

Kestral and Merlin Supplementary Information

1 Introduction

This information is intended to supplement the YouTube build videos and not replace them, please watch the videos here:

<https://www.youtube.com/watch?v=o5TCDVxQzKk>

2 Adhesives

Zap cyano is by far the best on the market, cheaper brands have far poorer performance.

Don't be tempted by larger than 1oz bottles, they may appear more economic, but they flood out making a mess and negating any saving.

Don't mix brands of cyano and accelerator, they're not all compatible.

Never use the pump that comes with accelerator, use the finest disposable pipette to apply it very sparingly.

Foam safe and low odour versions are inferior, but if you must use them make sure you use the matching accelerator as they are not the same.

Cyano has a shelf life of around a year unopened so make sure you buy from a volume supplier to get it fresh, unfortunately it's not marked with date codes.

Once opened, moisture in the air degrades performance within weeks, so only open when you're ready to build. Old and degraded thin cyano does not wick into joints and stick instantly as shown in the videos, if you're having problems then get a new bottle and you'll be amazed at the difference.



Z-Poxy 30-minutes is the best product for glassing the prop shaft, but only comes in a very large expensive pack.

Devcon Home 2 Ton works almost as well and comes in a far more reasonable size.

Don't be tempted to use faster than 30-minute epoxies, you won't have time to make a good job.

Some brands of epoxy are too viscous so won't soak into the glass cloth or allow you to smooth it down, they'll just make a mess.



3 Propeller

The prototype was fitted with a 40mm diameter three bladed brass prop which not only looks the part it works well with the motor that's optionally included in the kit.

If a plastic prop is used check that there is room for it between the rear of the keel and front edge of the rudder as some have a much deeper hub than brass props. The keel can be shortened by a few mm if needed, as shown in the construction video.

Propellers come in two types: clockwise and anticlockwise. This isn't referring to the internal thread, which is always an M4 clockwise thread, but the slope of the blades which determines whether it rotates clockwise or anticlockwise to propel the model forward. Unfortunately, manufacturers can't agree whether this is as viewed from the bow or stern! So, if you have a preference, you should find a seller who provides a clear picture of what you are getting rather than relying on a description.

I prefer one that turns in such a way that it screws onto the prop shaft when going forward so there's no chance of losing a prop when going at full steam, of course you still have to make sure the lock nut is tight, or it'll unscrew when going astern.

4 Motor

The kits optionally include a high-quality brushed motor that's ideal for this size of model. It has a ball bearing, long life brushes and a cooling fan so doesn't need water cooling when used with the recommended prop and battery. If other motors are used, please ensure the combination of motor, battery, prop and ESC are compatible, sorry but the number of permutations make it impractical for us to advise on this.

5 Battery

When using the motor optionally included in the kit, and the recommended prop, the ideal battery is a 2 cell LiPo with a capacity of 2200mAh or more.

A 6 cell NiMh battery is also suitable but limit it to a light weight 2000mAh type. Higher capacity batteries could make the boat nose heavy and prevent it getting onto the plane.

6 Electronic Speed Control (ESC)

With the recommended motor, battery and prop the Mtroniks Tio Marine 30 is the ideal ESC and was used on the prototypes. It's suitable for use with LiPo batteries and many aren't. The motor optionally included in the kit if pre-wired to plug straight into it, it's easy to setup and it will comfortably cope with the current without overheating.

If you use another ESC, please ensure it's adequate for the job, an overloaded ESC can fail and start a fire.

Always choose an ESC with a built-in Battery Eliminator Circuit (BEC), this just means it has a regulator that drops the battery voltage down to 5V and feeds the receiver and servos with power, saving you installing a separate battery for this purpose.

Most marine ESCs come with a Tamiya style plug for the battery. This is unfortunate as it was a poor connector in its heyday and is completely obsolete now that there are much better types such as the XT60, Deans or EC3/5, but it's stuck in the model boat world. You won't find a LiPo battery fitted with a Tamiya, only some NiMh packs, so you'll either need an adaptor or to change the plug on the ESC if you use LiPos.

