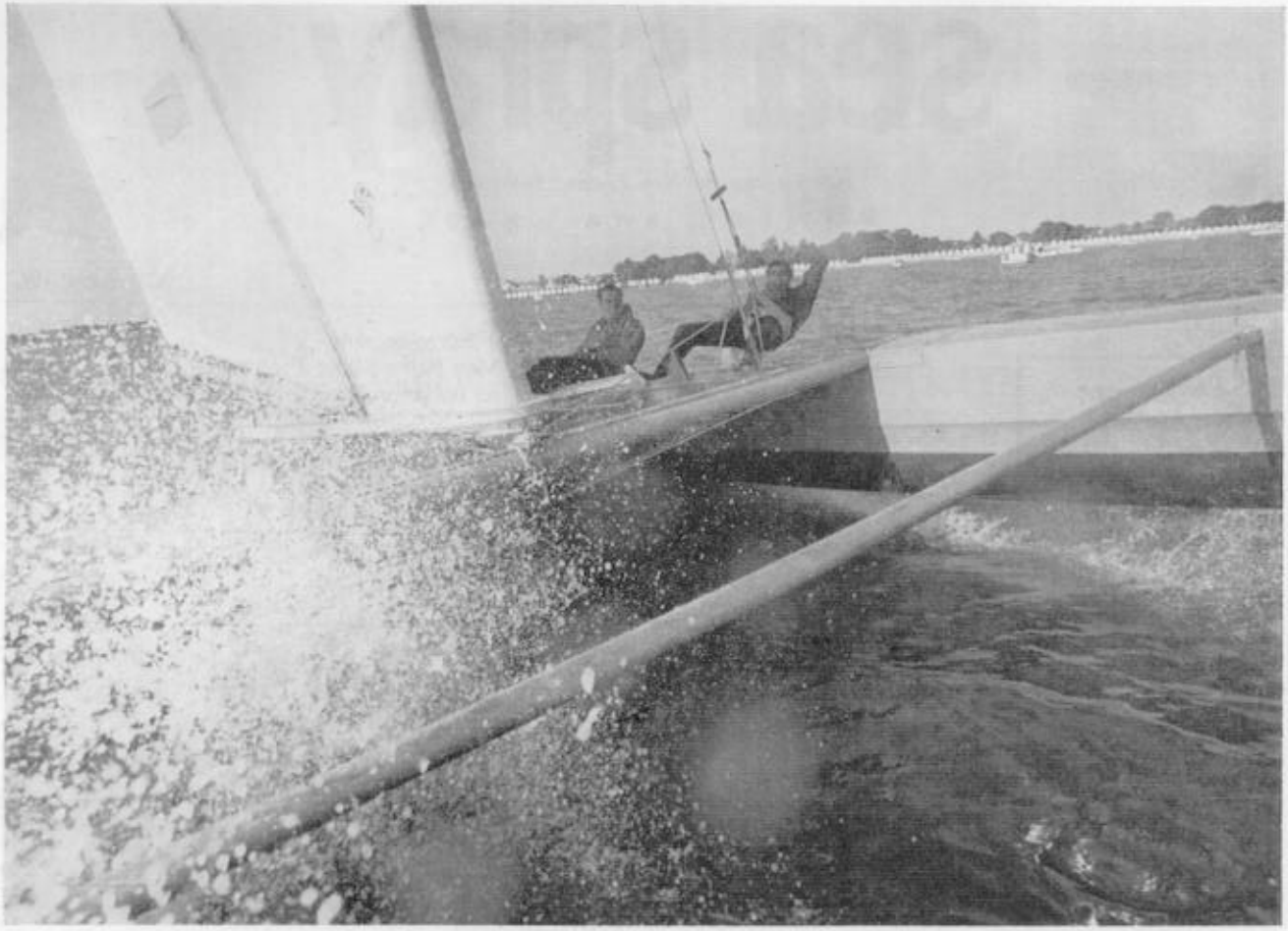


This dramatic shot is taken from the lee bow of the champion British International C class catamaran Lady Helmsman, winner of the Little America's Cup in 1966 and 1967. Sailing her is Reg White her builder who was elected Yachtsman of the Year in England for success ully defending the trophy on so many occasions and also for building the defenders. Note the deep section of the wing mast.

