Development of the Rêvo WASP 742

Design

Rêvo WASP 742 Polyethylene Powercat on Botany Bay, Sydney

I bought my first book on boat design at 11 years old (36 years ago).

Reading that book sowed the seed for the Rêvo WASP 742 shown here. Of particular interest to me was the inverted V bottom or “Sea sled” hull form. I could see the benefits of this hull shape but knowing some of the downfalls and limitations of sea sleds motivated me to start developing my own form of inverted V bottom boat.

Dave Grayson saw the boat on my computer and asked if he could build it. We decided to go halves in the 442 prototype. The 4.4 metre boat proved to be a perfect test bed. To have a boat that you could be aboard and thereby feel the handling and performance. To be able to see first hand the effect of weight and put the boat in extreme circumstances to test not only performance, handling and safety but structural integrity of the engineered structures was invaluable in the development of a completely new hull form.

The Rêvo WASP 442 prototype.

It was this testing that convinced me that the design was so good. I decided there was no point in taking the design further unless it was better in every way than an equivalent sized monohull. You can see some of this testing on my web-site where I took the boat out the morning after Cyclone Luci passed through Auckland. Winds that morning were gusting 55 knots in the gulf and where we test the boat has swift tides as well so it was short steep and nasty seas for a boat this size. Consequently we were the only boat out there that day.

So what have we learnt and what are the advantages of our Rêvo WASP (Water Air Suspension Powercat) hull form.

The boat is dry. We only took one very small amount of spray over the bow the entire hour and a half we were testing the 442 in extreme conditions. The 742 features a forward cockpit and it is a superb place to sit while underway. You simply do not get wet up there. And with the soft ride you can stay there in comfort.

The boat is very stable. A boat lacking stability can be hard to control in a following sea. This is often exposed coming home over a bar and is an area of design that I always pay a lot of attention to. A boat that does not cope well in following seas is a very dangerous boat indeed.

Most catamarans do track well in a following sea but their downfall is usually a lack of buoyancy in the bows. In extreme seas the bows depress too far and the boat can be stood up on its end. Wave piercers were developed to try to counter this very feature of the displacement powercat hull form. Our WASP hull form is not so fine in the ends so does not suffer from this problem. This reserve

buoyancy and buoyant hull form is also why the boat is so dry. The bows always maintain good buoyancy and float high even when depressed by a following sea.

You can see this effect on the video. To illustrate how safe the boat is I take my hands off the wheel and let the boat steer itself downwind. A fourteen footer in rough seas and winds gusting 55 knots steering itself downwind should give you some idea.

Bows of the Rêvo WASP 742. Buoyant and high. About to be taken to Auckland port for shipping to Sydney.

The opposite side to stability down wind is a soft ride upwind. The two are usually mutually exclusive. Take a monohull for instance. It is common for designers and builders to make a deep V hull for soft ride into a head sea. This deep V makes the boat less stable in a following sea. The most notable case of this is some Coastguard boats operating in NZ. Quite good into a head sea but they have a policy that they must tack downwind if the sea is over a metre (i.e. these rescue boats cannot drive directly down wind in sea over a metre! Better hope you're not directly down wind when you need rescuing). This was put in place as a result of some passengers and crew being injured in a following sea. To put this in perspective, these are 9 metre boats that cannot go directly downwind in a 1 metre sea. Compare this to the video of my 4.4 metre powercat in larger seas than this (equivalent to 3 metre seas for a 9 metre boat)and as you can see I take my hands of the wheel and let the boat drive itself directly downwind (in any direction in fact).

So how does the WASP achieve a soft ride upwind? The WASP hull is not as wide as a conventional catamaran. Catamaran designers will strive to get the tunnel running clear. If the tunnel is crammed

with water then there is a serious performance penalty, consequently the tunnels are designed high and wide to allow the water to pass through. Wide bridge decks are large flat surfaces exposed to slamming. If this is combined with narrow hulls which depress easily or are overloaded to begin with then the bridge deck is exposed to large and frequent slamming forces and are considered to be “hard riding”. The WASP hull form utilises a narrow beam overall as it deals with the tunnel water in a different way. Instead of tunnelling the water aft it uses this water for lift, turning it down instead. To reduce the drag of this water in the tunnel it is aerated as it passes into the tunnel reducing drag. This aeration of the water also reduces the impact in the tunnel as the water is “soft” or aerated water and deflected within the tunnel to avoid perpendicular impact forces on the surfaces in the tunnel.

