World Leader in Rating Technology

OFFSHORE RACING CONGRESS

ORC Rating Systems 2011

ORC International & ORC Club

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Margin bars denote rule changes from 2010 version

ORC

World leader in Rating Technology

ORC RATING SYSTEMS

ORC International Club

2011

Offshore Racing Congress, Ltd.

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Introduction

ORC Rating systems (ORC International and ORC Club) use the International Measurement System (IMS) as a measurement platform and the ORC Velocity Prediction Program (VPP) to rate boats of different characteristics in size, hull and appendages shape and configuration, stability, rig and sails measurement, propeller installation and many other details affecting their theoretical speed.

Boat ratings are calculated from the predicted boat speeds, calculated for 7 different true wind speeds (6-8-10-12-14-16–20 knots) and 8 true wind angles (52°-60°-75°-90°-110°-120°-135°-150°), plus the 2 "optimum" VMG (Velocity Made Good) angles: beating (TWA=0°) and running (TWA=180°), which are calculated obtaining an optimum angle at which the VMG is maximized. From the matrix of predicted performances a variety of handicaps are derived, and corrected times can be obtained selecting from a variety of options that range from the single number and triple number scoring based on Time-on-Distance or Time-on-Time to the "automated" methods such as the simple Performance Line Scoring (PLS) or the more sophisticated Performance Curve (PCS).

The VPP as the base of the ORC handicap system is explained in detail and a simulation software package can be purchased to study the theoretical boat speeds derived from the calculations when using IMS measurements. Details and order forms are available at the ORC website: www.orc.org.

Users of ORC Rating systems should consult the Administrative part of the IMS (Part A) for appropriate use of abbreviations, definitions, and symbols.

Certificates may be issued for ORC International for boats which are completely measured in accordance with the IMS and complying with the requirements of the IMS Rules and Regulations as well as those expressed in this document. In contrast, ORC Club certificates may be issued with less than complete IMS measurement where measurement data may be declared and/or obtained from other sources. The Organizing Authority of any race or regatta will specify whether ORC International or ORC Club certificates are required for entry, but both certificate types can be mixed in any race, being fully compatible.

1. LIMITS AND DEFAULTS

100 General

100.1 The IMS Measurement dataset of any boat is processed by the Lines Processing Program (LPP) which calculates hydrostatics and all hull characteristics required by the VPP. The calculations of the main hydrostatic data are explained in principle below, while the exact formulations are defined in the VPP and its documentation.

100.2 Default water specific gravity ***SG*** shall be 1.0253. FA and FF shall be adjusted from the measured freeboards ***FAM*** and ***FFM*** depending on the difference between ***SG*** at the time of measurement and the default value defined above. All hydrostatic calculations are then made using the flotation plane in nominal seawater, i.e. with default specific gravity.

100.3 Sailing Trim shall be the plane of flotation derived from Measurement Trim as in 100.2 with the addition of weight to represent crew, sails and gear.

100.4 Height of Base of I (HBI) is the calculated freeboard in Sailing Trim at the base of IG and ISP. It is used to establish the height of the center of effort of the sailplan.

100.5 DSPM and DSPS are the displacements calculated from the volume resulting from the linear integration of the immersed section areas obtained from the hull lines of the Offsets and the freeboards afloat, adjusted to the standard ***SG,*** in Measurement Trim and Sailing Trim respectively. DSPM is printed on the ORC certificate.

100.6 The Sailing Length (IMS L) is an effective sailing length which takes into account the hull shape along its length and especially at the ends of the yacht, both above and below the plane of flotation in Sailing Trim. L is a weighted average of lengths for three conditions of flotation: two with the yacht upright and one with the yacht heeled. The lengths for the three conditions of flotation from which L is calculated are second moment lengths derived from immersed sectional areas attenuated for depth and adjusted for appendages. The second moment lengths are:

LSM0 is for the yacht in Measurement Trim floating upright.
LSM1 is for the yacht in Sailing Trim floating upright.
LSM2 is for the yacht in Sailing Trim floating with 2 degrees heel.
LSM3 is for the yacht in Sailing Trim floating with 25 degrees heel.
LSM4 is for the yacht in a sunk condition such that compared to Sailing Trim it is sunk 0.025*LSM1 forward and 0.0375*LSM1 aft, floating upright.

The LPP calculates LSM's taken from the canoe body without appendages and from the full hull with appendages. The final LSM's are the averages of full hull and canoe body LSM's. IMS L is a fundamental parameter taken into account by the VPP in determining hull resistance and it is calculated as:

$$L = 0.3194 \cdot (LSM1 + LSM2 + LSM4)$$

100.7 The effective beam B is a mathematical expression of beam in which elements of beam throughout the immersed portion of the hull are taken into account with emphasis on beam elements close to the plane of flotation and remote from the ends of the hull. It is derived from the transverse second moment of the immersed volume attenuated with depth for the yacht in Sailing Trim floating upright.

100.8 The effective hull depth T is a depth-related quantity for the largest immersed section of the hull. It is derived from the area of the largest immersed section attenuated with depth for the yacht in Sailing Trim floating upright divided by B.

100.9 The Beam Depth Ratio BTR is the effective beam divided by the effective hull depth BTR = B/T.

100.10 The Maximum Draft of the Hull including fixed keel shall be the vertical distance from the Sailing Trim plane of flotation to the lowest point of fixed keel. For a centerboard, when ***KCDA*** is measured and recorded, the maximum draft shall be decreased by ***KCDA***.

100.11 VCGD is the vertical centre of gravity distance from the datum line in the hull offset file, while VCGM is the vertical centre of gravity from the measurement trim waterline.

101 Materials

101.1 It is the intention of the ORC Rating Rules to promote safety, address cost and allow materials that are readily available while prohibiting materials and processes that are not readily available.

101.2 The following materials are prohibited:

a) In hull and deck structures and rudders: High Strength (HS) carbon fibre with modulus exceeding 250GPa.

b) In spars with the exception of booms: Cored sandwich construction where the core thickness at any section exceeds the thickness of the two skins.

c) Any metal alloys containing titanium with the exception of generally available production hardware items. Titanium is not permitted in lifeline elements (stanchions, pulpits, pushpits etc.)

d) No material with density greater than 11,34 kg/dm^3.

e) Pressure applied in the manufacture of hull and deck structures greater than 1 atmosphere

f) Temperature applied in the manufacture of hull and deck structures greater than 80°C.

g) Aluminium honeycomb cores in hullshell and deckshell structures.

h) In hull and deck structures: Plastic foam core of nominal density less than 70kg/m^3.

102 Crew Weight

102.1 The maximum crew weight may be declared by the owner.

102.2 If the maximum crew weight is not declared it shall be taken as default calculated to the nearest kilogram as follows:

$$CW = 74.95276 \cdot \left(\frac{DSPM}{LSM\,0^3} \right)^{0.375} \cdot \left(\frac{RM}{DSPM \cdot MB} \right)^{0.4} \cdot LSM\,0^{1.55}$$

102.3 The possibility of extending crew position beyond the IMS sheerline is taken into account through CEXT factor in accordance with ORC Sportboat Class rule 4(c).