INTERNATIONAL CATS ARE BIG THRILL

by Malcolm Tennant

The N.Z. yachting scene has recently been transformed by the appearance of the International catamarans. These spidery racing machines are appearing in ever-increasing numbers as more and more yachtsmen become aware of their high performance on all points of sailing under all conditions.

The International cats are very different from those we have been used to seeing. They are lighter, longer and consequently finer, than others of the same sail area and crew number. The intense international competition is producing some very sophisticated hull shapes and methods of construction.

If the hulls of a catamaran are considered to be a displacement type then their maximum for a given wind strength is a function of the sum of two forms of hull resistance—wave making resistance and skin resistance. Wave making resistance is a function of the ratio of hull length to beam, or fineness ratio. So the finer the hull the less the wave making resistance. Skin resistance is a function of wetted area, consequently a semicircular hull form gives the least skin resistance. The perfect hull shape would therefore appear to be a very long slim semi-circular one.

However in yachting the one word that looms larger than any other is compromise and the International cats are no exception to this. Firstly there is a length restriction on the four International classes: A-18ft, B-20ft, C-25ft, D-30ft. The hulls must carry a load not only when level, but also on one hull as the boat heels and also depresses that hull. There are stresses and strains from the rig and from the water through which it is moving. The boats must also

perform equally well on all points of sailing in a variety of conditions.

Such a compromise has been obtained by two different approaches to the problems. The first approach began in England with Rod MacAlpine-Downie's C cats, the *Hellcats*. These boats had fine bows incorporating some flare and a moderate overhang. They were semicircular through the centre becoming a flattened "U" in section aft, a trend that was more pronounced in the later IIIs and IIIu designs. Most of the subsequent C cats from England have largely followed this formula although differences do exist.

The other approach was predominantly Australian and consisted largely of designs from the board of Charles and Lindsay Cunningham—*Quest, Wattle-B, C-A-Teen*. Basically the Cunninghams took their hard chine *Quick Cat* and rounded off the chines to give a "U" section right through. This "U" section along with a straight stem and a canoe stern constitutes what might well be called the "Cunningham look".

On the whole New Zealand designers have tended to be influenced more by the English approach than that of the Australians. Of the twelve N.Z. designs that I know, none has canoe sterns nor the flattened "U" section right through with the accompanying vertical sides. Some do have vertical stems but this can be attributed more to *Kitty* influence than Australian.

Most of the development in N.Z. is taking place in the A class catamarans, and fairly representative of the general trends here is the *Hustler* MK 1 and MK2 designed and built by Ron Given, Malcolm Tennant, and Ken Fay.

It is a slim boat, maximum hull beam 14in, very fine forward with the fineness coming a long way aft at the static water line to achieve minimum wave making resistance and maintain laminar flow as long as possible. The centre sections are minimum wetted surface semicircles. It has been pointed out by Dave and Jerry Hubbard that the semicircular shape is a compromise shape since it seems to suffer at high speeds where a planing hull might be superior. However it has been said that catamarans don't plane. Maybe they don't in the usual sense of the term, but most of the local A's have a flattened section aft just in case, and the G.T.F. *Hustler* is no exception, for the semicircular sections become flattened "U's" for the last 5 or 6 feet. Combined with this is a transom stern providing "hard" buoyancy that damps out any tendency to hobby-horse, and being much less susceptible to crew weight than the canoe stern, aids manoeuvreability.

