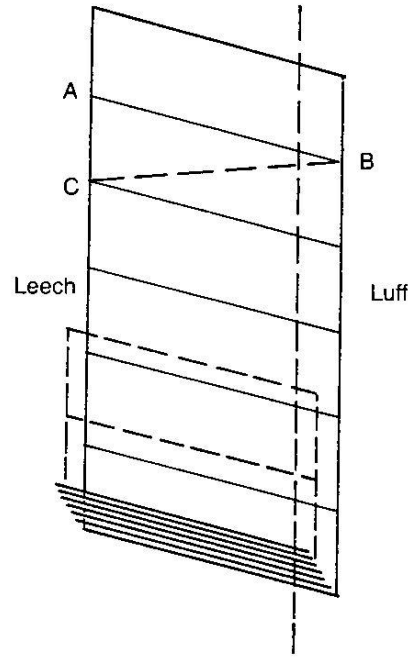
Batten stagger in a junk rig with cambered panels

by Arne Kverneland

(ver 20100126)

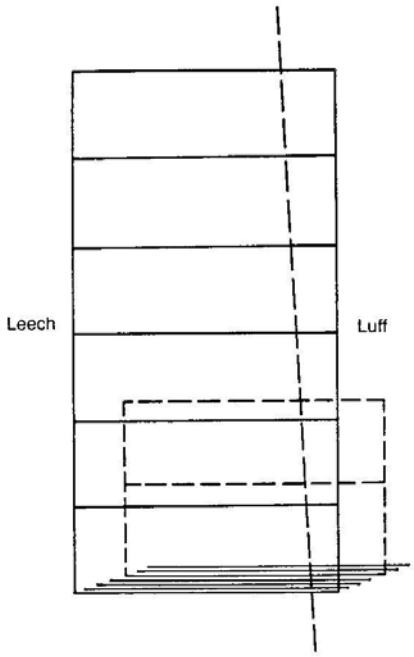
Basic batten stagger

Batten stagger is the word for describing how the battens in a junk rig pile up on top of each other when we lower the sail. Hasler and McLeod discuss the matter thoroughly in *Practical Junk Rig*, PJR. What we want is that the battens pile up in such a way that the upper battens stick out a bit in the aft end. This is known as *positive batten stagger*. That makes it easier to avoid sheet tangle when hoisting the sail and also helps avoiding trouble when tacking or gybing with a reefed sail. If the sail moves forward on reefing, this is known as *negative batten stagger* and should be avoided.



Parallelogram sail

Positive batten stagger



Rectangular sail

Negative batten stagger

The diagrams above, scanned from PJR clearly shows the difference between positive and negative batten stagger.

Batten stagger with flat panels

The sail generally wants to move forward when reefed due to the offset centre of gravity of the sail (the halyard is pulling it forward). What restricts this forward movement is the diagonal stretch in the sail cloth.

Look at the left figure above. Here the diagonal line CB is shorter than the batten length AB. When this panel lands on the sail bundle, it will move aft with the difference between AB and CB. The steeper the rise of the battens the more positive batten stagger one gets. Conversely, if you lower the rise of the battens, then CB will increase in length until it gets longer than the batten length. From then on we have negative batten stagger as in the right diagram above.

Batten stagger with baggy, cambered panels

On batten panels with camber in them the accurate PJR rules for batten stagger do no longer work. There is no longer any (or at least much less) diagonal stiffness in the panel to take care of the stagger.

Examples:
Johanna's and Broremann's rigs.
When lowering the sail on these boats, there is a marked negative batten stagger as the first (lowest) panel is furled (about 25cm in *Johanna* and 10cm in *Broremann*), but after that the rest of the panels lands with about no additional stagger. I am not sure why this is so, but I can think of two reasons:

- As the first panel comes down and the sail moves forward, the halyard goes vertical so the forces moving the sail forward will be reduced. Remember, the HK parrels are still effective on the still stretched out panels.
- I use semi short batten parrels. As the sail is lowered, these may gently start restricting further forward movement.

Remedy for *Johanna* and *Broremann:*
When I noticed this problem on *Johanna* in her first summer with JR (2003), I first added some batten extensions of thick rubber hose. These tend to lift the sheetlets clear of the battens below and are good for tacking and gybing.
However, they were not sufficient to get around the fact that the boom stuck out 25cm after the first reef was taken. The only solution was to modify the lowest panel by shortening the boom with 25cm and chopping 25cm off the clew corner of panel 7.

.. *Johanna* in 2008 with one panel reefed. One can see the red rubber hose batten extensions, and also note that the lowest batten is flush with the shortened boom...

When making *Broremann*'s sail in 2009, I assumed that I would get the same problem with this sail, so I made this mod to the lowest panel when in production. The boom was here shortened with 12cm. That has worked well. However, with the leech being more vertical thon on *Johanna*'s sail, there is no need for those rubber hose batten extensions on *Broremann*.

***Broremann*, showing her shortened boom**

***Broremann* with one reef, showing the moderate negative stagger**

Fanned panels.

Generally Western fanned panels seem to have more problems with *too much* positive stagger. When the sail is lowered the last battens and yard has crept so far aft that the yard tends to move behind the mast. This has been seen on the *Fenix* rig and on the Colvin rigs. My hunch is that the use of baggy panels will reduce or fully cure this problem. I have only had one fanned sail, but with thin cloth and a lot of bagginess, I never had problems with reefing.

(see photos below)

..Malena's fanned sail in 1992; the boom and yard taken from the original sail, are shorter than the battens...

Conclusion

On a Hasler-McLeod sail my advice to avoid a lot of negative batten stagger is this:

(.. I'm a bit on thin ice on this; there are so many sail shapes with different aspect ratios and I have only sailed under 5-6 sails so far...)

- Use semi short batten parrels so as to limit forward movement when reefing.
- I have doubled the rise in my boom and battens compared to what is considered right on a flat sail. It hasn't hurt (given too much positive stagger).
- Shortening the boom about 5-6% and cutting off the clew corner of the lowest panel may be an idea. It has worked for me.
- Consider moving the halyard's sling-point on the yard a bit forward, but not so much as to let the yard tip aft when hoisting and lowering.
- A cheap trick is to haul on the luff hauling parrel as you reef or furl the sail, but that is slower of course.
- Reefing while sailing close-hauled tends to increase positive stagger.

On a fanned sail I'd better keep quiet as I don't have enough experience.

Note!
All this is about junk rigs which are being sheeted with central sheeting. If the sail is to be sheeted with separate port-starboard sheeting, then one may not be so concerned about negative batten stagger.

I hope some of this makes sense.

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