



# SAILING WITH TAPERED BATTENS

BY PETE BINGHAM

## BACKGROUND

The standard battens on the Supernova are soft and quite floppy. As they are untapered, they have a maximum draft at 50% of their length, when the ideal aero foil shape is with the maximum draft around 42% producing a nice entry curve for the wind on the luff edge.

The more comprehensive background and rationale for tapered battens is in my document 'Performance Tuning Using Tapered Battens'. I have written this document following extensive sailing and testing over Autumn/Winter 2017 including some feedback from other batten users. Specifically, I would like to thank Gavin Young and Cliff Milliner for their valuable feedback for which I am very grateful.

The standard battens are quite 'passive' in how they work, being so soft. Since the Supernova sail has quite a large roach, it is better to use a more active batten (tapered) to keep the draft in the desired position and prevent depth (camber) changes by wind, especially in gusty conditions, or by trim.

By themselves, the tuning the battens won't get you to the front of the fleet. Sailing basics still account for 95+% of your speed around the course; but tuning the rig with the battens will give a positive edge (if that matters to you of course).

## TAPERED BATTEN SPECIFICATIONS

There are a few things we need to consider with battens (apart from cost):

- Material – this could be glass/polyester resin, epoxy, or carbon, or any combination (composite). Composite foam core is also possible, at a higher price.
- Length – measured from the tip that sits against the luff to the end cap where the tensioning string is.
- Width – usually 10mm, 12mm or 15mm.
- Weight – overall weight of the battenset in grams. The lighter the better for a given strength.
- Compression or stiffness – how much force is needed to bend the batten. They can be soft, medium or hard. For comparison, stiffness is measured in grams. Only big yachts have kilogram compressions.
- Tapered or not tapered – tapered battens are computer-profiled so that the luff end is thinner, making the point of maximum draft about 45% back. Untapered battens have a draft of 50%.
- Finish – whether coated or not. Coated battens will be less prone to splintering and will hold together if they break.

Tapered battensets are available from 2 suppliers currently – Contender UK (via Matt Biggs), and Dynaflex France (via me).

## STANDARD BATTENS (HARTLEYS/JECKELLS)

These are the standard contract battens supplied as default with the Jeckells sail from Hartley boats. The new sail material (from August 2017) uses the same battens as older supplied sails. Usually cut to length off a roll. Inexpensive.



- Material: Glass/polyester pultruded,
- Aquabatten endcaps 2 hole, no luff cap.
- Width: All battens 15mm
- Taper: All battens untapered
- Overall weight: 670 g

The battens are quite soft, and the sail shape relies on the sail cut (which may deteriorate over time).

## CONTENDER UK (MATT BIGGS)

These are 10mm and 15mm wide epoxy around £170 per set of 5.



- Material: Epoxy, Aquabatten endcaps 2 hole
- Width: Top batten #1 10mm, all other battens 15mm
- Taper: Top 2 battens untapered, 3 battens tapered
- Overall weight: 875 g

The battens are well made, robust and quite stiff - a bit of an investment but you may only need 1 set.

## DYNAFLEX FRANCE

These are 10mm wide black heat-shrink polycoated epoxy around £80 per set of 5 (landed price from France).

Supplied as a fully tapered 5 batten set (v1). Version v2 has stiffer middle sail batten characteristics.



- Material: Epoxy glass pultruded, poly coated
- Aquabatten endcaps 1 hole, no luff cap.
- Width: all battens 10mm
- All tapered (unlike Contender).
- V2 set has stiffer battens #2 and #3.
- Overall weight: 685 g
- V2.1 set has a tapered top batten, otherwise like V2

The battens give good performance at a reasonable price. Similar in weight to standard battens.

#### FIBERFOAM AUSTRIA

These are composite foam core battens at the premium end of the market – high quality, high performance with repeatable compression characteristics highly suited for a one design class. Indicative prices are £110 - £140 for a set of 5 tapered battens (landed price from Austria).

- Material: Composite foam cored with laminate.
- Width: 10mm top, 12 or 15mm otherwise
- Taper: All tapered, overall weight: 545 g (estimated)

These battens are not available currently for the Supernova.

#### TAPERED BATTEN & RIG SETUP

I have been testing using the original Dynaflex V1 and a second generation set of V2 battens, experimenting with different options for the top 2 battens. These include tapering and not tapering both top battens including stiffer top battens in stronger winds.

The Dynaflex v2 battens are stiffer than both the standard and v1 versions. This gives marginally better downwind sailing, as when sailing deep downwind (or on a run) the battens don't invert around the shrouds so easily and therefore present a greater sail area to the wind with more power.

