

To fit a keel (the Spearfish story)

Spearfish is a 26 ft Cygnus Cyclone
launched in 1992



The engine, a 7.2 litre 260 HP V8 turbo diesel, had dropped a valve, sheared a piston and put a con rod through the block. Ouch!



Originally built to take a Stern drive, she was retrofitted with a surface drive. Note the small hole where the shaft from the surface drive emerged.

Need for a rethink. Decision time Junk all the drive chain, lengthen the hull under the swim platform, cut out the bottom and fit a full-length keel, complete with prop tunnel. Stick in a new big turbo diesel, somewhere amidships and with a down angle gearbox, a shaft, a prop and a rudder, convert power into motion. Easily said.



Step 1; put the boat in the boatyard.
Pay 6 months rent.



Level up and add lots of support.



Inside the old stern engine compartment, now sadly empty. Note the soon to prove problematic engine beds.



Remove all stern gear, exhaust, anodes etc and mark out the cutting lines with a permanent felt pen.



Under the stern hull this piece needs to go to make a prop tunnel. Beginning to cut with a 4-inch grindette



The deed is done but along the way involved the purchase of a 9-inch grinder complete with diamond cutting disk.



View from inside. Oh my God, there's a big hole in my boat! Next, only a few bits of engine bed to cut out. If only I knew.



Two weeks and about a zillion hours later the beds are gone at last. These were made up of two lots of beds, (from the stern drive engine position and then from the surface drive position). They comprising glassed over hard wood, ply and steel bonded one on top of the other and had to be reduced to matchbox size pieces using a grinder, saw, hammer and chisel. Phew! Next had to feather all of the edges of the hole ready to blend in the new piece. This is best left to last. Grind, feather, knock, chip, damn, curse, grind, feather, knock, chip, damn, damn, damn, etc.



A piece of melamine covered hardboard, cut to shape and waxed, lies near the stern, ready to be fitted as a former (mould).



The former is held in place by "springy" sticks of wood. This stops the hardboard coming loose when working on the boat.



Three complexes on top of two coats of Gel. Hey, now my boat would float again. If only I had an engine.



Removing the former reveals the new prop tunnel under the stern hull. Looks good.



Cutting out the old fwd engine bulkhead and ribs to make room for the gearbox. A new stern engine bulkhead will replace it about 18 inches further back.



New stringers and ribs, tied into the old system, reinforce the new prop tunnel and the old hull. Note also the removal and making good of the old intake/seacock/strainer



Meanwhile back in the old shed at home, the new keel takes shape. A melamine covered chipboard half mould is coated with gel. The 4 x 2's are adding just the right amount of twist (I hope).



The completed half keel has been removed from the half mould and rests in the garden. 2 x gel and 2 x complexes were used.



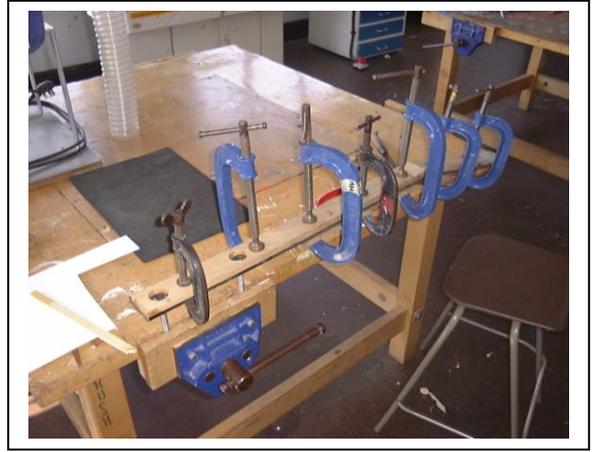
The mould has been reversed and turned over. This is now jugged up ready to mould the other half of the new keel. Using two sides of one mould ensures accuracy and saves cost.



The two halves of the keel have now been jugged up and joined with gel. Next step is to complete the lay up with 3 more complexes.



The keel/rudder skag is made of a stainless steel strip and iroko cladding. Two bolts are made captive by welding.



The composite skag is epoxy glued and clamped



The skag is glassed on to the keel shoe that is being laid up over polythene on the keel (upside down).



3 complexes complete the shoe and skag.



The complete shoe and skag, now trimmed up, lie next to the upside down keel, which is devoid of its protective polythene.



