

Pathfinder Pilothouse 17.4

part 4



Our philosophy right from the start on the Pathfinder Pilothouse 17.4 was that the systems had to be robust and easy to maintain without getting unnecessarily complicated and with a backup if possible. This is a boat that is intended to go to sea and stay there for long periods of time, so the systems had to reflect this.

■ PETER BRADY

SAFETY

Starting the systems description from a safety perspective, having separate engines in separate hulls with two individual fuel supplies is an excellent beginning. This gets even better when you consider that each hull has five watertight compartments and the fuel tanks are mounted in a separate area well above the waterline. Three bilge pumps are fitted in each hull, along with a manual pump and suction hose that can reach all compartments. High water alarms are also fitted in the engine rooms and the bilge system can be

monitored using the CZone system and display. This is also interfaced with the Simrad navigation system to pop up on the main screens if any pump turns on, or if an alarm goes off. Smoke alarms will be fitted in all cabins and the engine rooms, with a number of large fire extinguishers located around the boat in case the unthinkable happens.

ENGINES AND DRIVE TRAIN

We looked at a number of different engine options, but decided to stay with the mechanically injected 440hp Yanmar 6LY3-STP's that we used in our previous custom build Bathurst,

as the owner has been very happy with their performance and reliability. These engines have the highest power to weight ratio in their class, are very narrow which suits a catamaran hull and as they are a pure marine engine, equipment such as oil filters are positioned on top to make them easier to service.

Why mechanical injection over common rail? It is more forgiving to fuel quality which can be a problem when cruising to more remote places, plus it is more familiar to mechanics in these remote places. These engines

are electronically controlled for higher torque and a cleaner fuel burn and this allows the engine's operating data such as temperature, pressure and fuel consumption to be displayed on an LCD screen. As both the engines and gearboxes are from Yanmar, warranty and matching the correct type is less of an issue and in this installation, the gearboxes are 2.47:1 with an 8° down angle.

To deliver this power into the water efficiently which is critical in getting both the maximum performance and economy from the displacing hull form, we have again worked with David O'Shea of Speed Propulsion and Faster Propellers to get the right propellers. Having had a close working relationships with both Henley's in New Zealand and David over the last 20 years, we understand the importance of getting not only the size and pitch of the propellers right, but also the blade style and area ratio. Right at the start of the design process we now look at the optimum propeller for the engines and gearbox ratio and design the skeg depth to suit this, providing draft is not an overriding factor. The blade shape and area ratio is then matched to the engine torque and where it is delivered in the rev range as this is also critical. Because we run such a low slip ratio compared to most monohulls (which

is where our fuel economy comes from) it is important to work with propeller suppliers that have a specialist knowledge of power multihulls to get the best result.

In line with our philosophy of keeping it simple and reliable, the drive train is a conventional shaft set up with flexible couplings, lip seals, double ended shafts and as the boat is going to Western Australia, we have also fitted rope cutters. It is not just crab and crayfish pot lines that pose a potential problem of wrapping around the stern gear; being so close to Asia across the top end, abandoned drift nets and



The engineroom is laid out in such a way as to be easily accessible for both operation and maintenance.

long lines are also a major problem. Luckily the full length keels provide a high degree of protection to the stern gear and even allow the vessel to be put aground to clean the bottom and check for or repair damage if necessary.

STEERING

The rudders on a vessel with this operating speed range are always interesting to design as they theoretically have to be a compromise between the much smaller size wedge shape that you would normally fit for 20kts plus, yet be smaller than normal for displacement speeds. In reality with such widely spaced propellers, the rudders are hardly ever used when docking as the boat will turn in its own length with one

engine ahead and the other astern and so the size is not so critical for this, especially when a bow thruster is fitted, as it is on this boat. At the other end of the speed range the full length keels make the boat track very true and so trying to throw it around like a planing monohull is not realistic. So the rudder ends up being optimised for the mid cruising speed of around 17kts and is a foil rather than wedge shape, however the rudder and the structure around it, along with the hydraulic steering system, must be capable of handling high loads should a sudden high speed turn be required to dodge flotsam. In this boat we have used a Hydrive system to get



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the right combination of durability and a low number of turns lock-to-lock. It was tempting to use power assisted steering, however both the client and I like the reliability, feel and feedback of a conventional wheel and hydraulic system, plus it is easy to use the auto-pilot as power steering with a remote mounted on the helm seat.

