggers themselves are constructed of $\frac{3}{16}$ in. ply and $\frac{1}{4}$ in. spruce and are 8 foot long by 1 ft. deep with a beam at the top and bottom of 6 in. and 3 in. respectively. They have a buoyancy of about 1 hundredweight each and are filled with expanded polystyrene so that there is no chance of them sinking.

The outriggers were originally intended to be a compromise between the planing and knife-edge types and thus were fitted with the flat outer face at an angle of 45° to the vertical. In practice considerable dynamic lift was gained on a reach, but most lift is required when going to windward, when the speed, and therefore the lift, is least. When the curved fittings broke and the outriggers were replaced vertically, the windward performance seemed to improve, though possibly reaching was slightly slower than before.

Two points which were doubtful before the craft was built were the amount of additional underwater lateral area needed for windward work and the position of the mast to produce a more or less balanced helm. The boat now carries a dagger-board extending about 3 foot, which is satisfactory for all normal conditions, though a slightly deeper board might be an advantage for windward work in heavy weather.

The mast, after a few changes, is now stepped in a tabernacle on the forward crosspiece, the rear edge of the mast being only just in front of the leading edge of the dagger-board, i.e. much further aft than in a normal craft.

At the outset, though certainly interesting, I was very doubtful whether *Allycat* would be genuinely superior to a normal craft. There were a lot of unknown factors in addition to the problems besetting anyone building a boat for the first time. Also this was my first design to develop beyond the paper stage.

Taking everything into consideration however, ALLYCAT is a pretty and successful craft. Unlike a catamaran, she is very manoeuvrable and has superlative light weather performance. She is also rightable after a capsize, a thing which can happen to any light craft. She is the ideal lazy man's boat, with comfortable cockpits and jam cleats for all the sheets. In fact she handles like a small keel boat, but she is cheaper, faster and, with the outriggers and crosspieces unbolted, she has been carried easily on top of a small van.

The outriggers are smaller than is normal for a craft of this size, because I wanted to be able to right the craft in case of it turning completely over. They are proving adequate for the comparatively smooth water of the lake, but it is possible to drown an outrigger by keeping the sheets pinned in during a big gust, and if the boat were to be sailed on more open water, where the outriggers have to rise to a sea as well as supporting the wind force, bigger outriggers would be needed to provide the reserve buoyancy.

For the future, I would like, when I have the money, to build another trimaran of around the same size, this time an all-out racing one, with a hull shaped for higher speeds, bigger sail area, and some form of "wing" deck connecting the outriggers, the whole assembly being on slides across the hull so that the crew can sit right out to give the maximum power. This should give the cats a run for their money.

Pub, 78 (1st. ed. only)
p. 214-215

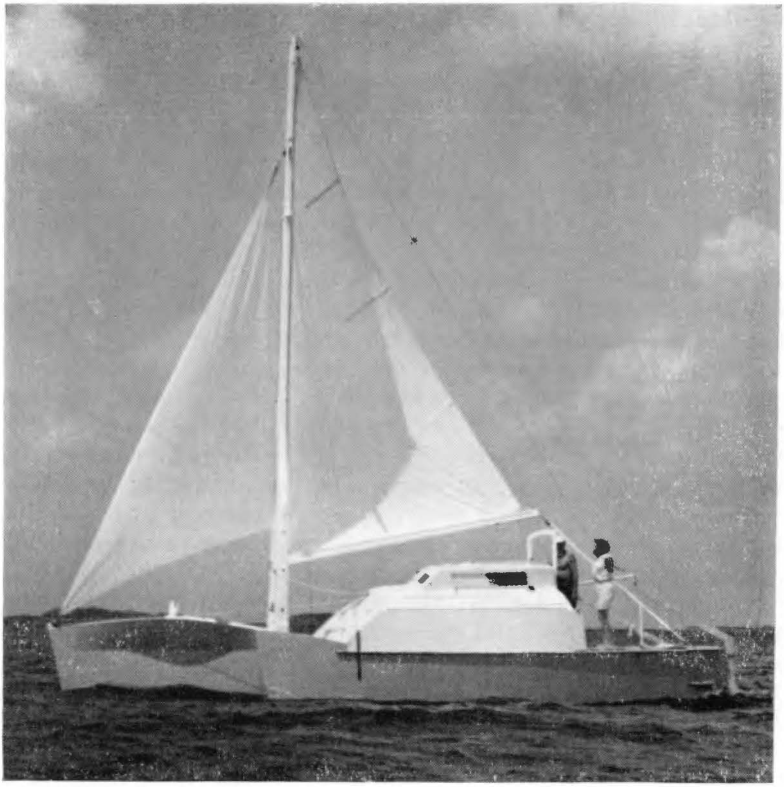
LOO

L.O.A. 31 ft. 6 in.	Length main hull 24 foot.
Maximum beam 13 ft. 0 in.	Length outer hull 22 foot.
Main hull beam 2 ft. 7 in.	Draft 14 inches
Displacement, 4,000 lbs.	Sail 315 sq. ft.

Designer-Builder: T. C. Burnham, P.O. Box, 156, Allapattah, Miami, Florida.

Case for the Tricatamaran

The common idea of a trimaran is one of a central hull and two outside hulls of lesser depth and overall length. Departures from this idea range from outer hulls of nearly equal length to the central hull, and depth below the l.w.l. from minus zero to several inches submersion. It is usually accepted that the weather hull should be

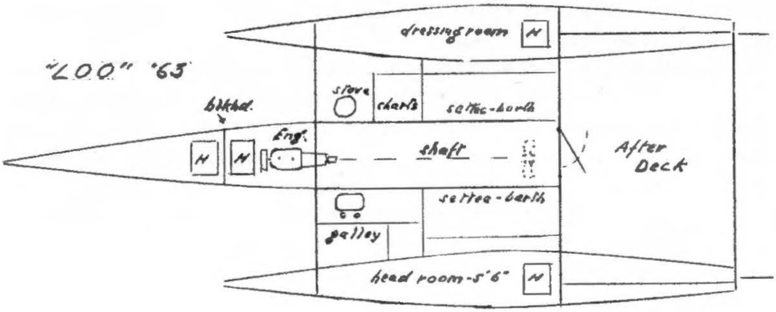


Loo.

flying, except when running off. But why not have the outer hulls of nearly the same depth as the central hull, thus changing the loading, and keeping all the hulls in the water, catamaran style?

The disadvantages are more wetted area and three wave patterns instead of two. These effects tend to slow the speed, but on the credit side there is less windage of the weather hull, and a shallower depth on the lee hull when heeled. In addition there are benefits, such as a lesser angle of heel, less pounding from the weather float, greater initial stability and therefore less transverse movement in a chop.

Following these ideas, "Loo" was designed in 1962 and built in 1963. Although not fully proven, this "tricatamaran" auxiliary sailer is showing promise. The benefits described above have materialised,



and the disadvantage of a higher wetted surface has been tolerable. High speeds have not been reached, but this is probably due to the complex cruising rig, windage from the rather high cabin trunk, and lack of adequate center plates.

On its maiden voyage, "Loo" was taken to sea on a cruise of 200 miles without proper trials, and heavily laden, surviving a furious squall of 35 minutes duration on one occasion.

SOLO TRIMARAN CROSSING

BY ARTHUR PIVER

P.O. Box 449 Mill Valley, California.

What is thought to be the first solo ocean crossing in a trimaran was interrupted by a Hawaiian reef near the end of October.

The craft was a 24 ft. *Nugget* and one of six of this design which had departed San Francisco deep-sea bound within several months.

The boat was sailed by Dave Landgraf, who had left San Francisco headed for Panama; but who had instead changed his course for Hawaii.

Arriving at the Island of Oahu at night, he steered for a group of lights—not noticing a reef in his path, He found himself dashed upon the coral by 10 foot high breakers—was washed off the deck and shortly thereafter found himself ashore with the loss only of his glasses.

The trimaran was battered on the reef in heavy surf for 20 hours; and later examination showed damage to be minor. This was a vindication of the contention that a boat can be built strongly but if sufficiently light lacks inertia to hurt itself.

Of interest to blue-water sailors is the fact that a wind vane was used to steer almost the entire distance. The vane consisted of a sheet of $\frac{1}{4}$ in. plywood of about 3 sq. ft., coupled to a servo tab 1/8 the area of the rudder.

Landgraf says: "The self-steering does a beautiful job. As long as the wind is fairly steady there is never any problem. On a down-wind run it still works well. There is a small amount of yaw but nothing to worry about. When we surf down a large wave the boat has always held straight and steady with no tendancy to broach."

Also used was my simplified navigation system, with the voyager having had about ten minutes instruction prior to his departure.

The 2,500-mile voyage took 28 days—with the major part of the time occupied by calm.

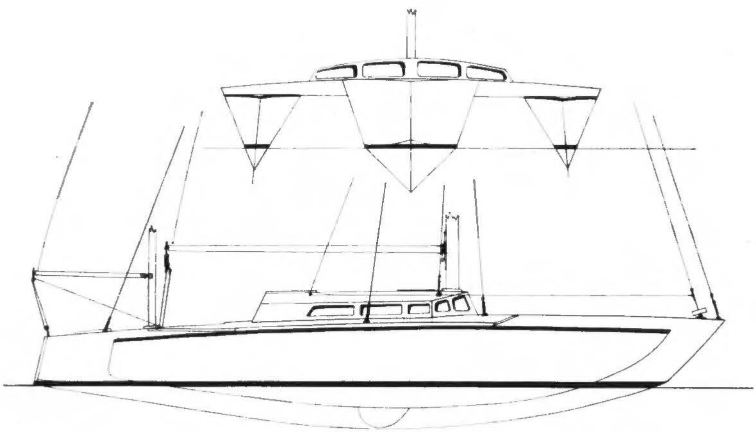
Dear Sir,

Enclosed are some drawings of our latest—the 38 ft. trimaran *Bird.*

We expect to enter her in this year's Single-Handed trans-Atlantic Race—and have been working like crazy trying to get her ready.

We have been sailing several times—although we have been having a spell of windless weather—and are hoping for some wind before we ship her (by freighter) to Florida February 14—from whence we will sail her to England.

Principal feature for single-handing is the roller reefing genoa. We expect to be able to vary sail area by remote control—in heavy weather we will furl the mainsail—carrying on with genoa and mizzen. As wind decreases, we expect to unroll more genoa—using the mainsail in only comparatively light conditions.