Meanwhile, back at the boat. Panels were cut from the swim platform to facilitate access. The 2 outer ones were saved to be glassed back in place later. A lip was glassed around the edge from underneath (upside down glassing – my favourite job!). Central hole will be a hatch.



The melamine chipboard and hardboard mould was built in situ. It needed very careful shaping to match the lines of the hull.



Softwood and chipboard were used to support the mould. The entire inside was treated to a couple of coats of mould release wax. The corners were radiused with plastercine.



Wood stringers underneath the mould keep it true. It took a full week of work (40 hours) to make the mould.



Sheet polythene keeps the mould dry. This was the most vulnerable stage of my outside building programme.



The first coat of white gel has been laid inside the mould. Note; here you can see the lip moulded around the cut out.



Five complexes later, the glass is now half an inch thick, minimum. Three of the four strengthening, glass on foam, stringers can be clearly seen.



The view inside the new hull extension, seen through the swim platform, shows that the stringers continue up the new transom.

Belt and Braces - 8 stainless bolts pass, low down, through the new hull moulding and the old transom.



The mould is off. Looks good

The view beneath the new transom reveals the new, substantial, prop tunnel.



Three coats of 2oz mat overlay the top of the new hull, bonding on to the swim platform and matching the existing structure.

The new lines are clearly seen in this overview.



The deck has been cut open, with a sabre saw, to make a new 4-foot wide engine hatch. Deck beams were cut long, so as to support a gutter system.



The boat has had the supporting blocks under the keel removed and replaced by blocks and barrels offset to each side.



The really nervy bit. Cutting the boat open, down the middle, underneath. This is the slot for the new keel. The old keel as well as ribs and supports inside were all cut away. The boat didn't move but it was a scary time.



The new keel is in (note the shoe along side). The keel was fitted by pouring gel from inside to fill the gap between it and the hull. A fillet was formed on the outside of the joint by using masking tape as a mould.



Inside, four complexes were laid over the joint and then tapered away until they reached the stringer. The top of the keel had a tapered lay up to also allow for this.



All in one shot, the hull extension and new keel with the shoe underneath. In the foreground lie the discarded pieces of hull and deck. Texas Chainsaw Massacre or what?



The new keel (white on the right), stopped short of the bow (left), leaving a step. This was done so as to avoid cutting out a slot in the hull beyond the forward watertight bulkhead.



A false keel is to be moulded to fill in the step forward of where the new keel stops. Parcel tape covers the remaining stub keel prior to moulding. This enables the false keel to be removed for final glassing and eventually gelling in place.



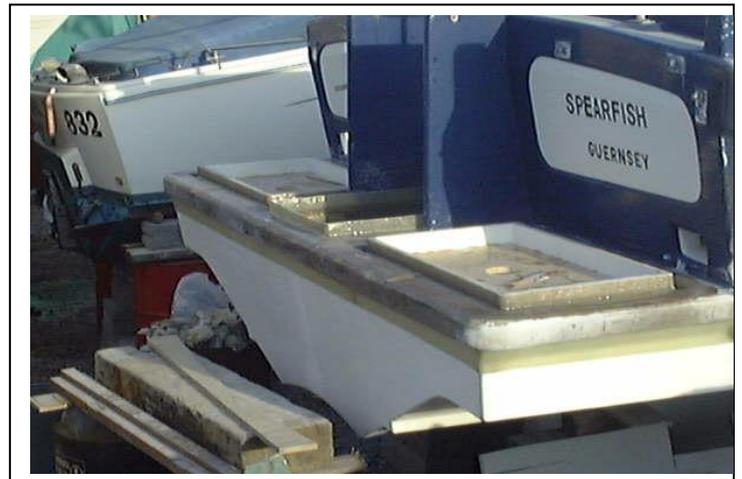
The false keel insert, now complete with laminated plywood filler piece has been removed from the hull for a clean up and application of the final GRP layers.



The false keel is now shaped, sanded and gelled. It was fitted in position and secured by bonding with wet gel – a very messy job. Fits well and looks good though.



Meanwhile back on deck the side gutters for the new deck hatch are being fabricated. The new engine bulkhead is already in place. Note, in the bilges, the glassing over (boxing in) of part of the new keel, leaving just a sump.



Out back the swim platform was due to have the cut outs glassed back in place. However, change of plan. Three wood/conti-board/parcel tape moulds have been used to facilitate glassing of a lip around the 3 openings prior to fitting some new bolt down hatch covers.



