Pathfinder
Pilothouse 17.4
part three

When developing the Pathfinder concept, the overriding aim was to create a unique and innovative design that was economical to build, practical and functional in its operation yet handsome and timeless in its styling. Over the years we have seen designs that were simple and cheap to build, however their lack of aesthetic appeal reduced their resale value. Equally we have seen designs (I have to put my hand up here) that are beautiful to look at but expensive and difficult to build pricing them out of the market. Creating the desired combination of style and economical build cost along with a layout that is user friendly is far more difficult than it sounds. Rather than starting from scratch and trying to reinvent the wheel, I have used as many of our proven features as possible as this makes both good design and business sense. Building on these I have added some new design features and construction details to achieve our goals, using simplicity where possible dressed up with some small features to soften the look.

■ PETER BRADY

THE HULL DESIGN

I have been working a continuous thread of development on my displaning hull form since 1995 with just small changes here and there looking for even more fuel economy through cleaner flow onto the propellers, carrying capacity or ride characteristics. Whilst each new design is built on this well tested model, I still tweak each one slightly, depending on the desired cruising and maximum speed. Although many powercat designers followed the Malcolm Tennant double ender with an anti-squat plate on the back (CS) because he claimed it was the most efficient hull form, I stuck to my own shape which had more in common with the 1930's motor launches as I could not see that the CS type was achieving any better results than I was. We essentially were looking to achieve the same goals of fuel efficiency and a seamless transition from displacement through to planing speeds, however I felt that my shape was a better sea boat in that the drag on the keel (greater depth aft) provided better tracking in a following sea. I am not sure about Malcolm's own designs but there were certainly plenty of evidence that clones of his hull shape suffered from air being sucked into the propellers (ventilation) and you will see a number of them have been retro-fitted with vertical fins or plates either side of the stern sections to try and prevent this. As my keel sections develop early in the hull's length encouraging the water to flow cleanly into the propeller, ventilation has not been an issue with my displaning hull shape.

Above the waterline the Pathfinder Pilothouse features the fourth generation version of my CVD (Controlled Vapour Dampening) development with again, small volume and dimensional changes as part of its continual development. Although it makes the boat slightly more complex to build, the multiple chines and V-pods work extremely well in breaking up solid water into vapour to soften the ride as well as providing gradual lift.

Working from this well proven base I was able to concentrate on the other challenge to reducing the economics of boatbuilding and the systems: fuel, water, air-con and electrics. The design of the systems and their layout is particularly challenging in a power catamaran as the hulls are narrow and therefore tight to work in, plus the systems sometimes need to be joined from each hull and at other times to be kept separated for redundancy and safety. Analysing the cost of the systems which are getting more complex every year brought us to the conclusion that it was the complexity factor of fitting, not the cost of the equipment itself, that could be improved on. To achieve this I lifted virtually all systems out of the hulls except the engines, genset and pumps to make them both easier to fit and to maintain. By lifting the wheelhouse floor up to side deck height I have also been able to remove all the mechanical components such as the fuel and water tanks along with their lines and pumps out of the hulls accommodation areas. The tanks can now be simple box shapes that are far more cost effective to build and in the case of the fuel tanks, gravity feed the engines. Even the house batteries are located up in this area, less than a metre from the main electrical board, again reducing cost, weight and complexity of wiring.

Is carrying this amount of weight (6 tonnes when fully loaded on the 17.4m version) up on the wingdeck structure a problem?

Not if you plan for it: the grid system of bulkheads and partitions which are 900mm deep under the pilothouse floor and nearly 300mm deep under the galley and aft deck make the wingdeck incredibly strong and distribute the weight of the fuel and water over the structure. I have designed in a number of build details that will ensure that these loads are distributed across the structure and down into the hulls rather than just over the wingdeck itself. Whilst tanks located in the hulls have their weight effectively carried directly into the hull and therefore the water, because they are widely

Construction is a blend of strip planked hulls, flat panels and moulds for the more complex areas.

spaced from the boat's centreline they place huge torsional loads onto the structure at sea, which this design will eliminate.