103 Hull

103.1 Age Allowance (AA) is a credit for age of 0.065% of ratings increase for each year from Age or Series Date to the current rule year up to maximum of 15 years (0.975%).

103.2 Dynamic Allowance (DA) is a credit representing dynamic behavior of a boat taking into account performance in unsteady states (i.e. while tacking) calculated on the basis of: Beating Sail Area/Volume ratio, Beating Sail Area/Wetted Surface ratio, Downwind Sail Area/Volume ratio, Downwind Sail Area/Wetted Surface ratio, Length/Volume ratio and Draft/Length ratio.

It is fully applied to the ratings of Cruiser/Racer, while for the Performance boats it is applied incrementally with only 20% of the full calculated DA applied in the fourth year and a further 20% in each of the following years until full DA is applied in the eighth year.

103.3 NMP (Non Manual Power) is penalty for boats using non-manual power as defined in 204(b). The maximum penalty is 0.5% to all ratings. If the declared crew weight as in 102.1 is smaller than default crew weight as in 102.2, the penalty is decreased as follows:

$$NMP = 0.5 \cdot \left(\frac{CW_{declared}}{CW_{default}} \right)^2 [\%]$$

104 Appendages

The longitudinal movement of the center of gravity of a centerboard when it is being raised or lowered shall not exceed 0.06 * ***LOA***.

105 Propeller

105.1 PIPA shall be the propeller installation projected area calculated on propeller type, installation and measurements.

105.2 For twin propeller installation, PIPA is doubled.

106 Stability

106.1 Limit of positive stability (LPS) as calculated by the LPP from the measured righting moment shall not be less than 103.0 degrees, except for the ORC Sportboats for which the limit is 90.0 degrees.

106.2 Stability Index shall be calculated as follows:

Stability Index = LPS + Capsize Increment (CI) + Size Increment (SI)

$$CI = 18.75 \cdot \left(2 - \frac{MB}{\sqrt[3]{DSPM/64}} \right) \qquad SI = \frac{\left(\frac{12 \cdot \sqrt[3]{DSPM/64} + LSM0}{3} \right) - 30}{3}$$

DSPM – Displacement in measurement trim calculated by the VPP
LSM0 – Second moment length calculated by the VPP

CI shall not be taken as greater than 5.0 nor less than -5.0.
SI shall not be taken as greater than 10.0.

Stability Index for water ballast yachts is calculated with the ballast tankage full on one side, empty on the other and for canting keel yachts with the keel fully canted.

106.3 Minimum Stability Index may be limited by the Notice of Race and Sailing Instructions for the Offshore Special Regulations Categories 0, 1 or 2 events, but other limits may also be set for any particular event.

Offshore Race Category:	0	1	2
Minimum Stability Index	120	115	110

106.4 For a boat with water ballast or canting keel, the Ballast Leeward Recovery (BLR) Index represents such a boat's relative ability to recover from a knock down with sails aback, i.e., knocked down with all water ballast or canting keel to leeward. BLR Index shall be calculated as follows:

$$BLRIndex = \frac{RA90 \cdot DSPS}{6 \cdot SA \cdot CE} + 0.5$$

Where the following values taken with full leeward cant or leeward ballast tankage full, windward empty, they are calculated by the VPP, in metric units:

RA90 - Righting arm, 90 degrees heel, sailing trim
SA - Rated sail area
CE - Center of Effort of the rated sail area

106.5 Minimum BLR Index may be limited by the Notice of Race and Sailing Instructions for the Offshore Special Regulations Categories 0, 1 or 2 events, but other limits may also be set for any particular event.

Offshore Race Category 0: Minimum BLR Index = 0.90 + 0.007*(LSM1 - 5)
Offshore Race Category 1 & 2: Minimum BLR Index = 0.75 + 0.007*(LSM1 - 5)

107 Righting Moment

107.1 When an inclining test is performed with weights that are transferred once from starboard to port side and the angle recorded four times in succession, the measured righting moment shall be calculated as follows:

$$RM_{(1-4)} = W_{(1-4)} \cdot 0.0175 \cdot WD \cdot \frac{PL}{PD_{(1-4)}}$$

$$RM_{measured} = \frac{RM_1 + RM_2 + RM_3 + RM_4}{4}$$

107.2 When an inclining test is performed with four weights that are transferred one by one from starboard to port side, the measured righting moment shall be calculated as follows:

$$RM_{measured} = WD \cdot PL \cdot \frac{0.0175}{SLOPE}$$

where

PL = ***PLM***/(1+***GSA/RSA***)
SLOPE = (4.0*SUMXY-SUMY*SUMX) / (4.0*SUMXSQ-SUMX^2)

SUMX - the sum of the inclining weights ***W1+W2+W3+W4***
SUMY - the sum of the pendulum deflections ***PD1+PD2+PD3+PD4***, referenced to datum point.
SUMXSQ - the sum of the squares of the inclining weights ***W1***^2 + ***W2***^2 + ***W3***^2 + ***W4***^2
SUMXY - the sum of the products of the inclining weights multiplied with their corresponding pendulum deflections ***PD1*W1 + PD2*W2 + PD3*W3 + PD4*W4***

The slope of a least squares fit straight line through the inclining weight vs. pendulum deflection is determined iteratively, plotting in turn each of the five possible combinations of four selected data points, as referenced to the fifth point. Of the five alternative plots, the one yielding the fit with the highest correlation coefficient determines RM.

107.3 For boats with movable boards or drop keels, the righting moment is corrected to: RMC=RM+0.0175*(***WCBA*CBDA+WCBB*CBDB***). For yachts with fixed keels or centerboards locked to prevent any movement: RMC=RM.

107.4 Default righting moment shall be calculated as follows:

$$RM_{default} = \left(a0 + a1 \cdot BTR + a2 \cdot \frac{\sqrt[3]{VOL}}{IMSL} + a3 \cdot \frac{SA * HA}{B^3} + a4 \cdot \frac{B}{\sqrt[3]{VOL}} \right) \cdot DSPM \cdot IMSL$$

where all the variables are calculated by the VPP

a0 = -0.00410481856369339 (regression coefficient)
a1 = -0.0000399900056441(regression coefficient)
a2 = -0.0001700878169134 (regression coefficient)
a3 = 0.00001918314177143 (regression coefficient)
a4 = 0.00360273975568493 (regression coefficient)
VOL - canoe body volume
SA - sail area upwind
HA - heeling arm, defined as
(CEH main*AREA main + CEH jib*AREA jib) / SA + HBI + DHKA*0.45
CEH - height of centre of effort
DHKA - Draft of keel and hull adjusted

Default righting moment shall not be taken greater than 1.3*RMmeasured nor smaller than 0.7*RMmeasured.

