

# Sailboat Rigging and Tuning

February 13, 2006

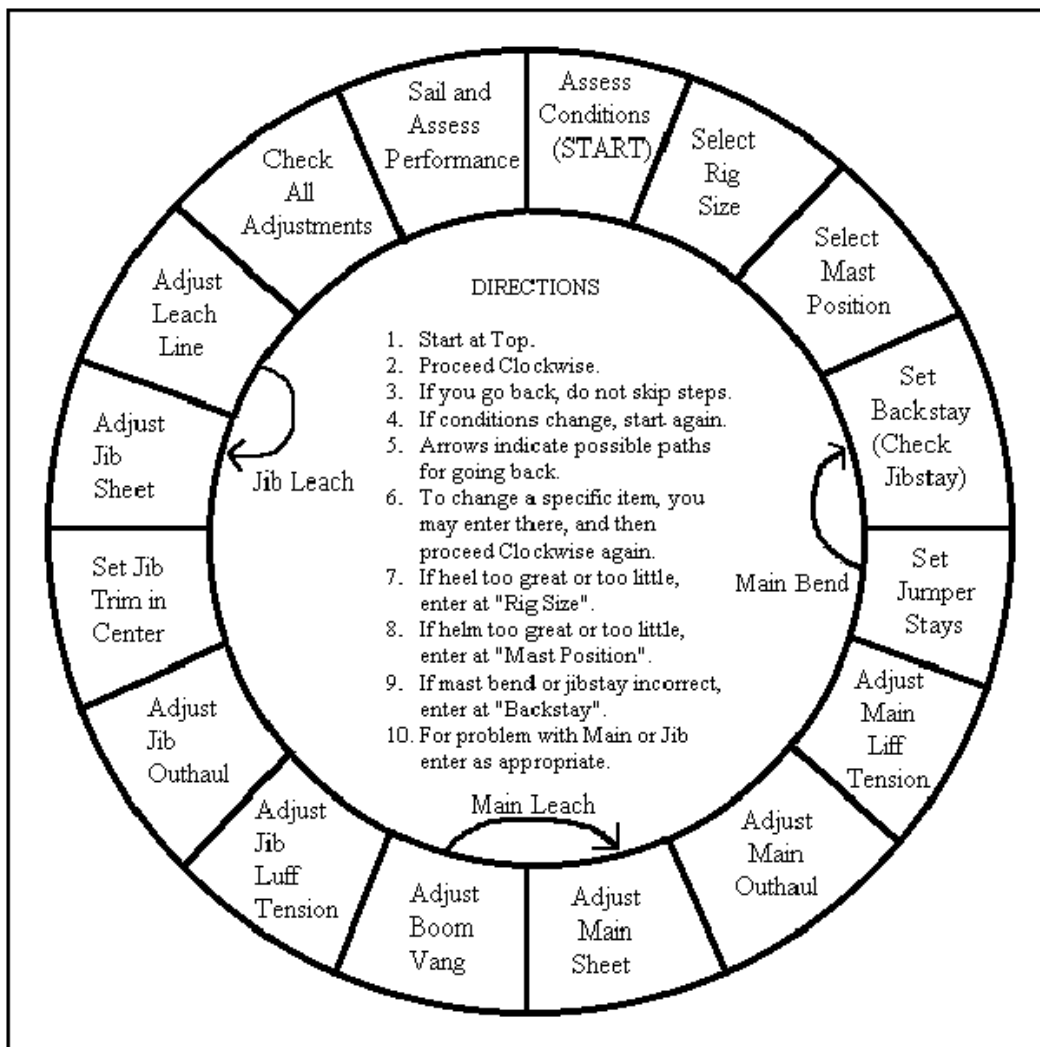


The following texts are compiled from three main sources, Bob Sterne ([www.crya.ca](http://www.crya.ca)), Greg Fisher ([www.modelyacht.org](http://www.modelyacht.org)), and the Soling 1M website ([www.solingonemeter.org](http://www.solingonemeter.org)). Follow these tips and you can get the most out of your sailboat. –Matt Engebretson

