

# Cargo Proa Prototype

## Building Blog



### NOVEMBER#1 2021

The to do list has taken a hammering. Another couple of weeks and it will be ready to ship, although due to shipping constraints, it probably won't leave until mid January.

Rassy has finished and installed the rudder hardware, installed the steering push rod mounts and built the push rods and kick up levers using tow in conduit. Looks like it will work.

The ww hull and the ends of the lee hull are glassed below the water and mostly copper/epoxied. Turning the hull so the painted surface was horizontal was fun. I dropped it a few inches/cm onto the corner of a 2 x 4 (50 x 100mm) piece of steel. The hull flexed a lot, left a mark, but no damage. Hopefully a similar result if it sits on a rock or coral. Putting copper and epoxy on horizontal surfaces is a dream, verticals, a nightmare. 25C of sunlight and it heats up to 75C, which makes it hot work.

All the ribs are made for the wings. Boring, but pretty quick once I got the wet out machine and moulding worked out. I ended up making the leading edge ribs separately to the trailing edges.

Took longer and will require gluing them together, but the results are better and gluing on the glass leading edge will be easier. Made a few more leading edge sheets, 'only' 14 to go.



Building wing battens

Ordered the sail cloth for the wings. \$Aus 560 / \$US420 to cover 2 x 50 sqm/5550 sq' wings fulfills the 'must be low cost' requirement. The f'glass leading edges are 20 sheets of 1.2 x 2.4 sqm x 1.5 layers of 400 db glass. 36 kgs/80 lbs of glass at \$AUS150 and the same weight of resin

\$Aus450. There is about 28,540m/10.6 kgs of tow (\$Aus 300) and similar of resin \$Aus130, total composite materials near enough \$Aus1,000, plus the sail cloth = \$1,600. A few bits still to make, plus some string, about \$Aus2,000/\$US1,500 all up and about 50 kgs/110 lbs each. Not bad, if they work and don't break.

The telescoping for the masts is pretty much done. The 300mm/12" dia 3rd section fitting into the 400mm/16" bottom section looks ordinary, but should work ok. There will be issues with the wing attachments going over the join, but not too hard to fix. The big problem was making the bearings so the top mast could be inserted in the top of the bottom mast, and telescoped. The bearing areas need to be accurate (ie turned on a lathe) for there to be a reasonable fit. I ended up with a pretty messy fix, but it solved the problem without a lathe. The other mast is the second section (350mm/14" diameter) into the bottom, which is a better fit and easier, except the bearing/bury is 1.2m/4' down the inside of the mast so only one shot at installation. Both will be done differently next time.

I have had a couple of emails asking what is different about the cargo proa build.

Low cost:

About \$Aus50,000 materials to sailing stage.

Light weight: Not sure how light, but we have used a tonne of resin, which implies about 3 tonnes all up, which is an order of magnitude less than any other 24m/80'ter. This works out about \$Aus17 per kg/\$US6/lb, including consumables and a fair bit of carbon. 2 winches, blocks (we are making most of them) ropes, safety and nav gear etc are not included yet.

Quick build:

16 months of 2 old age pensioners working 8 hour days 5 days a week and occasional student help. Another 2-3months to paint and assemble. Includes hulls, rudders, 8m tender, toybox, telescoping masts and wing sails, a heap of testing and several abandoned rabbit holes. Unstayed non rotating telescoping masts built with pultruded carbon strip. Cambered telescoping wing sails. Beams attached to the masts to reduce loads and lee hull height 3 piece lee hull, due initially to shed length, but it made mast installation easier and transport via container possible.

Canted, raisable leeward hung rudders supported by the chine for light weight, minimal drag and some lift. A simple kick up release mechanism which is independant of the rudder load. Push rod steering operated by a whipstaff which can be used anywhere on the boat. The front rudder is

used to luff the boat, the rear one to bear away. In tight maneuvers at low speeds, the rudders can be set vertically and both steer in both directions. Solid glass hulls with thin skins. Tougher, heavier and cheaper than foam cored, but flexible. We have overcome most of this with furniture, stringers, frames and small panels. Infused flat panels with integral male/female joins for almost all the components.

Simple, cheap, near idiot proof (ie, works even if the sheet is cleated, tangled or being stood on) pitch or heel operated sheet release. There is lots to go wrong or not work the way we thought it would, but the build is easy enough that fixing problems will be a relatively simple task.



Copper on WW hull



Lower mast preparation for fitting top section





Mast top section support ready for fitting



Rudder lift points



Proto type wing sail



Wing test 1



Rudder cases mounted



Wing test 2

## November#2 2021

From Rob Rassy:

**A**nother wet week passes, as work continues inside the shed and WW hull. I managed to finish sanding the 2nd side of the rudders and spent some time on the push rod steering system. Rob as usual has been industriously knocking off a heap of jobs and doing some experimenting with ideas he's been thinking about as well as working on the fishing canoe. Not too bad at all, considering we are now only working 4 day weeks till the shipping is organized and the containers arrive.

We borrowed a set of accurate crane scales and weighed the bits. Lee hull ends incl rudders (2 x 125) and middle (310), ww hull (350), beams (2 x 82), masts (2 x 122), wings (2 x 10 x 4.5kgs) and rudder blades (2 x 32). The toybox and 8m/28' tender were not weighed, but bathroom scales say 150 and 250 kgs. Total is 1,880 kgs/4,200 lbs. Strings, blocks, winches, o/board, safety and nav gear to come, but looks like <3,000 kgs/6,600 lbs ready to sail. Materials cost \$AUS50,000/\$US33,000.



Rudder case addition



Working on bunks



Inside WW hull



Steering testing 2





Steering testing



Canoe sides



Watch your step



Bonding on side



Sanding 2nd side



2nd side on

The fishing canoe weighs 11 kgs, with another couple to add. Should be able to be carried down the beach solo with a shoulder strap. With 5mm foam instead of 3-20mm, and 200 gsm glass in non impact areas, we may get the next one down to single figures. Will find out how it paddles next weekend, maybe do some stability/erighting testing if the weather is warmed. It has acquired the nick name FLIT. Funny Little Thing.

## November#3 2021

**W**hy assemble and launch the cargo proa in Fiji? Launching here would cost a lot. A 24m/ 80'ter is an expensive beast to truck, store and launch in this part of the world. Worse is that it needs to be registered which requires a survey, for which engineering data and design studies are required. The cost of this, in time and dollars is crazy. The alternative is heavily subsidized shipping to Fiji, free storage, workshop, launch ramp and mooring on the shores of Laucala Bay, the potential for a lot more publicity than I can generate here and officialdom who want to help rather than follow rules for steel ships. The wait is a nuisance and I am sure there will be drawbacks to Fiji, but at the moment it is a no brainer.

I've had a few emails from people wanting to help and/or sail on the boat. All are welcome, but the priority will be to get the boat launched, tested and operating. Beyond that, I will do whatever I can to facilitate volunteer workers, test sailors and visitors generally.

Fiji is a great place to visit, is desperate for tourists and will make you welcome. Please get in touch if you are interested.