Junk Rig for *Ingeborg*, Part two
Fitting the mast step and partners

by Arne Kverneland

With the sail finished (Jan. 2015), it was time to set to work on the hard bits. Job number one was to fit the mast step and partners. The mast cap and mast partners were welded up for me by a local aluminium supplier, Ryfylke Aluminium, who also supplied the tubes for the lower mast, boom, yard and battens.

20150321. The mast cap and partners, mainly welded up from 5mm aluminium.

I had hoped to get Ingeborg under sail this year, but a long cold spring, well below epoxy temps, plus life in general, slowed me down.

**The mast step**

Finally, with temps above 13°C, I could start on the mast step. As always, I made this one from several layers of plywood, set in epoxy. My preferred method today is a slightly refined version of the mast step used on my early boats, *Malena* and *Johanna*: I started by making a separate *mast sole*, without a mast hole in it. On top of that, I fitted the *mast step*, which is not quite as wide as the mast sole, and which allows me to trial-fit it with just a couple of screws and check the mast rake before screwing and epoxying the step firmly to the sole. With correct mast rake ensured by this mast step, I can make the partners neater, with only 20mm clearance for the wedges.
20150820. The top of the water tank has been cut away and the first template for layer one of the mast sole is finding its place.

I started with the first template layer with a pilot hole to help to align the layers of mast sole and step. Fortunately, Lundsvågen Båtforening has a service pontoon only 20m from its members’ workshop, which makes it easy to work and trial fit layer by layer of the mast sole (6 layers of 16mm birch plywood).
The key is to make all the layers fit closely to the hull with gaps being in the order of 2 mm or less. (..too wide gaps may make the epoxy ‘cook’ - guess how I know that...).
With the first layer taped into position, the next five layers were shaped, one after the other. Each layer was simply locked to the one below with two short wood screws. Later, these screws and the holes left by them made it easy to re-assemble the mast sole correctly, now with epoxy in between each layer. Note that the hull had previously been gone over with a little angle-grinder, to ensure good bond (...remember to bring a vacuum cleaner on board when an angle grinder or sander is to be used...).

20150826. The dry-fitted bits of the mast sole and mast step.

I then took the bits home to coat them there. The individual layers of the mast sole was only coated, while the 3-layer mast step was glued together now.

20150830. The 6-layer for the mast sole and the 3-layer assembled mast step. Note the notch in the (inverted) mast step, which, when fitted will work as a drain hole.
After coating, all the bits were wiped over with water diluted household ammonia to remove the waxy feeling surface.

20150912. The mast sole epoxied in place with the mast step not yet aligned or secured.

There are many other ways of making a mast step. If you are used to work with GRP, you will probably prefer to build up the mast step from that. Be my guest, but just remember that where this way of making the mast sole and step may look like overkill; to have a mast step come loose (or the mast jump out of it) is one of the last things you want to happen. That would turn the big mast into the mother of all can openers. I just mention it...

**Fitting the partners.**
Whenever possible, I prefer to put the mast through the foredeck. I feel this is the easiest way with respect to strength and ease of installation. The drawback is that the mast often has to pass through the centre of the vee berth sitting there (as it does on Ingeborg...). I like to make the partners from metal. These days I have both the partners and mast caps made from 5mm aluminium (photo p.1). Aluminium is easy to work with and the bits come out lighter as well.

20150818. Ripping away some of the inner liner gave a surprise...
I started with cutting away a square section of the inner-liner to give room for a backing plate of plywood. It came as a surprise that the deck was not a normal sandwich deck, but was single skin with strips of plywood plastered in place for extra strength. That added some extra challenges when fitting that plywood plate.

20150819. Dryfitting the backing plate. Note the nail through the pilot hole.

20150911, The dreaded moment - cutting that hole. This is the point of no return in the process.
With the deck being so flat, there was no need for filling up with plywood pads under the flange. If the deck is of the sandwich type, the edges of the mast hole (and bolt holes) should be well coated with epoxy.

20150912. Epoxying and clamping the backing plate in place. I also used temporary wood screws.
The uneven deck thickness meant that there were high spots and low spots between the deckhead and the backing plate. What I did was to ensure there was plenty of epoxy to fill the low spots where the flange bolts were to come. Further out I just added a number of high pads of thick epoxy. Then the whole lot was clamped in place and left to harden. I only drilled the holes for the 8mm (hot dip galvanised) bolts after the epoxy had hardened.

I use these backing plates mainly to spread the crushing pressure from those bolts. This is most useful when the deck is balsa sandwich. Above deck, each bolt was carefully covered with Sikaflex, and later painted over with 2-pot polyurethane paint. I suspect the backing plate could have been made much smaller in most cases. However, it is good to know that this kind of partners never have given problems on previous boats like *Malena* and *Johanna*.

![20150912. The bolts in place.](image)

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![20150916. With the mast hole well secured, Ingeborg was left to herself until next spring...](image)

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Next chapter will be about making the hybrid aluminium-spruce mast, the aluminium battens and yard and rigging the whole lot (summer 2016).

I guess I may even add a forth one about test-sailing and adjustments - sometime...

Stavanger 21.5.2017

Arne Kverneland

PS: At the time of writing this, Ingeborg is operational with the new rig, after overwintering in her berth.

PPS: My English appears to get worse and worse. Thanks a lot to Slieve McGalliard who proofread the text for me. That must have been quite a struggle.

( PPPS: Part One of Junk Rig for Ingeborg can be found here: http://goo.gl/TZSM62
I nicked it from JRA Magazine 72... )