Many marine ESCs come with an on/off switch which turns the model off without having to unplug the battery. There are optional switch mounting brackets in the kit, or you can extend the switch wiring and fit it under the rear seat as on the prototype, see picture of servo compartment below.

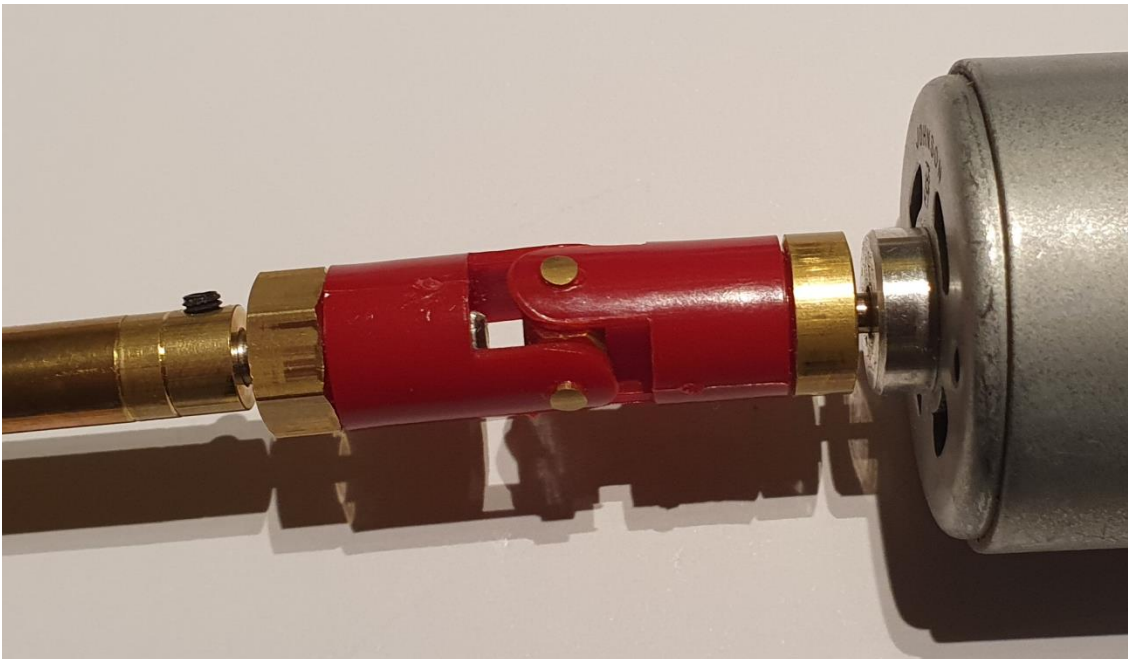
The easiest way to mount the ESC is with a piece of self-adhesive Velcro stuck to the ESC and side of the compartment. Mount as high as possible if the ESC is not waterproof. Keep the ESC as far away from the receiver as practical to avoid interference.

7 Propshaft

Here are the parts of the prop shaft assembly that's included in the kit, from the stern we have the prop (not included in the kit), a brass locknut and a flat thrust washer



On the front there's a brass thrust collar with locking grub screw, then the coupling and motor (optionally included in the kit)



The way to assemble this is as follows:

Fit the thrust washer over the threaded end of the prop shaft.

Fit the lock-nut on the threaded end and screw on fully.

Fit the prop and screw on fully.

Wind the lock nut back towards the prop and tighten with a suitable spanner to lock it in place.

Fit the shaft into the tube, don't use oil or grease until the hull has been painted as it will soak into bare wood and prevent the paint from adhering.

Press the prop and shaft up against the end of the outer tube.

Fit the brass collar on the unthreaded end of the shaft and fit close to the front end of the outer tube.

Lock the collar with a hex key, but ensure the shaft can turn freely.

Fit the coupling over the shaft up to about 1mm from the front of the brass collar and lock in place.

Fit the motor shaft into the coupling so there's about 1mm between the motor and coupling.

This puts the motor as far back as practical leaving the most space for the battery and keeping the weight as far back as possible which helps to get the boat up on the plane.

