

## Pushing the Envelope

May 13, 2006

I am in contact over the internet with an engineer that is looking onto an aluminum oceangoing catamaran. He just returned from Australia where he met important people involved in building power catamarans. They, of course, knew of Malcolm Tennant and his oceangoing catamaran designs and acknowledged that he has developed some good theories and talked respectfully of him. However they don't agree to a minimum width to length ratio of 13:1 of a single hull as must, but consider a ratio of 8-10 to 1 is more suitable for not loosing too much living space/area, and also tank test showed that the efficiency gain is not relevant and that Malcolm Tennant is too much of a purist in that respect.

### Size Does Matter

Having built what I believe is the only aluminum Tennant oceangoing catamaran let me first consider the space issue, a subject over which I have spent a lot of thoughts in recent years, if nothing else because I have been constantly walking, climbing and crawling over one.

Let me first establish what size boat I am talking about. I have set a maximum length of 55 to 60 feet for a boat to be run by a single person, or even better, by a couple. I have owned for over 10 years a motorsailer (PH7) of 50 feet, weighing about 25 metric tons and managed to maneuver and dock the boat by myself. Of course another person on board made things much easier, but I did not want to be locked to a dock just because I could not find some competent hand on deck. I feel that anything over 60 feet is too much to be handled by one person or by the average couple. It can be done, but you must be good and under extreme situations of say entering into a small harbor with winds and currents you must be darned good or you can cause more damage than Attila the Hun.

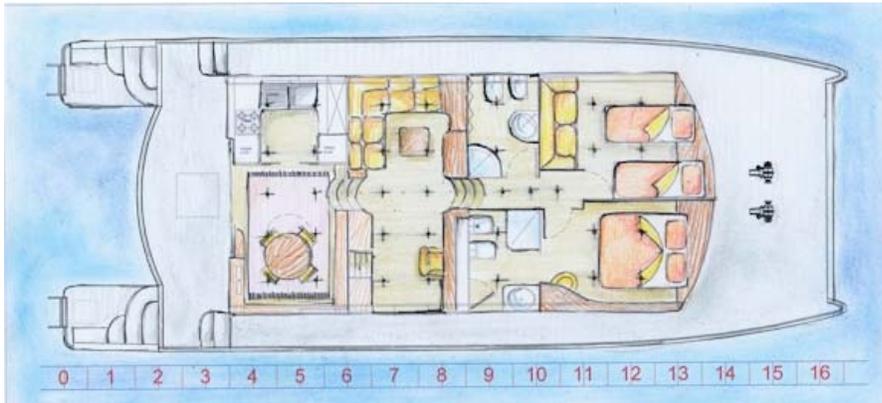
Most people in Italy have a one or two man crew when they own a boat of over 60 feet. There is nothing wrong with having a crew if you can afford it and put up with permanently having two comparative strangers around you. But if one crew member is also a good cook, you can literally be in boating hog heaven. A good friend of mine has a luxurious 76 ft fast yacht with two crew members who live in very nice crew quarters. The crew quarters are adjacent to the master stateroom, and although the wall in-between is well insulated, whenever a crew member sneezes my friend feels like saying "salud". This arrangement has had the effect to considerably inhibit my friend's sex life and he is now thinking of changing his boat. However, if you plan to go on long cruises you must provide decent accommodations for your crew, which will take up quite a bit of space on your boat.

So I set an upper limit for my catamaran of 60 feet, with a maximum weight of 30 to 35 metric tons, feeling that I can handle something a bit bigger than my old motorsailer due to the fact that a catamaran has two engines and if I feel that I have more problems than foreseen I can always add a powerful bow thruster. The only thing that makes me a bit apprehensive is the large lateral surface exposed to the wind, surface which is much larger than the one I had on my motorsailer.