Our WASP hull has a beam equivalent to a similar sized monohull, the result being that it is not excessively stiff and so leans in slightly in a turn. A far more comfortable and secure feeling.

Our WASP hull is the same length and breadth of a monohull but due to its rectangular shape it carries about 14% more interior volume and about 13.5% more projected deck area. Effectively, you pay for a boat on the basis of its volume which equates to size. To get a monohull with the same volume as our 742 WASP powercat you would have to extend the monohull out to 8.44 metres. To get an 8.44 metre monohull to plane at 34 knots (the speed of our 742 WASP powercat) you would require nearly 300 hp. The Rêvo WASP 742 achieves that speed with 230 hp. Put simply it is more efficient for the same volume and you get the same volume in a shorter length which might be important these days with storage space at a premium. Think of the saving on marina costs!

Sitting in the shipping cradle atop a monohull boat trailer. You can see from the trailer how the external length and breadth dimension compare to a monohull.

The WASP hull is set up for twin engines, one on each hull. The most obvious advantage of twin engines is redundancy. If one engine fails you have another to get you home. Because the boat planes so easily we can get the boat to 19.5 knots on one engine.

The other huge advantage of widely spaced twin engines is the low speed manoeuvrability. You can spin the boat in its own length by putting one throttle forward and the other back. You are in total control. To have such control especially when you are working in tight spaces at ramps or in marinas or for commercial and rescue boats you can imagine how beneficial that feature alone will be.

Twin engines widely spaced make handling the boat a dream. Walkthrough transom with boarding platform for easy access into the water

You have already seen the efficiency based on volume but it runs deeper than that. Many planing boats require huge horsepower to get them on the plane and the deeper the V the more trim angle the boat takes on and consequently the more horsepower required. Once on the plane the throttles can be pulled back but it effectively means that you have to carry around all the extra horsepower that is required simply to get the boat planing. A boat is fully planing when the bow stops lifting and starts to trim back down, what I refer to as full planing speed. We can set the trim of the motors on the 742 for cruising at 25 knots and do not need to adjust them in to get the boat fully planing at

12.5 knots. So the operating band on the 742 (full planing range) is 12.5-34 knots. Many typical monohulls this size will be fully planing at speeds between 16 and 19 knots. This full planing speed efficiency means that in extreme conditions the boat can be operated at any speed as required by the situation. Imagine crossing a bar, you want to be able to pick your moments and when you decide to power on you want the boat to get there quickly and be able to stay at that speed. This is where the full planing speed is so important. The lower the full planing speed, the more control you have crossing that bar and the safer it is going to be. A boat with a high planing speed is very difficult to get on the plane, takes a long time to get there and is hard to hold on the plane at lower speed making control in these situations very difficult.

So the boat is stable and carries more volume but what does that mean for passengers aboard. As a monohull boat is rolled by waves it carries momentum and will continue to roll so the leeward side is depressed further in and the windward side lifts further out. The angle of the sole (floor) becomes quite large. With the WASP hull form the leeward side depresses very little and correspondingly the windward side lifts less. The sole or floor remains more level so the passengers are not being rolled around as much which requires much less bracing and straining on their part, using less energy and making the experience less taxing and more enjoyable.

The advantage of the extra volume can be seen by comparing the 742 interior to an 8.44 metre monohull. The ultimate luxury is space. The 742 has two relatively large private cabins. Between these is a walk through screen to another forward cockpit with comfortable seating for 4 people. What I call ‘freedom of movement’ is the ability to move freely in a space without having to step around another person or slide through in an awkward unnatural way. The deck area is largely a flat open space. Easy to move around with out too many steps and obstacles. Imagine your kids in the forward cockpit while the adults have their own space in the main cockpit. No working around each other. Think about how the two cabins work without encroaching on the other living areas of the boat. This is the advantage of a rectangular hull over a triangular one and the extra volume and projected deck area gained by this.

Huge internal volume allows for a forward cockpit with comfortable seating for 4 people plus 2 reasonably large forward cabins, one to port one to starboard. Both seating areas in the wheelhouse fold down to form bunks for overnight stays. The table can be removed and replaced with a bench seat also.

The forward cockpit. A wonderful space that passengers love.

Port cabin with rod storage, lifecell, toilet and vanity. Starboard cabin is the same size and houses a berth.

Construction - fabricated polyethylene.