For movable ballast boats the default righting moment intends to predict the righting moment of the boat without the effect of movable ballast (water tanks empty, or keel on the center plane), is then decreased by a factor (1- RM@25_movable/RM@25_tot), where RM@25_movable is the righting moment due to the contribution of movable ballast at 25 degrees of heel, and RM@25_tot is the total righting moment at 25 degrees, with keel canted or windward tanks full. For these boats, the max and min bounds are set to 1.0*RMmeasured and 0.9*RMmeasured respectively.

107.5 The righting moment used in the VPP calculations will be the average between the measured and default RM as follows:

$$RM_{rated} = \frac{RM_{measured} + RM_{default}}{2}$$

107.6 If the inclining test is not performed for boats with water ballast as prescribed in IMS E5, the vertical longitudinal and transversal centre of gravity of the water ballast will be calculated as follows:

VCGwb = 0.5 * ***FA***
LCGwb = 0.7 * ***LOA***
TCGwb = 0.9 * Crew Arm

108 Rig

108.1 The upper end of any rigging shall be attached to the mast above a point 0.225***IG*** above the sheerline, except that there may be a temporary support to the mast near the spinnaker pole when the spinnaker is set.

108.2 ***P*** + ***BAS*** shall not be less than the greater of 0.96***IG*** or 0.96***ISP***.

108.3 Boom diameter by default shall be 0.06***E***. If ***BD*** exceeds this default, the mainsail rated area shall be increased as defined in 109.2.

108.4 Adjustable inner forestays, when fitted, shall be attached to the foremost mast between 0.225***IG*** and 0.75***IG*** above the sheerline.

108.5 Foretriangle height IM shall be calculated as follows:

$$IM = \left(IG + \frac{IG \cdot (GO - MW)}{J - GO + MW} \right)$$

IM shall not be taken as less than 0.65*(***P*** + ***BAS***).

108.6 If ***TPS*** is measured and bowsprit is recorded as moveable sideways in accordance with IMS F7.3 it shall be considered by the VPP as spinnaker pole with SPL = TPS.

109 Mainsail

109.1 Mainsail measured area shall be calculated as follows:

$$Area = \frac{P}{8}\left(E + 2 \cdot MGL + 2 \cdot MGM + 1.5 \cdot MGU + MGT + 0.5 \cdot HB\right)$$

If any of mainsail widths is not measured, it shall be taken as:

HB = 0.05 * ***E***
MGT = 0.25 * ***E***
MGU = 0.41 * ***E***
MGM= 0.66 * ***E***
MGL = 0.85 * ***E***

Mainsail measured area is calculated by the simplified trapeze formula above, dividing the luff in amounts of 1/4, 1/2, 3/4 and 7/8. Mainsail rated area is calculated by using the actual heights on the luff from the tack point to the points where mainsail girths are measured. These actual heights are calculated as follows:

$$MGMH = \frac{P}{2} + \frac{MGM - E/2}{P} \cdot E$$

$$MGLH = \frac{MGMH}{2} + \frac{MGL - (E + MGM)/2}{MGMH} \cdot (E - MGM)$$

$$MGUH = \frac{MGMH + P}{2} + \frac{MGU - MGM/2}{P - MGMH} \cdot MGM$$

$$MGTH = \frac{MGUH + P}{2} + \frac{MGT - MGU/2}{P - MGUH} \cdot MGU$$

Mainsail rated area is then calculated as follows:

$$Area = \frac{MGL + E}{2} \cdot MGLH + \frac{MGL + MGM}{2} \cdot (MGMH - MGLH) +$$
$$+ \frac{MGM + MGU}{2} \cdot (MGUH - MGMH) + \frac{MGT + MGU}{2} \cdot (MGTH - MGUH) +$$
$$+ \frac{MGT + HB}{2} \cdot (P - MGTH)$$

Thereby, the amount of roach will proportionally increase the rated area from the measured one.

109.2 If ***BD*** exceeds its limit set up in 108.3, mainsail rated area shall be increased by 2****E****(***BD*** - 0.06****E***).

109.3 The rated ***MSW*** shall be the smallest found on any mainsail in the sails inventory. If ***MSW*** is not recorded it shall be taken as 0.125*DSPM/64 (lbs) where DSPM is the displacement in cubic feet in measurement trim as calculated by the LPP.

110 Mizzen

Mizzen width defaults and rated area shall be calculated as for the mainsail with corresponding measurements.

111 Jibs (also applying to genoas)

111.1 Jib/genoa measured area shall be calculated as follows:

$$Area = 0.1125 \cdot JL \cdot (1.445 \cdot LPG + 2 \cdot JGL + 2 \cdot JGM + 1.5 \cdot JGU + JGT + 0.5 \cdot JH)$$

Jib/genoa rated area shall be the largest measured area of any jib/genoa in the sail inventory, but shall not be taken less than:

$$0.405 \cdot J \cdot \sqrt{IM^2 + J^2}$$

111.2 If any of jib widths are not measured, it shall be taken as follows:

JGT = 0.125 * ***LPG***
JGU = 0.250 * ***LPG***
JGM = 0.500 * ***LPG***
JGL = 0.750 * ***LPG***

111.3 Aerodynamic lift coefficients of the VPP calculations are credited in the upwind angles (AWA < 50) for each of the following:

a) If there is a genoa furler used in association with one genoa (***LPG*** > 110% ***J***) only

b) For boats with ORC Club certificate, if all jibs/genoas and mainsail are made of woven polyester

112 Mizzen Staysail

Mizzen staysail rated area shall be calculated as follows:

$$Area = YSD \cdot (0.5 \cdot YSMG + 0.25 \cdot YSF)$$

113 Symmetric Spinnaker

113.1 Symmetric spinnaker measured area shall be calculated as follows:

$$Area = \frac{SL \cdot (SF + 4 \cdot SMG)}{6}$$

Symmetric spinnaker rated area shall be the largest measured area of any symmetric spinnaker in the sail inventory, but it shall not be taken less than:

$$1.14 \cdot \sqrt{ISP^2 + J^2} \cdot \max(SPL; J)$$

113.2 If any of SL, SMG or SF is not measured, it shall be taken as follows:

$$SL = 0.95 \cdot \sqrt{ISP^2 + J^2}$$

$$SF = 1.8 \cdot \max(SPL;J)$$

$$SMG = 1.8 \cdot \max(SPL;J)$$

If SPL is not measured it shall be taken as ***J***.

113.3 If there is no any spinnaker aboard, the boat will be rated with an asymmetric spinnaker tacked on pole with following parameters: SPL = ***J*** and *Area* = 1.035 * *Area* of the the largest jib/genoa.