Now let's consider what kind of lifestyle I want on my boat. That's easy: I want a luxurious lifestyle. I plan to spend considerable time on board, at times away from civilization where you cannot hop off the boat and check into a hotel if you feel like a long, hot shower and a comfortable bed. However I don't want to spend over half a million dollars and suffer, because, in that case, I would rather stay at home or go to a luxury resort and save money. By luxurious lifestyle I do not mean marble tops in the bathrooms and gold faucets, although the interior must be pleasing. Notice that I said bathroom, not head, and this is what makes the difference to me. A bathroom for me or my guests must contain the same equipment of my bathroom at home, albeit a bit smaller, but not too much. It must have a separate shower stall, a full sized WC and, yes, a bidet. It goes without saying that the sink must be of a regular size and there must be space to store towels and the usual stuff that you find in all bathrooms on dry land. My cabin must have a queen size bed, enough storage space for clothes and shoes, without having to dismantle the bed or look under floorboards. The kitchen (again I don't call it on purpose the galley) must come with all the equipment one usually has on dry land, and especially important, a dishwasher.

Nothing, in my mind, spoils an evening more than, after a good dinner and a good bottle of wine, to order someone to wash the plates or, heaven forbid, having to do it myself. To load a dishwasher is just acceptable, to wash the dishes no. To eat I want a regular table and chairs. No dinette that becomes a bed. I want to be able to have my midnight snack sitting down comfortably without having to wake up somebody. The boat must also have a comfortable sofa where I can lounge and watch television if my companion wishes to sleep in total darkness in the cabin.

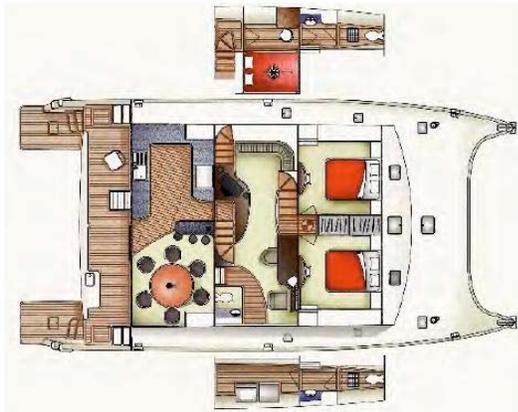
Considering all I have said a 55 foot catamaran can have only two cabins and two bathrooms.



The layout of the PH8

Malcolm Tennant tries to please the marketing people that believe the more beds a boat has the better, by moving part of the heads into the hulls and by squeezing a third cabin under the bridge. Unfortunately the third cabin is a slave quarter you would not want to assign to your mother in law and takes away

precious space that can be used for other purposes while the bathrooms become, well, heads. On top of that the third cabin's access robs precious floor space from the bridge.



The layout of Malcolm Tennant's New Yorker. The heads are not really luxurious (where are the bidets?) and the third cabin under the bridge must be rather claustrophobic.

Note that the New Yorker is a bit longer than the PH8 (17.58 m vs. 16.50 m) and quite a bit wider (9.00 m vs. 6.78 m)

I think that it is much preferable to devote the hull space to equipment, spares and supplies. I may be proven wrong, but by using the hulls for living spaces you end up having a hard time to fit all the necessary equipment into the cat (generator, water maker, AC unit, battery banks etc.). It can be done, but I would not like to be the guy that has to do maintenance on the equipment. It should be a rule that anybody designing or selling boats has to spend at least six months doing maintenance on them.

## How Many People Anyway?

The PH8, with two cabins, can sleep comfortably four people. Call it "five star" comfort. If you have five people on board (the fifth sleeping on the sofa of the guest cabin) the comfort degrades to "three star". To sleep six (one more body on the couch on the bridge), we end up with only "two stars". The number of people on board is just not limited to the amount of beds. More people with the same amount of space means more crowding, less privacy, more supplies and most important more possibility of friction on board. I remember once in Georgetown, Bahamas, when my ex wife and me, on the PH7 were stuck for three days while a northern passed through with rain and cold winds of up to 35 knots. Luckily we were only the two of us. I think that if we had been in six at the end I would have killed somebody. The degree of comfort on the PH7 was similar of the comfort of the PH8, with an added handicap for the PH8: growing older one becomes less tolerant of other people's idiosyncrasies.

Before we continue this discussion we must define what kind of cruising I want to do with my oceangoing, long range catamaran. The name says it all, I want to cruise for long distances to places where you don't find a marina with hot showers, restaurant and a supermarket. Cruises where you have to be self sufficient for a month, even if you touch harbors every second or third night, taking into account bad weather, other contingencies and the fact that you cannot find your favorite wine everywhere. Take one of my favorite cruises I did on the PH7: from Fort Lauderdale through the Bahamas, to Haiti, Jamaica, Honduras, Guatemala, Belize, Mexico and back to Fort Lauderdale.