The old engine hatch (upside down) was cut in two. The piece nearest to camera is to be reused.



The old engine hatch (now the fish/gear hold hatch) with the new half-inch shuttering ply piece spliced in place.



Two of the three new swim platform hatches. Half-inch shuttering ply with a temporary formica /chipboard shutter is glassed 2 x 2oz underneath. After removing the shuttering, 4 x 2oz glass is laid on the top (deck) side.



The finished hatches (minus Gel coat), in position on the swim platform. These hatches will be bolted down and will sit on rubber seals. The starboard side has the boarding/dive ladder through bolted.



The new engine hatch is made from 90% of an 8 x 4 sheet of half-inch shuttering ply. Shown is the sheet with formica edge shuttering in place. Getting the curve to match the camber of the deck is tricky. Six coats of glass will finish the job.



The two hatches in place on the deck. Note the new "home made" heavy-duty flush handles.



Just arrived the rudder assembly was a complete custom kit from Lancing Marine. The BIZ.



One 370 HP Cummins + Twin Disc 5050A gearbox straight from the factory and now residing in my shed. Brmm, Brmm, Oh Yeah!



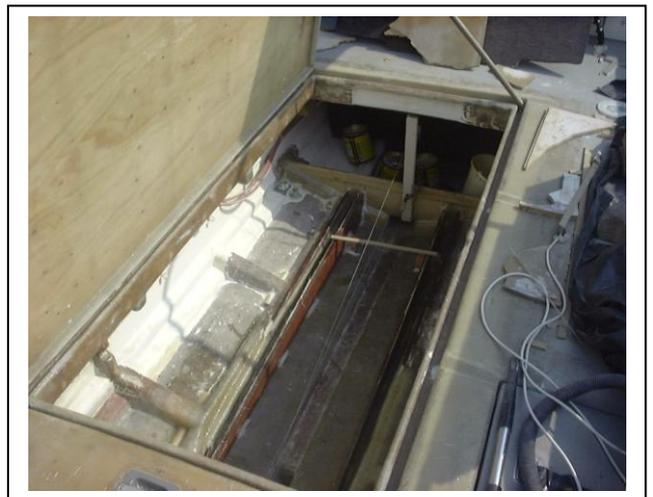
The engine hatch has been hinged (temporarily). A small half bulkhead has been glassed in which will catch the front of the engine beds. Most of the work done here, however, is unseen. The under side of the new gutters have been filled and glassed. Two days of upside down filling and glassing – great fun!



String lines everywhere. Lines for the prop shaft and engine beds were checked and rechecked. The new engine beds are box section, made from 20mm heavy-duty hardwood ply.



The beds were built on top of an existing stringer, but the back end needed a slice taken out to suit the engine angle. Note also the remains of the old engine bulkhead (forward of the battery switch panel), which has been ground, filled and glassed.



An over view of the whole engine bed area, now with the inside of the box ply beds glassed over. These will have a ply top (to complete the box shape) but with steel plates added as well.



The complete keel shoe (upside down) sits alongside of the boat. The bow end has been added since completion of the forward false keel (see page 9).



After gelling and sanding the outside of the keel shoe it has been stuck on with mucho wet gel. Lots of little bent sticks apply steady pressure after an initial shove with two hydraulic jacks.



The ply tops of the beds are bedded down on gel with the 20mm steel plates bedded on wet mat.



3x3 layers of 2oz give a 9mm covering to the beds. Matting edges were staggered eventually covering the whole engine bay.



Inside the new rear compartment the GRP rudder tube has been fitted, strengthened by plywood knees and a plywood shelf. Shelf provides a base for the new hydraulic steering cylinder



The mad axe man (diamond grinder man) has been at work. The old wheelhouse over hang was very practical but never looked quite right to me, so I cut it off. A new cut and shut smaller version is now in place. Various rails/masts/hand holds etc have all been temporarily unbolted or permanently removed (by sabre saw man).



The cockpit sides of the flybridge have also been given the diamond disc treatment. They now slope downward astern. Pipes are flybridge steering hydraulic hoses, which normally reside inside the hollow GRP ladder.



Various parts of the flybridge moulding (3 separate pieces are shown here) needed to be cut and shut. Gel is used as the bonding agent and filler, and then later a few layers of 2oz will strengthen the joints.



Here the composite piece from the previous photo is shown in situ. as the capping to the cut down flybridge cockpit side.



