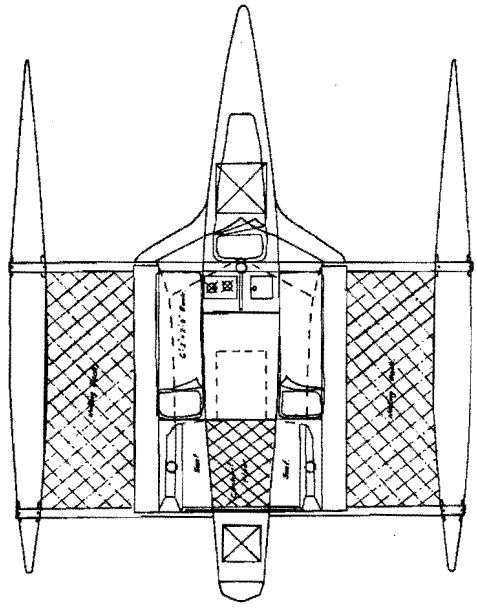

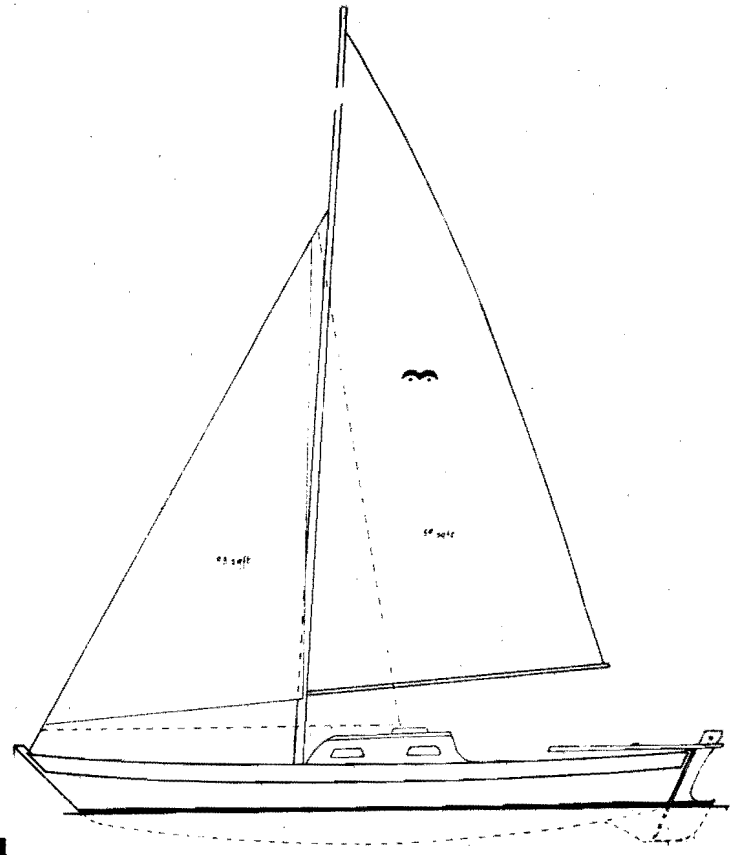

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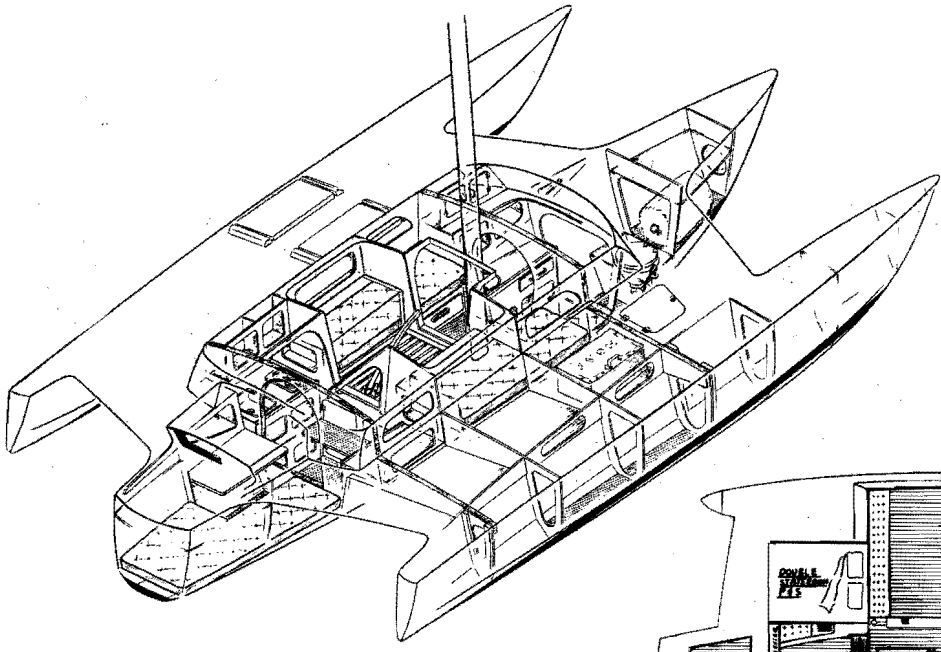

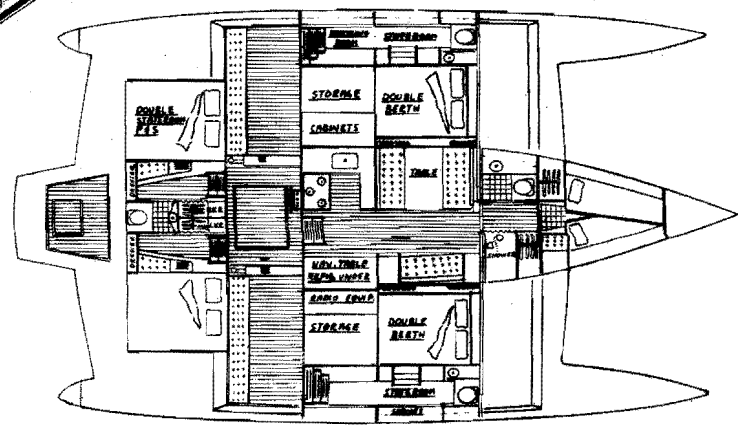

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" SPECIAL "

SEARUNNER TRIMARANS

by JIM BROWN

"NOTHING NEW UNDER THE SUN" . . . . . is a half truth.

Elements as old as the cosmos, when combined in a modern recipe, give nuclear energy, new at least to Earthlings.

The eight-note scale has formed the melodies of Western man by age-old conditioning, yet together with electronics and the poetry of rock, we have our new music.

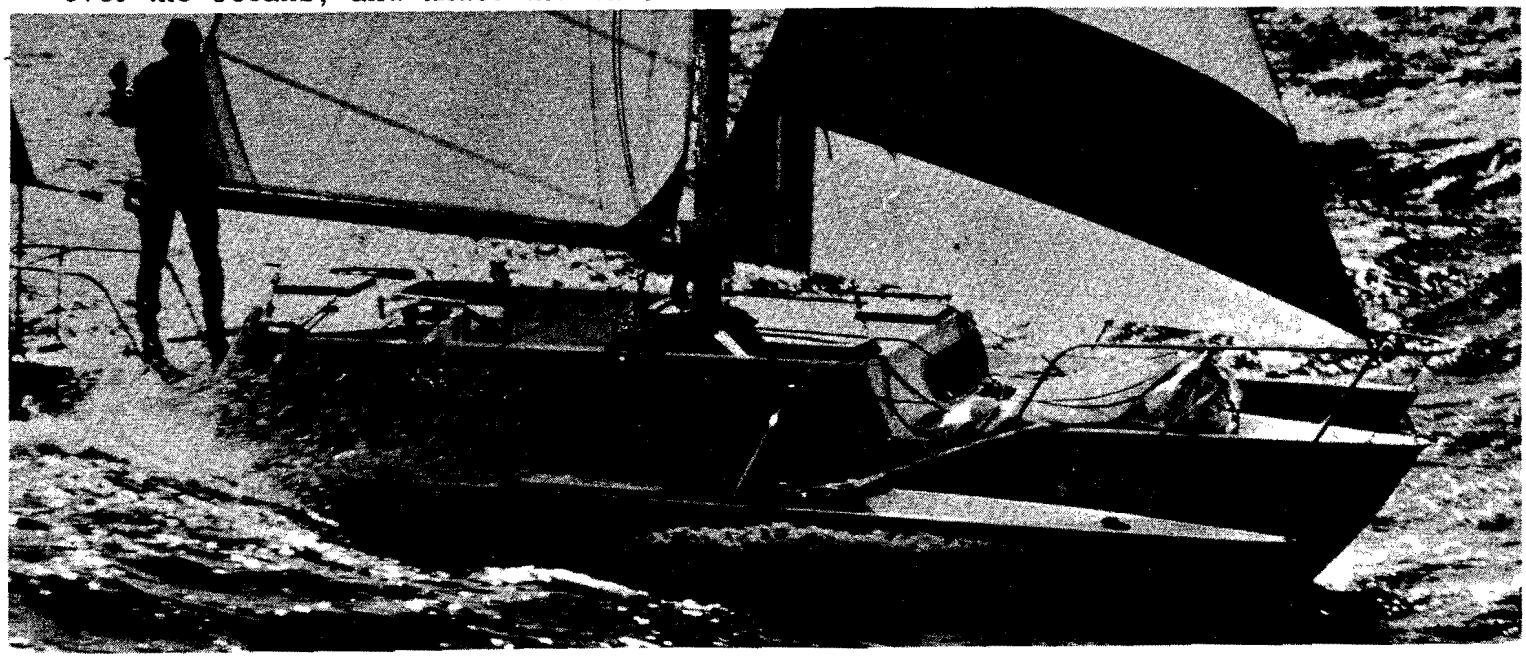
Sailing vessels are regarded as one of man's most lofty achievements. Their international importance to transport and communication has been lost now to nuclear propulsion and electronics, but their importance to individuals continues.

Many men are learning that ancient features can be combined into modern vessels. When combined by the hands of one individual builder-owner-man, that man gains a newfound freedom to move about the earth.

There is nothing new about a cutter-rigged yacht, or a retractable center-board. The Eskimo kayak has a 'midships cockpit; so do many classic cruising yachts.

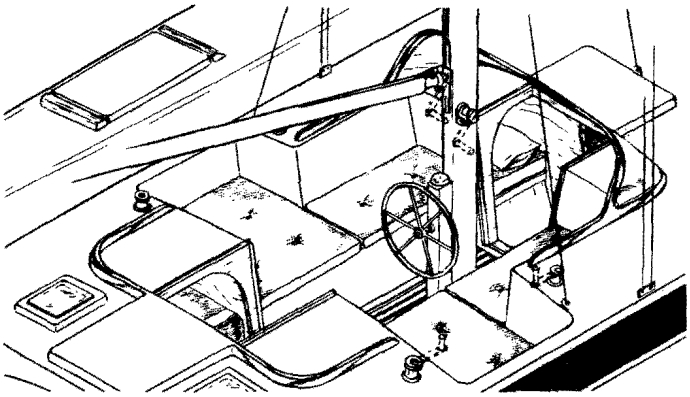
Asymmetric outriggers were developed in Melanesia before Christ.

But SEARUNNER trimarans COMBINE these features for the first time. Built by individuals from contemporary materials with modern technique, something new skates out over the oceans, and under the sun.

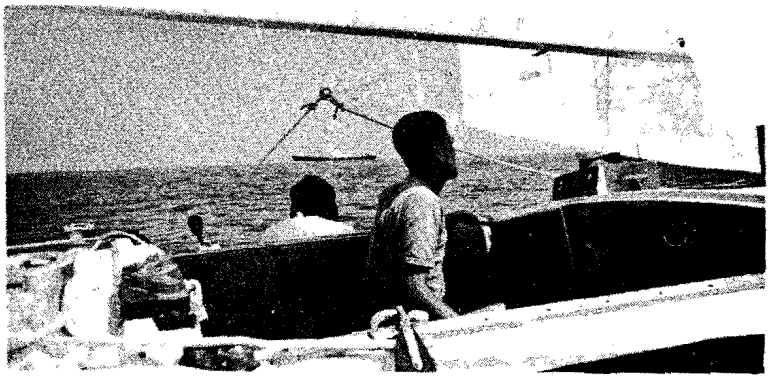


THIS IS SEARUNNER SAILING. A lone sailor rides the sterndeck of his wind powered surfboard - with cabins. Grooving the ocean, the boat steers herself by wind-rudder, as the rider contemplates a sail reduction. Bundled on the foredeck is his staysail. The larger headsail will be doused, and the staysail hoisted directly, without trading sails on a single stay. If, later on, the wind and sea increase further, he may reef the mainsail from within the shelter of the cockpit, and hunker-down.

THE CENTRAL COCKPIT

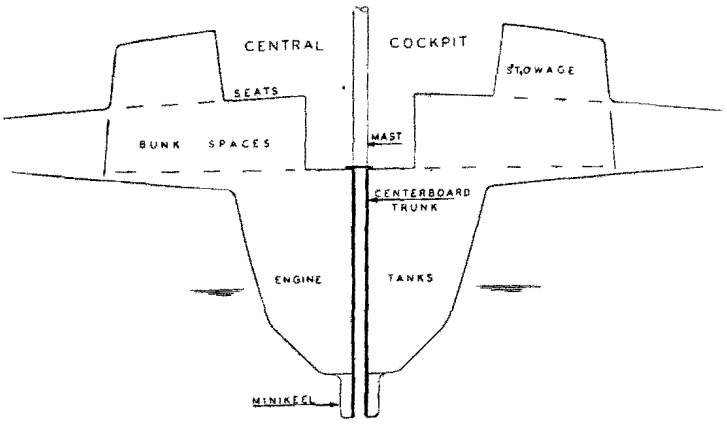


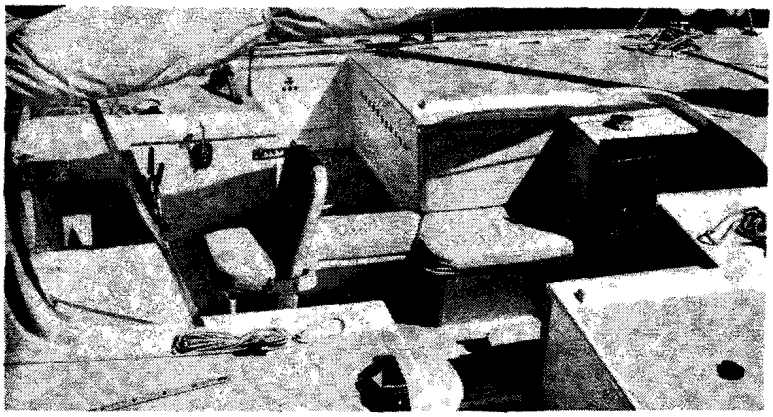
THIS COCKPIT gives a single pilot access to ALL the controls: halyards, sheets, roller-reefing and helm. The crew needn't leave this bastion to reach the mast for sail handling. From here, one has the best visual and sensual contact with his boat and its mediums.



MONITOR of this 25' SEARUNNER is the steersman's brain. Gathering information through the seat of his pants, the feel of the tiller, and the sound of the wind passing between the sails, he is the epicenter. Real sailors delight at this arrangement, where they can look up right into the "slot", and reach all controls at the same time.

Midships cockpits are often seen in cruising yachts, for good reasons. They are safer from waves washing in, and the crew falling out. Visibility is best in all directions - forward, aft, and up. Motion is least: the boat does not gyrate the helmsman, it gyrates around the helmsman. Engine, tanks, and heavy stowage is ideally located amidships also - for reasons of motion and control. Space for these is available beneath the central cockpit. Also, the center-board trunk does not interrupt the accommodation. NOW, a revelation. The cutter's mast may be located IN the cockpit.



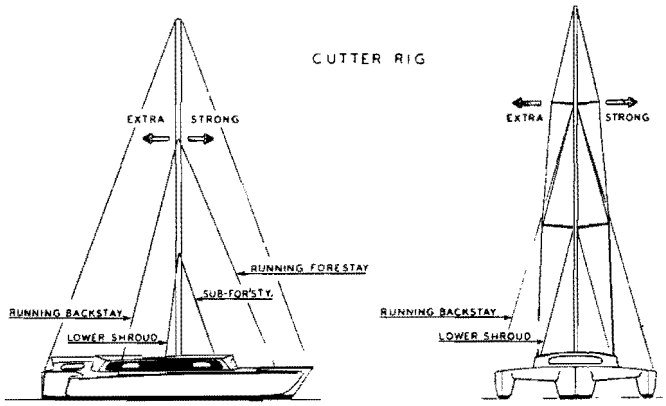


GREAT STRAIN at the mast step is widely distributed into the hull by the massive centerboard trunk and its bulkheads. The trunk also serves as a huge self-bailer for the cockpit. Space beneath the cockpit accommodates heavy stowage WHERE its weight belongs.

FORERUNNER SEARUNNER, the ketch-rigged BROWN 41, enjoys the safety and comfort of a central cockpit, but the crew must leave this nucleus to gain access to the masts.

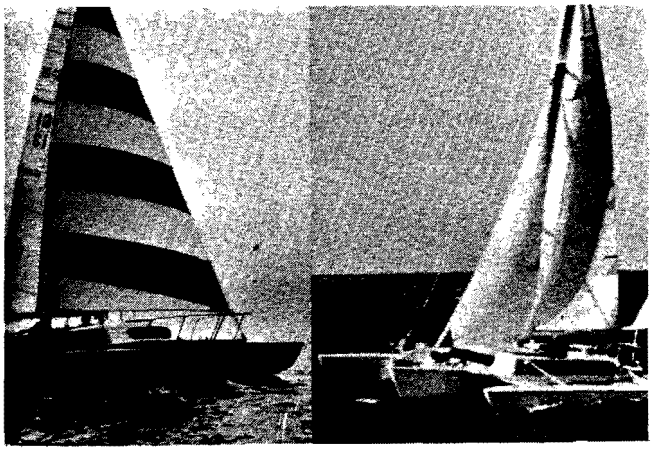
THE CUTTER RIG

A cutter is a sailboat with one mast amidships. The type is well regarded, for it is the strongest of all rigs; very versatile, and very beautiful. In central cockpit trimarans, great things happen with the cutter! The crew, even the helmsman himself, can reach the halyards and reef the mainsail without leaving the cockpit!

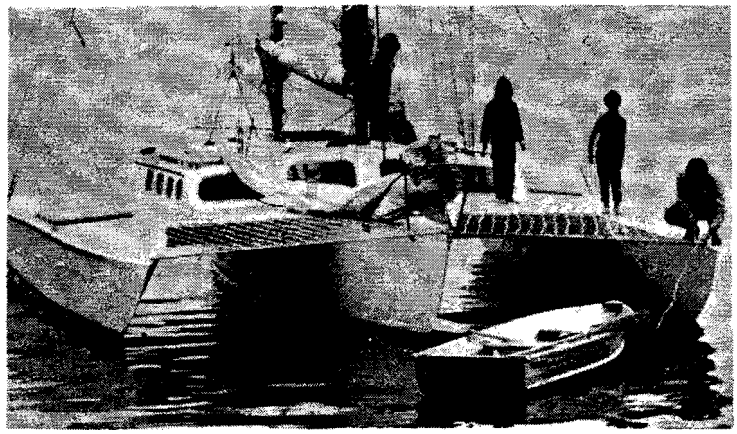


ADDED STRENGTH in the cutter is developed by "running stays" on the mast where strain is unanswered in other rigs. These runners may be released in all but heavy weather. The trimaran's great beam allows wide scope for boom between running backstays.

CUTTER'S BEAUTY is seen, felt, and heard. Here the genoa and staysail are used in concert on a light-airs reach, matching sail area to conditions. Wide platform allows efficient use of sail overlap not possible in monohull cutters.

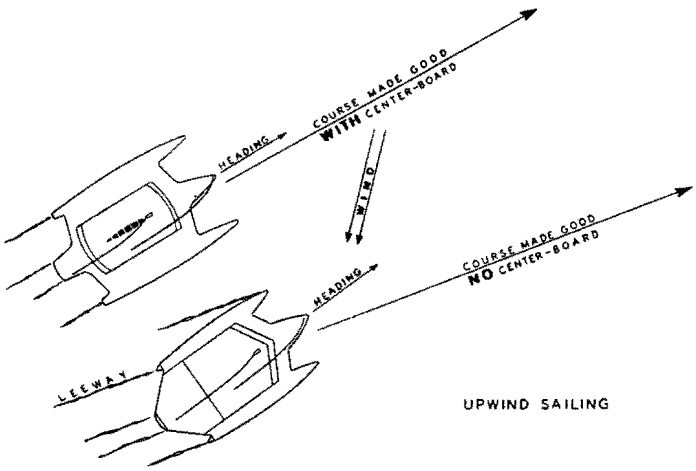


MATCHING SAIL area to wind force, the cutter is most versatile. As wind increases, huge light-airs genoa (left) may be dropped, and small staysail (right) hoisted without CHANGING sails on stays. If wind increases more, mainsail can be reefed without leaving cockpit. Intermediate "mule" genoa is shown inside cover. Because of cutter's COMBINATION with central cockpit, fewer crew are needed for safer, simpler sail-handling.

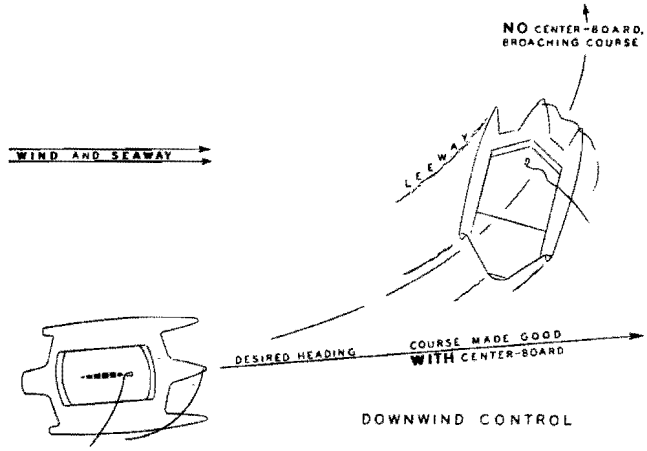


FIRST BROWN-design (1963), this 38' cruiser is a fine performer, but is hampered by the ketch's small sail area in light winds. The mizzen boom obstructs a self-steering vane. The cutter may carry greater area in fewer sails, reduce it more readily, and have the stern clear for the inclusion of SEARUNNER self-steering.

THE MULTIPURPOSE CENTER-BOARD

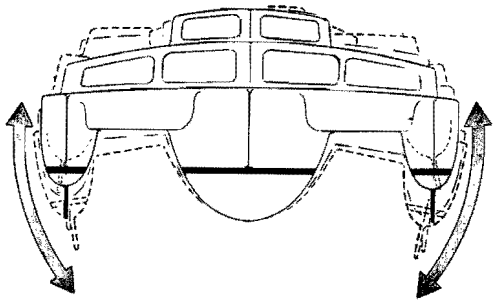


UPWIND SAILING

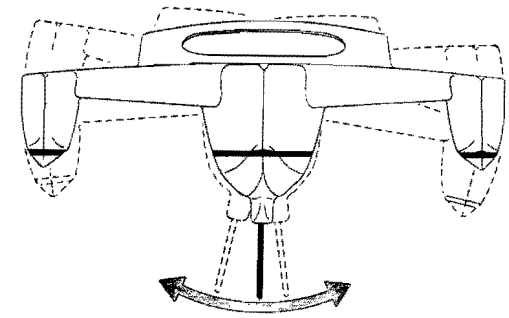


DOWNWIND CONTROL

A center-board is a retractable fin-keel which, when retracted, yields a shallow, beachable boat, and when extended, serves MANY purposes. A common misconception is that the board serves only to improve upwind sailing. In trimarans, it also has a profound effect on steering qualities - maneuvering and downwind control. More than any other single feature, the center-board is the difference between trimarans that are cranky, and those that are sea-kindly. Safety on the ocean, ease of handling, and COMFORT do not depend on cabin space alone.



NO CENTER-BOARD CAUSES "SNAP-ROLL" MOTION

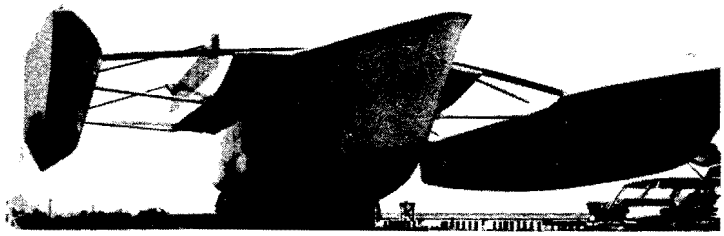


MOTION IS DAMPENED WITH CENTER-BOARD

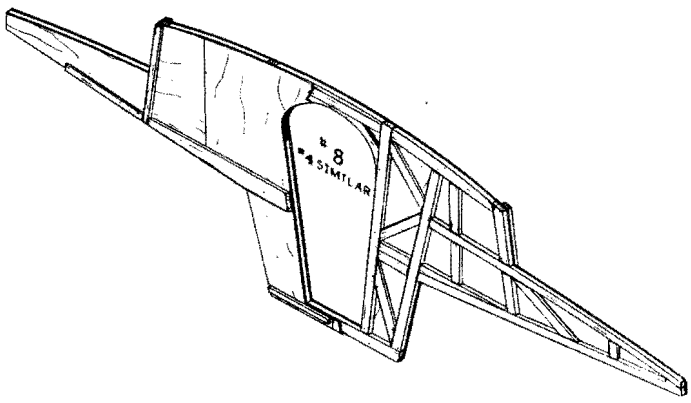
FINS OR "DAGGERS" in the floats are a reasonable substitute for center-boards to reduce leeway. But when the boat rocks, the fins let it. Decentralized weight, like float cabins, amplifies motion. The early BROWN-design below has no center-board. She's hot, and handy; but she finds herself disadvantaged in choppy seas with light wind. Un-dampened motion dampens crew spirit, and shakes the breeze from the sails.

A VERTICAL HYDROFOIL, the center-board is dynamically locked into deep, quiet water. It restrains the outriggers' response to commotion at the surface for comfort in the cabin and steady power in the sails. The experimental trimaran below demonstrates the value of a deep center-board. A 26-footer, she sails, and she feels bigger than she is.

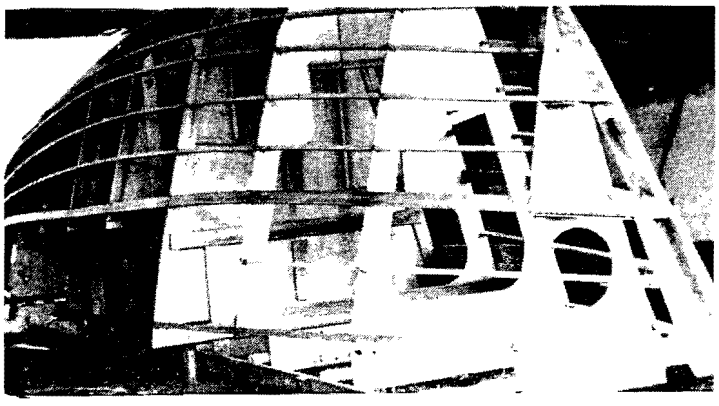
HULL FORM & CONSTRUCTION

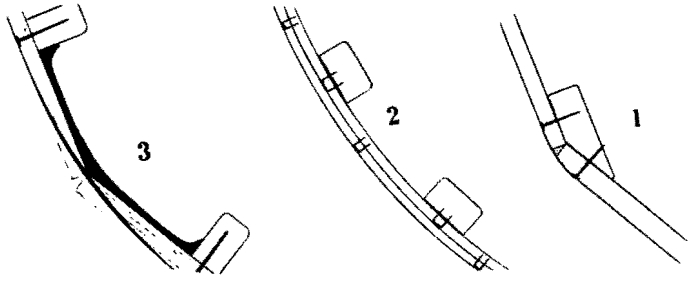


SEARUNNER hull form is a compromise. Racing trimarans have narrow hulls. "Cruising" trimarans (Roomarans) have a more burdensome shape. But performance is crucial in real cruising. The SEARUNNER form is a careful balance. It will carry realistic cruising payloads at a seaworthy gait, and still respond quickly to the rider's commands. A SEARUNNER's rider may also be its builder. His boat may not have the fastest theoretical shape, but it is practically the easiest to build, and far from slow. Consider all the requirements: performance, load carrying, strength, cost, longevity, availability of materials, and ease of construction. SEARUNNERS fit the most the best . . . a good compromise.



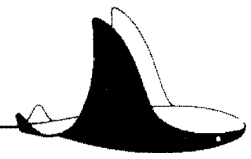
MAIN-STRENGTH BULKHEADS replace the earlier cross-arms with greater strength-per-weight and allow stand-up passage without ducking under beams. Relieved of mast-step strain, these sandwich diaphragms join with other full-width members under the cockpit to give SEARUNNERS strong wings.





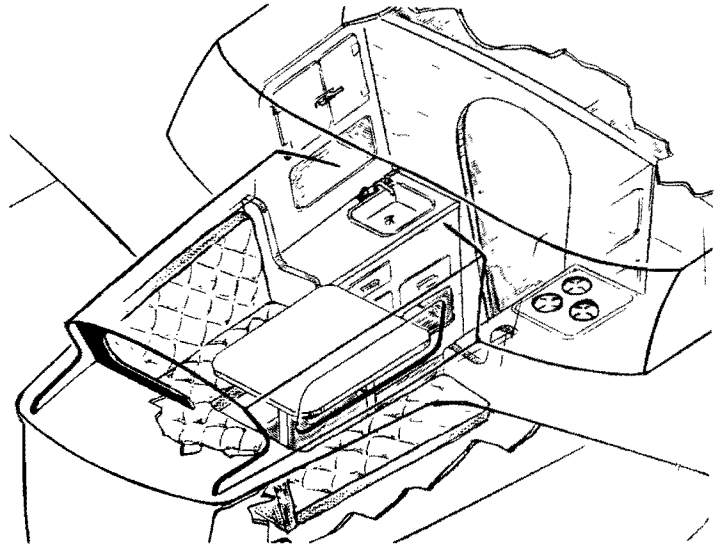
PLANKING METHODS: #1. Early "V"-bottom trimarans had hard-to-shape chine logs with little outside radius and large wet surface. #2. Molded plywood yields fastest shape but slowest building at greatest cost. Like #1, there is a troublesome center-line seam which complicates installation of center-board, rudder and prop shaft. #3. Good compromise is SEARUNNER "Molded-Chine" construction. Seams in the planking are made with fiberglas inside and out. Fiberglas makes a compatible, long-lived composite with plywood planking. Expansion-contraction coefficient of plywood planking is more like that of fiberglas than of lumber chine and keel stringers. "Molded—chines" have no "hard—spots" where failure starts, and there is a generous radius. The arrangement of the chines yields no center-line seam (upper left) to interfere with center-board, rudder and prop shaft. The planking thickness may be varied: thick strong bottom, lighter sides. Fabrication is simplified by fewer frames and stringers (lower left) because the builder does NOT have to MAKE THE PLYWOOD ON THE BOAT as in #2. And, the seams are made with a plastic material, which always fits! Testing shows adhesion in these seams to be stronger than the wood itself. "Molded-chines" have survived rough roads on a trailer, rough seas on the ocean, and beaching in the surf.

SEARUNNER INTERIORS

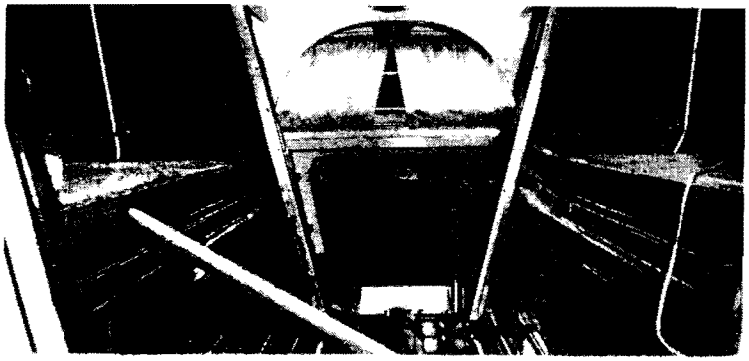


Should a sailboat be a vehicle, or a domicile? Do you want to go places, or stay places? SEARUNNER trimarans are not designed around an accommodation. They are designed as sailboats, with accommodations fitted in. A seamanlike interior is specialized: it is designed for stopping off, AND moving on. Each feature has its separate use, its separate space. SEARUNNER interiors have more separate-use spaces. A place for everything, not everything in one place.

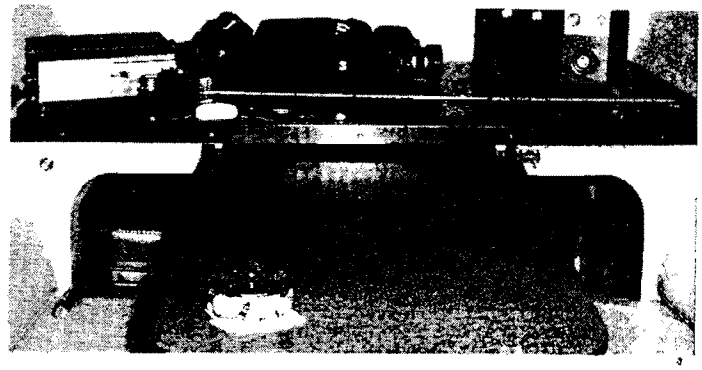
MAIN SALON of early BROWN-design appears comfortable and spacious. Lots of room for cooking, eating, sleeping, navigating and sitting around. But imagine all this happening at the same time while trading watches on a two-week passage?



SEARUNNER STERNCASTLE puts cooking and eating together, by themselves. Dinette is at the end of the boat; nobody has to pass through as at left. The off-watch can splice the mainbrace in the sterncastle, AND snore in the sleeping-cabins with a minimum of overlap.

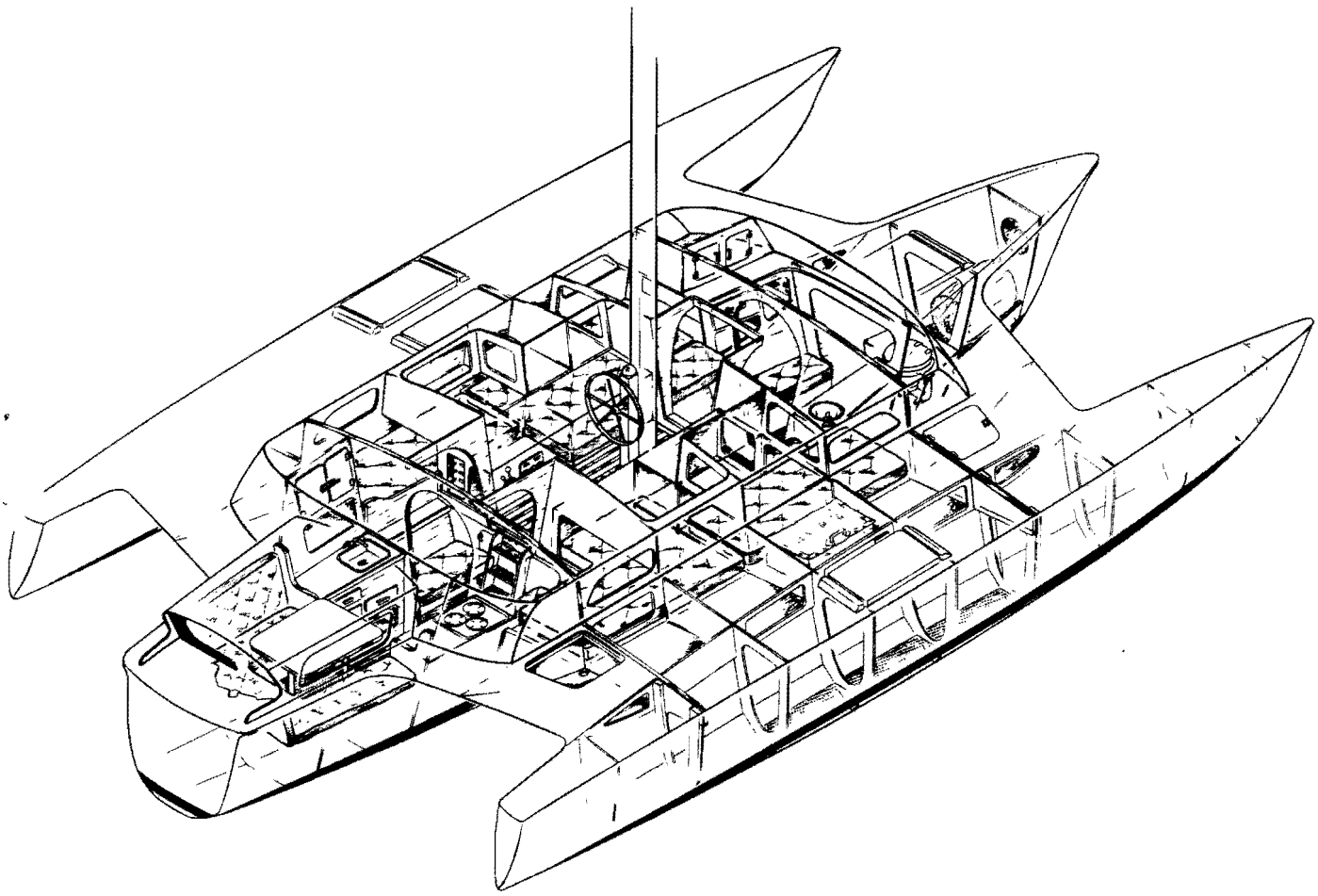


LOOKING THROUGH the cockpit of a 25' SEARUNNER reveals that "separate-use spaces" does not mean a chopped-up interior. With hatches open, one can see - and pass without ducking under beams - the entire length of the accommodation.



FIRST CLASS quarters are, by wise tradition, located in the stern. The noise of the water and the ruckus of the deck-watch goes on up forward, while passengers ponder the wake with secure comfort from the sterncastle lounge.

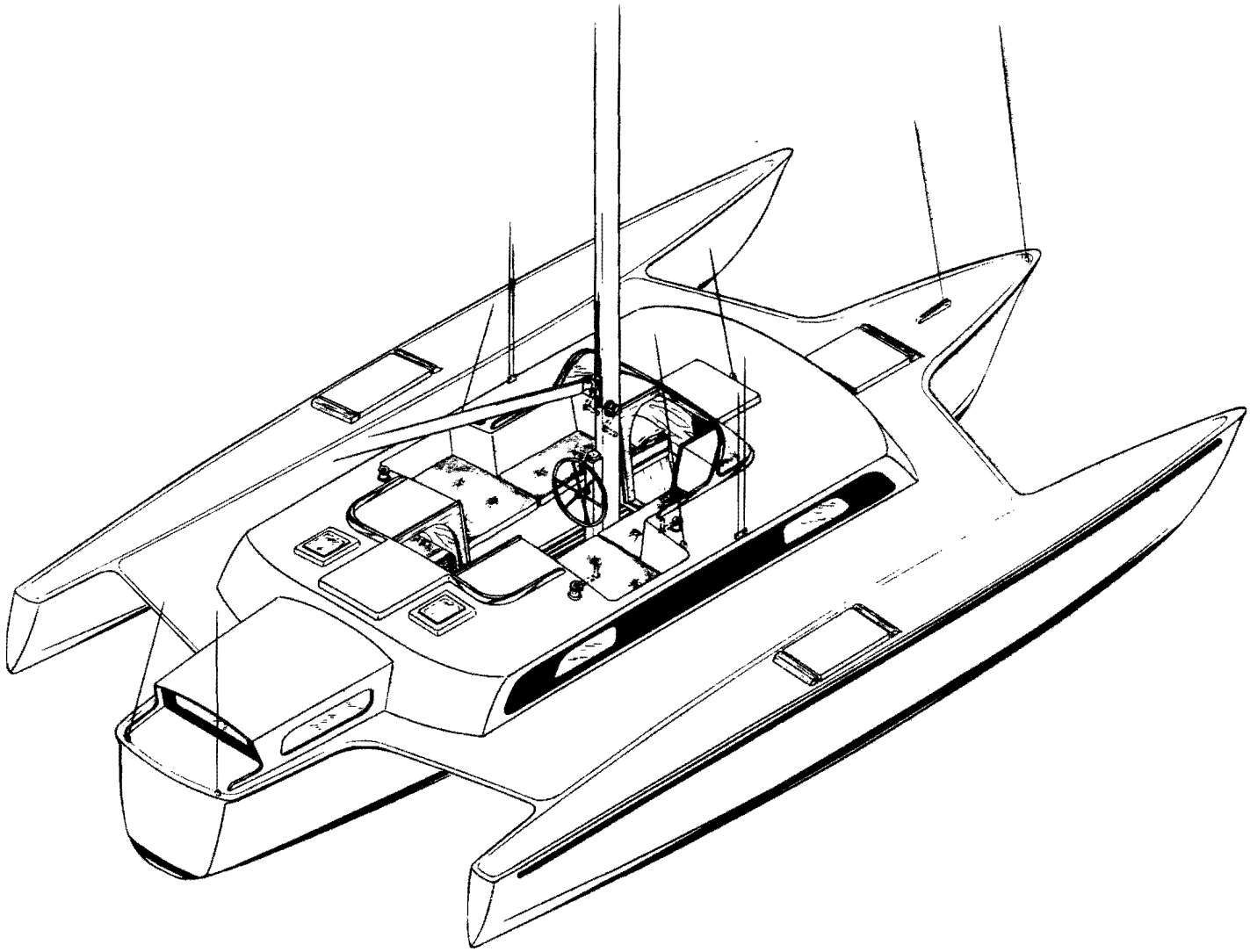
"BROWN 37" SEARUNNER



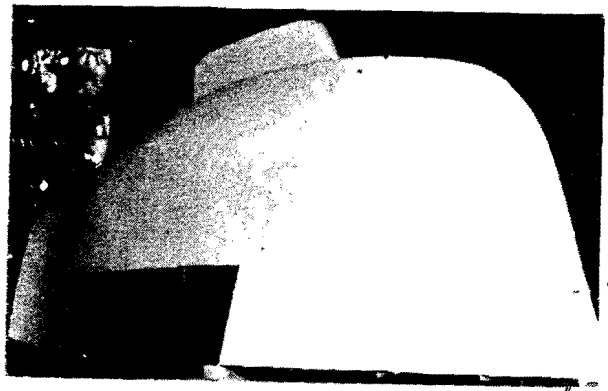
Wing bunks in the Thirty-Seven are arranged around the cockpit, with the lower half of the bunks partly under the cockpit seats. All bunks have sitting headroom; all may convert to doubles by raising a settee panel. Note the life-raft compartment in the wing, which has hatches both on deck, and in the tunnel. Access to other deck-stowage compartments is provided to keep anchors, line, and bosun's clutter out of the hulls.

"BROWN 37" SEARUNNER

A bus-driver sits behind the wheel, but a sailor sits beside the helm. The reason is that when the helmsman faces athwartships (sideways) he can see aft as well as forward. A bus advances on the static highway, but a seaway advances on a boat, often from behind. The helmsman must be able to see overtaking waves to do his job. While steering from this cockpit, he can reach all the control handles, which show here as dash lines on the mast and beside the deck-alley.