114 Asymmetric Spinnaker and Code 0

114.1 Asymmetric spinnaker luff shall be calculated as

$$ASL = \frac{SLU + SLE}{2}$$

114.2 Asymmetric spinnaker and Code 0 measured areas shall be calculated as follows:

$$Area = \frac{ASL \cdot (ASF + 4 \cdot AMG)}{6}$$

Asymmetric spinnaker rated area shall be the largest measured area of any asymmetric spinnaker in the sail inventory, but it shall not be taken less than:

$$0.6333 \cdot \sqrt{ISP^2 + J^2} \cdot \max(1.8 \cdot SPL; 1.8 \cdot J; 1.6 \cdot TPS)$$

Code 0 rated area shall be the largest measured area of any Code 0 in the sail inventory, but it shall not be taken less than:"

$$0.8106 \cdot \sqrt{ISP^2 + J^2} \cdot TPS$$

114.3 If any of ASL, AMG, ASF is not measured it shall be taken as follows:

$$ASL = 0.95 \cdot \sqrt{ISP^2 + J^2}$$

$$ASF = \max(1.8 \cdot SPL; 1.8 \cdot J; 1.6 \cdot TPS)$$

$$AMG = \max(1.8 \cdot SPL; 1.8 \cdot J; 1.6 \cdot TPS)$$

$ASF = 1.6 \cdot TPS$ - for Code 0

$AMG = 1.6 \cdot TPS$ - for Code 0

If TPS is not measured it shall be taken as ***J*** + ***SFJ***.

114.4 Code 0 performance shall be rated using the aerodynamic forces coefficients of the Code 0 and of the asymmetric spinnaker, where the VPP will calculate the best performance thereof.

2. RULES APPLYING WHILE RACING

200 Crew Weight

The weight of all crew members on board while racing weighed in light street clothes shall not be greater than the maximum crew weight as defined in 102.1 and 102.2.

201 Ballast, Fixtures and Equipment

201.1 The first sentence of the RRS 51 does not apply for the water ballast and canting keel systems and it is modified by adding as non-movable items recorded in the measurement inventory (IMS E2.2).

201.2 Unwarranted quantities of stores shall be considered as ballast. Any liquid carried on board in excess of 2.5 liters of drinkable fluid per person per day of racing, in the tanks or in other containers, and any fuel in excess of the quantity needed to motor for 12 hours is not permitted. Race Organizers may waive this requirement by specifying so in the Notice of Race.

201.3 Portable equipment, gear, sails and stores may only be moved from stowage for use in their primary purpose. Stowage in this respect is the position for any item of equipment or stores, to be maintained for the duration of a race or series, when such item is not in use for its primary purpose. Note: Moving sails or equipment with the intention of improving performance is prohibited and shall be considered as a breach of RRS 51.

202 Drop Keels and Movable Appendages

If any drop keel or movable appendage is to be locked when *racing* it shall be locked so and the locking device shall be in place.

203 Centerboards

The movement of a centerboard or drop keel while *racing* shall be restricted to one of the following:

a) Straight extension or retraction as in a dagger board.

b) Extension about a single fixed pivot.

204 Manual Power

RRS 52 is modified. Non-manual power may be used for:

a) canting keel and water ballast systems

b) adjusting stays, running rigging or spars on:

- all boats with LOA > 20 m
- Cruiser/Racer boats complying with IMS Appendix 1 with LOA <= 20 m.

205 Rig

205.1 Movement of the mast at the step or deck is not permitted, except for a natural movement of the mast at the deck not exceeding 10 per cent of the greatest fore and aft or transverse dimension of the mast.

205.2 If the forestay is adjustable it shall not be used to control mast rake.

205.3 Mast jack pump shall not be on board.

206 Sails

206.1 Exclusive of storm & heavy weather sails required by the Offshore Special Regulations, a boat shall not carry aboard while *racing* more sails of each type than the numbers defined as follows:

GPH	**Below 475.0**	**475.0 – 614.9**	**615.0 – 720.0**	**Above 720.0**
Mainsail	1	1	1	1
Genoa	5	4	3	2
Jib	4	3	2	2
Inner jib	1	1	1	1
Spinnakers	4	4	3	3
Mizzen	1	1	1	1

a) If there are no genoas in the sails inventory the number of jibs allowed on board shall be increased by two.

b) If the genoa is used with a genoa furler credited in accordance with 111.3 only one genoa shall be aboard while racing. That genoa shall be of area not less than 95% of the largest genoa recorded on the certificate.

c) Inner jib shall have ***LPG*** of 1.1****J*** or less and shall be tacked inside another jib or spinnaker.

d) Spinnakers include: symmetric, asymmetric and Code 0.

206.2 Notice of Race and Sailing Instructions may modify limitations set in 206.1 appropriate to the character of race.

206.3 Operating devices for securing halyards under tension (e.g. halyard locks) shall be permitted only if they can be remotely operated from deck.

206.4 Sail configurations may be used as follows:

a) If ***TPS*** is measured, any spinnaker (symmetric, asymmetric or Code 0) may be tacked on the centerline.

b) If ***SPL*** and symmetric or asymmetric spinnakers are measured, each of them may be tacked on the pole. Code 0 shall not be tacked on the pole.

c) If ***SPL*** is measured, a jib may be tacked on the spinnaker pole.

d) If no spinnaker is in use, two jibs may be set on the same tack point.

207 Jibs (also applying to genoas)

207.1 When a jib is set under a spinnaker or inside another jib and if the jib is trimmed flat along the center line of the boat:

a) the clew shall not be aft of LP measured from the luff of the foremost jib.
b) no more than 50 per cent of its area shall fall abaft the foreside of the mast.

207.2 If the jib is set flying, no tack pennant greater than 0.762 m may be used.

207.3 No jib shall be tacked such that the forward end of any batten is aft of the center line of the mast.

207.4 Jibs may be sheeted:

a) to any part of the deck or rail

b) to a fixed point no higher than 0.05****MB*** above the deck or coach roof

c) to the main boom within the measurement limit according to IMS F5.3.

d) to the spinnaker pole in accordance with RRS 50.2

and shall not be sheeted to any other spar or outrigger.

208 Spinnakers

208.1 Leech lines shall not be adjustable on symmetric spinnakers.

208.2 Spinnakers shall be sheeted:

a) from only one point

b) to any part of the rail or deck

c) to the main boom within the measurement limit according to the IMS F5.4

and shall not be sheeted to any other spar or outrigger.

208.3 Struts, spools or similar devices used solely for the purpose of keeping the spinnaker guy away from the windward shrouds are permitted only when the guy is attached to the pole and shall not to be used for any other purpose.

208.4 Where the asymmetric spinnaker is tacked on the centerline, tack pennants of whatever length may be used. Spinnaker shall be sheeted on the same side as the boom, except when gybing or maneuvering. In any case, the tack of the spinnaker shall not be moved on the windward side with the help of afterguys and outriggers.

