

Small is beautiful!

Re-rigging Broremann, my Oslojolle with a junk rig

..an illustrated summer letter to the Yahoo JR group ...



Before...



..after...

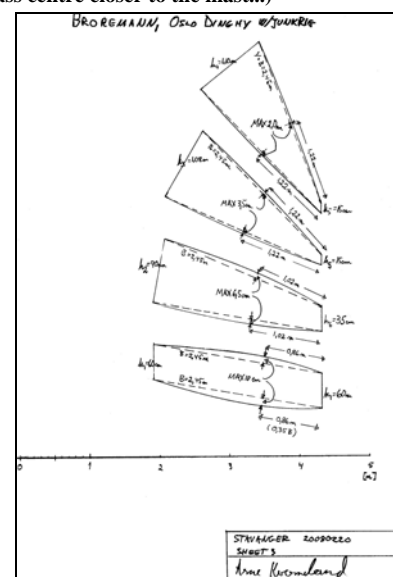
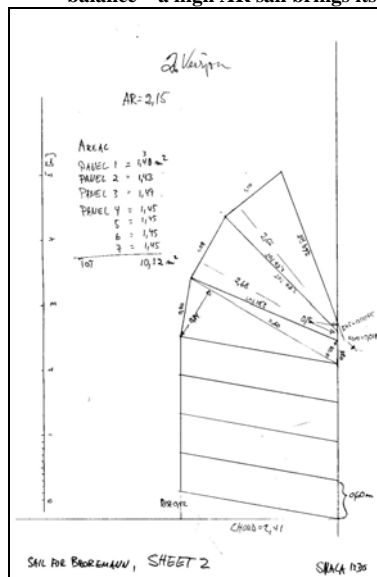
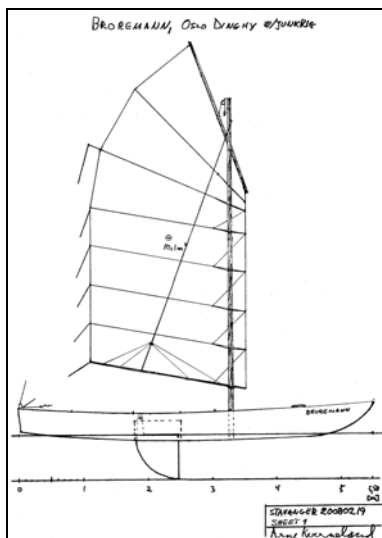
Hi folks!

During late winter and spring I have worked on and off to re-rig my 18ft dinghy, *Broremann*, from a 9sqm Bermudian rig (BmR) to junk rig (JR). During the process I took a number of photos, illustrating the process.

Sail plan

There is nothing new in this rig, compared to the rig of my *Johanna*. The main challenge was to scale the sail down and avoid making it too heavy. Unlike *Johanna's* sail this has a higher aspect ratio (AR= 2.15).

(..I generally find these moderately high AR sails to be easier to hoist, reef and tweak to a nice setting than the low AR sails. I guess it has to do with weight balance – a high AR sail brings its mass centre closer to the mast...)



The sketches that the sail is built from

(..I have added the sail plan in full size in the appendix. There you can study it in detail...)

As can be seen, the cb. of *Broremann* is far aft, so this brings the sail area unusually far aft too. When it actually got to rigging the sail, I moved the mast another 25cm aft – to the original BmR position. More about that later.

Finding the stuff to make the sail from

My attitude to sail cloth is that next to anything will work, so I just went up to sail maker Mathiesen and had a look. There I spotted a big roll of some fairly light, very soft – and extremely slippery stuff, nylon I guess. Unlike Johanna’s sail it was not coated, so any cutting would have to be done with a hot-knife. The main thing was that it was cheap and available then and there. In addition I bought sufficient 30mm webbing for bolt-rope and hoops, and some thinner webbing for batten parrels. Yes, and a big bobbin of thread. In another shop I got tailor’s chalk and a length of red ribbon to use as telltales. That’s about all.

Cutting in canvas

A serious asset with the cambered panel JR is that one only needs floor space for lofting one panel at a time. In fact, I never saw *Broremann*’s sail full size until I hoisted it. All I needed was to make a little plywood platform in my living room to cover the carpet, and go to work.



..Panel 6 about to be chalked up...



..one pattern enough for four panels...

The procedure of making the sail went like this:

I started with the lowest panel, and sewed the next to it as soon as I had cut it out (**Note 1 suffix**). When panels 4-7 were sewn together, I put this lower section aside and made the top section, starting with the top panel. Finally the two sections were stapled together and dragged to the sewing machine for final assembly. The batten pockets were fitted last.

