EPISODE 5: DOWNHAUL- THE KEY!

PEOPLE CAN TALK UNTIL THEY'RE BLUE IN THE FACE ABOUT HOW YOU CAN TWEAK THIS, ADJUST THAT AND GENERALLY FIDDLE WITH ANYTHING AND EVERYTHING TO RIG A SAIL, BUT NOTHING WILL EVER BE AS IMPORTANT AND CRUCIAL TO RIGGING A SAIL AS DOWNHAUL.

The problem is…how do we know how much or how little downhaul to put on to hit the sail's sweet spot for the conditions that we're faced with at the water's edge? Floppy down to here, tight up to there, nice shape created over there…it's a minefield out there as every sail possesses slightly different characteristics. However, luckily for us there are some common traits that cross the boundaries for all sails and as such Jim Collis is going to enlighten us and clear a simple yet effective pathway through this haven of confusion and, as always, give us some golden gems to take away!

WHY ALL THE FUSS OVER DOWNHAUL?

Rigging a sail has always, and I imagine always will, comprise of three aspects – downhaul, outhaul and batten tension. Out of these three (albeit all of them are essential for the rig to perform well), without the correct downhaul you might as well not bother with the other two and just go home; downhaul is the key!

A sail is effectively made up of two sections – the 'engine' and the 'exhaust'. The 'engine', or power, of a sail is located in the bottom half and the 'exhaust' in the top, the dividing line roughly being around the batten level with or just above the boom.

The bottom half of a sail has 'shape' or 'belly' to differing degrees in it, created by the curve of the battens in contact with the mast and the design built into the sail itself. This 'shape' in the sail is reminiscent of an aircraft wing. **(See fig. 6)**

As air (the wind!) gets deflected down both sides of the sail from the mast to the clew, a pressure difference is created on either side – less pressure on the leeward side of the sail where the air has to accelerate around the 'wing shape', and more pressure on the windward side where the air is travelling at its normal speed and is more compacted as a result. A resultant force, or 'drive', is created at 90∞ to the sail's 'wing shape' as the pressure difference tries to equalise itself and it is this drive that we feel in our sail when careering around on our windsurfer.

The top half of a sail has no 'shape' and is described as being 'flat', the battens being pulled away from the mast rather than in contact, thereby solely acting as stabilising stringers for the sail material rather than creating curve. As a result, the top half of a sail does not produce any 'drive'. The top half also has varying degrees of 'leech floppiness' (loose sail material on the leech that falls away and appears 'floppy' when on the beach), which acts as a release for excess and unwanted wind when we are sailing, like from a big gust. When a gust hits our rig, the floppy leech opens up, or 'twists off', to allow the excess wind to be exhausted and this in turn stops our 'drive' being affected down in the bottom half of the sail.

The two halves of the sail work together to give us a comfortable ride – a constant source of power in the bottom half, and an efficient exhaust system in the top half of the sail getting rid of excess and unwanted wind.

Downhaul is the main contributing tool for controlling this.

WHAT DOES DOWNHAUL ACTUALLY DO TO A SAIL?

When we pull on the downhaul it draws the tip of the mast and the foot of the mast closer together. This, in turn, does two things – it controls how much 'exhaust' the sail will have and how much 'drive' or power is set in the sail.

Firstly, as the two ends get closer together so the sail material goes 'floppy' on the leech from the top of the mast down – hence the term 'floppy leech' – setting up the essential ingredient of the 'exhaust' in our sail.

As more downhaul is applied so the floppiness of the leech extends further down the sail, thereby increasing the 'exhaust potential' of the sail, and vice versa with less downhaul.

Secondly, as the mast bends the battens pull away progressively from the mast from the top of the sail down. The battens that get pulled away completely from the mast lose their bend or curve and so don't create any 'shape' in the sail, and so no 'drive' is created in that area. Exactly what we are looking for in the top half of a sail.

Further down the sail, the battens start to pull out from the mast as well but stay in contact enough to be bent and curved and so create the 'wing shape' in the sail forming the 'drive' section in the bottom half. As well as this, the battens pull out enough so that they are able to 'rotate' around the mast so that the sail will work as a 'wing' in both directions.

As more downhaul is applied so the battens progressively pull away more and more from the mast causing them to be less curved and resulting in the 'shape' of the sail to become flatter and thereby less powerful. If less downhaul is applied then the reverse happens and our sail will have more 'shape' and so be more powerful.

So, with this in mind we can start to see why we would apply more downhaul for windier conditions and less downhaul for more marginal conditions.

Below are some classic examples of rigging a sail with the correct downhaul for windy and for marginal conditions –

Rigging a sail for windy conditions

Maximum downhaul for the sail should be applied.

