

Getting more from your Club500

Introduction

As some of you will know I joined the hooligans racing Club500s last season. I built and raced my own boat using what knowledge I already had, but also adding some new, and different techniques along the way. Colin just pipped me for the championship but my boat was certainly the fastest out there. Driving errors were my downfall which demonstrates that it is not always the fastest boat that wins. However I hope you will be interested in this more in depth article that builds and expands on the previous Club 500 racing tips produced in 2009 (was it really that long ago).

The aim is to provide information and techniques that could be used to improve the performance of your Club500. There is plenty of information out there but what follows is what I decided to use on my boat. It is relevant to building the kit from new or making improvements to an existing boat.

Because the Club500 is a single class race boat, with many standard components and construction rules, the scope for changes that achieve a significant step up in performance is limited. However significant overall performance improvements can be achieved by the '**Aggregation of Marginal Gains**'. This has been my maxim throughout construction, setting up, testing and racing.

There are two main areas that have the most significant effect on performance. Drag (friction caused by parts of the boat that are in contact with the water) and power (the force applied to the propeller via the drive line to generate thrust). So this article looks in some detail at each aspect of construction, set up, preparation and racing with these key areas in mind. It considers the methods that can be used to minimising drag and maximise power to achieve an improvement in performance.

When addressing these techniques and changes it is essential to **ensure compliance with the letter and the spirit of the rules** so keep a copy handy.

Construction

General

The lighter the boat the higher it will ride in the water so there will be a smaller area in contact with the water and less drag will be created. For the same power a lighter boat will be faster and accelerate better than a heavier one so reducing weight is a win win in both significant areas. Anything added to the boat increases its weight so don't add anything that isn't essential and make sure what is added, is as light as possible, but robust enough to stand up to the rigours of racing.

Light and strong is the key to a winning boat.

Superstructure & Hull

The dummy motor and spoiler can be dispensed with. Velcro can be used instead of wooden pegs to locate and fix the cabin. Add the minimum amount of buoyancy to stop the cabin roof sinking if dislodged. Use a light but strong plastic for the standard sized number board and a light weight bracket and bolt to secure it to the cabin. Mounting the number board to the back of the cabin means it is lower which makes the boat slightly less susceptible to side winds.





The need for strength, and flexibility, and the construction rules limit the opportunities for weight saving on the hull. But you can use a light waterproof packing material for the bow fender which will not soak up water and add weight like normal sponge rubber would.

Motor

Before using the motor it should be run in, cleaned and lubricated. I tried the underwater method which is reckoned to be the best for motor performance and life. There are a number of ways of doing this but this is how I tackled it. Fill a container with filtered water (from a

domestic water filter jug) to a depth that will fully submerge the motor. Connected the motor to a power supply set at 0V, submerge the motor and slowly turned up the voltage until it runs slowly at about 2.5Volts. Over a period of about 10 minutes slowly increased the voltage to about 3.5 volts and then run it for a further 5 minutes. Disconnect the motor and take it out of the water. Flush it through thoroughly, from the front of the can, with plenty of clean filtered water. Use a commercial motor cleaning aerosol to thoroughly flush the motor from the front of the can and then finally around the brushes and commutator. When all traces of dirt & carbon dust had been removed dry it out slowly with a hot air blower on low heat and put it in the airing cupboard overnight. Check it is clean and dry and use model car racing oil to re-lubricate the bearings giving it plenty of time to soak into the porous bearing material. Then run the motor for a few minutes at low voltage to help distribute and soak up the new oil.

Drive line

It is important to align the drive components accurately. Misalignment will result in noise and vibration which is wasted energy that should be driving the prop. Before gluing the motor mount in position fit the motor firmly to it's mount as it will be in racing trim.



Assemble the motor, alignment tool, prop shaft and prop shaft tube ready to locate in the skeg. Pass the prop shaft through the hole in the skeg and lay the assembly in the boat to determine it's fixing position. Mark the prop shaft where it exits the skeg and the motor mount position on the inside of the hull. Prepare all surfaces for gluing and then apply the glue of your choice before attempting to fix the assembly into position. I used Evostick Serious Stuff for the prop shaft and Aroldite Precision mixed with kevlar pulp for the motor mount. Stand the hull on it's bow with the line of the prop shaft just passed

vertical. Locate the assembly in position and hang it from the prop shaft entry to the skeg. Hold it in place with a peg or clip and straighten the hull until vertical and the motor mount rests in position on the inside of the hull. Allow the assemble to settle in position and then wait until the glue sets. This allows gravity to keep everything in line and prevents any adverse 'sets' in the drive line which could be caused by gravity if the hull was horizontal.