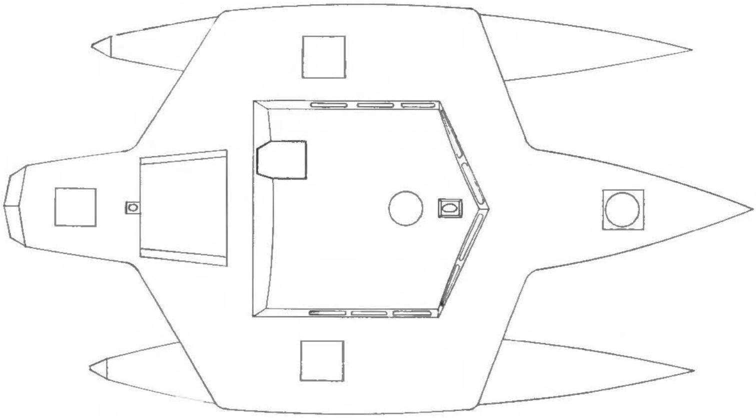
We are experimenting with remote-control wind vanes—one on each float after deck—using the weather one while sailing on the wind—both together when down-wind. The vanes can be varied from down below—and also have provision for differential action.

Original idea was to have the genoa stay swing in an arc from float bow to float bow—so for down wind it would act as a variable-area triangular squaresail. However, we have run out of time, and may not complete this feature.

The boat follows our usual configuration, with a somewhat narrower central hull.

It is too early to tell how she actually sails, although in light weather she seems to exceed true wind speed to weather—in smooth water.

Otherwise, trimaraning is in great shape. Cox Marine sold over a half-million dollars worth of our designs at the London Boat



Show, and a whole new trimaran-building industry has started in South Africa—where some $300,000 worth of our boats were sold at the show there.

We are now designing a series of large fiberglass trimarans for South African interests.

So you can see that we are somewhat busy—but anticipate a nice cruise across the Atlantic—planning to stop off at the Bahamas and Bermuda—where we will take off about April 1 for England.

Expect to see you there.

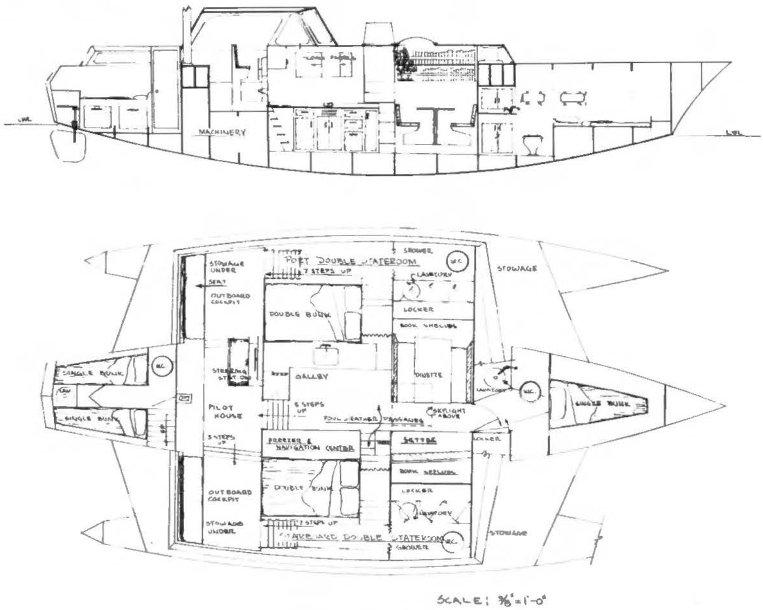
Regards,

P.O. Box 449, Mill Valley, California. ARTHUR PIVER.

46 FOOT TRIMARAN TRIDENT

Designer: Arthur Piver, 20 Marlin Avenue, Mill Valley, California.

This is the first of three designs which we have the pleasure to show of Arthur's larger trimarans, which can best be classified as "Ocean-going sailing houseboats." These boats have literally *everything* which is needed for luxury living but at the same time they will be able to cross oceans under sail in considerable comfort, and at no small speed. The one thing which they will not stand, however, is a large and heavy engine especially when it drags a large propellor when sailing. This will utterly ruin their sailing performance while not making them into good motor yachts.



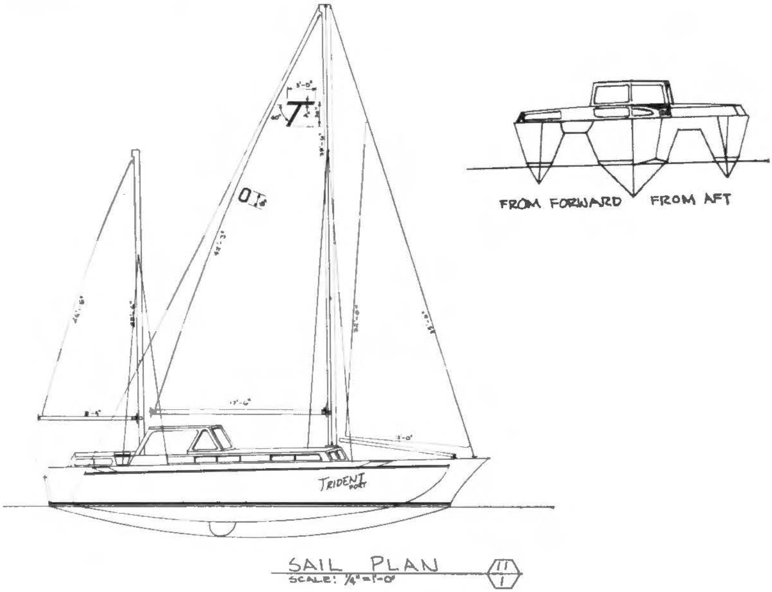
Trident.

Trident is a lovely craft and about the largest trimaran which could be managed by a family. The profile is similar to the original *Nimble* with a clipper bow for the main hull and spoon bows for the floats. Somehow, this doesn't look so jarring to my eyes as the previous designs with this dissimilarity, probably because of the larger size.

The main hull design has the right angled V keel angle of Arthur's designs and the same hull shape as before. The floats, however, are now chined to reduce wetted surface slightly and to reduce their draught so that small fins can be fitted for extra lateral resistance.

The Sail Plan. The ketch rig is handy and can be well stayed. It is drawn in such a way that this boat should sail under the jib and mizzen in strong winds. This seems a reasonable proposition but, not having open water experience of the type, I cannot pass any opinion.

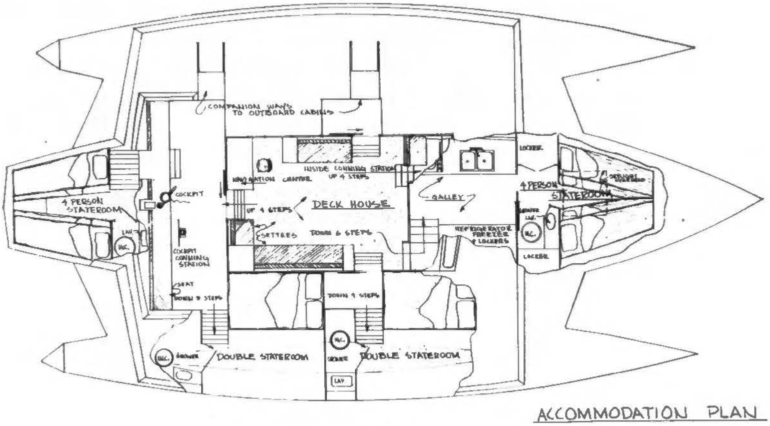
Accommodation. This is superb, With 4 W.C.'s and 4 wash basins, as well as everything else one needs, permanent living aboard should be very pleasant.



Trident.

The Engine. For the reasons stated above, Arthur never shows any engine installations in his boats with the result that the owners generally get some huge "Iron Lung" with an enormous propellor much to his disgust. He might avoid this trouble by specifying a Mercruiser drive and a definite engine which would not weigh down the boat and make it unsailable.

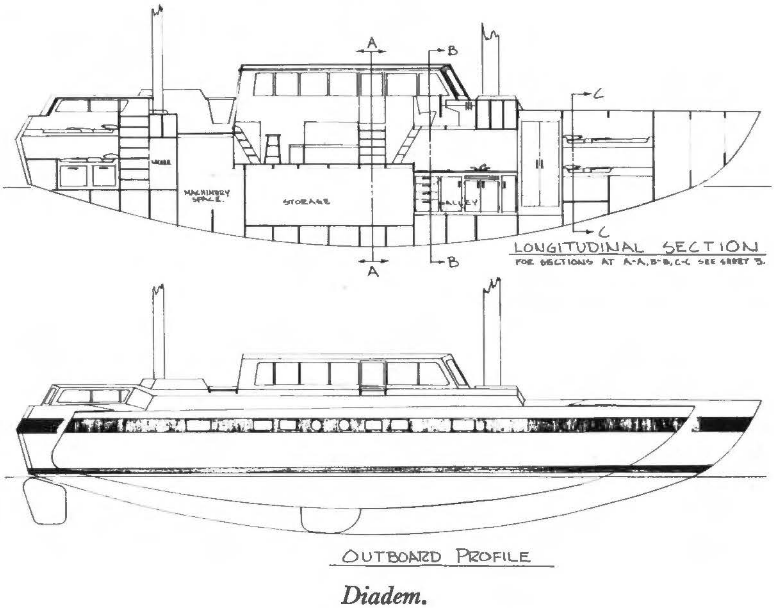
The Rudder. A balanced rudder is shown placed below the hull. This is more efficient than a transom placed rudder and less exposed to some dangers of damage. As against this, it fouls ropes and interferes with the accommodation.



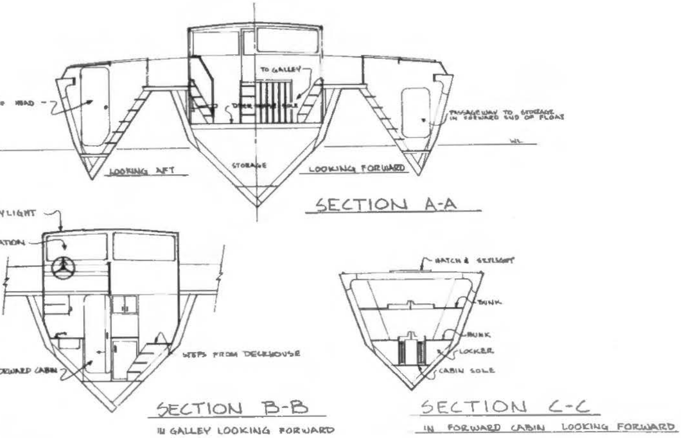
Diadem.

55 FOOT PIVER TRIMARAN DIADEM

This design is in all respects similar to the 46 *Trident* design, though spoon bows are used on the main hull as well as the floats, giving a slightly more balanced look to the craft.