EXHAUSTS AND PLUMBING

We usually make our own exhaust system, but decided this time to work with Foreshore Marine Exhausts to make sure we got the most out of the engines through the exhaust systems design and have even been able to use the mufflers as part of the access ladder from the aft deck into the engine room. Whilst on the subject of engine and engine room access, there is a watertight door from the hulls through the fwd engine room bulkhead with room to shuffle down each side of the engine, so the rear deck hatch which is large enough to lift out the engine through does not have to be opened at sea. There is close to standing headroom at the fwd end of the engine room where the salt water inlets and strainers are located, along with the fuel boards with their filters and valves.

When we laid out the fuel systems and plumbing, ease of use and maintenance was a priority. All the plumbing and fuel lines are placed, along with the electrical wiring, to make sure each system had its own individual path

where possible and that following the layout was intuitive. The fuel system is built around two individual 2,850 litre tanks with sumps to collect any water or contaminants. These tanks have BEP senders feeding into the CZone monitoring system and sight gauges as a backup. The tanks can be balanced quickly by opening a large balance valve and fuel can be pumped from either tank to the other to trim the boat or isolate a problem. The tanks can also be filled from either side of the boat and the filler

on the other side can be opened to work as an oversized breather if required when using very high volume fuel bowsers. As the tanks are mounted higher than the engines, the system is self priming and any air in it will go back to the tank rather than lodging in the lines or filters. There are shut-off valves for each line at the tank, so the fuel can be shut off in the event of an engine room fire and the drain lines are led down to the bilge, with an extra tap at the end outside the accommodation area so they can be drained into a bucket without the smell



Plumbing and electrics are run down individual paths both along the hull and across the wingdeck.

permeating through the accommodation. The feed and return lines from each tank on each side lead to a board on the fwd inside area of the engine room, where twin switchable filters with water in fuel alarms are mounted alongside a valve system that allows fuel to be drawn and returned to either tank. We have also used the same sized filters on the genset even though they are overkill so only one type of spare filter needs to be carried.

The fresh water system has been designed with the same degree of

thought and the ability to pump between any of the four tanks to ballast the boat for optimum trim; bow up in head seas for a softer ride and flat trim for following seas or maximum performance. This arrangement also allows the boat to be trimmed from side to side to allow for unusual loads or high side winds. A 210 litre AC watermaker from Stella Marine makes the boat self sufficient and the total tank capacity of 1,600 litres allows the boat to stay longer up the rivers in the Kimberley where the watermaker cannot be used. A manifold located in the workshop has been designed to control which tank the water is being drawn from, or which tank it is being sent to from the watermaker. The two identical Whale water pumps mounted alongside the manifold can be used to either increase the flow rate, or as a redundancy should one fail. The John Guest plumbing system is used for the feed lines around the boat and in areas such as the bathrooms where plumbing was not as easily accessed, then copper lines with permanent fittings were installed and tested by a plumber.

AIR-CONDITIONING

The air conditioning has an individual Marine Air saltwater cooled unit fitted for each area or cabin and particular attention has been paid to maximising their flow and return so they are as efficient as possible. Having said that, ventilation and insulation has also been made a priority so the use of the air-conditioning is at a minimum, as the less fuel the

genset uses to run it allows for a longer range.

ELECTRICS

When designing the electrical system we looked at all possible options including digital switching and lithium iron batteries. In the end we decided on a simple well proven combination of BEP circuit breakers, conventional switching and the highest possible quality AGM type batteries as the boat needs to be as easy to service in remote areas, as well as being as reliable as we

could make it. Having talked to as many people as I could about batteries, we settled on the American made, military spec Lifeline batteries as these are the only off the shelf batteries that pass the US Coast Guard and US military vibration requirements. Lifeline are not the cheapest batteries, however I could not find a person who did not speak highly of their quality and reliability and as the USA has such strong laws in regards to false advertising of performance and longevity claims compared to China, where virtually all other batteries are made, we knew we were getting what we paid for. On the suppliers advice we are using 6 x 1200hr 2 volt cells in series for the house batteries and 150hr Lifeline start batteries for each engine, with two in parallel for the davit winch, anchor winch and bow thruster bank. By using the same type and size of start batteries for these functions (anchor winches and bow thruster are like large starter motors) it provided redundancy should any one of these batteries fail and the anchor winch bank can also be used as an emergency house bank if any of those cells fail.