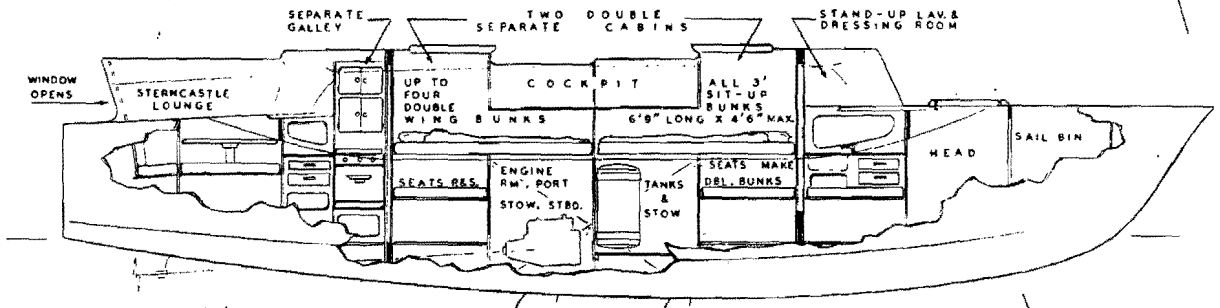


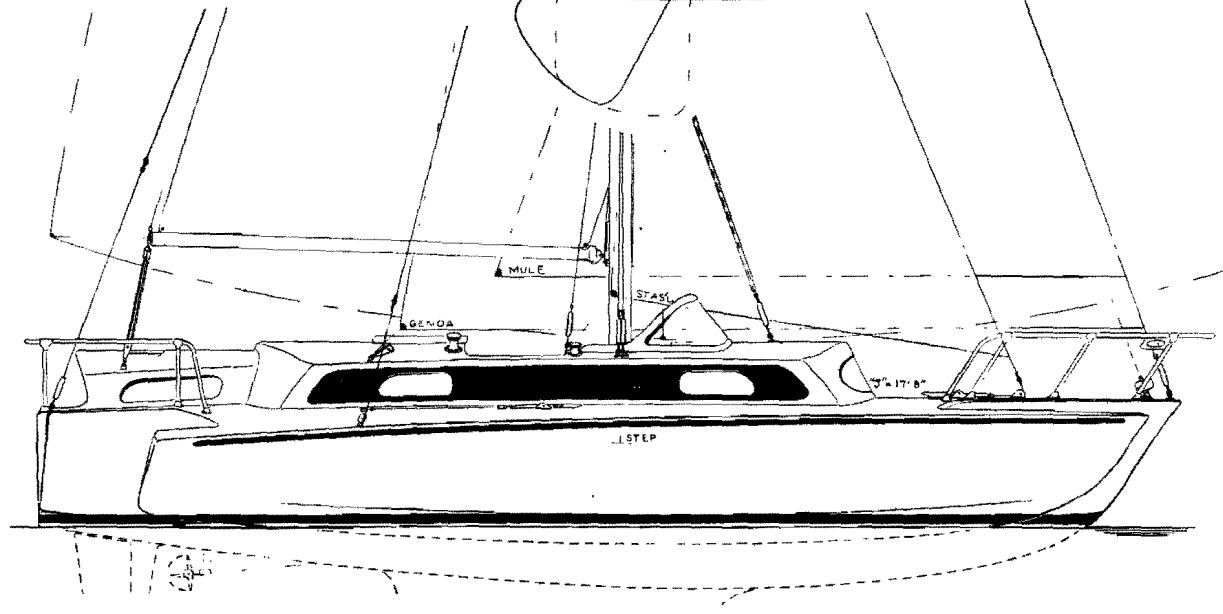
"BROWN 37" SEARUNNER



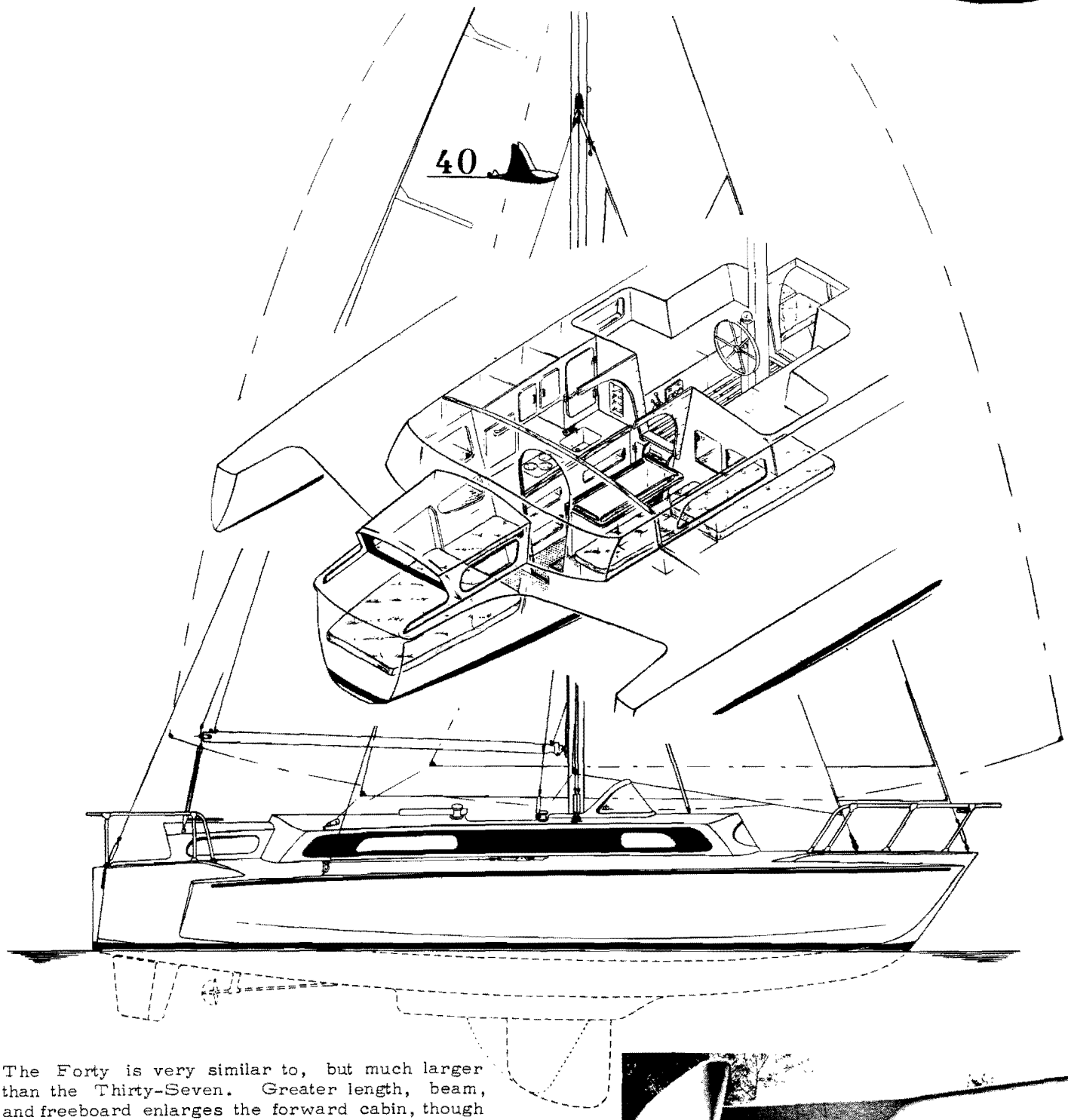
The Thirty-Seven is designed to be the smallest family live-aboard cruiser. It is the most compact SEARUNNER that has everything. Look at the NUMBER of features: two double PRIVATE cabins with bunks for up to eight; separate galley and lounge; separate dressing-room with shower and head; inboard engine; and SEARUNNER cockpit with the control layout for handling by two persons.

37

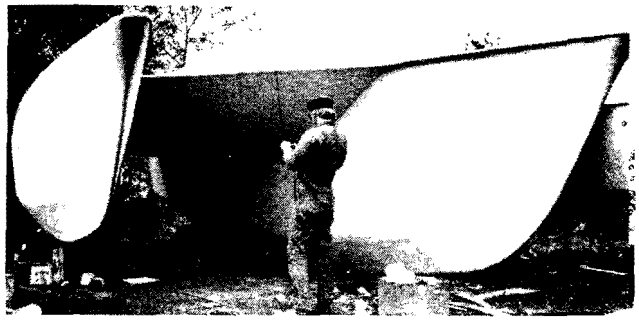




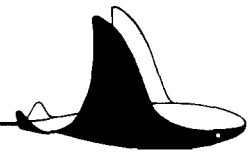
"BROWN 40" SEARUNNER



The Forty is very similar to, but much larger than the Thirty-Seven. Greater length, beam, and freeboard enlarges the forward cabin, though it is arranged as in the Thirty-Seven. Aft of the cockpit, there is a grand salon, with a master's cabin in the stern. Optionally, the sterncastle may contain a galley-lounge as in the Thirty-Seven, with a generous stateroom or elective features between sterncastle and cockpit.

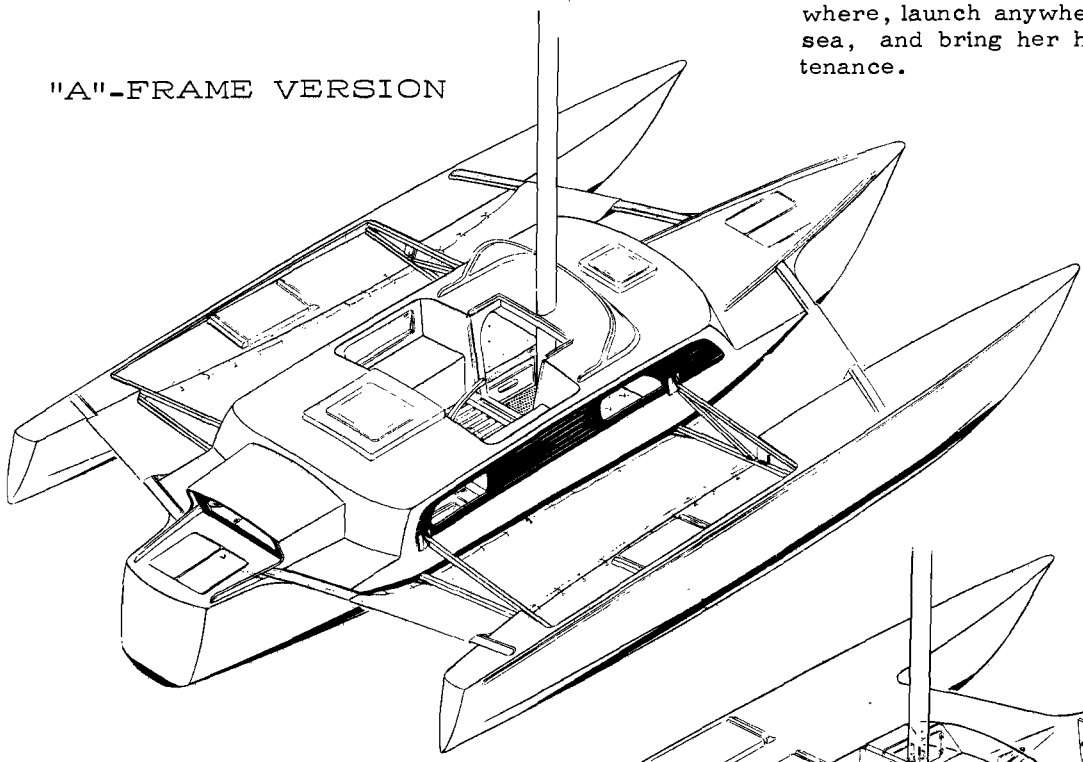


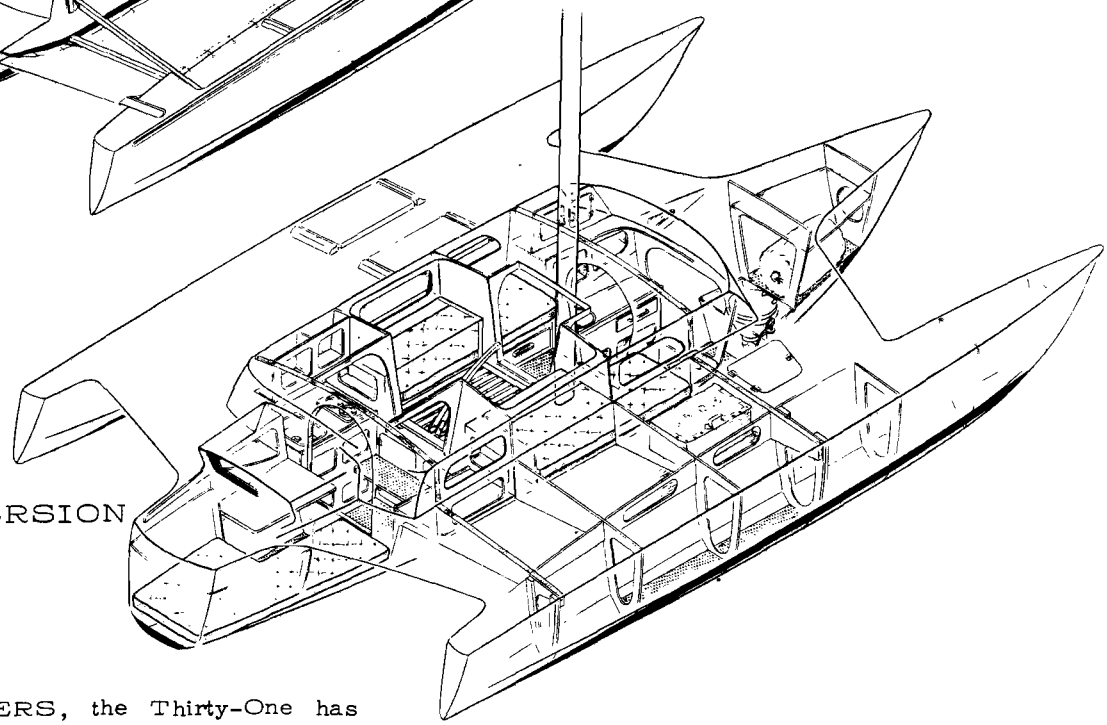
"BROWN 31" SEARUNNER



"Responsibility" may seem a strange term as applied to boats. But think of what you will owe to one you've built yourself! The smallest size that meets your needs will reduce that obligation. And the optional A-frame version, which disassembles for transport, will allow you to build anywhere, launch anywhere, transport over land or sea, and bring her home for storage and maintenance.

"A"-FRAME VERSION



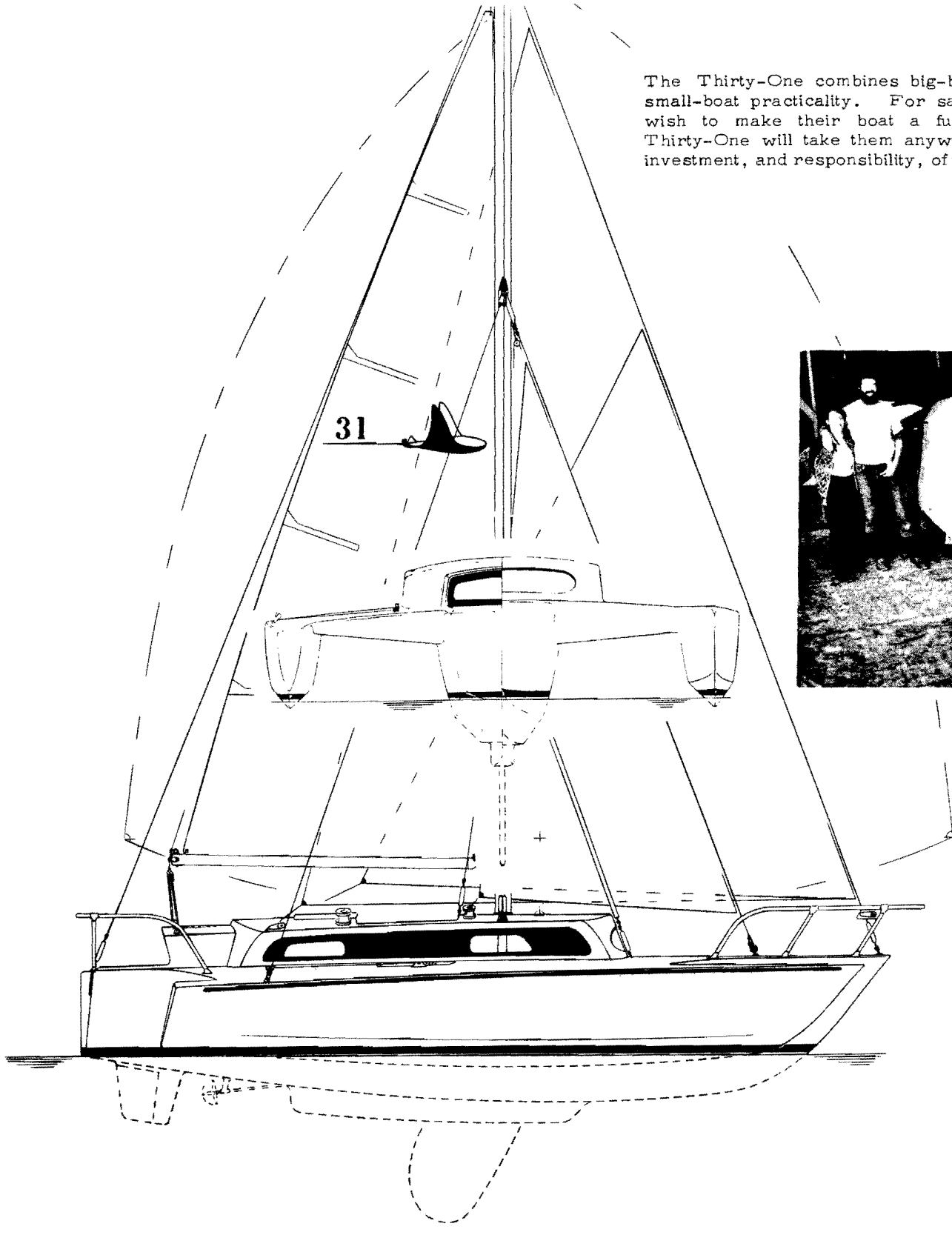


FIXED-WING VERSION

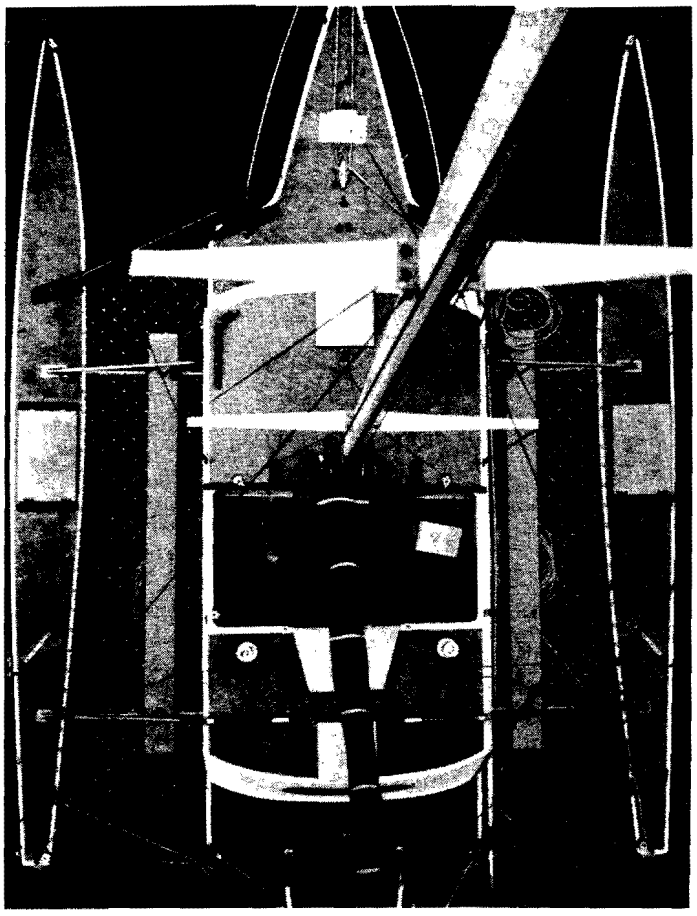
Like all SEARUNNERS, the Thirty-One has sit-up headroom in the wing-bunks. She sleeps four in two private cabins; has a private stand-up dressing-room and head; and a generous galley aft. Seating is arranged by converting the after double bunk and/or by affixing a portable table to the mast in the forward cabin.

"BROWN 31" SEARUNNER

The Thirty-One combines big-boat features with small-boat practicality. For sailors who do not wish to make their boat a full-time home, the Thirty-One will take them anywhere with half the investment, and responsibility, of the Thirty-Seven.



"BROWN 25" SEARUNNER



THE SEARUNNER COMBINATION of features first appeared in this remarkable craft at left. Her design concepts have proved so inherently right that sufficient confidence was gained by the designer to produce other SEARUNNERS.

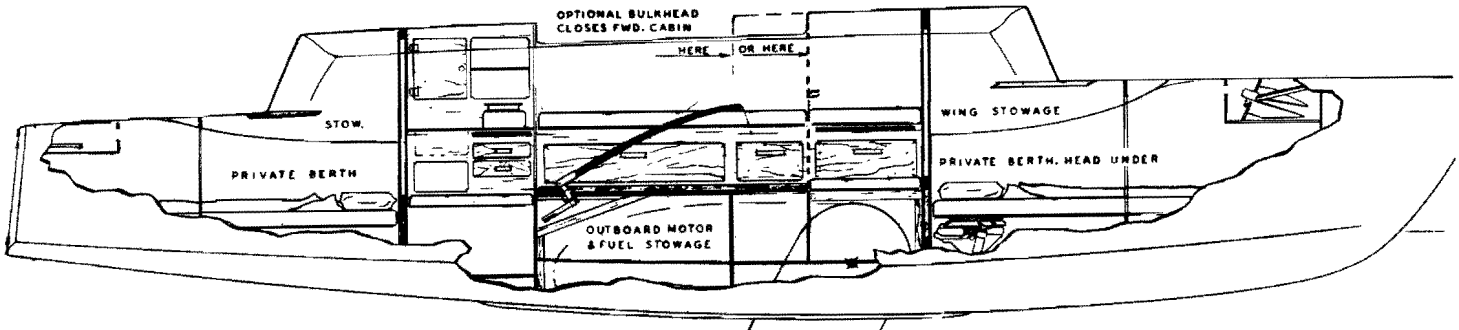
The same boat pictured on the front and inside cover, she has, in the hands of the man who built her, achieved a noteworthy single-handed passage from California to Hawaii. Heavy conditions were encountered in the November crossing which tested the worth of more than the craft. The boat survived because of the man.

This is an appeal to multihull enthusiasts. Realize that design developments are not all that it takes. A designer is nothing without a builder. And a boat is nothing without a sailor.

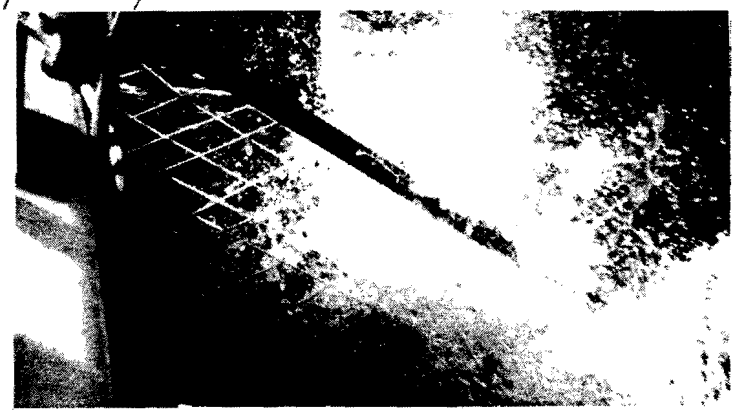
SEARUNNER trimarans may represent a new maturity to the developmental double-outrigger; but sending the masses to sea in sailboats is sobering.

Yet, the sea IS for sailing. Most trimaran people are newcomers to sailing. Unlike beginning "yachtsmen", they do not, as a rule, regard their new undertaking as a sport. It is to be a way of life. Just learning to sail a boat is like taking up golf. One may, or may not achieve proficiency.

But seafaring is no game. Begin with the understanding that, before heading for Tahiti, you will need to know your boat. You don't sail it, you're not in it, or on it. You WEAR it. Then you make a few short cruises, LIVING with the boat. You'll feel yourself adapting. Metamorphic adjustments will occur within you and you'll know when it's time.



THE TWENTY-FIVE'S interior has two single bunks, a cuddy-cabin forward of the cockpit, and a separate galley aft. For weekending, the cockpit converts to a large double bunk under the shelter of a boom-tent. This versatile interior gives the Twenty-Five the greatest accommodation for the best performance.



THE A-FRAME outrigger beams have been relentlessly tested (right) and found to be absolutely rigid, even after thousands of miles of ocean sailing.

"BROWN 25" SEARUNNER

SEARUNNER SAFETY

That trimarans are safe is unquestionable. That is, agreeing that "safe" is applied to seafaring to its real degree. Notwithstanding that outriggers were the first safe seafaring vessels known to man, the safety record of trimarans during their accelerated revival (the last ten years) is incredibly good.

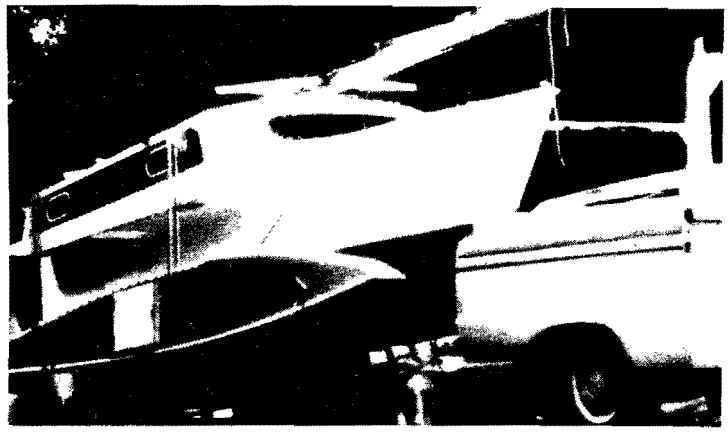
Consider this fact: without the aid of "professional" designers and syndicate financing, no other period in yachting history has been marked by such drastic mistakes and such shining achievement.

The achievement has been that the boats themselves have come from such boyish contraptions through to something like a SEARUNNER. This, in so little time, with so little danger. And the mistake has been that, somehow, the desperately interested public has come to believe that it must either accept, or reject, the dogma that you, Joe Water, with no experience and a brazen attitude, can be borne upon the ocean by THIS boat and no other.

The writer was involved with the first new trimaran sailings of the late Fifties and, in retrospect, can relate that brazenness was necessary then. When I think of the rudimentary trimaran I first took to sea, I recall that my gray understanding of the vessel was overcome by raw enthusiasm. But now we know what makes a good trimaran, and how to understand it. The beginning was the best, but now we see that the raw part of enthusiasm is foolhardiness. I'm glad to say the last of that is leaving now.

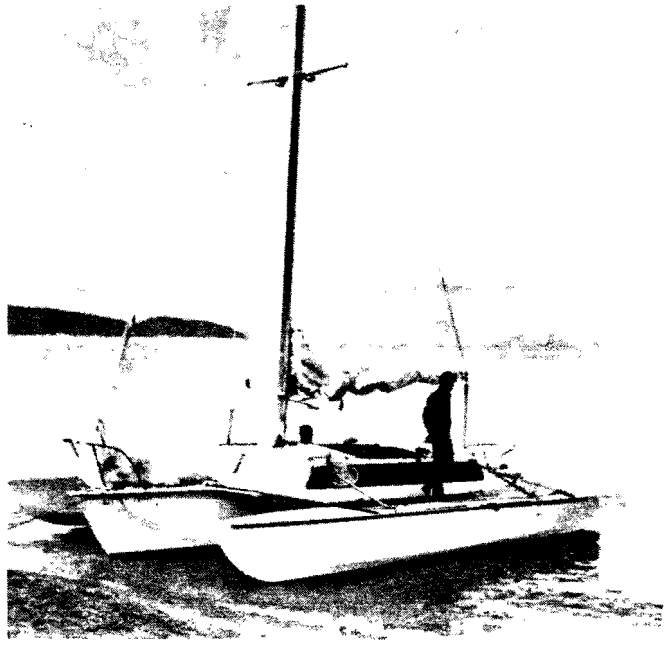
So the boys, and their attitudes which catalyzed the movement have matured. So have their contraptions. Those boats that were such extreme statements of the designer's freedom (and/or the builder's fantasy) are still tied up in the harbors, growing beards of seaweed. But those with a few of the right rudiments were able to sail out across the ocean. Though some have vanished, many have not. SO MANY, in fact, that wrong trimarans, even with reckless crews, have got to be pretty right boats. The right trimaran with the right crew has got to be safe.

I talk about "facts" as though they were statistics; but the reader can tell that I am speaking mostly from what I have come to believe in ten years of intense exposure to multihulls and their mariners. We are on to something good, and there's lots of evidence to prove it.



TRAILERING the Twenty-Five is accomplished by folding the A-frame. One bolt in each "A", and four bolts in each of the four wooden "cross-spars" are removed to allow folding. Note that the axis for folding is at the top of the cabin, rather than under the wing. This causes the floats to hang higher, above the trailer's wheels, while retaining adequate overall sailing beam - 16'5". (Welded A-frames in the Thirty-One do not fold, but remove for disassembly.)

VERSATILITY is the result. Here is a boat which will trailer, and also sail the oceans! Not only will it fit the highway and sail deep water, but shallow water as well. The sloop-rigged BROWN 25 below pulls up on a white beach in the Gulf of Siam.

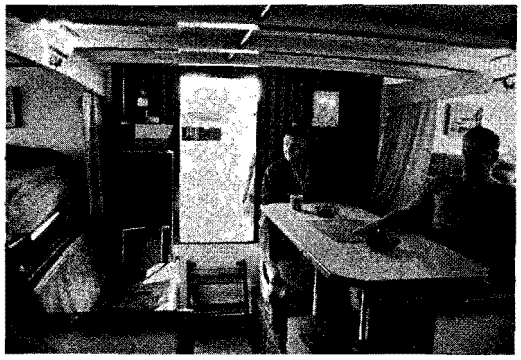


TRIMARAN DESIGNS

from the board of

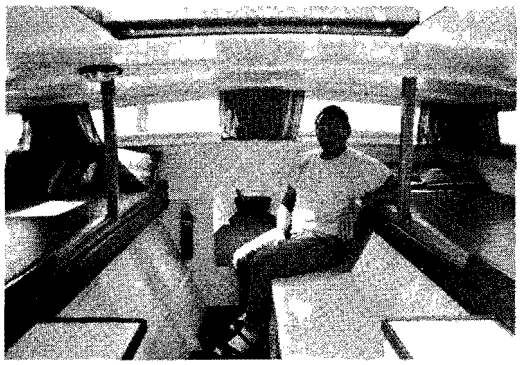
N.A. CROSS

INTERIORS

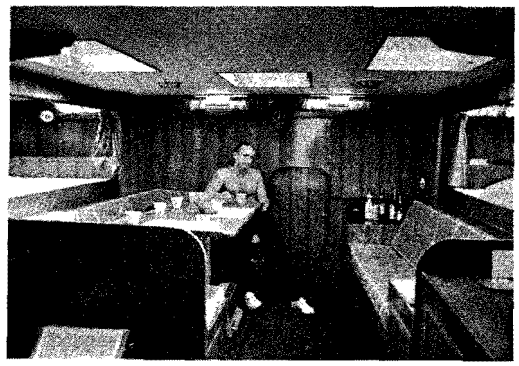


Cross 42

Cross 38



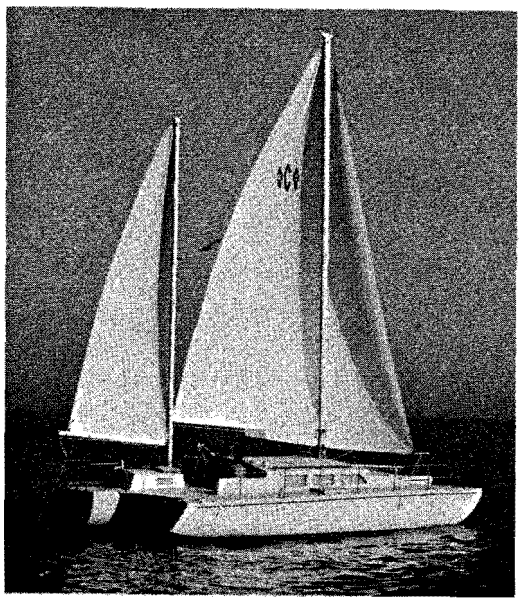
Cross 26



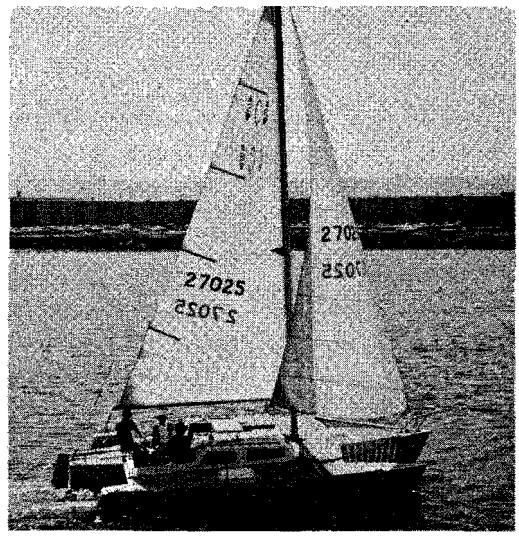
Cross 46

Interiors shown in photos and drawings are suggested layouts. Builders may modify interior to suit their personal requirements (modification to major structure are not to be made without approval of the designer).

COMPLETED BOATS



Cross 38



Cross 26

Winner 1970 Newport-Ensenada race, Multi-Hull div.

DESIGN FEATURES

NON-BALLASTED FIN KEEL on the main hull

A feature introduced on the first CROSS 24. It gives the trimaran the ability to come about easier, point higher and have good directional stability.

With the long fin keel and a ketch rig the trimaran will be a very easy boat to sail. By proper trimming of the sails the helm can be almost self tending. Self steering devices can be readily adapted.

The fin keel also protects the rudder and propeller from damage by floating debris. It will not be susceptible to damage as in designs with dagger boards, especially designs with the dagger boards in the floats.

The fin keel is strong enough to support the boat should beaching become necessary, however the floats should be supported to keep the boat level.

Maintenance problems normally associated with centerboards and dagger boards are eliminated.

SHALLOW DRAFT

Even with the fin keel the draft of the CROSS TRIMARANS is not excessive when compared to conventional boats.

For persons requiring a shallower draft trimaran the depth of the fin keel on the main hull may be reduced and fin keels added to the floats. The draft of the fin keel on the main hull should be enough to protect the rudder. Rudder draft may be reduced 3 to 6".

SHALLOW DRAFT FLOATS

The floats are designed to be emersed only a few inches to reduce the wetted surface. This feature improves the light weather performance, permits the trimaran to come about easier and have a comfortable ride. As the wind increases and the trimaran begins to heel, the lee float quickly builds up buoyancy and counteracts the heeling.

Trimarans with deeply immersed floats tend to be stiff and will react faster to a choppy sea causing an uncomfortable motion (snap roll).

LARGE LEVEL DECKS AND CABIN SURFACES

The large level decks with a minimum amount of curve will allow the safe handling of sails and anchors.

Sloping foredecks, as seen on some of the flush deck types, can make sail changing and anchoring a difficult and uncomfortable task, especially in rough weather.

TRUNK CABINS

The trunk cabins on the CROSS trimarans have less windage and freeboard forward than the flush deck types. Coming about will be easier, and handling when docking in a strong side wind will not be as difficult.

High freeboard forward also makes it difficult to reach the deck when leaving the dock. The opposite is true when approaching the dock.

LOW HEELING ANGLE

As the trimaran heels only a few degrees, living, working and sleeping aboard becomes an enjoyable experience. This is especially true in the galley when preparing meals. Women appreciate these comforts. How many men have you known who wanted a sailboat but their wives objected because of the heeling on conventional boats? Many men are now enjoying sailing because they have a boat their wives can enjoy too.

DEEP, NARROW, SIMPLY CONSTRUCTED BEAMS

These beams have great strength for their weight and take up very little of the cabin space. The beams are relieved for easier passage. Relieving the beams requires that it be attached to a strong bulkhead. The CROSS TRIMARANS have these bulkheads.

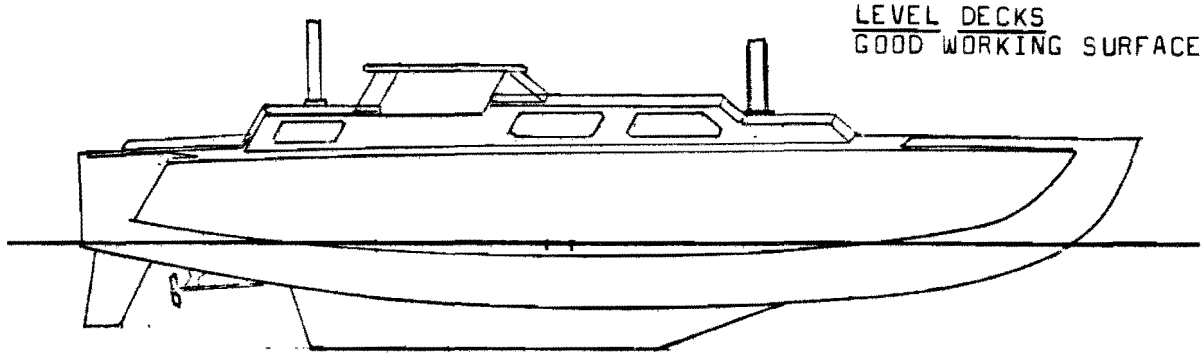
HULL SHAPES

Both the HARD CHINE (sheet plywood) and ROUND BOTTOM (double diagonal strip plywood) hulls are used.

Masts are simply supported on the deck and require no spreaders.

TRIMARAN DESIGN STUDY: DECKS and UNDERWATER FEATURES

LEVEL DECKS
GOOD WORKING SURFACES



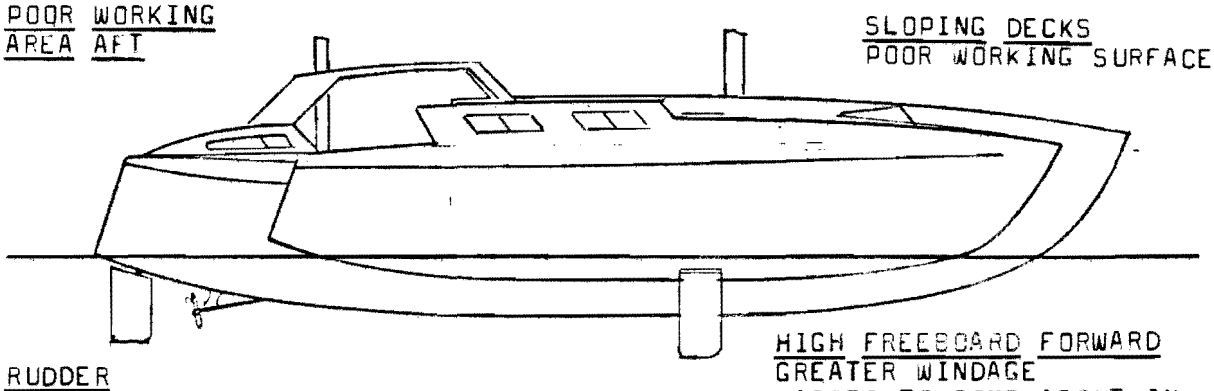
LONG FIN KEEL
PROTECTS PROPELLER AND RUDDER
GREATER DIRECTIONAL STABILITY
BETTER POINTING ABILITY
COMES ABOUT EASIER

LARGE AREA SPADE RUDDER
FOR POSITIVE CONTROL

CROSS 42 TRIMARAN

POOR WORKING
AREA AFT

SLOPING DECKS
POOR WORKING SURFACES



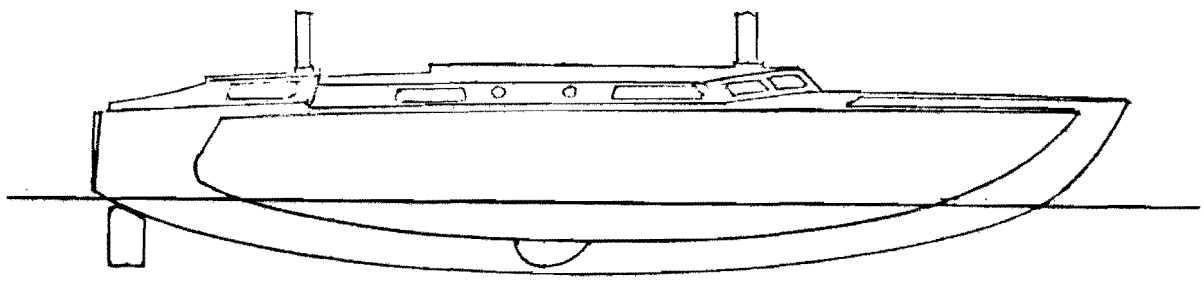
HIGH FREEBOARD FORWARD
GREATER WINDAGE
HARDER TO COME ABOUT IN
HIGH WINDS
GREATER DISTANCE FROM DOCK

RUDDER
GREATER DRAFT THAN MAIN HULL
SUSCEPTIBLE TO DAMAGE

DAGGERBOARDS
SUSCEPTIBLE TO DAMAGE
MORE MAINTENANCE

SHORT FLOAT LENGTH
MORE WETTED SURFACE

FLUSH DECK TRIMARAN



DEEPLY IMMERSED "V" FLOATS
GREATER WETTED SURFACE

SMALL AREA RUDDER
NO PROTECTION
POOR CONTROL

FLOAT FINS
NOT TOO EFFECTIVE
SUSCEPTIBLE TO DAMAGE

EARLY POPULAR DESIGN TRIMARAN

COMMENTS ON SHALLOW DRAFT AND FLUSH DECKS

Shallow draft is a desirable feature to have on any boat, It is a feature that has beem too highly stressed on some multihull designs.

A multihull is a sailboat and whenever you use sails you need a sufficient amount of lateral area (keel) in the water to counteract the sail forces. If there is not enough area or if it is not deep enough the boat will make a great amount of leeway and will have a weather helm.

The slower cruising multihulls need more area than the light racing designs.

If you are considering a shallow draft multihull be sure to get ALL the specifications. The design BELOW the waterline is just as important as above the waterline.

Some trimarans have been advertised as having a shallow draft, and the main hull does, but the rudder extends down BELOW the main hull! This is a dangerous situation as the rudder will be the first part of the boat to hit when sailing in shallow water. The rudder could be damaged and the boat hard to control.

