

POWER CATAMARANS:

Making the right choice part three

| story **PETER BRADY**

In the two previous articles we looked at the past and the present and how non-planing power cats have developed as well as the difference between the inshore and offshore type. In this last part of the series I will look at where non-planing power catamaran design is heading and its potential future.

THE FUTURE

The inshore charter and luxury semi-displacement markets are here to stay, they have the greatest obvious sales potential and because their business is a numbers game, this is the market where the bigger overseas production boatbuilders have and will concentrate. The cost of developing new moulds is high, particularly so for catamarans with their large surface areas so manufacturers will not stray too far in developing new technologies or concepts, instead just gradually modifying what they already have as it is far less risky. The power cats' stability, shallow draft and accommodation privacy is perfectly suited to the charter market and as long as the economics of the power cat's higher build and marina costs combined with its greater beam stack up, then this market will continue to grow. There are however two other markets with huge potential growth for non-planing power cats and these are where I think the most interesting developments will occur, as it is in these markets that non-planing

power cats have the greatest advantages over monohulls and planing cats.

The first of these is the fast long-range powerboat cruising market: in reality this is where in any vessel under 80ft it is almost the sole preserve of the non-planing power cat, so this market will gain momentum as boaties come to understand that it is possible to trans-ocean cruise at 13kts and over. This type of power cat also has the potential to take substantial numbers away from the sailing market because as cruising folk age, the power catamaran's ease of use could keep them on the water for another 10 years. Malcolm Tennant once stated that you could motor around the world in one of his power cats for the price of a rig in a similar size sailing cat and it actually turns out that his claim is slightly conservative these days. One of my 58ft powercats used 3.5lt per nautical mile including genset @ 15kts when coming around Australia's top end in 2002, with another of my 58 and a 50ft power cats achieving the same figures. If we calculate that an around the

world trip is 22,000nm which is the minimum distance for world record attempts, this would equate to 77,000lt of fuel and at an average of \$1.20 per lt, the fuel cost would be \$92,400. According to people in the industry I have spoken to whilst researching this article, \$92,400 would be the bottom end of the scale in regards to setting up a 58ft blue water sailing catamaran with rig, sails and deck gear and these costings do not take into account the fact that you would still have to purchase a couple of engines and their drive trains as well. In addition, this comparison doesn't take into account the compromises made in the boats arrangement to fit around the rig, the engineering cost of supporting it, nor the fuel you would use when motoring if the wind wasn't right or going to and from ports, or the maintenance and replacement costs of the rig after you've bought it. Come back to a 13kts cruise speed which is more realistic but still a very respectable trans-ocean cruising speed and the figures look even better for the power catamaran and yes, the engines will wear out eventually, but if you choose wisely,

five circumnavigations shouldn't be out of the question before a rebuild: I don't think there would be too many rigs or sails that would go that distance with being replaced.

Now before everyone starts screaming that I am anti-sailing, both Malcolm and I have designed our fair share of sailing cats and I still own a yacht and love sailing so I am not a power boat fanatic, however it is hard to ignore the fact that power catamarans have a lot of advantages when it comes to cruising particularly as you get older and less able. Many will argue that cruising heaven is the sound of silence when the auxiliary is turned off and in principle I do not disagree. But, given that most yachties still motor a higher percentage of the time than they would care to admit and that the sound of sails flapping when becalmed or a rig stressed in heavy weather are not exactly relaxing either, I think this argument needs to be kept in perspective, particularly if you spend some of the cash you have saved on the best engineroom soundproofing and vibration dampening you can buy. Twin engines with individual systems in separate hulls with multiple watertight compartments provide a very high degree of mechanical safety and reliability and when this is combined with shallow draft, protected stern gear and the manoeuvrability to turn in your own length, it makes cruising pretty relaxing especially when you throw in the ability to outrun unfavourable weather patterns or unwelcome visitors. My ideal long-range power catamaran would have a tender that sailed well or a sailing dinghy on board as well, so when that itch got too great I could throw it over the side and go for a sail.