The canvas soon proved to be rather unwilling to cooperate: No felt tip pen worked on it, and neither did masking tape nor any other tape. Luckily it was quite “dead” so it was easy to pin it down flat on the floor. The solution I found was to make full size patterns from painter’s paper. With the pattern pinned down, I could fairly easily mark up the panels with a tailor’s chalk - the only thing that would show on it.

(.. on the photo to the right; on the two lowest panels I tried to add a bit (25mm) rounding to the luff too to add camber. No success, but no big harm either. I just had to make a makeshift “broadseam”, a tuck really, to tighten the luff about 0.5cm. I’ll not try this again...)



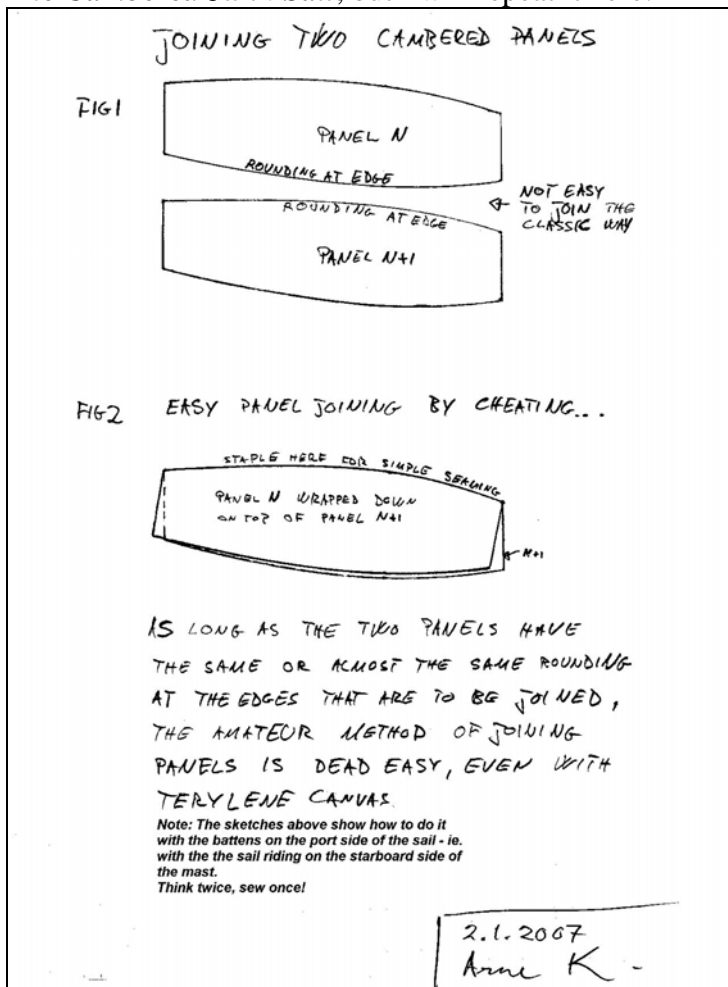
..panel 5 cut out and marked up for sewing. Note the handy 25mm spacer, next to the hot-knife...

Panel 5 was actually the only panel I made from two jointed pieces of canvas. With this slippery cloth I found that process so difficult that later I just drove up to the sail maker and bought a bit more canvas instead. Nice to have a local supply! All the panels were marked with T1-T7 on the starboard tack corner to keep me from screwing up at assembly. Also, although this canvas was not coated, one side was just a bit shinier than the other, so I took care to use the same side up. Actually, Panel 5 was also given a bit luff rounding, but only 12.5mm so didn't hurt.