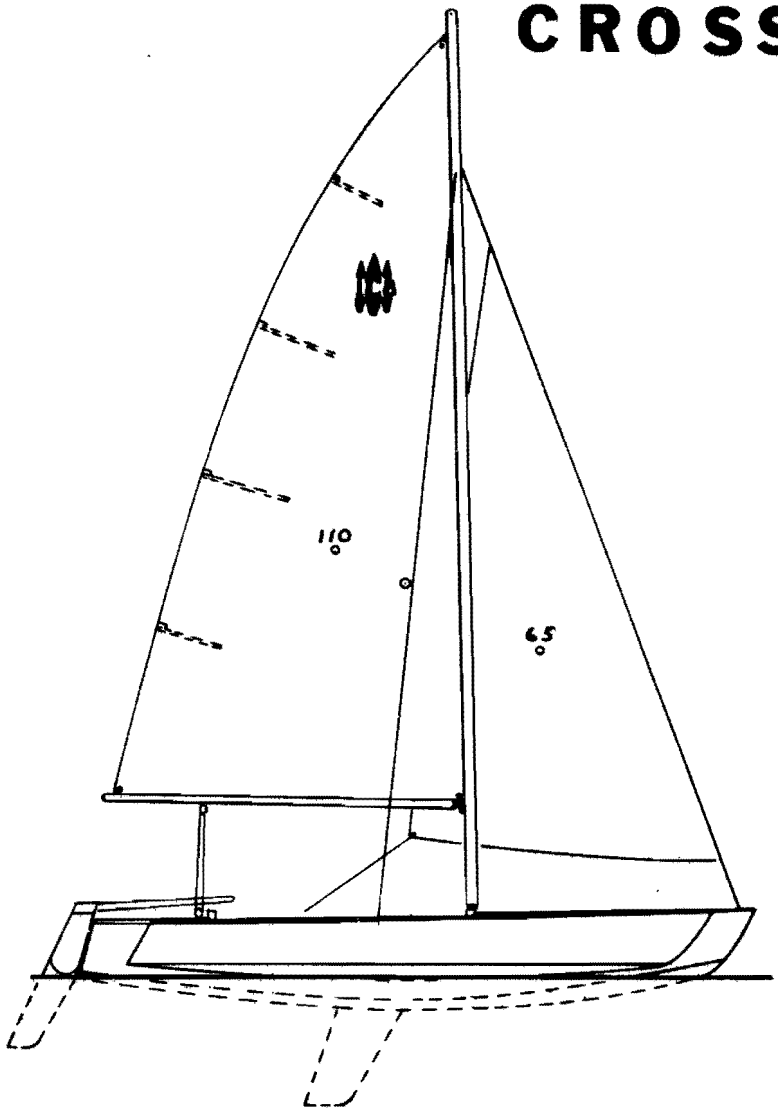
Daggerboards are fine, for RACING boats, but are susceptible to damage when used in cruising boats. They will jam or be hard to use if there is marine growth in the daggerboard trunk.

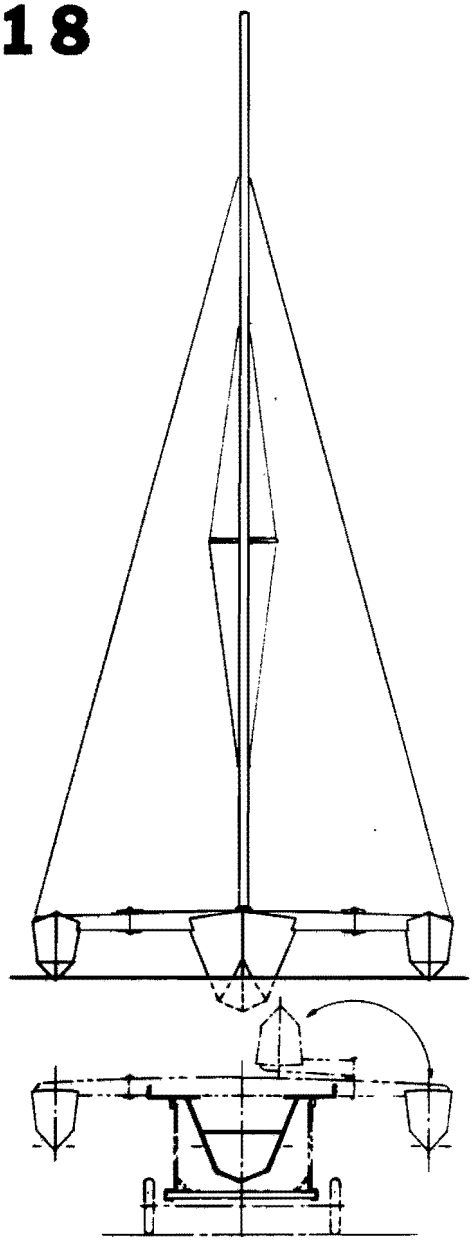
In a study comparing the draft of monohulls against the draft of the CROSS TRIMARANS it showed that the average draft of a 42 ft. monohull was 6 ft. The draft of a CROSS 42 is 4 ft. 2 in. which is considerably less.

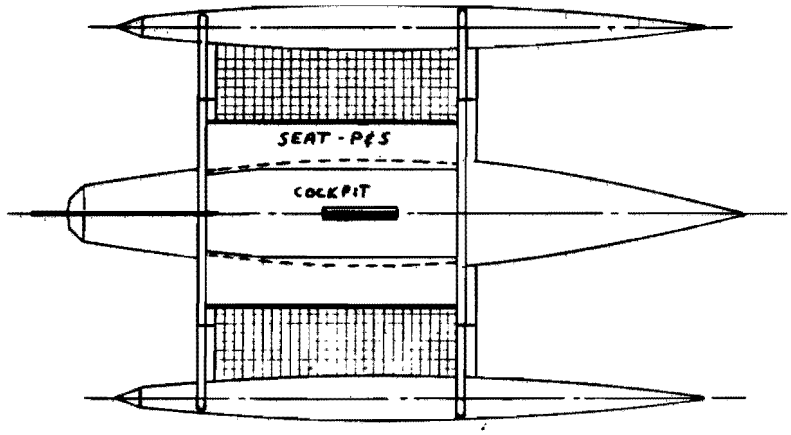
On a flush deck design the deck has been raised to the height of the cabin top and the bow is usually sloped down. Freeboard and windage is INCREASED. It sounds nice and is streamlined, like an airplane, but is it practical. (nobody walks on the outside of an airplane) Handling head sails or setting an anchor in rough weather on a sloping bow could be a difficult task. The greater freeboard will make it difficult to reach the dock when docking. The extra windage on the bows will make the boat harder to come about in high winds and rough seas.

The CROSS TRIMARANS feature large, level areas for working on deck and the two level cabin top allows one to go from deck to cabin top safely and easily. Trunk cabin sides are handy for installing hand grab rails (a good safety feature). They are nice to sit on or lean against when lounging on the deck. The side windows are closer to the main cabin area. Small windows are also installed in the forward cabin slope. (Large windows on cabin fronts are a hazzard.

CROSS 18



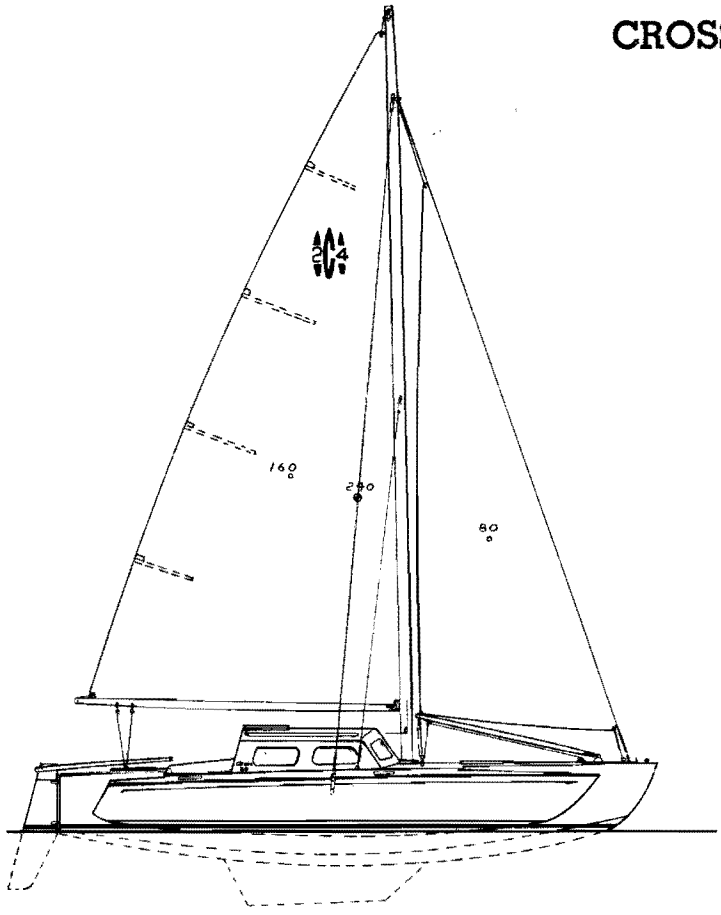




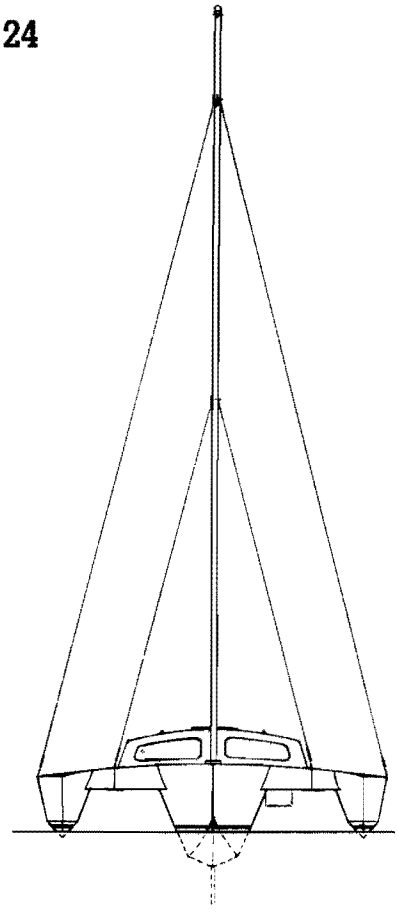
SPECIFICATIONS

LENGTH OVERALL	18'-0"
LENGTH WATERLINE	16'-8"
BEAM OVERALL	11'-3"
BEAM - FOLDED	6'-3"
DRAFT - BOARD DOWN	3'-6"
DRAFT - BOARD UP	1'-2"
SAIL AREA	175 SQ FT.
TOTAL BOAT WEIGHT	350 LBS
CREW	2 - 3

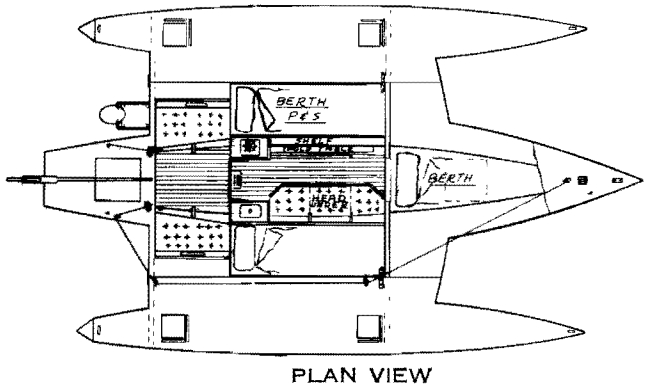
CROSS 24



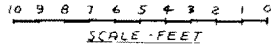
SIDE VIEW



FRONT VIEW



PLAN VIEW



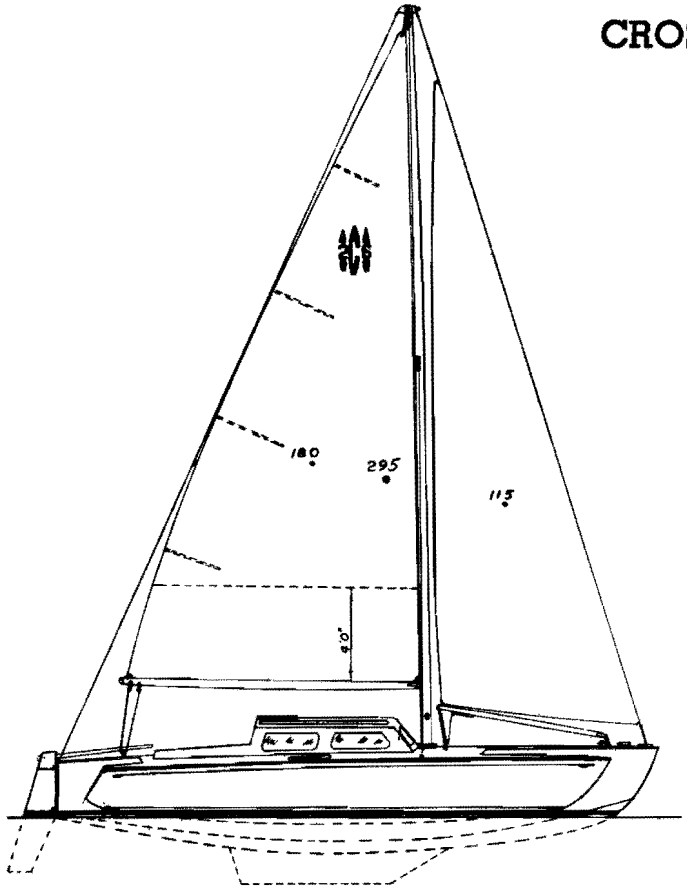
SPECIFICATIONS

Length Overall	23' 9"
Length Waterline	21' 8"
Beam	14' 0"
Draft	2'10"
Sail Area	240 Sq. Ft.
Displacement	2100 lbs.
Auxiliary Power	5 H.P.
No. berths	3
Headroom	4' 6"
Hulls: Hard chine, sheet ply.	
Width For Trailering	7'-9"

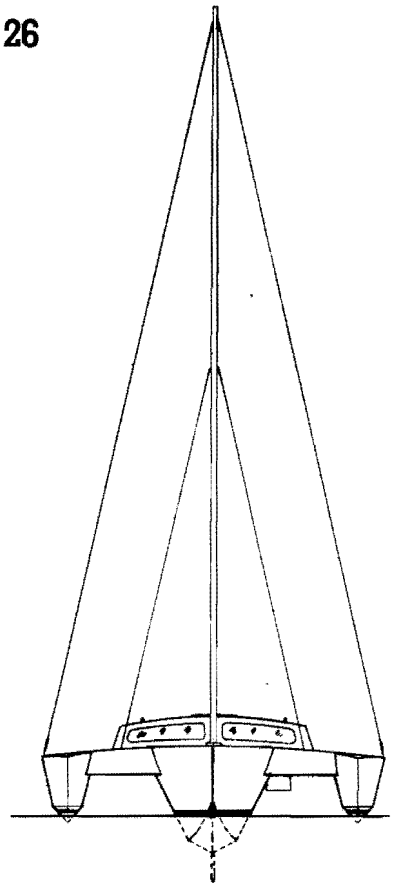
NOTE: FULL SIZE PATTERNS FOR FRAMES AND STEMS

NOTE: The DISPLACEMENTS given are the weight of the LOADED BOATS when they are floating on their DESIGN WATERLINE

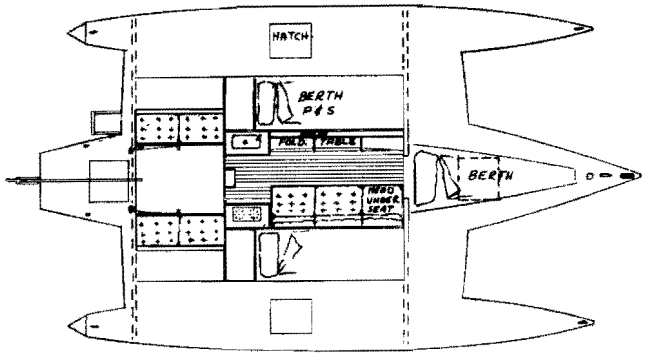
CROSS 26



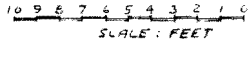
SIDE VIEW



FRONT VIEW



PLAN VIEW



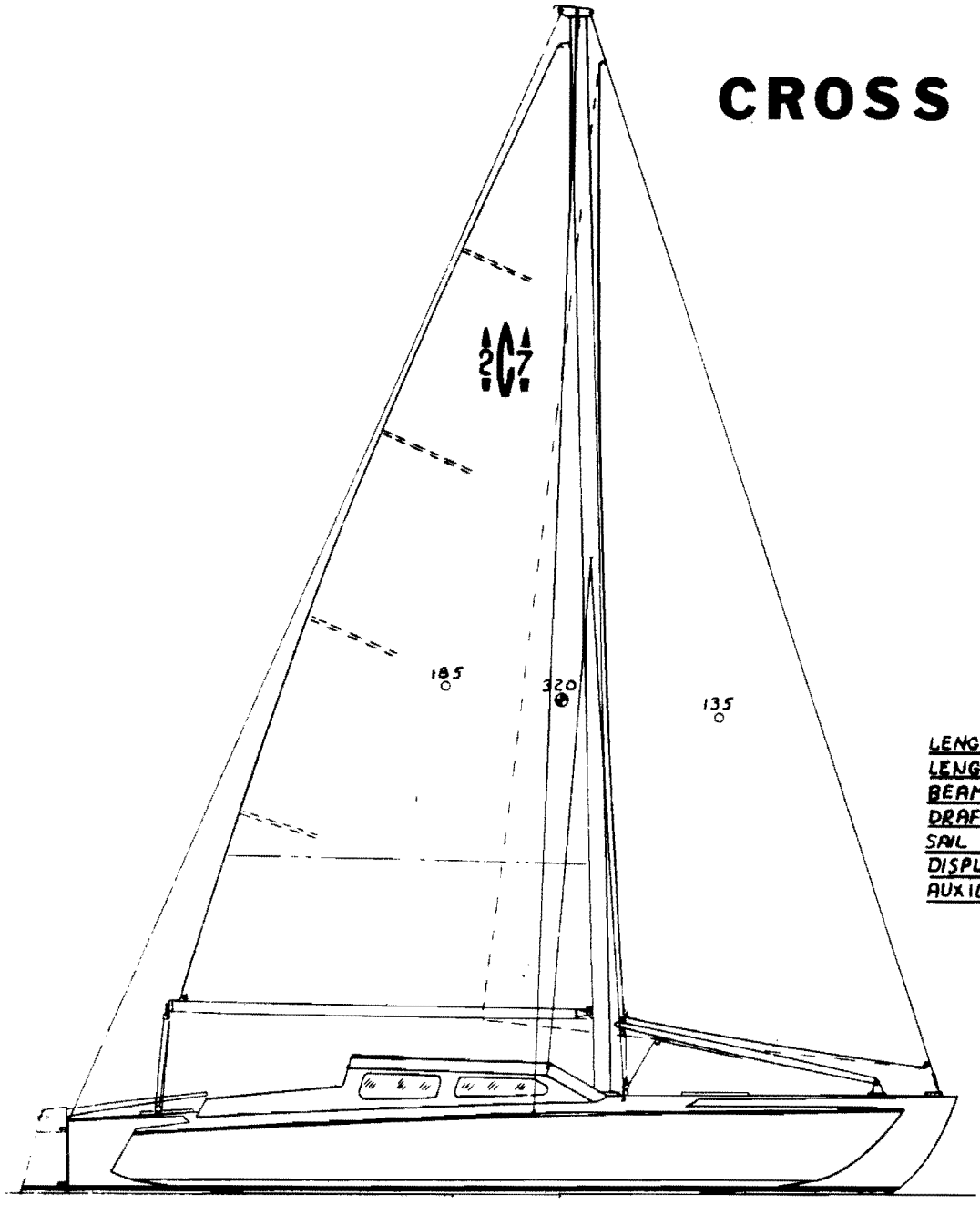
SPECIFICATIONS

Length Overall	26' 0"
Length Waterline	24' 0"
Beam	15' 0"
Draft	3' 0"
Sail Area	295 Sq. Ft.
Displacement	3100 lbs.
Auxiliary Power	5-7 H.P.
No. berths	3-4
Headroom	4' 10"

Hulls: Hard chine, sheet ply. Round bottom, double diag., (optional)

NOTE: FULL SIZE PATTERNS FOR FRAMES AND STEMS

CROSS 27



SPECIFICATIONS	
LENGTH OVERALL	27'-4"
LENGTH WATERLINE	25'-3"
BEAM OVERALL	17'-0"
DRAFT	3'-2"
SAIL AREA 100% FT	345 SQ.FT.
DISPLACEMENT	3200 LBS
AUXIL. POWER	6 H.P. OUTBD

THE CROSS 27 IS A CROSS 26 MODIFIED TO GIVE HIGHER PERFORMANCE.

The same construction drawings and full size patterns are used but modified as necessary.

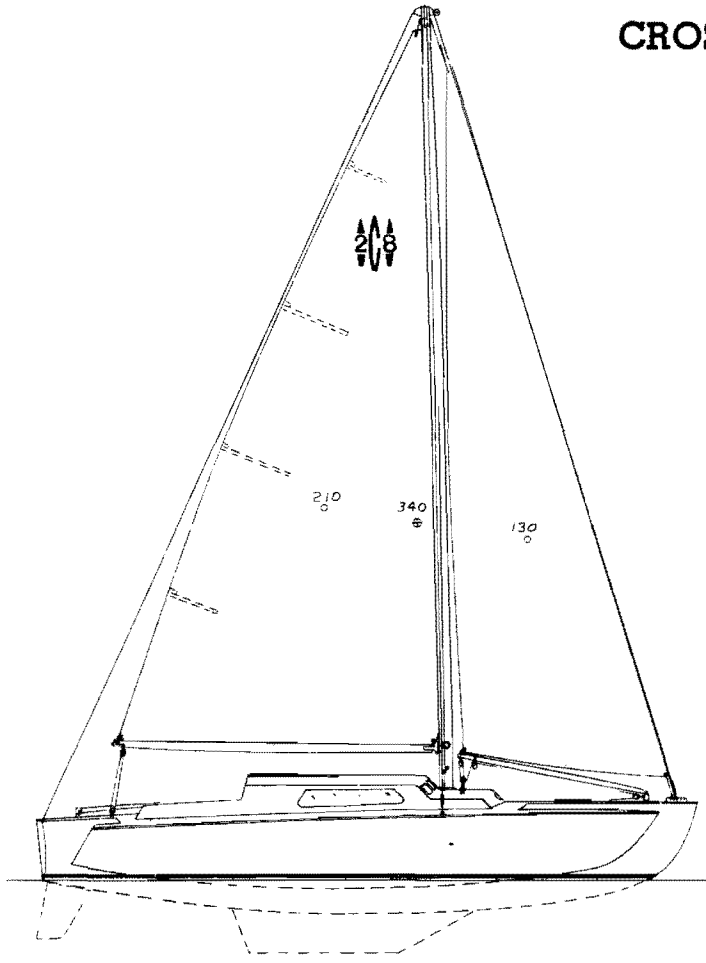
One of the CROSS 27's is sailing and a few more are under construction.

The CROSS 27 sailing has proved to be an excelent sailer and won our annual Coronado Island race here in San Diego last July, 1972.

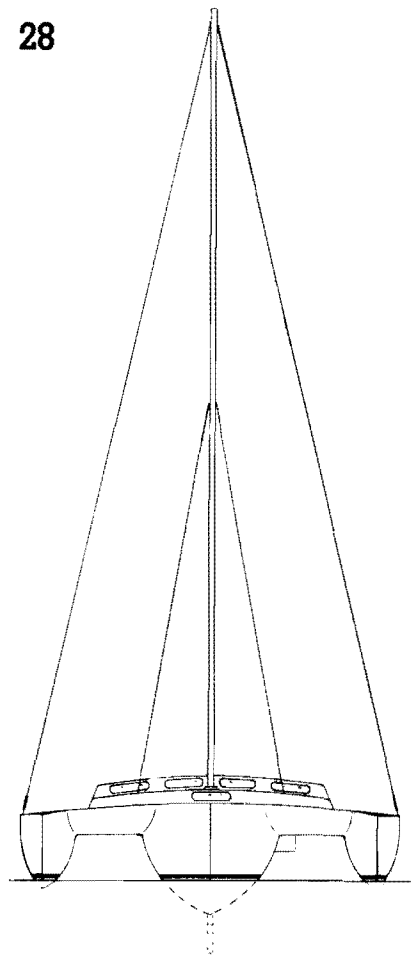
Overall length, overall beam and sail area have been increased with a very slight increase in weight. These are the factors that increase the performance.

Where shallow draft is not an important factor a new high performance fin keel can be installed. The draft is 4 ft.

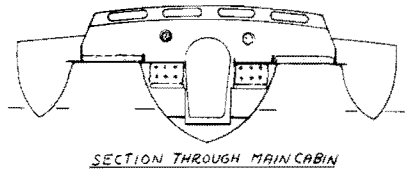
CROSS 28



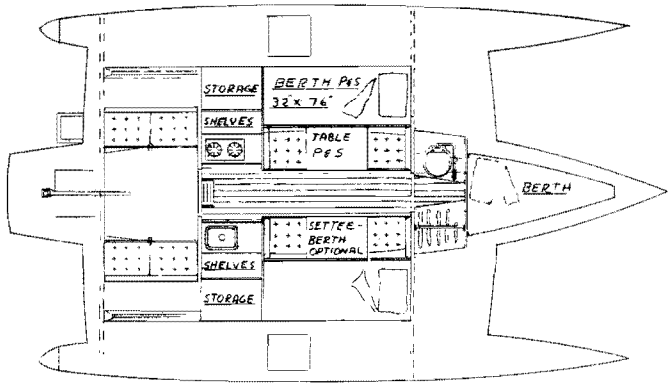
SIDE VIEW



FRONT VIEW



SECTION THROUGH MAIN CABIN



PLAN VIEW

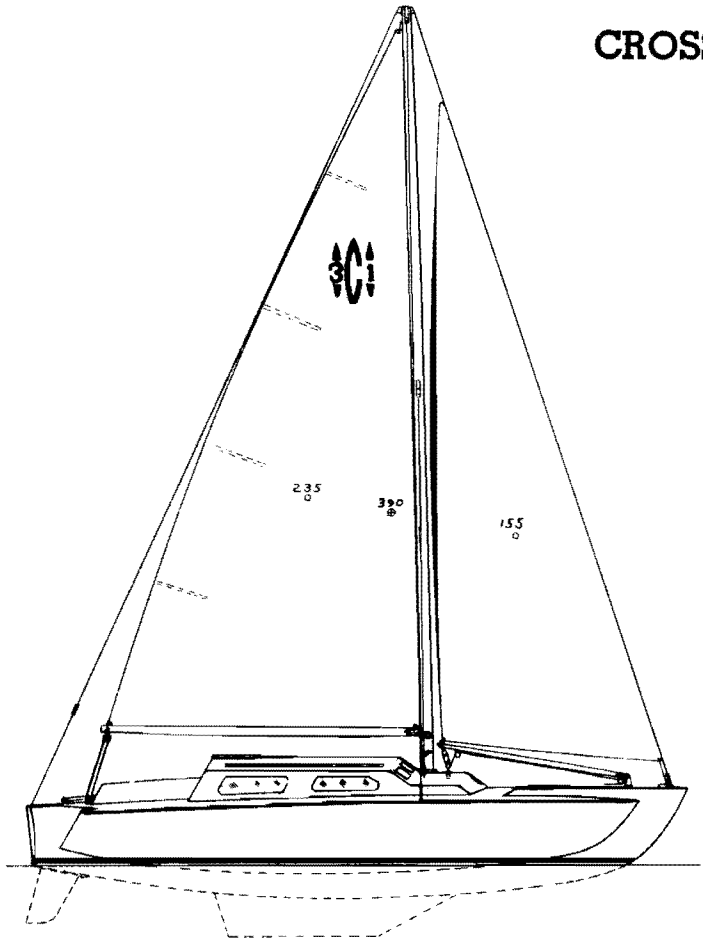
SPECIFICATIONS

Length Overall	28' 4"
Length Waterline	26' 0"
Beam	16' 7"
Sail Area	340 Sq. Ft.
Draft	3' 2"
Displacement	3700 lbs.
Auxiliary Power	6-10 H.P.
No. berths	3-5
Headroom	5' 3"

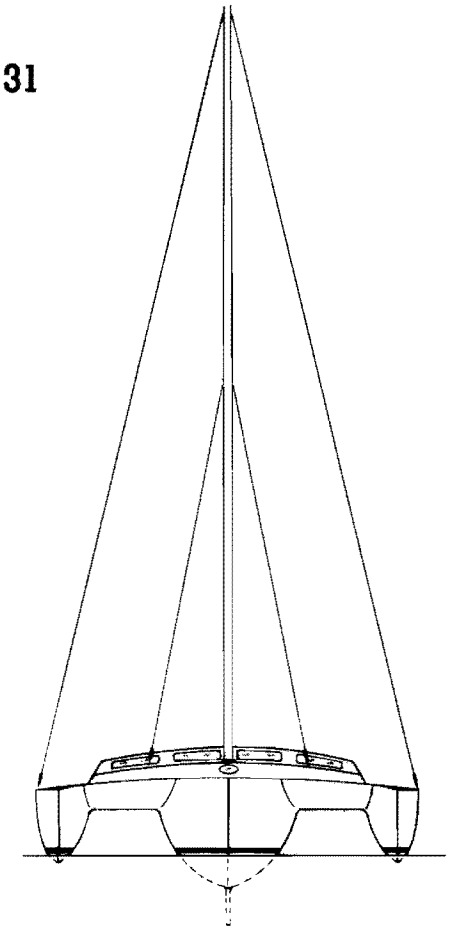
Hulls: Round bottom, double diagonal ply.

NOTE: FULL SIZE PATTERNS FOR FRAMES AND STEMS

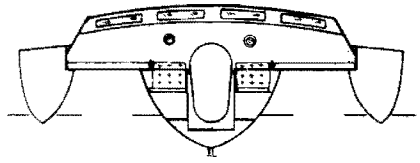
CROSS 31



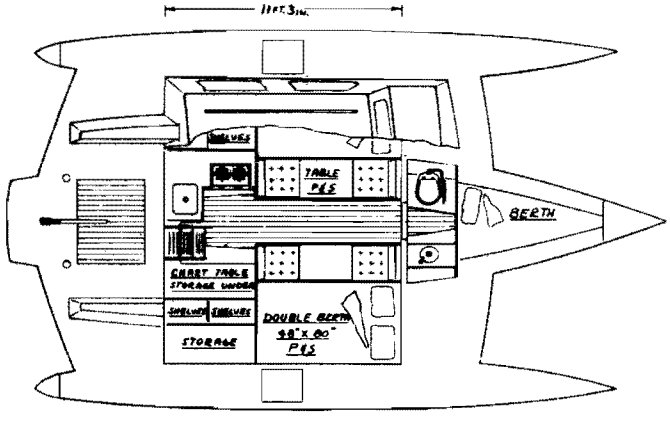
SIDE VIEW



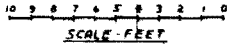
FRONT VIEW



SECTION THROUGH MAIN CABIN
LOOKING FORWARD



PLAN VIEW



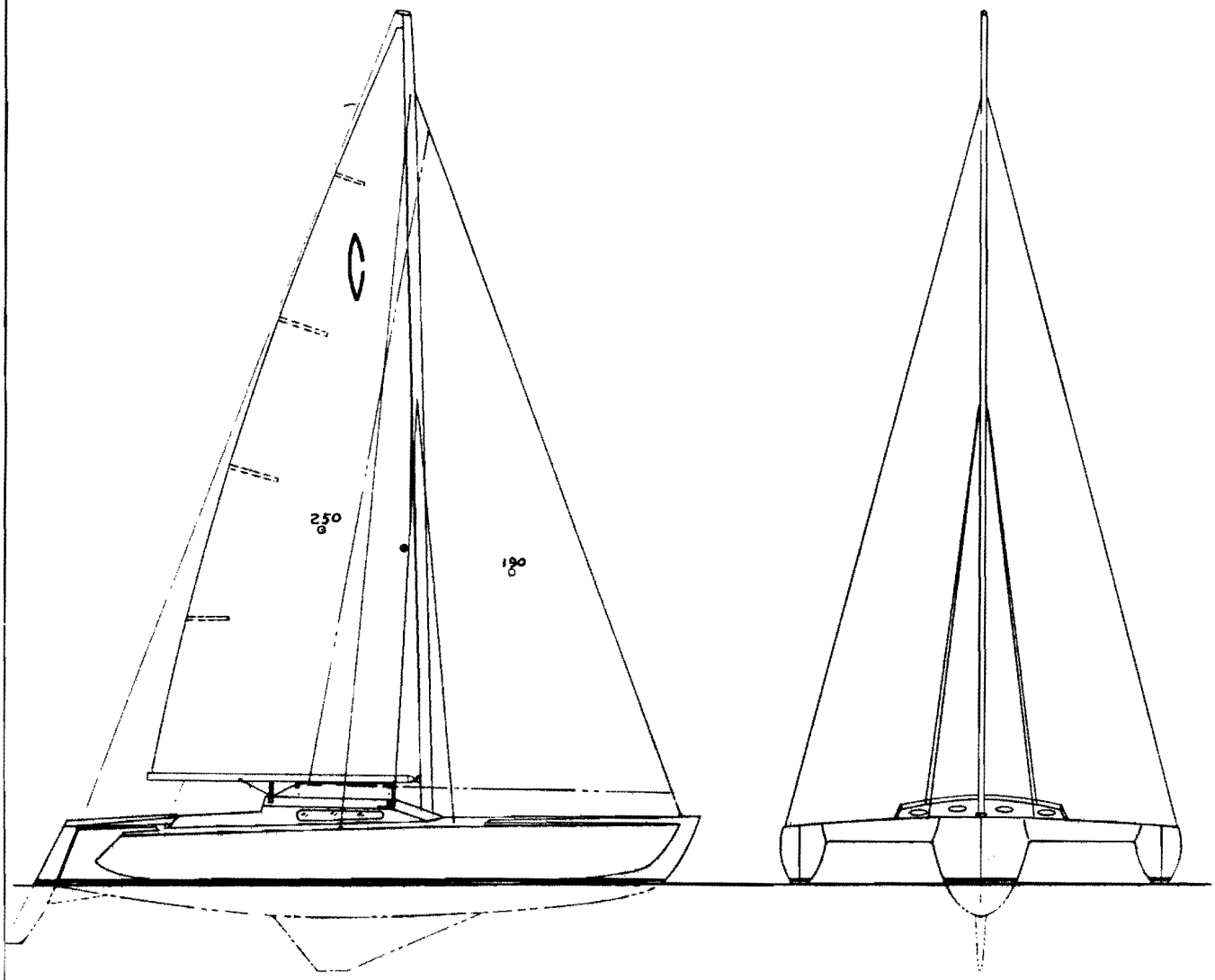
SPECIFICATIONS

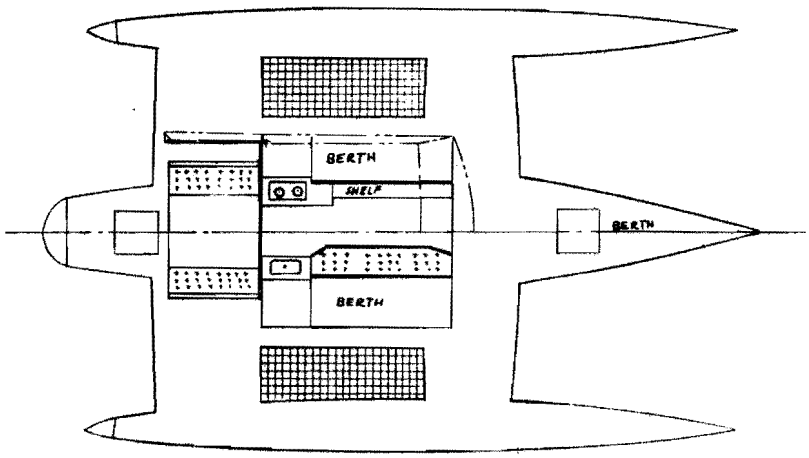
Length Overall	31' 0"
Length Waterline	28' 0"
Beam	18' 2"
Draft	3' 4"
Sail Area	390 Sq. Ft.
Displacement	5,000 lbs.
Auxiliary Power	7-15 H.P.
No. berths	4-5
Headroom	6' 1"

Hull const.: Round bottom, double diagonal ply.

NOTE: Full Size patterns for frames and stems.

CROSS 32R



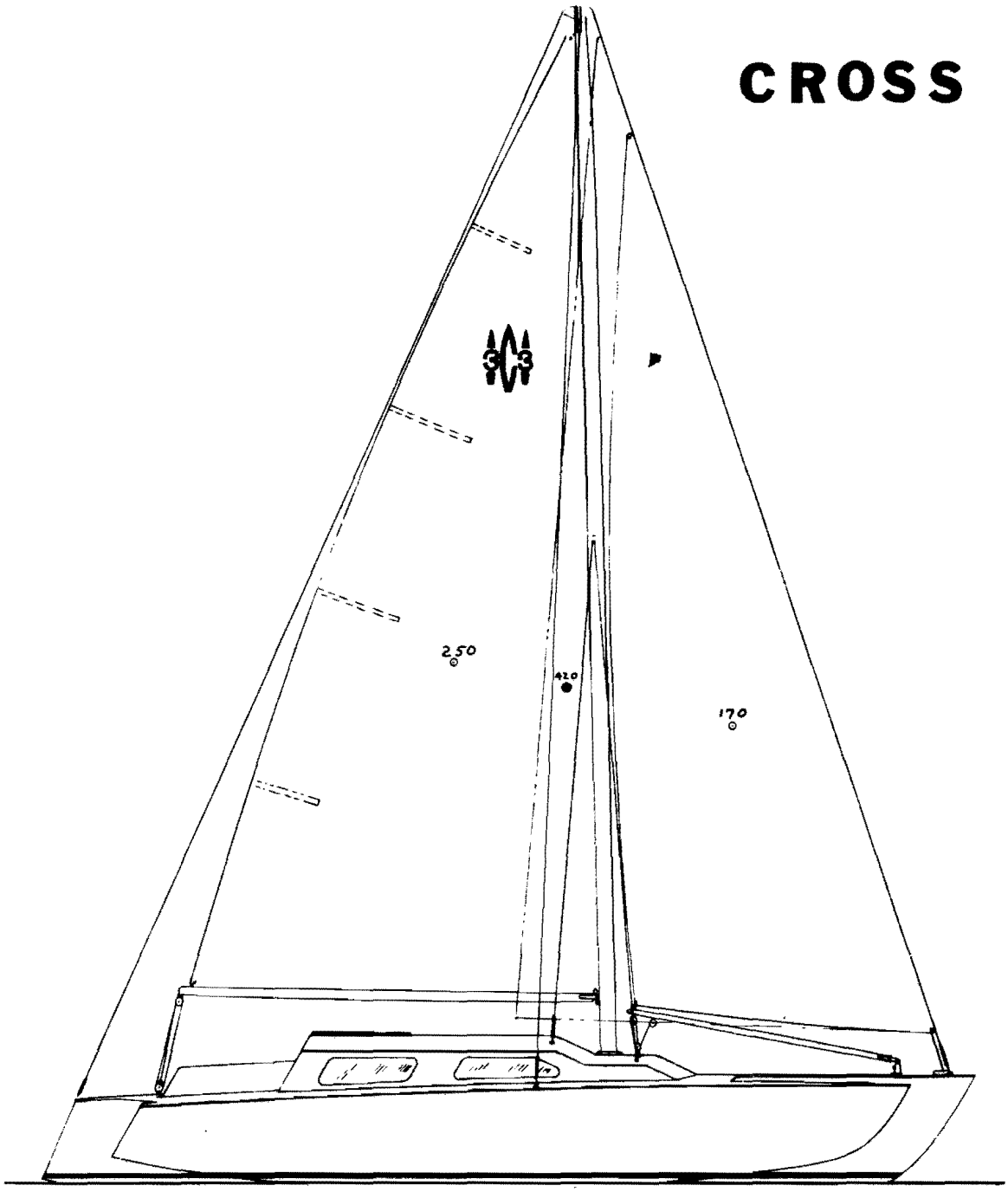


SPECIFICATIONS	
LENGTH OVERALL	31'-10"
LENGTH WATERLINE	30'-0"
BEAM OVERALL	20'-0"
DRAFT	4'-2"
SAIL AREA 100% F.T.	440 SQ.FT.
DISPLACEMENT	4000 LBS
AUXIL. POWER	10 H.P. OUTBD

RACING-CRUISING

CROSS 32 TRIMARAN
GENERAL LAYOUT
DRWG NO. 1232-1 SCALE 3/8"=1'
DESIGN BY N.A. CROSS

CROSS 33



SPECIFICATIONS

LENGTH OVERALL	33' 4"	DISPLACEMENT	5,300#
LENGTH WATERLINE	30' 0"	PAYLOAD	1550 #
BEAM OVERALL	20' 2"	AUXIL. POWER	7 - 15 HP
DRAFT	3' 6"	NO. BERTHS	4 - 5
SAIL AREA	420 SQ. FT.	HEADROOM	6' 1"

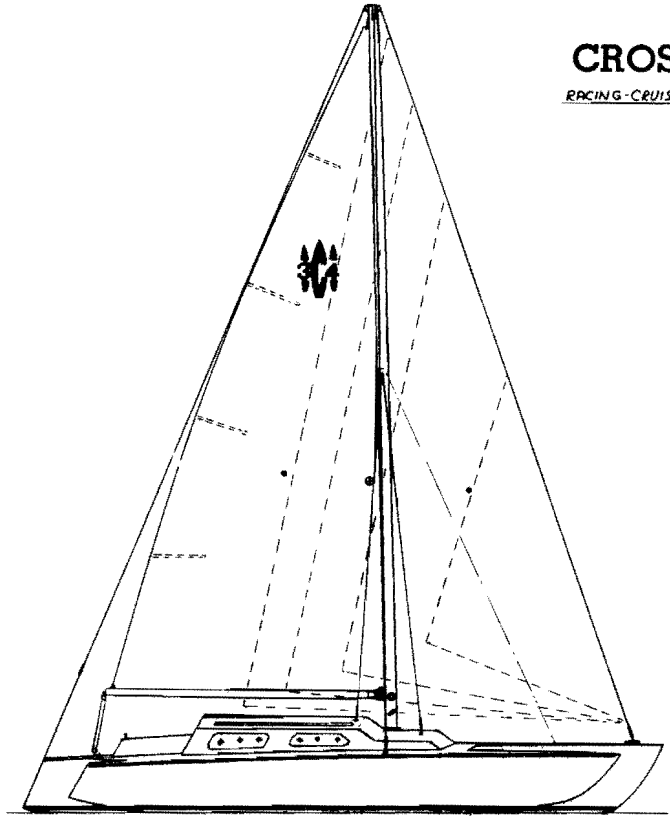
THE CROSS 33 is a CROSS 31 MODIFIED TO GIVE HIGHER PERFORMANCE.

The same CROSS 31 construction drawings and full size patterns are used but are modified as necessary.

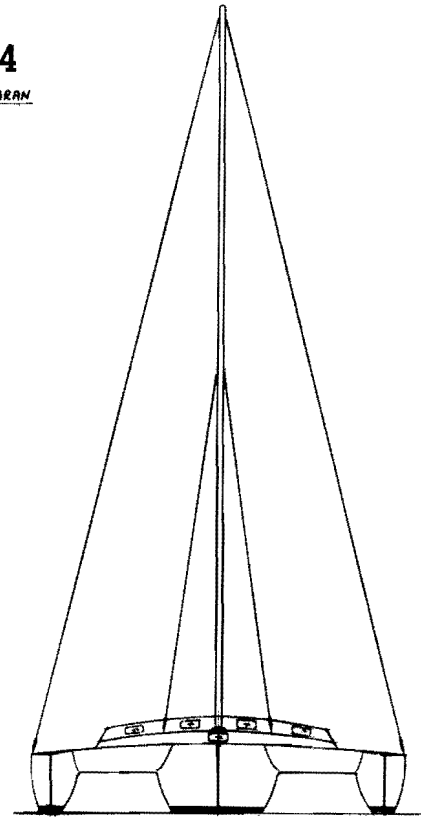
Overall length, overall beam ans sail area have been increased with a very slight increase in weight. These are the factors that increase the performance.