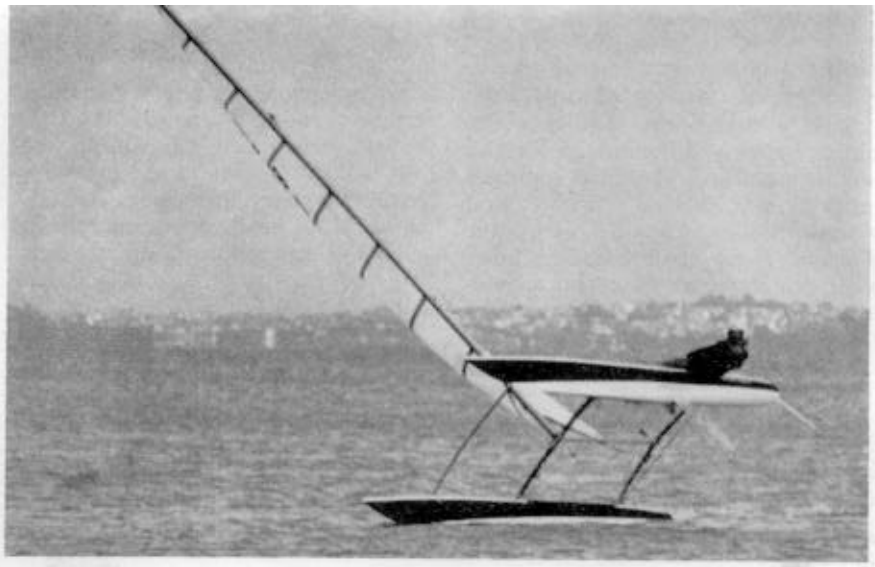
No keel rocker at all would most probably produce the fastest boat in a straight line. However the boat must be able to tack so some rocker in the keel is needed. How much is determined by a number of factors—position of the centre of effort, position of the centre of buoyancy, centre of lateral resistance, etc. However it is just as detrimental to have too much rocker as it is to have too little. Too much produces a rather nasty tendency for the stern to suddenly come unstuck and precipitate a nose dive. This incidentally seems to be more characteristic of the canoe stern hull and may explain the very small amount of rocker in a lot of Australian designs.

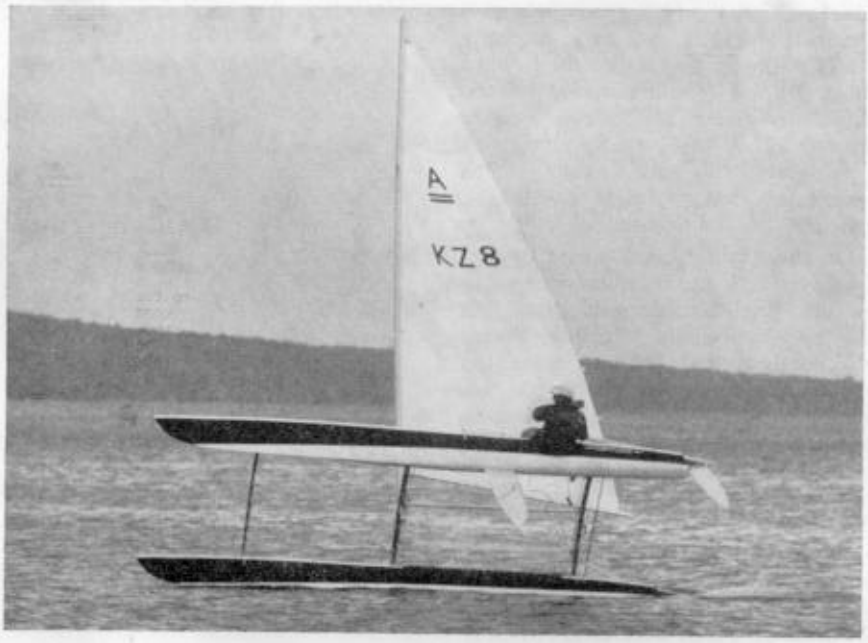
The materials used in construction have ranged from simple plywood to extremely sophisticated laminates of honeycomb material, terylene cloth, and fibreglass.

