

From Monohull to Catamaran

Sea miles and calculations sold this engineer on the multihull experience

by Harvey Griggs

The Beginning

Around a dozen years ago, my company hired a talented engineer whose avocation, I discovered, was designing and building catamaran sailboats. The engineer was Alan Slater, designer of a line of cats of varying size and speed which he called PDQ. At the time, these cats were built as "one-offs" out of marine plywood, foam, plastics and fiberglass.

I went to the east coast one weekend to sail on an early PDQ and was impressed. Although I still enjoyed cruising the Great Lakes in the family Northern 29, I became a subscriber to *Multihulls Magazine* and started reading, thinking and debating with my colleague. The biggest concern about multihulls, for me as for most monohull sailors, was a perception that multihulls, like the catamarans at the beach, turn over. I would have to overcome this worry before I could sustain more than a passing interest in cats.

Capsize

It is an unfortunate fact that some monohulls are lost on the oceans without a trace. Ballasted as they are, monohulls sink. By contrast, multihulls carry no ballast so they are extremely difficult to sink. If the probability of sinking is equal to that of capsize, it is easy to choose capsize because the crew of an overturned cat is usually rescued in this modern age due to satellites and EPIRBs.

But are the risks equal? More reading and some preliminary calculations eventually convinced me that they probably are roughly equal. Certainly racing catamarans are prone to overturning, because in order to win, it is necessary to fly one hull as much as possible to reduce hydrodynamic drag. In contrast, when sailing modern cruising cats, you should never lift a hull. Moreover, cruising cats are designed to be extremely difficult to overturn. One disinterested measure of safety comes from the Lloyds' insurance rates for good ocean cruising catamarans: the rates for multihulls and monohulls are the same. The British catamaran manufacturer, Prout, with something like 20 years in business and over 1000 boats built and cruising worldwide, claims that it knows of no capsizes by its boats.

I finally accepted that overturning is extremely unlikely after I did a few calculations for a modern fiberglass cruising cat of 34' length x 18' beam. With 100% foretriangle and unreefed main both sheeted along the centerline of the boat, just lifting the windward hull would take a wind of about 35 knots directly on the beam. We all know that it is virtually impossible to sheet the sails fore-and-aft in a high beam wind, and furthermore, cruising sailors start to reef in winds of about 20 knots no matter what size of boat they sail.

Another calculation confirmed the whole point. Knowing that in a 35-knot wind, this

particular design would be under double-reefed main and similarly reduced jib, I redid the calculations and came up with 70+ knots of wind to lift a hull. In that kind of weather, I would be lying to a parachute anchor with no sails up and wishing I was elsewhere.

Having slain the dragon of capsize, and having become convinced about the attributes of catamarans, I asked Alan Slater to complete the design of that 34-foot length by 18-foot beam cruising cat mentioned in the previous paragraph. Before it was finished, a group of investors decided to put the boat into production at PDQ Yachts. This boat is now known as the PDQ 36.

But, to return to my discussion...

Speed

Speed is so aggressively oversold by multihull manufacturers that many people think it is their only advantage (it's just one of many). Multihulls are unquestionably quick. Stars and Stripes, the one and only America's Cup catamaran, was clocked at over 35 knots and some of the ocean-racing machines turn in astounding passages.

But these are racing multihulls – what speeds are realized by large cruising cats with expansive bridgedeck accommodations? And what does it mean to you?

The PDQ 36 is probably the fastest in her size range. In very light winds, the taller rig of a monohull may pick up more wind and move her faster. In moderate to substantial winds, the PDQ 36 will soon show her transom. The skipper will often see 10-14 knots in a true 20-knot wind. Speedometers often read in the 20-knot range while surfing in heavy seas. In flat water, we believe that the PDQ 36 tops out at about 17 knots. Many have done 200 nautical miles per day in the open ocean. On a transatlantic trip, one did 980 n.m. in five days. On the Great Lakes, with lower wind velocity than on oceans, the speed of a PDQ 36 on a holiday family cruise is probably about one-third faster than a 36-foot sloop. That extra speed quickly translates into greater distance covered, and quieter anchorages reached more quickly.