CROSS 34

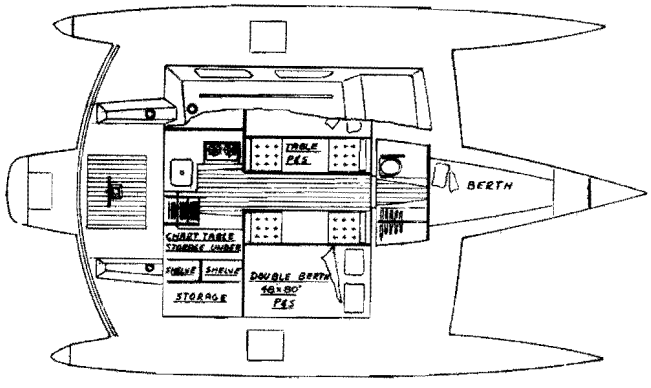
RACING-CRUISING TRIMARAN



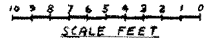
SIDE VIEW

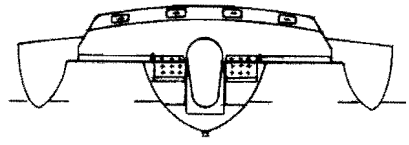


FRONT VIEW



PLAN VIEW





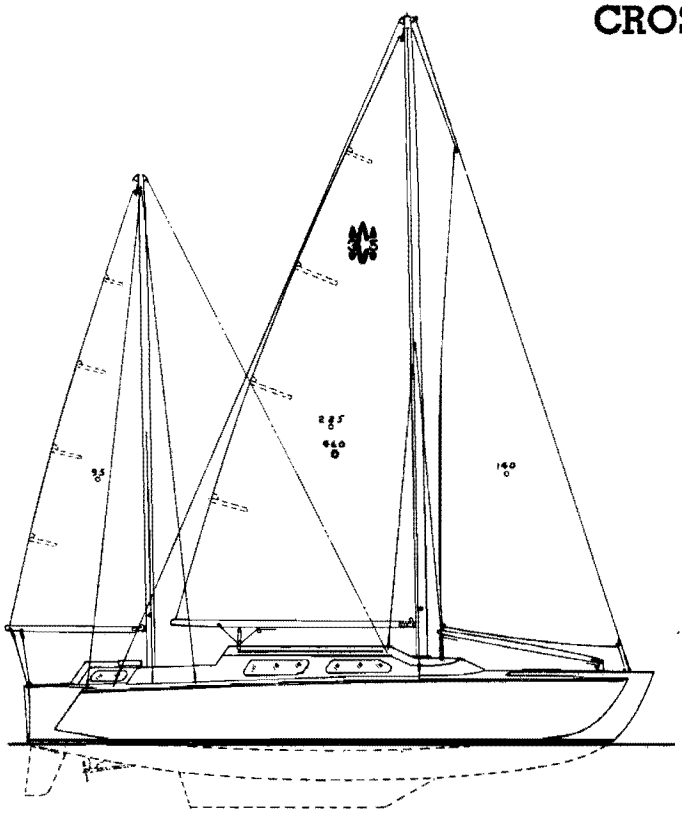
SECTION THROUGH MAIN CABIN
LOOKING FORWARD

SPECIFICATIONS

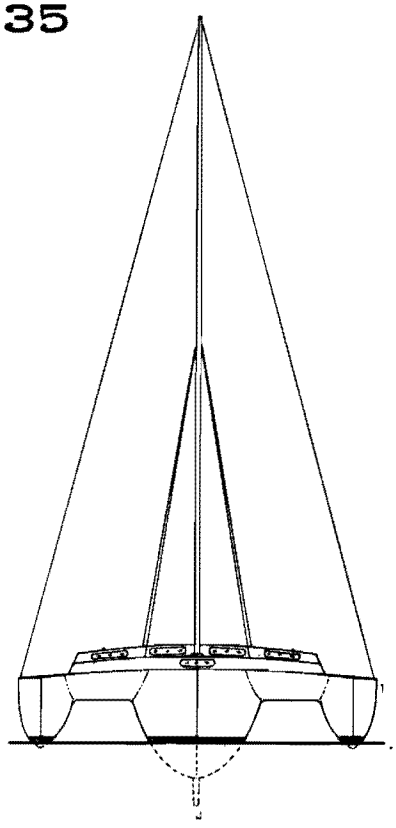
Length Overall	34' 4"
Length Waterline	30' 4"
Beam	20' 3"
Draft	3' 6"
Sail Area 100% F.T.	480 sq. ft.
Displacement	5300 lbs.
Auxiliary Power	15-18 H.P.
Berths	4-5
Headroom	6' 1"

Hull const.: Round bottom, double diagonal ply.

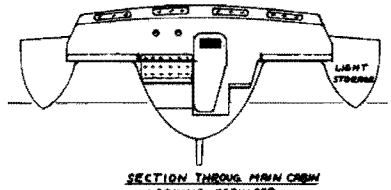
CROSS 35



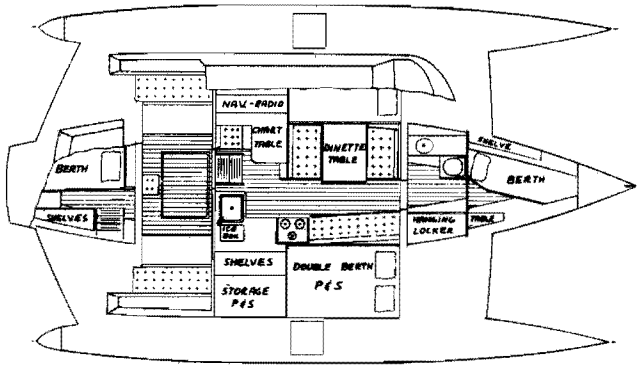
SIDE VIEW



FRONT VIEW



SECTION THROUG MAIN CABIN
LOOKING FORWARD



PLAN VIEW

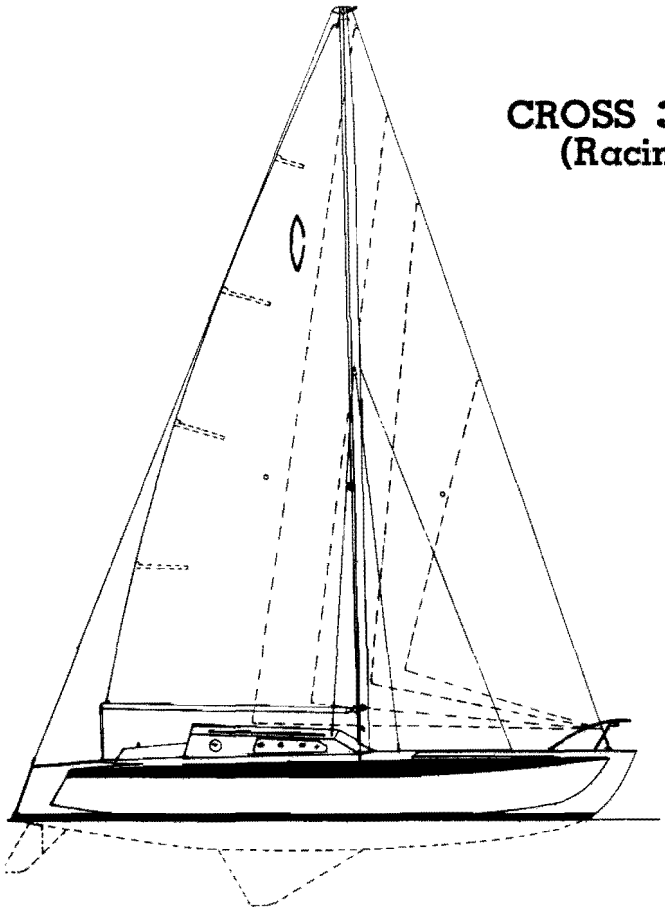
SPECIFICATIONS

Length Overall	35' 5"
Length Waterline	32' 9"
Beam Overall	20' 2"
Draft	3' 6"
Sail Area (working)	460 sq. ft.
Displacement	8000 lbs.
Auxiliary Power	16 H.P.
Berths	6

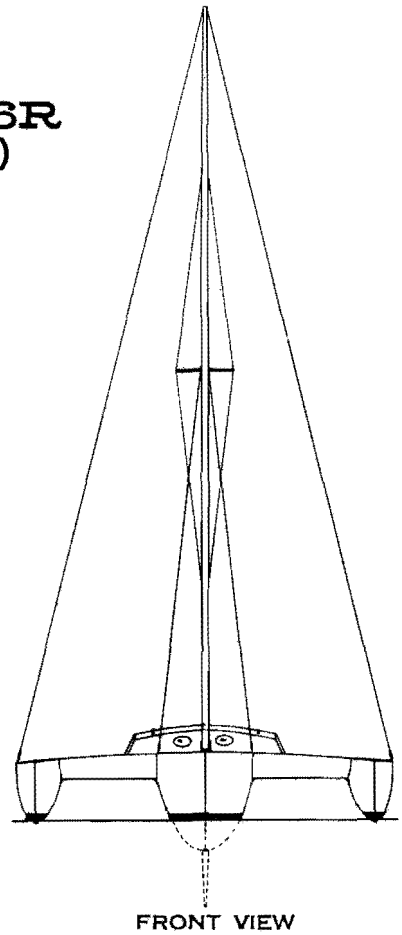
Hulls: Round bottom, double-diagonal ply.
Hard chine sheet ply optional.

NOTE: Full Size patterns for frames and stems.

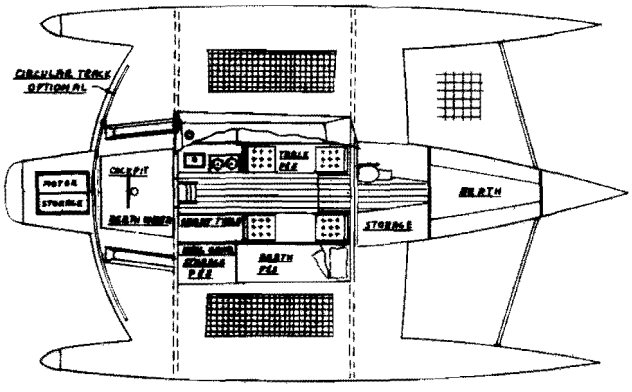
CROSS 36R
(Racing)



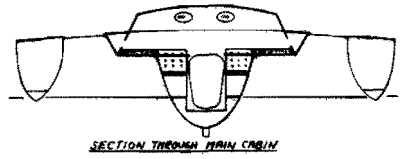
SIDE VIEW



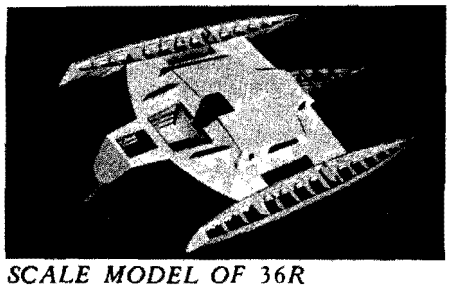
FRONT VIEW



PLAN VIEW



SECTION THROUGH MAIN CABIN



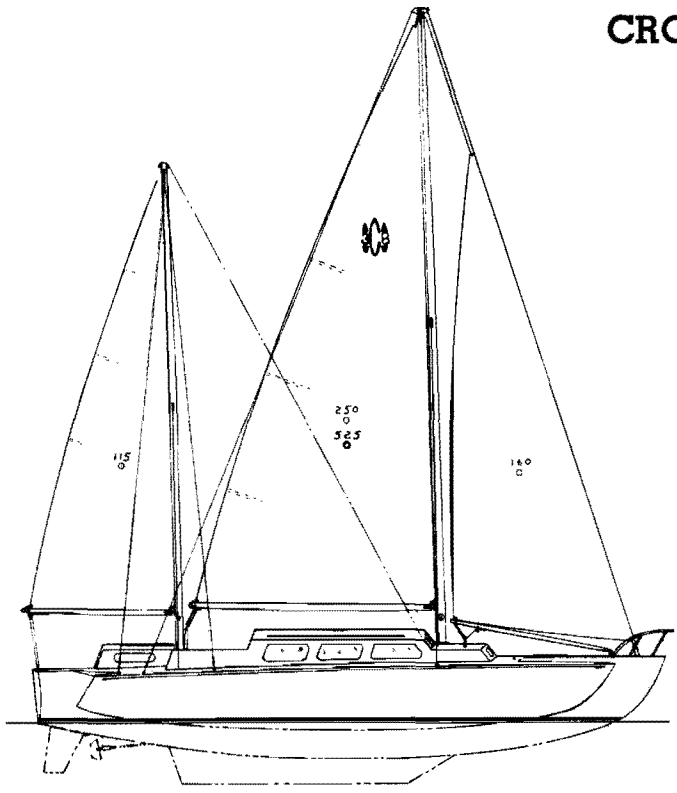
SCALE MODEL OF 36R

SPECIFICATIONS

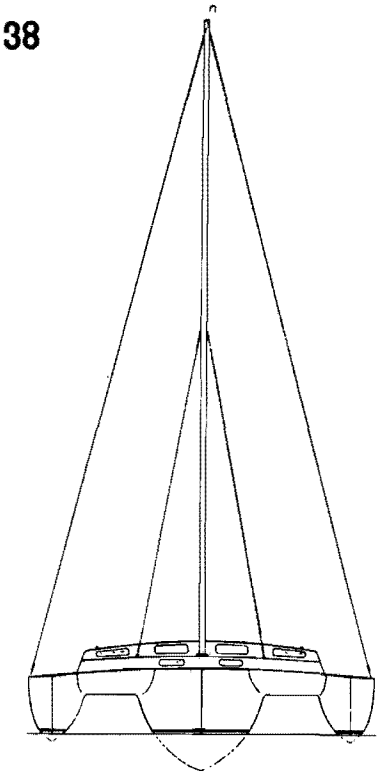
Length Overall	36'	7"
Length Waterline	33'	7"
Beam	22'	3"
Draft	5'	0"
Sail Area 100% F.T.	590 sq.ft.	
Displacement	6,000 lbs.	
Auxiliary Power	18 H. P. Outbd.	
No. Berths	4 - 5	
Headroom	6'	1"
Hulls	Round bottom, double diagonal ply.	

NOTE: Other Similar Racing Designs Will Be Available.

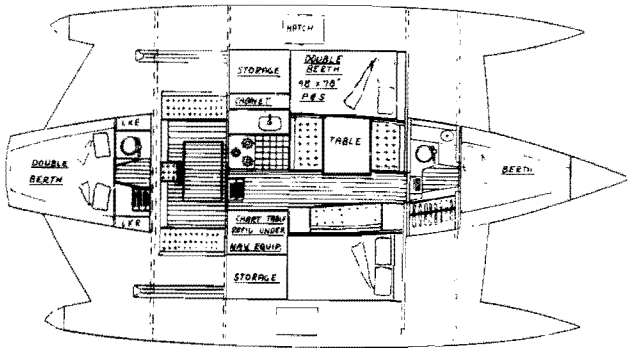
CROSS 38



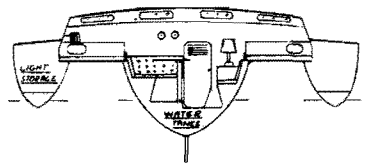
SIDE VIEW



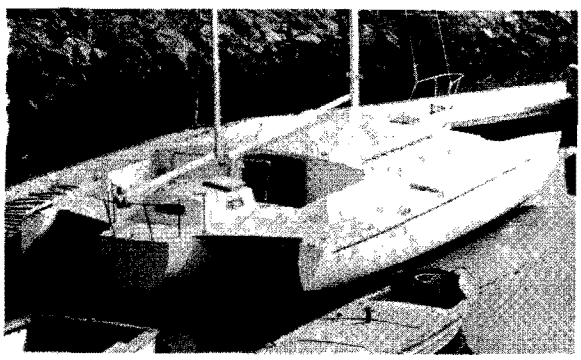
FRONT VIEW



PLAN VIEW



SECTION THRU MAIN CABIN LOOKING FORWARD



SPECIFICATIONS

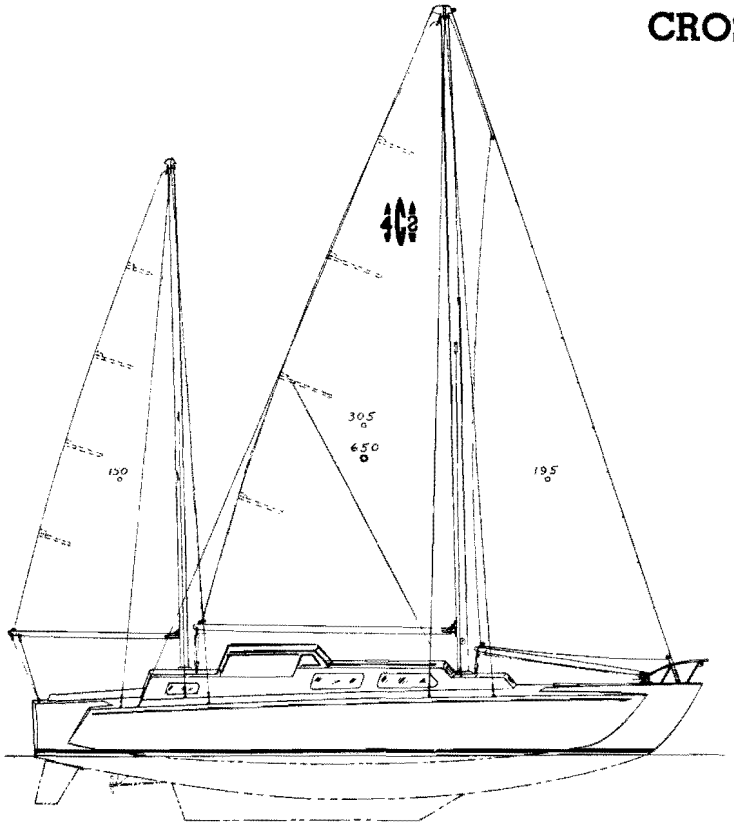
Length Overall	38' 5"
Length Waterline	35' 4"
Beam	21' 0"
Draft	3' 8"
Sail Area	525 Sq. Ft.
Displacement	9,500 lbs.
Auxiliary Power	15-25 H.P.
Berths	6-7
Headroom	6' 3"

Hulls: Round bottom, double-diagonal ply.

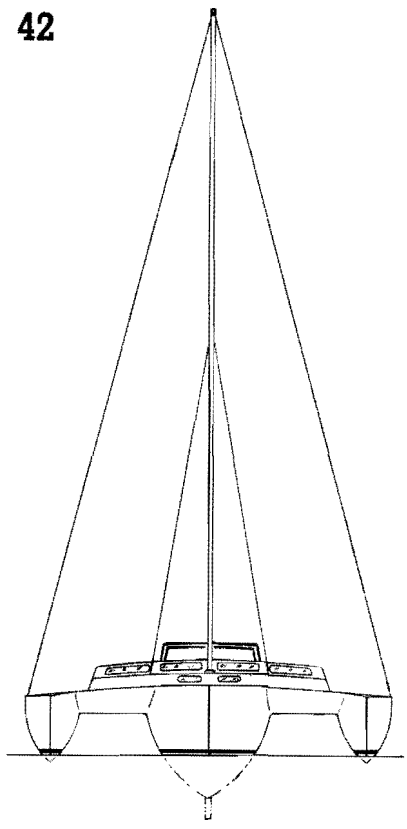
Hard Chine — Sheet Ply (Opt.)

NOTE: Full Size patterns for frames and stems.

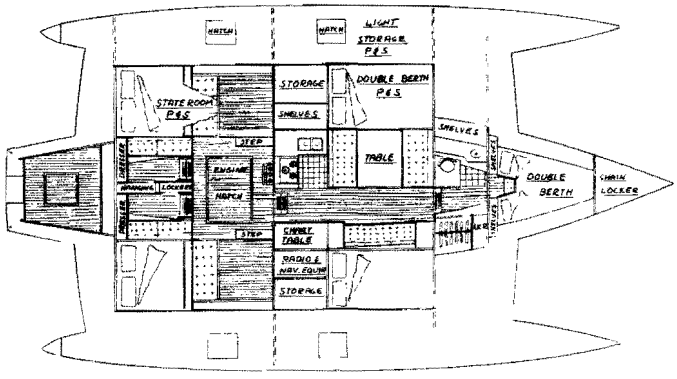
CROSS 42



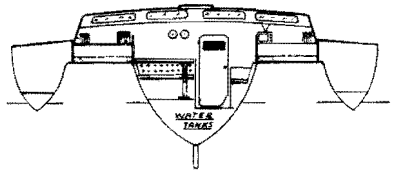
SIDE VIEW



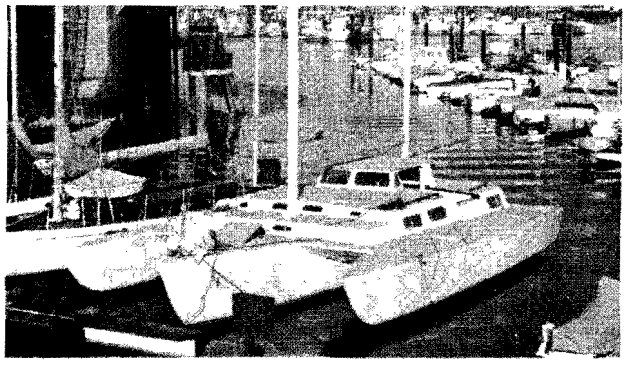
FRONT VIEW



PLAN VIEW



SECTION THRU MAIN CABIN
LOOKING FORWARD



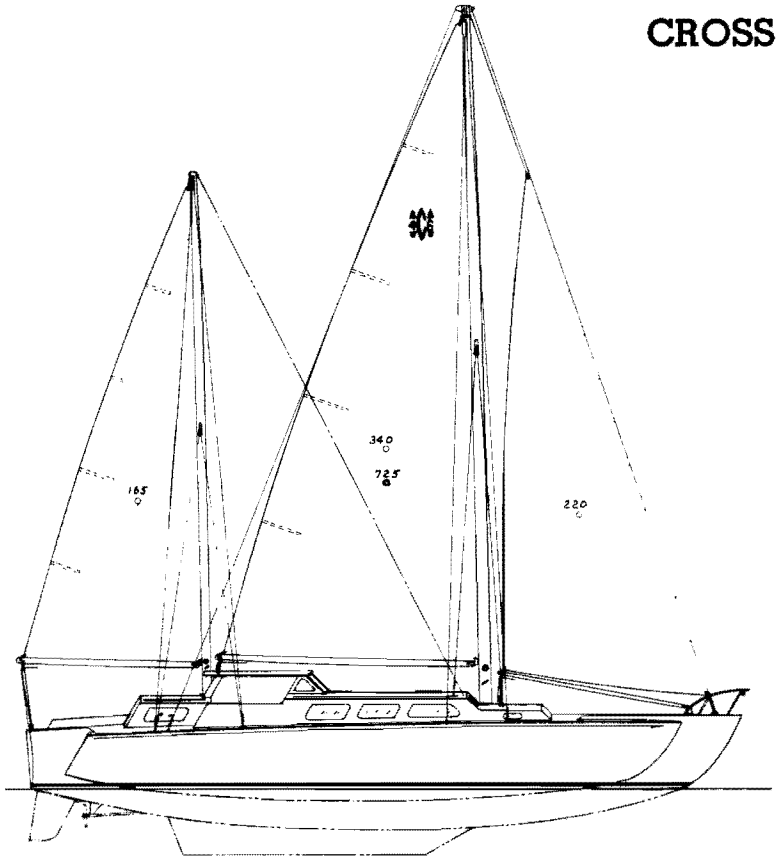
SPECIFICATIONS

Length Overall	42' 0"
Length Waterline	38' 8"
Beam	23' 0"
Draft	4' 2"
Sail Area	650 Sq. Ft.
Displacement	14000 lbs.
Auxiliary Power	20-45 H.P.
Berths	8-10
Headroom	6' 3"

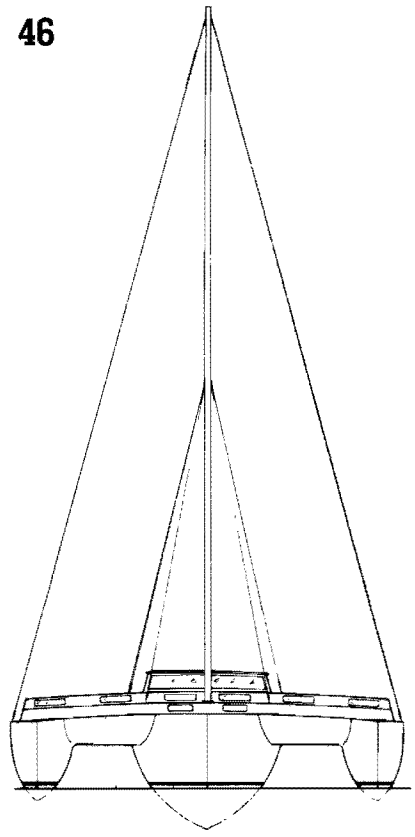
Hulls: Round bottom, double diagonal ply.
Hard chine sheet ply **(optional)**

NOTE: Full size patterns available.

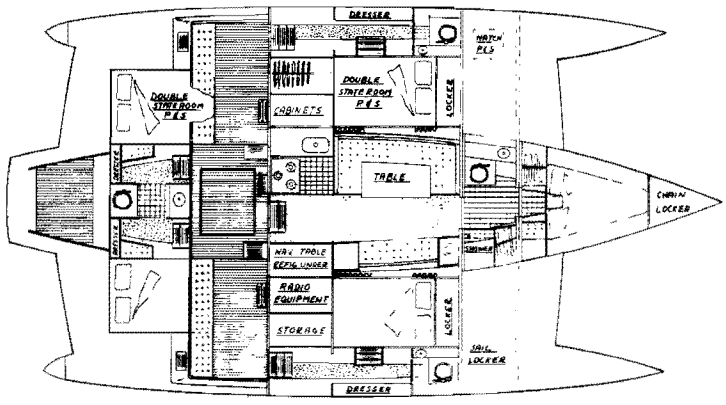
CROSS 46



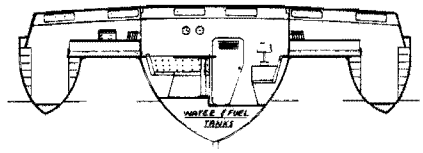
SIDE VIEW



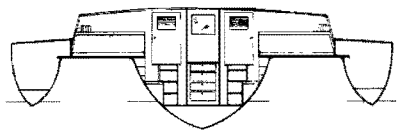
FRONT VIEW



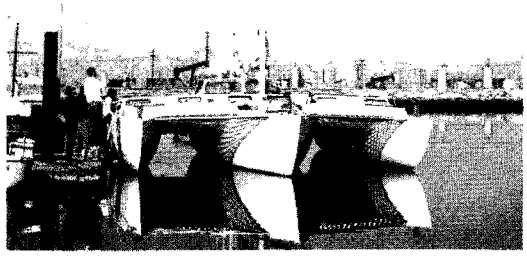
PLAN VIEW



SECTION THROUGH MAIN CABIN



SECTION THROUGH REAR CABIN

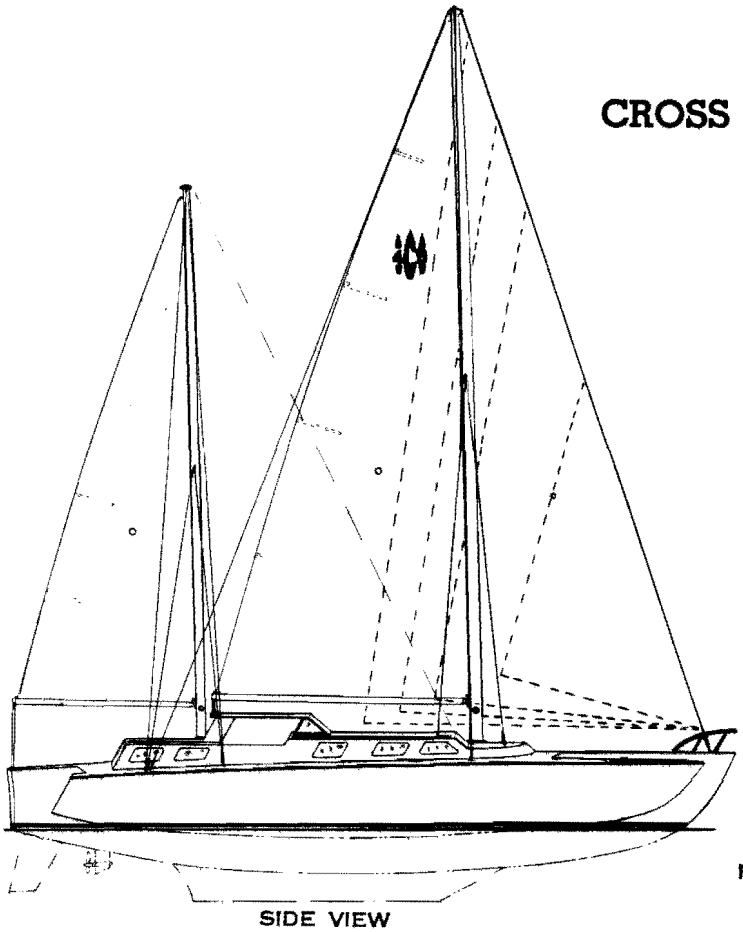


SPECIFICATIONS

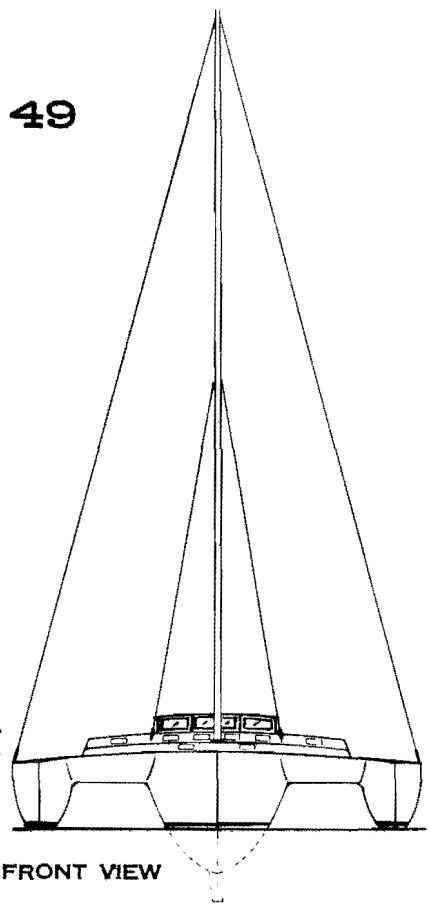
Length Overall	46' 0"
Length Waterline	43' 3"
Beam	25' 3"
Draft	4' 2"
Sail Area	725 Sq. Ft.
Displacement	19,000 lbs.
Auxiliary Power	35-55 H.P.
Berths	8-10
Headroom	6' 3"

Hulls: Round bottom, double-diagonal ply.

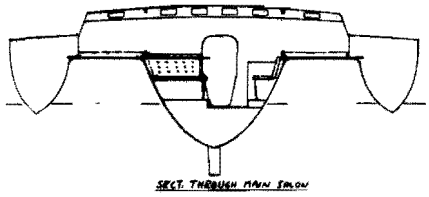
CROSS 49



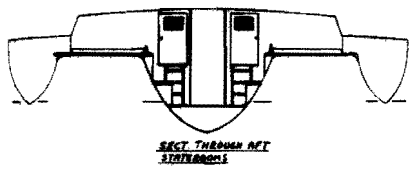
SIDE VIEW



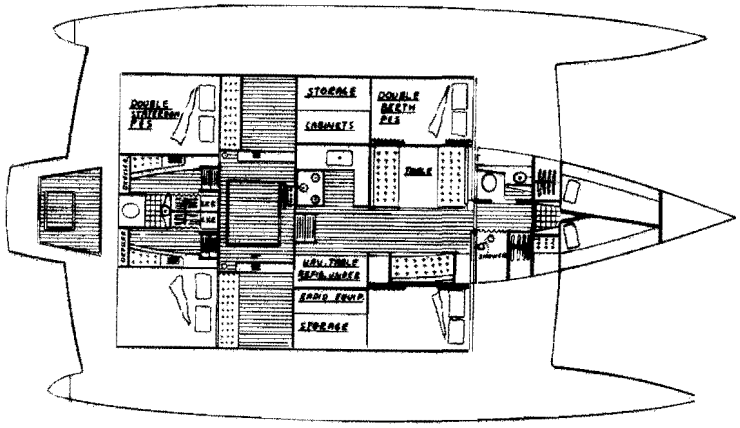
FRONT VIEW



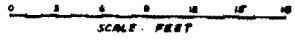
SECT. THROUGH MAIN SALON



SECT. THROUGH AFT STATEROOMS



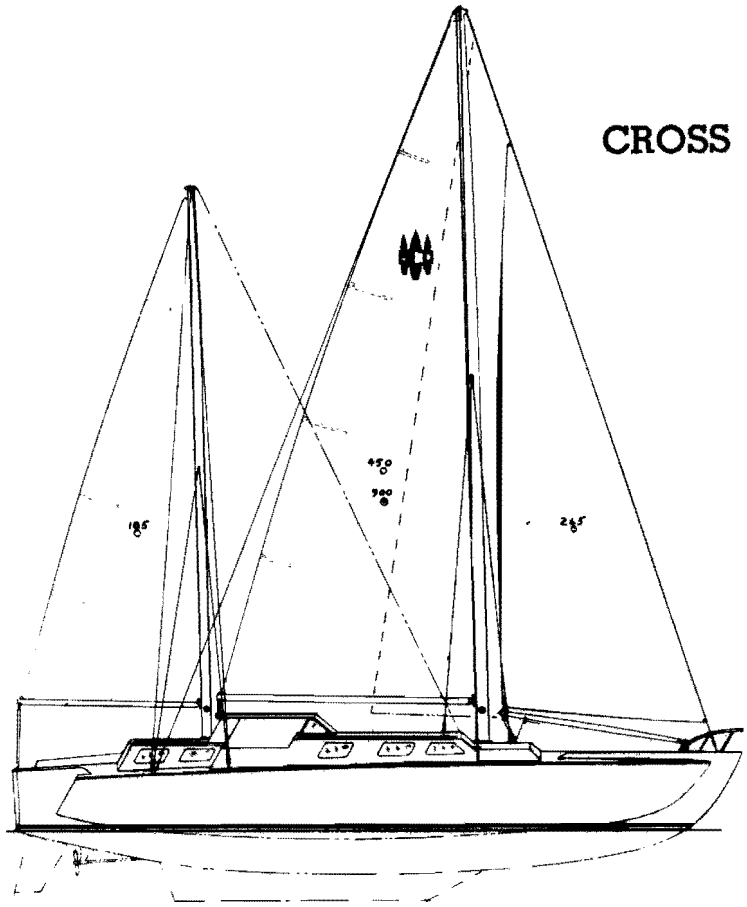
PLAN VIEW



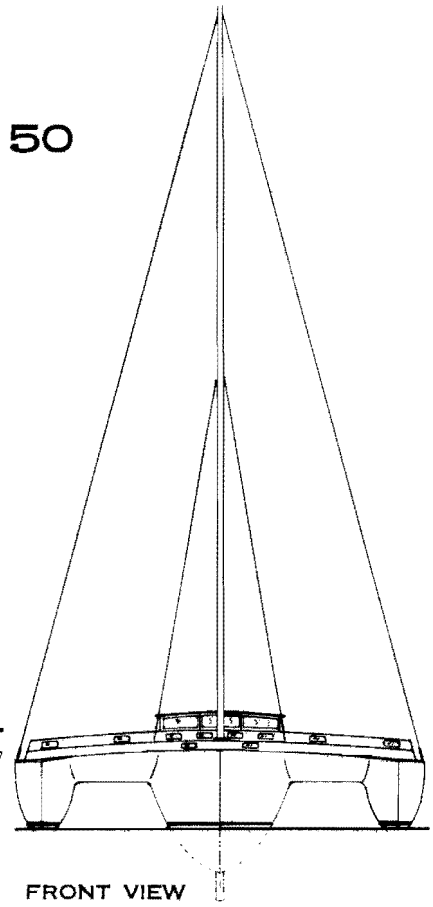
SPECIFICATIONS

Length Overall	49' 2"
Length Waterline	45' 2"
Beam	27' 0"
Draft	4' 10"
Sail Area 100% F.T.	920 sq.ft.
Displacement	20,000 lbs.
Auxiliary Power	55 H. P.
No. Berths	10
Headroom	6' 3"
Hulls	Round bottom, double diagonal ply.

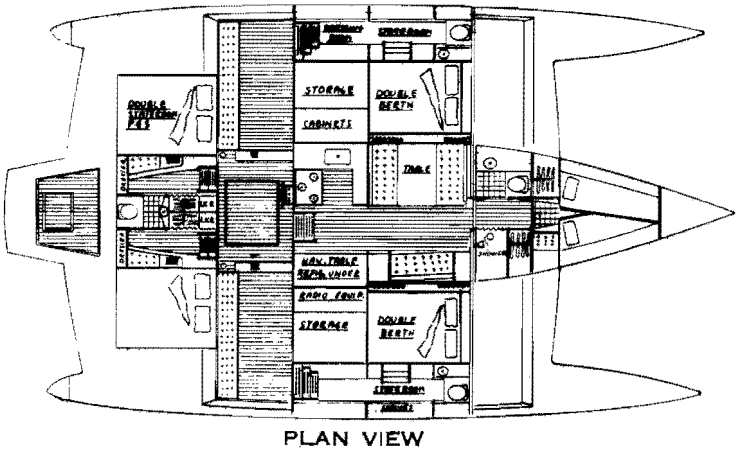
CROSS 50



SIDE VIEW

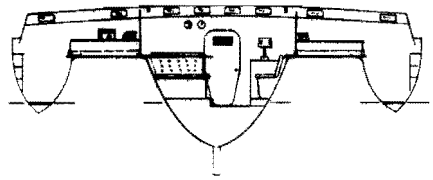


FRONT VIEW

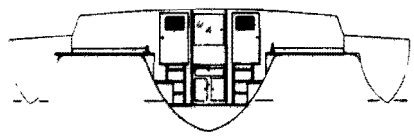


PLAN VIEW

SCALE FEET



SECT. THROUGH MAIN SALON



SECT. THROUGH AFT STATEROOMS

SPECIFICATIONS

Length Overall	49' 9"
Length Waterline	45' 8"
Beam	27' 0"
Draft	4' 8"
Sail Area	900 sq. ft.
Displacement	24,000 lbs.
Auxiliary Power	55 H. P.
No. Berths	10
Headroom	6' 3"
Hulls	Round bottom, double diagonal ply.

Lock Crowther M.I.E.(Aust).

Lock believes in competitive racing as the best design test of all. He has been developing cat and tri hulls through the medium of day racing in hot international classes such as A, B and C class catamarans, as racing in true sea conditions compares hull forms in their natural habitat and teaches far more than any amount of artificial conditions testing carried out in test tanks. Racing craft are pushed through seas at breakneck speeds to the point where it seems impossible for the boat and crew to withstand the battering any longer.

The outstanding success and popularity of his design concepts are reflected in this excerpt from a leading international multihull journal: "In Australia, racing trimarans have perhaps been perfected beyond those in the USA and most certainly, far beyond English types..."

This referred of course to the now famous "Jabberwock" , a Kraken 25 which lost only three out of two hundred races. Similar success followed with "Bandersnatch", the prototype Kraken 33 ocean racer. With a completely raw crew, three of wham had never sailed at sea before, she won the Sydney-Hobart Multihull Race. It is of interest to note that only two of the fleet of 47 conventional ocean racers had faster times, and both of these were craft nearly twice the size of "Bandersnatch". One was reported to have cost A$80,000 whereas "Bandersnatch" was home built, ready for racing for only $5,000.

His C class catamaran design "Nemesis" and the radical B class design "Mystery" are world class, both having obtained fourth place in a World Championship Series. Not only in hull design but in rigs, Lock is up with, if not leading the world. "Mystery" sported the first fabric covered wingmast ever and a lot of her success is due to the extremely light weight of this mast. Dope fabric covering has allowed even further increases in wing mast size, and during 1968/69, "Mystery" was fitted with a wing mast totalling 43% of the total sail area. This huge mast featured a thick 16" x 4'6" section with a blunt leading edge, and was instrumental in "Mystery's" victory in the NSW championship over the World Champion B class 'Tornado' cat.

More recently, Lock crewed on his Kraken 40 design "Ringo", an ocean racing trimaran, in the New York - Bermuda race. Against international competition, Ringo achieved line honours by some nine hours. This design, the ultimate in ocean racing trimarans is thought to be unbeatable. She has averaged 19 knots for two hours. "Ringo" was built in Canada, completely equipped including LORAN Navigation for $20,000.

With his engineering background, Lock has been instrumental in bringing cold moulded round bilge plywood hulls to their present state of perfection. Not only this, he has developed a construction technique whereby the sides of hulls down to the turn of the bilge are done in sheet ply, the bottom of the hull only being cold moulded. As can be imagined, this greatly reduces the time taken to build round bilge hulls.

SAFETY

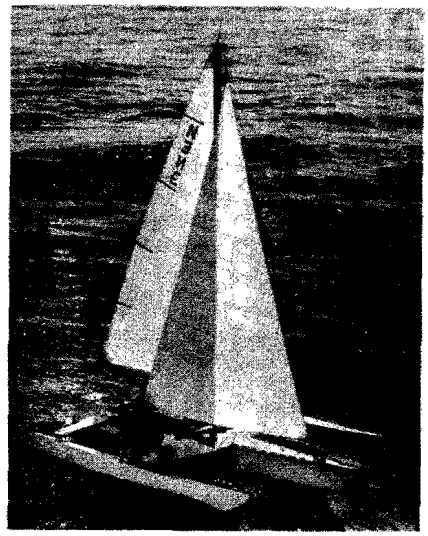
Crowther multihull designs are fully engineered to very high safety margins on structural strength. They are designed to withstand driving to the limit. Buoyancy compartments are an integral part of the boat to safeguard against flooding.

As has been stated, seamanship is the answer to multihull safety. However, should the crew be inept enough to cause a capsize, all ocean multihulls can be made habitable upside down. Basically this can be achieved by fitting crossarms or wingdecks with large watertight compartments which will enable the yacht to float very high in the inverted position, thus leaving plenty of airspace and a foot or so of water on the 'floor'.

Access is obtained by a hatchway through the wing floor alonside the hull. This hatch is simply a piece of ply bedded down in mastic with wing nuts to the outside bolting it down. Canvas can be slung across the hulls for bunks clear of the water.

It is strongly recommended that anyone contemplating ocean cruising provide the necessary flotation and furthermore carry a life raft plus a homing distress radio beacon. With this equipment, there is every chance that everyone will be picked up alive from a capsize.

Why a Multihull?



The last fifteen years have seen the multihull yacht develop from the experimental day sailing cat or tri into comfortable, safe, ocean going yachts offering qualities far surpassing those obtained in a monohull. The path to success has not been without its tragedies, but much has been learnt about multihull design and seamanship and it is safe to say the situation has finally gelled.