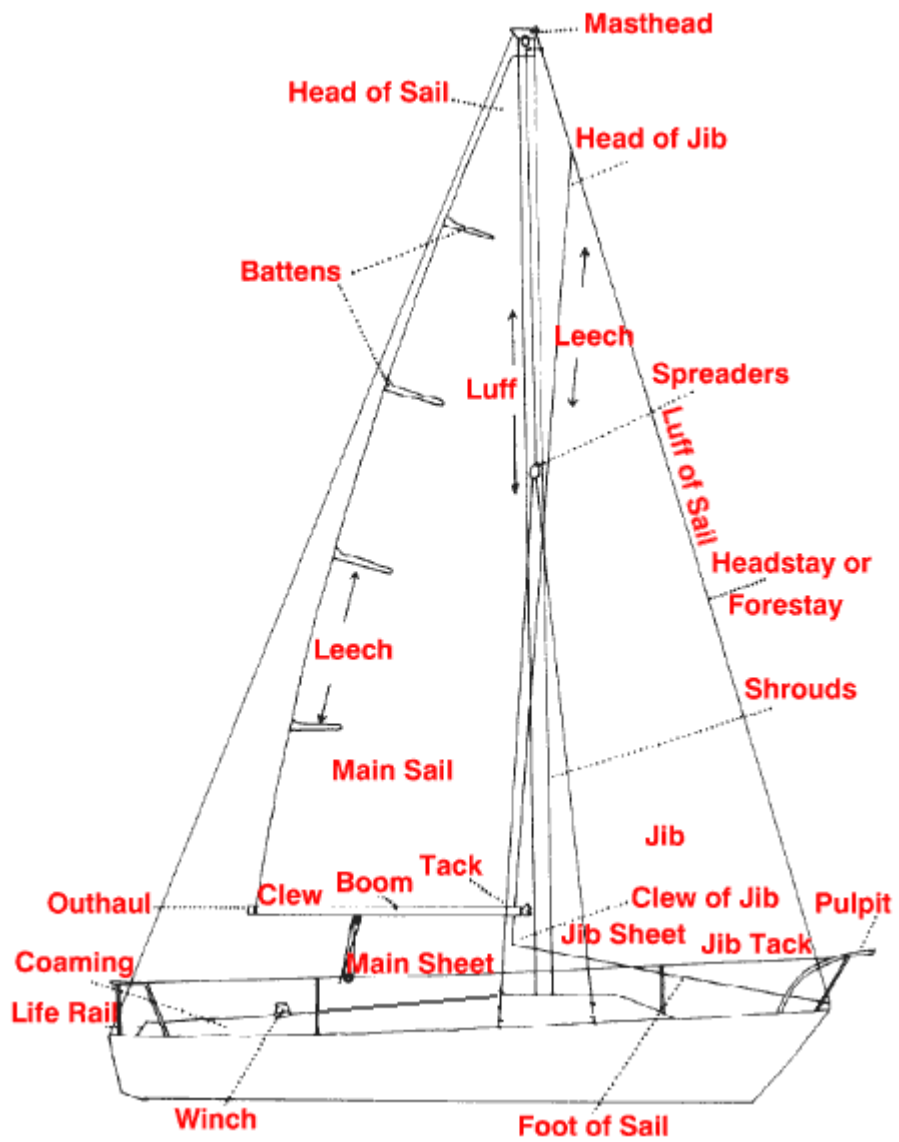
# The Tuning Cycle

by Bob Sterne  
May 1, 1998

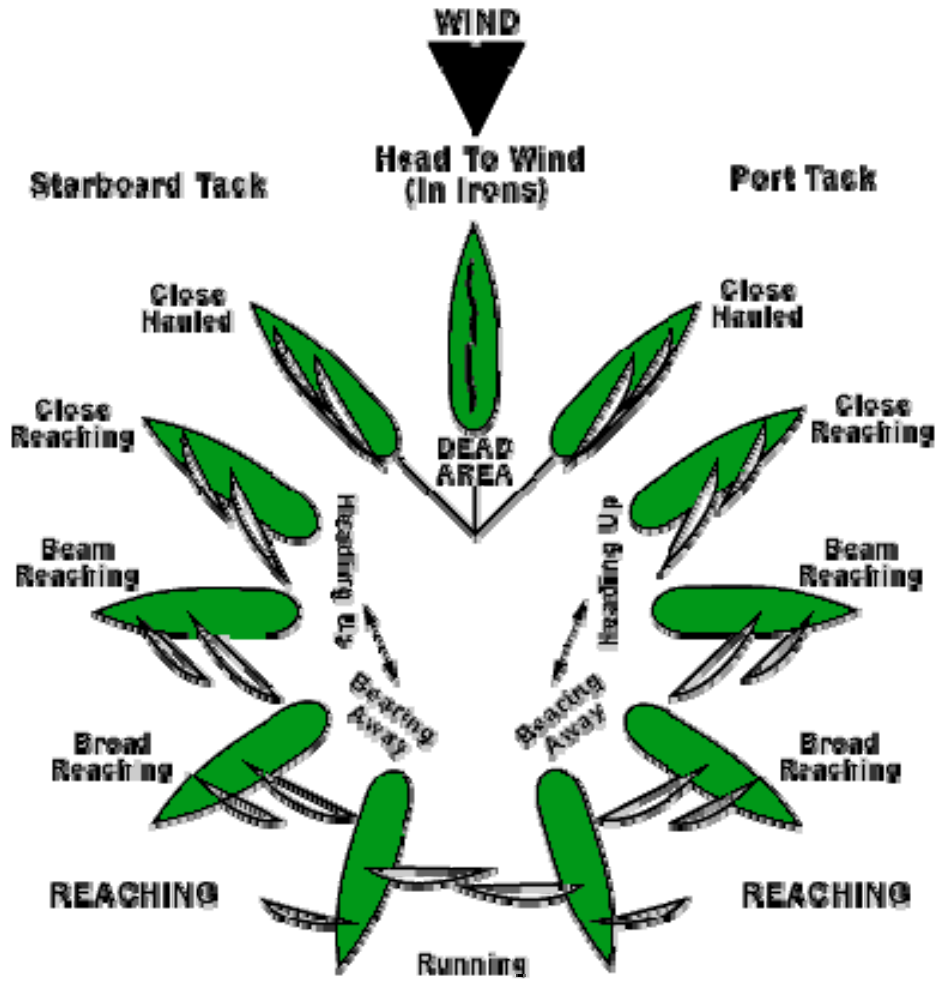
Tuning is a circle or more correctly, a spiral. Each trip around the spiral brings us closer to the center, the ultimate state of boat tune. At the beginning of each cycle, we assess the wind, water, and boat performance, and try to improve upon the previous cycle. Sometimes nature throws us a curve in the form of a change of wind or water conditions, and knocks us back out a row or two, and we have to claw our way back up again. This is what makes sailing such a challenge.



If you have any questions, please email me at: [rCsail@istar.ca](mailto:rCsail@istar.ca)  
(source [www.crya.ca](http://www.crya.ca))



(Source [www.amya.org](http://www.amya.org))



(Source [www.amya.org](http://www.amya.org))

# The Ten Commandments of Boat Speed

By Greg Fisher

July 1998

(Source [www.amya.org](http://www.amya.org))

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From the October, 1997 issue of Sailing World, here is an excellent article that is mostly applicable to our RC boats. I recommend the magazine for it's very good articles on sailing tactics and rules. - Miami Valley MYC June 1998 Newsletter.

**No. 1** Most boats perform best upwind with a nearly neutral weather helm. At times, the boat will develop weather helm, especially when in point mode but an excessive tug on the tiller indicates that the boat is badly out of balance. The quick fixes: sail the boat flatter, raise the centerboard, decrease mast rake or flatten the mainsail.

**No. 2** In most conditions, trim the mainsheet so that the top batten is parallel to the boom, rather than pointing inboard or outboard. To judge this, cover the last 10 inches of the upper batten with black tape. Then sight up the leech from under the boom, trim to the right spot and mark the mainsheet.

That said, there are times you can break this rule. When trying to accelerate, develop power in light-to-medium winds or when greatly overpowered in a breeze, the upper batten can be angled outboard 10 to 20 degrees.

Conversely, when trying to point high in moderate air, it's OK to slightly overtrim the main so that the batten hooks to windward in relation to the boom.

**No. 3** Figure out what is maximum mast bend, and then strive to attain it in most conditions. Maximum bend is the point at which overbend wrinkles (speed wrinkles, inversion wrinkles, etc.) develop in the lower quarter to lower third of the mainsail. Depending on the boat, you can bend the mast with mainsheet tension, vang tension, rig tension, mast blocks, spreader angle or a combination of all of the above.