The following notes refer to the Dynaflex battens. The rig could be set up with different options for light winds and heavier winds.

The default sail set up is to use the full tapered set. You can reduce the top sail power by substituting the standard battens in strong wind conditions. Maintain the bottom 3 battens tapered in all wind conditions - changing the top two battens between light wind and strong wind conditions. The top battens are critical because the sail roach as a percentage of the batten length is high, and sail camber is important to speed and high pointing.

**Light winds:** All battens tapered. The v2.1 set gives a 12% camber at the top with a firm leech with some return and generates more upper sail power in lighter winds. Use a minimum of batten tension just to remove wrinkles in the batten pockets – not too much tension.

With Dynaflex battens you can rig with all 5 battens tapered. You will notice the prominent forward draft at the top of the sail, looking up the mast. You may need to shorten your bridle as you will be able bring the boom closer to the centerline and still maintain good boat speed and higher pointing. With small increases in wind you should be able to notice a considerable increase in power from the top of the sail – most noticeable in those drifting conditions when you get a smallest puff.

**Strong winds:** The top battens could be stiffer for a shallower camber, as the lower part of the sail contributes most of the power. This creates a flatter top section and a softer (more open) upper leech which will allow the sail to twist off especially with Cunningham applied. In stronger winds the top battens should be tied with a little more tension if possible to reduce the camber. It is a personal choice whether to swap out the battens for non-tapered. I use a fully tapered set for 80% of the time especially in gusty conditions.

1. You may find the rig works better for you with untapered top battens, usually the top two. You can substitute the two battens for standard battens. It depends on your own ability to control the rig in stronger winds. The Cunningham should open the leech nicely and all this adds up to a nicely controllable rig in difficult wind conditions.
2. With tapered battens and when you aren't overpowered (i.e. not raking) it is better to have a tighter rig (more shroud tension) and have tighter lowers. With the standard battens you need much looser lowers to create mast bend otherwise the boat doesn't point very high. With tight lowers, the rig is more powerful on the reaches as you maintain a deep camber, while still being able to point high upwind. Unless you have adjustable lowers, set them just tight on the Allen adjusters before you hoist the sail. With adjustable lowers you can adjust them dynamically as you sail round the course (I do this a lot).
3. With a tight, upright rig, the boat feels more responsive in light winds as you are not wasting energy with the rig flapping around - you should be able to feel the rig driving forward with every adjustment of the mainsheet.

## SAILING NOTES

With tapered battens you are effectively changing from a passive batten set to an active batten set because of the increased pressure on the sail and the mast.

**Important note** - Sailing with tapered battens requires a lot more kicker to close the leech as it will be more open due to the stiffer sail 'back end'. This takes some familiarization through practice sailing. If you don't have any calibration system on your kicker, then it's a good idea to fix up some kind of reference system. The simplest is just two tape markers lining up either on the kicker cascade itself or on the forestay. Without a reference point you will find it much harder to get repeatable kicker settings.

If you get the leech closed down correctly with nicely trailing telltales, the sail shape will be very stable as there is so much tension in the sail with the tighter rig and the battens are under so much compression. The maximum draft will be set exactly where you want it, around 42-45% from the luff.

### **Lighter winds (light airs to moderate breeze):**

As mentioned in the setting up section, use tight lowers to prevent any mast bend and use the kicker as the primary control to close the leech. You can't do this with standard battens as their softness hooks the leech too much as soon as you put kicker on, and the wind stalls off the back of the sail. With tapered battens you can put a surprising amount of kicker on upwind without the sail stalling, rather than using mainsheet tension to tighten the leech. This means that your mainsheet 'energy' goes towards driving the boat forward.

If the wind is below a breeze, say <5 knots (down to light airs), in the lulls you will gain by loosening off the lowers to induce more mast bend - if you have adjustable lowers. Flatten the sail with some kicker. Adjust the outhaul for less sail foot. You won't be generating much power from the lower half of the sail anyway, and you will reduce drag by tightening the outhaul. This also increases the chance of the sparse wind staying attached to the sail (laminar flow). When the wind increases in a

puff, let out the outhaul a bit, release the kicker a touch and tighten the lowers to build extra speed. Each adjustment of the mainsheet will drive the boat forward. You will gain a good margin over anyone with standard battens as with more boat speed you can sail higher too.

#### **Moderate winds (F<sub>3</sub> - F<sub>4</sub>):**

You can use a lot more kicker upwind than you would normally have used, without the leech hooking. The leech also opens better with more Cunningham, so the upper sail twists off better in the gusts and keeps the boat more upright with less mainsheet easing. You should be able to feel the sail pulling the boat forward. The sail trim won't be as critical to keep boat speed high than with standard battens.