Windward Ability

Like many monohull sailors before me, I always thought multihulls could not sail to windward well. I have since learned that a modern, well designed catamaran will go to windward faster than a monohull in all but the lightest airs.

Note that I say “well designed”. Some catamarans are envelopes around “cottage” accommodations. They are recognizable by their wide hulls (giving a smaller hull centerline to hull centerline beam resulting in lower stability), solid foredecks (a negative when in heavy seas due to pounding and weight of water on deck), and low or nonexistent bridgedeck clearance (won't sail well anytime, least of all to windward). They are most charitably classed as motor-sailers, and we know they do not sail well to windward.

Design of the weatherly cat is well understood – it should have long, narrow hulls with

lots of bridgedeck clearance and an aerodynamic deck for low windage. The hull-beam-to-length ratio for PDQ cats is an astounding 12:1 – very slippery – and with high inherent directional stability, they require only a low-aspect-ratio keel for good windward performance.

Sheeted in, a PDQ will sail as hard on the wind as a race-equipped monohull. With sheets slightly eased, the PDQ will quickly leave the monohull behind. Although it is pointing lower, it will actually arrive at a windward destination much earlier than the monohull.

Ease of handling

I once admired a pristine racing sloop owned by an older couple who were just leaving the Great Lakes to take their dream cruise to the South. But rather than relaxing in the euphoria of “finally making it”, the woman, who was quite small, was nervous and apprehensive. She explained that she did the foredeck work, but was really not strong enough to handle the huge overlapping jib. A similar concern was expressed by a couple with a race-equipped 45-foot sloop. If the man became disabled, the woman felt she lacked the physical strength to bring their boat to port. Their solution was to find a third crew member – when they could!

This argument echoes the opinion of Adlard Coles in his famous book, *Heavy Weather Sailing*, where he suggests that boats under 40 feet are safer than larger ones due to the huge forces acting on larger boats in heavy seas. Even though capable of brisk speeds, the light weight, easily driven cat will have a modest rig which allows easy sail handling. The stable, non-heeling working platform is also helpful and safe. Handicapped sailors, such as the late Tristan Jones, and older owners can still enjoy sailing in a catamaran.

Heeling and Other Motions

Many sailors claim to enjoy the sensation of heeling. I guess it is fun on an afternoon sail. On the other hand, it is hard to believe that anyone who has done even a 48-hour passage at heel angles between 10 degrees and 20 degrees could find anything positive to say about cooking, eating, sleeping, dressing or using the head while heeled! The U.S. Navy has studied rolling and found that at 30-degree angles, fatigue and work efficiency become major problems.

Although it is argued that extreme angles of heel help the monohull crew to recognize an increase in the wind, multihull cruising skippers soon learn other signs and will reduce sail well before becoming pressed. With reduced sail, they will cruise more comfortably and still will speed past most monohulls.

Most cruising skippers will want to control speed for comfortable cruising in heavy weather. Being lighter, the catamaran has a quicker response to waves and its motion is somewhat jerky. The monohull, due to its greater mass has a slower response. Perhaps it is valid to think of the cat's suspension as similar to a sports car and the keel boat's as similar to a taxi cab.

Shallow Water

Cats have draughts of less than 3 feet which is perfect for the cruiser. In Chesapeake Bay, 40% of the water is less than 4 feet deep. One can sail the Bahama Banks without worry, gunkhole in Georgian Bay, find quiet coves in the Florida Keys, take short cuts out of marked channels and so on. If a cat does go aground, the crew can frequently simply get out and push! If the boat gets stuck on a falling tide, the crew can sit comfortable and level on the two keels and pretend they were cleaning the vessel's bottom.