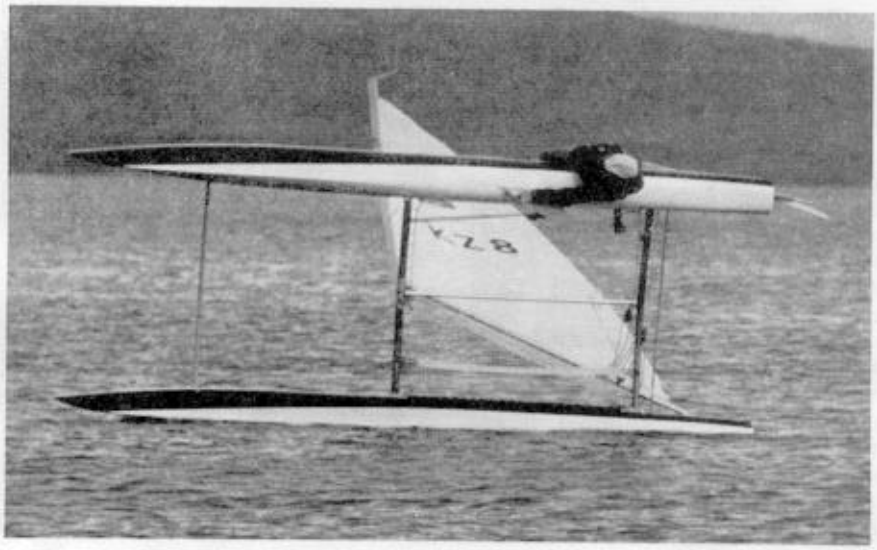
The first *Hell Cat* was fibreglass but subsequent *Hell Cats* have been moulded plywood with the exception of the production model IIIs's. The first Australian challenge for the "Little Americas Cup" saw some very sophisticated materials used. *Matilda* had a core of balsa planks sheathed

B-Lion an American International B class catamaran designed by the Hubbard brothers and built in fibreglass by the American Fibreglass Corporation. The B class has not yet proved as popular as the A and the C classes

Sea Spray feels rather guilty about this sequence of photos. We were trying to get action shots of Ron Given's Hustler and Doug Haigh's Rascal but these boats make so little fuss that they don't appear to be going fast until a hull lifts, so we asked Ron to fly a hull as he went past. He did, with spectacular results. He reached the point of no return before he realised it, and too late to ease. More on next page







on both sides with fibreglass. *Quest I* used a resin impregnated honeycomb sheathed on both sides with resin impregnated terylene. *Quest II and III* use fibreglass bottoms joined on to vertical plywood sides.

As might be expected, the American boats used fibreglass extensively. In fact all the Little Americas Cup challengers from the U.S.A. from *Wild Cat* through *Beverly, Sealion* and *Game Cock,* have all been of fibreglass construction. The Hubbard brothers *Sea Lion* was built of polystyrene planks sheathed in fibreglass. Their *A-Lion* was produced in straight fibreglass with the result that it weighs 300lb fully rigged, twice that of many of the N.Z. A's.

Plywood has been the material most favoured for the construction of International catamarans outside the U.S.A. John Mazzotti built the *Mantas* by cutting panels out of sheet ply, fibreglassing them together down the keel and then pulling them together around internal bracing. This produces a very light hull and a similar method has been used extensively in N.Z. by Graham Stanton in all his boats subsequent to *Scat* and including his C class, N.Z's first.

Hard chine boats are considered by many to be more suitable for amateur construction and a number of hard chine A's are being developed in N.Z. In this we seem to be unique for no hard chine designs have been reported from overseas. One hard chine design that has been sailing for a season is that of Bruce Farr (Doug Haigh's *Rascal*). In this boat very light (1/10) ply has been laid over frames and stringers giving curvature not unlike that achieved by moulding.

Moulding in one form or another has proved to be a most popular form of construction. There are A's built by the usual diagonal veneer method but there have been a large number, fifteen at the time of writing, constructed by a method pioneered in N.Z. by Ron Given, Malcolm Tennant, and Ken Fay. The

The boats were sailing on their own off Takapuna beach with an offshore breeze and Ron found it impossible to right Hustler with the mast and sails lying in the water. Doug tried for some time to hold his boat in a position where he could get hold of Hustler's mast and give it a lift but the wind was squally and he kept getting blown away. It was nearly dark and they had blown nearly to Rangitoto before this manoeuvre succeeded and they got Hustler up. She is on her way to being righted in the last shot on this page. If nothing else these pictures give a good idea of the details of Hustler's hull shape, centreboards and net decking, and a warning of the difficulty of righting them on your own

