

Boat optimization and preparation

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About me

- ▶ Boat captain and project manager of Katariina II sailing team
- ▶ ORC national measurer in Estonia
- ▶ Sailing experiences in ORC, Match Race, Melges 24, J70, Star Sailors League and ice-boating



Fast Boat - Sail high average

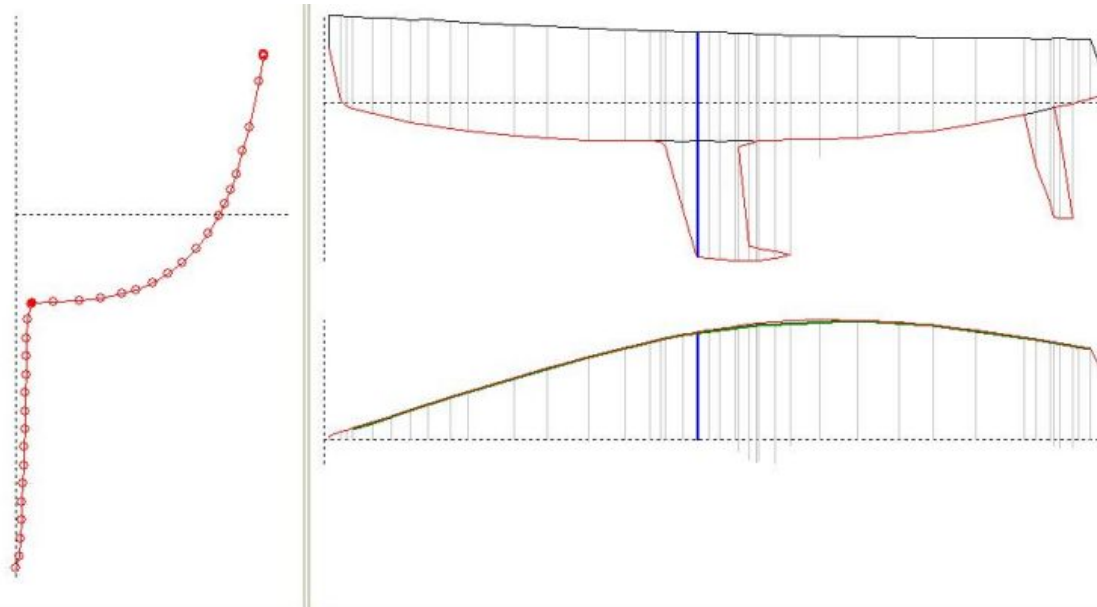
- ▶ Well balanced and easy to trim - get feedback from boat
- ▶ Able to sail fast on all courses, wind condition and sea state - all-rounder
- ▶ Boat is well maintain and take cared. All system works perfectly
- ▶ Good sails with nice/new shape
- ▶ Optimized in two way- relatedly good performance vs rating ratio - not downgraded or rating saver mode and but still fast

ORC international

- ▶ For International regattas, based fully on International measurement system.
- ▶ Based on a complete boat measurement
- ▶ Validated offset file (Hull scan or Designer file with correct FB point)

ORC club

- ▶ For national and club level, administered locally to keep it simple
- ▶ Data may be declared by the owner or obtained (might be worse than ORCi data)
- ▶ Can be used with not validated offset file, sometimes even from similar boat.