Staying level while grounded is more than comfort. One PDQ 36 pounded on a reef for two hours in a three-foot swell. While the reef ate part of the keels and one rudder, the boat was towed off with no damage to the hulls whatsoever and was repaired for about \$2,000. A forty-foot keel boat suffered the same grounding in the same place shortly after and the pounding while the vessel lay on her side resulted in a total loss.

Performance Under Power

One attractive attribute of the modern cat is its ability to motor easily into heavy seas. The long narrow hulls slice through the waves with much less pounding than a monohull. Once, at the Burlington Bay channel in Hamilton, Ontario, a wind of over 50 knots slowed a PDQ 36 down to 1-2 knots. This was barely acceptable, but the monohulls there were forced to wait outside the harbor as they could make no headway at all against the storm! That particular 36 was powered by twin 10 HP outboard motors.

A PDQ's hydrodynamic efficiency is a most important factor in its overall performance. During an Intracoastal Waterway passage from Toronto to Miami in a PDQ 36, we cruised on one outboard generally doing 6.5 knots with a fuel consumption of 10-12 miles per gallon. Once, while racing to meet a bridge opening schedule and, I have to admit, cheating with a scrap of jib unfurled, we passed a 33-foot trawler that was doing seven knots flat out. They had a 130 HP motor, were using 13 times as much fuel, and probably still refuse to believe that our outboard was only 10 HP.

The most important difference from a keel boat, however, is twin engines. The widely spaced screws allow you to rotate your boat within its own length – that's a level of maneuverability unknown to monohull sailors – and makes getting in and out of moorings a snap. PDQ's with twin diesels are as easily driven and as maneuverable.

Cost and Value

One of the problems that I, along with other monohull sailors, suffered from is the belief that multihulls were unnecessarily more expensive than monohulls. I have realized that part of the problem is defining a fair comparison. Do we compare length or square footage? Is a 36-foot x 18 foot cat the same size as a 43-foot x 15-foot monohull (648 vs. 645 square feet)? In some ways the answer is 'yes', in some ways, it is 'no'. If you look at the 'yes' side of the coin, the multihull is a bargain. Certainly, dockage, usually based on length, is a bargain, and if you're the one who gets to haul the sails up and grind the winches, the 36-foot multihull looks like a better bargain than

the 43-foot monohull any time.

As to comparing the costs of multihull and monohull manufacture, the mold needed for cats is very expensive, and the bulkhead fitting must be done to very high standards, particularly for the mast support, but structure is needed to support several thousand pounds of lead keel for the typical monohull. Catamaran construction gives some economies. The lighter weight of the cat means smaller sails, rigging and winches and the extreme propulsion efficiency means smaller motors.

One thing is certain. Due to the extremely fast development of the cat, there are very few good used boats available and depreciation is therefore low, so the budget-conscious sailor may have to stay with smaller keel boats or pick up an older monohull.

One Man's Conclusion

The incredible comfort and space in a modern catamaran may not be valued by the gung-ho, press-on-regardless racer. Neither will it be by the traditionalist craftsman who gets such pleasure by owning a restored mahogany strip classic. But some cruisers like the benefits of separate cabins with complete privacy for visitors, the large galley where one can cook in comfort even at speed, the large dining lounge with the panoramic view, the separate navigation area, the larger shower and head, the sheltered cockpit, the 10-foot dingy suspended from davits, the twin engines, the safety, the speed, etc. etc...

My choice is rather obvious. May I suggest that you consider carefully, then choose?

About the author

Harvey Griggs began sailing in the 1950's with a sailing canoe, and progressed to interest in multihulls via a Mirror dinghy, Albacore, Laser, sailboard, CL16, Northern 25 and Northern 29. Head of a well known engineering firm, he is one of the founders of PDQ Yachts. His engineering abilities contributed to the design of the PDQ Capella and Altair.