Diadem.

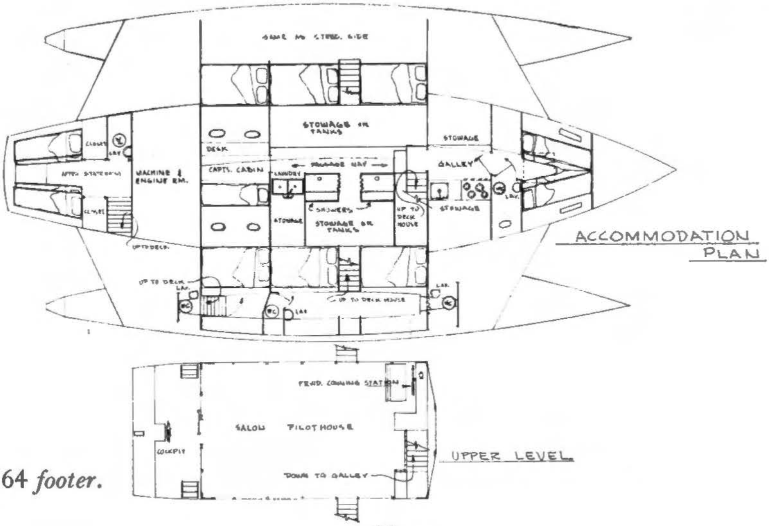


Diadem.

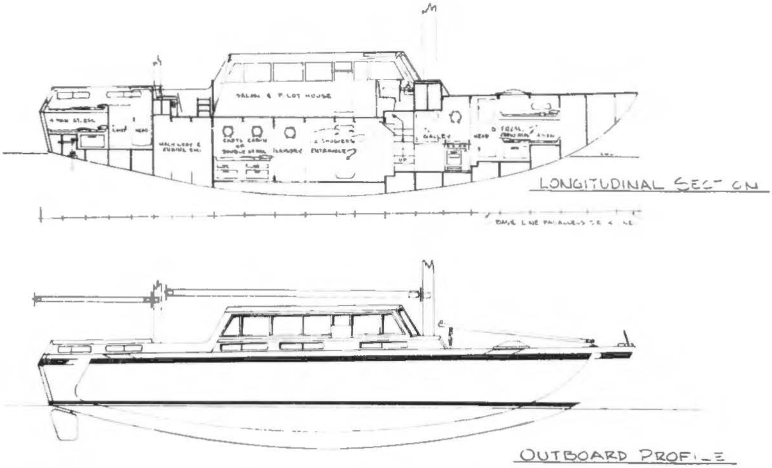
Accommodation. Arthur says that with his craft he has almost solved the housing problem and this craft shows this to perfection. I count 16 berths with staircases running up and down to various levels. Here we have a craft suitable for a man and his wife and 14 children or possibly it might be suitable for a school—I am afraid my imagination boggles at these astronomical figures.

64 FOOT PIVER TRIMARAN (UNNAMED)

In general design, this is the same as the 55 footer *Diadem.* The accommodation has now, apparently become more or less a block of



64 *footer.*



64 *footer.*

flats (apartments) with 9 staterooms and 19 berths. A huge saloon on the first floor might well have some billiard tables in it. No doubt, the craft was designed with luxury cruising to the Bahamas in mind.

Dear Sir,

For some years I've had it in mind to build a shallow draft sailing craft for a "coast crawl" along the 2,000 miles of Australia's South-East and East Coast, exploring every cove, bay, and island on the way, and perhaps ultimately reaching that mecca of all Australian yachtmen—the Great Barrier Reef. Apart from reasonable seaworthiness other requirements were a draft of less than two feet to allow entry into numerous small rivers, and inlets, and a total weight of not more than 1,000 lbs. to allow for beaching and manhandling on open ocean beaches.

Another most important consideration was an investment of not more than £300 or £400 as there is some danger of losing the craft on a bar, and such a figure could be risked with a clear conscience as the reasonable cost of such an adventure.

This last requirement put a limit of about twenty five feet on the overall length, but this can provide sufficient storage and accommodation—bearing in mind that it is intended to spend most nights in quiet refuge between open sea hops of twenty to fifty miles.

At first, the choice seemed to lie between a small Chesapeake Bay Sharpie or a scaled down version of Herreshoff's "Meadow Lark," but after reading some of the early A.Y.R.S. publications it became obvious that a multihull craft was the answer.

The Catamaran had the great disadvantage that a twenty five footer weighing only 1,000 lbs. would be too prone to "flip" and would make an unsafe cruiser (Ballasted keels and mast head floatation do not appeal to me in the least).

The Trimaran was the logical choice, but there seemed to be considerable difference of opinion as to what a Trimaran should look like; so to find out for myself, I built during 1960 two Trimaran main hulls each sixteen feet long, and three different sets of floats—short, medium, and long—giving in all five different combinations (the short floats were such a failure that they were tried on only one hull).

From the answers obtained I designed and am now building the twenty five footer. I had intended to delay this article until this craft was launched and proven. However, due to lack of time, launching day is still some months off and I feel I must now come to the defence of the Tri-configuration, in view of the rubbish that is being written by people who don't know any better, and published by people who should know better.

To give a means of direct comparison against the Catamaran, the first hull was a single sixteen foot "Quickcat" catamaran hull, with modified deck sheer to bring the cross beams level.

The "Quickcat" is of box sections, approximately fifteen inches wide on deck, six inches wide on the bottom, with sides sloping at about 20°. It is an extremely successful class, many hundreds strong, and contrary to the opinion expressed in an early A.Y.R.S. publication, does *not* pound in a seaway, being only two inches wide at point of slap.

The hull was given two floats which were very approximately the same shape but more half scale. They were nine feet long, twelve inches wide on deck and four inches on the bottom (pointed at both ends). These floats were quite successful but more successful were later ones approximately three quarters scale i.e. twelve feet long, twelve inches across the deck, six inches across the bottom.

Short ski types planning floats were also tried, seven feet long and one foot wide. These were hopeless—they caused so much fuss that even on a smooth sea they never would reach planing speed, while in seas three feet or four feet high they were positively dangerous. Their use in such conditions resulted only in much frustration, broken cross beams, and the only capsize in a season's sailing when the craft was deliberately forced beyond the limit in winds up to 45 m.p.h (two masts were blown out of her).

Trimaran with Quickcat main hull.

Although "Quickcats" draw only four inches of water this type of hull sails quite well with centre board up, and the Trimaran was originally built without one. It was however found necessary to put one in to come about with 100% certainty in big seas.

The Trimaran was given the same sail area as a "Quickcat" (but in divided rig) and sailed in a "Quickcat" club. By comparison with the twin hulled craft it was:—

(1) 100% safer—since it never capsized, which a Quickie often does.
(2) 100% more manoeuvrable—since it never missed stays, which a Quickie often does.
(3) Only 75% as fast to windward.

Number 3 was rather hard to explain since the Tri was about the same speed off the wind, was of very similar shape, had the same sail area (125 sq. ft.), was the same weight (about 180 lbs.) and had much the same beam, seven feet against six feet three inches). I can only think that the loss of speed to windward was due to the wind resistance of the exposed weather float.

Hull No. 2 was designed to find out if a wide hull which *might* plane would be faster than a narrow one which can only knife through the water. Again it was sixteen feet long but with a flat planing bottom approximately two feet wide at maximum and fifteen inches wide at the transom. The same floats and gear were used, with the following results:—

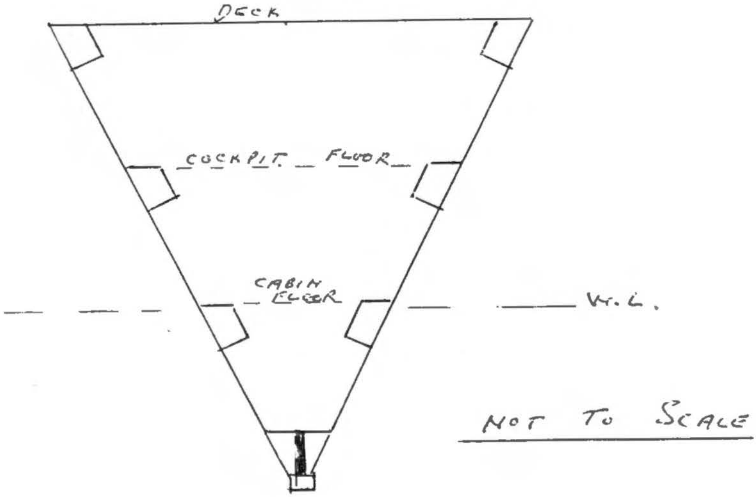
(1) There was a lot more room—you could sit in this one instead of on it.
(2) Maximum speed off the wind was slightly higher (maybe eighteen knots against sixteen).
(3) Speed to windward was much the same—but this hull *did* pound like the devil in a seaway, and was very hard on gear. As she came over a two feet to three feet sea at 10 knots even the skipper's teeth were in danger of snapping off.

Due to a mis-calculation one set of floats were originally two inches out of the water in the static position and it was like trying to balance on a razor's edge. To solve the problem it proved easier to cut the bottom out of the main hull with an electric saw and put in a new bottom two inches higher, rather than drop the cross beams. Such is the case construction of flat bottom ply hulls that the new bottom (and plate case) went in in one night and we were sailing again next day —wet varnish and all.

1960 was a busy year—we even tried a single float as an outrigger on extended cross beams—but I think we got all the answers we needed.

Pressure of business prevented the starting of the twenty five footer until September last, but after four months the main hull is now complete. She is of Uffa Fox "Bell Cat" type—a straight 60° V from keel to deck but with maximum depth (and beam) 50% aft.

Main hull is twenty five feet LOA, twenty three feet LWL, three feet six inches beam at deck, three feet six inches high (sides) eighteen inches beam at water line, sixteen inches draft. 5/16 inch ply has been used throughout with only those stingers needed for fastening. There are no frames other than the two bulkheads which pick up the cross beams.



The self draining cockpit is four feet by three feet with a deck fifteen inches wide on three sides of it. Two can be slept on the floor of the cabin and forcastle. The side decks under the cabin are used for stove, sink and storage rather than bunks. Weight of complete main hull is 400 lbs.—cost £120 (Aust. = Sterling £100).

Overall beam will be fifteen feet with cross beams of three inches by three inches by ten gauge and three inches by two inches by ten gauge steel tube (stronger and lighter than timber).

Main sail will be 150 sq. ft. set on a twenty eight foot mast. Storm jib 50 sq. ft., mast head jib 100 sq. ft. genoa 150 sq. ft.

