

## Adjust Your Mast Rake for More Speed (Advanced)

On many boats, one can adjust the mast rake. Mast rake is how far forward or aft your mast is at its top. Mast rake is important, because it is a major component in the boat's balance and feel. If the mast rake is off, you may end up with your rudder always slightly turned just to maintain your boat's heading. A rudder that's slightly turned is never as fast as one that's almost neutral (not much pressure on it when sailing). When you tack, you push the rudder way over, which slows the boat down because the rudder creates resistance with the water in order to make the boat turn.

The following images show how the rake affects the boat's balance. In Figure 1, the mast is raked too far aft. This moves the center of effort of the sails behind the center of effort of the foils, causing excessive weather helm and the boat to round up. In Figure 2, the boat's mast is raked too far forward, moving the center of effort in the sails forward of the center of effort of the boat's foils. This causes excessive lee helm and the boat to want to fall off.



Finally, in Figure 3, the boat's mast rake is correct, since the center of effort in the sails is directly above the center of effort of the foils. With the sails and the foils balanced, the tiller should have very little weather helm, and so you can sail straight without the tiller constantly being turned, producing very little rudder drag.



You can adjust your rake using the following method. First, if you have a tuning guide that tells you what the boat's mast rake should be, check that the rake is at that point. For sailors with and without a tuning guide, now go out sailing. Mast rake affects performance the most when sailing upwind. Get the boat's trim right by sitting where you should be, and make sure that the sails are correctly trimmed. It is also important make sure that your centerboard or daggerboard are in the correct upwind positions. For example, if the jib is cranked in and the main too far out on a 420, the results of mast rake adjustment will be incorrect. If your centerboard is only 3/4 of the way down, results will also be off.

Now that the boat and sails are trimmed correctly, notice how the helm feels. If you let go of the tiller, does the boat round up really quickly? Does the boat go straight, or want to fall off? Remembering the balance images above, if the boat wants to round up quickly, the mast is probably too far aft. On an Optimist, move your mast step back and try the process again. On a 420, move your mast step aft, loosen your shrouds and tighten your headstay and jib halyard and try the process again. Your goal is to have the helm neutral, with just a slight touch of weather helm (when the boat wants to round up slowly). If, when you let go of the tiller, the boat wants to fall off, the mast tip is too far forward, and should be moved aft. On Optimists, move the mast step farther forwards to rake the mast aft. On 420s, move the mast step farther forwards, and tighten your shrouds and loosen the forestay and jib halyard. Repeat the process until your boat is balanced, and you'll be sailing faster without using the rudder to keep you going straight and slowing you down.