**No. 4** Every boat has its optimal rig tension. Find out what it is and maintain it. Most boats sail best with the rig just tight enough so that the leeward shroud starts to go slack when it's blowing 10 to 12 knots.

If the rig is too loose, the Jib entry will become quite full. The result is poor pointing ability. Too tight a rig, on the other hand, is sometimes indicated by overbend/inversion wrinkles in the entry of the jib - a small-scale version of what happens to a mainsail with maximum mast bend. In addition, if the rig is too tight, the entry of the jib will be quite flat and the telltales will break on both sides of the jib at nearly the same time. In short, the jib becomes hard to steer to.

**No. 5** Sail the boat on its lines. Usually, a boat will not perform when its bow or stern is buried in the water. Besides the obvious drag this can affect the balance of the boat and the tug on the tiller (i.e. bow down creates weather helm). Instead position the crew weight so the transom is just kissing the water. The result is a smooth, undisturbed wake. Watch where the top sailors sit and copy them.

**No. 6** Trim your jib so that, if there were a batten in the middle of the leech, it would be parallel with the centerline of the boat. Put a piece of dark tape on this real or imaginary batten. Only in rare exceptions does a jib ever get trimmed off this position. One time would be for acceleration - ease the sheet so the middle leech stripe is angled 10 degrees outboard from centerline. This trim is for 'first gear' and should match to the mainsheet ease when the main's top batten is also angled outboard for acceleration.

**No. 7** Set your jib leads so your luff breaks evenly from top to bottom. When the boat is overpowered, move the lead aft until the top breaks just ahead of the lower and middle telltales.

**No. 8** Set your jib and main luff tension so that there are always some slight horizontal wrinkles along the luff. In very light winds, completely relax the luff tension so there are slight wrinkles all the way from head to tack. Tighten it gradually as the wind builds, so that in heavy air slight wrinkles appear only in the lower few feet or both sails.

If the luff tension is too soft, these wrinkles will be too big. But they'll never be as long or pronounced as the inversion wrinkles from excessive mast bend or too tight a forestay. Those wrinkles angle from luff to clew. The wrinkles controlled by luff tension are much smaller and perpendicular to the luff.

**No. 9** Every boat has a sweet spot - a precise steering angle for optimum performance upwind. Every boat also has a groove, which is the range of acceptable steering angles. It's up to the skipper to learn both. The lower end of this range is for acceleration. At this angle, both jib telltales should be streaming straight aft. The luff of the jib should rarely break, but the leeward telltales should never stall.

The center of the groove is the sweet spots where the boat should be sailed 75 percent of the time. Here you should steer so the weather telltale is slightly stalled. The other end of the groove is the pinching mode, which is used in breezy conditions, especially in flat water. This side of the groove is usually higher than simply letting the weather telltale lift. On most boats you can actually steer so the front of the Jib breaks as much as a foot back from the headstay for short periods.

**No. 10** When in doubt, copy the fast guys.

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## **Soling 1M Rig Setup and Tuning** (Source <http://www.solingonemeter.org/>)

### **How To Set Up Your Rig**

1. Install rig to where you would normally install.
  - In heavy airs use the front hole
  - In Medium airs use the middle hole
  - In light airs use the back hole
2. A ) By looking at the mast from the side of the boat make sure the mast is as straight as possible.  
B ) Check to see if the mast is centered left and right by tipping boat over on a straight table and measuring from the tip of mast to the ground and then reversing the above on the other tack. Make adjustments as needed.  
Once the mast is set up as described above you are ready for the next step.

Bring the boat to the site.

### Setting Up The Main

1. Heel the boat over in the cradle to simulate the boat sailing through the water. If you have tell tails turn the boat till the inside one (closest to the wind) starts to fly straight.
2. Pull the boom in to the centre of the boat with the transmitter. (You want the winch transmitter and the trim to be set at max in and still have adjustment of at least .75" both + , - on the boom adjustment)  
Adjust the main boom so that the main boom is off the centre line about .75"
3. Adjust the out haul so that you have about .75" - 1" from the boom to the sail. (tighter in heavy airs and drifters and looser in light airs and choppy water.)
4. Snug up the cunningham (not tight) to take any wrinkles out of the sail. As the air increases add more cunningham. Again you don't want it tight.
5. Pull the boom vang tight so that the middle batten is parallel to the boat.  
The upper batten is twisted off to leeward  
The lower batten is twisted to windward  
Recheck that after setting the boom vang that the main boom is still in, roughly .75" off the centre line.