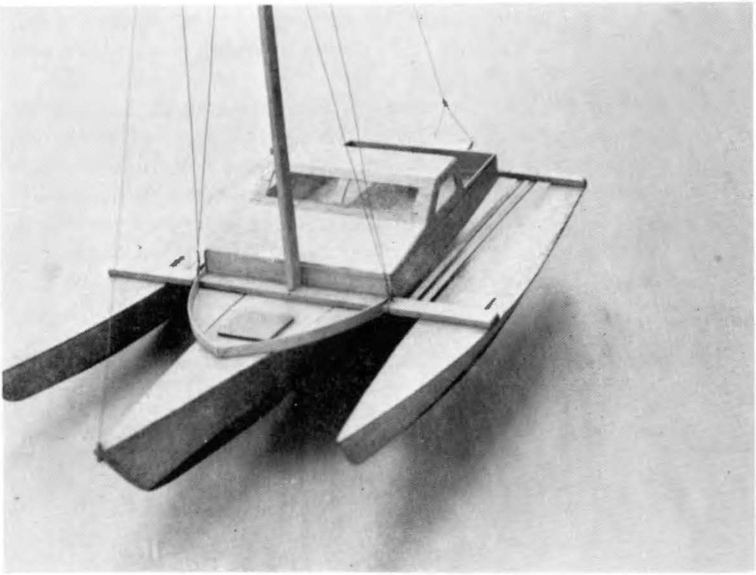
Launched weight will be 800-900 lbs., total cost £300-£350.

The 60° hull was chosen in the face of "expert" opinion for the following reasons:—

(1) Seakindliness in rough water at high speed.
(2) With sixteen inches draft will not need centre plate.
(3) Ease and economy of construction (no bottom; sides came out of one sheet of twenty five feet by seven feet ply).

All chines and stringers were pre-cut with a 30° angle on one face and required no finishing except for a few feet at the bow where the angle was eased.

It is generally held that there is not enough buoyancy is a 60° hull, but here's the secret—*the floats will be* 4/5 *main hull scale.* They will



Model of 24 *foot Trimaran.*

be twenty feet LOA and two feet nine inches wide and deep (sides). Drawing seven inches in the static position they will support their own weight and the weight of the cross beams and spars.

In this particular case they will be 2/3rd buoyancy material and 1/3rd storage space, but could each take a bunk if necessary.

I hope that before my next letter to you I'll have a few thousand miles of successful ocean cruising behind me, which will obviate the need to theoretically justify the safety of floats whose buoyancy so greatly exceeds the total displacement.

Australia is very strong in Catamarans with nearly a dozen different successful classes up to twenty feet long, but unlike our sister dominion New Zealand, has been rather slow to recognise the advantage of the Trimaran. Most of those so far built have had cruising rather than racing in mind. Several Loadstars have recently been launched but below this size Piver's designs are considered a little "tubby" and the New Zealand Hartley preferred. (My boat is somewhat like a fined-down Nugget).

A locally designed twenty five foot Trimaran has been racing very successfully against Flying Dutchmen and twenty foot Attunga and Yvonne Cats on the relatively sheltered waters of the Gippsland Lakes, being up to 15% faster in strong winds, but this craft is an out and out racing machine with both men always on the trapeze. Even so I doubt if it is as fast as a "C" class Cat which it equals in size and sail area.

It is my opinion that the future of the Trimaran in this country is the cruiser or cruiser/racer from twenty five feet upwards, and that the configuration will tend more and more towards the three hulled Catamaran, with a length/beam ratio of about 16:1 (waterline).

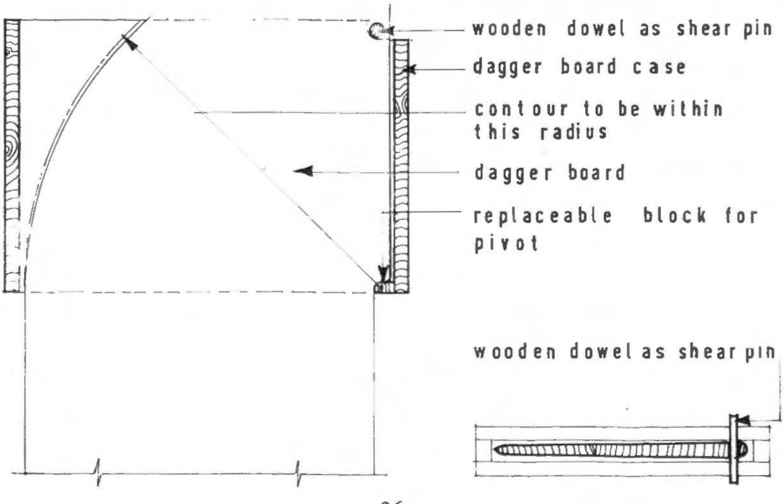
Wishing you every success in the valuable work you are doing.

J. O. Colahan.

27 Spicer Street, Beaumaris, Victoria, Australia.

Dear Sir,

I enclose a sketch of my "rotating daggerboard." I am fitting this to my new catamaran (alright, so I'm a "Square"!) in the hope that



violent contact 'twixt it and the sea bottom will not necessarily result in breakage, or worse still, damage to the bottom of the boat.

I think the sketch is self explanatory. A possible additional advantage of the system is that as the pivot is at the rear, the leading edge will be forced to windward whilst tacking. Anyway, you may think the idea worth passing on.

W. ALMOND.

"Rozel," St. Cuthbert's Estate, Benfieldside, Consett, Co. Durham.

To the Editor of A.Y.R.S. PUBLICATION.

SIR—Working model and details of twin gunter sails can be copied gratis. (VICtoria 0963).

GEOFFREY BOWLES, CR., R.N.

Dear Sir,

I take this opportunity to tell you first of all how I appreciate your publications. It is, for me, the most interesting literature I know, and I think I have read, or re-read my collection at least a hundred times. Yet, everytime I find something new and interesting in it. I must thank you for what you have done for the Association and for all of us amateurs by your publications.

I have been experimenting myself a little bit, without much success however. Four years ago I built a narrow longboat-like hull of 16 ft. 8 in. overall, 2 ft. 2 in. beam, and with a length of 15 ft. and a beam of 1 ft. 6 in. on the waterline—Draft 9 in. I rigged her first as a Polynesian outrigger with a float of 15 ft. overall, placed at 7 ft. 2 in. of the centreline of the boat, and with a lateen sail (area 75 sq. ft.) hoisted to a short tri-pod mast. A steamlined wooden board, 1 in. thick, 1 ft. 4 in. wide and 2 ft. deep, was hung against one of the outrigger beams, close to the boat and between boat and float.

The whole contraption was simple, strong and inexpensive: outrigger, float, board, spars and rig (ex sails) cost me less than £3. As a poor man's fast, seaworthy cruiser, I think the Polynesian outrigger can hardly be beaten.

The boat was rather fast in light weather, but never reached really high speeds, although I sailed her in strong blows. I must add, however, that I sail on a canal, where the wind is never steady. Moreover, the sail area was small, and the sail was only a very provisional affair, sewn together without system out of pieces of old bedsheets.

The next year I decided to try the trimaran idea. I thought I had invented something by using narrow, high-sided, asymmetric floats, to eliminate the board, but found out that there seldom seems to be something new under the sun. Mr. Manners came to approximately the same idea some years before I did, and in the U.S.A. Mr. Holloway built a similar contraption. I understand that Dar-es-Salaam sailors used it a very long time before us.

The thing works rather well indeed, although I never was as successful as Mr. Holloway, who seems to have eliminated all leeway. With my boat, windward sailing was neither worse nor better than with the centreboard in the Polynesian configuration.

The total beam was now increased to 10 ft. This trimaran configuration proved to have some advantages: she sails in a much more quiet and silent way, stability is more Keelboat fashion, and the asymmetric disposition of the floats at either side of the boat is more acceptable to a traditional mind. On the other hand, it is much more expensive (about £10 in my case), more vulnerable, much less simple to build and perhaps slightly less seaworthy.

I then decided to try another rig, mainly because of the stubborn decision of the old, baggy lanteen, never to go about without oar assistance, unless in very light weather, and in absolutely flat water.

I first used a second hand Bermudian sail of 75 sq. ft. Windward ability was improved, as she sailed slightly closer to the wind, and perhaps faster, and going about was also slightly better. On the other hand, the capsizing moment was larger, and in gusting 3 to 5 winds, the lee float was often submerged.

Running and reaching speed seemed to be notably lower than with the old lanteen, which, I think, was partly due to the larger capsizing moment of the rig. Furthermore, the high, relatively heavy mast was a nuisance. One day it broke at deck level, so I decided to try the sloop rig.

A staysail of 40 sq. ft. was home-made, and the mainsail was cut down to 55 sq. ft.

Going about now was fairly good, and so was acceleration. Although she did not point as high as with the Bermudian *Una* rig, general windward ability was therefore much better. Top speed, however, seemed to be even lower than with the *Una* rig, and I never succeeded in reaching an average speed higher than four knots in the unsteady canal winds.

In very light weather, however, the performances were really amazing, and I have been sailing on a mirror-like water, when no wind could be felt on one's cheek, and no leaf on the trees, no flower nor blade of grass was moving. To everybody's amazement she sailed along at one, or one and a half knots, and went about slowly, but without hesitation.

However, as I could not reach an acceptable maximum speed, driving force in strong beam and aft winds seeming to be low, I tried a new rig of my own conception. It was approximately that proposed by Mr. Thomson in A.Y.R.S. publication No. 33, but with a four sided foresail, instead of the proposed triangular one. Both sails were loose footed, fully battened, and their luff was a fine wire, set taught between upper and lower yard.

First thing I had to do was to increase the surface of the after sail, and decrease that of the fore sail, as the whole rig stubbornly insisted in putting itself square to the wind, and in driving the boat backwards. Whatever I did, I could not make the thing work decently. On two occasions, however, I must have hit, by accident, the good sail to wind incidence for the boat then shot forward in a short burst of speed, which made me think that perhaps the idea was right after all. I am, however, no longer enthusiastic about it, and next season I hope to explore the spritsail. I would be very grateful if you could supply me with some information about it.

In Europe it seems to have been used since the 15th Century at least, and old sailormen told me that it is very efficient and simple. I understand that the fast sailing outrigger boats of the South Seas carry it.

