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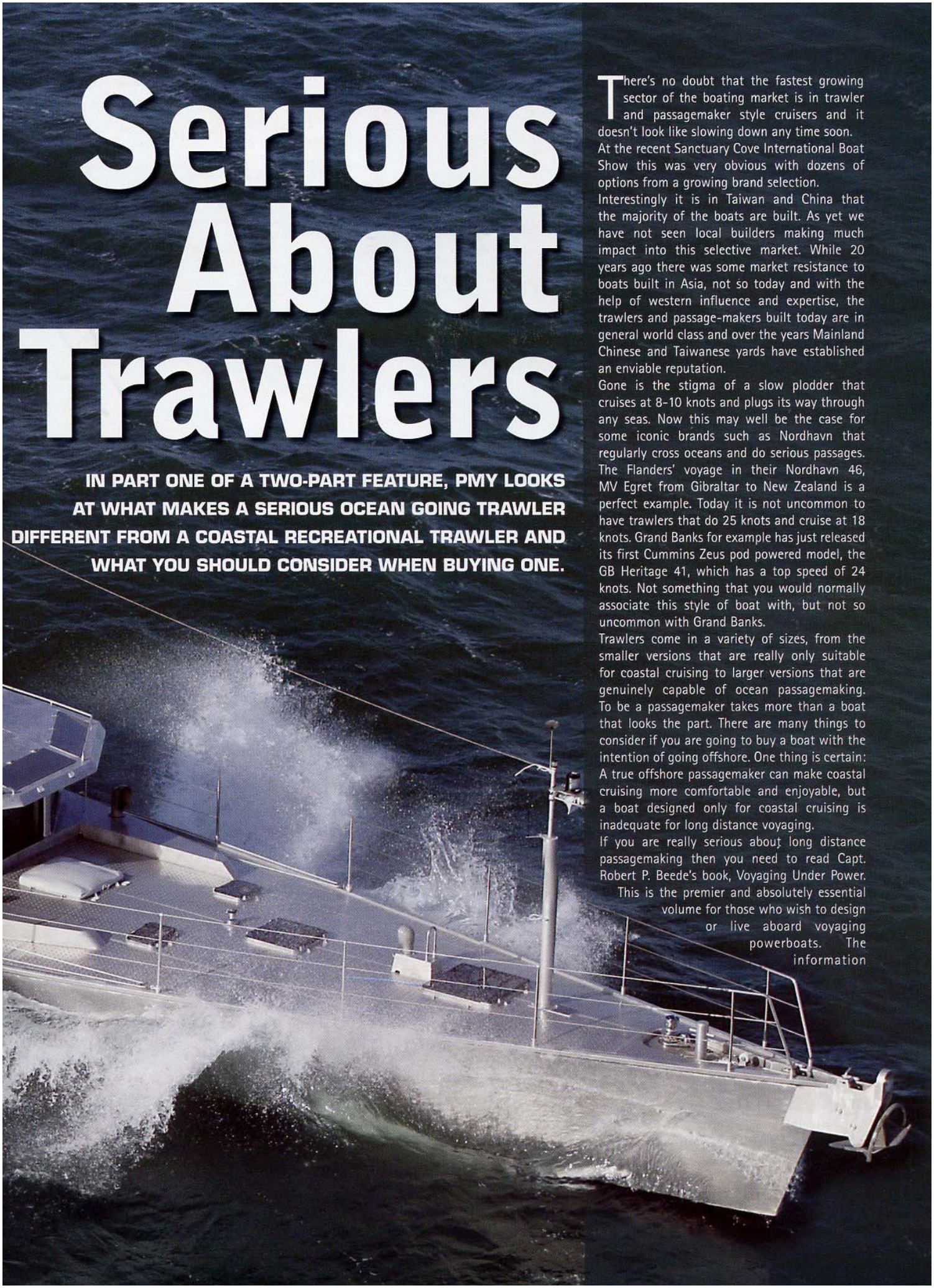
Serious About Trawlers

IN PART ONE OF A TWO-PART FEATURE, PMY LOOKS AT WHAT MAKES A SERIOUS OCEAN GOING TRAWLER DIFFERENT FROM A COASTAL RECREATIONAL TRAWLER AND WHAT YOU SHOULD CONSIDER WHEN BUYING ONE.



There's no doubt that the fastest growing sector of the boating market is in trawler and passagemaker style cruisers and it doesn't look like slowing down any time soon.

At the recent Sanctuary Cove International Boat Show this was very obvious with dozens of options from a growing brand selection.

Interestingly it is in Taiwan and China that the majority of the boats are built. As yet we have not seen local builders making much impact into this selective market. While 20 years ago there was some market resistance to boats built in Asia, not so today and with the help of western influence and expertise, the trawlers and passage-makers built today are in general world class and over the years Mainland Chinese and Taiwanese yards have established an enviable reputation.