### Setting Up The Jib

1. Set the out haul to match the main.
2. Set the cunningham so the line is not loose.
3. Adjust the boom so that the end of the boom points to the shroud.
4. You set the jib leach tension by pulling on the back / fore stay..  
The tighter the back/fore stay, the tighter the leach. Set the leach so when you look at the jib leach from the rear that the main and jib are equal to each other.
5. Start at the beginning and recheck the entire process.

You may need to do this several times to get it right.

### Test Rudder for Straightness

### **Very Important !!!**

1. When you put your boat in the water you have to make sure the rudder is straight.
2. Point your boat head to wind is best and with the sails out give her a liberal push. (Hands off the control stick)
3. Adjust the trim so your boat tracks straight. Do this as many time as needed to find the true centre of the rudder.
4. Note where your trim is in case you disturb it in a race. Having the rudder centered gives you the feeling you need going up wind (weather helm).

### Test Sail

Sail up wind close hauled away from any other boat (In Clean Air) as soon as possible. You need the boat to sail hands off for about three to five boat lengths before she needs to be headed down to fill the sails.

**To much helm?** (Boat rounds up and you loose control)  
(Can't tack)

Move mast further forward and start at the beginning.

Or

Open the leach of the main to balance her out.

**Not Enough Helm?** (Can't point)  
(Can't tack)

Move mast back and start at the beginning.

Or

Close the leach of the main to balance her out.

### **Boat Handling**

#### Sail Clean

There are a number of things that effect your position on the race coarse. The first is sailing clean. I can't do well in a race if I'm tangled up with another boat before the start.

**You have to, have to, have to sail clean.**

#### Get Your Head Out Of The Boat

If you have driven a motor bike or a full size sail boat you would do everything to avoid a collision. It is important to do the same in this sport.

Get used to sailing with your head out of the boat. You need to see the other guy coming and even if you are in the right, it's not worth proving it in a show of head butts.

#### Practice Your Mark Rounding

When my boat is set up and I'm happy with it, I go practice mark rounding. The windward and leeward marks are great tests. I sail as close as I can and try to gauge the gap between the boat and mark. If I left lots of room I sail back and do it again till I am happy with my mark rounding. It's never perfect but by practicing you will get better at judging the roundings.

#### Smooth Steering

You don't sail a full size boat by ramming the helm hard to starboard or port without a major lose in boat speed. Steering should be smooth. Think of the rudder as a brake.

#### Port Tack Approach Vs Tacking Below

Many times while going up wind it is better to dip the starboard tack boat because if planned early, you will have gained up more speed due to heading down and as you pass the transom you can use the speed to pinch up and gain back some of what you lost. When you meet next, you will be on starboard and in command and he will be forced to dip or tack. Hopefully you planned it right and are able to fetch the windward mark. If he tacked below he runs the risk of being steam rolled. If he dips, he will be behind you going around the mark.

#### Starts

If you want to start at the pin (leeward Mark), sail from the committee boat (windward mark) to the pin and count the seconds it takes for you to sail to the pin. If it takes 20 seconds you will know when to start at the committee boat to be at the pin with full speed. You can do the same if starting at the committee boat. The key is to be at full speed and clean air so you have the options to tack or sail with the fleet.

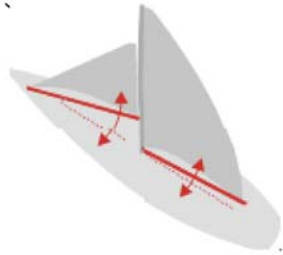
**And Finally,  
Practice Practice Practice!!!**

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[Technical]

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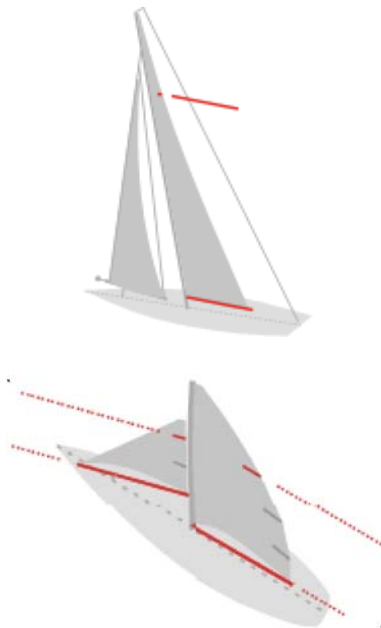
**Main sail sheeting angle:** Get the tip of your thumb between the sheeting post and the boom.