The second market with huge potential for the non-planing power cat is the commercial fishing and workboat industry. The limited load carrying ability of planing power cats has discouraged fisherman and in particular crayfishermen from taking up power catamarans in any numbers. Planing hulled catamarans were trialled in the 80's and 90's, but unfortunately they didn't perform

as well as was claimed and once burnt, fishermen were, as the old saying goes, twice shy. Because a planing hull's performance is absolutely governed by its power to weight ratio, if they are built or outfitted too heavily or loaded more than the designer has allowed for, they just will not plane and once this happens, they become a very inefficient displacement hull. This inability to plane is made worse by the fact that they often have wider hulls for their overall beam than my displaning or Malcolm Tennant's CS high speed displacement type: this makes their tunnels narrower and as the designer expected them to climb onto the plane increasing the wingdeck height, they usually end up with a minimal tunnel height as well. Once these two situations combine, their hull wave trains meet

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in the middle of the tunnel, filling the area with solid water which can add a huge percentage to their wetted surface which is drag, and this drag in turn reduces their performance even further while increasing their fuel consumption.

My displaning type hull is very forgiving to weight both in performance and fuel economy and so works very well for commercial applications with a load of 3 tonnes on a 15m commercial vessel only reducing the top speed by half a knot and increasing the fuel consumption @ 17kts from 58lph to 67lph total. Not all non-planing power catamaran hull forms are as suitable for commercial applications with wider hulled semi-displacement hulls suffering from similar problems to planing cats when pushing up above displacement speeds. How do I know this? By studying the designer's and manufacturer's

published fuel economy figures which are slowly getting worse as their hull widths increase to gain more interior volume. This trend has gone to such an extreme that the published fuel economy figures of a 15.7m production power cat capable of just over 21kts from 2 x 550hp engines were over double that of one of my displaning designs or Malcolm's CS hulls of around the same length, both of which are capable of 26kts with 2 x 440hp engines and were 30% worse than a recently launched 17m planing monohull capable of 27kts powered by 2 x 700hp engines.

I have also compared another production cat that at just over 13m can only make 17kts and uses twice the amount of fuel at this top speed with similar horsepower to one of my displaning cats of comparable size

that can do 23kts. To the cruising person this drop in fuel economy and therefore the ability to have a high cruising speed and range means these boats are only capable of making the common passages on the east coast of Australia between Sydney and Brisbane, or Brisbane and the Whitsundays at 8kts without refuelling. However to the commercial fisherman, increased fuel consumption is decreased profit and to demonstrate this I have calculated that a crayfishing boat of around 15m in length operating for 1,000 hrs a year at an average speed of 17kts could save 60,000 litres of fuel over a monohull or planing catamaran with similar speed and carrying capacity. There were 235 crayfishing boats in Western Australia alone in 2014 and approximately 400 more in the rest of Australia so if even 20% of these boats were replaced with displaning catamarans there could be a diesel

fuel saving to the country and the operators of around 7,620,000 million litres.

For this example I have only looked at one part of the fishing industry, but there are reef fishing fleets, abalone fleets, gill netters, long liners, dive boats, whale watchers and a multitude of other maritime activities such as fisheries patrol, rescue services and police boats that could all benefit from fuel efficiency and an increased load carrying ability. We have had a displaning dive charter boat working since 1997, a whale watching boat since 1999 and a fisheries patrol boat operating since 2006 and all have proven to be extremely fuel efficient and comfortable operating platforms.

Given all these advantages, why haven't non-planing power catamarans sold in greater numbers to date?

The first reason is that boats are still compared by length rather than on an enhanced lifestyle, therefore the power catamaran looks more expensive on paper compared to a monohull of the same length so people are put off before they really look at the lifestyle advantages of a power cat rather than just its length.

The second reason is that the fuel efficiency of a well-designed non-planing power cat is so good compared with most planing power boats that the public just does not believe the figures. This is compounded by the fact that virtually no production monohull manufacturer will publish their fuel consumption figures and power cat designers and builders of not particularly fuel efficient hulls either disparage more efficient designs or don't discuss what their fuel usage is. This has without doubt been the most frustrating aspect of designing displaning power cats over the last 25 years although I can understand some of the scepticism as not all non-planing catamarans are fuel efficient and we all get tarred with the same brush. Malcolm Tennant published graphs comparing his CS type with semi-displacement and planing boats of similar sizes back in the 90's which created a lot of

interest, however their impact seems to have been lost over the years. We have run some in-depth comparisons for the long-range cruising market with not only planing and semi-displacement types but also with very traditional displacement designs and the results have been amazing with the displaning power cat equal to or better than designs such as the Dashew 64 monohull which is marketed as being ultra-fuel efficient at displacement speeds. We have also been collecting data from a number of our owners who are equally frustrated that no one believes their fuel figures and once we have compiled the information will publish this data with its effect on range and running costs to prove the results.

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The third reason is that there is still an underlying prejudice against multihulls that they might tip over even though there is not one documented case of a non-trailable power cat capsizing in the world that I can find.