Gone is the stigma of a slow plodder that cruises at 8-10 knots and plugs its way through any seas. Now this may well be the case for some iconic brands such as Nordhavn that regularly cross oceans and do serious passages. The Flanders' voyage in their Nordhavn 46, MV Egret from Gibraltar to New Zealand is a perfect example. Today it is not uncommon to have trawlers that do 25 knots and cruise at 18 knots. Grand Banks for example has just released its first Cummins Zeus pod powered model, the GB Heritage 41, which has a top speed of 24 knots. Not something that you would normally associate this style of boat with, but not so uncommon with Grand Banks.

Trawlers come in a variety of sizes, from the smaller versions that are really only suitable for coastal cruising to larger versions that are genuinely capable of ocean passagemaking. To be a passagemaker takes more than a boat that looks the part. There are many things to consider if you are going to buy a boat with the intention of going offshore. One thing is certain: A true offshore passagemaker can make coastal cruising more comfortable and enjoyable, but a boat designed only for coastal cruising is inadequate for long distance voyaging.

If you are really serious about long distance passagemaking then you need to read Capt. Robert P. Beede's book, Voyaging Under Power. This is the premier and absolutely essential volume for those who wish to design or live aboard voyaging powerboats. The information

presented is interesting and compelling. Most people reading this book will come away from it with a very much expanded understanding of what makes a good serious live aboard, long range, offshore powerboat. This type of vessel was essentially defined by the author of this book.

According to Beede, when designing a long range passagemaking vessel, certain factors that affect performance must first be considered. Terms such as displacement/length ratio (D/L), speed/length ratio (S/L) and prismatic coefficients are among those that designers need to understand.

[A few words about units of measurement are appropriate here, along with some explanations. Naval architects began using these ratios back in the days of the imperial measurement system, and have never changed, so displacements are in pounds and lengths are in feet. The term speed/length ratio is a misnomer, as it is actually calculated from speed in knots divided by the square root of the waterline length in feet. Throughout this article, we'll stick with the old imperial units. The prismatic coefficient is a measure of the lengthwise distribution of below the waterline volume (buoyancy) about the centre of the vessel. Consider the solid shape bounded by the hull surface and the plane of the waterline and select the vertical cross-section of maximum area – usually a little aft of amidships – then imagine a shape, called a prism, formed by extruding this maximum cross-section fore and aft to the ends of the waterplane. Now divide the volume of the hull below the waterplane by the volume of the prism – this is the prismatic coefficient. Old sailing ships that were quite blunt at both ends, like Capt. Cook's Endeavour, had a prismatic coefficient of around 0.9, whereas a typical figure for a displacement-hulled passagemaker is around 0.65 – Tech. Ed.]

EXPLORING EXOTIC DESTINATIONS LIKE THIS ARE ALL POSSIBLE IN A SERIOUS PASSAGEMEKER.

Without getting too much into 'techo ramblings' it is things like the D/L and prismatic coefficients that make the difference between a trawler that's suitable for coastal cruising and one that is designed for serious ocean passages. The value of the D/L, which should be calculated with the boat fully loaded, separates the serious passagemakers from the wannabes.

According to Beebe, a satisfactory ocean-crossing trawler style vessel of around 50ft overall length cannot have a D/L less than 270 and a bit more is desirable. The shorter the vessel the larger the D/L should be and in fact you must increase the D/L in smaller vessels if you wan t

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NORDHAVN ARE REGARDED AS THE DEFINITIVE OFFSHORE TRAWLER.

you wan t to carry the load necessary for self-sufficient passagemaking. For example, the D/L for the Nordhavn 46 is 383. An added advantage to designing a hefty boat is that it can be built to heavy-duty scantlings and without concern for weight saving construction techniques. In the long-run, a more heavily built boat will be more comfortable, can carry more supplies and equipment, and will more readily endure the wear and tear of the sea.

In the ratio of area above the water to that below (A/B), the smaller the ratio the better and again Beebe states that anything from 2.1 to 2.6 qualifies as an ocean going vessel.

PMY reviewed Mary T, a Ganley 50 passagemaker, back in 1999. Mary T was specifically custom designed and built for ocean crossing and it had a prismatic coefficient of 0.64, a displacement of 25 tons and a waterline of 39ft 5in. Its D/L was 407 and its A/B 2.38, which according to Beebe make it ideal for heading offshore.

Passagemaking is also about reaching the desired destination in comfort, with good fuel economy and maintaining a steady speed.

Twin or Single Engine?

At some point every skipper dreams of making a long offshore passage – maybe across an ocean, or to the Pacific Islands. But when dreams close in on reality, issues creep in such as what is the most seaworthy hull and what should I have, twin or single engines or maybe a wing engine. What about redundant systems and what about the rest of the equipment?