Just as the smaller day racing cats and tris are far far speedier and more seaworthy than the day sailing monohull, the large cat or tri far exceeds the monohull in performance. Kraken 40 for instance, has made 300 miles in 24 hours on a close reach. Off the wind she would probably do 350 plus miles. The 40 ft. keeler can only achieve 170 miles at maximum. Tabarly's "Pen Duick IV" has recently crossed the Atlantic in ten days, breaking the twelve day record held by the schooner "Atlantic" since 1908. This tri has also broken the Trans-Pacific race record, beating in a fleet of monohulls including the 73 ft. lightweight fin keeler "Windward Passage" by 1½ days. "Pen Duick IV" did the 2000 odd miles in eight days.

It has always been recognised that multihulls are faster off the wind, what is not generally well known is that modern designs fitted with deep fins or preferably centreboards are faster to windward as well. It is inevitable that sooner or later you will need to beat off a lee shore in a gale. Some earlier designs with fat hulls and shallow fins are incapable of achieving this. Rest assured that all of Lock's designs are extremely fast and comfortable to windward.

The average person blessed with a little commonsense goes about learning multihull seamanship, first, by reading all available literature, then practically, preferably by learning the caprices of a small lively day sailer, the principles of which apply directly to the large multi. This is followed up by crewing on offshore multis, especially in a few races, before the final step of commanding his own multihull yacht. Exactly the same steps are taken by the budding keelboat owner. It is paramount suicide to step aboard armed with book knowledge only, hoping to cross the unforgiving sea.

Man is basically resistant to change and because multihulls are a new idea they naturally receive far more than their fair share of adverse publicity when a disaster strikes. Over the last few months in Australian waters at least a dozen keel yachts have been lost, some with lass of life. The only two receiving any publicity at all owed this to their particularly unusual features. Had any of the other yachts been a multihull, they also would have made the front page.

Ninety-nine percent of the multihull accidents which have occurred can be put down to three causes:

1. Inexperience on the part of the crew -i.e. poor navigation or overdriving.
2. Uncontrollable natural causes such as the whale which "Bandersnatch" struck.
3. Structural failure, due to poor construction or design.

None of these causes are unique to the multihull. Many monohull yachts have sunk and will continue to be sunk by the same causes.

Cruising multihulls have a performance not far removed from those achieved by the ocean racing yachts "Kraken 40" and "Pen Duick IV"
The advantages of the cruising multihull have been eulogised before, but it does no harm to repeat:

1. No heeling or rhythmic rolling, the multihull sails almost level, making a surprising difference to life aboard. Once ship life aboard an upright multihull has been experienced, there is no desire to go back to wolking at 40° or being rolled continuously back and forth through 40° each way.

2. A far more comfortable pitching motion, absolutely no bone jarring pounding and very little yawing.

3. Shallow draft makes a multi the most satisfactory craft of all for exploring the shallow reef strewn Carribean and Australia's Great Barrier Reef, the best type of cruising in the world. A multi can be easily beached for antifouling or just to save the row ashore in the dinghy to some secluded, normally inaccessible beach.

4. Very large open deck areas for lounging in the sun.

5. Fast passage making reducing the time spent on boring ocean crossings, lessening the chances of meeting storms and greatly increasing weekend cruising range.

6. High speeds under power with small economical motors.

To sum up - more fun and comfort, therefore better yachting.

THREE BASIC TYPES
with do-it-yourself simplicity

To a prospective multihull owner, the range of designs available is a little bewildering. For this reason the Crowther range has been divided into three, making the choice much simpler. Basically they are:

1. Ocean cruisers
2. Ocean racers
3. Day sailers.

All the ocean going craft feature strong, cold moulded plywood hulls with graceful lines. Round bilge hulls are far stronger, quieter and more efficient than the angled sheet ply chine shape.

OCEAN CRUISERS

A family can live aboard the larger designs with all the comforts of home. All Crowther multihulls feature shoal draft for poking into shallow creeks - ideal for tropical reef areas and can be beached without the need to launch a dinghy. Their safety and performance is superior to other multihulls. Buccaneer 24 is not large enough for long ocean cruises but she does have overnight accommodation plus the added advantage of easy trailering to your favourite holiday cruise area.

OCEAN RACERS

These sleek spidery designs are the ultimate in multihull performance. Featuring light, low windage netting decks, retractable centreboards, high aspect rigs with efficient sheeting arrangements, low windage profiles and extremely strong, light construction, they can be built by any experienced handyman. An outstanding ocean racer must be easy on her crew; accordingly these craft have comfortable accommodation, a galley, chart table and ample stowage for gear.

DAY SAILERS

The small off-the-beach yachts are pure racing machines without accommodation; simple trampoline decking and trapezes for the crew. The trimarans demount into three hulls and two crossbeams by undoing eight nuts for easy trailering. The A class cat is trailered in one piece. B and C class cats demount or fold down the centre as required by the customer.

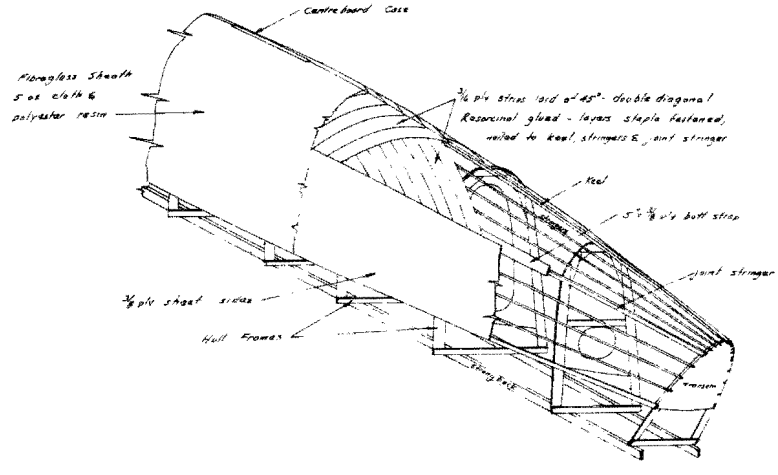
It now appears that for large multihulls it is possible for the experienced amateur builder to handle fibreglass foam sandwich techniques. Spindrift 37 and 51 are the first Crowther designs available in the world for amateur construction in foam sandwich.

CONSTRUCTION TECHNIQUES

Some people shudder at the thought of cold moulding, possibly because it sounds mysterious and difficult. Actually the moulding method used for Crowther craft is equally as simple and easy as constructing chine hulls. Strips of 1/8" or 3/16" ply, from four to twelve inches wide depending on hull curvature, are placed across the hull at 45° and butted against their neighbours, glued and nailed along the keel and down over the feathered off edge of the sheet ply hull sides. The second layer is glued at right angles to the first, nailing as before and using staples as an additional means of achieving a good glue line. Staples are placed in position over a cloth tape enabling their removal by jerking up the tape. The edge of the moulded section is feathered off to match the sheet ply sides using a hand power planer. A small ply butt strap inside the hull reinforces the join line.

All except the very largest designs have full size frame patterns. The frames have timber edging for greater strength, and supports for interior accommodation are built in. The major components of the wingdeck are prefabricated and rapidly assembled onto the hulls. Fibreglass sheathing may be used if desired.

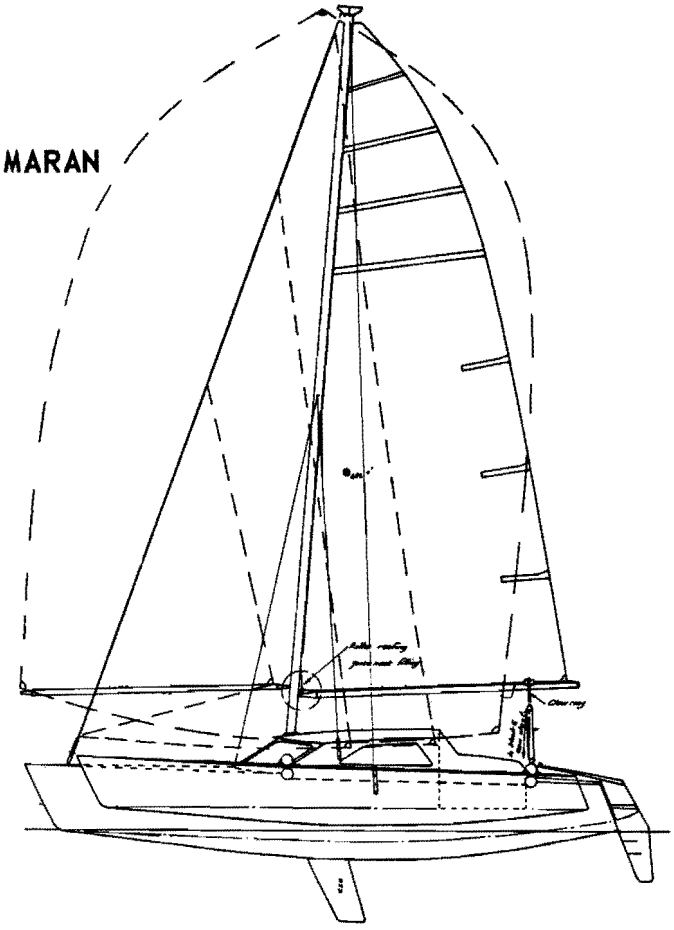
Foam sandwich hulls are built over a mould constructed in the same manner as for cold moulding except that the frames and stringers do not have to be boat quality materials. PVC foam is laid over the mould and glued to keel, gunwale and centreboard case. The foam can be bent by cutting grooves or by heating. The whole keel is then fibreglassed on the outside and finished off ready for antifouling. The hull complete with keel, gunwales and centreboard case is then removed from the mould for fibreglassing inside to form the glass-foam-glass sandwich. Any necessary plywood bulkheads are then glassed in place.



Cold moulding construction method.

OCEAN CRUISERS

BUCCANEER 24 TRAILER TRIMARAN



Buccaneer is the ideal holiday sail boat - she can be taken apart and trailed behind any car.

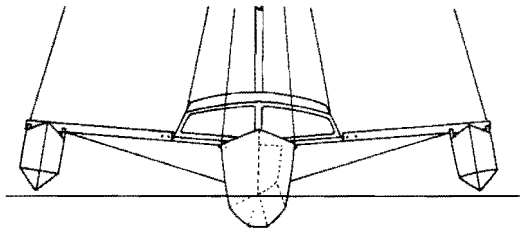
Buccaneer comes apart easily for trailering to your favourite holiday spot. She can be left at moorings if desired and just trailered home for the winter. With these possibilities and the extremely simple construction she is extremely popular.

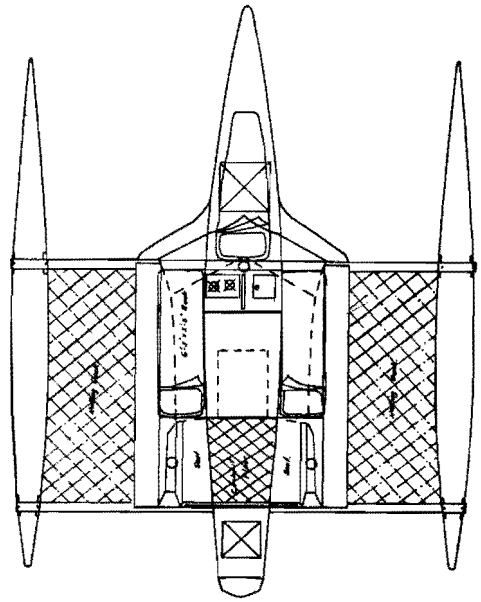
Two comfortable wing bunks, a small galley and 4ft 9in of headroom are provided in the cabin, and an additional berth up for'ard can be used when not taken up by sail stowage. There is ample stowage space under the cockpit floor and in the stern locker. A small outboard, say 3-5 hp can be mounted on the stern for windless days. The hulls are constructed entirely of sheet ply, fibreglass taped at the chines or glassed all over. The main hull is double chine, almost as good as a moulded hull and much less work. The hulls are easily constructed by any handyman without the need for a strongback.

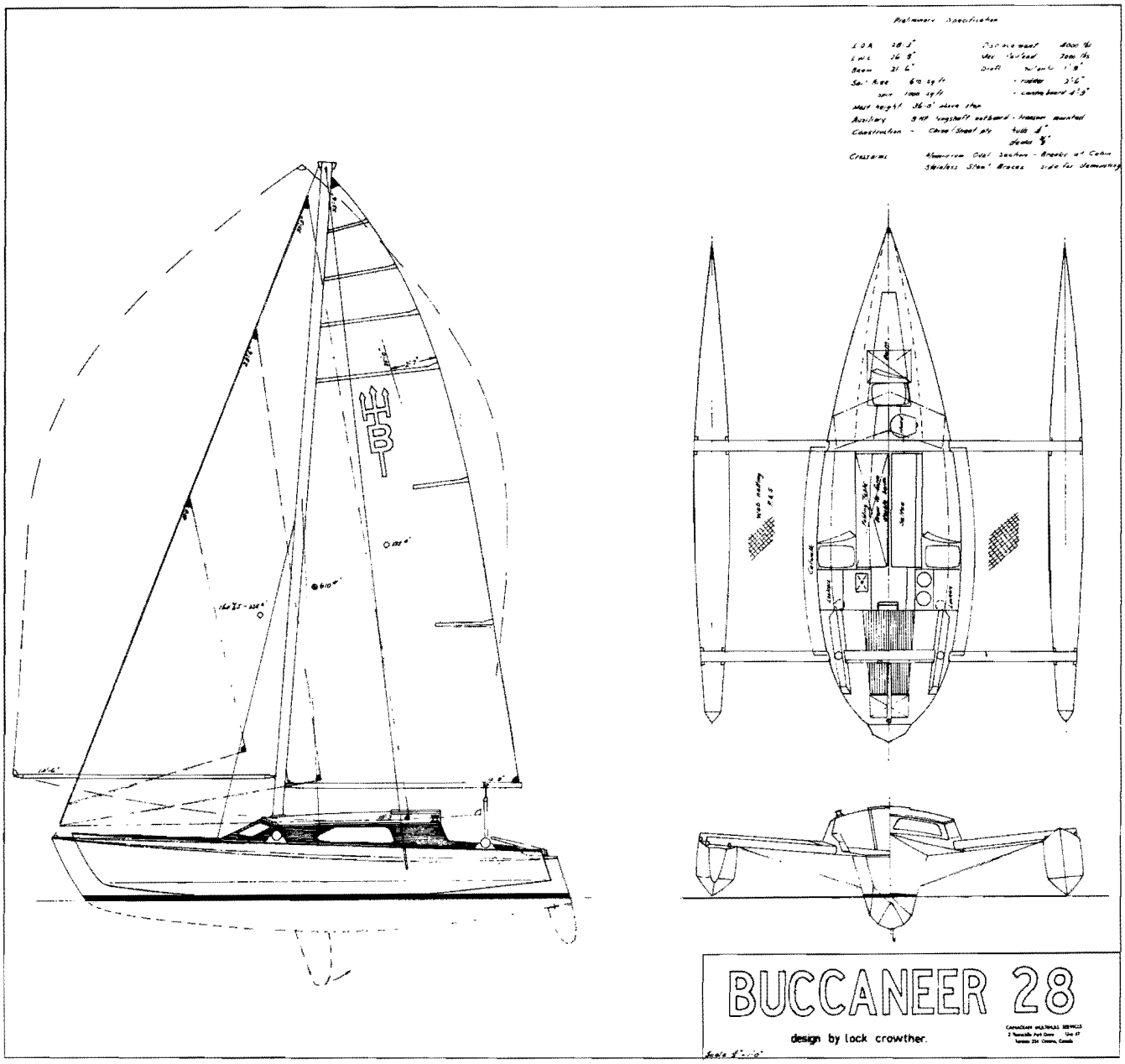
Crossbeams are readily available aluminium tubing which is simply joined by wooden plugs and bolts. With her wide beam and large sail area she is very fast, catering for those who want speed with a large genoa and spinnaker or for those who like to cruise with a smaller working jib.

L.O.A.	- 24ft. 0in.	Sail Area: Cruising	- 320 sq.ft
L.W.L.	- 23ft. 0in.	Racing	- 402 sq.ft.
Beam	- 19ft. 0in.	Displacement	- 2000lb.max
Main Hull Beam	- 3ft. 0in.	Payload	- 1000lb.
Draft	- 1ft. 3in.	Features: Daggerboard and knock up rudder	

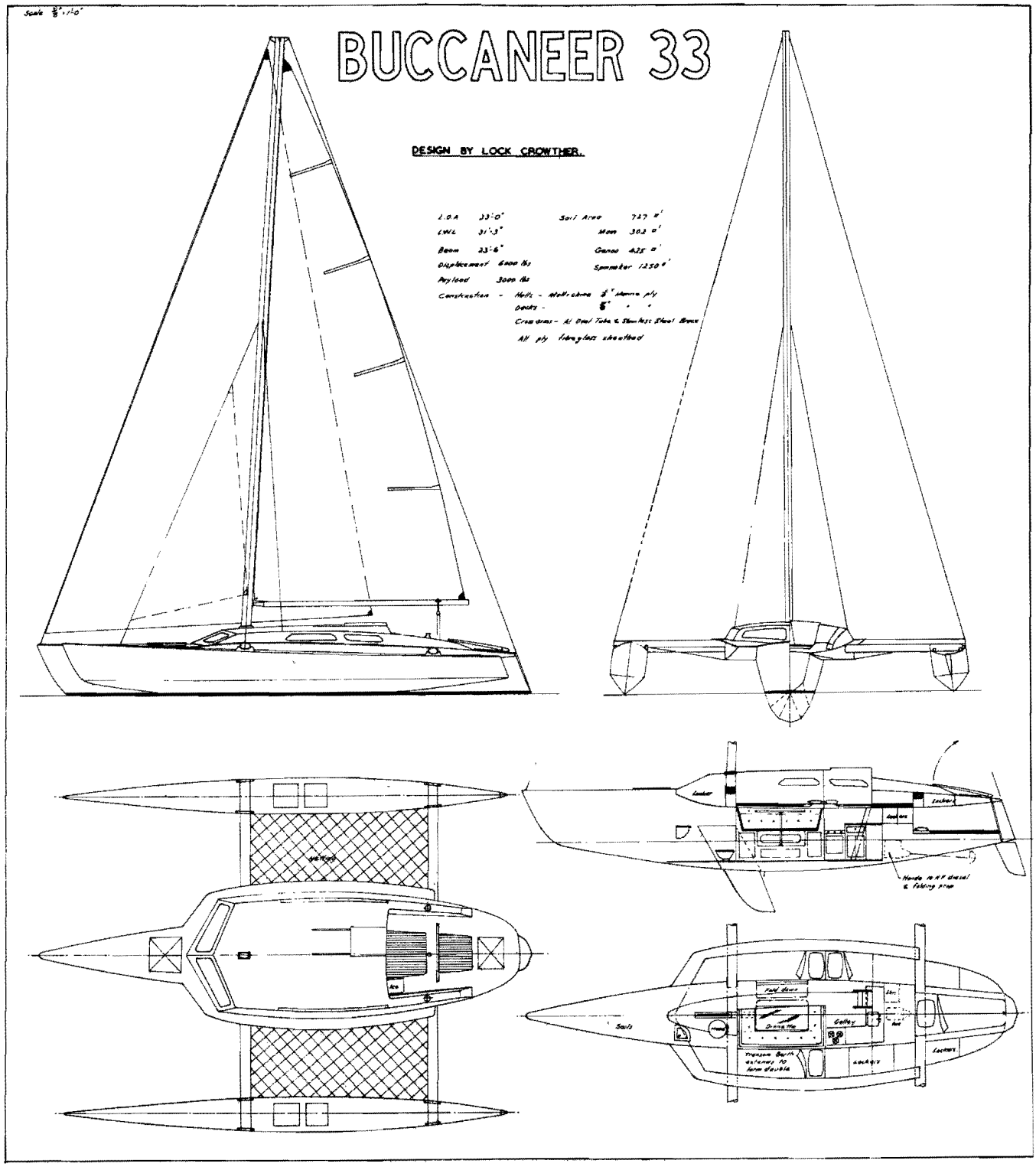
The MKII version has a longer wider and higher cabin, with bigger bunks and more headroom



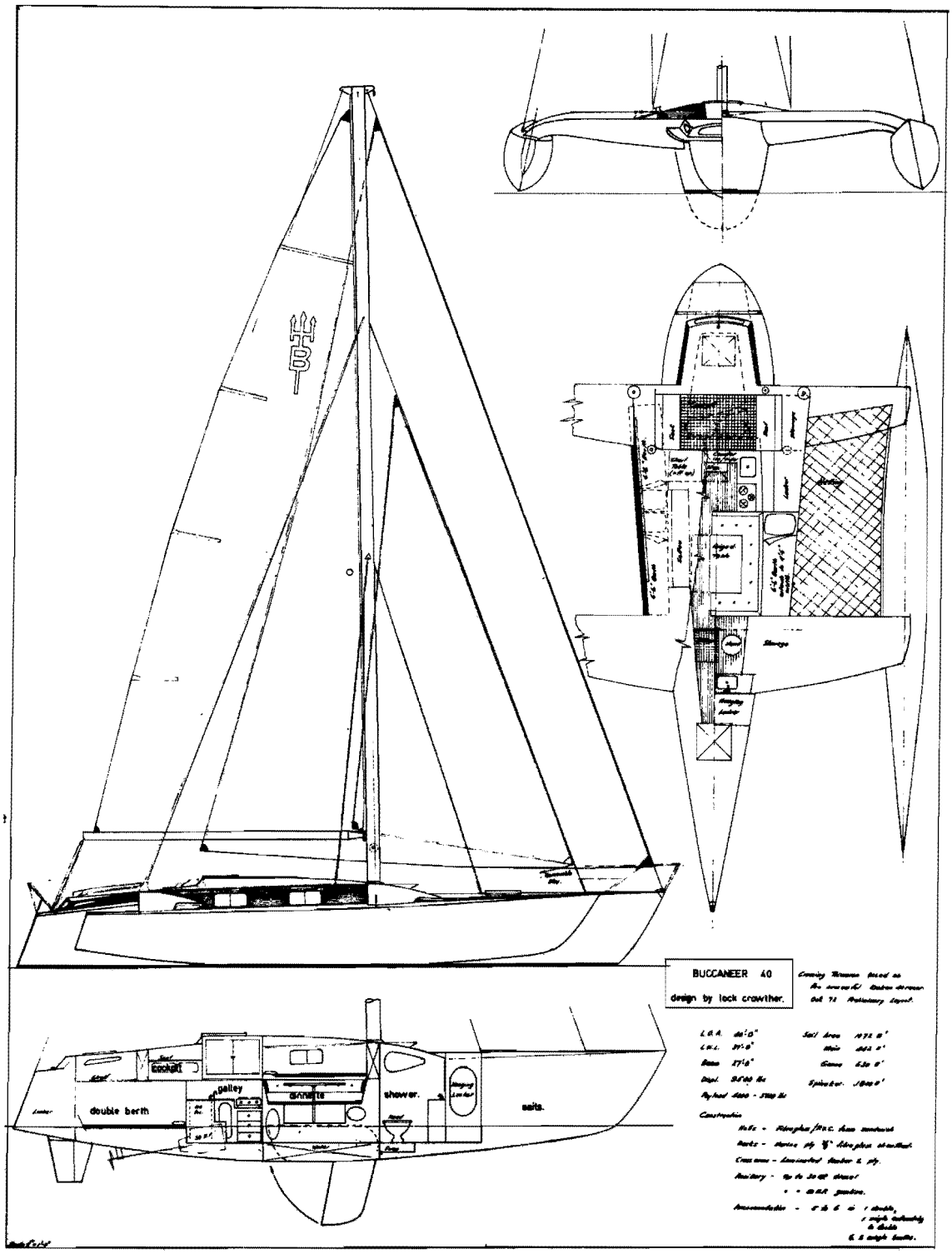




Hard on the heels of the fantastically successful Buccaneer 24 comes the new Buccaneer 28. Many B24 owners wanted to move up to something with a little more room and weight carrying capability, while a large percentage of new builders felt the B24 was a little too small, and the Buccaneer 33 was a little too large, for their needs. The B28, being in fact a larger version of the B24, fills these needs in an ideal way. The B28 maintains the sail area to weight ratio of the B24, while at the same time carrying a 100% increase in payload. Bunks for 4 - 5 people, with galley capacity to match are included, while the underslung rudder keeps the transom clear for an outboard motor. There is room under the cockpit for a small inboard, such as a Turner, Vire, or Wankel, if inboard is desired. The tremendously rigid aluminum cross beams and steel braces of the B24 are retained, giving this attractive Trimaran a deepsea-going capability for ocean wanderers. This design is highly recommended by C.M.S. for Cruising or Racing.



The success of the BUNYIP 20 and BUCCANEER 24 with their simple, easy construction and high performance, has led to the design of the BUCCANEER 33. Made completely of sheet plywood, the emphasis is on strength and simplicity. "Keep it simple, Keep it light" is Locks motto, producing Tri's which are both seakindly and fast. The worlds leading Trimaran designers have now, without exception, moved to metal crossbeams as a means of ensuring uniform strength in designs for amateur building. Lock uses spar stock for the crossbeams, with stainless steel dolphin braces. As a result this 33ft Tri can be completely dismantled for transport, while the wide beam allows a large sail area to take advantage of light wind conditions. With her light but strong construction a 50/50 weight to payload ratio has been met, producing a Tri both fast and seaworthy. Wing nets eliminate the heavy and complex wing decks, with their risk of wave damage. The B33 incorporates todays most advanced design features, and is highly recommended as a fast safe Tri for Ocean or Longshore cruising.



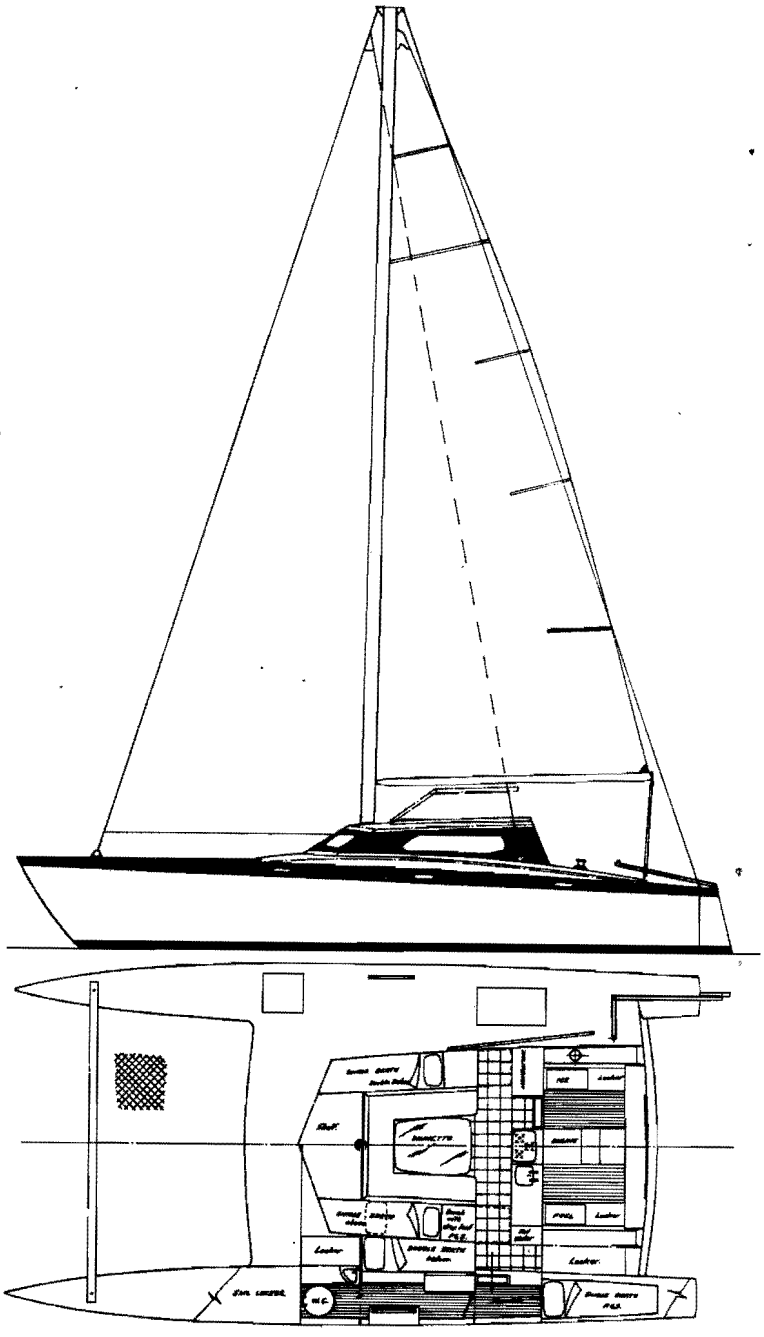
Following the great success of the Kraken 40 ocean racers "Ringo", "Hurri-Kane", and "Captain Bligh" there has been much demand for the K40 as a fast cruiser. Unfortunately the K40 does not have the interior comforts nor payload capacity to do justice as a cruising boat. Lock has now produced the Buccaneer 40 to fill this need. This elegant Tri has round bilge hulls in foam/glass/ sandwich which can support a payload of 4000-5000 lbs and gives sleeping accomodations for 5-6 persons together with dinette, galley, and bathroom facilities, to ensure comfortable cruising. The general lines of the K40 are maintained but the larger sloop/ cutter rig and increased bouyancy outriggers ensure that the Buccaneers fast, safe cruising performance is maintained.

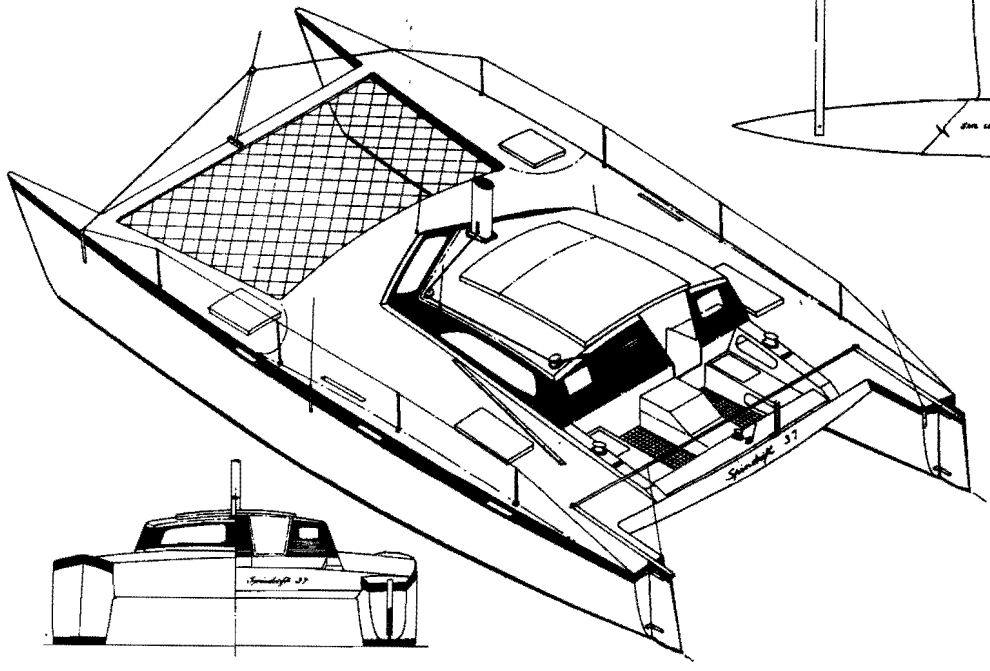
SPINDRIFT 37

For a medium sized cruising catamaran, Spindrift 37's accommodations are ideal, featuring completely self contained private double cabins with full headroom in each hull and providing complete privacy for two family groups, say owners and guests. Hull form affords complete payload capacity for all necessary stores and cruising equipment. Her simple sloop rig with five headsail graduations, roller reefing and large comfortable cockpit makes for easy handling by two people, yet she can take a large cockpit crew for hard day or ocean racing.

The cabin has been designed to provide minimum wind resistance in a head wind and consequently is very low. This also adds to her sleek appearance, yet with her unusual lift up cabin top raised, she provides full headroom in the cabin area. With the cabin top lowered, the headroom is 4'6".

Daggerboards are the most efficient 'leeway preventers' yet devised, but if you are worried about running aground, Spindrift 37 may be sailed to windward with the daggerboards raised at the expense of extra leeway. The boards are essential if you get caught out and have to claw off a lee shore in a gale. The sloop rig is the simplest, most effective and easily worked rig of all for the size of the yacht. As most passage making consists mainly of light weather work, a large spinnaker and light weather genoa are part of the sail wardrobe. The spinnaker is wider on the foot and longer than that used on a monohull as a cat provides as wider sheeting base and there is no fear of rhythmic rolling running the pole under. The construction of the hulls is foam-fibreglass sandwich. The hull mould frames of packing case timber gussetted with hardboard are set up on a strongback in the usual manner. Timber stringers spaced about one foot apart are laid around the frames to form the mould. The laminated keel and gunwales, the centrecase and stem are temporarily attached to the mould. PVC foam sheets ¾" thick are laid over the mould and glued to the keel and gunwales. The foam has ½" deep slits around the turn of the bilge to facilitate bending. After fibreglassing the outside, the hull is lifted off the mould, turned over and fibreglassed inside. A few plywood bulkheads are glassed in place to take the wing attachments and hull accommodations. Simple plywood "I" beams with timber edging connect the hulls together with the plywood wing floor. Basically the design is a smaller version of the racing catamaran Spindrift 40 but orientated towards cruising rather than racing.





SPECIFICATIONS

L.O.A.	-	37ft 6in.
L.W.L.	-	34ft. 0 in.
Extreme Beam	-	20ft.0in.
Draft hull only	-	1ft.8in.
rudder	-	2ft.9in.
daggerboards down		4ft.8in.
Sail Area - main & genoa		900sq. ft.
spinnaker		1400sq.ft.
Displacement LWL	-	7000 lbs.
Approx. weight empty	-	3800lbs.
Maximum payload	-	4200lbs.

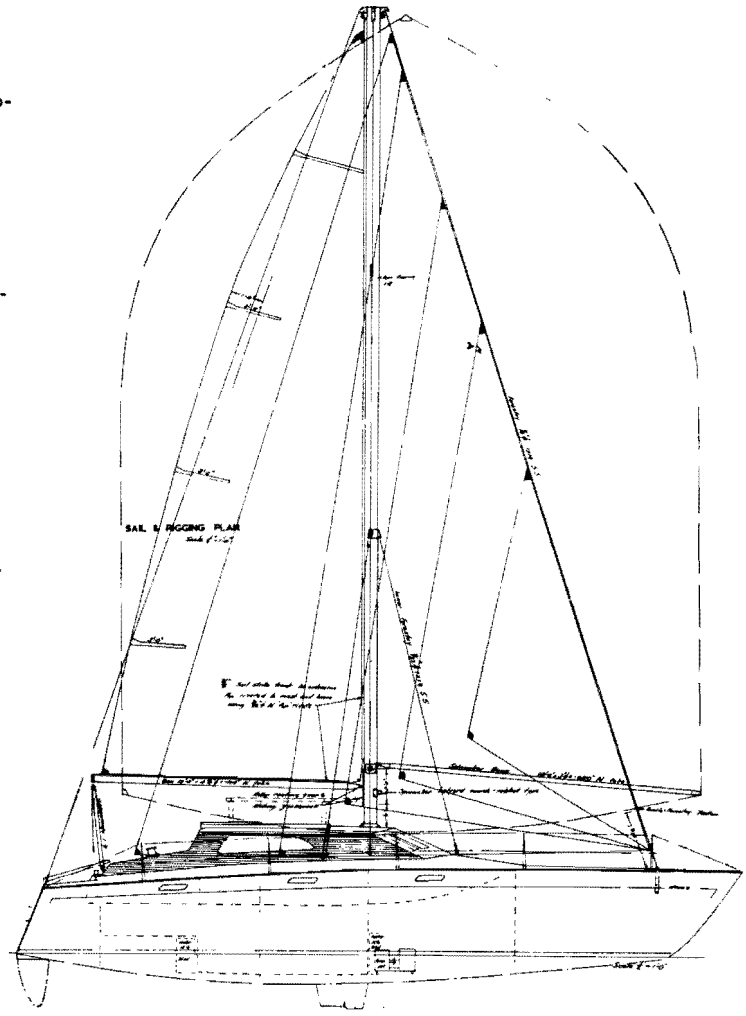
SPINDRIFT 40

Spindrift 40 is a cruising - racing catamaran, capable of long distance cruising or of competing with any multi or monohull design anywhere in the world. Her accommodations are very comfortable, completely self contained private double cabins with full headroom in each hull, provide privacy for two family groups.

Developed from a long line of extremely successful ocean racing and day sailing multihulls she can maintain incredible average speeds with an easy sea going motion keeping her crew alert, comfortable and efficient. She definitely has the potential to do a 300 mile, 24 hour run as did her sister Kraken 40 trimaran in the 1969 Bermuda race.

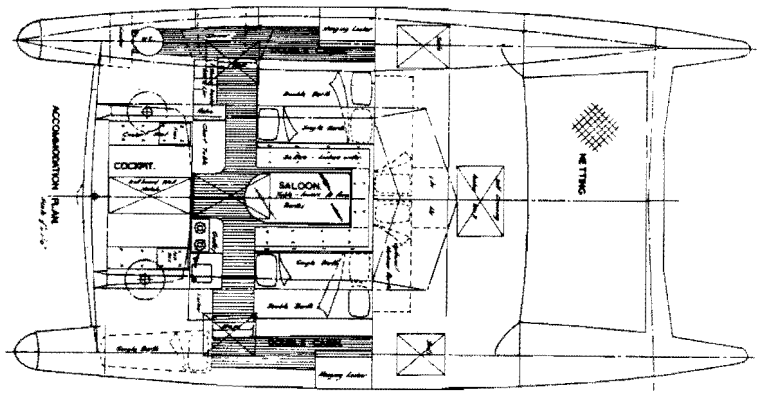
The cabin has been designed to provide minimum wind resistance in a head wind and consequently is very low. This also adds to her sleek performance, yet with her unusual lift up cabin top raised, she provides full headroom in the cabin area.

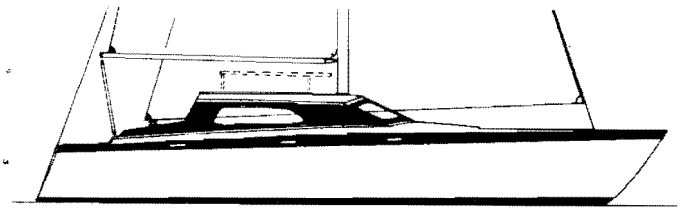
The main disadvantage of a catamaran as compared with a trimaran is the reduced overall beam, and hence reduced sail carrying power. Wing clearance is inter-related with hull spacing; the wider the gap, the higher the wing. Most cat designs have insufficient stability as the designs have provided full headroom in the wing cabin, necessitating a low wing clearance and hence narrow hull spacing. Lock has used the ingenious "Thunderbird" style lift up cabin top to provide full headroom, yet under sailing conditions with the top down, the cabin is very low and the wing has been raised accordingly, allowing much greater hull spacing. In fact she has four feet more beam than the average cat of her length and therefore much greater stability and safety.

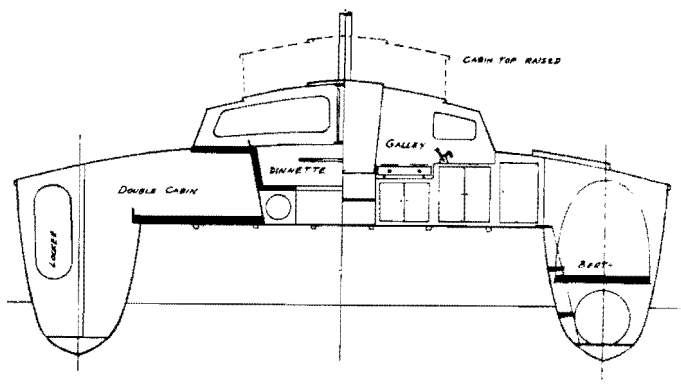


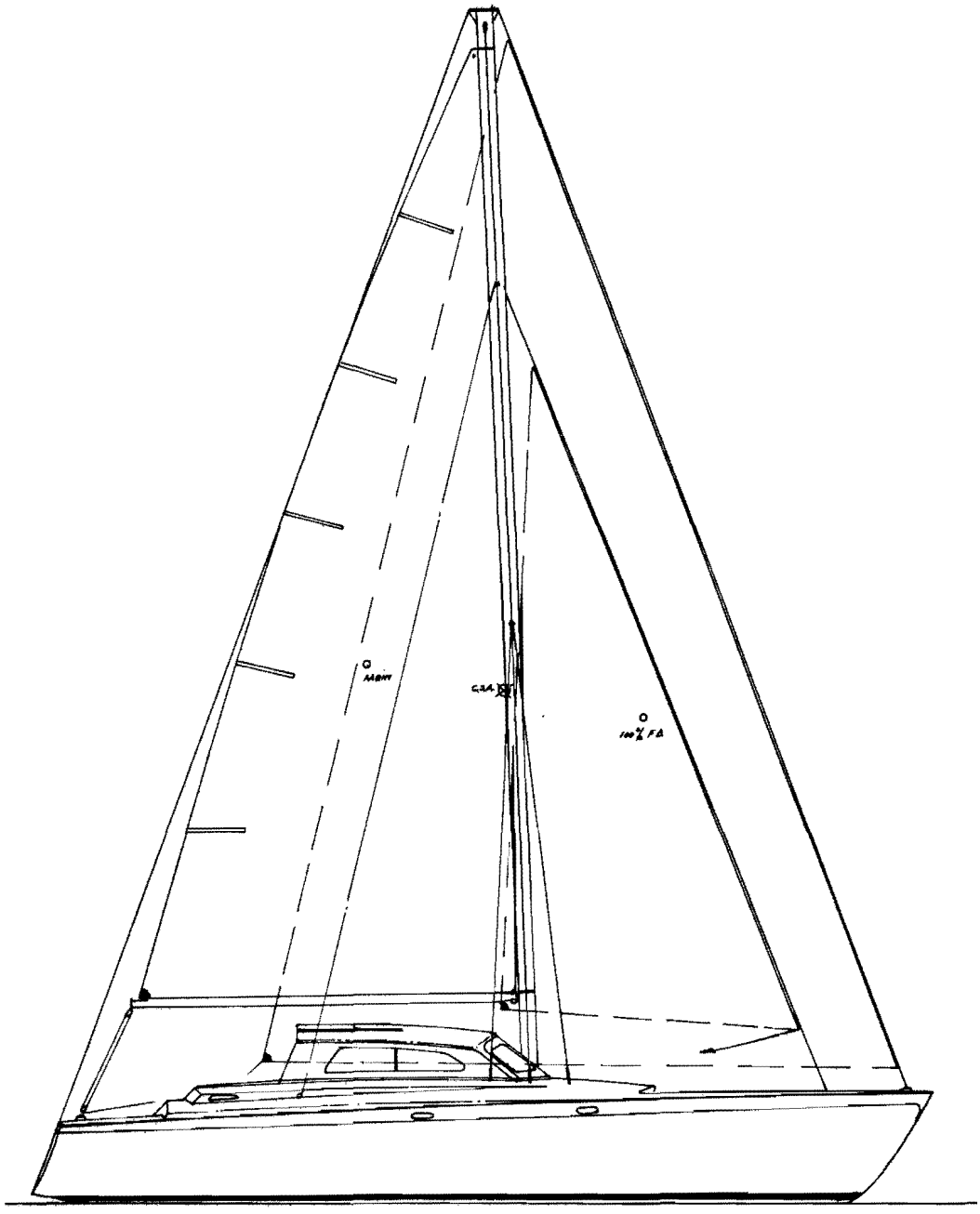
SPECIFICATIONS

L.O.A.	- 40 ft.
L.W.L.	- 36 ft.
Extreme Beam	- 21 ft.
Draft - Hull only	- 1 ft. 9 in.
rudder	- 2 ft. 9 in.
daggerboards down	- 4 ft. 9 in.
Sail Area - main & genoa	- 971 sq. ft.
- spinnaker	- 1500 sq.ft.
Displacement L.W.L.	- 8000 lbs.
Approx. Weight empty	- 4500 lbs.
Maximum Payload	- 4500 lbs.
Auxiliary Power	- 20 hp O/B





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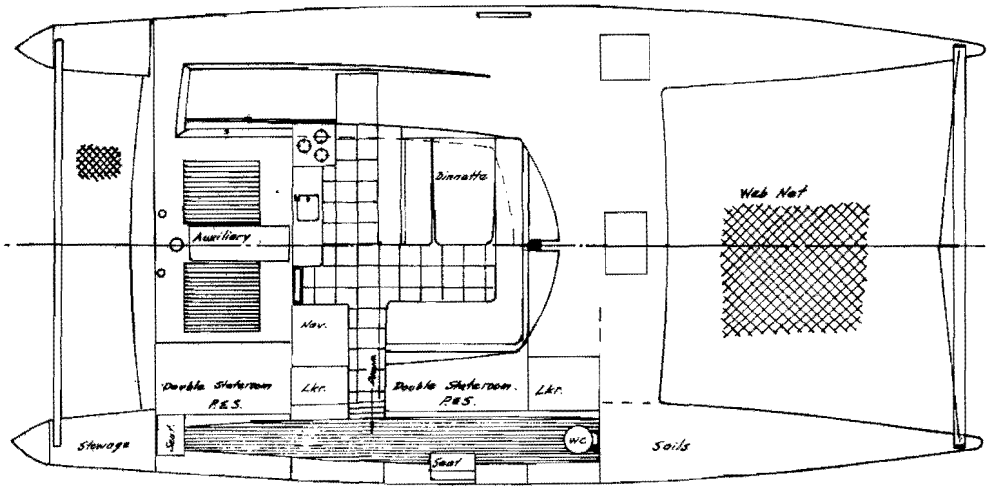
Dinette
Web Net
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Galley
Double Stateroom P&S.
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Stowage
Seat
W.C.
Seat
Sails

OCEAN CRUISER

Spindrift 45 — Design by Lock Crowther

This is the latest of Lock's catamaran designs and is ideal for a permanent family home. She is also great for charter work with her four private double cabins and large galley/saloon area. Full headroom is provided throughout.