It took us about four months, with a maximum of four people on board, and four crew changes. Had we been in six it quickly would have become hell. Besides, do you think that it is easy to organize six people that all get along and with time to come with you? If for a few (short) days a friend or relative wants to join you while you are enjoying say Montego Bay in Jamaica, you can always offer him or her the couches and at the same time give them a clear message that their welcome is limited in time, or schedule the arrival for when the guest cabin is available.

There is another problem if you have over four people on a boat of under 60 feet on a long cruise. The kitchen, the washer drier, the water and waste tanks being really sized for four people. To cook for six usually requires a bigger pot to boil the

water for spaghetti. You will not be able to fit all the pots and plates into the dishwasher in one go. The freezer will be probably too small, forcing you to eat more canned food, with the quality of life taking a plunge.

## More Space

Is it possible to create more space? Potentially, there are three ways to create more space on a cat of a given length.

Make the boat wider. I have been conservative and limited the width of the PH8 to 6.78 m for many reasons, and perhaps I could have gone to the full width suggested by Malcolm Tennant, 9 m. I don't have any experience maneuvering a cat in various situations, only time will tell how many problems the width of a cat can give, be it 7 or 9 meters. But, as you can see from the layout of the New Yorker, you don't really gain room for a third cabin. The extra 1.5 m of width pushes the "five star" comfort of four people to a "six star" comfort.

Make it a double decker. The PH8 does not have enclosed space on top of the other. The pilothouse is raised, but the space below is barely one meter high and at most you can convert that space, as I said before, to slave quarters.



A side view of the PH8. The boat is still very light, but even at full load the sides are high



The front view of the PH8. You cannot lower the anti-slam nacelle (the middle keel, above the water level), without compromising bad whether capability.

To really gain a lot of space you will have to go to the "double decker" design, where the pilothouse is above the main deck. If you try to apply the "double decker" concept to a catamaran of maximum 18 meters you would end up with what Malcolm Tennant calls the "wedding cake" design. Apart from looking weird it probably could have stability problems.



A 21 m "expeditionary" catamaran designed by Malcolm Tennant. To gain space the pilothouse is placed above the cabins.

The "double decker" design is beautiful and practical, but with a length of 21 meters (almost 69 feet) you enter into a different league. You would not want to run it just with your wife or a friend. They would leave you after one week. Just think how much work to keep the boat clean. So one or two crew members become almost mandatory.

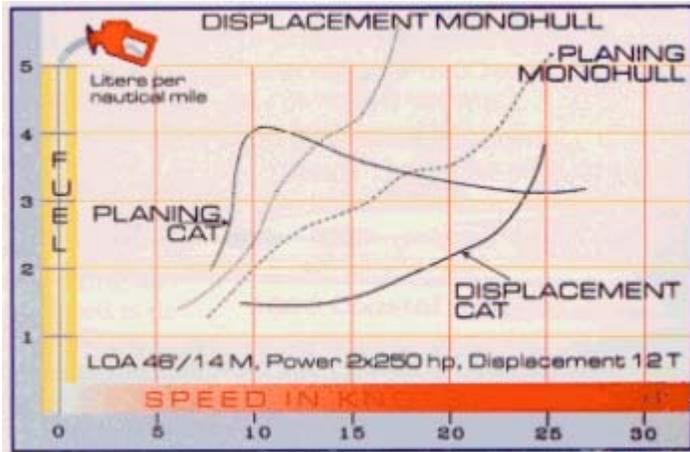
Make the hulls wider. The hull beam of the PH8 is 1.14 m, the LWL is 15.17 m, giving a ratio of 1 : 13.3. Admittedly, a "purist" ratio. But widen the hulls to 1.60 m and you get a ratio of 1 : 9.5. And what have you gained? The heads and the floor space of the third cabin under the bridge are a bit wider, but you lose efficiency. How much I don't really know at this moment, but I have a feeling that the tradeoff is not acceptable, at least not to me.