Thanks to evolutions in design and engineering, long-range cruising powerboats – passagemakers – are more reliable, more efficient, and more comfortable at sea than boats of even a few decades ago. Stability and engine failure, the two biggest concerns of cruisers, have been dealt with in innovative and sometimes surprising ways.

Twin screws also solve the get-home power dilemma. Single-engine boats usually have a wing engine and separate shaft for emergency propulsion or a means of powering the main shaft from a genset. For get-home power a hydraulic pump on the genset, which can drive the main shaft is an option but if you choose a wing engine, since it's problematic to match the power of the genset with the power needed to push the boat, it usually results in a way-too-big genset or feeble get-home power. Twin screws solve all of this: Since displacement-speed power requirements are low, either engine can push the boat to cruising speed.

Most main-engine failures are due to dirty fuel or cooling problems, so it is often recommended to have keel cooling and good filters. Having a day tank built into the fuel system is a way of improving your changes of not having a fuel disaster. The diesel moves from the main tanks through large filters such as Racor into the day tank, then is filtered again en route to the engine.

Obviously, the power passagemaker depends entirely on its engine(s) for propulsion, and a great amount of attention must be paid to selecting, installing and maintaining the power plant(s). The marine diesel engine has proven to be one of the world's most dependable machines ever made, and today's new diesels are better and more reliable than ever. However, there is some concern amongst purists about using electronic diesel powerplants for long-range work without a back-up: Electronic diesels are designed to shut down to protect themselves if anything goes wrong and in some situations, it would be better for the engine to keep running, even if it was damaging itself. With non-electronic diesels, going offshore with one engine was no big deal, as long as you carried spares and knew how to do repairs and install replacement parts.

Despite the reservations about modern electronics mentioned above, the many advantages of a single-engine installation usually outweigh the desire to have a twin-engine boat. Greater economy and reduced noise and vibration are the most obvious benefits. But single-engine boats also handle better in rough conditions, especially when running off the wind, due to the prop blast against a large rudder. The propeller and shaft of single-engine boats are also easily protected from damage caused by hitting submerged objects or running aground, by incorporating a keel and 'shoe'. And, of course, maintenance is half of what a twin engine installation requires. It should be noted, however, that twin-engine designs may also incorporate a bilge keel and 'shoe' in line with each shaft, which arrangement has the added benefit of reducing draft compared with a single-engine installation.

Because of the inherent efficiency of a displacement hull, the amount of horsepower required to drive the boat at cruising speed is significantly less than what typical "trawler-like" semi-displacement boats require at the same speed. When specifying horsepower, you should consider the more conservative, "continuous rating" figure provided by the engine manufacturer, which is often little more than half of the intermittent recreational rating for the same engine. Be sure to compare horsepower ratings carefully, and remember that full displacement hulls require significantly less power than other types of hull designs. Large, slow-turning props are best, with around 3-to-1 gear ratios. To ensure trouble-free, continuous use, all engines are de-rated. In order to further reduce noise, wear and vibration, engines that develop their rated horsepower at low rpm are preferred for passagemakers.

The Right Hull

Recreational trawlers are pleasure boats that resemble commercial trawlers. They can also be called cruising trawlers or trawler yachts. Within the category, however, are many types and styles of vessels. A commercial trawler for example, nearly always has a displacement hull for load-carrying capacity. Recreational trawlers, on the other hand, are as likely to have a semi-displacement hull.

A displacement hull is supported exclusively or predominantly by the pressure of water displaced by the hull. A semi-displacement, or semi-planing hull form is capable of developing a moderate amount of dynamic lift, but most of the vessel's weight is still supported through displacement.

Most trawlers, be they designed for serious passage making or coastal cruising, are based

THE FLEMING 55 HAS A RANGE OF 2,000 NAUTICAL MILES AT 8 KNOTS YET, WITH HER STANDARD TWIN CUMMINS QSC 500 HP COMMON RAIL ENGINES, SHE CAN ATTAIN SPEEDS APPROACHING 20 KNOTS.

on a semi-displacement hull that has developed largely from the hard-chine hull. Instead of hard angular chines, semi-displacement hulls often have rounded chines that are used to soften the ride. These rounded chines are quite sharp aft to help generate lift from the flat bottom, but the hull fines away (narrows), reducing the volume as it runs forward to provide good wave penetration and a level ride. To improve planing performance and reduce spray, a pronounced chine is often incorporated into the rounded forward sections.

A skeg or keel is frequently used with a semi-displacement hull to give good directional stability. Without this the hull would have little grip on the water and would tend to have poor directional stability. The semi-displacement hull design is an interesting compromise that takes something from other displacement monohull designs. A displacement hull moves mainly through the water while a planing boat rides more over the surface. A displacement boat is unlikely to run faster than 10 knots.