Construction is in PVC foam/fiberglass sandwich for the hulls and in plywood for the wingdeck.
The prospective amateur builder should not be put off at the thought of foam sandwich construction. It is actually easier and much quicker than cold moulded construction, as proved by the many successful amateur built Spindrift 37's, and 51's.
Performance-wise, Spindrift's narrow hulls of 14:1 L/B ratio and 1300 sq.ft. of sail ensure that she has a performance similar to the Kraken 40.
Around 300 mile per day runs will be relatively easily obtained. As with the two smaller Spindrifts the overall beam is four feet wider than is normal for a catamaran to provide stability and sail carrying power.

This, together with a relatively high, finely faired wingdeck, allows her to be driven hard to weather in rough conditions.

The rig is basically sloop with a removable inner forestay enabling conversion to cutter. It is not intended that two headsails be set at once. Rapid reduction in headsail area required during squalls are made by dropping the large genoa and setting the staysail. The resultant $\frac{3}{4}$ rig is extremely efficient for heavy weather windward work and further sail reductions can be made by roller reefing the main. Both headsail halyards are led back to the cockpit so that the sails can be changed without leaving the cockpit.

For those who jib at the thought of home built hulls. Crowther Multihulls will supply hulls in glass/balsa sandwich to the waterline, straight glass below for a very reasonable price.
The hulls come complete with bulkheads, centre case and rudder tube and are ready to connect to the ply wingdeck structure.

Specifications

L.O.A.	45'-0"	Displacement	11,500 lbs.
L.W.L.	39'-6"	Approx. weight empty	8,000 lbs.
Beam	23'-0"	Max payload	5,000 lbs.
Draft	2'-1"	Auxiliary power	40 H.P. outboard, twin 15 H.P. inboards with folding props. or 40 h.p. diesel/petrol inboard/outboard with extended leg.
Sail area	1300 sq. ft.		

Construction - Hulls - Fiberglass sandwich.
Decks - $\frac{1}{2}$" & 3/8" plywood, fiberglass sheathed.
Crossbeams - Plywood/timber 'I' beams.
Cabin top - Foam/Glass sandwich.

Price of Hulls on application.

SPINDRIFT 51

Spindrift 51 is a catamaran for world cruising as a permanent floating home, capable of averaging 200 miles per day as she is an outstanding passage maker.

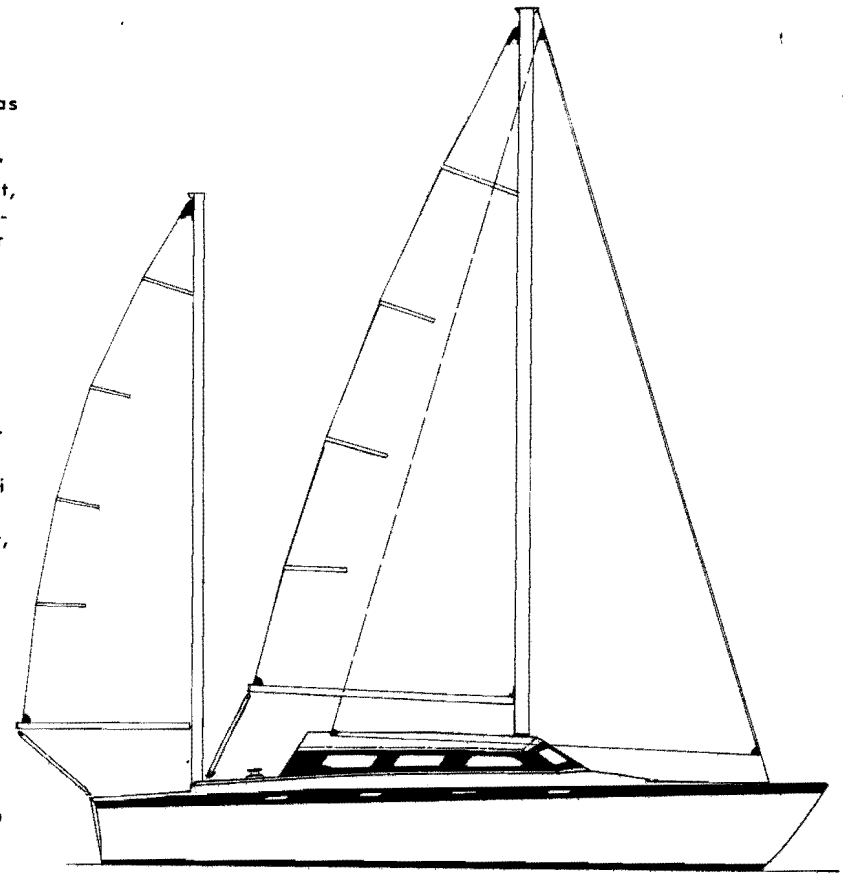
Her accommodations are the ultimate in comfort, completely self contained large double and single cabins with full headroom in each hull provide privacy for up to four family groups.

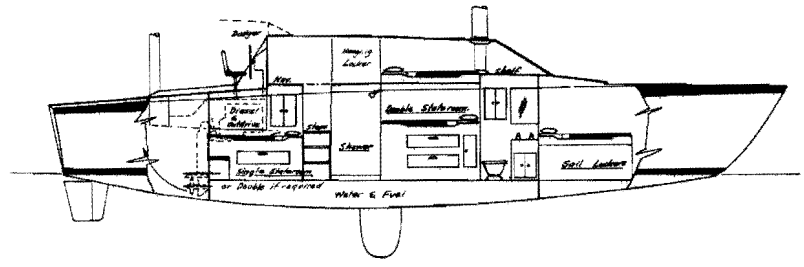
She also has room in the hulls for a workshop and photographic darkroom if desired.

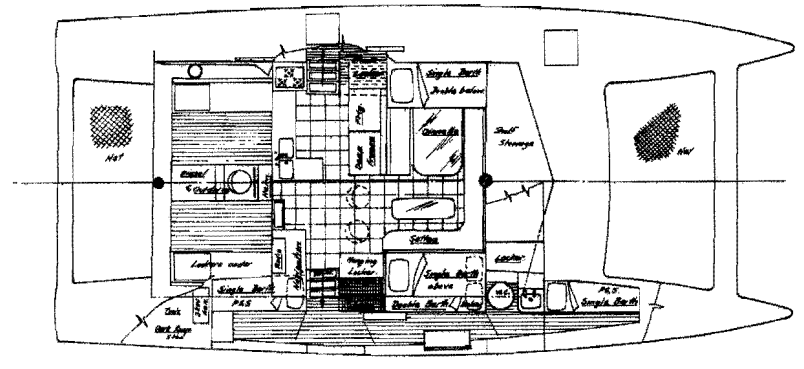
Hull form affords complete payload capacity for all necessary stores and cruising equipment.

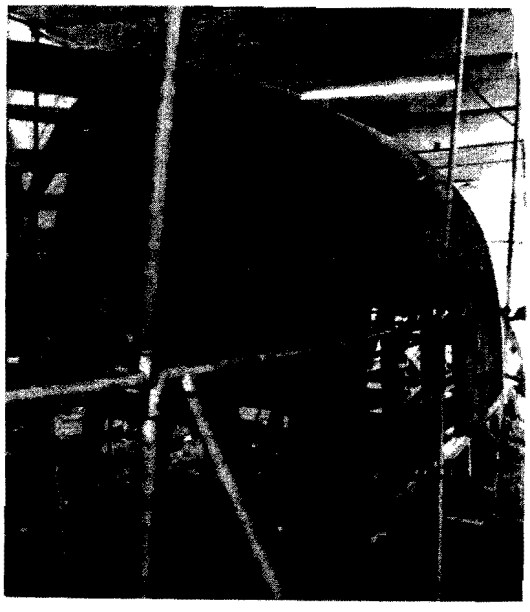
Basically the hull sections are slightly deeper than a semi circle and have veed bottoms to prevent the sudden release and lift out which occurs on a semi circular hulled cat. The ends of the hulls are more eliptical in section, still with the vee, particularly aft, as this allows an easy pitching motion.

As the waterline is continually varying at the bow and stern, the eliptical sections are on the average of minimum wetted surface. It will be noted that the bow has ample freeboard and flair to prevent nose diving into sea and that the stern flairs to match the bow and dampen any pitching. The construction is straightforward if a little unusual as the hulls are foam-fibreglass sandwich. However, provided the prospective builder has had little experience with both fibreglass and timber before, no difficulties will be experienced. In fact the foam sandwich construction is quicker and easier than plywood construction and has advantages of insulation, sound proofing, rot free and lack of maintenance. Spindrift 51 is so large and stable there is only a very small likelihood of her ever being capsized due to mishandling in knockdown conditions.







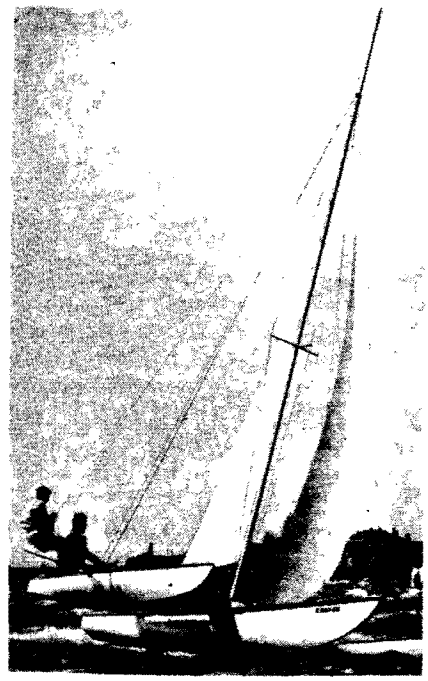


Foam-fibreglass sandwich construction.

SPECIFICATIONS

L.O.A.	- 51ft. 0in.	Sail Area - Genoa, main & mizzen	- 1460 sq. ft.
L.W.L.	- 45ft. 0in.	Spinnaker	- 1950 sq. ft.
Extreme Beam	- 24ft. 0in.	Mizzen stay-sail	- 520 sq. ft.
Draft - Hull only	- 2ft. 3in.	Displacement L.W.L.	- 22000 lbs.
Rudder	- 3ft. 3in.	Approx. weight empty	- 11000 lbs.
Daggerboards down	- 5ft. 8in.	Maximum payload	- 1300 lbs.

DAY SAILERS



KRAKEN 18

A slightly faster, more attractive version of Bunyip 20 with round bilge hulls. Kraken 18, constructed in fibreglass is available in the U.S.A.

CONSTRUCTION - Hulls: Two layers of 1/12" veneer cold moulded over a simple male mould.
Crossarms: 3/16" sheet ply over a simple box beam
Trampoline Deck between hulls.
Crew: Two man crew - both on trapezes for flat out racing.
Alternatively with a smaller headsail, she may be used for general pottering about without the need for trapezing.

L.O.A.	- 18 ft. 0 in.
Beam	- 11 ft. 0 in.
Sail Area	- 227 sq. ft. - sloop rig - racing 167 sq. ft. - small headsail

NOTE: The rigs for Kraken 18 & Bunyip 20 are identical.

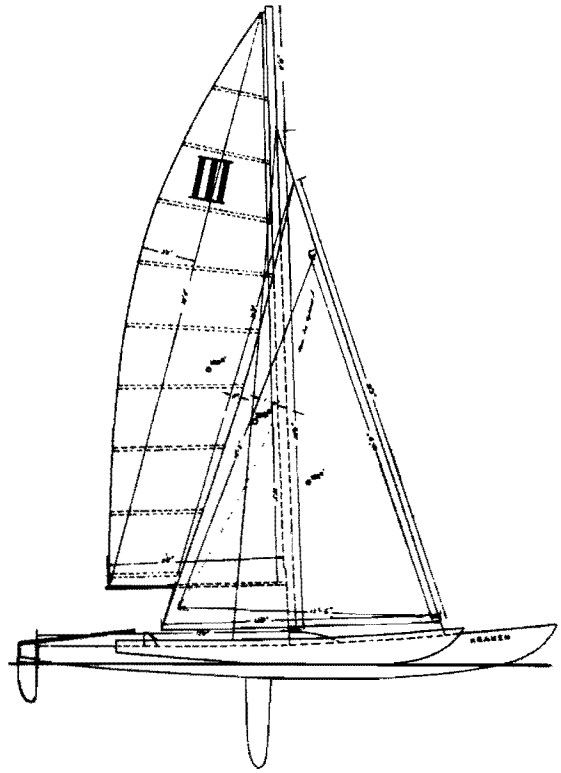
KRAKEN 25

Virtually a C Class trimaran of unbelievable light weather performance and good heavy weather performance. This is the trimaran for racing enthusiasts who want to show up the local catamarans.

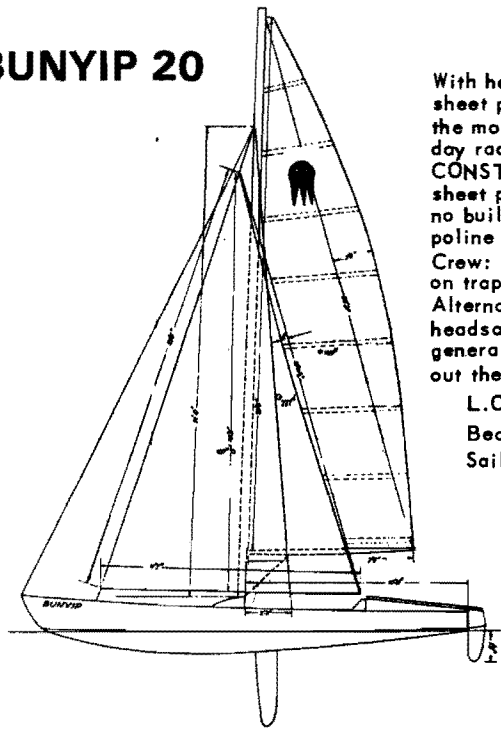
CONSTRUCTION - Two layers of 1/10" veneer cold moulded over a simple male mould.
Crossarms: 3/16" sheet ply over a simple box beam.
Trampoline Deck between hulls.
Crew: Two man crew - both on trapezes - may be sailed three up if desired.
Kraken 25 requires some expertise to get the best out of her.

L.O.A.	- 25 ft. 0 in.
Beam	- 14 ft. 0 in.
Sail Area	- 300 sq. ft. - She has a small headsail for heavy weather.

TRAILERING - All the day racing trimarans are trailerable by undoing eight bolts and removing the trampoline decking. The three hulls and two crossarms are placed side by side to form a trailerable package of narrow overall width.

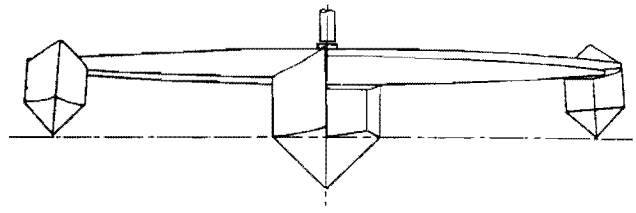


BUNYIP 20



With her extremely simple sheet ply chine hulls she is the most popular of Lock's day racing designs.
CONSTRUCTION - All 3/16" sheet ply over simple frames, no building jig required, trampoline deck between hulls.
Crew: Two man crew - both on trapezes for flat out racing. Alternatively with a smaller headsail she may be used for general pottering about without the need for trapezes.

L.O.A.	- 20 ft. 0 in.
Beam	- 11 ft. 0 in.
Sail Area	- 227 sq. ft. sloop rig - racing 167 sq. ft. small headsail



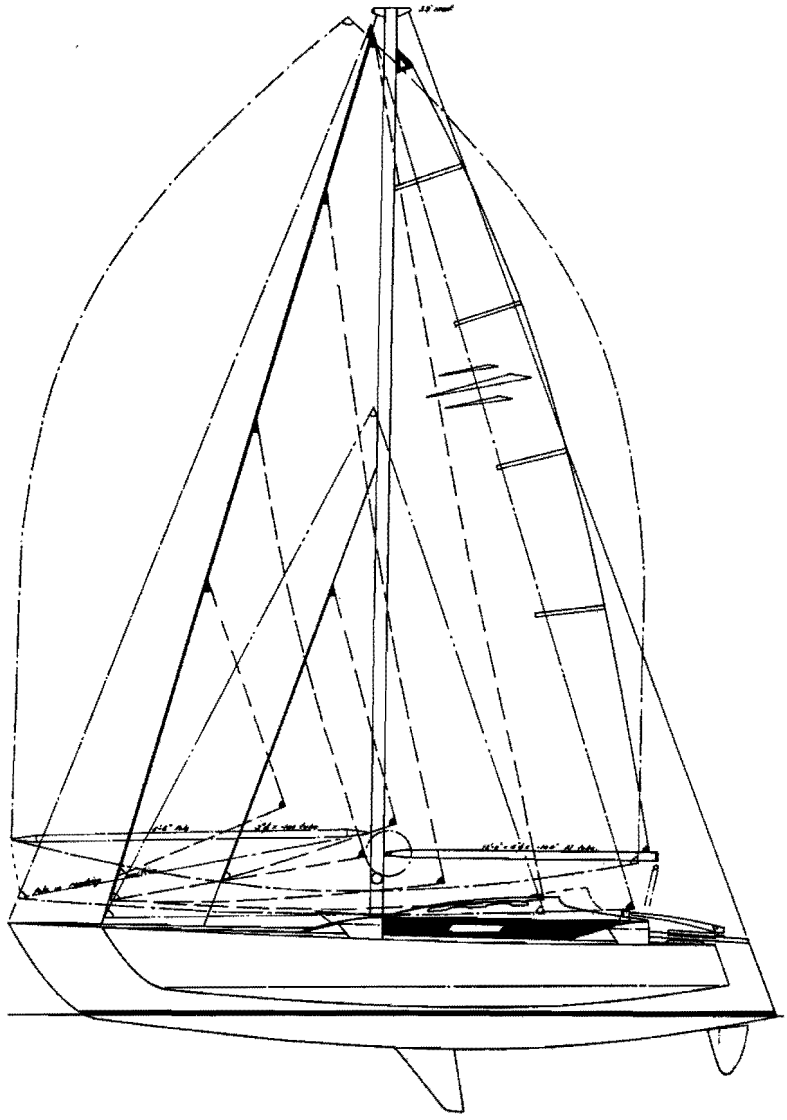
OCEAN RACERS

KRAKEN 33 Mk IV

The new Kraken 33 is expected to be some 30% faster than her predecessor "Bandersnatch", which won the inaugural Sydney-Hobart Multihull Race in 1966. This huge performance increase is accompanied by corresponding increases in structural strength and safety.

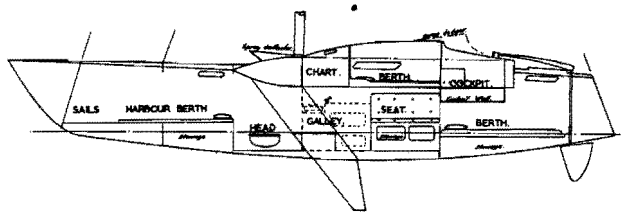
The hull design has been considerably developed through competitive racing in A, B & C class catamarans. "Mystery" a B cat, designed by Lock Crowther is N.S.W. champion cat, ahead of the equal world champ Tornado B cat "Mehitabel". The new hull lines have minimum wetted surface sections throughout, increased freeboard, fore and aft stability and much improved manoeuvrability. The combined effect of the new lines, the daggerboard in lieu of a quadrant centreboard and the spade rudder is to reduce wetted surface by 30%. Skin friction being the major drag component at average speeds in average sea conditions, the reduction in surface area will have a marked effect.

Sail area is larger and has large extras including a flat kite cum drifter genoa set flying or from a spinnaker pole. The cross beams are built up off the floats on stilts so that the floats can be driven under without the cross beams dragging in the wave tops. The conventional wing decks are replaced with nylon netting; this eliminates in one stroke, much unnecessary weight, the danger of capsize due to wind forces on the exposed underdeck and wave pounding on the under side of the leeward deck.

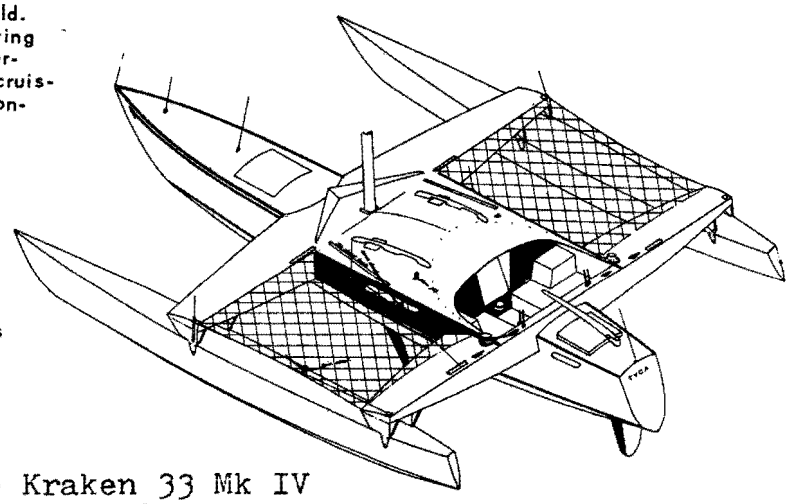


ACCOMMODATION

This has been improved, the cabin is now somewhat longer, giving a good sized galley and separate chart table. The feet of the bunks extend into the cockpit which gives a very spacious layout. The angled daggerboard now barely intrudes into the cabin at all. As the main hull is about a foot wider at deck level the cabin is quite spacious compared to "Bandersnatch". The wide fore deck and increased freeboard make a roomy fore peak with plenty of space for the sails, head and a fourth berth. The bunk under the cockpit, commonly called the "afterberth" is extremely comfortable in a seaway and is much sought after by weary crewmen. This bunk has full sitting headroom.



John Hitch, skipper of "Bandersnatch" will have the prototype launched Christmas 1969. Martin Pollard, winner of the Bermuda Race 1969 on handicap hopes to complete his Kraken 33 about the same time. Others are well under construction in various parts of the world. This design and her larger sister Kraken 40 are proving very popular not only because of their unbeatable performance but because they double as a comfortable cruising boat that is far safer than any other multihull configuration yet designed.



SPECIFICATIONS

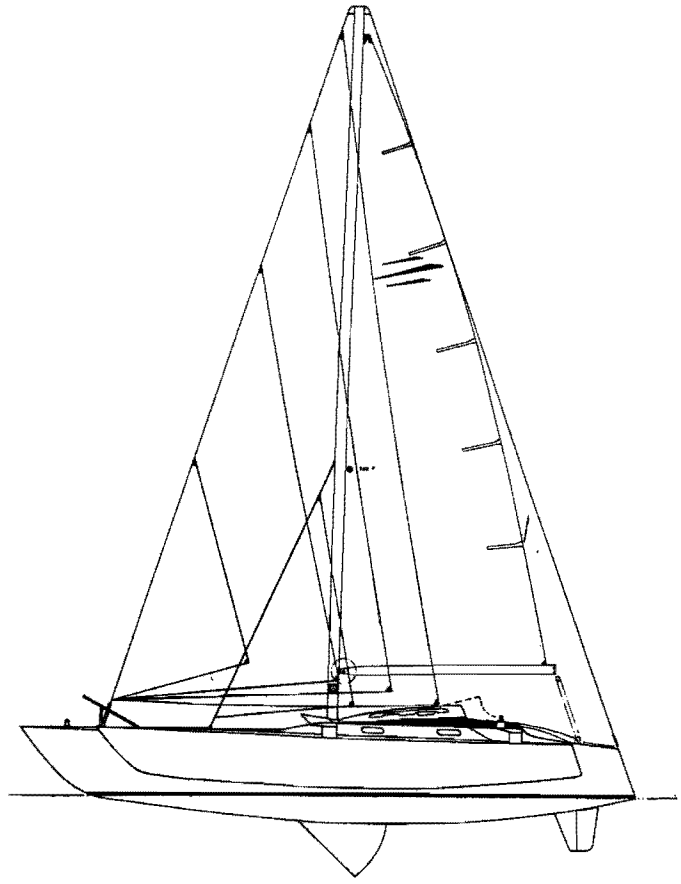
L.O.A.	- 33ft. 0in.
L.W.L.	- 30ft. 0in.
Beam	- 23ft. 0in.
Displacement	- 4000 lbs.
Sail Area	- 592 sq. ft. working sails
	- 500 sq. ft. reacher
	- 800 sq. ft. spinnaker
Accommodation	- 4 berth
	6 ft. headroom

In her first ocean race the Kraken 33 Mk IV "MANTA II" came first to finish, first on corrected time, and set a new course record for the Brisbane- Gladstone race.

KRAKEN 40

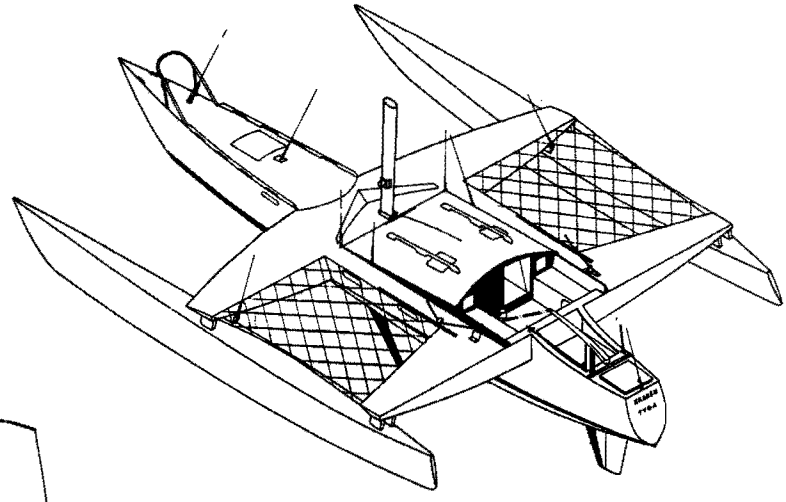
This sleek offshore racing machine is a direct development from Kraken 33 racing experience. We are sure she is the world's fastest trimaran, (possibly the world's fastest sailing boat in a stripped condition with her light weather rig of 950 sq. ft.) She is Lock's newest design for long distance racing or very fast cruising. As an ocean racer she requires a five or six man crew; for cruising, a four man crew is ample. Alternatively, she can be sailed as an out and out harbour racer simply by stripping her of all paraphernalia and using a special light weather rig of 950 sq. ft. of working sail. "Ringo" fitted with the large rig took line honours in the 1969 New York - Bermuda race close reaching 296 miles in twenty four hours. She would have broken the record seventy two hours for 640 miles set by Barlevento in the 1956 race had the wind held. "Ringo" has averaged 19 knots through the water while cruising. Her true potential has yet to be realised.

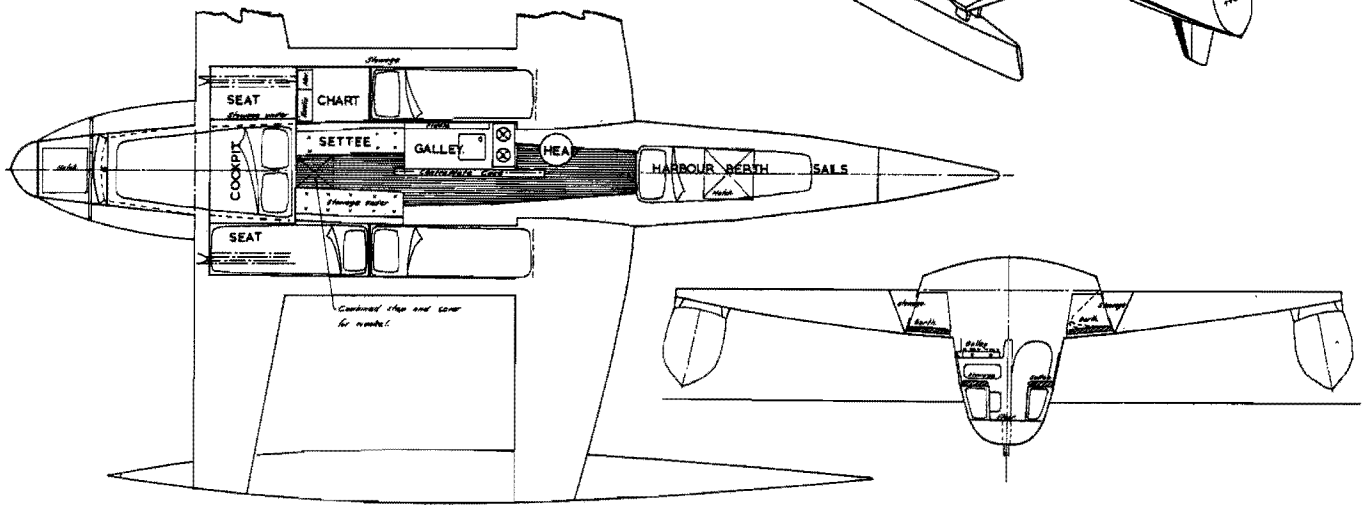
Both rigs feature larger than normal spinnaker and huge flat reaching spinnaker which can be set off the pole or stem head. The main hull design is based on the latest from that fastest developing of all classes, C class catamarans. Here experience has proved that maximum length/beam ratio and minimum wetted surface is required. Hence the narrow hull with minimum wetted surface sections carried through from bow to transom. Kraken 40 provides five to seven berths, three in the wings, one double under the cockpit and others up forward. A complete galley, fine chart table, head, in fact all the necessary comforts for cruising are built in. Materials cost $A6,000 to 8,000.



SPECIFICATIONS

L.O.A.	39ft. 6 in.
L.W.L.	35ft. 6 in.
Beam	27ft. 0 in.
Sail Area 750 sq. ft.	(950 sq.ft.)
Headroom	6 ft. 3 in.
Displacement	5000 - 6000 lbs.
Pay Lood	1700 - 2700 lbs.
Aux. Power	18hp O/Board or 10hp Wankel under floor driving folding prop.





CATAMARANS

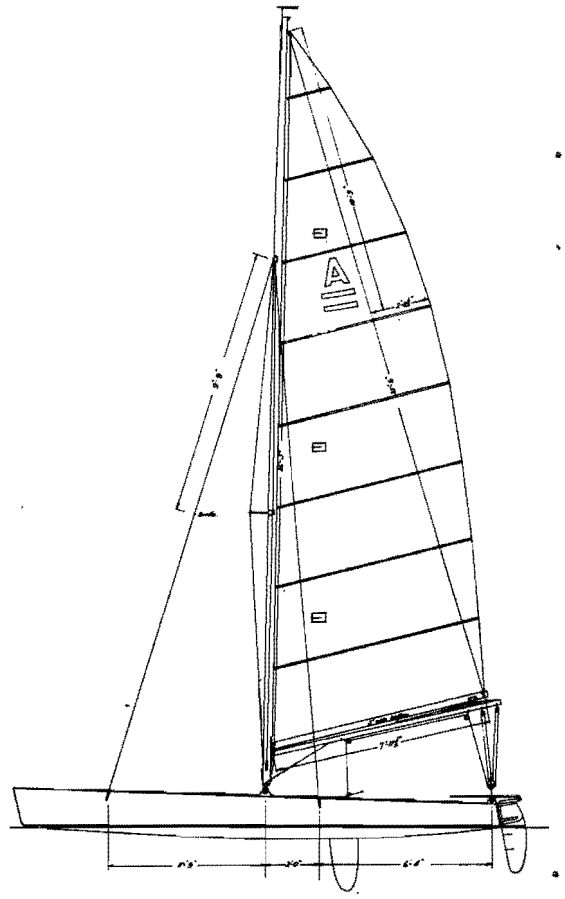
"A" Class CATAMARAN

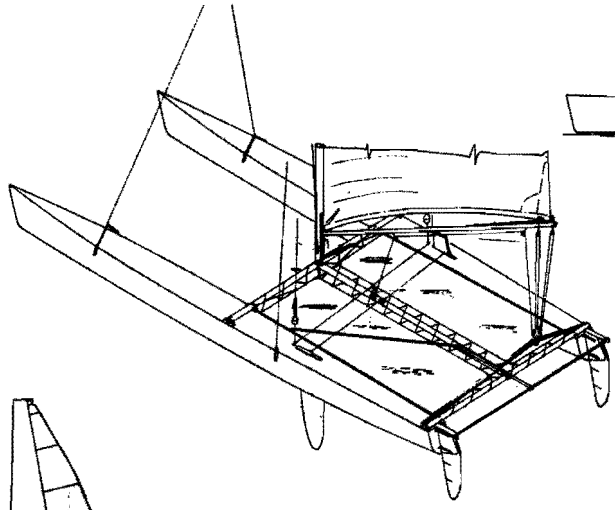
For the single handed racing enthusiast, this is the most sophisticated and fastest A Class to date. This design sports a very high aspect ratio sail set far aft on the hulls, virtually eliminating the bow burying characteristics of catamarans.

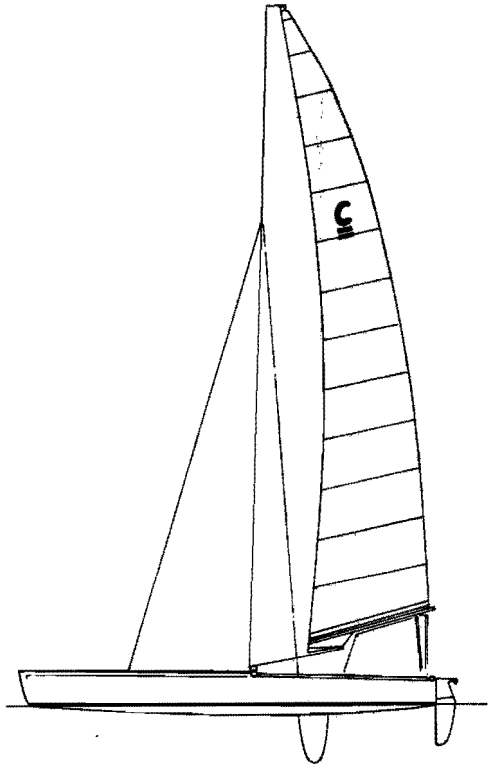
Hulls are an ideal combination of ply sides, rounded decks for stiffness and a moulded fibreglass hull bottom for low maintenance and simplicity. All crossbeams are marine aluminium alloy tube, trampoline decking is netting or terylene and the alloy spar is a specially tapered extrusion.

L.O.A.	- 18 ft. 0 in.
Overall Beam	- 7 ft. 6 in.
Sail Area	- 150 sq. ft.
Approx. fully rigged weight	160 - 170 lbs.

Because a mould is needed for the glass bottoms, the hulls have to be professionally built.







"C" Class CATAMARAN

The ultimate in two man catamarans for speed and excitement. This sailing machine is at the forefront of catamaran design. Easily constructed by the tortured ply method, she sports a high aspect sloop rig or alternatively a wing masted cat rig. This latter mast has to be removed if the cat is left unattended but is worthwhile because of the gain in performance.

As with the A Cat, the rig is higher and further aft than usual for improved all round performance and prevention of lee bow burying. This is a design for the real catamaran racing expert.

CONSTRUCTION - 3/16" sheet ply, stitched and fibreglassed along keel and pulled into shape at the gunwale. Fibreglass reinforced in stress areas, internal foam slab support for bows.
Connecting structure is aluminium extrusions, stainless steel dolphin brace and trampoline decking. Wing mast is alloy extrusion and ply ribs, aircraft fabric covered and doped - much lighter in weight than conventional wing masts.

L.O.A.	- 25 ft. 0 in.
Beam	- 14 ft. 0 in.
Sail Area	- 300 sq. ft.
Fully rigged weight	- 600 lbs.

SEAWINGS TRIMARANS

BY R.C. "SKIP" JOHNSON

This piece is mostly about a new line of trimaran designs for the amateur or professional builder. They are called "Seawings" Trimarans. Before getting down to cases, I'd like to philosophize a bit; make a few observations.

There are a lot of bad trimarans around. We've all seen them. Poorly designed, indifferently-built, leeward-going, misshapen boxes. With horror stories to match. These things cost a lot of money, and broke a lot of hearts. These ill-bred craft have made trimarans the object of scorn among many experienced seamen. Why? Because some promoters, more blessed with a silver tongue than a golden hand, exploited the naivete and lust for adventure of would-be cruising folk. They said they don't cost much and anybody can build one. And then, why, you just go out and sail right around the world! Many laughed. Many believed, and eventually the word got out that trimarans were reaching freaks that didn't go to weather very well and tacked badly. Sometimes they even came apart. Well that's true enough of a seagoing motel room with a novice at the helm. Mean-while, a handful of dedicated men, motivated more by the technical challenge and love of the sport than by the lust of gold, patiently developed the breed. Improved configurations and improved construction techniques were tested. This second generation fulfills the promise. They are safe, high performance cruisers. They have made a shambles of the record books. Windward performance? The Observer Single Handed Transatlantic Race is on the wind all the way. In the last one 5 trimarans faced a sterling field of 53 other yachts, some costing half a million dollars, and one 128 feet long! Trimarans finished first, third, fifth, sixth, and twenty-seventh. So the technology does exist.

What then is required to build and cruise a trimaran? Just what it takes to build and cruise any other sailboat. Namely:

TALENT:

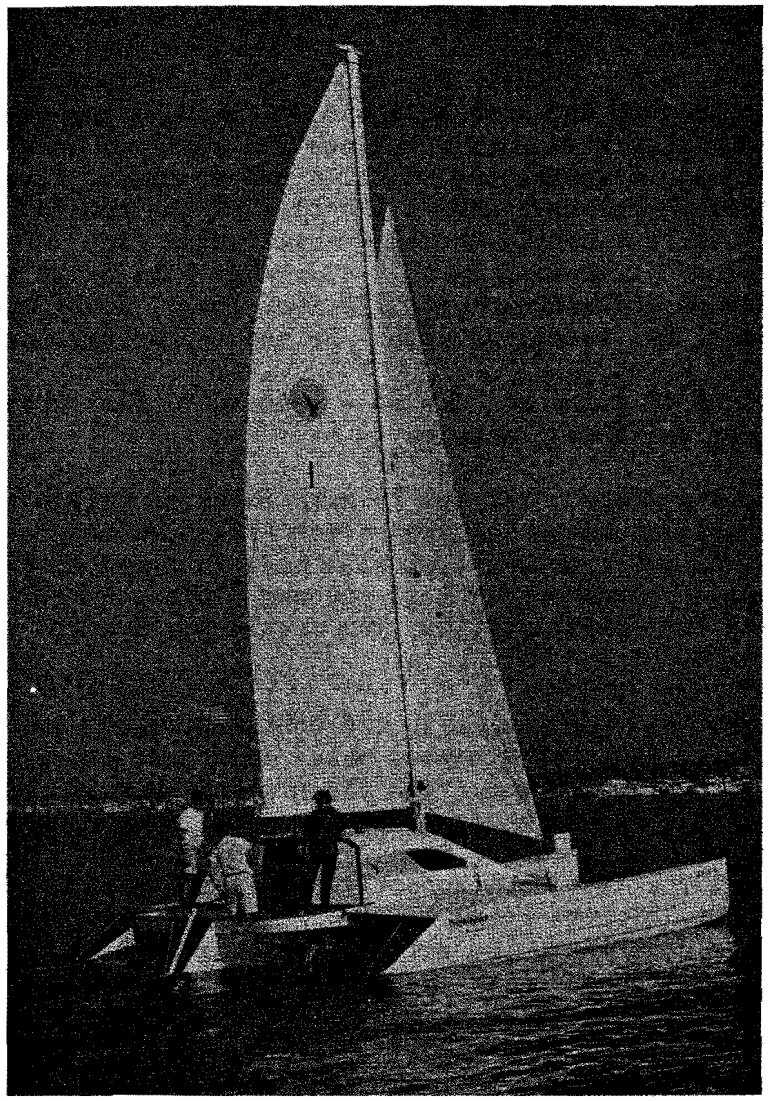
You don't have to be a genius, but you do have to care. Given time, patience, and determination the skills can be acquired. You will have to procure and learn to operate both hand and power tools. You will have to learn to reject shoddy results, to be self-critical. To perservere till you can produce a well-faired, well-joined structure. Lacking this determination, you should buy a boat, or take up basket weaving.