209 Mizzen Staysail

209.1 Mizzen staysail shall be sheeted:

a) to any part of the rail or deck

b) to the mizzen boom within the measurement limit according to the IMS F10.1

and shall not be sheeted to any other spar or outrigger.

209.2 The tack or tack pennant shall be secured abaft the point of intersection of the afterside of the mainmast with the main deck and must also be secured directly to and no higher than the rail cap, deck or cabin top (includes dog house top).

209.3 No more than one mizzen staysail shall be set at the same time.

209.4 No mizzen staysail shall be carried on a yawl or ketch whose mizzen is set on a permanent backstay in lieu of a mizzen mast.

210 Penalties

If any of the rules of Part 2 are broken by the crew through no fault of their actions, the penalty imposed may be different from disqualification, including no penalty.

3. CERTIFICATES

301 Certificates

301.1 **ORC International certificate** may be issued for a boat completely measured in accordance with the IMS and complying with the requirements of the IMS Rules and Regulations as well as ORC Rating systems. However, IMS hull measurement as defined in IMS Part B may be replaced by designer's data provided that:

a) The designer sends to the ORC hull data in 3D surface format (such as IGS) including the hull and all appendages with fore and aft water plane reference points which shall be marked on both sides of the hull, so that they can be used for flotation measurements. The longitudinal position of the reference points shall be inside the flotation waterline and not more than 0.05*LOA from the waterline ends

b) The ORC Central Rating Office will then create an offset file which shall be validated by checking one or more of the following:
- LOA, MB, deck beam at any stations, any section girth or height
- displacement calculated by the LPP from the freeboard measurements compared with one coming from actual weighing or calculated from the design waterline

This procedure shall be checked and approved by the ORC Chief Measurer and shall be used only for an exact type of boat with exact appendages for which data is provided by designer.

It is the owner's responsibility to ensure compliance, while the designer shall confirm by a signed written declaration that the data provided are within the closest possible tolerances.

301.2 **ORC Club certificate** may be issued with less than complete IMS measurements, in cases where measurement data may be:

a) Measured in accordance with the IMS

b) Declared by the owner. Any declared data may be taken or corrected by the Rating Authority if there is reasonable doubt about any declared data.

c) Obtained from any other source, including photos, drawings, designs, data from identical or similar boats.

302 One Design Certificates

302.1 ORC International and ORC Club certificates may be in the form of a One Design certificate where all data affecting a boat's rating are standardized based on the set of measurements for classes having One Design class rules or having all the IMS measurements in close tolerances. In such case no measurement is needed providing that there is proof that the boat is complying with the One Design Class measurements.

302.2 Any change of the One Design class measurements shall render invalid the boat's One Design certificate and a new standard ORC International or ORC Club certificate may be issued.

302.3 Data for the ORC International or ORC Club One Design Classes based on their class rules and actual IMS measurements of at least 5 measured boats shall be collected by the ORC to issue One Design certificates, whose data will be made available to the rating authorities when ORC is satisfied that the production of the class is within close tolerances. National rating authorities may issue One Design certificates for the national One Design Classes in their area when they are satisfied with the measurement data.

302.4 One Design measurement data may be changed from time to time due to changes in the Class Rules, IMS Rules or ORC Rating systems.

302.5 One Design certificates shall have the notation "One Design".

303 Certificate Issuing

303.1 Certificates shall be issued by the ORC Central Rating Office or by the National Rating Offices appointed by the ORC Nominating Bodies having a contract with the ORC for using ORC-certified computer software. A levy as determined by the ORC shall be paid for all valid certificates issued.

303.2 National Rating Offices shall be the Rating Authority in their areas and shall issue certificates for the boats normally stationed or racing in their jurisdiction. Measurement data of any boat shall be available and shared with any rating office, particularly when boats change area, owner, sail number, and are requesting certificates from several Rating Offices' jurisdictions. Data will not be available to other parties without the written permission of the Designer.

303.3 The Rating Office shall have the authority to issue the certificate upon receipt of the measurement data, but if anything that can be considered unusual or against the general interest of the IMS Rule and Regulations or ORC Rating systems is found, the Rating Office may withhold the certificate pending an examination of the case and issue a certificate only after approval is obtained from the ORC.

303.4 The certificate shall be valid until the date printed on the certificate, which shall normally be 31st December of the current year.

303.5 A boat shall have only one valid certificate at any one time. The valid certificate shall be only the one issued last.

303.6 When the Rating Authority has reasonable evidence that not by her own fault a boat does not comply with her certificate, or that she should never have received a certificate, it shall withdraw the certificate, inform the owner or his representative in writing of the reasons for this withdrawal, re-check the data and

a) Re-issue a certificate if non-compliance may be corrected; or

b) If non-compliance may not be corrected by the Rating Authority, the certificate shall be invalidated and the owner or his representative shall be informed in writing.

303.7 The Rating Certificates once issued are considered public, and the Rating Authority shall supply a copy of any certificate to any person upon payment of a copying charge.

304 Owner's Responsibility

304.1 The owner or his representative shall be responsible for:

a) Preparing the boat for the measurement in accordance with the IMS

b) Declaring any required data to the measurer

c) Ensuring compliance of any measurement data to those printed on the certificate. Compliance with the certificate shall be defined as follows:

i) All measured, declared or recorded values shall be as close as possible to those on the certificate. Differences are allowed only if the values on the certificate give a worse rating (i.e., lower GPH)

ii) The sail area shall be smaller or equal to the respective one printed on the certificate.

iii) The actual crew weight shall not be considered as an issue of compliance with the certificate, but it is applied while racing in accordance with ORC Rule 200.

d) Using the boat and equipment as prescribed by the RRS, IMS Rules and ORC Rating systems.

The owner or his representative shall sign the statement on the certificate: "I certify that I understand my responsibilities under ORC Rules and Regulations".

304.2 A certificate shall be automatically invalidated by a change of ownership. The new owner may request a new certificate with a simple declaration that no changes have been made so a new certificate may be issued without the need of any new measurement. Conversely the new owner has every right to have his boat re-measured.

304.3 Any change of the measurement data requires new measurement an issuing a new certificate. Such a change may be:

a) Changes of ballast in amount or location or configuration.

b) Change of tankage, fixed or portable, in size or location.

c) Any changes in the engine and/or propeller installation.

d) Addition, removal or change of location of gear or equipment, or structural alteration to the hull that affect the trim or flotation of the yacht.

e) Movement of any measurement bands used in sail area measurement, or any changes in spars, spar location or headstay position.

f) Any change to the size, cut or shape of the maximum area sails.

g) Changes to the shape of the yacht's hull and/or appendages

h) Changes to spars or standing rigging configuration, including elements of rigging identified as adjustable while *racing*.

i) Changes to the other hull measurements in accordance with the ORC Rule 304.

j) Any other change of the data in the certificate that affect any rating.