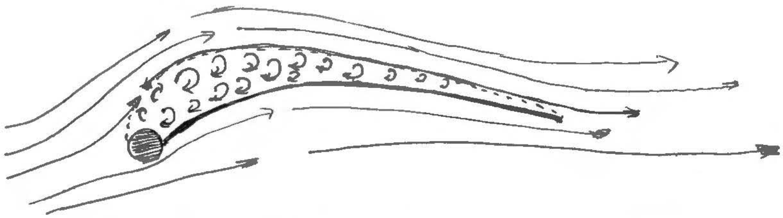
Pidgeon describes the rig of the fast outrigger canoes of Port Moresby as "twin square spritsails. In the A.Y.R.S. publication No. 18 the picture of a *Motu* outrigger canoe shows a spritsail that indeed seems to be square. European spritsails have different shapes. Which one now is the best? Don't you think it would be interesting to study this sail too, when tunnel and other tests are made?

You see, personally, I don't like the Bermudian sail, neither as a Una rig nor as a sloop or cutter rig. Not on a multihull, certainly not when it is built on more primitive lines. It makes me think of a corrugated plastic roof on an ancient barn. So, if there is any possibility of reaching an acceptable efficiency with a fuller, lower and more primitive looking rig, I prefer that one.

A word about basic research on sails: everybody is quite certain that the lift of a sail is determined to a large extent by lower pressure on the leeside, which is due to the higher speed of the air particles moving along the longer leeside of the cambered aerofoil. In "Readers' Views" column of most yachting reviews, one can read every now and then discussions between yachtsmen about this point of the theory of sailing. Some of them have doubts about the leeside of their sail being much different from the weather side. After reading Lt. Colonel Bowden's paper in A.Y.R.S. No. 41, I, too, started to wonder.

The wool tufts, indeed, are well stretched aft-wards, on the weather side of the sail, which indicated a fast flow of the air particles, but are turning around at the leeside of the sail (except where they are stretched by the draft of the headsail) which indicates no fast flow at all. So what? With this sail, one should expect lower pressure at the weather side of the sail, where the air flow is shown to be faster, so the sail should bulge out to weather. But it does not.

I thought of the following explanation: perhaps the wind shadow shape is like a thick aerofoil at the leeside of the sail. At the rounded surface of this foil the air particles are then moving at high speed, which creates a low pressure field at this level, about this way:—



This theory could, I think, explain a lot of things and can perhaps help us to improve on sails.

Now, if I'm trying to tell you something that is known since people first started investigations of sails and wings, I hope you will forgive me. It is one of my bad habits to discover things that are known for ages.

I read in the October publication No. 45, with much pleasure, Mr. Bruce's contribution about his tank tests with models of equal weight but different length and different L/B ratios. It brought home to me the idea that perhaps we have been thinking too much in terms of speed versus square root of waterline length, which made us too often forget that, displacement being more or less unchanged, length of the waterline is the most important single factor determining speed.

Of course, for the displacement boat chap it is extremely important to get the best speed out of a given waterline length, as for his sort of boat an additional foot on the waterline is a rather expensive affair, and furthermore R.O.R.C. rules put a heavy fine on the boat that tries to improve on its speed, not by elaborate refinements in lines and equipment but simply by lengthening slightly the waterline. But I think that for the multihull enthusiast who is not interested in R.O.R.C. rules (better say: " R.O.R.C. Alchemistry ") the problem is not the same, as for him waterline length is not necessarily expensive.

To make my idea clear we might compare models 8 and 12 in Mr. Bruce's paper (series No. 1, speed in knots versus $R^t/W\%$). We see there that to reach a speed of 1.48 knots model 8 needs 40% more power than model 12. That means that a boat of 12.63 feet long with a beam of 1.58 ft. and a displacement of 380 pounds, needs 40% more sail area to reach a speed of 5 knots, than a boat of 16.62 feet long, 1.39 ft. beam and the same displacement.

Actually if we compare all the figures of this table, we find that a boat built after model 12 will, with less than 2/3 of the sail area of a boat built after model 8, be only slightly slower in high winds, virtually as fast in light weather, and notably faster in normal sailing weather. This boat will also be more easily moved under power, oar or towed along the towpath in land waterways.

The question now is, can she be built at the same weight and for the same price? I think so, I think that she will be even less expensive.

Let us think of a small, one man trimaran. As she carries only 2/3 of the sail area. the capsizing moment of the rig will be, even if we take into account a large constant height of the boom above the deck (or the waterline) less than 2/3 of that of her shorter sister. Suppose we use the same floats for both boats, then the overall beam of the longer boat can be less than 2/3 of that of the shorter one. Since shorter beams need not have the same section as longer ones, the weight of this part of the boat can be not much more than half that of Model 8's. The same applies to mast, boom and rigging, which brings us to the following conclusion:—

	MODEL 8	MODEL 12
Central hull	100 pounds	127 pounds
Floats	50 ,,	50 ,,
Beams	50 ,,	30 ,,
Rig	30 ,,	20 ,,
Rudder, etc.	20 ,,	20 ,,
	250 ,,	257 ,,
Crew	130 ,,	130 ,,
Total	380 ,,	377 ,,

Since gear takes a large slice of the price of a boat, and the sail area of the longer boat should be less than 2/3 of that of the shorter one, I suppose, the former boat will be less expensive as construction weight is the same.

As for the manoeuvrability, I think that greater length will be compensated by smaller beam. The smaller beam will also be a boon when looking for "parking room" in a crowded yacht harbour.

But the best asset of the longer boat is, in my opinion, the lower and smaller rig, which not only gives peace of mind in a blow, is less dangerous when there are children aboard, but also is much more handy in certain circumstances, e.g. when stepping and unstepping the mast. I, for instance, don't like to have to ask the bridgekeepers to stop traffic and open the bridge every time I feel like having a look at the other side. Since I have a family (two young children) I'm no longer interested in sailing day and night, and battling gales and headwinds.

My present idea about boating is travelling by sail and oar along the Coast or the Estuaries during the relatively warm and (more or less) sunny days, like did the ancient Greeks in Homeric times, and pull the boat up the sandy beach, or anchor it in a snug cove for the night, or explore inland waterways rowing the boat, or towing it along the towpath, and whenever the wind is free, sailing, as did, only half a Century ago, the inland watermen.

Don't you think the best way to develop really fast and cheap boats is to organise Races on a total sail area basis as is done in sand, land and ice boating?

A few remarks now about Mr. Bruce's tests.

First: is it really L/B ratio that matters? It could also be, I think, $L/\sqrt{\text{main section area}}$, and the difference can be very important. Arthur Piver's trimaran hulls lie between models 5 and 8 as for their L/B ratio, but between models 8 and 12 for their $L/\sqrt{\text{main section ratio}}$.

Perhaps the whole thing simply boils down to the $\frac{W^{\frac{1}{3}}}{L}$ ratio. If this is true, then beam does not really matter either. Don't you think it would pay to investigate this? I don't think it is very difficult to do.

I send you, to close this letter, my best wishes for this New Year. I hope it will be very happy for you and successful for the Association.

K. MICHIELSEN.

Noordhoek 26, Oudenburg, Belgium.

The Proa.

THE PROUT PROA

L.O.A. 39 ft.
L.W.L. 28 ft.
Beam 1 ft. 10 in.
Beam W.L. 1 ft. 4 in.

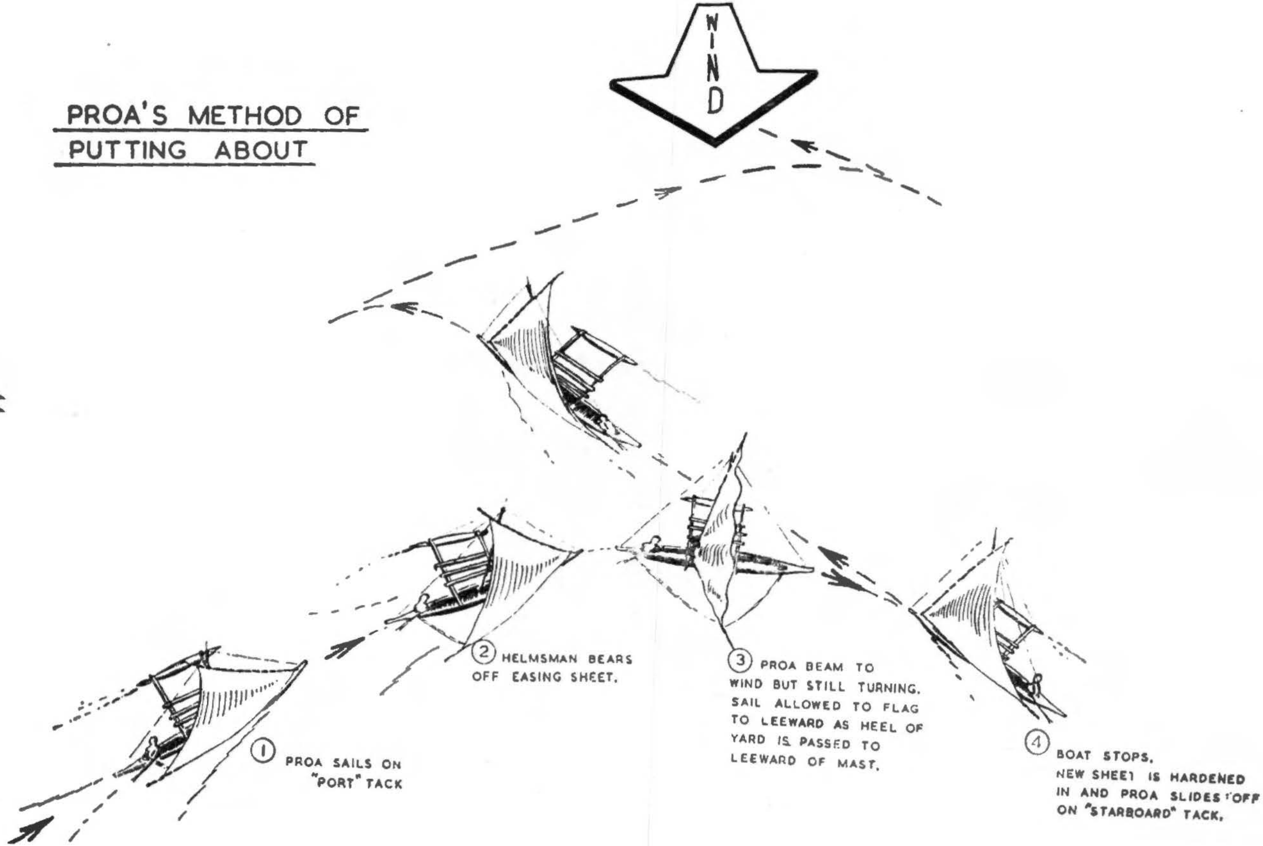
Overall beam
Sail area

Designers: Micronesians modified by the Prouts, 1 The Point, Canvey Island, Essex.