The new lines of the flybridge are seen in this overview, but minus the mast and towing poles etc it is still hard to visualise the final effect.



Where the wiring, cables and pipes ran, under the flybridge moulding, used to be a right mess, nothing dangerous just untidy. Now I've fitted some plastic pipes and although you have to stand on your head to see then, they do make the difference.



The underside of the flybridge dash also looked messy with wires, cables and pipes all clipped and cable tied but still visible. Not any more they're not. Three new mouldings hide them away. Only two whole days work – aaarrghhh!!!!



A new aluminium mast (tube hoop) was built around a temporary MDF jig, ready for welding. In the background is the ladder frame that required some serious repair following "modification" by another boat while I was moored up last year.



The stern gear came from Lancing Marine although the shaft and prop were sub contracted to Clements. "Blue" shaft is just a protective cover. Front seal is a carbon jobbie and the prop is nibral.



The underside of the new shorter roof overhang has had a GRP liner made. Took forever but certainly looks good



The swim platform hatches are finished with a non slip surface created by thickening gel and using an artex roller. Note 4 bolt downs.



The new welded aluminium hoop has been bolted to the new roof overhang. Cables run totally inside the tubes and pass through the roof then via the new plastic pipes under the flybridge sides to emerge sight unseen in the wheelhouse. Neat.



Centre panel on the swim platform is now hinged and the newly rebuilt ladder is insitu.



The finished gelled out engine compartment. The drill is being used to power a boring bar that was used to cut a path for the glass stern tube.



The boring bar is seen here inside the keel in the rear hold. A cut down grinding disc was attached to a piece of studding driven by a drill. Clever stuff but still very slow, like it took all day.



Once the hole was bored the glass tube was slid in place and the keel backfilled with off cuts and slow cure resin. An inspection hatch allows access to the front end of the stern tube so as to service the seal.



The keel is filled and overlaid with a few layers of mat. Ribs and stringers tie in to the existing structure. The inspection hatch now has a lid.



Where the hole bored for the stern tube broke out through the side of the keel a tapered overlay of eight layers of 2 oz mat was used to strengthen it. Multiple layer of gel repeatedly sanded has left an almost invisible streamlined bulge.



Engine bay now has the stern tube, shaft and coupling fitted. The plates are epoxy coated steel mountings for the engine feet to be tapped into. Each plate is held down by 4 x M10 stainless bolts tapped into the plates set into the beds.



The undersides of all of the hatches were cleaned and new neoprene seals fitted. The new gear hold hatch has been gelled but the engine hatch still needs some further reinforcing and so is only gelled around the edge.



The big moment arrives at last. In goes the engine.



Snug as a bug in a rug and yes it does line up.



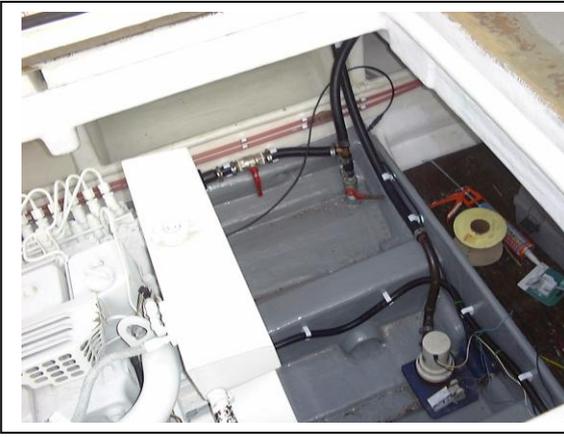
The rudder is now fitted in place; note the neat bottom bearing (made by me). The whole lot is made of 316 (A4) stainless but it has all been epoxy coated to form a base for the antifoul.



Under the central hinged hatch in the swim platform the top end of the rudder assembly is also complete. Bronze tiller arm faces astern. Note rudder stops, greaser and through bolt for emergency tiller.



The inspection hatches for the built in fuel tanks were removed and the tanks cleaned. A new outlet and master shut off valve was installed in each tank.



My big old trusty 1500GPH Rule pump plus auto switch was mounted in front of the engine, pumping out in an emergency through a new hose and skin fitting. Also the deck wash pump can now be used to empty the sump via the new tee junction and valve system.



