

Cargo Proa Prototype

Building Blog

FEBRUARY 2021

Not much big picture stuff happening but plenty of testing and working on the unfinished loose ends. Rob R took the photos and videos, and wrote the following: We've been breaking a lot of things lately and I don't mean the vac pumps though the casualty rate there is getting pretty high. The breakages are the result of testing, which was totally planned to happen. On Monday the 18th we retested the original truss sample after adding a vertical support to stiffen the end to make it more realistic to the actual beam situation. The result was a broken web member which had only distorted badly in the first test. With that little diversion out of the way we continued working on all the other projects Rob has on the go.

I set about finishing the build on the new designed to fail, scaled test beam. It was due to be tested on Thursday and needed to be post cured prior to testing, so the pressure was on. The beam assembly proved quite easy and was completed with time to spare. Meanwhile things were not going so well on the infusion front, a hull side layup got ruined (edit: it will be used for bulkheads, so not a complete disaster) when the pump stopped working after every one had gone home. Also Rob was unable to get a vacuum on the stub mast layup so it had to be pulled apart and the mould recoated with resin. (edit: an opportunity to simplify the construction) On a more positive note I have started on the mould we will possibly be using to build the actual beam. It will be used to make a test piece first for practice and to iron out any bugs with the infusion process.

Thursdays test went to plan and has given us the confidence in the engineering calculations to commence the actual beam build. The engineers have given us some material dimensions as well as design dimensions and a load of 200kg as the point of failure. Well! we must have done the build properly and the calculations are correct, because that's almost the exact load that it broke at. A fluke! I think not! Martin seemed very happy with the result, commenting that we could have a lot more confidence in the numbers now. As the 200kg load was applied and the severe distortion set in clicking and cracking sounds could be heard as individual fibres failed loading the remaining ones more and more till the trickle became an avalanche and the point of catastrophic failure was reached creating a loud crack and the sudden

dropping of the load.

To be honest the beam tested wasn't exactly built to the plan as we couldn't stop ourselves from trying new ideas and making improvements. As can be seen in the photos the top web was replaced with a single piece layup, saving a lot of time, effort and it appeared weight as well. We concluded the top would be in tension for the test so no cross reinforcing was included. We are calling this part of the beam "The walkway" and if it ends up being part of the build it will have cross strengthening where the side web meets the top members. There will be no diagonals as they will be replaced by the walkway. When the load was removed from the broken test beam it straightened up and was able to lift the 20 kg. load tray proving the top and web were still intact and only the lower member had broken.



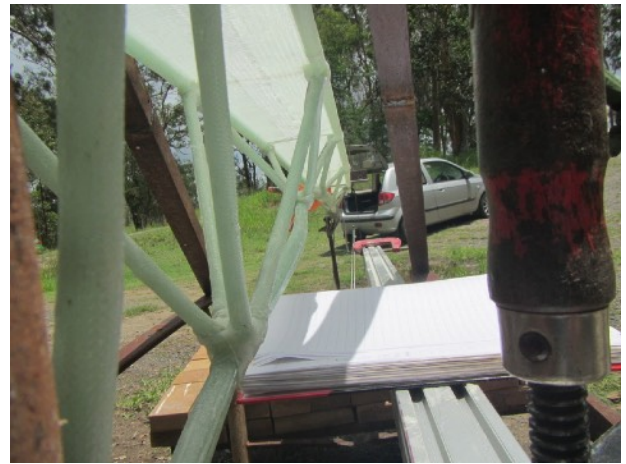
Breakable beam in test rig



Ready to load



Aprox half design load



Lower strut distortion



Recording data



Massive distortion at designed failure load



Close to design load



What happens when the web spacings are too large



Crack bang and the load drops to the ground



The repair



The damage



Will it come back straight



I have since repaired the damage with the intention of testing the beam upside down to see how the walkway and beam behave under negative loads. The pictures tell the story, the load was 1/3rd of the right way up.