Owner: Captain Ratsey.

On Anson's voyage around the world in 1742, a Micronesian Proa was captured from the Spaniards. It was taken aboard the

PROA'S METHOD OF PUTTING ABOUT



Centurian and carefully measured and documented. From these plans and dimensions, the Prouts have built this fine Proa for Captain Ratsey. All the dimensions of the original account for both hull and sails have been used but moulded and sheet plywood have replaced the Micronesian timber, and glue and screws have been used instead of lashings and Spanish windlasses.

The drawings and photographs show the craft which we publish by kind permission of Yachts and Yachting and the Prouts.

The Main Hull. This is a light, shallow and asymmetric hull which was not decked. No centreboards were used and steering was by oar.

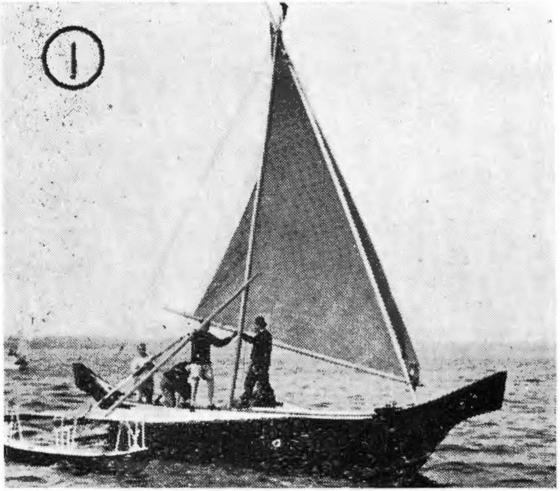
The Float. This was completely decked and watertight.

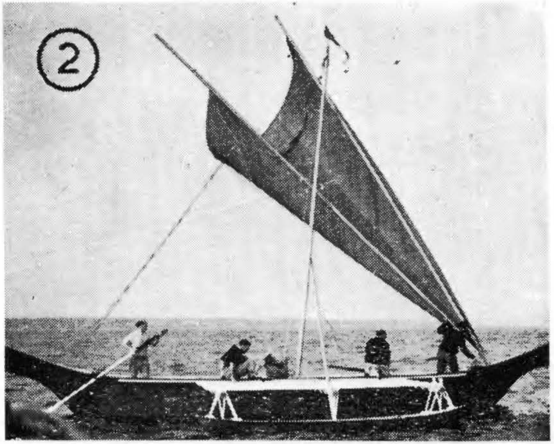
The Rig. This was made as in Anson's drawings but every Micronesian sail photograph I have ever seen has had the boom of the Oceanic Lateen cocked up at a considerable angle, the reason for which I didn't know. From the sailing trials with this proa, it is now quite obvious that this is an essential feature because otherwise the boom end trips in the sea and the sail cannot be let out enough to spill the wind.

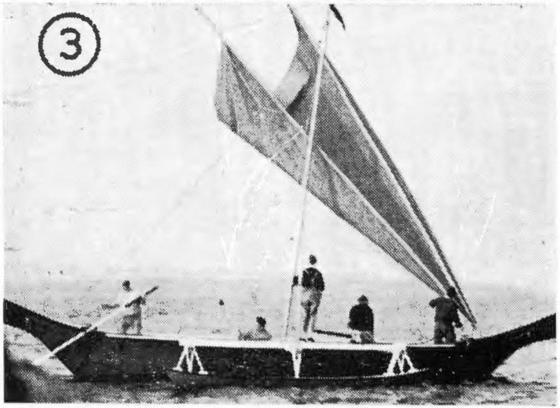
The Sailing Trials. These took place in a force 3 to 4 wind. In very light going the speeds were only comparable with the faster dinghies but as the wind got up, the speeds increased enormously and the report says that she was very much faster than the 27 foot Prout cruising catamaran, which was in attendance, as could be expected Putting about, which was done in the traditional way by dislocating the lower end of the yard from its socket and dropping it over the lee side and getting it along to the opposite end of the main hull, was finally got down to 25 seconds from full speed ahead on one tack to full speed ahead (or astern) on the other. The time given for the same manoeuvre in the Fiji Islands for the King's Thamakau is given as a full minute so there was nothing to be ashamed of in this matter.

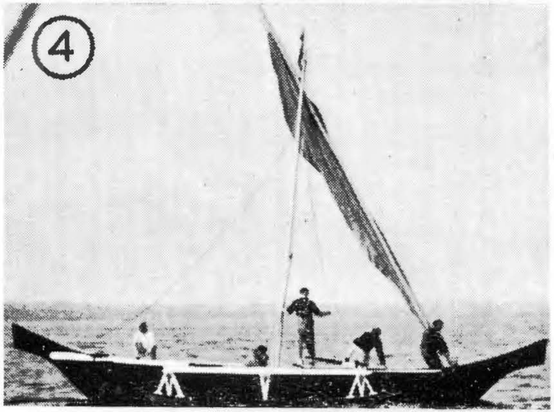
The Capsize. The first trials ended with a capsize. This was more or less to be expected from novices trying to sail such a refined craft. The speed of the boat was such that the apparent wind must have come from well before the beam and at a greatly increased speed. A slightly stronger puff of wind would therefore produce an unexpectedly great capsizing force and before the crew had time to get to the end of the bridge deck, she went over so far that the boom end caught in the water and the wind could not be spilled from the sail. The capsize was therefore inevitable.

Conclusion. From the article by Peter Milne in Yachts and Yachting, it would appear that the proa, which created no indentifiable







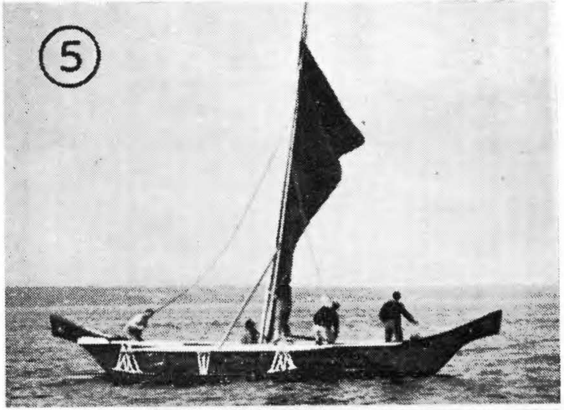


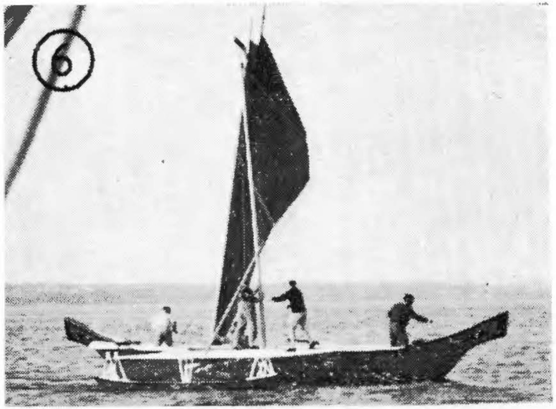
1 Helmsman bears off as preparation is made to brail sail.

2 Brail up sail and cast of whip purchase (hauled down on old forestay) so yard heel can be lifted from socket.

3 Helmsman ships steering oar when float is lying dead upwind.

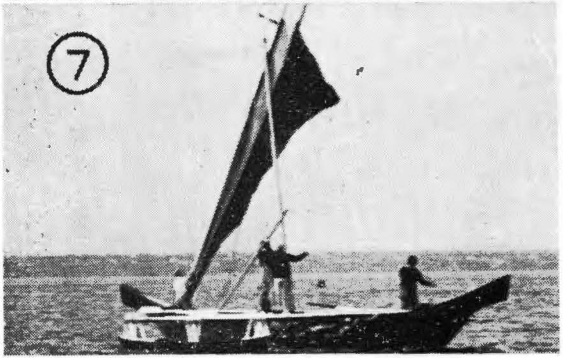
4 Helmsman rocks mast, swigging on whip on his end of stay, which helps lift yard heel from socket.

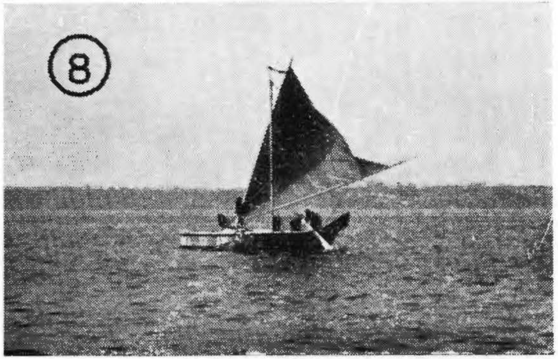




5 Yard dropped over lee side, inside double sheet arrangement, enables heel to pass to opposite end of proa.

6 Oarsman on new tack sees double sheet arrangement doesn't foul and prepares steering oar.





7 Rocking movement of masthead is repeated with whips on Jackstay and heel of yard goes into the new socket.

8 The sail is unbrailed, sheeted in and boat slides away on new tack.

surface waves, confirms our calculations in A.Y.R.S. No. 6 *Outrigged Craft* that it is the fastest possible non-hydrofoil sailing machine. Its speed around a racing circuit is unlikely, however, to be faster than that of a catamaran. Our congratulations for this fine craft must go to Captain Ratsey for his intiative in having it built and to the Prouts for building it. The judicious use of hydrofoils on such a craft might see some very exciting sailing.

This craft is for sale at £290 complete with sail. It cost over £1,000 to build and is a thoroughly well made craft.