305 Measurement Protests

305.1 When, as a result of any pre-race inspection or measurement, it is determined that a boat does not comply with her certificate:

a) When the non-compliance is considered to be minor and can be easily corrected, the boat may be brought into compliance with her certificate, and, when necessary, a new certificate may be issued. The Measurer shall inform of such a correction the Race Committee, who shall approve a new certificate issue.

b) When the non-compliance is major (even if it can be corrected) or if it cannot be corrected without requiring significant re-measurement, a boat shall not be eligible to enter a regatta. The Measurer shall inform the Race Committee who shall act in accordance with RRS and inform the Rating Authority.

305.2 When, as a result of any measurement protest by a boat or by the race committee, it is determined that a boat does not comply with her certificate, the non-compliance shall be calculated as a difference in percentage of GPH:

a) If the difference is less than or equal to 0.1%, the original certificate will be maintained, the protest will be dismissed and the protestor will have to cover any cost involved. RRS 64.3(a) will apply but no corrections are needed.

b) If the difference is more than 0.1% but less than 0.25%, no penalty shall apply, but a new certificate shall be issued based on the new measurement data and all races of the series shall be rescored using the new certificate data. The Protest will be considered accepted and the protestee will have to cover any cost involved.

c) If the difference is 0.25% or more, a boat shall receive a 50% place penalty in any race in which her rating was incorrect. The Protest will be considered accepted and the protestee will have to cover any cost involved and the yacht shall not race again until all non-compliance issues are corrected to the limit defined in a) above.

305.3 If a boat's certificate has to be recalculated during a race or series as a result of an error or an omission in the production of the certificate of which the boat owner could not have been reasonably aware, according to 303.6(a), all races of the series shall be rescored using the new data.

305.4 The results of a race or series shall not be affected by measurement protests lodged after the prize giving or such other time as the Sailing Instructions may prescribe. Nothing in this paragraph shall bar action under the RRS concerning a boat deliberately altered and shall not limit in any way acts of the Race and Protest Committees against any individual person involved.

306 National Prescriptions

National Authorities may by their national prescriptions change rules of Part 3 for national events under thier jurisdiction.

4. SCORING

401 General

401.1 ORC Rating systems provide a variety of methods for calculating corrected times using the ratings calculated by the ORC VPP and displayed on the ORC International and ORC Club certificates. Selection of the scoring methods depends on the size, type and level of the fleet, type of the race, and local racing conditions and its use is at the discretion of National Authorities or local event organizers, except for the events governed by the ORC Championship Rules.

401.2 Corrected time shall be displayed in days:hours:minutes:seconds. When calculating corrected time, the boat's elapsed time shall be translated to seconds, calculations shall be made and results shall be then rounded to the nearest second (for example: 12345.5 = 12346 seconds). This time in seconds shall be then put back in days:hours:minutes:seconds format.

402 Performance Curve Scoring

402.1 Performance curve scoring is the most powerful engine of the ORC International rating system. Its unique feature, making it fundamentally different and much more precise from any other handicap system, is its capacity to give and rate different handicaps for different race conditions because yachts do not have the same performance in different wind strengths and directions.

402.2 ORC International certificate is providing a range of ratings (time allowances expressed in s/NM) for different wind conditions in the range of 6 – 20 knots of true wind speed from optimum beat, over 52, 60, 75, 90, 110, 120, 135, 150 degrees of true wind angle to the optimum run.

GPH
578.7

General Purpose Handicap (GPH) is an average representation of all time allowances used for simple comparisons between boats and possible class divisions. It is calculated as an average of the time allowances of 8 and 12 knots true wind speed for the Circular Random pre-selected course as defined in 402.4(b). GPH is used for simple scoring option "Offshore Time-on-Distance" and it is also printed on the ORC Club certificate.

TIME ALLOWANCES							
Wind Velocity	6 kt	8 kt	10 kt	12 kt	14 kt	16 kt	20 kt
Beat VMG	1006.2	813.7	724.7	683.9	659.7	645.3	635.6
52°	643.5	536.8	485.8	466.4	456.0	449.9	445.1
60°	600.6	510.6	465.5	447.6	439.3	434.1	429.1
75°	569.0	489.6	451.7	429.9	418.3	412.1	404.6
90°	542.9	463.8	434.5	423.8	414.8	398.6	384.5
110°	550.1	472.9	436.1	411.5	395.3	385.9	369.9
120°	581.2	492.4	448.1	421.3	396.7	376.6	354.7
135°	679.6	546.5	480.6	444.0	420.1	397.3	351.8
150°	821.4	642.4	544.5	484.9	448.8	425.1	383.7
Run VMG	948.4	741.7	628.5	554.8	501.6	464.4	418.1
Selected Courses							
Windward / Leeward	995.2	792.7	687.6	627.3	587.9	561.5	532.6
Circular Random	800.3	644.5	561.2	512.9	483.1	463.5	438.7
Ocean for PCS	905.0	708.2	596.9	527.5	481.1	447.9	402.0
Non Spinnaker	888.4	705.7	605.6	546.1	508.9	484.5	455.2

Figure 1 - Time allowances as printed on the ORC International Certificate

402.3 When calculating corrected time by the Performance Curve Scoring, a course to be sailed shall be taken as one of the pre-selected courses for which time allowances are given on the certificate, or constructed from the data measured at the racing area.

402.4 Pre-selected courses are:

a) **Windward/Leeward** (up and down) is a conventional course around windward and leeward marks where the race course consists of 50% upwind and 50% downwind legs.
b) **Circular Random** is a hypothetical course type in which the boat circumnavigates a circular island with the true wind velocity held constant.
c) **Ocean for PCS** is a composite course, the content of which varies progressively with true wind velocity from 30% Windward/Leeward, 70% Circular Random at 6 knots to 100% Circular Random at 12 knots and 20% Circular Random, 80% reach at 20 knots
d) **Non Spinnaker** is a circular random course type (see above), but calculated without the use of a spinnaker

402.5 When the course is constructed the following data shall be taken for each leg: wind direction, length and direction of each leg, and optionally, the direction and rate of the current on each leg. Any leg can be split in sub-legs in case there is a marked shift in wind and/or current direction.

402.6 Percentage of each wind direction, corrected for the tide is calculated from the constructed course data.

402.7 For each course, a boat's performance curve is calculated using the course definition and time allowances given in the certificate.

402.8 The vertical axis represents the speed achieved in the race, expressed in seconds per mile. The horizontal axis represents the wind speed in knots *(Figure 2).* Elapsed time shall be divided by the distance of the course to determine the average speed in seconds per mile.

For that average speed a point on the performance curve shall be determined by interpolation and a respective average wind for that points shall be determined as "Implied Wind". If the "Implied Wind" point would fall outside of 6-20 knots of wind a respective 6 or 20 knots value shall be used.

"Implied Wind" is representing the boat's performance on that course. The faster the boat has sailed, the higher the "Implied Wind", which is the primary index for scoring.

