

RS700 Righting Moment and Weight Equalisation

Proposal to adjust the equalisation method rules

Preamble

In most dinghy classes the sailors at the top end of a fleet will conform to a narrow type of sailor. The specific of the boat will determine the specifics of the sailor. You probably won't see a 75kg sailor in a Finn or 100kg sailor in a Moth and you are even less likely to see one of those compete and win at the top level (or any level). The same principle applied to nearly every class.

You will see 75kg and 100kg sailors in the RS700. Sailors from both ends of the scale and at any point in-between will win races at the top level. The Righting Moment and Weight Equalisation system is responsible for that. It is the difference that gives the RS700 such broad appeal.

If we want to maintain the broad appeal it is important that the equalisation system works for all those who sail the boat, regardless of weight or height.

The equalisation rules were last modified in 2005 when the range of sailing weights was expanded to the current 75kg – 93kg, which meant the rack width had to be expanded from 6 holes, (5 increments) to the current 8 holes, (7 increments).

Those under 93kg have always known the RS700 is something special. Over the last 10 years an increasing number of sailors over 93kg who want something special or something other than a Phantom to sail have found a great home in the RS700. Unfortunately, these folk are not catered for by the current equalisation rules. At a few of our recent big events 50% of the fleet have been over the equalisation range.

The design characteristics of the RS700 allow it to carry weight well with little disadvantage compared to the lighter helms, even in light winds. It also converts weight into leverage very efficiently. What we see out on the race course is that unequalised leverage is starting to shift the balance of power towards the heavier and taller sailors.

If we let the equalisation system lapse the type of sailor attracted to the RS700 will narrow just like any other class and its popularity will reduce. That would be a shame.

This document presents the case to bring those over 93kg into the equalisation system.

THE CURRENT RULES

The current equalisation system seeks to equalise the Righting Moment and Weight, to a factor of 66% for sailors weighing between 73kg and 93kg. In 2005 when the rules were last changed that covered most folk sailing the RS700.

RIGHTING MOMENT EQUALISATION

(Weight equalisation is addressed on page 5.)

As I now understand (with the help of Phil Morrison) there are two components to a sailors Total Righting Moment (TRM) or leverage.

1. The Helm weight (x) the rack width from the centerline, as if the crew was standing up on the rack.
2. The helms righting moment about their feet, being the extra righting moment from laying back in the trapeze, as measured on the “plank”.

Once the sailor is weighed and measured using the “plank”, a rack width value provides the final part of the equation which determines the rack settings such that the Total Righting Moment (TRM), or total leverage is equalised (to a factor of 66%).

An average 75kg sailor (hole 8) has a TRM value of 178 kilogram-metres. At the other end of the scale (hole 1) the average 93kg sailor has a TRM value of 190kg-m. That’s a spread of 12kg-m or 7%.

Each 3kg change in a sailors TRM value will trigger a one-hole change (either up or down) in the rack setting to equalise the comparative leverage.

We know from real time racing, for those within the range the equalisation system works well. Sailor from both end of the range win races at the top level.

The population is getting taller and heavier

The design characteristics of the RS700 allow it to carry weight well. It is a virtue that the taller and heavier helms find the RS700 a great boat to sail. But since 2005, when the rules were last amended, the number of folk who are above 93kg and therefore outside the equalisation rules has risen from just a few to about 50% of the fleet competing at the big events.

A representative TRM value of a sailor at the upper end of the current weight range who might weigh around 100kg is 214kg m. So, it’s a 12kg-m range for those within the equalised range and then the next 7kg of helm weight delivers an additional 24kg-m of leverage or Righting Moment. It is a significant increase in righting moment and therefore power and boat speed for a relatively small increase in overall weight.

Righting Moment summary

1. We believe the Righting Moment part of equalisation system works well for those within the equalised range.
2. The TRM range is small enough for the lighter sailors to compete and win races.
3. But a significant proportion (who compete at the bigger events) of the RS700 sailors are now above the equalisation range.
4. Leverage increases proportionally faster for every kilogram of body weight above the upper equalisation band and to a point where the smaller and even average size sailors are unlikely to compete in average to windy conditions.
5. Its very likely that 100kg sailors will win races in the light or medium conditions. Its very **unlikely** that the smaller helms will win above 12knts.

