

MTMBC F/E - Choosing a Wacky Racer

Introduction

The Wacky Racing class of boat is a step up from Club500s and F600Bs in terms of performance, construction, and driving skills. To make it as inclusive as possible the specification allows for the use of Mono (single hull), Catamaran (twin hull) or Hydroplane (triple hull) configurations. Batteries can be NiMH or Lithium polymer of Voltages & capacities defined in the specification. These have been calculated to provide roughly equivalent power in the different configurations allowed.

You may already own a potential Wacky Racer because the specification offers a wide range of possibilities in terms of hull design, battery choices and motor types meaning that provided the battery specifications are adhered to almost anything else goes in terms of a boat that can be entered into Wacky Races. Scratch built, Kit, **Almost Ready To Race** or **Ready To Race**. Below is the relevant extract from the rules.

1. Drive battery power must be as specified here. **All batteries must have original labels and wrapping undisturbed. Lithium polymer 2s1p up to 2,700mAh or 3s1p up to 1,800mAh or NiMH or NiCd up to 12 x 2/3A up to 1,700mAh.**
2. Any hull
3. Any motor

Appreciating that a wide choice with insufficient knowledge is not the best basis for selecting a boat to buy or build, this article looks at the likely options, their characteristics, and what may be needed to win.

So the name of the game is to race the boat as fast as possible, over a 5 minute race, using all the power available. Consequently scoring the highest number of laps in the given time throughout the season and winning the MTMBC Championship.

General Characteristics

In order to be fast a boat needs to have low hydrodynamic drag. The less contact with the water the less drag so with limited power available it makes sense to have a small light-weight craft. A race boat also needs to be strong enough to withstand the occasional contact with other boats and unexpected items in the water. It is in the nature of racing that sometimes a boat will be involved in a capsize so a self righting boat would be able to continue racing. Whether a boat is scratch built, a kit, ARTR or RTR, maintenance and spares are essential to keep in the competition.

A successful boat will probably be between about 400mm and 550mm long and under 1.5 Kg in weight. Any longer and it is likely to be too heavy and have too much contact with the water creating unnecessary drag. Any shorter and in rough conditions the craft will try and follow the shape of the waves reducing overall speed and making it difficult to control.

Hydroplane - Mini Hydro - (Rigger)

A light fast boat designed to skim across the water.



Potentially the fastest option with only 3 small areas in contact with the water at speed. Hydroplanes are usually surface drive which means only the bottom half of the propeller and rudder is in the water. This avoids the need for hardware associated with the propeller to be dragged through the water underneath the boat. Hydroplanes are very fast in moderate conditions because small waves mean even less contact with the water hence less drag. They are however susceptible to flipping in rough, windy, conditions and it is only good luck if the boat lands the right way up. In general hydros will not self right so flip a hydro and if it lands the wrong way up it will be the end of your race. Generally they tend to be more fragile than other types of vessel and are more difficult to set up and drive.

Catamaran (Cat)

A boat with twin hulls in parallel.



A low drag configuration designed to lift out of the water onto the inside edges of the two hulls. Usually surface drive but can be submerged drive. A good option for a Wacky Racer because it is low drag, stable on the straights and round the corners. It is susceptible to flipping at high speeds and in windy conditions. Some designs incorporate a self righting feature which will keep you in the race if capsized.

Mono hull - Mini Mono & Mini ECO

A boat with a single hull.

In theory the slower option for a Wacky Racer however a number of hull configurations are possible that can allow it to be almost as fast as a Hydro. Mono hulls can be divided into, sub surface drive, and surface drive and can be further divided into un-stepped and stepped hulls.

Most mono hulls can be made to self right by virtue of a suitably shaped superstructure or by incorporating a flood chamber. This is an important feature for a race boat and is a significant advantage over hydroplanes.

Mono - sub surface drive. (ECO boat)



Sub surface drives are more conventional with the drive being provided by the whole propeller submerged beneath the hull like the Club500 and F600. Lift is mostly provided by the thrust of the propeller through the angle of the propeller shaft. Much of the hull remains in contact with the water which means good predictable handling but high levels of drag. The propeller, propeller shaft and rudder, remain in the water underneath the hull and add significantly to the hydrodynamic drag. Notice how small the prop shaft, prop & rudder are on this prize winning ECO boat - all in an effort to keep drag to a minimum.

Mini Mono - unstepped surface drive.