The Rêvo WASP is a plastic boat. Not fibreglass but plastic. High Molecular Weight Polyethylene (HMWPE) It is fabricated or welded from flat panels much like an alloy boat. This varies from LDPE (low density polyethylene) boats that are rotationally moulded. The tensile strength of the material is higher and by fabricating we can make each part the right thickness as required by the engineering. If we need a part 20mm thick we make it 20mm thick and more importantly we know it is 20mm thick. Effectively you get the feel of a fibreglass boat but with more toughness and durability than an alloy boat. The net result is a boat that feels like fibreglass, but truly maintenance free. The plastic comes in any colour you want, even metallic. There is no corrosion and no gelcoat or paint to worry about. And at the end of its life it can be melted down and re-used. 100% recyclable.

The product is UV stabilised so has a very long life.

Coming into the trolley on the owner's slipway for the first time. The polyethylene construction makes for an attractive boat with soft curves and radius corners. This boat is Matterhorn White but you can have any colour you want, even metallic.

The boat had to meet a 300mm loaded draft requirement as the boat was to be used in a tidal waterway. This was another very important and beneficial feature of the Rêvo WASP hull form. It is very shallow draft which once again would be of huge benefit for commercial or rescue work, but equally good for pleasure boats as in this case they can access shallow water anchorages or get in close to shore for safe anchorage in foul weather.

The final piece of the puzzle. Believe it or not the boat does fit into that shed. The happy family with their new boat.

Performance.

To bring some balance to the evaluation of the boats performance, here are some thoughts of people who have been aboard the boat.

Colin Simpson, professional skipper, commercial fisherman

"This is the best cat I have ever been on by a long way. If I had the money I would order a 20 metre version right now. It is so smooth and the way it can operate at any speed makes it very appealing to me as a commercial operator. The handling is phenomenal. And the plastic was a great material to build the boat in."

Jason Swan, engineer, alloy boat builder

"This is it, this is what I want. It is so smooth and feels so right. It just seems so effortless in the way it moves and handles. It does what it has to do without any fuss. It's perfect I love it.

Peter Kearney, former owner of Glasscraft Boats, developer of the Rayglass Sportsman 22, now spends most of his time cruising worldwide in his yacht.

"The thing that hits you about the boat is the smoothness and quietness of the boat. The way it moves through the speed range is much like an automatic car. There seems to be no transition

from displacement to planing, no big sticky hump to climb over before she accelerates, it just seems to keep increasing in speed more like a displacement cat than a planing cat but it is planing. Jim is at the forefront of development with this material and it is exciting to see where it will go from here. This boat looks stunning and feels fantastic. Very impressive"

Danny Clark (owner)

Jim initially priced an aluminium boat for me, so too did the Nth Queensland builder. When I met with Jim and discussed my situation and requirements, Jim brought up the idea of the HDPE boat. I had a look at Jim's 6m fly fishing boat and I was very impressed.

What impressed me more was Jim's experience and skills, he designed me a boat which he could "float" on his computer so I could see what the final draft would be like. He also spent plenty of time going through all aspects of the project and the benefits of the HDPE.

Coming form Australia and having a boat built in NZ could have added more risk and additional problems. None manifested.

Three things resulted from my first meeting with Jim:

1. Yes it was possible to have a boat built to my requirements at my budget.
2. Jim was an experienced and innovative boat designer/builder. In my research I could not have a boat like this built in Australia. I knew the end product would be the best possible boat for my situation.
3. Jim and I trusted each other and had the confidence to enter into this relationship. My trust in Jim only grew throughout our project. He delivered what he promised, at the price he promised and never compromised his process.

So now I have my boat. I could not be more pleased. The draft at preliminary sea trials ended up around 280mm, better than spec. This means a lot to our usage ability. The boat is a soft ride, the HDPE and design seem to absorb swell and chop to provide a quiet "slap free" ride. The space on the boat is great, we have a free flowing deck, leading to a bow rider section, all easily accessible. The beam is not wasted with a CAT and we have as much space up the front as we do in the stern. The boat gets on the plane very easily, even on one motor and because of the weight and the sleek design it is very fuel efficient. I get pretty close to 0.8 nautical miles for litre of petrol.

It also looks great. I could not have been happier with the result or the process.

A picture taken at the first sea trial. You can see the very flat wake. An indication of the efficiency of Rêvo WASP hull. How that wake looks is exactly how the boat feels!

LOH 7.4 metre

BOH 2.565 metres

LOA 8 metres

Horsepower 2 X 115

Top speed 34 knots

Full planing speed 12.5 knots

Fuel consumption at 23 knots 26 litres/Hour (combined)

Fuel capacity 200 litres

Price as displayed $278,000 plus GST