G.T.F. boats were constructed by using two overlapping layers of 2.4mm three ply as veneers. These were not applied in the traditional diagonal fashion but straight over the hull at right angles to the keel. This is similar to the system used in the Yachting World catamaran but whereas MacAlpine-Downie butted his ply to the keel, G.T.F. moulded the ply right over the hull without a keel for ¾ of the length of the boat. This type of construction was also used in the moulding of decks. This produces a compound curved deck of extreme strength and appears to be unique to N.Z.

This brief survey of the hulls of

the International Catamarans indicates that New Zealand does not lag behind the rest of the world in design or construction, and especially in the A class, may actually be ahead.

HUSTLER

While Graham Stanton was developing *Scat* in Canterbury, three Auckland yachtsmen were doing some serious thinking about A class cats and eventually Ron Given, Malcolm Tennant and Ken Fay built the first three in Auckland.

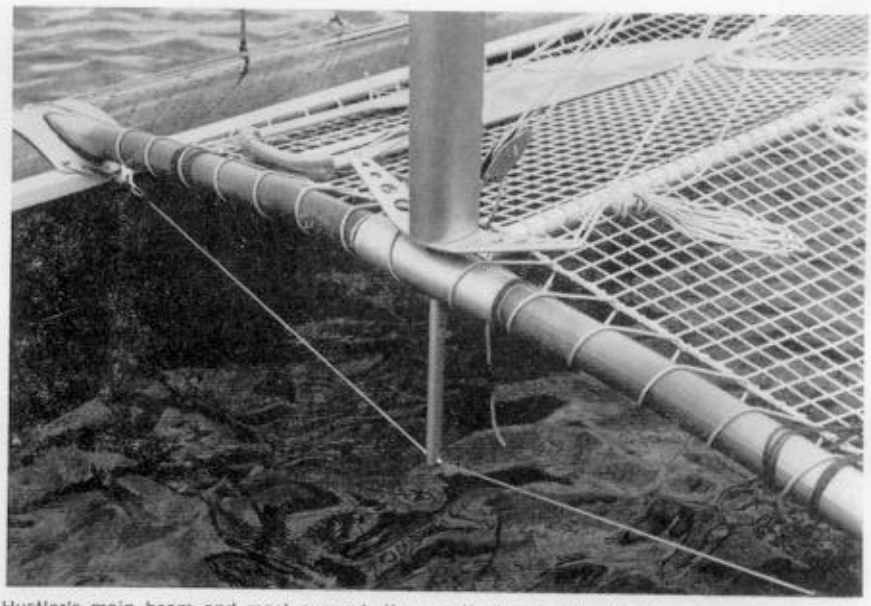
These boats were the result of many months designing and calculating and a large amount of guessing as nobody seemed to know very much about them. The boats were designed almost entirely from first principles with some help from overseas publications.

The hulls of the Mk 1 *Hustler* featured a very fine entry with a moderate overhang. This ran into a semi-eliptical section amidships, then becoming a semi-circular section with a flattened U section for the last 6ft. A reverse transom was recessed to give a razor sharp run off at the stern.

The hulls were not moulded in the traditional method of three diagonal veneers, but instead two skins of 2.4 mm 3-ply were laid across the hull from gunwale to gunwale with the joints staggered. The advantages of this system are the ease of handling, quickness of building and the perfect finish obtained. When this hull was combined with a moulded deck of similar construction, the final monocoque structure was of extreme strength and rigidity. Nowhere was it possible to depress any part of the hull with the hand. Lightness as well as strength was there, and these hulls painted and ready to be joined together weighed 38lb a piece. The transoms and centrecases in one of the boats were fibreglassed into place and this proved to be very satisfactory.

Doug Haigh

Alloy tubes join the hulls and there were some variations in the size and gauge of tubing used. Curved beams were used initially on one of the boats but these failed under stress. We have found the most satisfactory method of joining is to weld straight double beams of 2¼in diameter, 10 gauge tube to alloy plates bolted through the decks.