Now that we have identified that fast long-range cruising and mid-sized commercial water craft have the most potential for both new developments and markets, where do we go from here?

1: FUEL EFFICIENCY

It is extremely important that we keep developing the most efficient hull forms in terms of fuel savings and load carrying ability as these attributes are crucial to the success of both long-range cruisers and commercial applications. From all my research and experience, round bilge is the optimum for achieving this as it has both less wetted surface and less wave making resistance than the hard chine hull form at the

speeds that both these types will operate at the majority of the time, and provides a softer ride. There have been a number of studies from WWII onwards to determine the most efficient power boat hull form and although each study was looking at different lengths and types of boats, there is a general agreement from them that round bilge is more efficient up to 18kts, hard chine planing hulls are more efficient from 18-35kts and over that, stepped chined hulls are best. This finding is reflected in practice when you look at extremely fast sailing craft both monohull and multihulls, many of which can achieve well over 30kts and yet they are still basically round bilge hull forms as they spend a considerable time sailing in the mid-

teens, so the advantages of a hard chine hull at the very top end do not outweigh the disadvantages the rest of the time. Yes the round bilge hull is harder to build in some materials, however when you take in to account its advantages of efficiency, softer ride and the higher stiffness to weight of curved sections, I believe the extra effort is worthwhile as the bottom is only somewhere between 15-25% of the overall surface area and therefore the effect on the overall build cost will not be that great.

2: RIDE QUALITY AND SEAWORTHINESS

Ride quality is much harder to define than speed or fuel efficiency and yet it is the difference between comfort at sea whether cruising or working. A passive and predictable motion means less seasickness, less stress and most importantly, less chance of injury. The ability to stay comfortably at sea in rough

conditions is one of the most underrated attributes of a well designed non-planing power cat as it allows for faster passages when cruising and more money making time on the water during commercial operations. The ability to set your speed to suit the conditions rather than having to be on-the-plane or off-the-plane makes life on the water so much more comfortable. We have had many instances when we've been delivering my designs up and down the Qld coast of a planing monohull passing us at around 20kts in flat water, only to catch and pass them later in the day when the seas had picked up. We were still comfortably doing 16-17kts slicing through the waves with a minimum of fuss, whilst they had either come off-the-plane back to displacement speed or were still maintaining planing speed but throwing huge sheets of water sideways while slamming into one wave after another. Some of this rough water ability comes from the non-planing power cats underwater

lines, however a great deal of it comes from just above the waterline with the amount and distribution of reserve buoyancy. The wingdeck cannot be ignored in helping or hindering sea keeping and motion: too low or narrow means higher slamming loads which are both uncomfortable for those on board and hard on the boat's structure. A steeper entry angle to the wingdeck particularly in combination with a low wingdeck can virtually stop the boat short as it tries to butt its way through seas and I have heard plenty of stories of people being thrown off their feet in power cats suffering from this combination of problems. Design features like my combination of inside topside chines and chined V-pods are more complex to build but work extremely well when delivering the power catamarans smoother ride, both when punching into waves and in following seas. It has been a surprise to me that very little effort has been put into this area by other designers worldwide and I

can only assume they do not spend much time at sea on their designs as the benefits are so obvious.

3: BUILD COST

As I have stated earlier, I believe it is smart to spend a little more money when it comes to saving fuel and gaining a better ride. However I have also spent the last 23 years developing the P.A.C.K. boatbuilding system in an attempt to reduce the overall building costs of the power catamaran anywhere I can as their large surface areas do make them appear expensive if you compare them with a monohull of the same length. Luckily non-planing power cats are not as sensitive to weight and so expensive high tech materials are not necessarily the only answer: it is much more about creating a robust and durable vessel at a reasonable cost that is easy to maintain, particularly when breaking into the commercial market. Our materials costs in Australia will be slightly higher than Asia where most

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materials are manufactured these days, however it is labour that is the huge difference if building local or getting a boat from overseas. We cannot reduce the local hourly rate of labour, therefore we have to strive towards reducing the amount of labour we use and using it most efficiently. Modular construction, infusion and just plain thinking outside the box will help to keep costs down as will direct marketing, low overheads and minimal transportation costs. Shipping a catamaran to Australia from overseas is not cheap particularly with a multihull's beam, and when you take in to consideration the agents at both ends, plus duties that can add substantially to the final cost to the public so the difference between the imported and locally built boats is not as great as most people think. When the Australian dollar was high, we saw a rush of boatbuilders

setting up in Asia then followed by clients to buy boats off them as they claimed that by having ex-pats supervising, they could maintain high build standards for a very low cost. Experience has proven that the build quality was not as claimed and as the dollar has dropped, the huge savings are now not there either.