5 degrees

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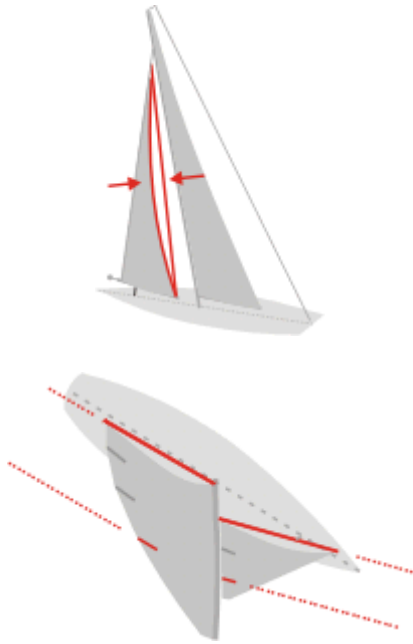
**Jib sheeting angle (slot):** Make sure you can stick the ends of four fingers between the jib boom and the mast (three if you have thick fingers).

12 degrees



**Main sail twist:** Have the middle main batten parallel with the boat centre-line, the lower batten pointing in a little, and the upper batten falling off some. Peter Spence suggests having the top batten falling off the same amount as the main boom sheeting angle -- that is, have it parallel with the boom. Make this setting without wind in the sails; when sailing, the leech will open up as necessary.

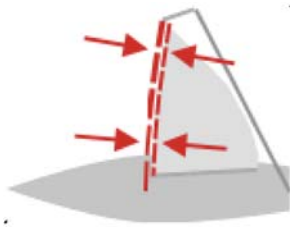
7.5 to 10 degrees



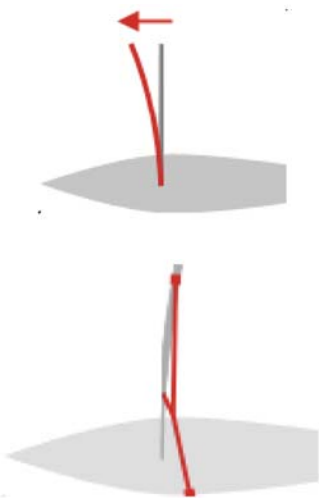
**Jib twist:** Have the gap between the leech and the topping lift take at least two fingers.

10 to 12.5 degrees

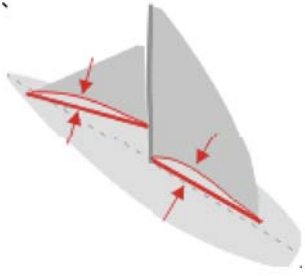
Or, like the mainsail, have the upper batten parallel with the jib boom.



**Mast bend (mast ram):** Set the mast curve to nicely match the main luff curve, then straighten the mast a smidgen (OK, maybe 3 mm) to push fullness into the middle of the sail if the wind is lighter than "top of No.1".



**Jibstay tension:** Make sure the jibstay never flaps in the breeze. (If you take this seriously, you'll have to have mast pre-bend to obtain the necessary backstay tension. Or, set your shrouds well aft of the mast and use a "V" spreader.)



**Main draft (outhaul):** Get at least a finger and a half between the foot of the main and the boom, up to two fingers.

8%

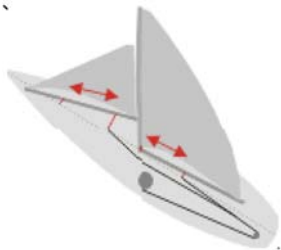
**Jib draft (outhaul):** Get at least a finger between the foot of the jib and the boom, up to a finger and a half, but two fingers might be a bit too much.

6%



**Jib pivot:** Somewhere around 25% of the jib foot, less if you have achieved high jibstay tension.

20% - 25%



**Sheeting radius:** Make sure the jib boom sheeting radius (distance between pivot point and jib sheet attachment point) is around 10% longer than the main boom sheeting radius (distance between gooseneck pivot axis and main sheet attachment point).