The intention is that when going forward the thrust is transmitted through the thrust washer into the rear end of the outer tube, and when going backwards the thrust is transmitted by the brass locking collar onto the front end of the tube.

The motor bearings should never take the thrust as they're not designed for it.

You may spot that most brass props aren't threaded deep enough to accept all the threads on the shaft, so a couple of threads go into the bearing in the rear end of the tube, this is not ideal but standard on mass produced prop-shafts. Fortunately, the bearing goes a long way into the outer tube so there's plenty of bearing for the unthreaded shaft to bear on. If you wish to cut the thread on the shaft down here's how: First fit the nut, saw off the excess with a fine-toothed junior hacksaw, file the end of the shaft round using a fine file, then remove the nut to open up the threads.

Obviously don't run the motor for more than a few seconds before the shaft is lubricated.

You can get a syringe of white grease from most model suppliers that's ideal for the purpose, a small squirt in each end of the outer tube before assembly is enough, but it does need reapplying at regular intervals.

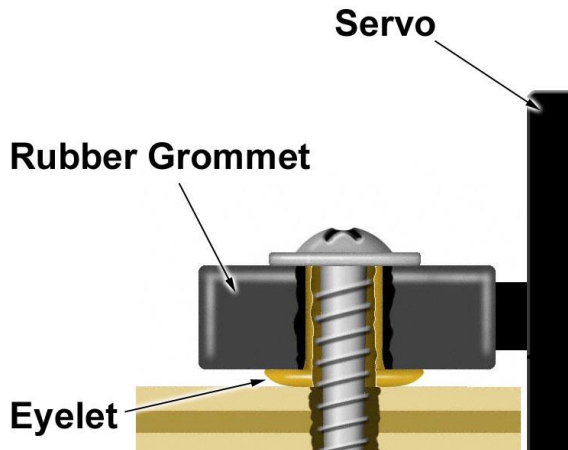
Don't fill the tube with grease as it adds a considerable drag to the motor.

Oil is useless as commercial propshafts do not have rubber seals, so it just runs out of the back and contaminates the pond, makes a mess in your car boot etc. Adding an oiler tube near the front of the tube just makes a bigger mess and doesn't even lubricate the front bearing as oil doesn't run up hill.

I don't use thread-lock on the prop threads but if you do it's advisable to use the type that can be removed for maintenance.