So as long as the dollar does not rise too high, locally we are in with a fighting chance, particularly when you add in personal service and if we can develop unique products then the opportunity to export is on the cards again as well.

4: LAYOUTS

This is an area where there is still plenty of room for development, particularly if we can work out ways to take the maximum advantage of the power catamaran's beam and

privacy. To a degree we have all been guilty as designers of building on sailing catamaran layouts rather than starting afresh. Even much of the styling which in turn dictates the layout is taken from sailing cats, however as much of this is based around the rig and deck gear, it is not ideal for a power cat. Once we move on from this position and accept that catamarans can look like other power boats and that they do not have to be futuristic or just plain different, then we will attract more buyers. Sensible interiors that take full advantage of the catamarans beam to create privacy in the sleeping arrangements, yet provide an open plan, inclusive socialising and operating area will also attract more buyers. Avoiding the tube-like saloon layouts of most monohull powerboats that require everyone to sit sideways to each other like birds on a wire will provide a far more comfortable and user-friendly interior. Plenty of light and ventilation is always attractive, particularly to women and first time boaties as it lessens the chance of seasickness and the ability to see as much of the boat as possible makes keeping an eye on guests and particularly small children just that little bit easier and therefore less stressful.

5: PROPULSION SYSTEMS

The right choice of engines, gear ratios and propeller types are absolutely crucial in getting the best performance and fuel economy from the non-planing power cat. We ran two different types of diesel engines of much the same horsepower in sister ships in the early 2000's and the difference in fuel economy was up to 30%. Trying different propeller styles, sizes and pitch considerably reduced the difference, but the results set a path that we have not deviated from. Just as they break most rules of naval architecture, non-planing power catamarans are not the same as monohulls when it comes to choosing the right propeller, so monohull propeller data or programmes cannot be used with any confidence in their accuracy. It is only experience that provides propeller manufacturers with the data

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base to get the best combination for non-planing power cats and I now seek their advice as I design the boat to get the right combination of type, diameter and pitch, rather than see what we can fit after the design is finished.

I see a strong future for diesel-electric propulsion for non-planing power cats if the economics can be made more realistic with more commercially viable systems available. To date most development has gone into manufacturing and marketing units to simply replace a conventional diesel auxiliary rather than purpose designed to take advantage of the electric motors 100% torque on start up to increase efficiency. A great deal of work has also been put into to having a run silent option from a battery bank which just adds more cost and weight for what I believe is only a small gain.

The real jump for diesel electrics will be when we can purchase the components off-the-shelf to build systems like larger ships by using a combination of water cooled electric motors and variable output gensets. This would allow on-demand output for both propulsion and the ship's system with the possibility of multiple generators that can come online as more power is required. The water cooled electric motors would run more efficiently as heat is the enemy of efficiency in electric motors and the ability to mount the gensets wherever it suited would allow for optimum trim, quietness and isolation from vibration. The electric motors 100% torque on start-up allows for a far more efficient propeller match as no allowance needs to be made in the propeller's sizing and design as you would for the diesel engine

to get to its maximum torque. We already have one of the pieces of the jigsaw puzzle in the variable speed gensets designed and built here by Arrid Power Australia for the owner for the boat we have just launched and if we can get hold of the rest, then the diesel electric power cat may not be too far away.

The incredibly fast development of both the planing and non-planing catamaran when compared to other types of boats that have had hundreds and even thousands of years of trial and error to work shows its huge potential. Rather than being at the zenith of non planing power cat design after 30 or so years, I think we have learnt enough to understand the type but are just really starting to see its true potential. We know what works to maximise the types performance, fuel economy and therefore range. We know how to make them more seaworthy and provide a softer ride. We know now how to deal with slamming loads under the wingdecks and how to increase their torsional strength. We now need to develop new arrangements and styles that maximise the type's assets and then most of all we need to educate the boating public on these advantages.

We need to be innovative in both the design and construction as innovation is not about the latest look or being radical for the sake of it, nor is it by adding more complex electronics or electrics either: innovative design is about making the most of the advantages the type already has and then building on them by thinking outside the square.

If you like where non-planing power cats are at present, then hang on to your hat as I believe the best is yet to come.

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Just in the water off for a run the first of the Pathfinder 'M' range the West Coaster 49 Paradigm. A full test and photos will be in the next issue.