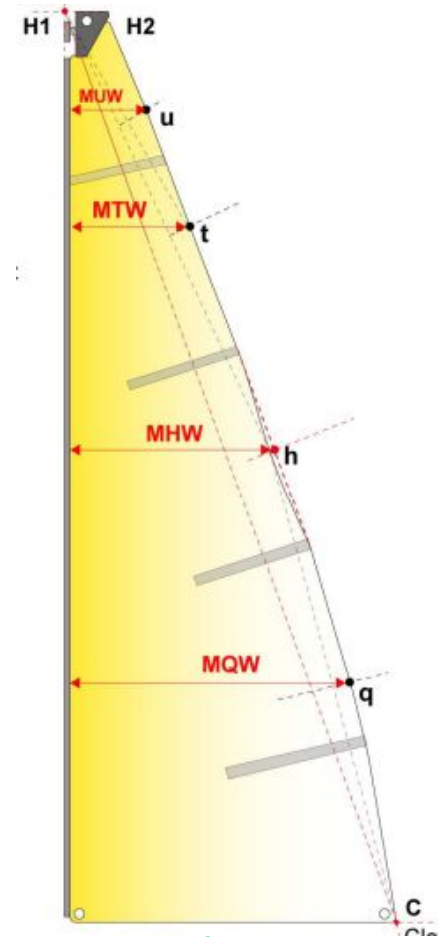
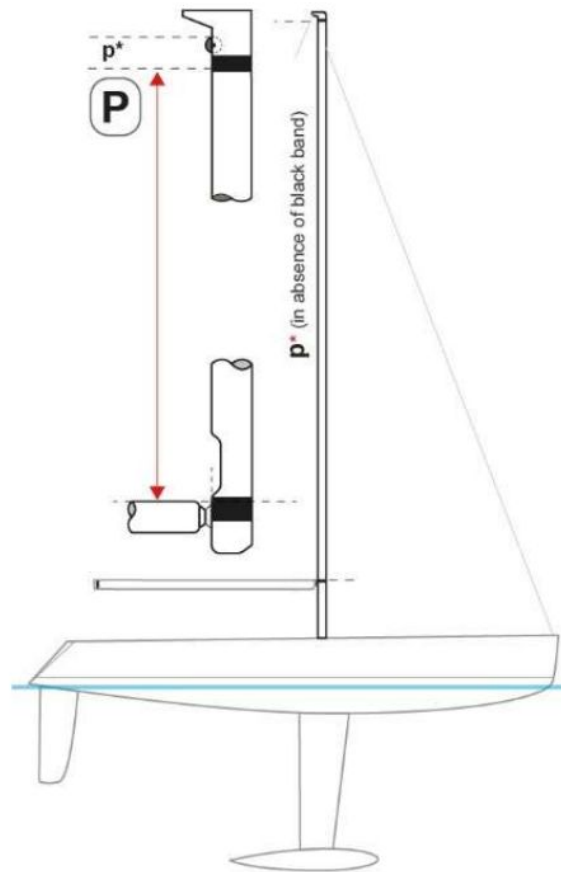
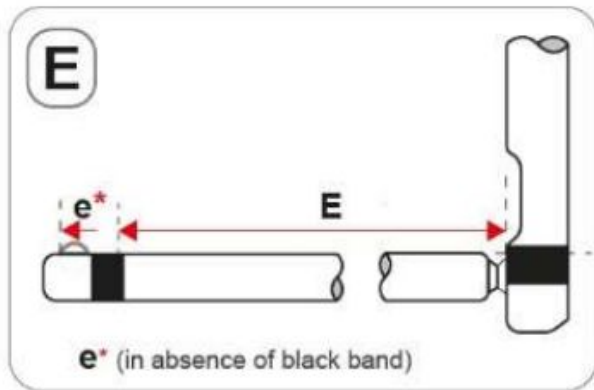


ORCclub data and optimization at first level

- ▶ Certificate include alldata, no empty boxes:
 - ▶ Righting moment and if possible add unit trim
 - ▶ Mast weight, center of gravity and cross section or furling main sail
 - ▶ One/furling headsail (genoa)
 - ▶ Adjustable backstay or not
 - ▶ Woven polyester (dacron)
 - ▶ P and E marks
 - ▶ Propeller data (folding or solid)
- ▶ Boat, rig and sail are measured correctly (both ORCi and ORCclub).
- ▶ Remeasure your brand new sails after couple of use.
- ▶ Get rid of the biggest sails, which you do not use.