The semi-displacement hull is part displacement hull and part planing hull, and it also includes aspects from the long, thin monohull. It will work reasonably well at speeds up to 25 knots, but above that the power requirements start to rise out of proportion to the speed increase, and the ride can be very wet. To enhance performance, earlier hulls tended to be narrow, which restricted the internal space. Modern versions work well by utilising a wider beam and often include stabilisers in the form of active fins or the more complex paravanes.

Stability and Comfort at Sea

Stability and comfort in rough seas are a major concern for those venturing offshore. Too much initial stability and the boat will feel like it's "snapping" from one side to the other once it encounters rough conditions. Too little, and the boat will roll easily even in small seas. Finding the right roll period, or the frequency with which a boat rolls from side to side, is as much an art as it is a science, and it is important that a comfortable rate of roll is achieved through proper hull shape, the location of the boat's centre of mass, and the value of the boat's rotational inertia about the longitudinal centreline (roll axis). The period of pitching is also important and this is affected by both the hull shape and rotational inertia about the transverse axis through the centre of mass (pitch axis). Tank testing for ideal hull shape and careful attention to weight distribution are crucial for optimising seakeeping characteristics. Some designers incorporate ballast to enhance stability. For example, to minimize the danger of a knockdown and enhance their righting ability, all Nordhavns are ballasted with an amount that is approximately 10% of their unloaded displacement.

Fuel Consumption

For the technically minded, the most economical cruising speed is about 85 per cent of a vessel's maximum displacement hull speed. The speed/length ratio is best understood by knowing that the 'rule of thumb' (i.e. empirical) hull speed for a displacement hull form typical of monohull passagemakers equates to an S/L ratio of 1.34. Using 1.34 as your boat's S/L, one can determine its hull speed by multiplying 1.34 by the square root of its waterline length. This is the speed at which the hull makes waves with a wavelength (distance between crests) equal to its waterline, and it is the speed which cannot be exceeded without applying great amounts of additional power. The longer the boat, the higher its theoretical displacement hull speed.

From the practical side of ocean voyaging nothing is more important than accurately determining the amount of fuel required to reach your cruising destination. John Menzies from Auckland-based Dieselcraft Evaluations has vast knowledge in this area. He says experience shows that very few owners of performance sports cruisers have any real idea of how much fuel they burn at any given rev range. "This is critical. It is one thing to know that a vessel is burning X amount at 25 knots and so much more at 30 knots but we need to know how much that engine is burning at 8, 10 and 12 knots." These, he says, are typically the most economical hull speeds in vessels under about 80 feet. If a boat has a waterline length of 49ft (14.94m), its hull speed will be 9.38 knots (1.34 x square root of 49) and it will operate most efficiently in the 7.7 to 8.4 knot range.

Most modern production sports cruisers are not designed nor properly equipped for extended voyaging. This is clearly evident from the size of their tankage. Most 50ft to 65ft production sports cruisers typically carry between 1000 and 6000 litres of diesel; well short of that required to steam 1200 miles in ocean conditions and provide a 20 to 25 per cent margin for bad weather.

By way of example, Menzies quotes his experience with two Hatteras 65s on similar Tasman crossings. The first vessel, with twin 1080hp engines, consumed 9500 litres at an average speed of 10 knots. The second Hatteras, with larger 1400hp engines, used the same amount of fuel cruising at 8.8 knots. In both cases the crew had to almost double the vessels' fuel capacity. Menzies says it is important to remember that many vessels won't deliver more than 90 per cent of their diesel tank capacity because of the location of the fuel pick-up. Also, it is important to note that very small changes in speed make large changes in fuel economy.

When considering a passage it is important to remember that, on average, a vessel under 80 feet will cruise at between 8 and 10 knots. This gives a daily run of between 190 and 240 nautical miles; or a typical passage of five to seven days.

In general a good passagemaker is a simple, seaworthy, and fuel efficient long-range cruisers that provides all the necessary on-board comforts. In the end you have to choose the right boat for the task ahead. Just because it looks like a passagemaker, it doesn't always mean it is capable, or in fact was even designed to cross oceans. There are some, such as the Nordhavn that are and then there are others – and there are many – that are not and were never designed to be. Great in the harbour or around the coast, but not something that you should really consider crossing the Tasman Sea in. If you really want to learn more about what does and what doesn't make a true passagemaker then read Beede's book – you will learn a lot.

Special thanks to Nordhavn for their assistance in compiling this article.

In Part 2 (Sept/Oct Issue) PMY looks at some of the latest trawler options, both coastal or ocean capable now available on the local market. PMY