MONEY:

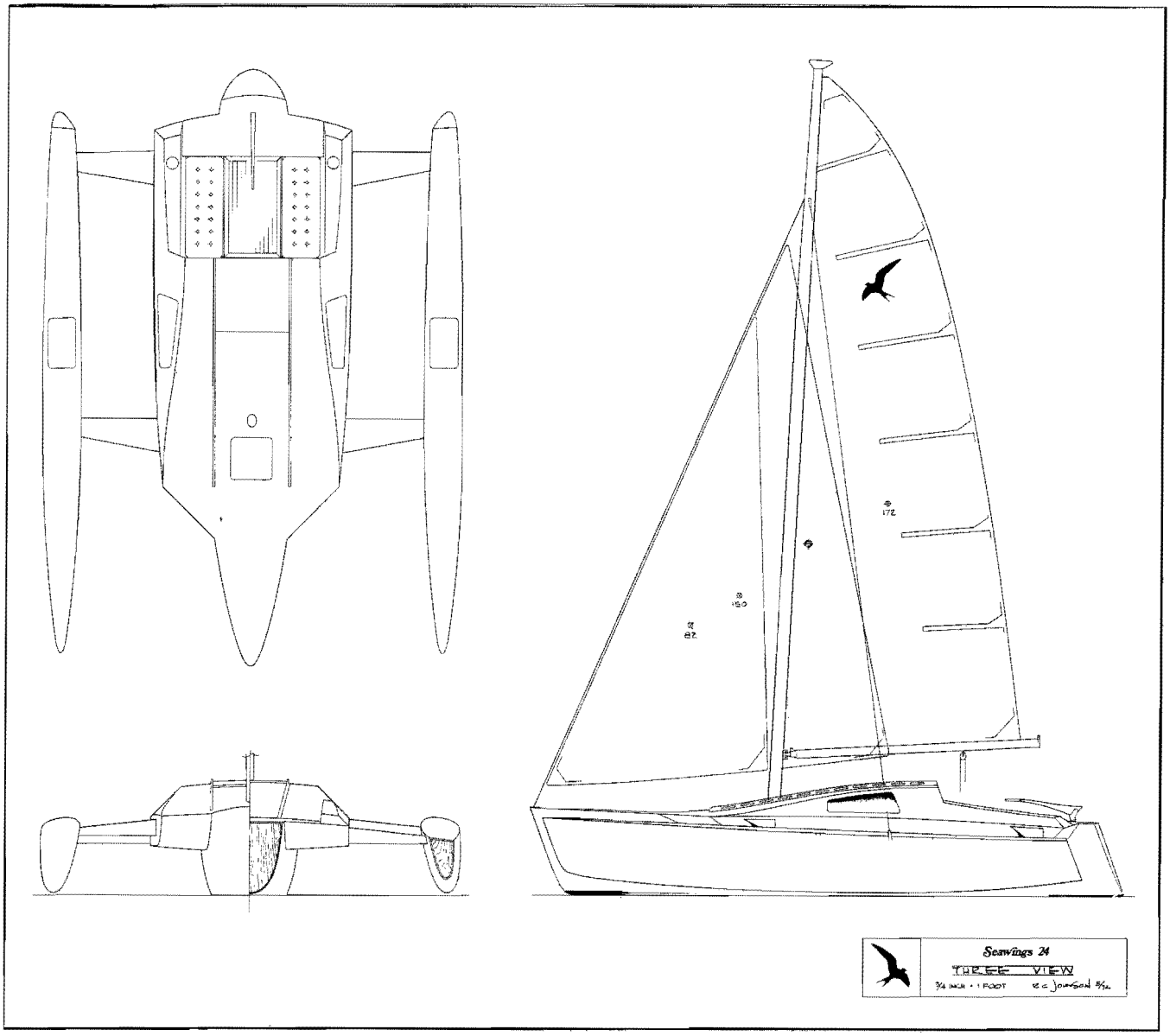
Notwithstanding some very bad advice to the contrary, trimarans are expensive. Remember that winches, sails, and bottom paint cost just as much for "us" as"them". Find a boat like you'd like to own. Ask the builder what is cost him. Materials, yard rent, tools, etc. Depending on the size, you'd better have, or be able to get your hands on, between then and twenty thousand dollars, rock bottom. You can get something afloat for less, but honestly, is it a cruising boat? You don't need the dollars in a lump. You're going to be engaged for 2 to 5 years in building, and the big expenditures come last. So eat beans and do it! Better plan about a thousand for tools, and another thousand for plans and materials before you jump in. To do it right.

SEAMANSHIP:

Having had the perserverance and good fortune to get it all togeher, go ahead and launch it. If your're a sailor, take off! If your're not, or don't know for sure what one is, better find out before you do anything rash. Many people have blown this last verse to their enduring sadness. Opportunities abound to crew on other's boats. Good crew is hard to find and always in demand. The chances of a successful cruise are immeasurably enhanced, if you have previous experience. Know what your're about. Racing may not be your bag, but there is no better way to learn the sailorly arts, fast. The least you should do, is to lay hold of a dinghy and sail the pants off it. It does wonders for developing the skill, awareness, and judgement you will need. Go down to your local library, section 910.4, and read it all. Having done all these things, you may find you like sailing, even cruising. You may not. Either way, you win. Don't be wary of the lack of skills or dollars. Those can be acquired. Do be wary of not caring. It can lead you down a very unrewarding path.



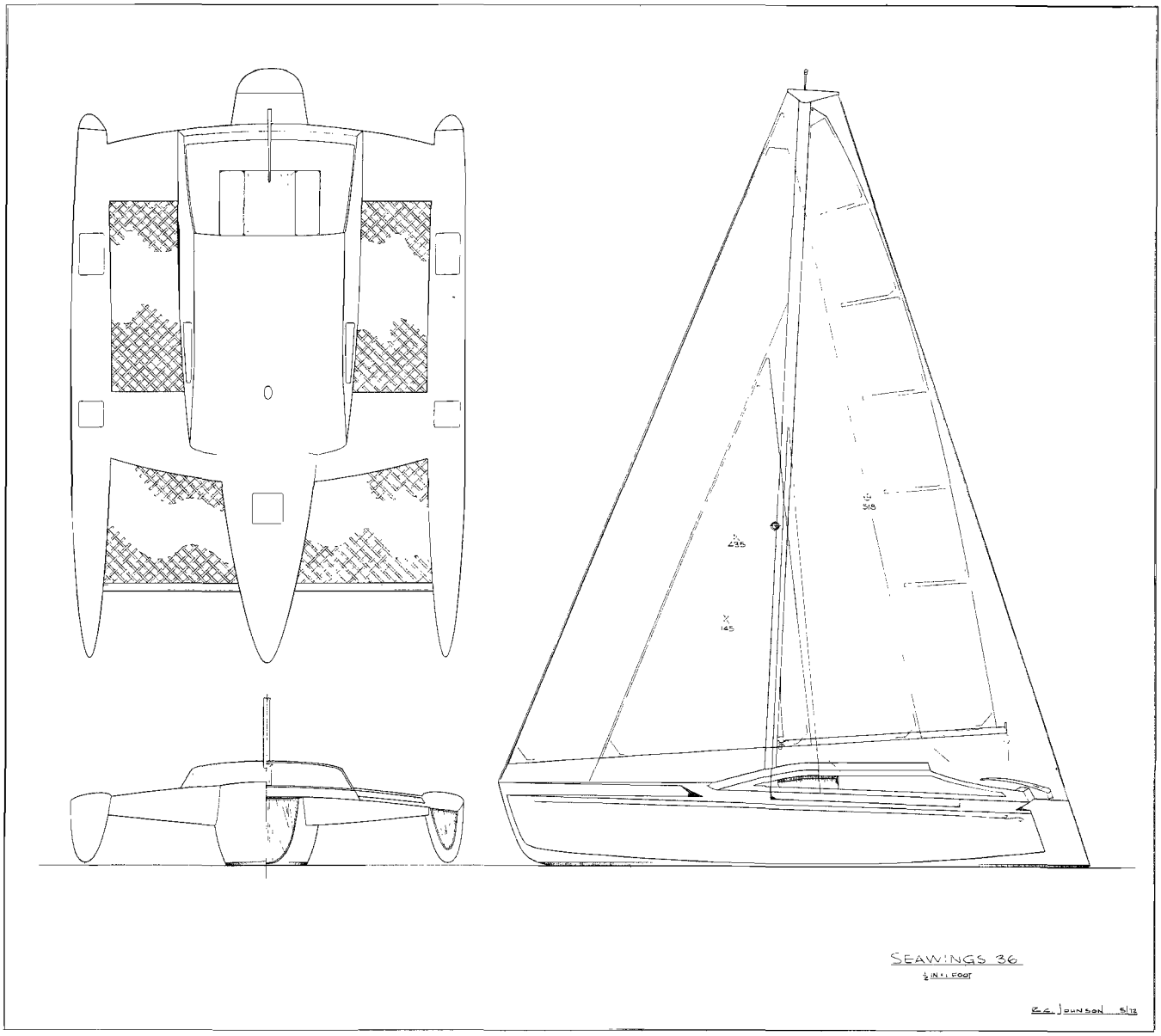
"NIGHTHAWK". Skip Johnsons 1967 prototype



LENGTH	-	24FT	GROSS WEIGHT	-	2200LB
BEAM	-	17FT	PAYLOAD	-	1000LB
SAIL AREA	-	322 SQ FT	AUXILIARY	-	OUTBOARD

THE SEAWINGS 24

This design joins the growing number of fast but commodious trimarans which can be easily demounted and trailed on the roads. Its crossarms are easily obtained aluminum extrusion. The hulls are either wood or foam sandwich. Your choice. The rig is efficient and the sail area sufficient, without being overbearing. The round hull shapes give quiet smooth water performance with load carrying ability, and the pleasing shapes make this a most attractive sailboat.

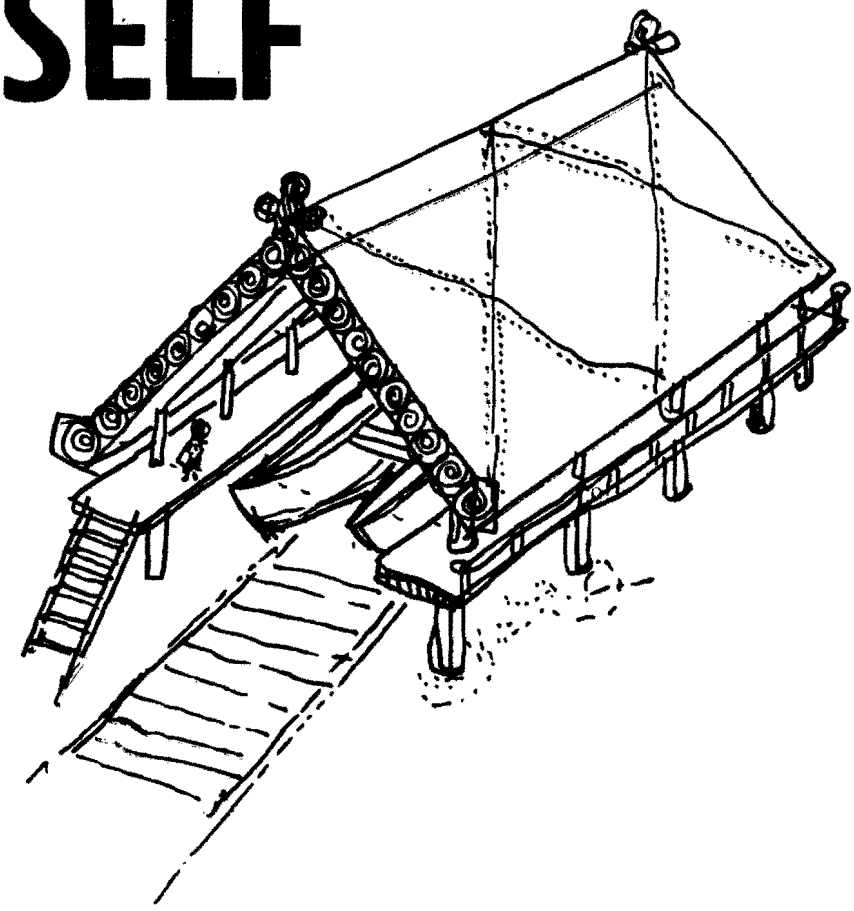


LENGTH	-	36FT	GROSS WT.	-	8500LB
BEAM	-	24FT	PAYLOAD	-	3000LB
SAIL AREA	-	803SQ FT	AUXILIARY	-	INBOARD OR OUTBOARD MTRS.

THE SEAWINGS 36

This bluewater cruising yacht can be built in wood or in foam-sandwich construction. In keeping with "Skip's" philosophy the hulls are round bottomed, with your choice of a centreboard or fin keel. The accomodation is especially well planned for a boat of this moderate size. The efficient cutter rig allows for the maximum variations of sail configuration, without the weight and windage of two masts. For day sailing, longshore cruising or ocean passage-making, this an excellent all round design.

BUILD YOURSELF



A MODERN SEA-GOING POLYNESIAN CATAMARAN

PLYWOOD DESIGNS

DESIGNED BY JAMES WHARRAM

THE PIONEER OF POLYNESIAN CATAMARANS

PRESENTED BY
CANADIAN MULTIHULL SERVICES
EXCLUSIVE NORTH AMERICAN AGENTS

POLYNESIAN CATAMARANS

Designer : **James Wharram**

James Wharram, designer of "Polynesian Catamarans," is one of the new "philosopher designers," who have left the cities and banded together with other artists and designers to create a new lifestyle, a lifestyle which will encourage other people to create, and to satisfy their dreams.

Since 1954, Wharram has designed, lived, and sailed on his own catamarans. His four Atlantic crossings make him the British pioneer of ocean catamaran sailing.

For the last few years, his ocean voyaging has been curtailed due to an ever increasing demand for his "Polynesian Catamaran Designs."

Design Principles

The "catamaran*" was the voyage ship of the Ancient Polynesians who, over a period of 1,000 years, in these double-hulled ships, made the greatest sea colonising voyages in the history of Man. Wharram's studies in the early 1950's broke down the principles of Polynesian sailing craft into these four basics :

1. Narrow beam/length ratio hulls.
2. "Veed" cross section.
3. Flexibly mounted beams joining the hulls together.
4. No permanent deck cabin between the hulls.

The narrow beamed hulls give speeds above the square root of the waterline length (owing to minimum water disturbance), without the necessity of planing with large sail areas.

The shallow draft "Veed" hulls require no centreboards or fin keels for good windward performance.

The absence of projecting centreboards or fin keels has been shown to increase stability on modern catamarans.

The hulls joined flexibly together decrease capsizing possibility, as both masts and boat bend like trees to wind gusts.

The absence of a deck cabin reduces windage and lowers the centre of hull gravity, which again increases stability.

After cruising around Europe and sailing to the West Indies in 1955–57 aboard the 23 ft. flat-bottomed catamaran, TANGAROA (still the smallest catamaran to make an ocean voyage), in Trinidad, in 1957, Wharram built the 40 ft. RONGO, which embodied all the Polynesian principles. Aboard this ship he subsequently made three successful Trans-Atlantic voyages, including the first across the North Atlantic ever made in a multihull.

Since 1963, Wharram has developed these principles into the range of designs shown in this brochure.

Building System

When Wharram built his first "Veed"-hulled catamaran, the 40 ft. RONGO, in Trinidad, he built it as his professional building experience had taught him. He first constructed an absolutely level building base, 45 ft. x 10 ft. set with 18 levelled and squared baulks of timber to which were fixed and squared 18 frames and bulkheads.

Each of these frames and bulkheads were "notched" to receive stringers. The hulls were built, decked and "cabined," then the interior furniture was added. It was a laborious task which no other designer of monohulls or multihulls questioned until Wharram drew up his range of simple to build "Polynesian Catamaran Designs."

Fionnuala MacDowell, 21-year-old co-worker on Wharram's present boat, the 51 ft. TEHINI, wrote in an article in "Practical Boat Owner" (October, 1970) :

* "Catamaran" is a Bengali word meaning "tied logs," misapplied by Europeans to Polynesian ships which, in the Society Islands were commonly known as "Pahees."

"All Wharram's 'Polynesian Catamarans' are built on the same simple principles. A ply backbone slots into four bulkheads, giving the basic shape of the boat immediately. Stringers are nailed on to give the boat a cagelike look, and over the stringers the plywood is sheeted, glued and nailed. Then, the outer keel layers and skeg are fixed and shaped, the hull "sheathed" and rolled over ready for the next stage, fitting the cabin furniture."

Fig. 1 shows clearly what she means. In a few easy steps, Wharram revolutionised boat building in plywood, cutting down time spent on a building base, on frame making, on notching in for stringers, and on as many as 16 bevels along the keels and floats of other catamaran or trimaran designs, compared to the four on the Wharram designs.

The cabin furniture of the "Polynesian Catamaran Designs" acts as part of the hull stiffening structure, giving terrific strength for minimum ultimate labour. Wharram also considered the builder in being the only designer who specified stock wood sizes that can be "bought off the shelf" in any timber yard. A great saving in time and money.

Sailing Ability and Stability Factor

It is no use having a beautiful, easily constructed boat if it will not sail ! A few comments from builders on the sailing of their "Polynesian Catamarans" follows :

45 ft. ORO : "I am extremely pleased with the craft, and the flexibility factor seems to me to be the answer. It shook me to see the hammering she would take to windward. One night of the voyage gave us a force 10. I base this estimate on the opinion of my crew, who is a meteorologist by profession and a regular sailor in small boats. We were surfing at speeds never reached before (12 knots), in perfect comfort under the small jib and 25 per cent. mizzen. I am convinced she is uncapsizable. I have a very high opinion of your design principles and feel that the boat would go anywhere in comfort and safety."

40 ft. NARAI : "We averaged 8–10 knots in the Bristol Channel, and have touched 18 knots (Brookes and Gatehouse log)."

From Singapore : "NARAI is a real sea-going thoroughbred, although the sea was quite bad, with the tail end of the lashing North-East monsoon. None of us were aware that the sea was bad at all. We do know that the waves were sometimes coming from the stern at a height above our heads. Her "canoe" stern took large quartering waves without problem. She is a superb lady of the sea, and I am very proud to have built her. The "V" hull is very good."

34 ft. TANGAROA : "Yesterday, on the river in NGATAKI, the wind was Easterly 6, enabling me to get on a broad reach. It was the fastest she has gone so far, about 16 knots. We were really screaming along. When hard on the wind (in strong winds), the boat was not making any leeway at all."

27 ft. 6 ins. TANE : "TANE reached 16 knots in the strong gusts, and we had five people on board."

22 ft. HINA : "I have enjoyed your design tremendously, and am happy to recommend it to anyone who wants a fast seaboat. Before leaving Pago Pago (Samoan Islands), last June, we had several bashes into 20 ft. waves and 40 knot breezes, well offshore; no problems, and no other boats in sight."

From California : "I have just sailed my HINA 70 miles, from San Diego to Ensenada. During the last two hours I had a following sea with 10–12 ft. breaking swells, in an estimated force 5–7 (gusts up to 45 mph were reported by the coastal station), and HINA surfed for 8–10 seconds at a time. I am very happy with, and quite confident of, the Wharram design."

Note the question of capsize, as mentioned by one builder. In the A.Y.R.S.* publication No. 66, Dr. John Morwood wrote :

"To my knowledge, no trimarans, and only two catamarans, have been designed with relative immunity to capsize (or self-righting when capsized) in mind. One of these is the James Wharram series of designs."

The Wharram Designs

"All of Jim Wharram's designs are similar to the TANGAROA, A.Y.R.S. No. 59, with no bridge deck cabin and triangular hull sections with, as a result, the greatest hull beam at the deck. If such a design goes over, she will not capsize until she has turned more than 90 degrees. Even then, the minimum mast

* "Amateur Yacht Research Society": a world-wide organisation and one of the primary developers of multihulls. Director: M. Ellison, Old Cottage, Hermitage, Newbury, Berkshire, England.

head or lower buoyancy will not allow the centre of gravity to get so far away from the buoyancy of the downward hull that the normal heave of the ocean in such circumstances will not bring her upright again."

Wharram, himself, wrote in an article in October, 1970, "Yachting Monthly" :

"An important advantage of the symmetrical "V" hull is shown in Fig. 2. It is a very difficult hull form to capsize due to the flare on the outside of the hull."

Even so, his larger designs all have a "stability factor" of force 8 (smaller designs: force 7–8), i.e. according to design stability calculations, if you had (or could keep up) all working sail area with the wind on the beam in a force 8 gale, the craft would not capsize.

This stability factor is used by other designers who produce safe, stable offshore multihulls. Multihulls that have capsized are always designs that have a stability factor of wind force 4–5.

Catamarans versus Trimarans

Although the exaggerated, to the point of being ridiculous, claims of certain trimaran designers have irritated and brought forth caustic comment from Wharram in the past, he is not blindly against trimarans. He does point out, however, that one has to build three hulls of a trimaran compared to two of a catamaran, and both hulls of the catamaran can carry load. If a trimaran is to be efficient, only the one main hull carries load, otherwise it is merely a three-hulled catamaran, and, "why build three hulls when two will do?"

Advantages of the Polynesian Catamaran over a Yacht Catamaran

For many years the most radical difference between "Polynesian Catamaran Designs" and other catamaran designs was the flexibility of the fastenings of the two separate hulls and the absence of a deck cabin, resulting in the following advantages :

$\frac{1}{3}$ to $\frac{1}{2}$ cheaper and faster to build due to no deck cabin.

Ease in transport of finished boat: one hull at a time (for inland builders).

Less windage and, therefore, better tacking and faster sailing.

Platform high off the sea, avoiding pounding and again increasing speed.

Super working deck because no cabin is in the way.

The two hulls joined flexibly eliminate wringing strain due to: uneven loading—sailing to windward in a rough sea—or even in a choppy harbour. Flexibility gives the boat a longer life.

Wharram summed up his design ideas in the previously-mentioned article in "Yachting Monthly," as follows :

"The Prout Brothers, and Bill O'Brien, have shown conclusively that for normal gales around the coast, indeed for 95 per cent. of ordinary sailing, the two hulls of a catamaran can be rigidly united by a deck cabin and be strong and safe in hard weather, and that my designing for the "ultimate" is, perhaps, unnecessary. I accept the criticism, but a catamaran flexibly fastened, with no deck cabin, has advantages apart from utmost survival. It is easier and cheaper to build and transport, faster, due to less windage, and with the lower centre of gravity one can carry sail longer. The deck space of a "cabinless" "Polynesian Catamaran" is enormous. In harbour we can erect a deck tent and use the space."

Choice of Design

All the boats shown in the brochure have, like members of a family, a superficial resemblance, but, again like members of a family, they all have different characteristics. The basic division in the designs is between those which have less accommodation on a given waterline length to achieve high speeds, and those labelled "cruising," which have maximum accommodation within the confines of the design and maximum load-carrying ability. For example, compare the 45 ft. ORO with the 45 ft. ARIKI, both of similar overall lengths and beam, but the ORO can carry one third to one half as much again in people and stores on a long ocean voyage, due to its greater internal volume. However, not all people wish to make ocean voyages; they wish to race or make exciting high-speed passages between ports at, say, no greater distances apart than 300–400 miles. Under these circumstances the ARIKI would be the more suitable boat for many people. A similar comparison can be made between the RAKA and TANGAROA.

Difficulty in Choosing a Design

If anyone has serious doubts as to their building ability, it is advisable to begin with a HINA. Many builders have done this, developed their building and sailing skill, then moved on to one of the bigger designs. Wharram's advice is to have a realistic look at what facilities you really have. For the basic catamaran man/wife team, his advice is not to go bigger than a NARAI. Although man/wife teams have built OROs, it is undeniably hard work. The staff at "Polynesian Catamarans," who have all built one or other of the designs shown, are fully aware of blisters, aching backs, and money running out. They wish to see boats on the water. Their advice is to think carefully, visit other "Polynesian Catamarans" being built—then make a decision.

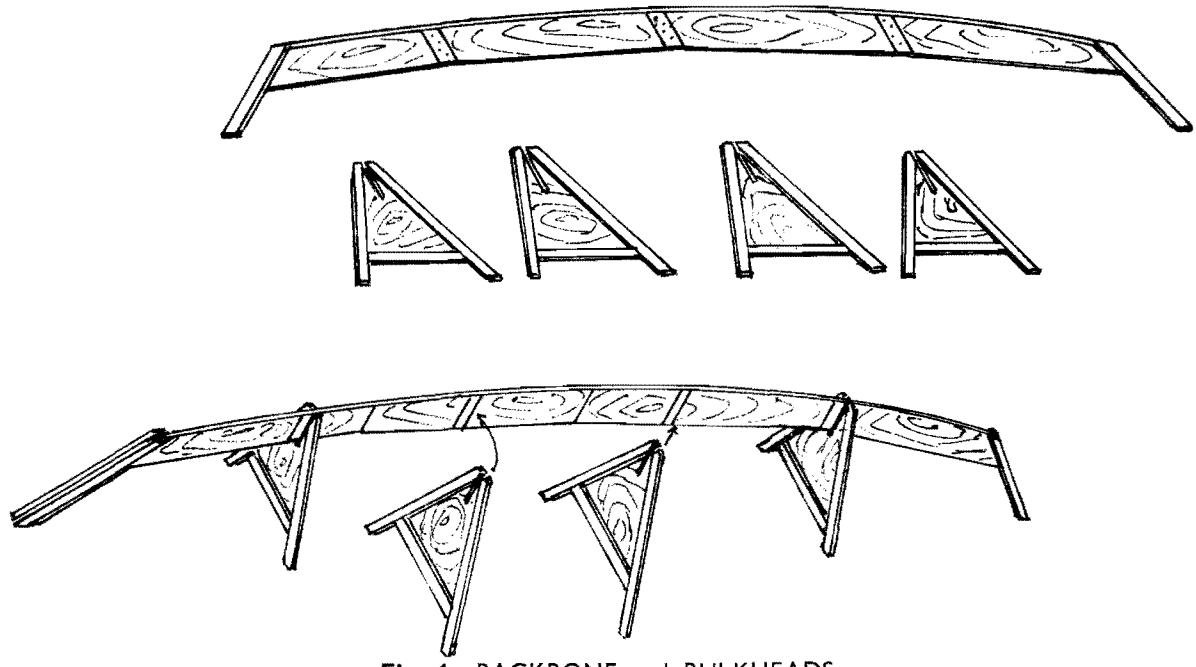


Fig. 1 BACKBONE and BULKHEADS

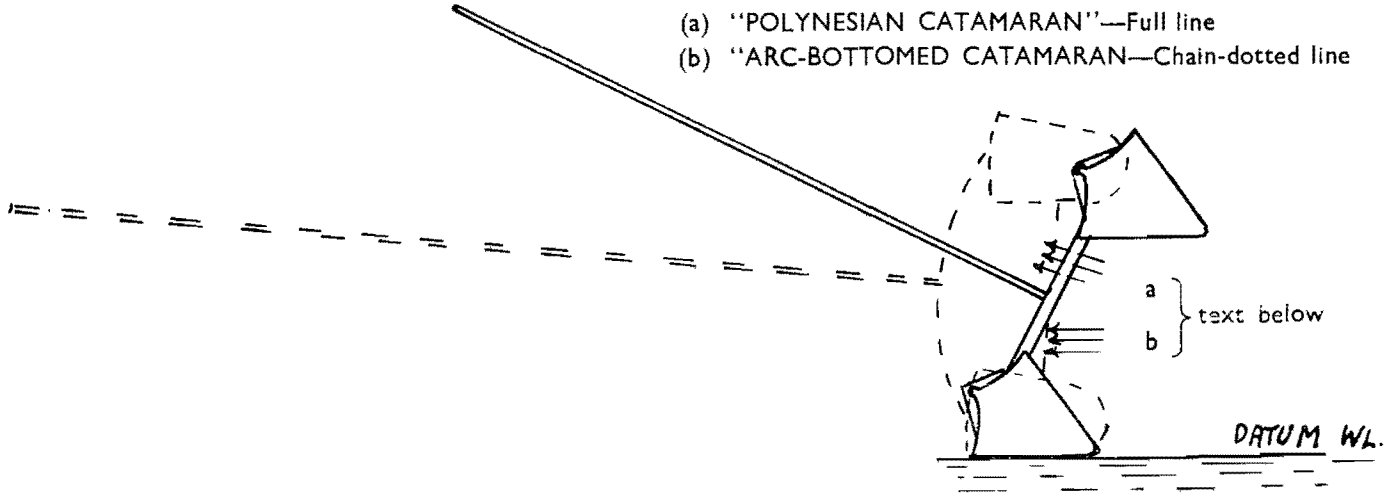


Fig. 2 FLIPPED V-HULL RETAINS RIGHTING ADVANTAGES FROM HULL WEIGHT. ARC-BOTTOM TYPE AT RIGHT ANGLES DOES NOT :

(a) Slatted platform of "Polynesian Catamarans" prevents wind pressure and thus capsizing moment.

(b) Solid platform of "Deck Cabin" type aids capsizing.

As a result of the rapidly rising cost of materials, we enclose a material list with each study plan, so that you can make your own costing.

A WORD FROM C.M.S.

Over the years Jim Wharram's Polynesian Catamarans have built up an enviable reputation for safety, seaworthyness, ease of construction and low cost. We have been Jim's North American agents since 1968 and our sales of his designs are greater than all of our other designers put together. We have a record of close association with Jim and Ruth which leads to constant improvement in the plans, and updating of designs. We keep a stock of Polycat plans on hand at all times and you can be assured of same day shipment when you order.

There have been several attempts to copy Jim's unique designs, but since these copiers have always added "improvements" of doubtful value, the results have usually been unhappy. One ex- Wharram agent from Los Angeles has been pirating Jim's plans openly, to the point where legal action has been called for. You should therefore be warned that any plans purchased from anyone other than James Wharram or ourselves are being sold illegaly and are therefore stolen goods. Apart from this, you are losing the one most important asset of the plans, consultation with the designer during building and sailing trials. A registered sail number goes with the plans. One boat only is to built from each set of plans and the sail number stays with that boat for life. A record is kept both by ourselves and Wharram, for identification.

The sole objective of C.M.S. is to provide plans and services to amateur builders. Once we have sold you a set of plans, that is not the end of the story. "C.M.S. Sails" provides top quality sails cut especially for multihull requirements and to the exacting specifications of the designer. Their cost is well below that of sails of comparable quality from other popular sail lofts.

For Canadian customers we can provide - at preferential prices - plywood, bronze boatnails, spars, and a wide range of yacht equipment - at less than catalogue prices. Quotations cheerfully given upon request. We recommend the Wood/Epoxy system of building and can supply the saturation Epoxy from stock.

We look forward to having you as our customers - and friends.....

Yours Sincerely,

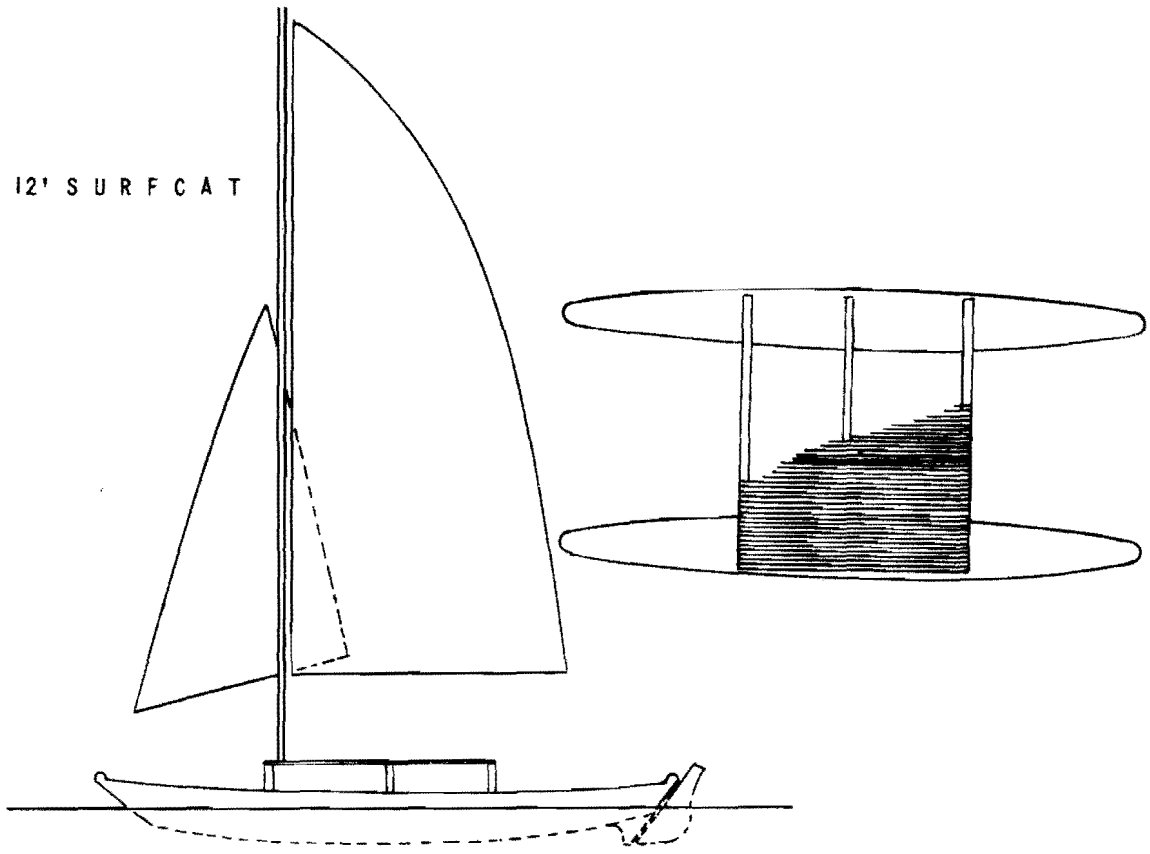
Canadian Multihull Services

Hangar # 2. Toronto Island Airport. Toronto. Ontario. CANADA.
M5V 1A1. Tel (416) 366-4253

NEW

DESIGNED BY JAMES WHARRAM

12' SURFCAT



Overall Length	12' 5"	Weight 150 lb approx.	
Waterline Length	11' 5"	Bermudian Rig Sail	
Overall Beam	6' 1"	Area 70 sq.ft. approx.	
Beam of each Hull	1' 4"	Building Time	
Draught	8"	100 hrs. approx.	

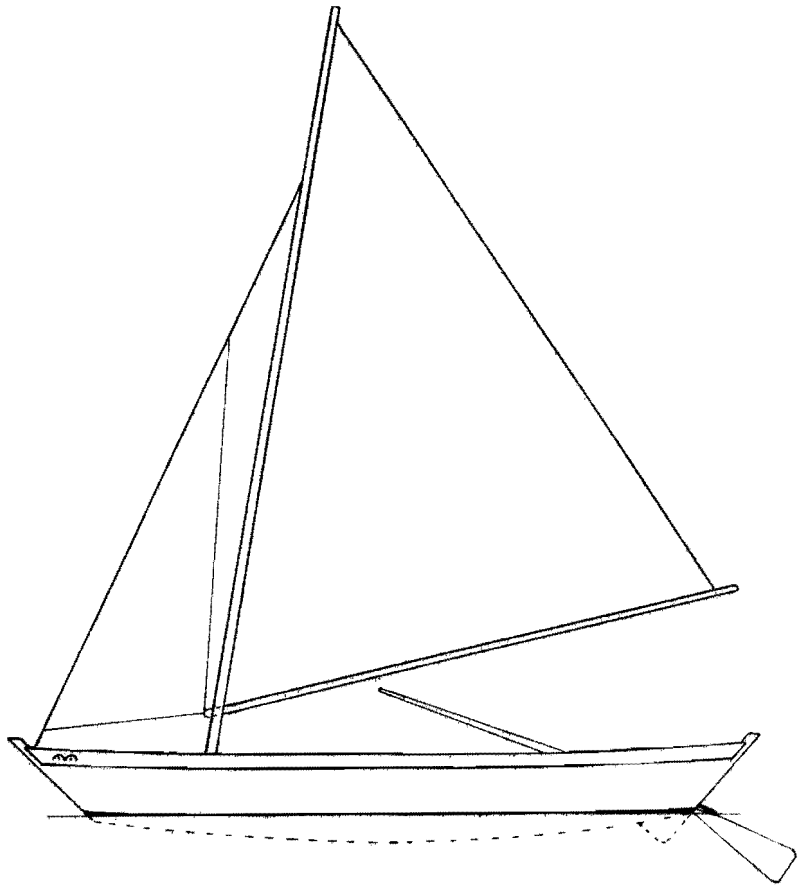
THE WHARRAM SURFCAT

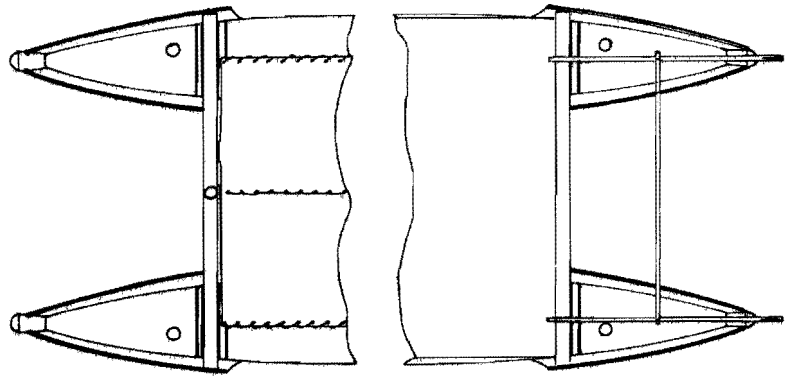
* Designed for the beginner
* Simple to build
* Easy to transport. Car Top.
* No below keel projections.
  Enables off beach sailing.

* BUILDING PLANS - SEE ENCLOSED PRICE LIST
* COST OF MATERIALS - APPROXIMATELY $350.00

As a result of the rapidly rising cost of materials, we enclose a material list with each study plan, so that you can make your own costing.

MAUI





With plywood deck or trampoline steered either by rudders or sweep

Overall length	16′ 9″	5 m.	Draft	8″	20 cm.
Waterline length	13′ 7″	4·07 m.	Weight	375 lbs	170 kg.
Overall beam	8′	2·40 m.	Sail area	100 sq. ft.	9 sq. m.
Beam of each hull	2′	60 cm.			

Cost of materials, including sails : $450.00 Approximately
Building Plans : See enclosed price list.

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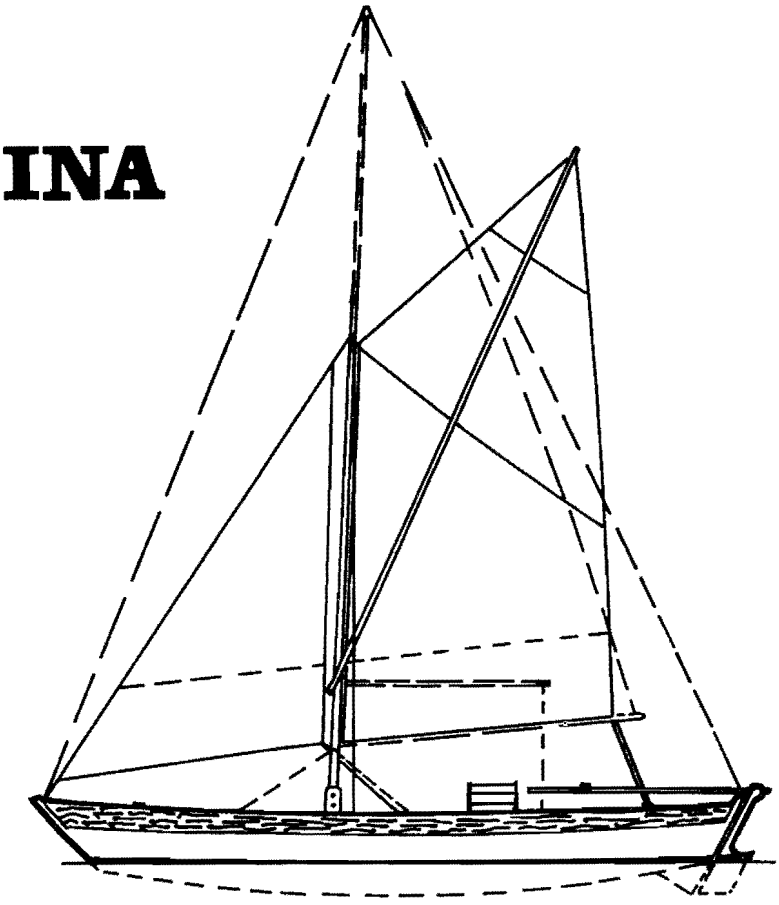
HINA



Overall length	22′	6·60 m.	Draft	1′	30 cm.
Waterline length	18′ 6″	5·55 m.	Weight	650 lbs. approx.	300 kg.
Overall beam	10′	3 m.	Loading capacity	1,000 lbs.	460 kg.
Beam of each hull	2′ 6″	75 cm.	Sail area	173 sq. ft.	15 sq. m.

HINA (pronounced HEENA), is easily demountable for loading on a simple, flat-top trailer for car towing.

A canvas or terylene "cuddy," instead of a more expensive and difficult to dismount ply cuddy, provides shelter for the family in showers, a windbreak for cooking, privacy for simple toilet facilities.

In harbour, or on a beach, the 85 sq. ft. (8 sq. m.) of platform give ample space for an overnight tent, to save hotel bills.

Designed for family sailing, coastal cruising, fishing (both by line or as a platform for underwater swimming).

Cost of material, including sails : $750.00 Approximately.
Building plans : See enclosed price list.
Study plan and photos : See enclosed price list.