Mainsail area:

$$\text{Area} = \frac{P}{8} \cdot (E + 2 \cdot MQW + 2 \cdot MHW + 1.5 \cdot MTW + MUW + 0.5 \cdot MHB)$$



ORCi for International level

- ▶ What is your target?
 - ▶ Offshore
 - ▶ Inshore
 - ▶ Racing level you are aiming
- ▶ What is your budget?
 - ▶ Sails - different type of sails, some spare sails for lower level regatas and good one for high level.
 - ▶ Boat maintenance and upgrade (bottom fairing, halyards, trimming systems, shrouds, electronics)
 - ▶ Rebuild (hull reinforcement, new foil/keel, mast, rudder).
- ▶ Compare your boat strenght and weakness against your opponents
 - ▶ Light vs strongwind
 - ▶ Upwind vs downwind
 - ▶ Pointing vs speedmode
 - ▶ Lowmode vs VMG (downwind)

ORCi for International level

- ▶ Understand reasons why you are slow or fast - figures and ratios
 - ▶ RM (displacement/RM) (RM/Upwind sa)
 - ▶ Upwind Sa (Sa/displacement) (Sa/wetted area)
 - ▶ Downwind Sa (Sa/displacement) (Sa/wetted area)
 - ▶ Boat balance (Upwind/ Downwind/ Reaching)
 - ▶ Rating/Performance (Compare your boat different setups and test certificates).

Time Allowances

- ▶ Make test-certificate (sailor service) and compare results
- ▶ Re-calculate the results with test-certificate.
- ▶ Make Time Allowances tabel and add other competitors.

Time Allowances in secs/NM							
Wind Velocity	6 kt	8 kt	10 kt	12 kt	14 kt	16 kt	20 kt
Beat VMG	699.1	586.6	543.1	519.5	504.9	495.6	487.2
52°	456.2	396.5	374.8	360.1	349.3	341.3	331.8
60°	430.0	380.1	356.5	340.7	329.6	321.4	310.8
75°	412.3	365.3	333.9	315.9	303.0	293.2	278.8
90°	417.3	368.6	330.4	302.6	284.4	270.7	251.7
110°	454.4	381.0	344.7	321.4	291.2	263.2	228.3
120°	467.3	385.2	339.2	309.6	288.4	270.2	234.6
135°	521.2	409.4	358.4	315.9	279.9	252.2	220.6
150°	627.0	484.4	409.2	363.1	322.8	285.6	228.3
Run VMG	724.0	559.4	472.6	419.3	372.7	329.8	263.6
Selected Courses							
Windward / Leeward	711.6	573.0	507.8	469.4	438.8	412.7	375.4
All purpose	542.5	448.5	402.2	373.0	349.3	329.7	302.5

- ToD (singel number) coefficients are calculated for the respective course model (Windward/Leeward or All-purpose) with the following wind strength distribution:

<i>TWS (kt)</i>	6	8	10	12	14	16	20
<i>Time Allowance percentage</i>	5%	10%	20%	30%	20%	10%	5%

Advanced optimization with designer

- ▶ Explain to him what you want to achieve and how do you feel on the boat. Designer has never sailed with our boat.
- ▶ Get some data/log. Later you can do simulation with different VPP-s.
- ▶ Boat drawing is a must. Get it from yard or scan the boat.
- ▶ Make sure your boat is fully measured and data is correct
- ▶ Turning the building process, scale old and new equipment (make sure you are in the target).
- ▶ Involve your sail designer or someone who has been worked with you already.

2023 changes

- ▶ Hydrodynamics - new residuary resistance model
- ▶ Aerodynamics - There is an updated de-powering scheme with removal of default righting moment
- ▶ Sail coefficients are updated for headsails set Flying (mid girth ratios from 50% to 85%)
- ▶ Internal ballast, if any, shall be permanently fixed below the cabin sole, or as low as possible.
- ▶ Default righting moment is removed from Rule 107.4 and is replaced with an estimated righting moment that is used where righting moment is not measured or is obtained from another source.
- ▶ Maximum number of mainsails allowed aboard while racing is increased from 1 to 2 (Same P and E)