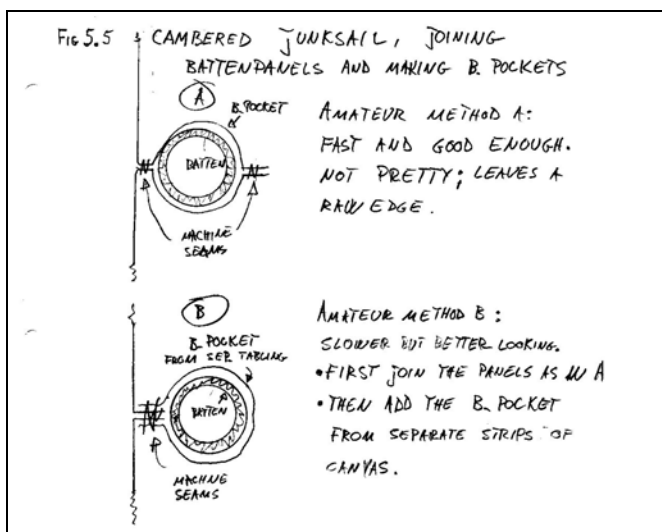


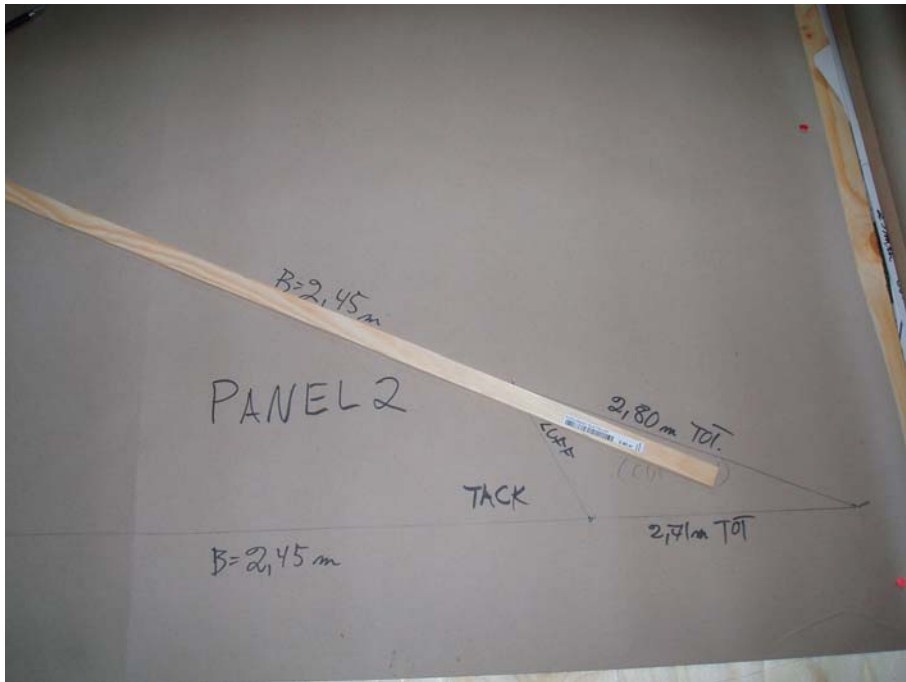
.. panel 4 ready with tack corner marked on. No luff rounding here...

The method of joining batten panels has been described elsewhere in this **Files** section, under *The Cambered Junk Sail*, but I will repeat it here:



The method above makes assembling the panels very easy, as long as the rounding in the adjacent edges is not too dissimilar. On *Malena's* sail (1994) I used amateur method A (below). For *Broremann's* sail I used method B. I think this is better, as it lets you make nicer openings between the pockets, and also make the batten pocket of thicker material at the mast. With Method B the first seam joining the panels is also totally protected from sun and chafe by the "pocket seam".





..making pattern for panel 2..

A thin wooden batten is very useful when making a nice and even rounding. A few well-placed nails let you shape the rounding to your liking.



.. the tools of the trade...

I first marked up the corners of the panels. With a nail in each of them I could mark up straight lines with a chalked line (.. without chalk – forgot to buy it...). Then it was easy to make the correct rounding with that wooden batten.

(.. on panel 1 and 2 I actually drew up a triangle first, using helping lines. See sail plan, sheet 2 at full scale...)



.. panel 1 and 2 ready to be chalked up...

The temporary plywood floor was very useful and let me nail and cut with hot-knife as much as I liked. After use, there were many stripes from the hot-knife, but most of the actual drawings and writing was done on that painter's paper.



.. no comments...

Well actually there is: In all panels except in panel 3 I followed the sail plan. However, in panel 3 I cheated a bit. Sheet 3 says that the rounding should be 65mm on both upper and lower edge. In practice I cut it with 100mm rounding on lower edge and 30mm on upper. This was to make it fit better to the adjacent batten panels. When watching the sail flying, I can't see that this has given any problems so I guess I'll draw in such un-even or asymmetric rounding in future sail plans.



.. fitting telltales before adding the webbing boltrope...

The simple one-seam hem shown above was fitted to the edges of the sail before joining the batten panels to each other. When all panels were assembled, I attached the telltales at the leech. *I stress that these telltales are very handy in keeping you from over-sheeting the sail, so recommend them.*

Then it was time for the webbing type boltrope.



..webbing coming on...



.. and here; the peak corner webbing hoop ..