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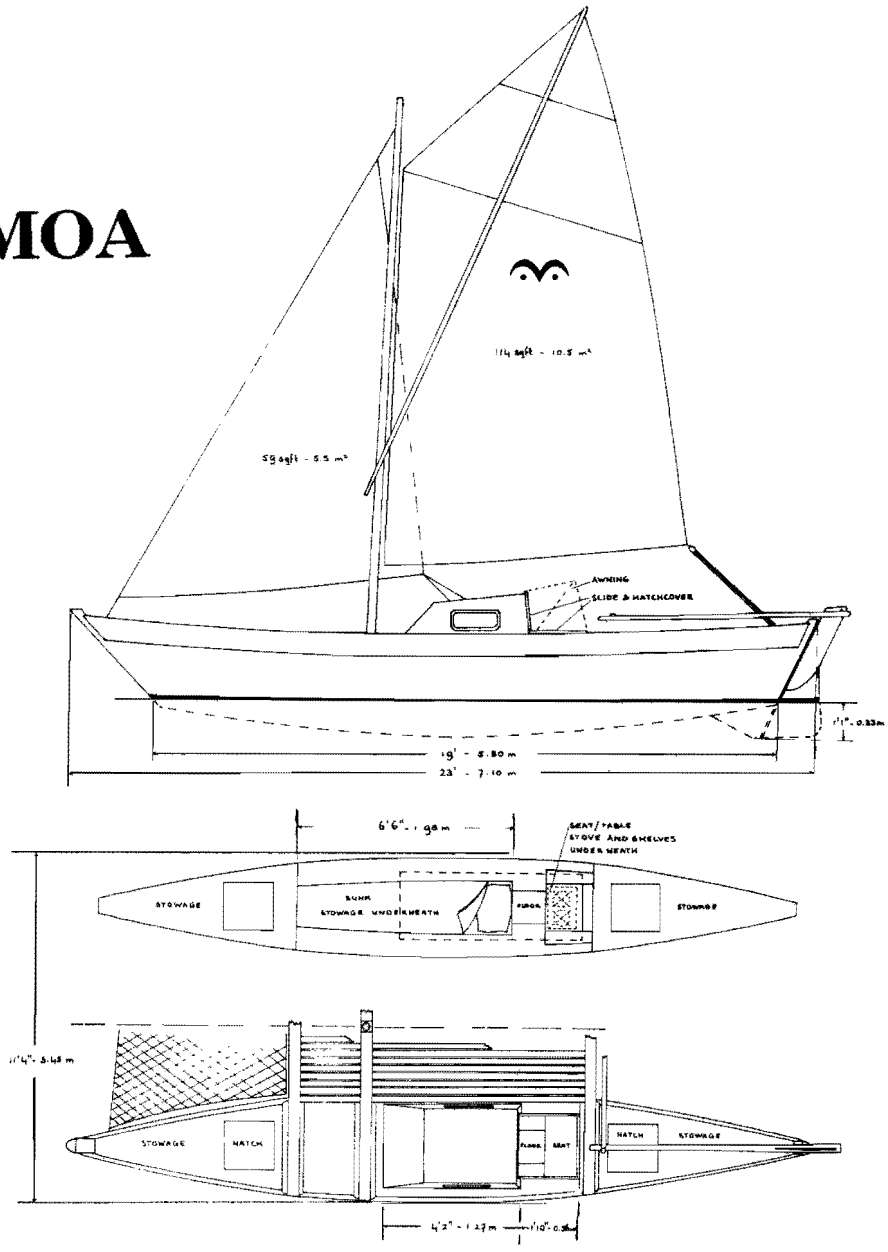
HINEMOA



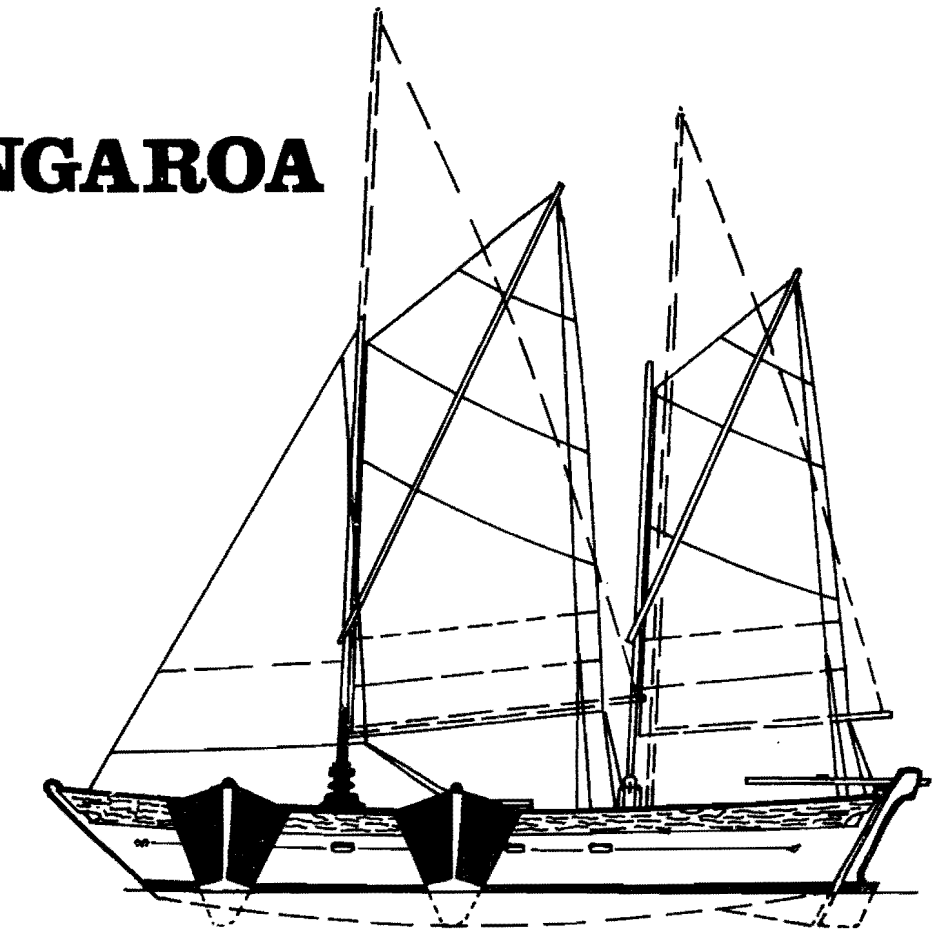
Overall length	23′	7·10 m.	Sleeping capacity	2 single bunks	
Waterline length	19′	5·80 m.	Weight	800 lbs.	360 kg. approx.
Overall beam	11′ 4″	3·45 m.	Loading capacity	1,250 lbs.	600 kg. approx.
Beam of each hull	3′ 1½″	95 cm.	Sail area	173 sq. ft.	15 sq. m.
Draft	1′ 1″	33 cm.			

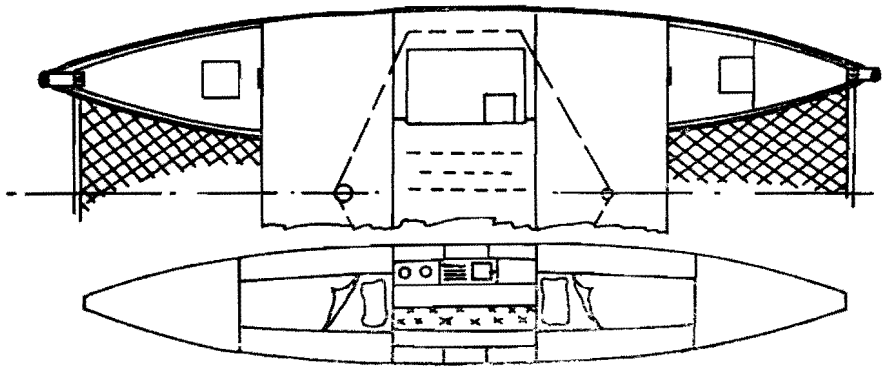
HINEMOA is a cruising version of Hina, with a hull beam of 3′ 3″, providing space for a 6′ 6″ berth in each hull, together with room for a galley or chart table in the after end of the centre sections. There is sitting headroom under the cabin top—lengthened by awnings for harbour use.

Cost of materials (including sails) : $850.00 Approximately.
Building plans : See enclosed price list.
Study plan : See enclosed price list.

As a result of the rapidly rising cost of materials, we enclose a material list with each study plan, so that you can make your own costing.

TANGAROA





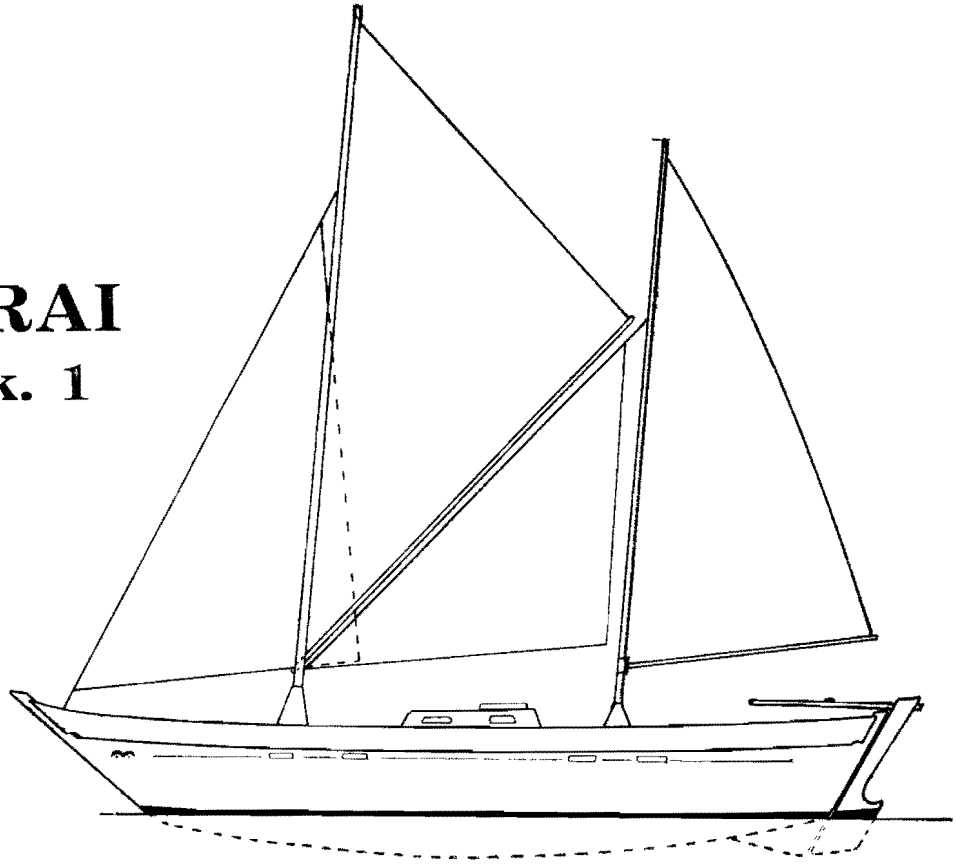
Overall length	34′	10·20 m.	Sleeping capacity	4 single bunks	
Waterline length	28′ 6″	8·55 m.	Weight	1¾ ton	
Overall beam	16′ 6″	4·95 m.	Loading capacity	3,100 lbs.	1,450 kg.
Beam of each hull	5′ 6″	1·65 m.	Sail area	400 sq. ft.	36 sq. m.
Draft	1′ 9″	55 cm.			

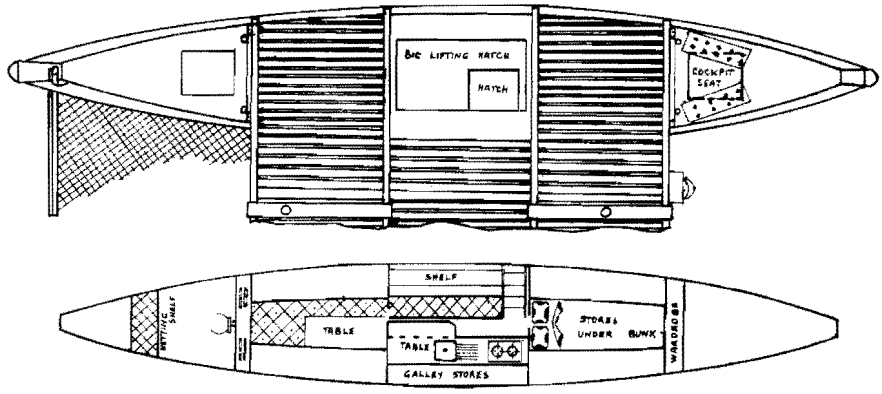
TANGAROA can be built in the average garden or extended garage. She is designed to carry four in individual bunk cabins. To squeeze in bunks for more people will ruin a holiday.
In harbour the two large hatches lift up like a Dormobile roof to give 6′ 6″ (1·95 m.) headroom. A deck tent over the two hulls and platform gives the accommodation of the roomiest "Yacht Catamaran." At sea the main hatches close down, and one has the performance of an ocean racer. TANGAROA, with her narrow beam/length ratio, her lack of windage and low sail rig, is one of the fastest and safest sea-going multi-hulls of her size.

Cost of materials (including sails) : $4500.00
Building plans : See enclosed price list.
Study plan and photos : See enclosed price list.

As a result of the rapidly rising cost of materials, we enclose a material list with each study plan, so that you can make your own costing.

NARAI
Mk. 1



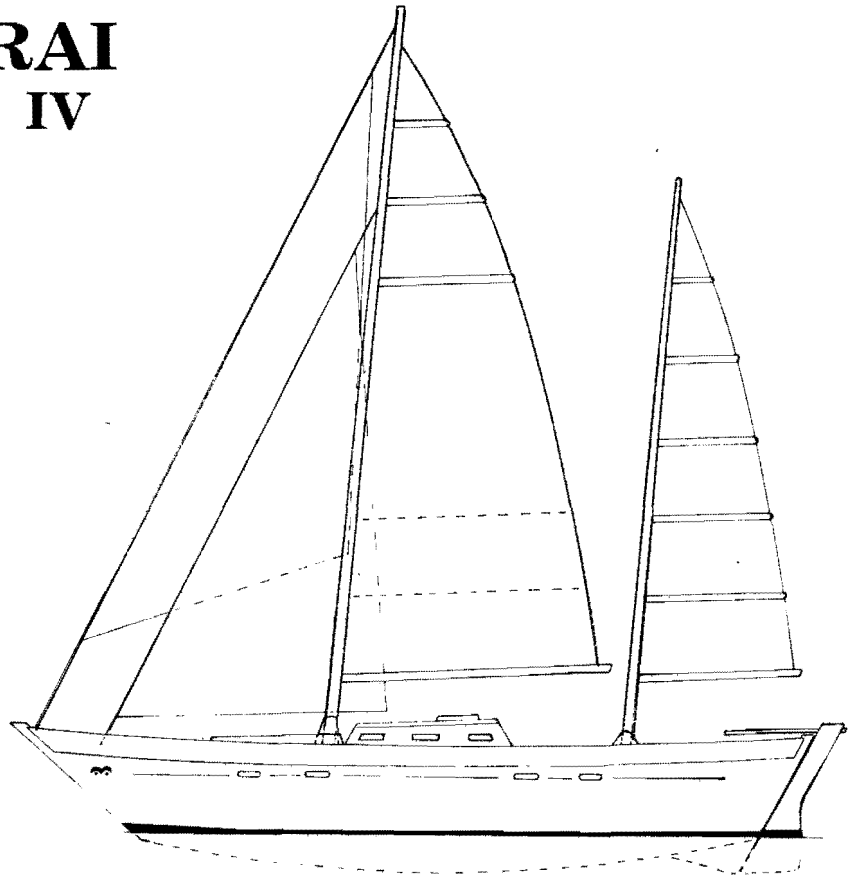


Overall length	40′	12 m.	Headroom	6′	1·80 m.
Waterline length	32′	9·60 m.	Sleeping capacity	4 double bunks	
Overall beam	18′ 6″	5·55 m.	Weight	2½ tons approx.	
Beam of each hull	6′ 2″	1·85 m.	Loading capacity	2 tons plus	
Draft	2′	60 cm.	Sail area	600 sq. ft.	54 sq. m.

NARAI (NAARAAI, all "A's" in Polynesian names pronounced as in "far").
NARAI comes in four versions, being similar to the 40′ (12 m.) RONGO, but easier to build and faster to sail. Different rigs available.
She is suitable for family ocean cruising, weekend cruising for eight, or racing, depending on rig chosen.
Cost of materials (including sails) : $6500.00 Building plans: See enclosed price list.
Study plan and photos : See enclosed price list.

As a result of the rapidly rising cost of materials, we enclose a material list with each study plan, so that you can make your own costing.

NARAI
Mk. IV



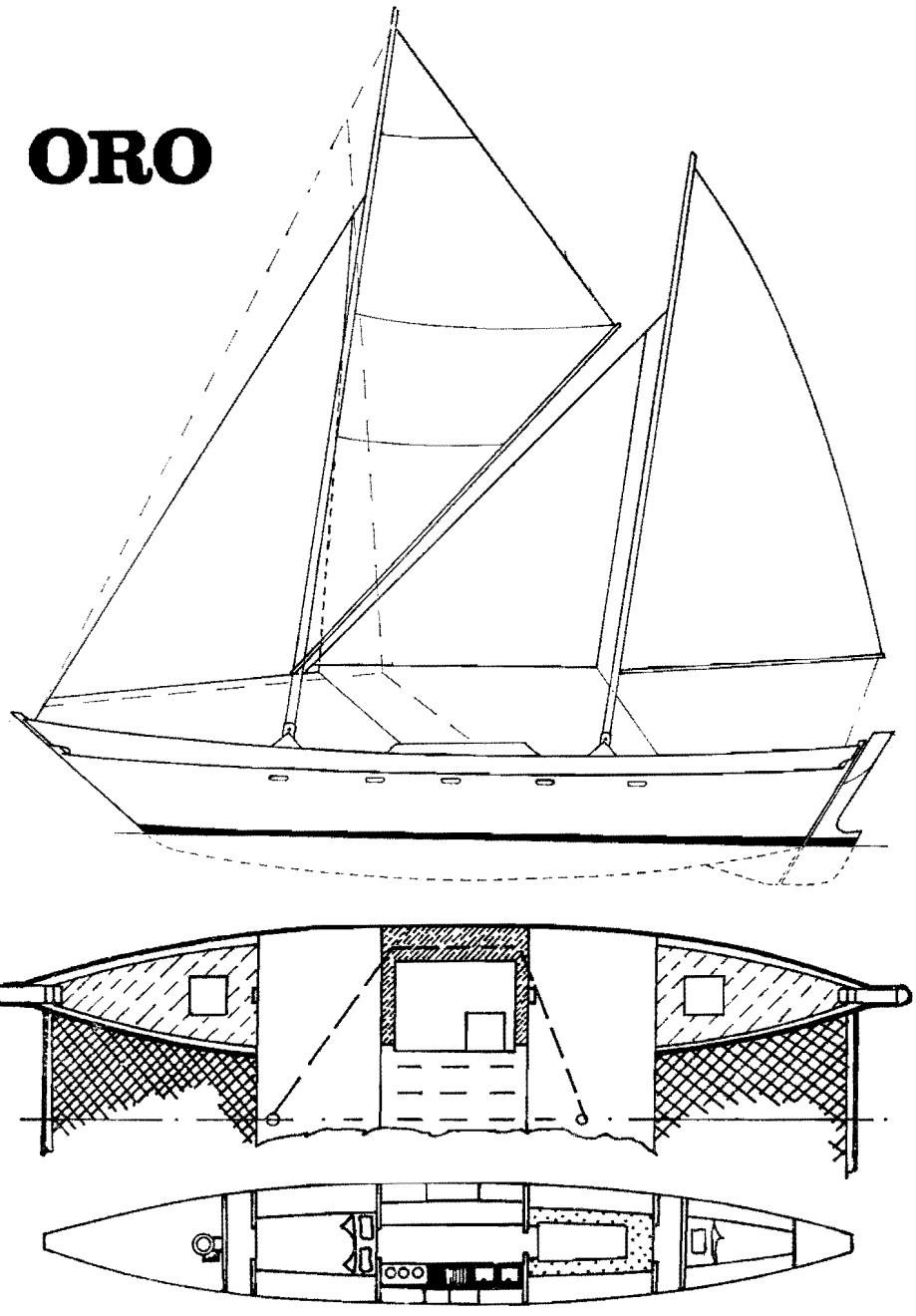
Overall length	41′	12·30 m.	Headroom	6′ 6″	1·95 m.
Waterline length	32′	9·60 m.	Sleeping capacity	4 double and 2 single bunks	
Overall beam	19′	5·70 m.	Weight	3 tons approx.	
Beam of each hull	7′	2·10 m.	Loading capacity	2½–3 tons	
Draft	2′	60 cm.	Working sail area	529 sq. ft.	49 sq. m.
Draft fully loaded	2′ 3″	68 cm.	Maximum sail area	840 sq. ft.	78 sq. m.

NARAI Mk. IV incorporates NARAI Mk. III, with a wider individual hull beam than Mk. I and II, and is the latest development of Polynesian Catamaran designs. She is flush-decked, with the beams in troughs, giving more headroom in the bunk cabins, and the central living cabins are similar to those of the 51′ TEHINI.

Cost of materials (including sails) : $7000.00 Approximately
Building plans : See enclosed price list.
Study plan : See enclosed price list.

As a result of the rapidly rising cost of materials, we enclose a material list with each study plan, so that you can make your own costing.

ORO



Overall length	46′	13·80 m.	Sleeping capacity	4 double and 2 single bunks	
Waterline length	35′ 3″	10·60 m.	Headroom	6′ 7″	2 m.
Overall beam	20′	6 m.	Sail area	750 sq. ft.	67 sq. m.
Beam of each hull	7′	2·10 m.	Weight	3½ tons	
Draft	26″	65 cm.	Loading capacity	3 tons	

Fabulous ORO can be built and equipped for approximately $8500, designed to sail at speed averages of 8–10 knots (peak speed of 15–20 knots).

ORO has four private bunk cabins, each with a double bunk and an 18″ (45 cm.) deep and 6′ (1·80 m.) wide wardrobe The two "working" cabins, galley and chartroom/library/office, are 7′ 6″ (2·25 m.) long, and 7′ (2·10 m.) (at deck level) wide. Provision for three extra single bunks.

The main hatches lift off as on a cargo ship, so that air and sun can enter the ship in warm weather. Designed for fast, all-weather weekend sailing for 6–8 people, ocean-voyaging for 4–6, suitable for charter work, beach chartering, sailing guests, or a small expedition ship. Different rigs available.

Building plans : See price list. Study plan and photos : See price list.

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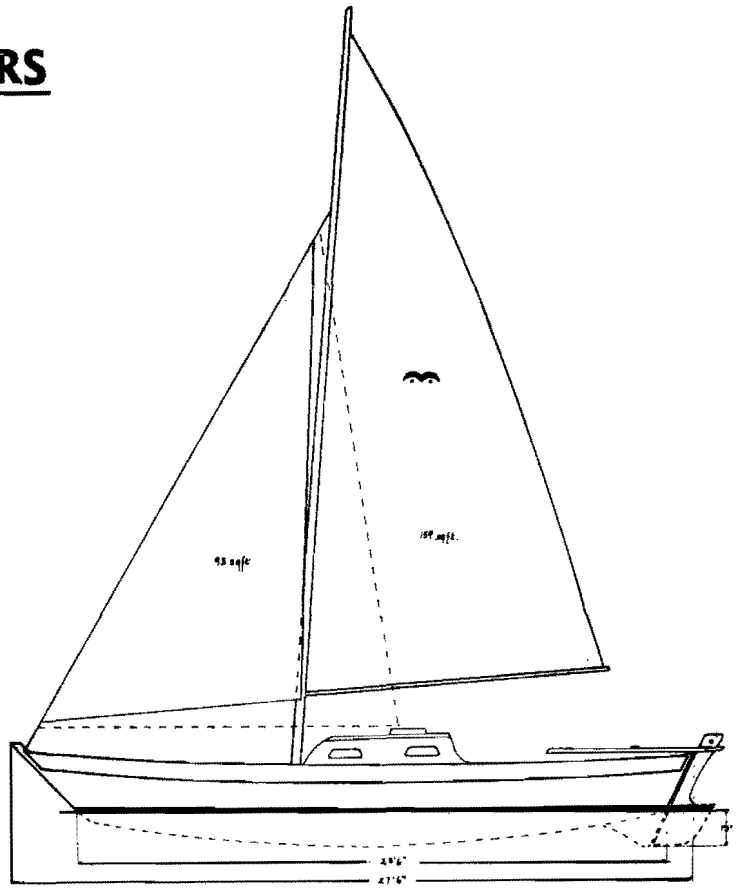
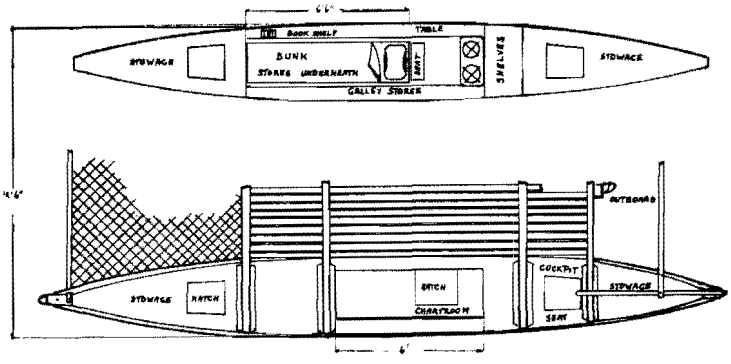
RACING CRUISERS

TANE





Overall length	27′ 6″	8·25 m.	Headroom	4′ (sitting headroom)	1·20 m.
Waterline length	23′ 6″	7·05 m.	Sleeping capacity	2–4 single bunks	
Overall beam	12′ 6″	3·75 m.	Dry Weight	1,450 lbs. approx.	700 kg.
Beam of each hull	3′ 2″	95 cm.	Loading capacity	1 ton	
Draft	1′ 5″	45 cm.	Sail area	225 sq. ft.	20 sq. m.

TANE (pronounced TAANE) is the smallest of our range of racing/cruising catamarans. The centre cabins are 11′ 3″ (3·37 m.) long, with a 6′ 6″ (1·95 m.) bunk in each hull, a separate galley in one hull, and a chartroom in the other.

When offshore racing (or cruising) with a 3-man crew, one man can be at the helm, the others resting in their bunks. In harbours you inflate an "Igloo" tent on the slatted platform with full standing headroom and extra sleeping accommodation.

TANE can easily be dismantled and towed behind a car. She is seaworthy enough to be used for long distance single-handed voyaging.

Cost of materials (including sails) : $3000.00 Building plans : See enclosed price list.

Study plan and photos : See enclosed price list.

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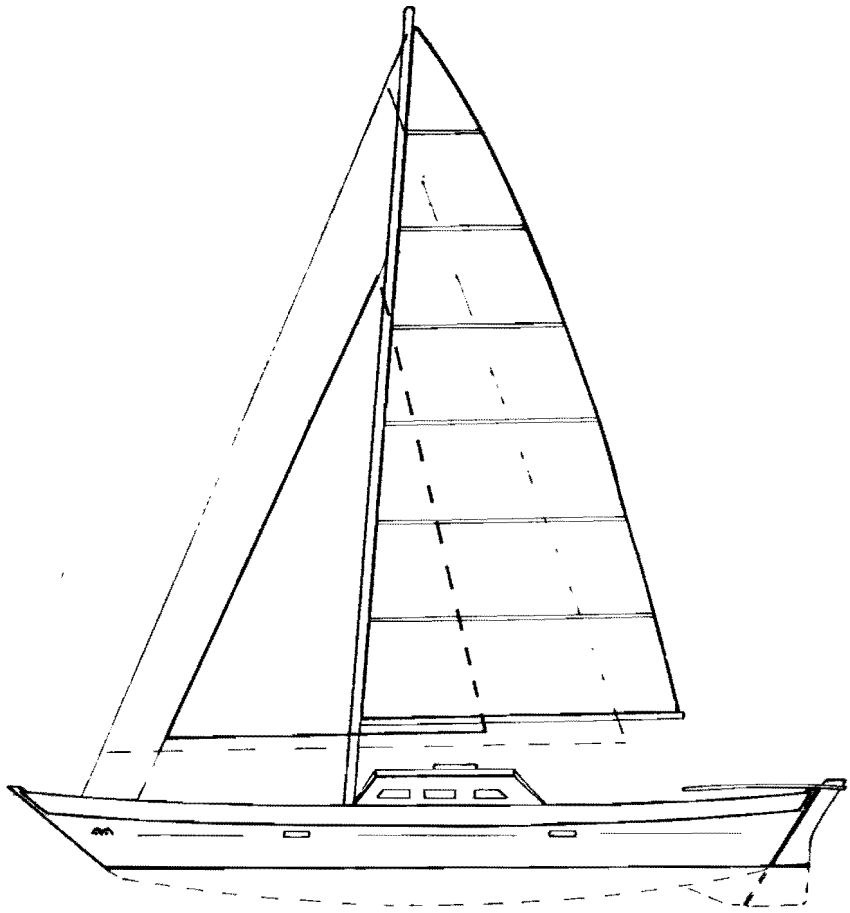
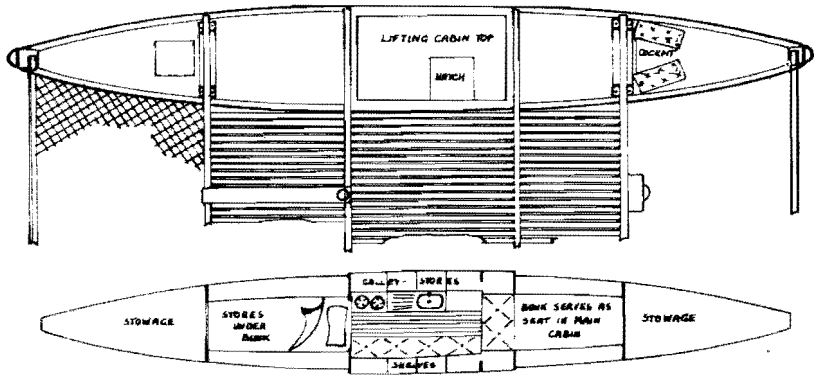
RAKA





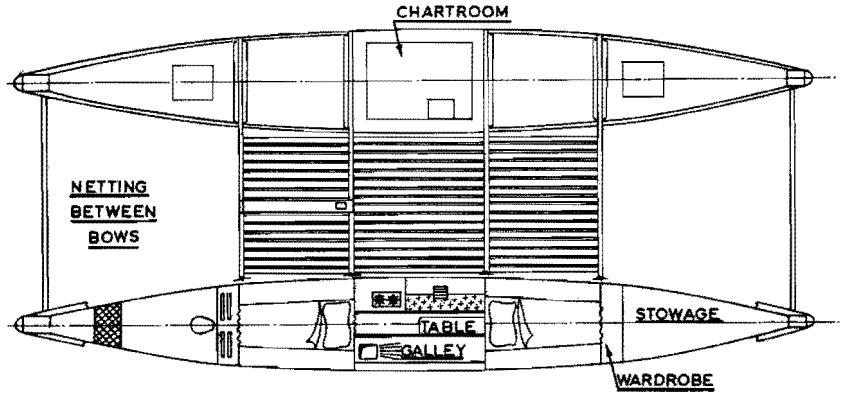
Length :			Headroom	5′ 6″	1·65 m.
Waterline	30′	9 m.	Sleeping capacity	4 single bunks	
At deck level	34′	10·20 m.	Dry weight	3,000 lbs. approx.	1,400 kg.
Extreme overall	36′	10·80 m.	Loading capacity :		
Overall Beam	17′	5·10 m.	for racing	$\frac{3}{4}$ ton	
Beam of each hull	4′ 9″	1·42 m.	for cruising	$1\frac{1}{2}$ tons approx.	
Draft	1′ 10″	55 cm.	Working sail area	415 sq. ft.	37 sq. m.
			Maximum sail area	627 sq. ft.	56 sq. m.

RAKA (pronounced RAAKAA) leads the way in offshore racing design. Some designers have adopted the canoe stern to avoid turbulence, others have adopted overhanging bows and flare to prevent nose-diving, others have abandoned deck cabins for higher speeds and better tacking. RAKA has all these positive features and is a prize-winning boat.

Cost of materials (including sails) : $5000.00 Approximately
Study plan: See enclosed price list Building plans : See enclosed price list.

As a result of the rapidly rising cost of materials, we enclose a material list with each study plan, so that you can make your own costing.

ARIKI



Overall length	45′ 6″	13·65 m.	Headroom	6′ 2″	1·85 m.
Waterline length	38′	11·40 m.	Weight	2½ tons approx.	
Overall beam	20′	6 m.	Loading capacity :		
Beam of each hull	6′	1·80 m.	for racing	1 ton approx.	
Draft	2′ 4″	70 cm.	for cruising/racing	2 tons approx.	

Working sail area Bermudan Cutter : 712 sq. ft. 66·2 sq. m. Bermudan Ketch : 700 sq. ft. 65 sq. m.
Maximum sail area Bermudan Cutter : 977 sq. ft. 90·8 sq. m. Bermudan Ketch : 1114 sq. ft. 103·5 sq. m.

ARIKI (pronounced AAREEKEE) represents a possible revolution in ocean racing—at the moment a sport of the rich. ARIKI can be self-built for little more than $8000 (depending on Rig); is ideal for sports-syndicates and suitable for cruising, off-shore races in the Channel, Round Britain Race, or single-handed Transatlantic Race.

Speeds: Hourly averages of 10-12 knots, with bursts of 15-20 knots.

Study plan : See enclosed price list Building plans: See enclosed price list.

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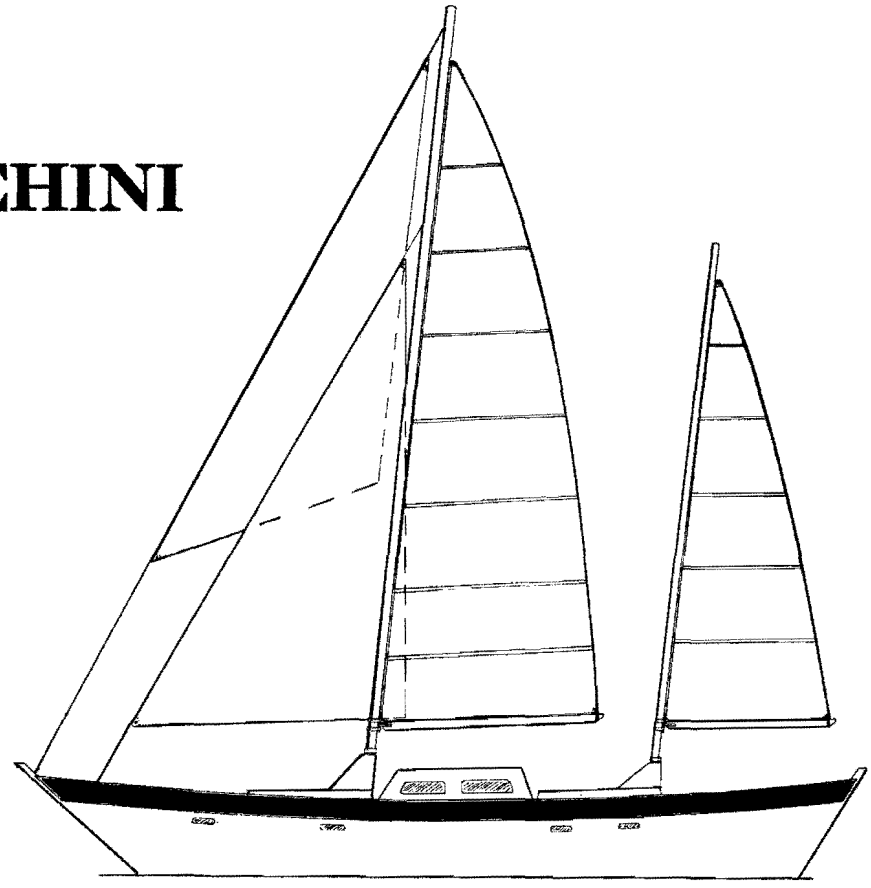
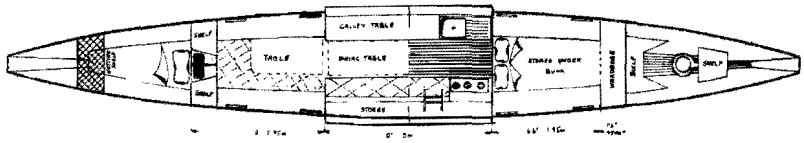
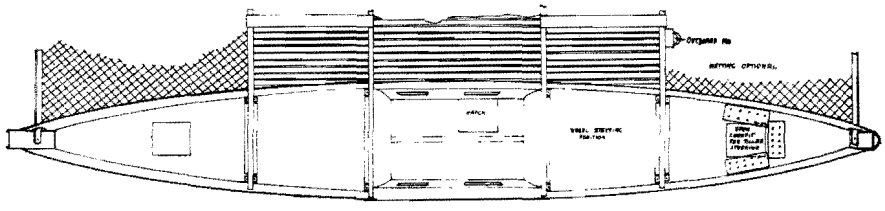
TEHINI







Overall length	51′	15·30 m.	Dry weight	4 tons approx.	
Waterline length	40′	12 m.	Loading capacity :		
Overall beam	21′ 6″	6·45 m.	for racing	1 ton	
Beam of each hull	7′	2·10 m.	for cruising	3–4 tons	
Draft	2′ 3″	70 cm.			

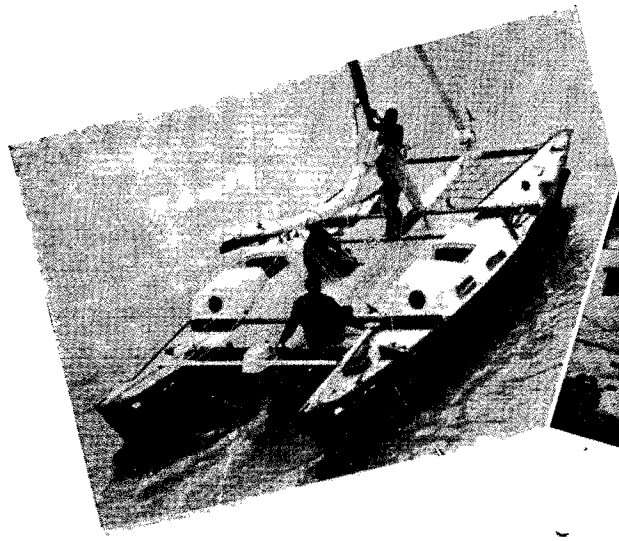
Bermudan Cutter Rig :			Bermudan KetchRig :		
Working sail area	820 sq. ft.	77·1 sq. m.	Working sail area	782 sq. ft.	72·7 sq. m.
Maximum sail area	1200 sq. ft.	111·4 sq. m.	Maximum sail area	1346 sq. ft.	125·5 sq. m.

Superb TEHINI (pronounced TEHEENEE) was designed and built as my personal vessel, able to cross oceans swiftly to visit Polynesian Catamaran builders all over the world.

She will be used as a charter ship (sleeps 10), and, with a Bermudan Cutter racing rig, will fight for a place in the world's top offshore multihull races.

Study plan and photos :See enclosed price list Building plans :See enclosed price list

As a result of the rapidly rising cost of materials, we enclose a material list with each study plan, so that you can make your own costing.



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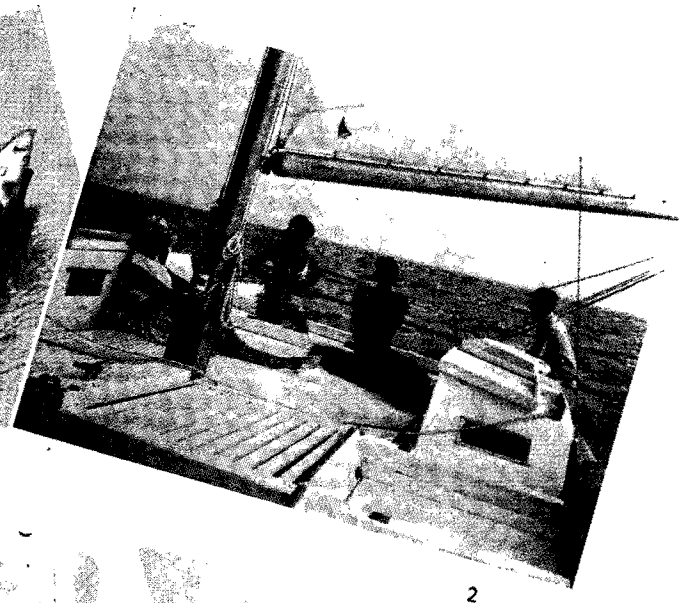
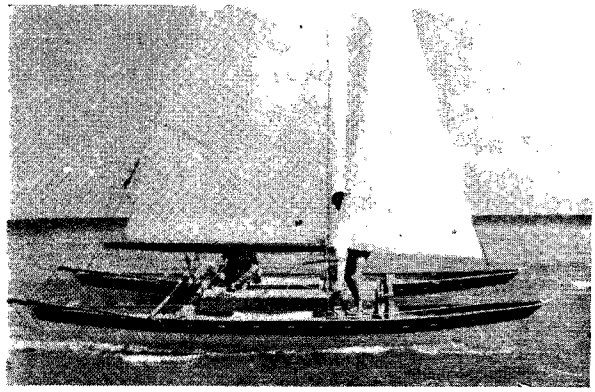


2

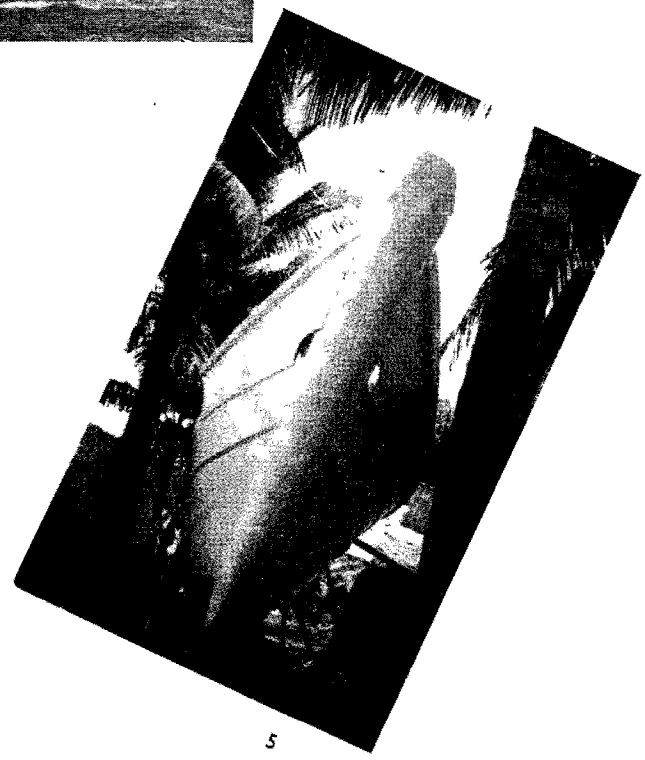
1. TANE (Multicoques, France)
2. TANE (Canada)
3. HINA (Lautier, Holland)



3

4. MAUI (England)
5. TANGAROA (Major Cowing, Grenada, W.I.)

4



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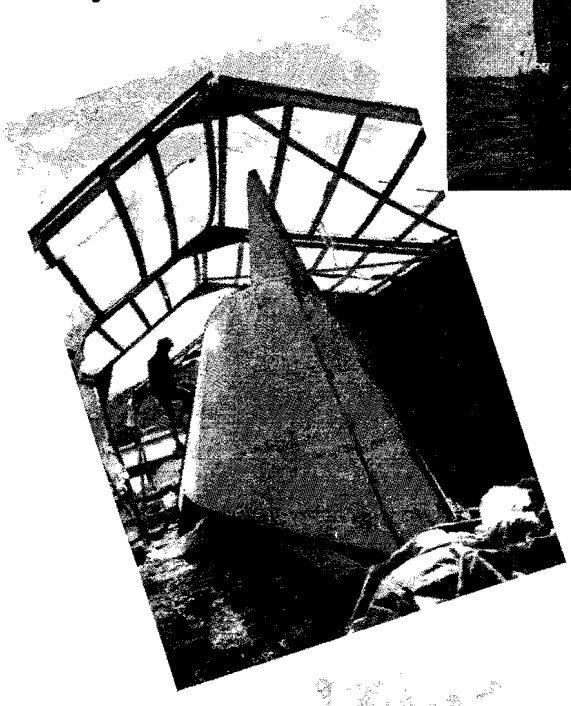

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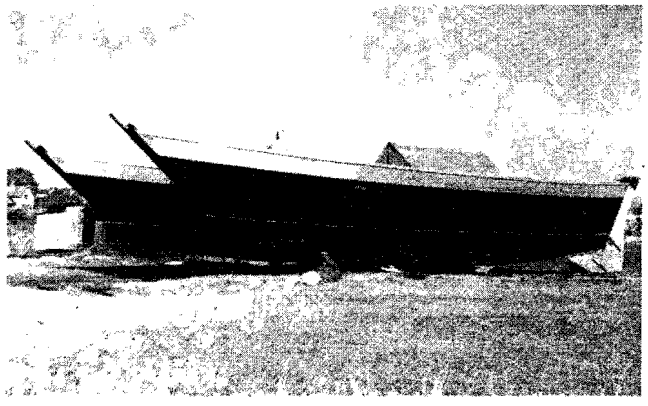

11

6 and 7. ORO (B. Rochester, England)

9 TEHINI (by courtesy of D. Kruger)

8, 10, 11 TEHINI (J. Wharram)

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