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Deck Stiffeners, Use of Epoxy Resin, Motor Gearbox and Mounting

This document was written by Paul Naylor and is published here for FMES online viewing, and was written during 2025.

Sundowner – 8

Every time I think about it, I think of something to do before gluing the deck down – it worries me as there is bound to be something I forgot for later hassle. This is time (and *in time*) I thought about some deck fittings that will be secured to the deck. Fortunately, most of these are around the edge and fall on top of a stringer that will be strong and provide capacity for screws. A few though are quite substantial, prone to knocks and in the middle of the deck. So far, I have contemplated the anchor winch (foredeck) and the two mast mounts (forward of each hatch).

The mast mounts in particular needed this forethought as the 1.5mm deck will not be strong enough to take a mast – not that I plan to erect sails on them like the prototype was able to do - but because their height provides lots of opportunity to brush against them and leverage to spoil a mounting! My solution is to glue 9mm ply stiffeners to the deck (for the winch) and between the beams and stringers under the deck for the masts. These all have curves sanded into them to match the deck profile.



An aside now for anyone proposing to try epoxy resin! I have already mentioned my 'slow setting' resin selection and how long it takes to dry. My experience with resins has been limited to glass fibre polyester resin and there, the quantity and mixing of the catalyst, although important, seems to be less critical. This might be because for polyester resin, the 'hardener' is a catalyst to assist a reaction to go hard, whereas for epoxy it is a hardener that needs to be thoroughly mixed throughout (but I am not a chemist!). Here, it seems that in spite of care to use the right amount of hardener, it needs to be very well mixed with the resin. I discovered this waiting an interminable time for part of the interior coat to 'go off'. In warm weather and in four days, it was still tacky, but only in the places where I used up the last of the mix I had made. The rest was fine. Apparently, if you do not take great care to mix the whole lot thoroughly, resin that you scrape off your mixing pot when it is nearly all gone and apply 'to avoid waste' might not be as well mixed with hardener... how do you get rid of tacky resin from inside a hull and crevices etc if this happens? The only solution, it seemed, was to mix up a new lot and apply over the tacky coat. It seemed to work this time, but I wish I had used polyester resin!

I also, at this stage, decided to bend up the strips for the upper deck edge rubbing strakes whilst I could place them in position and clamp to the hull stringers for shaping. When the deck is in place, clamping to let the steamed wood 'set' would be much harder. I did not have a long enough piece of mahogany to cut for these, so used plain hardwood strip as for the lower rubbing strakes. I have no idea what wood it is, it was a convenient size from a large DIY shop and has the associated quality: extremely dry and brittle and prone to cracking, but it worked OK. I will dye these to a teak colour – Sundowner was made of teak - before gluing in due course, so they are on the shelf for later. They have sprung back a little but the main bend is there that matters.



I did not have enough 1.5mm ply to make the whole deck from a single piece, and it seemed extravagant to buy a piece 1200mm x 600mm for this when I had enough acreage of ply but the wrong shape. I cut the deck in two parts and joined them where it will be easy to blend them together using doublers and by tapering the fit. The photo is an upside-down view and you can see the joint in the middle. The clamps at the bow end are securing the glued ply doubler to strengthen the mounting for the anchor winch.



The last job that I have discovered so far prior to gluing the deck down is to get the motor mounting sorted. I have collected a few bits to help: the motor itself and a universal joint, a 12-tooth pinion and a 21-tooth gear wheel (which took a while to arrive). These seem like odd sizes but they are what the supplier had and are nearly 2:1 ratio. They are cheap (so I can experiment) hardened steel gears with grub screws and unfortunately a 5mm shaft hole in each. They are 'modulus 1' in size so reasonably strong in case the propeller gets snagged (I may have to arrange for a sacrificial coupling somewhere to take account of this risk). The 'modulus' of a gear is the 'pitch circle diameter (PCD)' in millimetres (where the teeth make contact with the mating gear) divided by the number of teeth, so my 12-tooth wheel has a PCD of 12mm and has 12 teeth, and its mating wheel has 21 teeth and a PCD of 21mm. Thus, the gear wheel centre to centre distance here is 16.5mm. The key to experimentation and the ultimate suitability of the gears is whether I can soften them or not! Once I made a differential for a quarter size steam lorry using an old mini differential and this required me to soften the mini half shafts so I could cut and turn them to size...duly achieved with much heat (they are large comparatively) and slow cooling.

The motor is mounted on its stand via four M5 tapped holes in the frame at the output end, and it seems most sensible to make a gearbox to bolt to these and hence ensure a rigid and aligned motor/gearbox connection. If I make the gearbox from a block of aluminium – conveniently in stock – I can fill it with oil or grease to keep it quiet and free running. I also have some miniature ball bearings that might come in handy. The main task though is to see if I can soften the gearwheels (at least the hubs) so I can enlarge the hole: the motor is 0.25"!

Coming back to this instalment after having received the gears... I heated them up to red heat for a minute or two (after removing the grub screw provided that is) and let them cool naturally. In the lathe, I was able to drill out to 6mm and pass a 0.25" reamer through without too much difficulty. The gears still seem to retain a little hardness, all the better, but not enough to trouble a drill or reamer. Both still have sharp edges!

After a sleep-on-it (planning the next step is very productive prior to going to sleep!), I used some aluminium block and thick plate that I had to make a two-piece gearbox. This used the motor mounting bolts to locate it on the motor, with the motor bearing housing as a location. The piece of plate was fixed to the motor and the gubbins all locate in the block. I had some 0.25" ball races that came handy (they are easy to find and cheap anyway in case replacements are needed) for the output shaft that is also 0.25" (a piece of silver steel I had, unhardened, plain but for filed lands for the securing grub screws). I used Loctite retainer compound to hold the bearings in although they are a gentle push fit in the housings I turned for them. I don't propose to describe these any more being a standard piece of model engineering! The photo shows the two parts of the gearbox and the motor prior to closing. The screw on the top covers an oiling hole – I haven't bothered with a drain hole: the gearbox seems pretty sealed and I will use thick oil or maybe grease. It all seems to run OK with 6 volts on the motor and it did not get warm after 15 minutes running, so that seems satisfactory. I have also mounted the motor on some anti vibration mounts as you can see ready for the mounting in the hull. The gearbox lowers the line of the output shaft and this allows it to be lined up with the rather low propeller shaft. After measuring up for suitable



and removeable motor mounts, I have now mounted it in the hull and lined up the shaft. After another 15 minute run nothing got hot or vibrated, so I think it is OK. The red coupling that you can see is a proprietary coupling of 'standard design' and I think that any 'sacrificial' parts I make to break if the propeller stalls for some reason will be redundant as this coupling is plastic and brass where it matters and will probably shear first....

I can now, I think, glue the deck down...