This was plain sailing, no need for stapling things together first. I felt almost there...



A number of small hoops were also fitted along the head and foot of the sail (above) and also at the batten position.



.. fitting the batten pockets...

Here I have found that a good, white drawing pencil is better than the chalk...

Fitting the batten pockets proved to be a real fight: The slippery stuff slid out of position whenever it could. The only way was to be generous with the staples. The thing is that one wants the pocket seam to land exactly on top of the panel joining seam. Slow job, but it ended well. The two top pockets were made to take a 20mm batten, while the lower pockets were made for 16mm battens (already purchased).

In the end it turned out that the 20mm pipe was only needed as batten no 2. This is slightly longer than the others and definitely takes the highest load. The 16mm battens were actually 16mm aluminium tubes with 1.5mm wall. The 20mm batten was 20/1.5mm.



.. details at the batten end...

As can be seen, the open batten pockets ends end up about 100mm from the edge of the sail. The batten rests in the big hoop and its horizontal position is secured with a lacing to that little black hoop. I don't stretch the sail along the battens. With my primitive way of cutting camber in the sail it is best to have the sail rather slack (1% of batten length) here, to let the camber develop unhindered.



.. the prepared bundle of battens...

The battens came in 5m lengths, so with the net batten length of the sail being 2.45m, I just cut the battens in half, to 2.5m length. This is enough – just. Before banging the ends flat and drilling them, I squeezed in some goo (cheap sealant) in each end to make them watertight.



.. fitting the sail to wooden yard and aluminium battens – indoors...

The spring was very cold this year so I decided to assemble the sail-batten bundle in-doors. In reality they will stay and move together forever.

Making this sail was both easy and complicated. Even if it is just 1/5 the area of Johanna's sail, there are still just as many parts, so you don't scale down the work to the same degree as you scale down the size....

Rigging.

I had ordered a mast before Christmas, 5.3m long and 80mm in diameter. This was late to be ready so I borrowed a mast meanwhile. Although this was only 70mm diameter, it would have to do. When inspecting the boat, I came to the conclusion that I would try stepping the mast in the original BmR position. All I then had to do, was to make a new mast step. This had to be easy to remove and sit on top of the BmR mast step to let me reinstall the original rig easily. It ended up as a plywood-and-epoxy job, hopefully strong enough.



.. maststep, the top is just screwed on for easy removal...



.. mast on, ready to receive the sail bundle...



.. dryfitting the sail, the first batten parrel is on...



.. sail up for the first time...



.. and nicely furled...

Sailing

Finally, on the 19th of June we launched for the first test sail. Since then I have been sailing her (him?) a lot. Meanwhile I'm afraid *Johanna* has just served as a resting shed, although she too is fully operational. *Broremann* is so ridiculously easy to sail, and with her (?) shoal draft she opens new local waters inaccessible to *Johanna*.



.. first glimpse of her, tacking out ...



.. leaving harbour, 7 up, for the first time...

Problems:

There haven't been any big problems; everything went surprisingly smooth.

Still, here are a few ones.

- **Mast bend:** The mast is very thin at only 70mm so I don't press the boat very hard, only just letting the rail kiss the water with me sitting inboard, before reefing.
- **Weather helm:** The problem was anticipated with the aft-set mast. After a bit confusion caused by the rudder blade swinging too far aft (corrected now), the remaining weather helm is very modest, both in tiller force and tiller angle (next to zero). When reaching and running the tiller forces rise, but it seems that I will mostly stay in control. I see no reason to move the mast now. I think I can thank the fore position of the max camber point that I get away with this aft-set rig. It definitely moves the effective CE of the sail forward. This I noticed on both *Malena* and *Johanna* too.
- **Sail Area:** I only went up from 9sqm on the BmR to 10sqm on the JR this time. The boat has proven to stand up much better to the breeze with the junk rig – now I only reef (alone, sitting down) in the middle of F3 I guess. This surprised me a bit. I now wonder if the reason could be one or more of these:
 - The BmR is much taller, so will have a longer heeling lever.
 - The JR has flatter sail than the BmR. The 8% camber may look like a lot when fitted this way in a batten panel, but by general standards it is moderate.
 - The BmR mainsail may be bigger than it says. I wonder if they don't reckon with the roach of such sails. In that case the BmR is as big as or bigger than the JR.

Anyway, the performance is good, the boat seems to accelerate almost without heeling; the present JR seems to drive the boat in such an effortless way. Still, I could always use another panel; I guess I'm used to a bit more brutal sailing...