The sail will have a great deal of 'floppy leech' (probably right down to the boom) and hence lots of exhaust potential. It will also not have much shape in the bottom section, as the battens even

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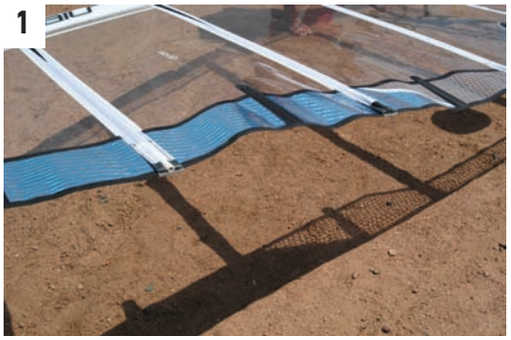

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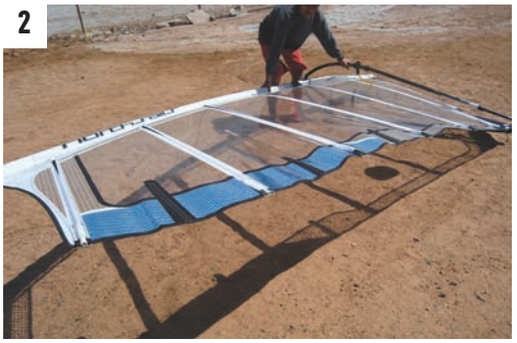

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there will have started to pull marginally away from the mast. This would mean that the sail would be quite de-powered and excellent for exhausting any huge gusts. **(See fig. 2)**

N.B. It is possible to downhaul a sail too much resulting in there being no shape or stability left even in the bottom half of the sail. If in doubt as to whether you can downhaul your sail anymore but keep it working effectively, the best advice is to think about changing down sail size!

Rigging a sail for marginal conditions

Minimum downhaul should be applied here.

The sail will have less leech flop and so less 'twist' and exhaust potential. There will also be more shape in the power section of the sail due to the battens being fully in contact with the mast. This would mean the sail would be set for much more power.

N.B. We must beware of letting off too much downhaul to try to get as much 'shape' and power in the sail. A sail is designed to have a wind range – hence the different sail sizes to change to for different conditions. One sail won't cover all wind strengths. If we let off too much downhaul then the battens above the boom (in the exhaust section of the sail) start coming into contact with the mast and creating shape and thereby 'drive'. This will make the sail feel like the drive is coming from too high and it will be very uncomfortable to sail with. The battens in the bottom half of the sail will also not be pulled away enough from the mast for them to rotate properly and so the sail's 'wing shape' will only work effectively in one direction! **(See fig. 4)**

MINIMUM... MAXIMUM... HOW DO YOU KNOW HOW MUCH DOWNHAUL TO APPLY?

It's all very well being told to put maximum or minimum downhaul on a sail but how do we actually know how much to apply before we reach the desired setting?

Luckily there exist several helpful rigging aids from manufacturers that help us to establish how much downhaul to apply to their sails for certain conditions and there are also some other easy tips for checking.

Visual Trimming Systems

These are very useful markings on certain manufacturers' sails, which are placed at the head of the sail. Most systems have a maximum and a minimum mark. As the leech starts to go floppy as you apply downhaul, you stop when the floppiness reaches the desired marking for the prevailing conditions: Maximum – windy, minimum – marginal. **(See fig. 1)**

Rigging Measurements (Luff and Base/Extension)

All Manufacturers supply these with their sails and they should be used.

They are generally very accurate and even if they aren't they are generally only wrong by a few centimetres. Once downhauled to the measurements given by the manufacturer it usually requires no more than 1cm more or less of downhaul to hit the maximum or minimum setting. Some manufacturers will even put this in their rigging instructions. **(See fig. 5)**

Batten Rotation

This is an easy check system for whether there is suitable downhaul on a sail. Battens in the top 'exhaust' section of a sail should be away from mast; battens in the bottom 'engine' section should be in contact but can be rotated by hand. This is not a precise tuning method for maximum or minimum settings, but it does indicate that the sail has sufficient downhaul to work properly and tuning to extreme settings from here will consist of putting on no more than 1cm more or less of downhaul. **(See fig. 3)**

Looking at the Belly or 'Shape' and the Leech 'Flop'

This is really only useful once you have rigged the same sail a few times and you are starting to get used to how it looks when downhauled.

After a while you will start to automatically downhaul until the leech is floppy to a certain place on the sail you know, and the belly, or 'shape' in the sail looks suitably flat or full for the conditions.

JIMBO'S HOLY GRAIL TO DOWNHAULING

A sail is designed to have an 'exhaust' section and a 'power' section working well together. Downhaul is the key to achieve this.

- Use manufacturers' aids to get in the rough ball park for the correct amount of downhaul (Visual trimming systems and rigging measurements)
- Use batten rotation and possibly looking at the leech flop and shape as a final check.
- Next episode Jim looks at tying together the downhaul and outhaul and will give us 'Rigging made simple'.

Jimbo's Gems is written by Jim Collis - Pro Coach, Instructor Trainer and Tester for Windsurf magazine. If you'd like any more information on coaching or training to be an instructor with Jim please contact him on **jimcollis@windsurfevolution.co.uk** or visit **www.windsurfevolution.co.uk**

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