As normal, once you get overpowered, loosen the lowers and put more kicker on to flatten the sail. I have found that you can sail a lot further up the wind range before you need to rake the mast – this is a good thing as it keeps the boom higher and stops you hitting your head so often.

#### **Downwind/reaching:**

Fast downwind sailing needs more kicker as the leech will open out too much, losing power. I use a little more kicker downwind than with standard battens and can maintain good boat speed. The same is true when reaching.

I can vouch that on a reach in an F<sub>3</sub> wind sailing parallel to another boat, I can consistently sail a few percent faster than a 10kg lighter helm in an identical boat with identical sail but rigged with standard battens. The only difference I believe was in the battens. However, you can easily lose all that gain with a couple of bad tacks.

Downwind, with a little pressure in the sail you can still sail low if not slightly 'by the lee'. By the lee doesn't work as well (not as fast) as with the standard battens, possibly because the wind entry shape is flatter (on the leech). It is possible to sail by the lee, but it's more difficult to find the sweet spot. In any case, the trade off for better speed and pointing upwind outweighs the difficulty of sailing by the lee downwind. Sailing dead downwind is marginally faster than with standard battens with the Dynaflex v2 set – hard to be precise but this is more of a feeling based on sailing with other Supernovas. For sailing deep, I find that letting the rig off a little helps with boat speed.

## APPENDIX 1: THE TECHNICAL STUFF

### STANDARD BATTENS (HARTLEYS/JECKELLS)

These are the contract battens supplied with the Jeckells sail from Hartley boats

- Material: Glass/polyester pultruded, Aquabatten endcaps 2 hole, no luff cap.
- Width: All battens 15mm
- Taper: All battens untapered
- Overall weight: 670 g

Top	Batten #1:	Untapered L 900mm, W 15mm, Draft 50%	Compression:	1200g
	Batten #2:	Untapered L 1480mm, W 15mm, Draft 50%	Compression:	400g
	Batten #3:	Untapered L 1935mm, W 15mm, Draft 50%	Compression:	200g
	Batten #4:	Untapered L 2285mm, W 15mm, Draft 50%	Compression:	100g
	Batten #5:	Untapered L 2540mm, W 15mm, Draft 50%	Compression:	65g

The battens are not coated so it is possible to get glass splinters when handling, which are very uncomfortable if you get them.

### CONTENDER UK (MATT BIGGS)

These measurements are from 1 set supplied June 2017:

- Material: Epoxy, Aquabatten endcaps 2 hole, no luff cap.
- Width: Top batten #1 10mm, all other battens 15mm
- Taper: Top 2 battens untapered, 3 battens tapered
- Overall weight: 875 g

Top	Batten #1:	E10120NT L 900mm, W 10mm, Draft 50%	Compression:	1200g
	Batten #2:	E15140NT L 1470mm, W 15mm, Draft 50%	Compression:	950g
	Batten #3:	E15140CT L 1920mm, W 15mm, Draft 45%	Compression:	460g
	Batten #4:	E15140CT L 2270mm, W 15mm, Draft 45%	Compression:	300g
	Batten #5:	E15160C L 2510mm, W 15mm, Draft 45%	Compression:	400g

On the Contender battens supplied, batten #5 is a little short.

### DYNAFLEX FRANCE

20 sets of Version 1 (v1) battens (all tapered) have been distributed to other Supernova sailors for evaluation. The version 2 set (v2) has slightly stiffer middle battens and has been sold to 15 other sailors. The second batch of v1 battens were slightly too short so the length is increased using tip caps. These measurements show corrected overall lengths, with compression/stiffness in grams:

**V1.0: (July 2017)**

Top	Batten #1:	Tapered L 905mm, W 10mm	Draft 43%	Compression:	1025g
	Batten #2:	Tapered L 1470mm, W 10mm	Draft 45%	Compression:	400
	Batten #3:	Tapered L 1920mm, W 10mm	Draft 45%	Compression:	220
	Batten #4:	Tapered L 2275mm, W 10mm	Draft 47%	Compression:	290
	Batten #5:	Tapered L 2525mm, W 10mm	Draft 46%	Compression:	340