8 Rudder Servo

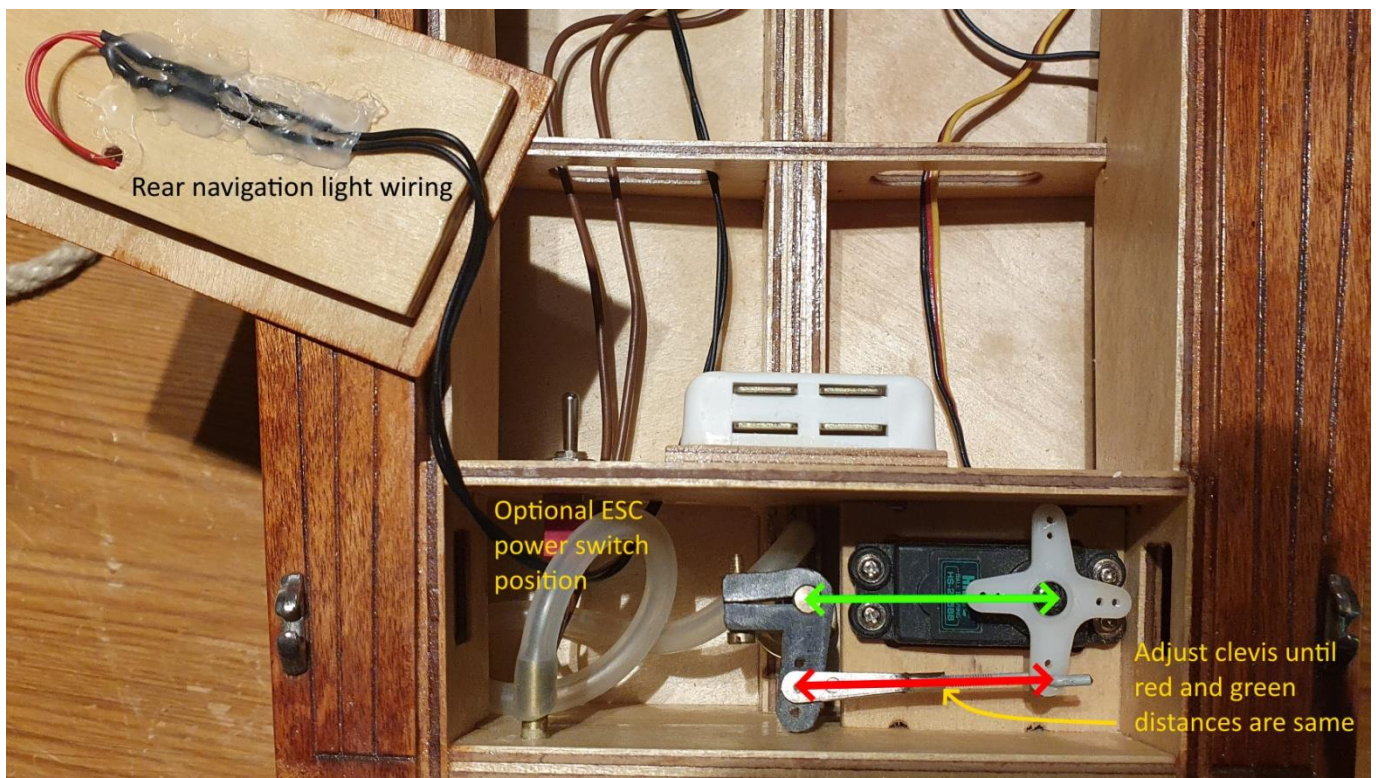
The kits are supplied with pre-cut servo trays for the Hitec HS225MG and the more economic Etronix ET2015 as well as a blank that you can cut for other servos. Note the Hitec HS225BB is an inferior servo with plastic gears and not recommended, the MG has metal gears that won't strip even if the rudder gets jammed by floating debris. Servos come with a mounting kit consisting of screws, vibration absorbing rubber grommets and brass eyelets, but many people assemble these incorrectly, the eyelet is fitted from the bottom as shown so that the rubber grommet can't be squashed to the point it's ineffective.



Servos come with a fairly short lead which will need a servo extension lead of at least 150mm to reach the receiver in the front compartment. Choose a JR type extension for a Hitec or Etronix servo or a Futaba extension for a Futaba servo.

The supplied servo linkage needs adjusting before use, screw the clevis on or off the pushrod until the distance between the holes in the tiller and servo arm is the same as the distance between the rudder shaft and servo shaft, see below. If you don't do this then the rudder will move further to one side than the other when you move the stick.

Also shown below is an alternative location for the ESC power switch, this is a toggle switch with a couple of extension wires soldered in place of the slider switch that comes with the ESC.



9 Servo Plugs

In an ideal world there would be one standard for servo plugs but unfortunately the major manufacturers have fought a silly battle for many years, and we have two common types: Futaba which has a key sticking out of one edge of the plug for polarisation and JR/Hitec which have two bevelled edges for the same reason.

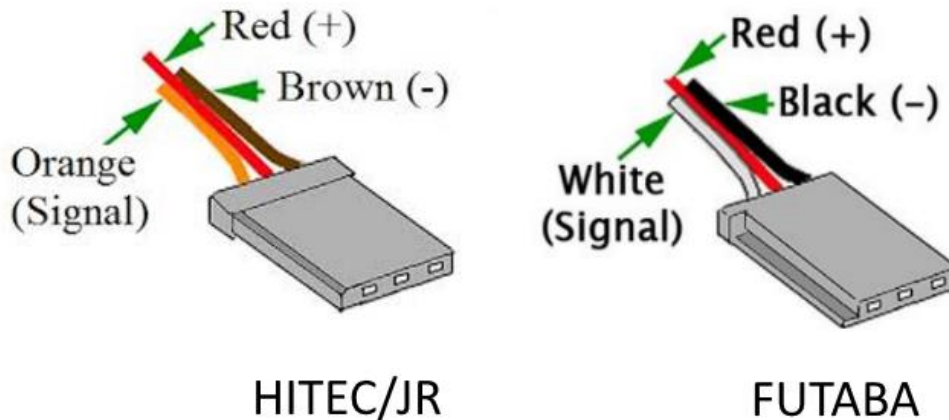
Note the electrical signals are in the same order and compatible, the only problem is one of mechanically fitting one type into the other.