We followed this same thought process in our purchase of an American built Sterling inverter-charger and used

the Sterling charger to charge from each engine's alternator to make sure we were getting the most value from their output.

On board, AC power is produced by a 15Kva Mace genset with the inverter able to power all systems from the house bank, except the air-conditioning, for silent operation of the boat at night. Twin shore power leads allow the air-conditioning and ships power to operate at the wharf with the switching between the ship and shore power deliberately kept manual, so the operator decides and knows where the AC feed is coming from. There is an inclination or fashion at present to make every decision on boats automatic and to lower the skill and knowledge level of the owner or operator from AC switching to systems that automatically dock a boat. Unfortunately when these systems fail or play up, and they will one day, the owners are left completely helpless as they either have never had to gain the knowledge or skills to operate without them, or have lost them by being so insulated. What we have made sure of in this vessels electrical system is that the small details have been thought through and taken care of from the location of the house battery bank less than a metre from the main

switchboard to reduce voltage loss and the weight saved, through to the running of the AC power down one side of the boat and the DC down the other to reduce the chance of interference. We have even placed LED strip lights in every compartment including the bilge so inspection of the structure and equipment is easy. The power draw of LED lights is so low that they will not be a drain on the system and they are so easy to fit at the building stage compared to later.

ELECTRONICS

The vessels electronics are comprehensive without being over the top and are based on the owner's extensive passage making experience. Trymax Marine have supplied and will install a Simrad based system; again redundancy and performance are the order of the day. Two depth sounders – one with a powerful multiband 2kw transducer, are fitted along with two radars – one being a broadband closed array unit and the other being an open array more powerful unit for great punch power and distance. Three 15" displays relay information from the GPS, radars, sounders, auto-pilot, FLIR infrared camera and service monitoring systems to both the helmsman and the navigator

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seated alongside. A 12" Simrad screen and console provides the same information and control at the upper station along with the Yanmar remote controls and digital information screen. Communications are by VHF and Satphone along with mobile and internet technology.

REFRIGERATION AND COOKING

Refrigeration is again designed around practicality and redundancy with a 12volt fridge and freezer in the galley, another set of these in the pantry, plus a Freeztec water cooled AC eutectic freezer on the back deck and a powerful Eskimo flake ice-maker feeding into a second insulated compartment alongside it. If the 12 volt units play up, then the eutectic unit can have its temperature adjusted to become either a fridge or freezer, and if it breaks down, ice from the ice-maker can be used to fulfill the same function. Cooking in the galley is by a four burner gas hob coupled with a microwave-steamer-convective oven and a gas barbecue in the aft beam.

OTHER SYSTEMS

As the boat will spend a large amount of time in crocodile infested waters a large tender was required and to lift this up onto the upper deck an ADC 500kg lift with power slew is fitted. The tender cradle will also form racking for 10 x portable petrol tanks for the tender. This allows the full tanks to be swapped with empty ones in the tender whilst in the cradle, extra tanks to be carried in the tender if required and the tanks to be carried up to a garage if a petrol bowser is not available at the wharf.

The boat also threw up another unusual design challenge; the targa top had to lower so the vessel could pass under a bridge on the way into the owners pontoon so he didn't have to wait for low tide. This requirement was further complicated by the amount of electronics located on it, particularly the open array radar scanner. Luckily, seven years ago we designed and built one of these for one of our Leopards which has been working without a hitch ever since. We were able to draw on this experience to keep the operation simple, but also minimal and elegant, again using electric actuators.

> I hope this series of articles about the Pathfinder Pilothouse 17.4 has been of interest. I have gone into great detail (although it has still just scratched the surface) on both the why and how we have designed and constructed this vessel as I believe that this level of detail is required to be competitive at the international level. The passage making powerboat market has been dominated by companies from the USA such Nordhven and Kadey-Krogen and we have to first match their level of systems competence, then demonstrate that we have an even better product with its far superior speed, versatility and lifestyle advantages. I believe this boat will show that we have this competence and also what the Australian boat building industry is capable of when given the opportunity and for this, we owe a great deal of thanks to our client.