- **Creases and scalloping panels at luff:** The battens and sail are very light. In addition the Hong Kong parrels (see sail plan, p.1), which are fastened to the same point as the fairly short batten parrels, may have a slightly too steep angle. They thus may want to pull the battens together. It may be an idea to move the HK parrels to a point, say 20cm further aft of where it is now. An alternative is to fit a couple of down-hauls. When sailing 7 up, the luff is nicely stretched, thanks to the (elastic) tack line. I don't like down-hauls, but since Broremann is meant to be a test bed, I might fit them.

(.. this is more an aesthetic than performance issue, I think...)

Conclusion, so far:

I am terribly happy with this boat and rig. The small niggles above are not able to rob the joy I feel when scooting around in this boat. I feel like a boy who has got his first bicycle.

How many boats, junks or whatever can do these stunts:

- We can be running before with the sail fully squared out. Then I can put the helm over, round up and tack, and still have speed enough to bear away to full downwind. Just like that! (.. no, I don't touch the sheet...)
- Sailing back to berth in between the rows of expensive boats is one thing. I also tack my way out! Try that! The oars that I once fitted, now see little use...



.. tacking out between the boats, oarlocks in cold stand by...

- And still she (okay then; *she*) is well behaved. With the tiller brake on she can find her way across the bay with me just sitting there, not touching anything.

I guess I'll have to stop here – thanks to the gloomy weather I could take the time to put this together, but now the sun is coming out...

(Note 2 at 20100317)

Best regards

Arne Kverneland

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NOTE 1, page 2 at 20100317

Well, actually I fitted the simple hems at luff and leech of each panels before connecting them to the rest of the sail. The upper and lower panels of course also had hems sewn to head and foot...

NOTE 2, page 12 at 20100317

Since the day of writing this letter there has been lots of sailing. In my cellar a new 5.3m by 9cm mast is waiting for final treatment and fitting. A new mast hole will have to be made, this time in the originally planned position, 25cm forward of the position I used the first summer.