Hitec/JR plugs will fit into a Futaba socket, but Futaba plugs won't fit into a Hitec/JR socket because of the key.

Then there are 'universal' sockets which simply have the plastic cut away so both types will fit.

The problem with all this is that you can reverse the plug because the polarisation doesn't work between types.

Fortunately, this does no damage, the servo just doesn't work if the plug is reversed.



10 Glassing

Don't, it's as simple as that! When built as instructed this kit is tough and durable and needs no additional strength from a glass fibre coat. All you're doing is adding weight that may affect the performance, adding cost, wasting time and making it harder to paint.

11 Varnishing

I only use traditional yacht varnish such as Rustins, it's the only way to get a good finish.

Avoid polyurethane/water-based varnishes which just put a plastic skin on top of the wood that peels off.

Dilute the varnish about 2 parts varnish to one-part thinners i.e. white spirit or turpentine substitute.

Apply a thin coat which will soak deep into the wood and protect it.

Allow to dry thoroughly and sand lightly with fine wet and dry before applying the next thin coat.

Build up at least 3 coats this way, more for a deep finish.

The mahogany-coloured decks are obtained by first applying a couple of coats of Liberon spirit wood dye before applying the clear yacht varnish. Make sure it's the spirit based one not the water-based version. Avoid applying dye to any area you want to glue as it inhibits adhesion.

12 Painting

There are as many variations on painting techniques as there are modellers but here's my approach.

First fill any minor imperfections with Milliput White putty, this is far better than the car body fillers that so many reach for. It's water based so easy to apply, can be smoothed with a wet finger, and tools and hands can be cleaned with water. Despite this it's completely waterproof when set. Also, it has a simple 1:1 mix ratio unlike car filler with its "pea to golf ball" mix which is impossible to scale down to the small quantities you'll need for this kit.

When the filler is hard sand with progressively finer paper until you're happy it's not only looks but feels smooth. Do not sand wet or the wood will need to be left for days to dry before you can apply paint. Remove dust with a tacky cloth.

Spray with Hycote filler/primer to fill the grain. Ordinary primer won't fill the grain on wood, you end up applying numerous layers to get the same result as a single coat of filler primer.

Sand with fine wet and dry but use it dry as you may expose patches of wood and don't want to get them wet.

If necessary, apply one more coat of Hycote filler/primer, maybe just in areas where you've sanded through.

When dry sand again, make sure you're happy with the finish before proceeding.

Apply one coat of white or grey Hycote primer, as appropriate to your topcoat colour. This is only to cover the yellow filler primer with the correct base colour for the gloss. When dry very lightly sand to remove any roughness, if you expose the yellow it'll need more primer.

Apply a coat of Hycote Double Acrylic, when dry very lightly sand to remove any roughness.

Apply a topcoat of Hycote Double Acrylic, you need to make this a 'wet' coat to get a gloss finish.

Do not apply a lacquer coat, there's no need and it often goes wrong.

There are plenty of videos on YouTube explaining how best to use a rattle can but briefly: warm the can if it's cold, shake it thoroughly to mix, start and stop each stroke off the model to avoid streaks at each end of the stroke, avoid dust like the plague, don't spray in wind, spray each surface horizontally as much as you can to avoid runs.

I've found that Halfords acrylic rattle cans are compatible with Hycote, but if you mix any other brands test their compatibility thoroughly on scrap wood as some brands react badly with each other.