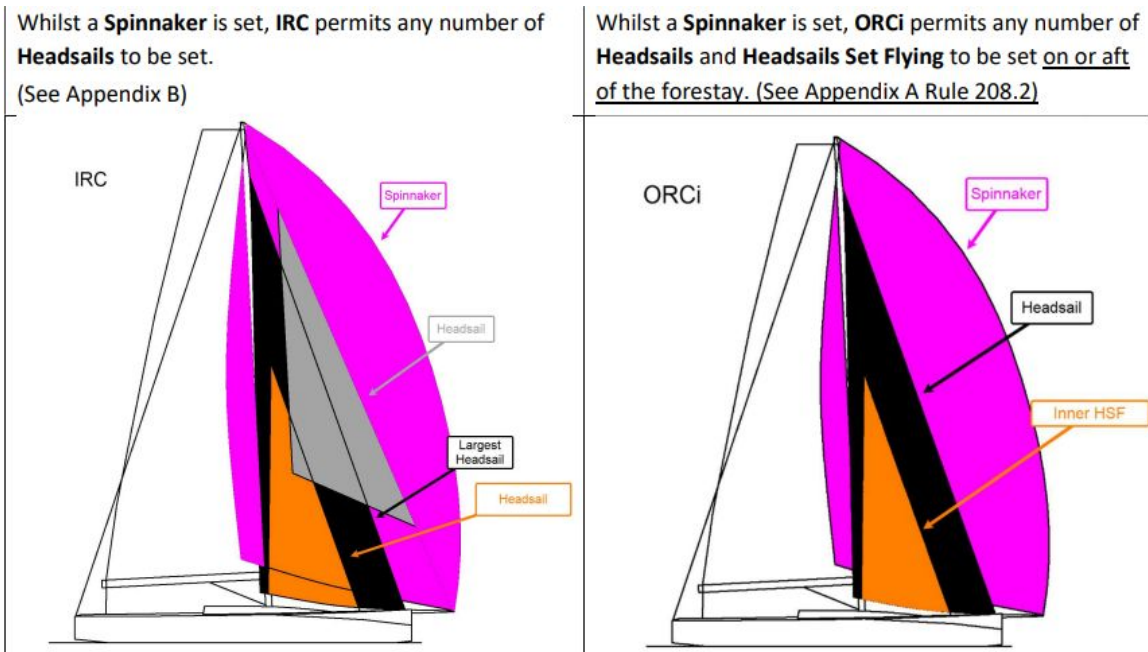
HSF- Headsail set flying



Headsail set Flying: ORC vs. IRC

ORC:

- Symmetric spinnaker/ A-symmetric spinnaker - mid-girth at least 75%
- Inner stay (spinnaker staysail and genoa staysail)
- Headsail set Flying, can be use front of headstay (rating increase)



Square top vs Pin tip

- ▶ The roach will proportionally increase the rated area from the measured area by giving the exact area and centre of effort height for square top and other high roach main sails.
- ▶ Effective rig height - fractionality, overlap and roach- are determined in order to calculate the effective rig height which determines the induced drag of the sails.
- ▶ Square top pros and cons (theory):
 - Shorter leech, easier to trim and twist
 - Better center of effort against center of lateral resistance. More sensitive rudder balance
 - With double backstay more sail area
 - less effective (shorter span)
 - Stiff and heavy top



A-symmetric vs symmetric

1. Symmetric spinnaker on pole only
 2. Asymmetric spinnaker tacked on CL
 3. Asymmetric spinnaker on pole , asymmetric on CL and symmetric on pole (mix)
- ▶ A-symmetric faster in light wind and reaching
 - ▶ More design sensitive (rig height, sheeting point)
 - ▶ Setting a tack on centerline, will reduce the rating.
 - ▶ In stronger wind rating will reduce, but in light you pay in rating.
 - ▶ Symmetric faster in medium and stronger wind and deep angles
 - ▶ Less design sensitive more option trim (afterguy, down/uphaul and barber)
 - ▶ Spinnaker boom itself will penalize
 - ▶ In lighter wind rating will reduce, but in strong you pay in rating.