Then there is a further problem due to the aluminum construction. All metal boats have frames that are connected by stringers, over which you then place the plates. Practically speaking, from the hull width you must subtract the width of the frames, which for the PH8 are about 20 cm. In an engine room you can place equipment around the frames, but that is not really feasible for a stateroom. Besides you must not forget that you must insulate the living quarters of an aluminum boat if you don't want to cook in summer and freeze in winter, aluminum being a very good heat conductor. And then there is one more problem. To make an entrance to the hull space you must cut into stringers and reinforce around it. A very messy affair, contrary to any KISS principle. These last problems do not exist or are minimized if the cat is built of composite.

To sum it up: You must accept that an aluminum cat that under 60 feet long can only have two comfortable cabins and that to extract something livable from the hulls is like squeezing blood out of a stone. If you really need more decent space you must upgrade to a substantially bigger (and much more expensive to build and run) boat.

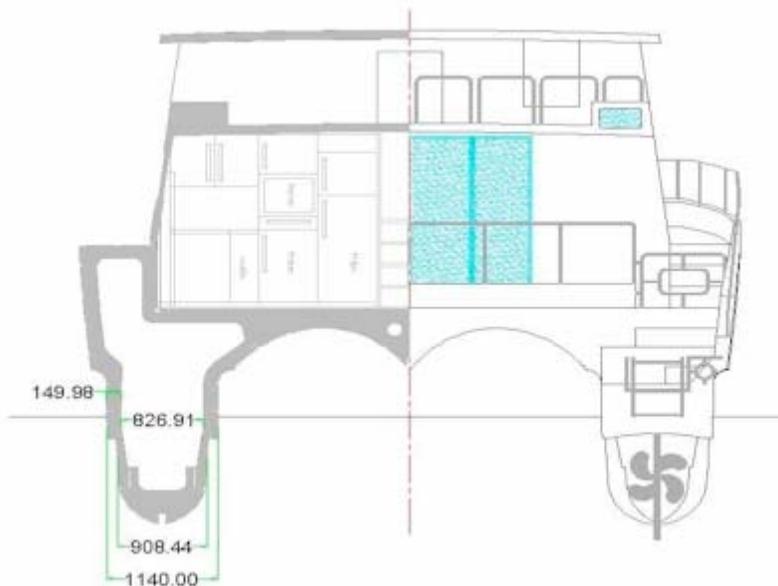
## A Look at Narrow Hulls

When I decided to build an oceangoing catamaran two factors made me choose the cat concept. The seaworthiness and inherent stability of a cat and the economy of running one. To my surprise when I tried to get a power curve for various catamarans I did not find anything really useful. Malcolm Tennant published a power curve, but it is very vague and for a comparatively small cat.



### How efficient are catamarans really?

I am building an aluminum catamaran because I want to push the concept of an efficient oceangoing catamaran to the limits, in other words to "push the envelope", said in aviation terms. I cannot nor want to do basic research, like tank test various models or explore new ways of powering a boat, like diesel-electric drives. I want to obtain the maximum efficiency at an affordable price (whatever affordable in the nautical market may mean) with technology that is available on the market today. If it means a bit more effort in building (narrow hulls), be it. Hopefully it will pay for itself over the years.



This is how narrow the hulls of the PH8 are.



The engines fit without too many problems into the hulls and have been lowered from the side decks after taking off the air filter and generator.

When the owner of a 40 foot, 1981 Trojan saw the engine rooms of the PH8 he was pleasantly surprised how much room there was around and above the engines compared to his boat. I guess that Einstein was right, everything is relative.



Besides being very narrow, I tried to maximise the efficiency of the hulls below the water level. Rudders are in line with the keel (if necessary the propeller shaft can be extracted through the engine room) and even the sacrificial zincs are recessed, to reduce drag.

An ancient Chinese curse says "may you live in interesting times". Our times are very interesting. We are polluting our planet with the carbon dioxide that causes global warming and using too much energy, energy that is produced mostly by ever more expensive oil. I feel that I owe it to my children and nephews to try to save as much oil as possible by not wasting any. Even saving "only" 10 or 20 percent is a good deed towards mother earth and on top your wallet will thank you. That's why the car I drive is a Toyota Prius, a highly efficient and low polluting hybrid and I try to create a very efficient oceangoing power catamaran. If that makes me a purist like Malcolm Tennant, I am proud to be one.