What is being proposed

We are proposing to widen the scope of the Righting Moment equalisation rules to cover sailors weighing between (depending on the “plank” measured righting moment) 77kg and 99kg.

This will require one additional rack setting to be added inside the current hole 1 to be called hole 0.

The effect of the change is to move the rack setting **chart** one hole to the right. At the same time the heavier helms who were previously outside the scope of the righting moment equalisation move in one hole to the new hole 0.

There are also changes to the weight equalisation rules. These are set out in the next section.

I have explained how changes to the Righting Moment changes effect each category of sailor on the next page.

What will this mean to everyone?

1. For the vast majority of sailors who are currently sailing off **hole's 2 to 7** you will move up **one** hole. Its adds a shade over 2% of additional leverage.
2. For a lucky few who are also sailing off **hole's 2- 7** who were just short of getting that extra hole, you might move to the very bottom edge the band **two** hole higher. It might not apply to anybody, but it is possible.
3. For those who were legitimately within the equalisation range on **hole 1** you will move to **hole 2**, a 2% leverage gain. This would apply to sailors weighing around **91/92/93kg**

4. For those sailors who's TRM value took them just outside the current equalisation range, you probably weigh around **93/94/95kg** and by default were on hole 1, will stay on **hole 1**. It will depend on your Righting Moment as measured on the "plank".
5. For those that were 3kg or more above the equalisation bands, so **above 96kg**, assuming average or higher "plank" numbers, you will move onto the new **hole 0**. This will result in a TRM reduction of around 2.5%.

These changes are a simple logical evolution of the current system. This is not revolution. The heaviest sailors will still have higher TRM values because the equalisation factor is still 66%, but the gap to the light and average size sailors will be narrower. In fact, the gap will be same as the gap between the sailors who were previously with the equalisation range.

The key point is that this proposal brings most sailors into the same equalisation rules.

WEIGHT EQAULISATION

First draft proposal presented in Weymouth

Those who were at the meeting in Weymouth in August would have seen a first draft proposal of an idea to fully weight compensate (by 66%) everybody, in 1kg increments, right up to sailors weighing 100kg. This would have meant some sailors adding as much as 9kg versus the current rules which is equivalent to, an average of 8% (and as much as 11%) of their body weight, all for a gain of 2.5% of additional leverage or Righting Moment.

This proposal contains a simplified modification to the Weight compensation element, of the equalisation rules.

We are now proposing the following:

As with the righting moment equalisation we are proposing to move each weight band, except at the bottom end, up by 3kg.

1. Below 79kg, 12kg added.
2. 79kg to 83kg, 9kg added. Represents a maximum 56% compensation.
3. 84kg to 87kg, 6kg added. Represents a maximum 50% compensation.
4. 88kg to 93kg, 3kg added. Represents a maximum 50% compensation.
5. Above 93kg, no added weight.

These changes represent an average additional weight (as a percentage of the starting helm weight and compared with current rules) of 3.5%. As already mentioned, for a leverage gain of 2.5%.

The changes maintain essentially (as close as the 3kg lumps will allow) the same percentage equalisation as the current weight equalisation rules.

Summary of the changes being proposed to the Righting Moment and Weight equalisation rules

1. The changes are being proposed such that the majority of the RS700 sailing population would be included within the equalisation rules.
2. A few sailors will find themselves just outside the range, so those weighing around 100kg, but only just!
3. These changes narrow the current TRM gap between the 77kg and 99kg sailors but leave the heavier sailor with a leverage advantage. The 66% equalisation factor still applies
4. The changes maintain exactly the same leverage and weight equalisation relationship between those who are within the current equalisation bands.
5. We believe leverage is the dominant factor and so have kept the changes to the weight equalisation as simple as possible.