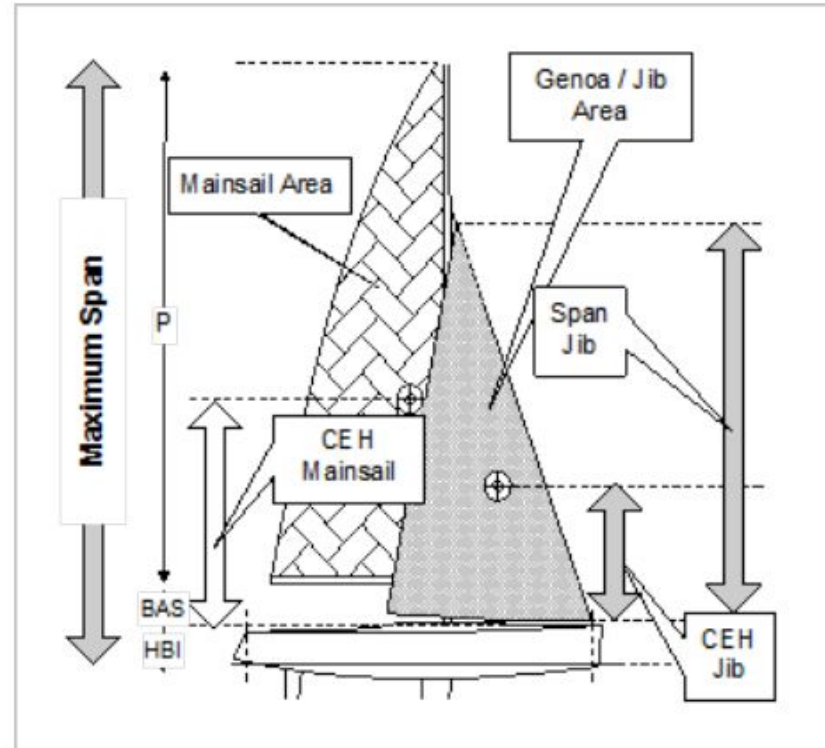
Fixed Ballast/lead

- ▶ Easiest and cheapest way to change your rating without cutting and buying new gear. Lead cost euros 2,5-3,5 per kg and it is resellable
- ▶ Internal ballast, if any, shall be permanently fixed below the cabin sole, or as low as possible. Permanently fixed is considered firmly secured by bolting or gluing that prevents any movement while racing (rule).
- ▶ Changes of ballast in amount or location or configuration requires new measurement and issuing a new certificate (rule).
- ▶ Ballast increase boat displacement and wetted area - which reduce your rating
- ▶ Increasing boat displacement will also increase the RM -which increase the rating little
- ▶ Higher the displacement will increase risk to increase stress for hull, mast and sails.

Genoa vs Jib

Centre of effort height:

- ▶ Sail area
- ▶ Headsail overlap
- ▶ IG/Sail span
- ▶ De-powering and flating headsails and main sail to be more accurate in different conditions. (according 2022 AMG notes de-powering is bigger with 2023 VPP).



First 36,7 (2022VPP) Genoa vs Jib:

Windward / Leeward	973.8	796.3	694.4	651.1	629.6	606.8	580.8
Windward / Leeward	991.1	809.3	702.7	655.3	633.2	610.3	581.9

Conclusion

- ▶ Sail much as possible - as input data
- ▶ Improve your sailing skill, together with that you increase the knowledge, how to make the boat faster (way cheaper than building complete new boat)
- ▶ Analyze your results and performance
- ▶ Try to understand what other boats are doing (optimizing) and analyze it as example
- ▶ Improve your boat and rating to sail faster, not only finding a better rating
- ▶ Try to improve your boat trimming ability, turn it as all-rounder
- ▶ Focus on simplification and high average boat speed

Best theory is practice



July 8

Registration and equipment inspection
in Pärnu YC marina
At 19:00 Opening ceremony

July 9

Pärnu short courses

July 10

Pärnu – Kuressaare/Roomassaare

July 11

Kuressaare circle

July 12

Kuressaare/
Roomassaare – Kõiguste

July 13

Kõiguste circle

July 14

Kärdla circle

July 15

Kärdla circle
Prize giving ceremony