"PALINDROME"—A Micronesian Trimaran

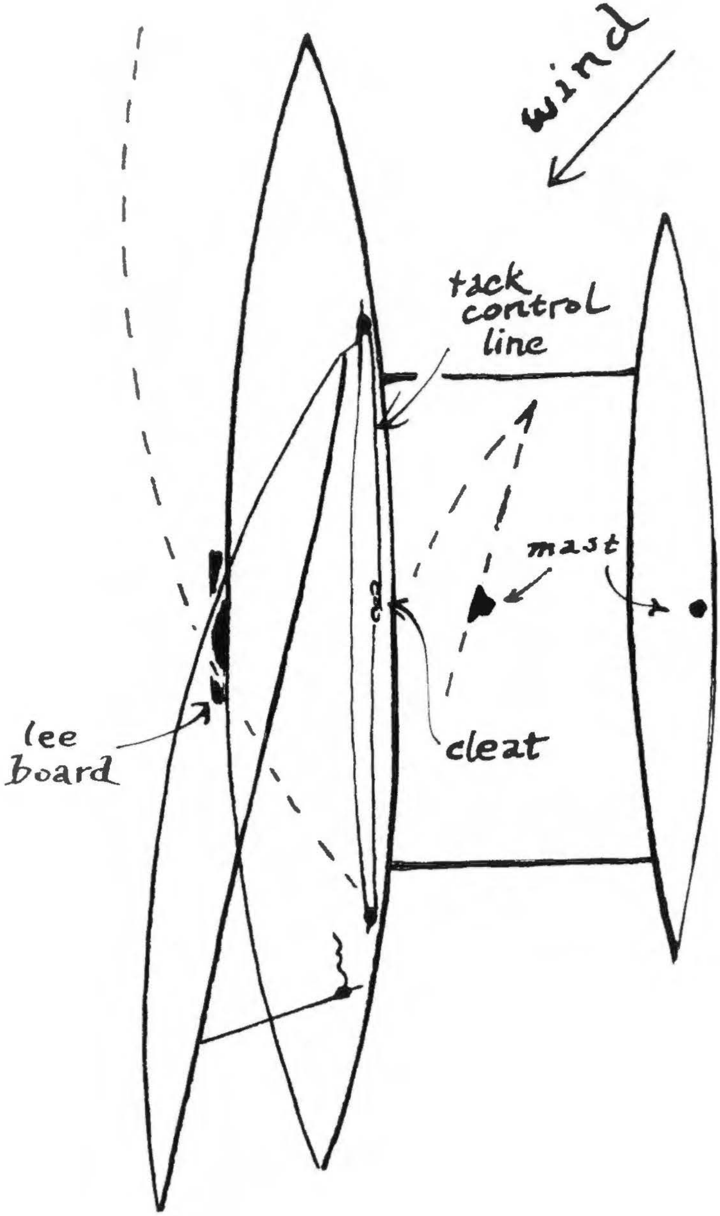
(A "palindrome" is of course any word or phrase reading the same backwards as forwards—"Radar" or "Madam.")

BY RICHARD ANDREWS

25 Audubon Drive, Ossining, N.Y., U.S.A.

L.O.A. 16 ft. Sail Area 75 sq. ft.
Beam 8 ft.

The aim of this project was to gain experience with sailing by the Micronesian principle, and to determine if it is a practical one


wind
tack control line
mast
mast
lee board
cleat

for sailing alone in varied conditions. "Palindrome" herself was strictly a temporary summer's week-end concoction, made up out of a Canadian paddling canoe to which we added the cross arms and floats of our trimaran "*Serendip.*" This provided a very stable and commodious sailing platform of reasonable performance with which to test various sail rigs. In all the tests, the same bipod mast was used, stepped to windward of the main hull on a heavy cross plank and stayed by lines to either end of the canoe. We also borrowed "*Serendip's*" dagger board, which was clamped to the lee gunwale

of the canoe at center, and kept thus without adjustment. Steering was by paddle.

Test No. 1: To try out the possibilities of a reaching jib as a sail rig now free of the problem of sheeting around a mast, we borrowed a lateen sail from a "*Sailfish*" and removed the gaff and boom. The tack was snapped to a line formed into an endless loop over pulleys at either end of the canoe, with a cleat to hold any desired position of the tack. The clew of the sail was sheeted to the stern of the canoe or to the lee outrigger float as desired.

Results: Efficiency seemed very good in light winds, but we could not keep the luff tight in stronger wind. With more complex tackle this could certainly be done, resulting in a very powerful sail.

Test No. 2:—The gaff and boom were replaced on the sail, and the tack again snapped to the loop line and the boom controlled with paired sheets. This was very similar to the Oceanic lateen form except that the mast remained vertical and the position of the tack could be varied rather than being fixed in a socket on deck.

Results: Control of the sail was excellent, and balance always as desired, giving good windward performance and quick shift from tack to tack. The only snag came when we let the sail become back-

winded, and couldn't spill the wind as the boom lay against the end stay. The bipod mast took the strain very well, although made of light tubing, but the craft was out of control and the lee board wrenched loose from its clamps. Carrying the end stays to the float rather than to the main hull should correct this fault.

Test No. 3: The sail was freed from the tack control loop and the boom fixed to the mast by a simple lashing, which brought the general plane of the sail to a more windward position. The aim of this test was to see if this alternative position would provide for very quick shifts from tack to tack, by a simple yank on the sheet.

Results: The helmsman sat amidships and was able to make very rapid reversals of the sail such as might be desired in tacking up a narrow river. The correct positioning of the sail became critical without an adjustable tack line.

A sail rig using a lateen gaff or spar but not a boom, was not tried but should be entirely workable. The boom is chiefly desirable for control in a smart breeze.

Conclusions: We found the Micronesian principle of sailing entirely practical and changing tacks quick and simple. Our tests

were on a mountain lake subject to odd gusts and beset with narrow rocky reaches. The light bipod mast stood well and seems to us to solve the back-staying problem for this rig. Side or end stays should be kept to windward of the main hull to give a boom some play if back-winded. The problem of balance of centers was solved with the quickly varied tack position of the sai' by means of the loop of line, which also serves to carry the tack to the other side of the mast when "coming about." Only one centrally placed lee board was required, and steering was very light and easy.

One can use a sail of excellent proportions and the mast is clear of the sail in working the ship, and clear of air flow over the sail.

A hull form can be used with a straight keel, simple to make.

The sensation of changing tacks in a smart breeze is great fun; as the sail is reversed the craft comes to a pause and then swoops around and sails off on the other tack almost as if one were on a great swing!

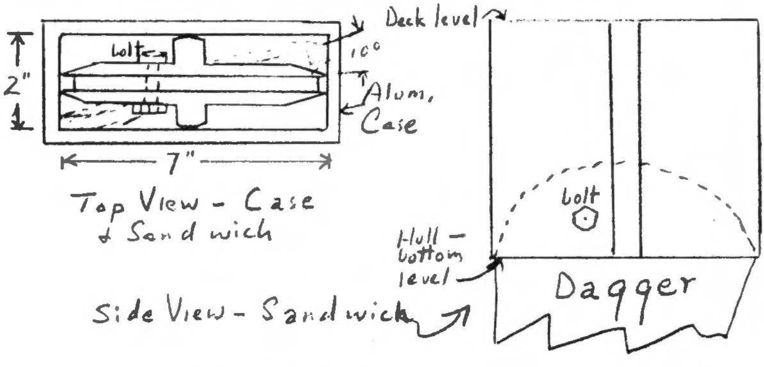
ADJUSTABLE DAGGERBOARD EXPERIMENT

BY HOWARD K. MORGAN

1442 Inwoods Circle, Bloomfield Hills, Michegan

The Manners 14 ft. sports catamaran has a single dagger normally mounted through the cockpit between hulls and just aft of the mast. In order to have a dagger which did not pierce the surface, two were placed through the hulls. The original dagger was 17 in. fore and aft while the two newer ones were each about 6.5 in. average. The depth of the original board in the water was about 33 in., the new ones only 19 in. beneath the hulls. Thus the older board had about a 4 sq. ft. one side area while the new ones had 1.7 sq. ft. total on one side.

The new boards are sandwiched between two aluminium pieces which extend down the full length of the case just to where the case is even with the bottom of the hull. The two pieces which make the



sandwich have a simple bolt through the board and this bolt is finger tight, enough to allow the board to rotate on the bolt backward if struck. When it strikes an obstruction, the whole sandwich is pulled down several inches and the board rotates aft until its length is parallel with the hull. Naturally, this reduces the total draft from some two feet to about one foot, counting hull draft and board together. Thus a case length of only 7 in. is used. Naturally the sandwich is lifted out completely before beaching. A wood shear pin near the top of the case allows the sandwich to drop when it hits the obstruction and a chain prevents the sandwich from slipping too far through or becoming lost.

While not perfect protection against obstructions, it is certainly sufficient for most purposes and allows a very short slot.

The top view of the case also shows that the sandwich is only the full 2 in. case width at the center where the sandwich loosely touches the case sides. Thus the boards can be rotated either right or left about 10° maximum. This now allows the board to cancel leeway or slip by being adjusted the proper amount to the correct side.

The following experiment was performed to indicate the effectiveness of the arrangement. First the boat was sailed downwind with the two boards held at center adjustment with no tilt angle. At the bow between the two hulls was a simple vane in the water on a rod which came up to an indicator needle to show the degree of slip. Downwind the slip was indicated as zero. Now both boards were turned 10° in one direction and then, later, in the other. The hull slip in each case was indicated as 5° right or left. Thus the hull was restraining the slip to about half the angle set by the boards. The tiller was moved 5° to retain the same course downwind in each case. Rudders are same size as boards.

Next a series of measurements were made beating to windward. Remarkably stable readings were obtained which were almost identical on either tack. The averaged result follows:—

Condition	*Slip to Leeward*
No boards	14°
Both boards, set 10° leeward	10°
Both boards, centered	5°
Both boards, set 10° windward	1°
Original Board	4°

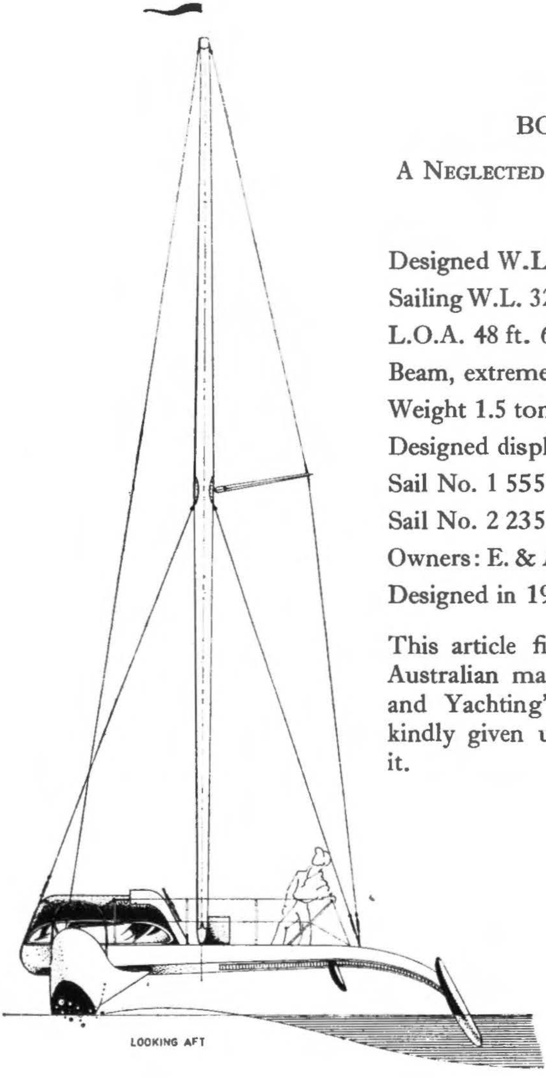
In the first measurement (the hulls had been modified from their original shape) the helm was a very heavy windward one. The speed was about 4 knots in all but slower running tests. With boards now inserted but turned to leeward—a condition that would never be used—some 4° of the leeway was nevertheless eliminated, thus they even helped somewhat. In the centered condition, the amount of slip was almost identical to the original board arrangement (last entry) but with four and one-half square feet less wetted daggerboard surface total. In the next case, almost perfect correction for slip was achieved with boards angled to windward as intended. Slightly greater tilting angle or a slightly larger board area would have given the ideal result of no slip; zero degrees.