402.9 Corrected times are calculated from the "Implied Wind" using the performance curve of the scratch boat which may be the fastest boat in the fleet or a theoretical "standard" boat *(Figure 3).*

For each boat's calculated "Implied Wind" a point on the scratch boat's performance curve shall be determined by interpolation and a respective average speed in s/NM shall be found at the vertical axis.

Such average speed shall than be multiplied by the course length and final corrected times in seconds transformed to days:hours:minutes:seconds format.

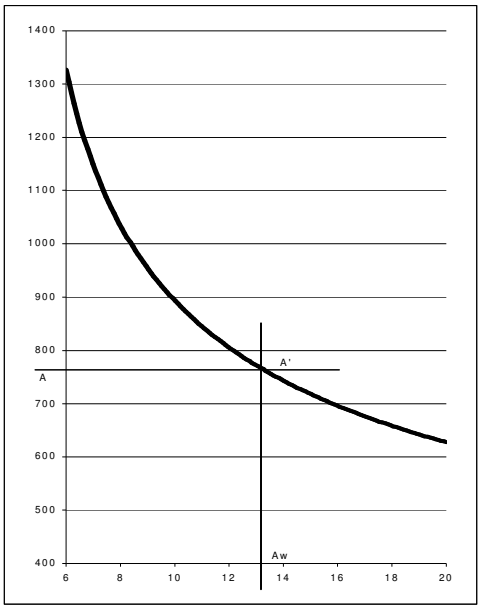

Figure 2: Performance Curve

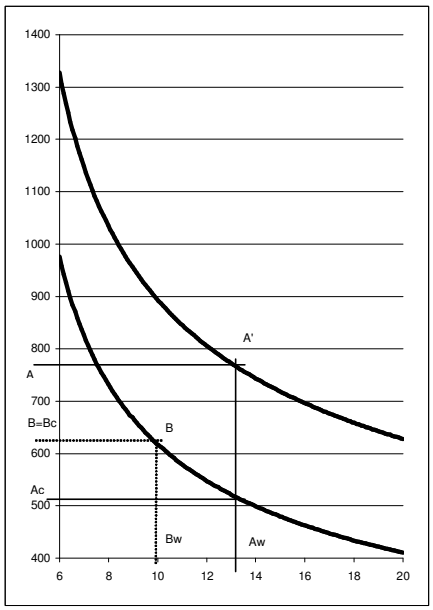

Figure 3: Determining Corrected Times

402.10 "Implied Wind" for the winning boat is normally in the range of real wind strength dominating for the race. However, in case that "Implied Wind" does not represent fairly the real wind strength during a race, the Fixed Wind method may be used to enter the performance curve with the predominant wind speed in the horizontal axis and getting the appropriate Time allowance in the vertical axis. Such a time allowance is then used as single number Time-on-Distance coefficient as defined in 403.2.

402.11 All the formulas for course and performance construction and interpolations together with relevant code for the scoring software are available from ORC and scoring software may be downloaded at the ORC website (www.orc.org).

403 Simple scoring options

403.1 ORC International and ORC Club certificates are providing simple scoring options using the ratings determined as single, double or triple number. For any of the simple scoring options, ratings are given for the offshore (coastal/long distance) and for the inshore (windward/leeward) courses.

SCORING OPTIONS						
	OFFSHORE COASTAL / LONG DISTANCE			INSHORE WINDWARD / LEEWARD		
Time On Distance	578.7			650.1		
Time On Time	1.0368			1.0383		
Performance Line	PLT 0.807		PLD 61.4	PLT 1.092		PLD 304.4
Triple Number	Low 1.0157	Medium 1.3205	High 1.4872	Low 0.7697	Medium 1.0522	High 1.2263

403.2 **Time On Distance**

Corrected time is calculated as follows:

*Corrected time = Elapsed time – (ToD * Distance)*

With Time-on-Distance (ToD) scoring, the coefficient of time allowance of one boat will not change with wind velocity, but will change with length of the course. One boat will always be giving to another the same handicap in s/NM, and it is easy to calculate the difference in elapsed time between two boats needed to determine a winner in corrected time.

Special ToD coefficient calculated with an average crew weight of 170 kg is available for double handed racing as well as calculated for non-spinnaker configuration.

403.3 **Time On Time**

Corrected time is calculated as follows:

*Corrected time = ToT * Elapsed time*

With Time-On-Time (ToT) scoring, time allowance will increase progressively as the wind velocity increases. Course distance has no effect on the results and need not be measured. Corrected time will depend only on the elapsed time, and the difference between boats may be seen in seconds depending of the duration of the races. The longer the race, the larger the handicap.

Special ToT coefficient calculated with an average crew weight of 170 kg is available for double handed racing as well as calculated for non-spinnaker configuration.

403.4 **Performance line**

Corrected time is calculated as follows:

*Corrected time = (PLT * Elapsed time) – (PLD * Distance)*

With the time coefficient PLT and distance coefficient PLD, two boats may be rated differently in light or heavy wind conditions, and it is possible that one boat is giving a handicap to another in light wind conditions, while the opposite may be true in heavy wind conditions.

403.5 **Triple Number**

Corrected time is calculated as follows:

*Corrected time = ToT (Low, Medium or High) * Elapsed time*

The Triple Number system provides a set of three time multiplying factors ToTs (as described above for Time-on-Time) given for three wind ranges:

- Low Range (less or equal 9 knots)
- Medium Range (between 9 & 14 knots)
- High Range (greater or equal 14 knots)

The Race Committee shall signal before the start the wind range to be used for scoring, but it may change this in case of significant change in the weather conditions.

ORC INTERNATIONAL CERTIFICATE SAMPLE

BOAT

Name **BELUGA-SAILING-TEAM**
Sail Nr **GER 5355**

GPH

575,5

GENERAL

Class **RODMAN 42**
Designer **VROLIJK**
Builder **RODMAN**
Series **07/2002**
Age **05/2003**
Age Allowance **0,585%**
Offset File **Beluga.off - 28/4/2009 11:12:02**
Measurement by **HEINRITZ/KALL - 24/04/2008**

HULL

Length Overall	**12,400 m**
Maximum Beam	**3,496 m**
Displacement	**6.340 kg**
Draft	**2,663 m**
IMS Reg. Division	**Cruiser/Racer**
Dynamic Allowance	**0,088%**
Fwd Accommodation	**Yes**
Hull Construction	**Solid**
Carbon Rudder	**No**
Trim Tab	**No**

IMS L **11,019** VCGD **-0,229** VCGM **-0,219**
Sink **21,99 kg/mm** Wetted Area **29,42 m²**

ORC
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2011
ORC International Certificate