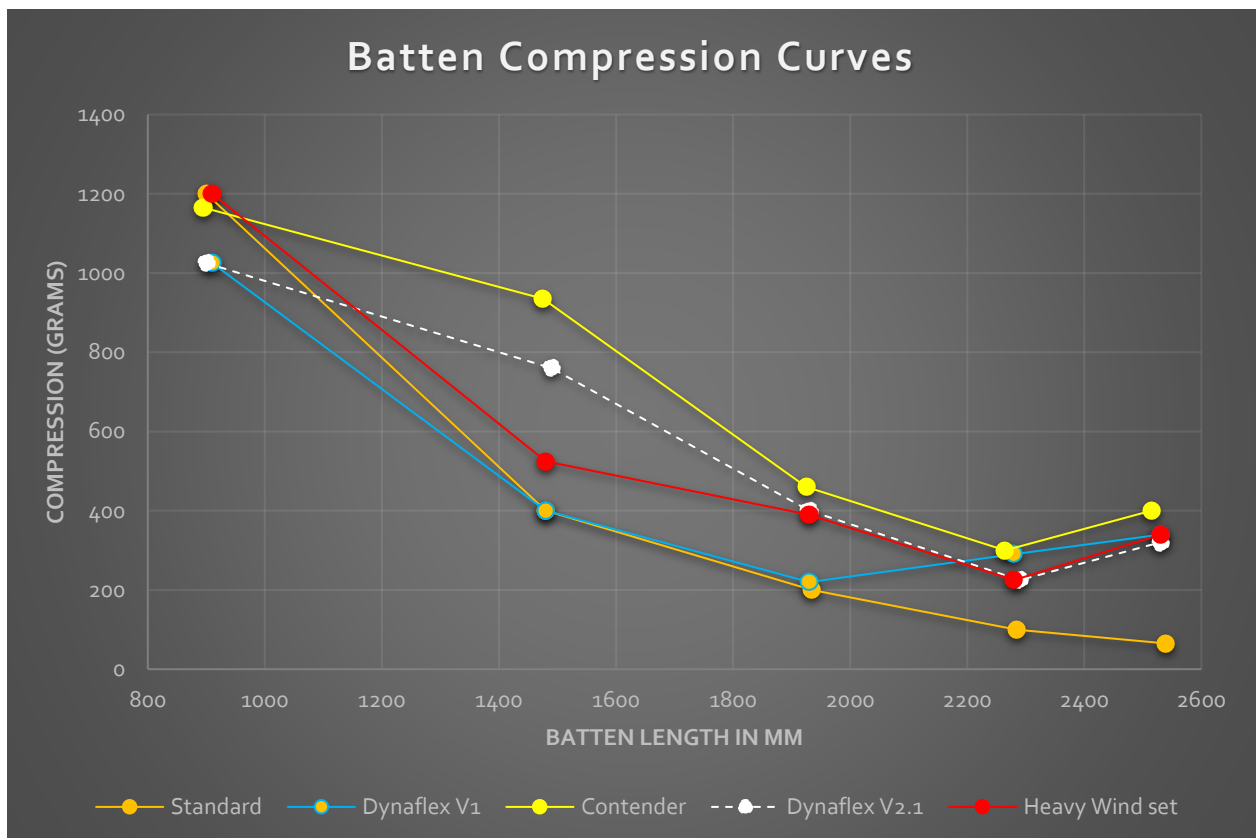
**V2.0 (Development set - early 2018):**

Top Batten #1: Not Tapered L 905mm, W 10mm Draft 50% Compression: 1500g  
 Other battens identical to v2.1 set below.

**V2.1 (released July 2018):**

Top	Batten #1:	Tapered L 900mm, W 10mm	Draft 43%	Compression:	1000g
	Batten #2:	Tapered L 1490mm, W 10mm	Draft 45%	Compression:	760
	Batten #3:	Tapered L 1940mm, W 10mm	Draft 45%	Compression:	400
	Batten #4:	Tapered L 2290mm, W 10mm	Draft 47%	Compression:	225
	Batten #5:	Tapered L 2530mm, W 10mm	Draft 46%	Compression:	320

The graph below demonstrates the compression/stiffness values overlaid for comparison.



1. The Dynaflex v1 battenset has similar characteristics to the standard battens except for the more forward draft (by full tapering) and extra stiffness of the bottom two battens. The top batten, as supplied, is soft, but extra stiffness of the top batten can be achieved by substituting a standard batten (but no taper).
2. The Dynaflex v2.1 battenset offers better mid sail stiffness to reduce the likelihood of batten inversion when sailing downwind/by the lee. Light wind performance is enhanced by keeping the top 2 battens tapered.
3. For heavy wind sailing when there is too much top sail power, replacing the top 2 battens with standard non tapered battens allows for easier rig control.
4. The Contender battenset is relatively stiff by comparison except for a relatively soft top batten. Both top battens are untapered.