A 5° improvement in leeway would result in about a 5% or slightly greater increase in speed directly to windward in beating. Measurements were made of speed in each part of the experiment but differences in speed, if any were not discernable. A general observation was that the speed stayed much the same in all the twin daggerboard conditions.

Three rather interesting observations were made during the experiments. The first was the effect of the wind dropping during beating with the angled new boards in which case the helm reversed from an easy weather helm to a moderate lee helm. As soon as the wind picked up again, the helm pressure returned to normal. This comes from the fact that the lift of the new boards tipped to windward is dependent on boat speed. If the wind drops off before the boat can slow down proportionally, the side force from the wind is not enough to balance the still great side reaction from the tilted centerboard.

The second observation was the behaviour of the slip indicator. With the boat lying dead in the water, the wind would rise and as the boat started the slip angle would soon indicate some amount. As the boat further picked up speed, this slip angle would decrease until it finally became a steady minimum. The slip angle decreases as the boat starts to "go." The interesting thing was to see how long it took for the needle to steady down the last few degrees to minimum slip angle. Thus when one races, it seems important indeed not to lose speed by careless steering because not only is forward speed lost, but an abnormal amount of slip is carried for a longer time than normally realized. The practice of allowing speed to build up rapidly by turning slightly downwind when the breeze springs up may pay off both in higher average speed and lower average slip in puffy weather. The indicator shows very nicely when the boat is truly "going" because this occurs only at a minimum slip angle. The angle is much the same over quite a considerable range of wind speeds and sail trim when on a beat.

The last observation shows the relationship of rudder angle to the course of the boat. It should be remembered that the slip angle is that which exists between the heading and the course angles. Invariably the rudder angle was about 4° to the course. Since the course equals the slip angle in the previous table, the rudder angle was always less by 4° than the slip angle. In the case with the boards set properly, 1° slip, the angle of the rudder is thus actually reversed to 3° on the other side of the heading from the slip angle. Why this rudder angle should be almost constant was not obvious.



BOTJE III

A Neglected Type—the Flying Proa

Designed W.L. 32 ft. 10 in.

Sailing W.L. 32 ft. 10 in.-40 ft. 10 in.

L.O.A. 48 ft. 6 in.

Beam, extreme

Weight 1.5 ton

Designed displ. 2.2 ton

Sail No. 1 555 sq. ft.

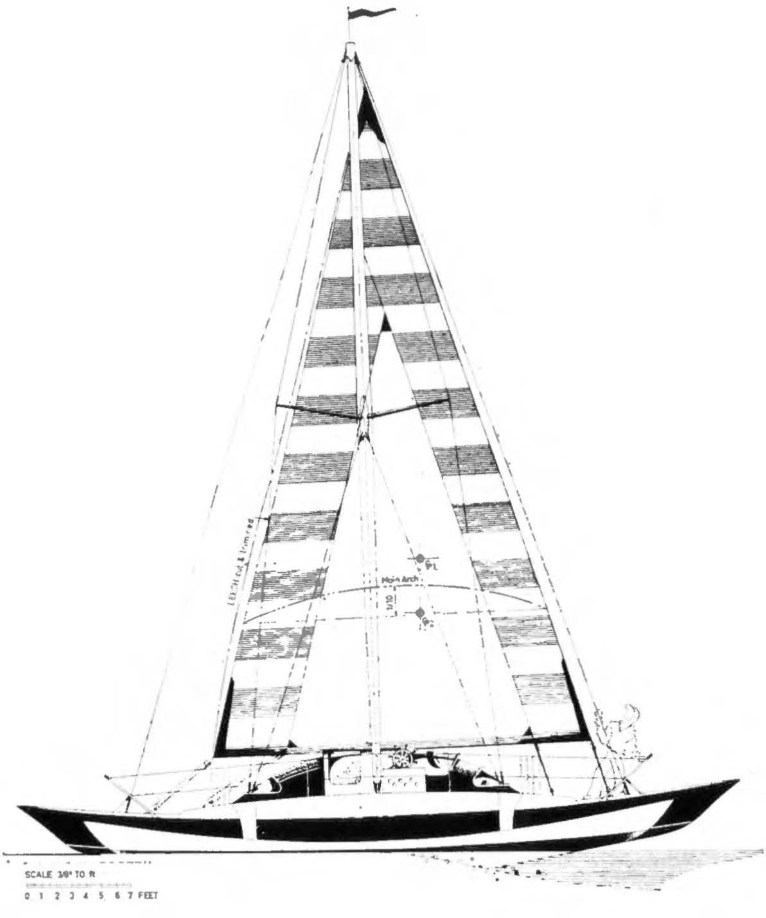
Sail No. 2 235 sq. ft.

Owners: E. & A. C. Silver, Holland.

Designed in 1962 by J. S. Taylor.

This article first appeared in the Australian magazine "Power Boat and Yachting" whose editor has kindly given us permission to use it.

After sailing various prototypes of the Polynesian family, Catamarans, Trimarans, Polynesian outriggers, in search for a fast and reliable offshore cruiser, I ended up with the most neglected type—the Flying Proa.



Three years of trials are backing this particular design and evidence tends to show that the Flying Proa has something neither the conventional craft nor any of the other Polynesians ever had. Considering the offshore Proa as against any other offshore type, she—

(a) not only could have the highest potential speed but can make the best daily run which is not exactly the same thing.

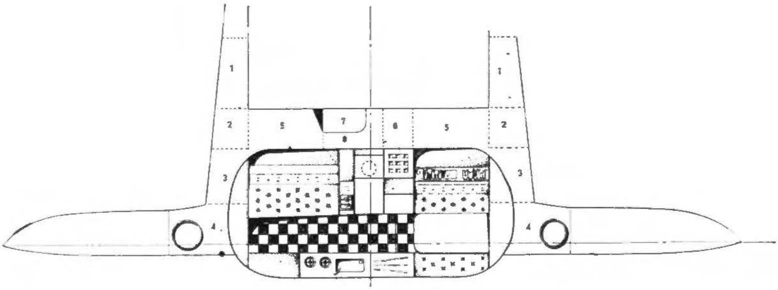
(b) would work along leeshore in the finest style of our best racing craft of conventional design, and she does not fail to work free in bad sea conditions, thus showing a distinctly different breed from the present crop of cruising Catamarans and Trimarans;

(c) would hove-to both under bare poles and while carrying some canvas at any angle to the wind as wished for;

(d) has the most seakindly hull that could be re-developed, not spoiled with the usual tennis court-like platform high in the air calling for windage and in bad weather—for trouble;

(e) is suitable to develop a craft free of the inherited characteristics of Trimarans and Catamarans of having rapidly diminishing stability when the weather-hull lifts. Experience shows that trying to make ANY Polynesian type self-righting by employing ballast or masthead flotation is doomed to failure, the usually pseudoscientific theories notwithstanding.

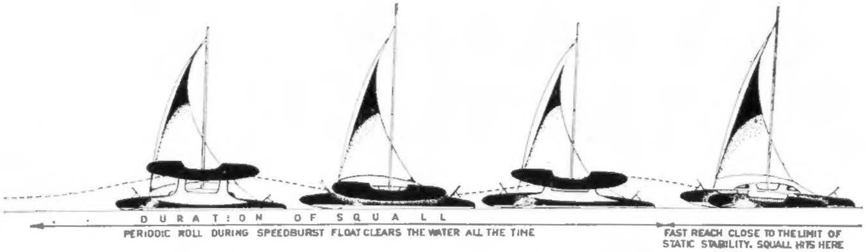
The Proa design is natural to employ aerodynamically developed ballast to balance the aerodynamically developed sail pressure. Auto-



matic balance could be achieved and has been achieved in the design of *Botje-III.*

Being the first modern development of the type, the details are worthwhile to study. The customary clumsy rig arrangement of the type was changed into the simplest rig ever carried by an ocean going craft. On her well stayed and highly buoyant mast she carries two sails in her working rig in jib-like fashion. While sailing the two sails set not unlike the genoa and the staysail of the conventional cutter rig.

The sails are cut symmetrically, and each bottom corner has sheet attached ending in powerful winches. On the drawing the boat moves to the right and the tensioned sheet in front acts as forestay, the sheet around the winch controls the set of the sail. She changes



Shows that BOTJE III has totally different stability characteristics from any Catamaran, In the minute the outrigger float leaves the water the aerodynamic ballast, the size of which is subject of the windstrength, balances the pressure on the sails whatever size it is. Exceptionally strong squall, while carrying a lot of canvas, would dismast the boat without capsizing her. After the float lifts free the boat finds her new balance with a few oscillations and without calling for the interference of the crew.

tack on a beam reach, by tensioning the slack sheet and slackening the one in tension before.

In practice it is a very quick manoeuvre and the boat stops in a few yards and starts to make sternway (which is the bow on the new tack, the boat being perfectly the same in the forward or aft sections). The outrigger always on the windward side.

The total sail area of 790 sq. ft. might look moderate for her length but is just about the largest sail area ever carried by an offshore boat of two tons displacement.

The accommodation plan that follows very well the peculiarities of the type is a credit to the owner. Mr. Silver has kept his requirements to a sensible minimum thus making it possible to avoid the far too common trap of designing a houseboat while expecting the performance of a seagoing thoroughbred.

The construction is based on 6 mm ($\frac{1}{4}$ in.) ply, fibreglassed both internally and externally, to have the final strength of $\frac{3}{4}$ in. one-piece timber planking. All cavities of the main hull up to 6 in. above the main waterlevel are filled with plastic foam making the rest of the hull self-bailing. Steering is with wheel from the deck but provision made for dual controls below deck.

PRINTED BY F. J. PARSONS LTD., LONDON, FOLKESTONE AND HASTINGS.