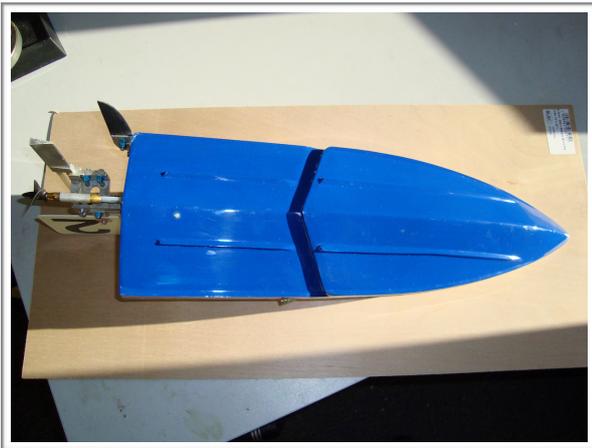


By moving the prop shaft, rudder and the propeller from underneath the hull to behind the transom, half out of the water, the drag is reduced significantly allowing the boat to be faster through the water. The bottom half of the propeller and the lower part of the rudder remain in the water. Although the hull is designed to lift out of the water at speed a significant part of it remains in contact with the water which helps with stability and handling, but also creates drag. Note the unstepped hull on this Mono recovering from a spin.

Mini Mono - stepped surface drive.

A stepped mono hull is designed to lift out of the water at speed with only a triangular area in front of the step and another in front of the transom in contact with the water. This reduces the drag and allows the boat to

travel quickly across the water. Because there is very little of the hull in contact with the water they are fast but are prone to instability particularly in the corners and are not so easy to set up and drive.



Two surface drive stepped mini monos. The one on the left relies on a shaped superstructure to achieve self righting. See picture in 'setting up' below. The one on the right clearly showing it's flood chamber vents on the transom.

If you are equipping or modifying a boat here are a few tips on selection of batteries, Motors and Electronic Speed Controllers.

Batteries

Although NiMHs can be used the power to weight ratio offered by Lithium Polymer batteries is far superior and make them an obvious choice.

The choice between 2S or 3S Lipos is less obvious but it is generally reckoned that 3S is more efficient because the higher voltage means the ESC and motor have to handle less current and losses in the motor are less at low current and higher voltages. However both configurations are in use by Fast Electric racers. Selection of battery brands can make a significant difference to performance. e.g. A cheap & cheerful brand with a nominal capacity of 1,800mAh may only deliver 1,700mAh where as a better quality pack could deliver closer to 1,900mAh which is a significant difference.

It is best to talk with other racers and find out who is using what batteries and which perform the best.

ESC

Select an Electronic Speed Controller with a Battery Eliminator Circuit otherwise a separate battery supply will be needed to power the Rx and servo. This would add unnecessary weight.

Experience has shown that a ESC rated at 2 to 3 times the average current (Amps) anticipated is best so it can deal with repeated high current peaks which are a feature of Fast Electric racing boats. Average current is higher using a 2S lipo than a 3S lipo. It can be calculated from the capacity of battery and the race time. With a 2S set up a capacity of up to 2.7Ah is allowed. The race time is 5 minutes so to use the full capacity of the battery in 5 minutes the average current would need to be $12 \times 2.7A = 32.4$ Amps. So a water cooled ESC rated at 70A or higher would be suitable.

With a 3S set up the capacity allowed is 1.8Ah. $12 \times 1.8A = 21.6$ Amps. So a water cooled ESC rated at 45 Amps or higher would be suitable.

Motor

Brushless motors are much more efficient than brushed motors. They are smaller and lighter for the same power and require much less maintenance.

The calculations required to determine the correct motor revs per volt would be complex so we have to rely on the experience of regular racers. A modern race boat propeller in an un loaded state is reckoned to be rotating between 30,000rpm and 40,000rpm. If we take a 7.4 Volt set up at say 35,000revs $\div 7.4V = 4730KV$. So a 11.1 Volt set up at 35,000revs $\div 11.1V = 3153KV$. These figures are for surface drives and for guidance only. A few hundred revs either way may well work out OK. Sub surface drive boats require less Revs/Volt because the whole propeller is submerged.

(My surface drive mono hull is fitted with 3S lipos and a 3,400KV motor)

As with the ESC the continuous current rating of the motor is important so be careful with motor selection as they are often specified as Max Amps and not continuous. Fast Electric racing is demanding on motors because of the high current peaks and the continuous demands of a flat out race.

Setting up on the water



Having a well balanced boat is essential to get the best racing performance. Given that major features like batteries, motor and ESC have already been determined and installed in the boat the next step is to get the balance of the craft right so it runs correctly. This means at high speed it should run flat and stable with as little of the hull in contact with the water as possible. This can be achieved by moving the battery and any other weighty components fore or aft as required.

Finally select the right sized propeller to achieve the 5 minute race time at the highest speed possible.

Setting up is inevitably a question of trial and error which is best done before racing starts but small

changes are often required during the season to fine tune performance.

It is rare to have a boat that performs well 'out of the box' without it needing some tweaks to get it running more quickly and achieving the race time. Always be looking to improve your boat and your driving performance. Talk to other racers who are always happy to share their knowledge and help you to improve.

I hope you have found this article interesting and perhaps it's encouraged some of you to have a go at Wacky Races. I have included some links to web sites selling boats that may be suitable for Wacky Racing.

The choice is up to you but I hope it's a little more informed now you have read this article.

Please feel free to contact me at parker42@btinternet.com or ring me for a chat on 0118 9700162.

[See you lake side.](#)

[Dave](#)

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