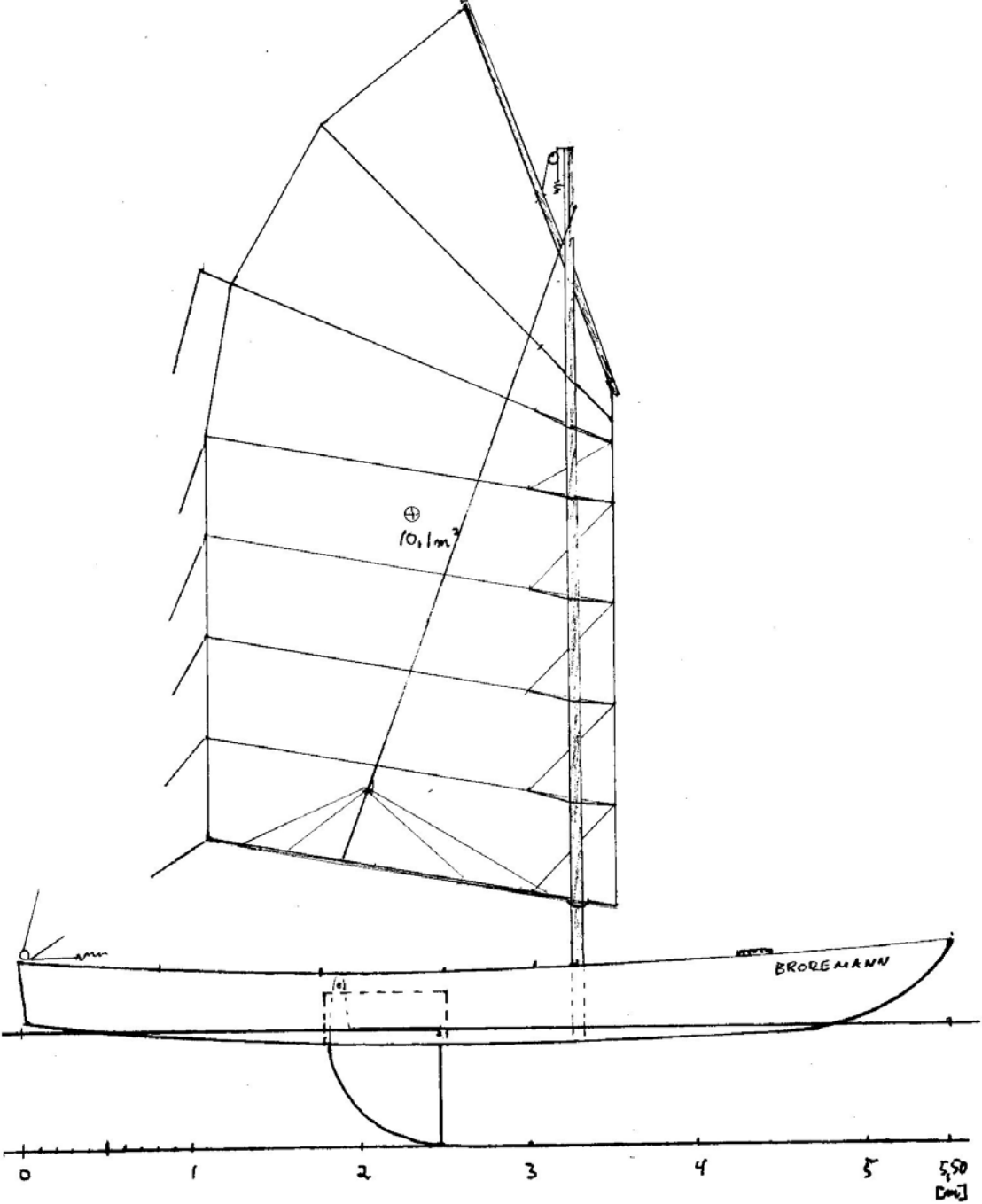


.. Just a month now until spring is here. The snow has almost gone – this photo was taken in February...



..something to look forward to – with a straighter mast though...

BROREMANN, OSLO DINGHY W/JUNKRIG



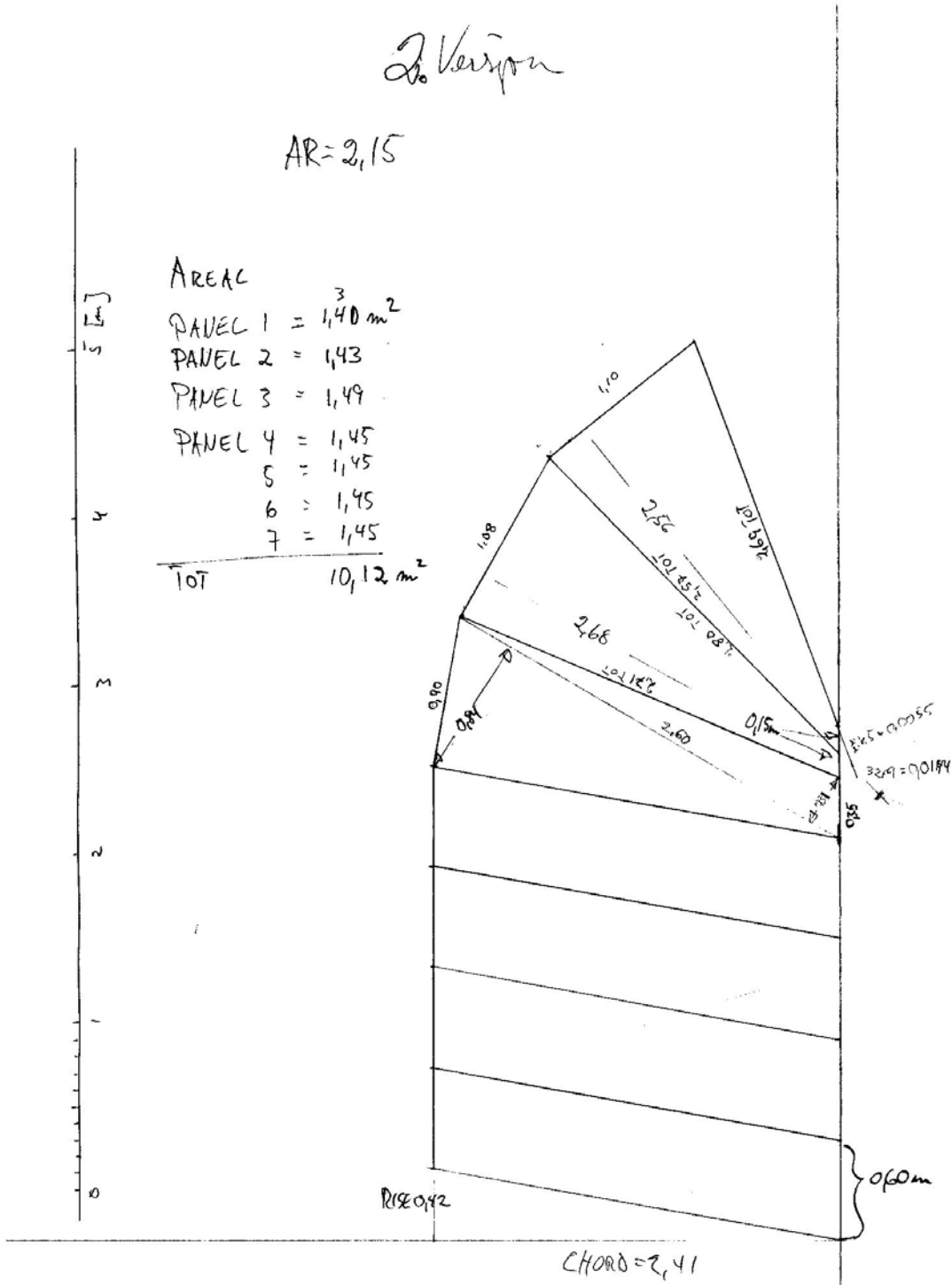
STAVANGER 20080219
SHEET 1
Arne Kverneland