Propeller

The size of the propeller can not be changed but you can clean off any flash or ridges which are the result of the manufacturing process and sharpen the leading edge. If you have a number of propellers it is worth checking them for slight differences in the manufactured size. A slightly bigger diameter propeller will perform better.

Speed Controller

The higher the voltage applied to the motor the faster it will turn so it is important to keep the electrical resistance between the battery and the motor terminals low because resistance causes voltage drop. ESCs have resistance so it is important to select one with a low forward resistance. As a general rule the higher the current rating the lower the resistance. Make sure you choose one with a BEC so you don't need a separate battery for the radio gear. I use a 50Amp aircraft ESC which is light and has low forward resistance. The disadvantage is that aircraft ESC's don't have reverse. You can cut off the on/off switch and solder the wires together so it is permanently on. This removes one potential source of bad connections and a little weight.

Batteries

If everything else is operating at 100% and the battery pack is not up to the job you will never achieve the best performance from the boat. Therefore it is worth choosing the battery packs you buy carefully. Like many things it is a balance between performance and cost. Don't go for the higher capacity packs which are expensive, tend to be more fragile and are unnecessary for Club500 racing. Look for race packs that have been assembled specifically for car racing where the cells have been selected for the pack. They perform well are reliable and reasonably priced. I bought 3,000mAh packs from Ansmann Racing but anything up to 4,300mAh from a recognised supplier should be fine.

Wiring

Every wire and every joint in the power circuit adds a small amount of resistance which causes a small drop in the voltage reaching the motor terminals. They also add weight and are potential sources of faults so keep wiring and connections to a minimum.



Use wire rated at at least 20 Amps and gold plated connectors from 3.5mm to 4mm diameter. Do not install a fuse as they are resistive. A safety loop made from a short loop of wire and a 4mm gold plated plug & socket connecting the positive of the ESC to the positive of the battery pack will act as a reliable on/off switch. If it is installed outside the hull it allows powering on and powering off without needing access to the inside of the boat.

Rudder

The size of the rudder can not be changed but you can sharpen the leading and trailing

edges to reduce drag. Excess material can also be cut from the rudder and servo arms to save weight.

Radio

There are no restrictions on the radio gear so you can use a light weight Rx and servo.

Set up

Hull

The lower the weight sits in the boat the more stable it will be. Initially mount the battery tray on velcro strips to allow movement backwards and forwards. Once the best position is determined, in testing, or after the first few races, the tray can be glued in position which lowers it by several mm. Note the rules on not cutting down the tray. The position of the ESC is not specified so mount it low down, but not so low it will sit in water if the boat gets wet inside. The same could apply to the Rx but I prefer to mount mine on the raised platform to keep it dry and the aerial well above the water line. (I believe a Rx mounted below the waterline contributed to my loss of control of the prototype F600 at a recent event)

Drive line

Glue the inserts into the universal joint and assemble the drive line making sure the motor is in the same position on the mount as when it was glued in place. Allow a gap between the prop boss and the thrust washer to make sure the thrust is taken by the motor and not the thrust washer. This also allows the motor to move slightly in a collision without the whole drive line tightening up. Run the motor slowly and adjust it's position until the prop shaft runs as smoothly and quietly as possible.

Rudder

Set the rudder dead straight. This will ensure minimum drag when running in a straight line. It is a good confidence builder when you are sure your boat will run true with no rudder input. The way I do it is to turn the boat over and clamp a straight rod about the length of the hull to the rudder. Operate the radio as normal approaching the centre line from both directions so it lines up accurately with the centre line of the boat.

Check for drag

Turn the boat upside down and look along the bottom of the hull. Visualise water flowing over the hull and check for any objects interfering with the imagined flow and remove them if possible. Large washers on the prop shaft or rudder typically add unnecessary drag.

Preparation

Testing

This is a valuable activity as it checks that your boat is running smoothly and reliably before race day. It allows you to set up the rudder throw and practice your driving skills. Choose a still day and run the boat in a straight line through still water. Moving the battery pack towards the stern will cause the boat to porpoise or bounce. Moving it forward will make it run flatter with more of the hull in the water. Adjust the battery position until the minimum amount of hull is in contact with the water and the boat runs as flat as possible. Adjust the rudder throw so that maximum throw will allow your boat to turn in a circle no tighter than needed to get the boat round the tightest turn on the course. This can be done with the end point adjustment on your Tx or by adjusting the position of the servo/rudder arm link. It helps to reduce the sensitivity of the steering.