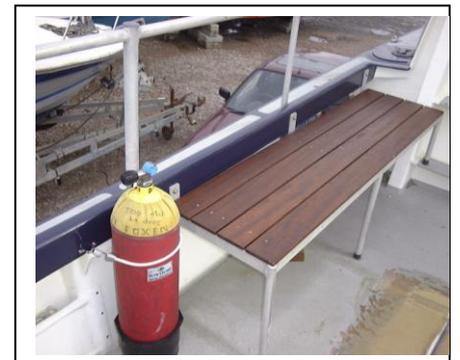
The 3 main battery switches on their panel were refitted next to the battery compartment in the new engine bay. Wiring runs inside the 2-inch plastic pipe. The majority of the electrics needed altering or replacing. Note gear cable next to exhaust bend.



All of the dark blue was repainted with 2-pack polyurethane. Took all day to mask up. The new extended hull has been epoxied. Note transom mounted high-speed transducer.



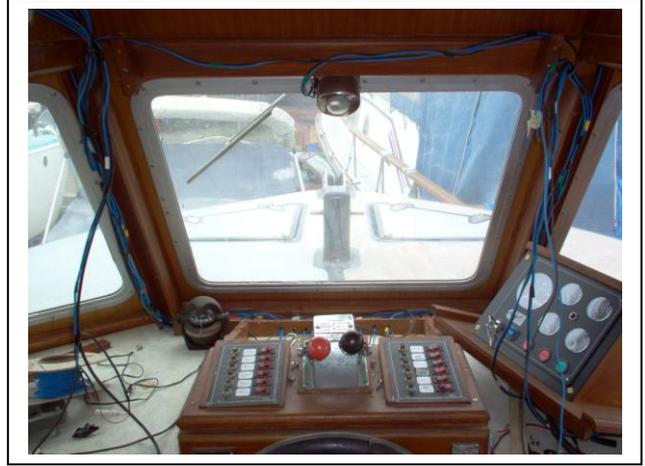
The overview showing new keel, hull extension, reshaped flybridge, cut down roof overhang and new mast/frame.



It's the little jobs that take the time. The carbon seal from Lancing didn't have water injection. It does now. Take one A4 stainless M12 x 50mm bolt plus penny washers, lathe turn and drill then weld and hey presto, one water injection skin fitting. Next job was to make a copper earth-bonding strap to bridge the R&D coupling. Needed; some copper sheet, tin snips, drill, solder and blow torch. Job done. Back on the boat the old deck seating needed renewing; Iroko planks, stainless screws, gorilla glue and 4 coats of Danish oil. My diving tanks are now held in place by new stainless saddle clips and stainless ended bungee straps. Cross 4 more jobs off the list.



The new rear gear hold has had some gas rams fitted whilst alongside on the deck are the newly modified beaching legs. They were lengthened to compensate for the new deeper keel.



The wiring needed substantial reworking. The new instrument panel was a plug in but the flybridge panel, including alarms, couldn't be piggybacked as before so had to be rewired from source. In addition the new mast meant a rewire of all of the lights and aerials.



The foredeck gel finish had suffered some wear and tear so rather than trying to patch and match I decided to renew it all. Port side has already been part done with a base coat of grey gel whilst the starboard side is in the ground off state.



I added 2 new 55W marine floodlights onto the mast plus a new low tone marine horn.



Final touches to the rewiring of the wheelhouse saw a new matt black surround to the built in overhead instruments panel. I also designed and made some new switch covers (blue & white) using CAD/CAM. Note new steering wheel (Christmas present to myself – 2004).



Engine installation components all came from ASAP Supplies. Six inch exhaust hose, muffler/waterlock and transom outlet. Fuel hoses, Racor 900 MA filter, plus lots of fittings. Two-inch water inlet valve leads to a gunmetal filter housing with DZR fittings. Yet another second mortgage job!



The new rear gear hold has had some of the floor glassed over and a specially moulded support bonded in so as to mount the vetus muffler/water lock. Note also the grp tubes passing through the bulkheads. Had to make all this myself.



The finished article. The muffler is held in place by home made stainless clamping bands. Exhaust tube will be sealed into grp tubes to maintain watertight integrity.



Inside the engine compartment the hose clamps to the injection bend.



Out back the transom outlet was sculpted into the transom and the hose routed up and then bent down through the grp tube in the bulkhead to join on to the muffler. Bending 6-inch exhaust hose – piece of cake –NOT. This job was a total pain in the arse.

