

Righting Moment, A Decisive Factor

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The Righting Moment (RM), i.e. your boats ability to withstand the heeling force from the wind and the sails, is one of the most decisive factors for your upwind speed in winds over 3-4 m/s.

Let's compare a car with a sailboat. No matter how big an engine you've got, if the driving wheels don't get a good grip on the road, you'll spin and move slow. You will not be sailing fast to windward if your boat resists the heeling forces poorly, no matter how much sail power you've got.

In the 2.4mR Class, we are not allowed to use our bodyweight to balance the heeling forces. Most 2.4mR's are also rather narrow designs. For our RM, we have to rely mainly on the lead ballast in the keel. The more lead, the lower the CG (center of gravity), the higher RM and driving power upwind.

In our class rules as for our bigger sisters the 6, 8 and 12 meters, the RM is controlled by the scantling rules. The minimum skin weight for the hull and deck (3.6 kg/m^2) is the most important rule limiting the possibility to concentrate the CG (center of gravity) on a 2.4mR.

A weight calculation for a 2.4mR may look like this:

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| Hull and deck area..... | 7.5 m ² |
| Hull and deck skin..... | 27 kg |
| Extra reinforcement in bottom area and other areas..... | 9 kg |
| Rudder..... | 1 kg |
| Bare hull and deck..... | 37 kg |
| Fittings and buoyancy material..... | 8 kg |
| Complete boat without lead and sails..... | 45 kg |

Every kilogram of the boat you can transfer from the structure, down into the keel will increase your upwind power.

Check your rudder, many are over 2 kg. Do you have a chair in your boat? Can you throw it out, or could it be made lighter? How about your pedals? Are they made of thick plywood? They can be of sandwich panel just as well. Have you checked the weight of the floatation material? If it is foam blocks, you can be sure they suck water. We have had boats passing the flotation test in the spring but not in the autumn. Watertight bulkheads and floatation bags are an alternative worth considering. Bulkheads make the boat more rigid and floatation bags weigh the same all year around. What about the piece of plywood where you have all your cleats? Surely you can cut out lighting holes in it.

The boom does not have a minimum weight in the class rules. Is your rig down to the minimum 6.5 kg? Many boats have 2.5 mm rigging wire when 2 mm does the same job.

Some boats do not exploit the maximum allowed depth fully. I have had boats in my workshop that were 24 mm less than maximum. The keel can be cut off close to the bottom and be lowered to maximum 1000 mm.

How well the lead ballast fits down in the keel makes a difference. If you check how much water you can pour down into the keel before it reaches up to the top of the upper piece of lead, you will get an idea of how much unexploited volume you have in your keel.

Other ways to improve the RM is to put a thicker keel on your 2.4mR. Going from the standard 12% section to lets say 15%, adds considerable volume to the keel without adding very much resistance. More volume in the keel adds to the total displacement of the yacht and the boat has to be re-measured. The minus side is that if you add weight instead of moving weight from the boat down into the keel, you will have less sail area per kilogram of boat. Very little experimentation has been done in this field so far.

To sum it up; it is a good idea to take out the lead and unrig the boat and put in on the scale to see how much you can improve your stability. If you're about to buy a 2.4mR, it's a good idea to bring your bathroom scale and request to have the weight of the boat without lead checked before you let go of your money.

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