Maintenance

It is a well worn saying that to finish first, first you have to finish. And it is as true for Club500 racing as any other racing. Following race day I remove the prop shaft and rudder to clean them. The motor can be removed and the bearings lightly oiled once during the season. Testing lubricants in the racing season has been aimed at deciding which is the best one for the job. I tried GT85, light grease with PTFE, and light oil with PTFE. The GT85 initially worked well but allowed too much water up the shaft in the latter races. Grease slowed the boat too much. The light oil worked well but slowed the boat a little and by the third race was letting too much water up the shaft. The final test involved applying GT85 to the prop shaft and bearings before fitting and allowing it to evaporate. I did this three times until a coating of PTFE based lubricant remained on the shaft and bearings. When tested this did not slow the boat significantly and only allowed a minimum of water up the shaft even after the third race. This is what I intend to use in the in future.

Pre-race

Clean and polish the hull. Lubricate and fit the prop shaft, propeller and rudder. Check the security of the motor mounting, universal joint, propeller, rudder and servo. Test the operation of the radio by connecting a race pack, running the motor and checking that everything is working OK.

Charging the Race Packs

After studying the battery characteristics and trying different methods of charging this season I have decided the following method is both practical and effective in getting the best from the race pack. Charge the pack to 50% capacity at twice the 'C' rate (i.e. 6 Amps for a 3,000mAh pack) at home before leaving for the venue. Then charge at the same rate immediately prior to the race at the lakeside. Charging takes about 15 minutes but this ensures the pack is fully charged and warm when it is fitted in the boat. I suggest using a charger with temperature monitoring and cut off to ensure the batteries are not taken beyond their designed parameters. After trying several different methods In the final rounds of the season this one appeared to give me the best performance.

Racing

The start

Make sure you and your boat are ready to go on the start line at the start time. As Linford Christie says go on the 'B' of bang. Leave the start gate in a straight line and try and maintain a straight course towards the first buoy. Barring any interference, if the rudder is set correctly, you shouldn't need to touch the controls it until you get there.

Driving

The shortest distance between the buoys is a straight line. Try and glance ahead when you have rounded a buoy to correctly align your boat for the next one. Don't turn past the line because you will need to straighten up and that just



looses speed. There are two basic methods of steering round the buoys and which one you decide to use depends on your abilities and the situation you are in. The simplest way is to take a wide line on full throttle so speed loss is minimal. The alternative is to take a tight line into the buoy, reduce the throttle and turn, staying close to the buoy and then accelerate away. This is more difficult to get right but can be quicker and is a useful move to get passed an opponent who is taking the wider line. If you are following a boat overtake on the outside if you are fast enough. If not fast enough to get past follow them closely to keep the pressure on. They will soon succumb and make a mistake so you can nip past. When in front of a faster boat maintain your line, keep close to the buoys and make a positive effort not to turn too far past your line for the next buoy. Keep calm, the faster boat has to find a way round you, so don't make it easy for them.

Driving Standards

If you are slower don't weave and block following boats. Do not circle the buoys. If you are not in control retire and get off the course. Don't cross the racing line unless it is safe to do so. Doing any of these is likely to earn you a warning from the Race Controller. Repeated offences may see you disqualified from the race.

Tactics

Being well prepared will give you confidence in your boat and your ability. Take some time to practice driving techniques and set your boat up prior to racing it. During the race take advantage of the initial higher voltage of your pack to get to the first buoy in front and establish a lead. Don't ease up even if all the other boats drop out because you need to score as many laps as possible. They will all count towards your overall score at the end of the race day. If you are chasing another boat and can't quite get past, be patient and if all else fails try talking to your opponent. Warn him that you are behind and want to get past. This may break their concentration and allow you past. It sounds unlikely but it often works.

Race hard and fair but don't take it too seriously. The aim is to enjoy the racing even if you don't win. All racers make mistakes particularly when they are learning so be ready to slow down to avoid trouble. Make yourself aware of any newbies and take extra care around them. It is unlikely that anyone will deliberately 'take you out' so maintain a sense of proportion and enjoy the rough and tumble of our non-contact hobby.

***See you lake side
Dave***