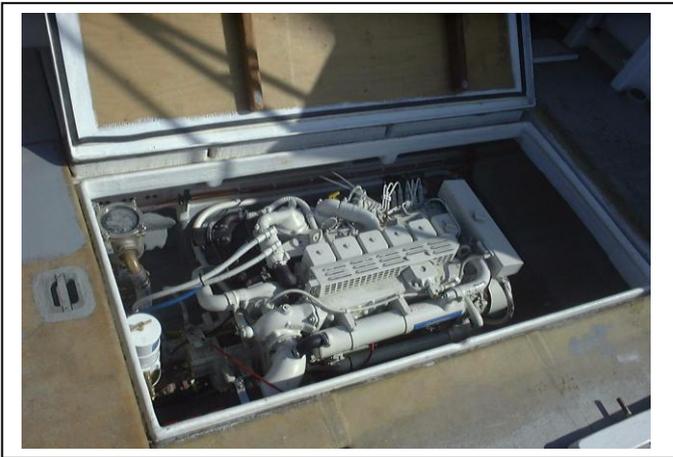


The 2-inch diameter intake system fits really neatly. I modified some stainless brackets and bolted it to the bulkhead. New DZR valve sits on top a new gunmetal high-speed scoop (small pic.). This scoop was a special order and is absolutely the biz. Can't see this baby overheating!



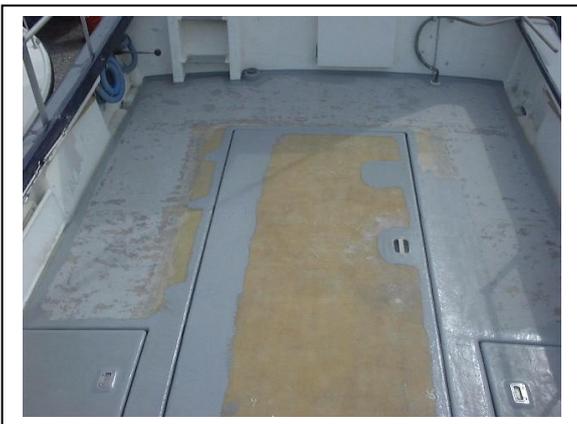
The Racor 900 MA fuel filter is bolted to the rear engine bulkhead and plumbed in with 15mm copper tube. Yellow flexible fuel lines are the extremely expensive half-inch CE/ISO rated ones. Blue hose is the carbon shaft seal water feed.

The overview of the rear engine bulkhead shows how neat and accessible everything is.



Connected up a fresh water hose and ran the engine. Found a small water leak but otherwise perfect. Fixed the leak and did a second test. Estimate 3 weeks to launch.

Another of those annoying little jobs. The bilge pumping hose wouldn't stay down in the sump. I made an end fitting with a lead sleeve, shown here, about to be consigned to the depths. Good solution – worked well.



I ground back all of the remaining deck gel, so as to match all of the old with the new. Some of the edges have already been masked and covered with two coats but the rest needs doing. If only it would stop bloody raining.

It did stop raining – briefly. Took a whole day to mask up and gel first coat and then another day to do the same for the second coat, but it was worth it. Neat or what?



The hull was originally treated with a copper/epoxy mix called Copper Bot. This provided protection and anti foul. After 11 years it was losing its effectiveness so I decided to redo it with the same product now called Copper Coat. Unfortunately I had to sand the old surface to get a key for the new. One weekend plus 3 hours every day after work for a week saw everything sanded using a random orbital sander with 60 grit discs. That was one mother of a job. However, one sunny day saw half the hull coated with 4 coats of the new copper coat. Just the other side to do and hopefully no more anti fouling for another 11 years.



Eventually was able to finish gelling the fore deck with the non-slip pattern. April showers – bane of my life.



The fishing registration numbers had to be removed after I sold my license, so I fired up my CAD/CAM machine and made these instead. Not sure if it's exactly legal but I like it.



The rear hold already had a ply floor and now I decided to add some boxing in of the sides and over the muffler. You can now chuck in any old stuff without fear of damage.



Had to wait nearly a month for 48-hour forecast of dry weather so I could epoxy the last half of the hull. That's about it. You never completely finish but got to get her in the water and test that motor!



Out of the boatyard and awaiting launch. Two years and two months after the original engine went bang. So much for "6 months" work!



About to go in the water using Marine and General's new 75 tonne hoist. Fingers crossed. Strain gauge read 10,000 lbs (4.5 tons).



In the water. Hooray!