J. Veijon

AR=2,15

AREAL

PANEL 1	=	1,40 m ²
PANEL 2	=	1,43
PANEL 3	=	1,49
PANEL 4	=	1,45
5	=	1,45
6	=	1,45
7	=	1,45
TOT	=	10,12 m ²

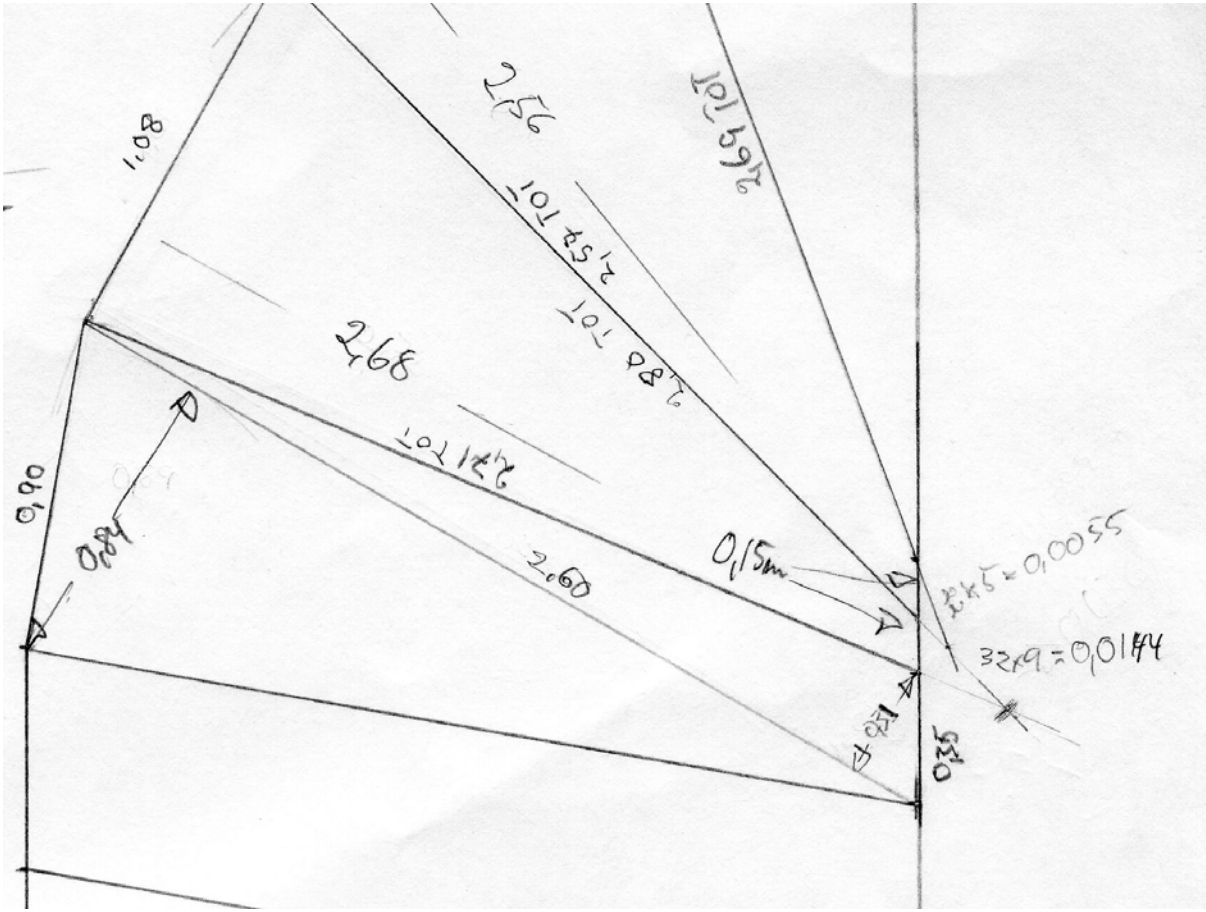


SAIL FOR BROREMANN, SHEET 2