Will carrying this amount of weight up on the wingdeck have a detrimental effect on stability?

Again surprisingly no, and in fact it's just a trade off between an increase in the vertical height of the tanks for a decrease in their width out from the boat's centreline.

The big win however with this arrangement is the fact that I can now place all the variable weights – fuel, water and even storage, as close as possible over the design's fore and aft centres reducing the variation between full and empty load to 10mm in trim. This concentration of weights over the centres will reduce pitching to a minimum, which in turn makes the motion more comfortable and reduces the loads on the structure.

THE CONSTRUCTION

As the effects of the downturn created by the GFC were beginning to bite on the boatbuilding industry, we realised that we had to keep on with the development of our P.A.C.K. (Prefabricated Assembly Component Kit) construction system that we had been using for the last 14 years, but make it in an even more cost effective direction to stay in business. I starting designing and building around moulded flat panels 35 years ago when building a large fishing boat wheelhouse, realising even then that less joins and better cosmetics made for good economic sense. The P.A.C.K. construction system has always been based around the use of moulded flat panels where possible and one-off male or female moulds where a more complex shape was required. This system allowed me to use the optimum type of cores and laminates for each part of the boat and I have now taken this principle one step further by using different resins for each part of the construction as well. To date we had generally used epoxy resin for all the construction, however we were determined to reduce the cost of custom boatbuilding, so we had to find a way to minimise the filling and fairing, therefore making panels that were cosmetically pre-finished and more stable under higher temperatures was critical. Whilst epoxy is an excellent resin and adhesive for just about every part of a boat, its weakness is its relatively low heat distortion temperature of between 50-60°C for general purpose resins. In colder climates this is not so much of a problem, however with boats destined for the tropics it can make for unstable cosmetics unless the whole boat is given a layer of exactly the same type of filler so it all moves together. Unfortunately this requires huge and unpredictable amounts of labour and most of the filler (ie money) ends up as dust on the floor and defeats the objective of reducing our boatbuilding costs to remain competitive with imported boats. Our solution was to use our experience in infusion and production boatbuilding techniques to produce infused vinylester panels with a sandable gelcoat face that would be fair from the start, with excellent cosmetic and stability properties. Up to 7.4 x 2.2m in size, these panels were used for the topsides, the flat sections of the wingdeck and for all the decks and cabin structure. Because these panels were infused, their weight was light with consistent engineering properties and an exceptional core bond and we were still able to use different types of cores where required for different properties, along with different thickness and amounts and types of reinforcing. As they came off the table with a gloss finish, we could see their fairness as we wrapped them around the bulkheads and stringers. The stringers were then glassed over and to the panels at the same time as the panels were glassed to the bulkheads. These stringers were not just used to fair and stiffen the panels; they were also used to run wiring and plumbing fore and aft and to support the lining in the accommodation. Sealed face MDF moulds were built for the complex shapes such as the front CVD section of the wingdeck and the inside topsides, and these were carefully hand laid with vacuum bagged cores. For the round bilge hull bottoms we used stripped planked Western Red Cedar with epoxy resin and multiaxial stitched fabrics as I am convinced this is still one of the smartest and most cost effective ways to get a fair, strong, stiff and acoustically quiet hull. Epoxy resin was used for all the secondary bonding and panel joins as this is where its superior flexibility, adhesion and low shrinkage are the correct choice and heat distortion and cosmetics are not an issue.

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Blending this mixture of boatbuilding techniques and materials required both trade skills and engineering experience to know what, when and how to use the combinations. Developing it has required me to be involved with every detail of the project, as planning and attention to detail is needed on a daily basis. Luckily this is what I love doing and I believe this is the type of boatbuilding and design technology that Australians and New Zealanders are very good at. Hopefully it will provide our industry with an advantage, however small it may seem, to survive into the future.

Wingdeck structiral grid under aft deck.

Next issue I will wrap up this series with the mechanical and systems description of the Pathfinder Pilothouse 17.4