Hustler's main beam and mast support. It was attached to the hulls by plates so that the mast position could be changed in early trials. Decking is nylon net. Bracket at base of mast is to control mast rotation

Ron Given

Two of the boats used alloy centreplates and rudders, but at the speeds involved these tended to cavitate.

Net trampoline decks are the most suitable as they are comfortable, hold no water and present no windage when the boat is flying a hull.

All the boats were una-rigged as this was considered the most suitable for a single-hander and it has proved to be as fast as a sloop rig to windward and faster on a run and reach.

A Mark II version of *Hustler* has now been produced. This is basically the same design but incorporates slightly more buoyancy and more fullness for'ard. At the time of writing there were 13 As of this design built or building.

Lessons Learned

- Wooden boards and rudders are the most satisfactory.
- Very small centreboard area need — 1.5 sq. ft.
- A great deal of torsional strain on the rear beam from the long hulls pivoting around the main beam.
- Welding of beams quite satisfactory but expensive if done properly.
- Flexibility of the boat is detri-

Rascal on her trailer showing the very fine entry and the knuckle in the topsides for'ard

mental to performance either on or off the wind.

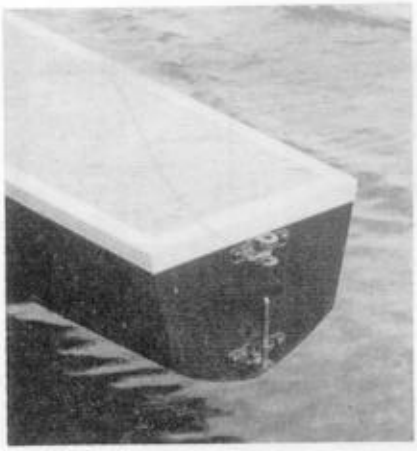
- A flexible rig has its place on catamarans because the high power to weight ratio of the As means that they very quickly become overpowered as the breeze freshens.
- A cat can and should be sailed to windward on one hull for maximum performance.
- The boats lift a hull very soon but are completely controllable and can be sailed indefinitely on one hull when going to windward.

RASCAL

Rascal was designed for Doug Haigh by Bruce Farr. She is the maximum 18ft in length and 7ft 6in beam. The hulls are constructed of 1/10in sheet ply with the outer layers of ply laid across and up and down the boat for strength. The ply frames are at 2ft centres. One eighth inch ply was used on the decks, and each hull decked and painted weighs 44lb. As well as keeping the spray down a knuckle in the topsides for'ard gives extra buoyancy to help eliminate burying of the fine bows.

The cross beams are held by ¼in alloy angles, and the main beam which acts as a mast support and brace is 3½in in diameter of 10 gauge alloy tubing. The bow, fore and aft, and aft beams are in 18 gauge tubing and the centre and bow beams are 2in in diameter and the aft beam 3in in diameter. A piece of timber on edge through the aft beam takes the mainsheet track and also acts as a spacer for the bolts holding the beam to the hulls. The boom is 2in in diameter and of 10 gauge anodized alloy. The hollow wooden mast has a maximum diameter of 2¼in and is open one side to take the sail rope. One set of side stays and a forestay acting as a brace come from a low hounds position with a wide jumper strut at the top. The jumper stays pass over another set of struts and run almost the full length of the mast — from the bottom until about 3ft from the top.

Rascal's deck is terylene cloth. The sail is loose footed with a foot batten. The hull decks are flat amidships and peaked for'ard of the fore-beam



Stern shape of the Farr designed Rascal

The centreplates and rudders are wooden and the tillers are offset about 2in in 2ft to help turning. Once a ¼in wooden pin was sheared by the thrust of the rudders in a turn.

Ten ounce terylene has been used for the trampoline deck, and the stack-out straps run across the deck allowing the weight to be swung in any direction. The mainsail is loose-footed. Doug Haigh says *Rascal* performs best in a breeze with one hull just clear of the water.

Do-it-yourself cost is estimated at $280.