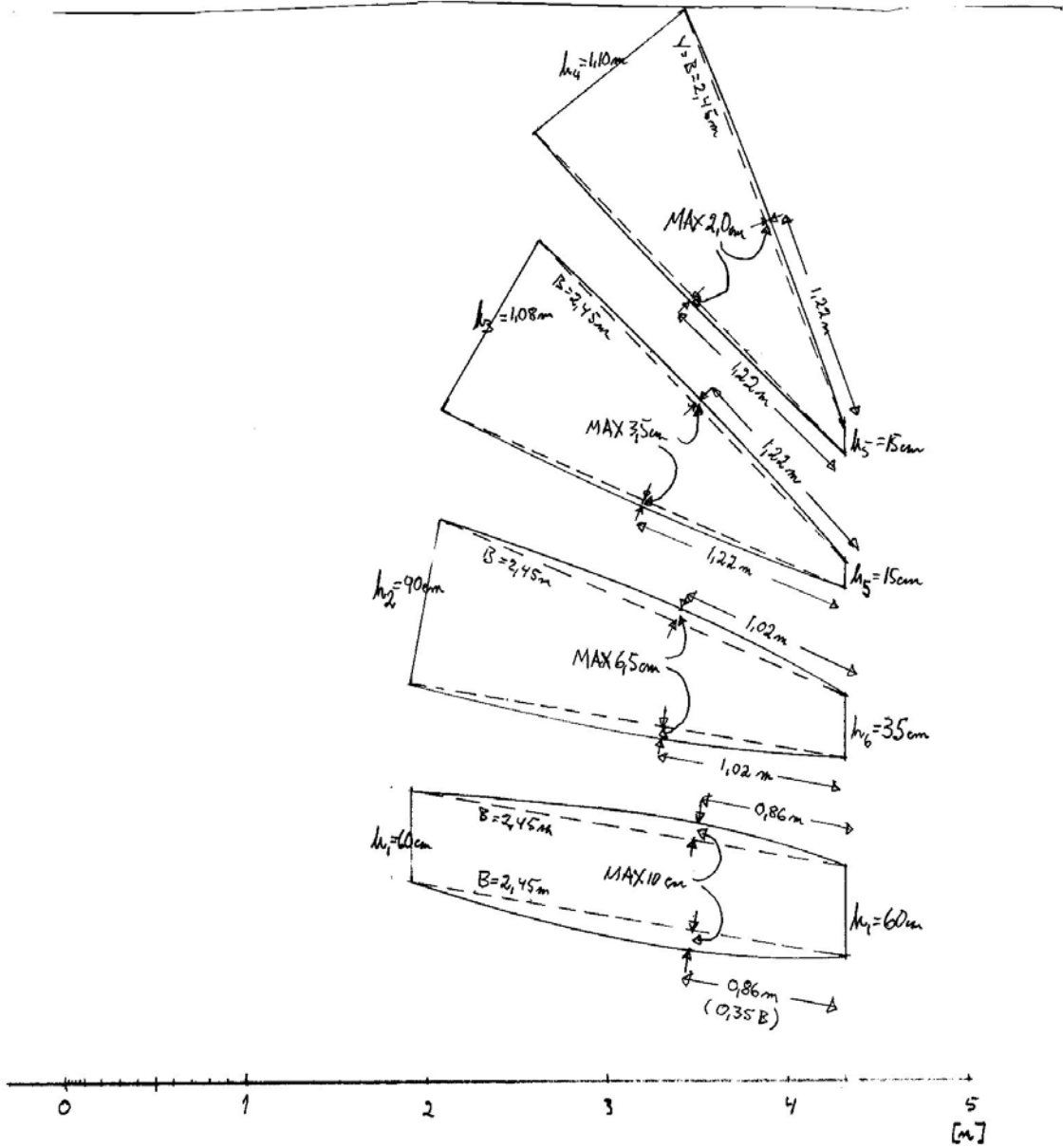
SKALA 1:30

.. Btw, the batten length B is 2.45m...

Broremann, sail plan, sheet 2,
details



BROREMANN, OSLO DINGHY W/JUNKRIE



STAVANGER 20080220
SHEET 3
Arne Kromleund