SCORING OPTIONS

	OFFSHORE COASTAL / LONG DISTANCE			INSHORE WINDWARD / LEEWARD		
Time On Distance	**575,5**			**630,7**		
Time On Time	**1,0426**			**1,0702**		
	PLT	PLD		PLT	PLD	
Performance Line	**0,896**	**91,2**		**0,895**	**195,9**	
	Low	Medium	High	Low	Medium	High
Triple Number	**1,0128**	**1,3276**	**1,5057**	**0,7739**	**1,0632**	**1,2349**

Rating Office

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TIME ALLOWANCES

Wind Velocity	6 kt	8 kt	10 kt	12 kt	14 kt	16 kt	20 kt
Beat VMG	**967,7**	**791,0**	**700,5**	**662,5**	**639,3**	**625,7**	**636,3**
52°	**632,0**	**526,1**	**476,8**	**459,5**	**449,5**	**443,2**	**444,0**
60°	**592,1**	**503,8**	**460,4**	**442,3**	**433,0**	**427,0**	**423,9**
75°	**560,7**	**488,3**	**449,2**	**424,7**	**410,3**	**403,3**	**395,6**
90°	**557,6**	**476,7**	**440,0**	**429,9**	**406,8**	**389,0**	**371,9**
110°	**584,9**	**489,2**	**444,1**	**413,9**	**387,8**	**368,8**	**356,7**
120°	**611,4**	**504,8**	**455,1**	**424,1**	**398,1**	**371,4**	**332,6**
135°	**695,4**	**556,3**	**487,6**	**450,4**	**423,6**	**399,6**	**350,0**
150°	**836,4**	**661,8**	**551,9**	**491,3**	**454,9**	**428,7**	**384,4**
Run VMG	**965,8**	**764,2**	**637,1**	**560,9**	**506,8**	**469,4**	**419,7**
Selected Courses							
Windward / Leeward	**984,8**	**788,9**	**680,5**	**619,1**	**580,0**	**554,2**	**534,3**
Circular Random	**798,5**	**642,4**	**558,1**	**508,6**	**477,8**	**457,8**	**434,9**
Ocean for PCS	**852,0**	**671,2**	**570,0**	**507,8**	**466,4**	**436,8**	**395,1**
Non Spinnaker	**855,1**	**682,3**	**587,8**	**531,6**	**496,4**	**473,5**	**447,1**

Velocity Prediction in Knots for True Wind Speeds

Wind Velocity	6 kt	8 kt	10 kt	12 kt	14 kt	16 kt	20 kt
Beat Angles	**42,9°**	**43,0°**	**39,9°**	**38,6°**	**37,9°**	**37,7°**	**38,6°**
Beat VMG	**3,72**	**4,55**	**5,14**	**5,43**	**5,63**	**5,75**	**5,66**
52°	**5,70**	**6,84**	**7,55**	**7,84**	**8,01**	**8,12**	**8,11**
60°	**6,08**	**7,15**	**7,82**	**8,14**	**8,31**	**8,43**	**8,49**
75°	**6,42**	**7,37**	**8,01**	**8,48**	**8,77**	**8,93**	**9,10**
90°	**6,46**	**7,55**	**8,18**	**8,37**	**8,85**	**9,25**	**9,68**
110°	**6,15**	**7,36**	**8,11**	**8,70**	**9,28**	**9,76**	**10,09**
120°	**5,89**	**7,13**	**7,91**	**8,49**	**9,04**	**9,69**	**10,82**
135°	**5,18**	**6,47**	**7,38**	**7,99**	**8,50**	**9,01**	**10,29**
150°	**4,30**	**5,44**	**6,52**	**7,33**	**7,91**	**8,40**	**9,37**
Run VMG	**3,73**	**4,71**	**5,65**	**6,42**	**7,10**	**7,67**	**8,58**
Gybe Angles	**141,2°**	**145,6°**	**150,5°**	**160,0°**	**165,5°**	**170,9°**	**172,7°**

Certificate

Number **140303**
ORC Ref **XXX00017043**
Issued On **10/1/2011**
VPP Ver. **2011 0.99**
Valid until **31/12/2009**

Crew Weight

Declared	**835 kg**
Default*	**812 kg**
Non Manual Power	**No**

Special Scoring

	ToD	ToT
Double Handed	**579,9**	**1,0346**
Non Spinnaker	**607,0**	**0,9885**
N/S Perf. Line	**61,4**	**0,801**

Sails Limitations

Genoas	Jibs	Spinnakers
0	**5**	**4**

Spinnaker configuration **Asymmetric-Pole**

Storm Sails Areas

Heavy Weather Jib	**33,45**
Storm Jib (JL=10,23)	**12,39**
Storm Trysail	**16,58**

Owner

BOAT

Name	**BELUGA-SAILING-**	Sail Nr	**GER 5355**
File	**GER5355.dxt**	Data in	**meters/kilograms**

RIG

Forestay Tension	**Aft**	Spreaders	**2**
Inner Forestay	**None Fitted**	Runners	**0**
Carbon Mast	**Yes**	Jumper Struts	**None**
Taper Hollows	**No**	Jib Furler	**No**
Fiber Rigging	**No**	Main Furler	**No**
Lenticular Rigging	**No**	Without Backstay	**No**
Articulated Bowsprit	**No**		

P	**16,620**	E	**5,700**	MDT1	**0,120**	TL	**2,000**
IG	**15,627**	J	**4,550**	MDL1	**0,244**	MWT	**194,00**
ISP	**15,729**	SFJ	**0,302**	MDT2	**0,079**	MCG	**6,177**
SPS	**3,087**	SPL	**4,550**	MDL2	**0,176**	CPW	**0,000**
BAS	**1,603**	TPS	**4,720**	MW	**0,241**	BD	**0,250**
BAL	**0,152**	FSP	**0,065**	GO	**0,274**	BWT	**0,00**

MIZZEN RIG AND SAILS

N/A

COMMENTS

KEEL POSITION MOVED 100MM AFT NEW KEEL 2009

INCLINING TEST AND FREEBOARDS

Inclining Test **Current Inclining**

Flotation date **23/04/2009** SG **1,0090**

FFM	**1,369**	FF	**1,375**	SFFP	**0,160**
FAM	**1,134**	FA	**1,138**	SAFP	**12,030**
W1	**110,00**	PD1	**541,6**	WD	**12,150**
W2	**110,00**	PD2	**545,6**	GSA	**1,0**
W3	**110,00**	PD3	**535,7**	RSA	**1,0**
W4	**110,00**	PD4	**535,7**	PLM	**9000,0**

Maximum beam station from stem	**7,434**
RM Measured / Default	**195,0 / 181,1**
Limit of positive stability	**130,1°**
Stability Index	**133,6**
Freeboard at mast at 4,852	**1,212**

PROPELLER

Installation	**Strut**			PRD	**0,412**
Type	**Folding**			PBW	**0,000**
Twin Screw	**No**			PIPA	**0,0037**
ST1	**0,046**	ST3	**0,000**	ST5	**0,315**
ST2	**0,000**	ST4	**0,110**	EDL	**1,020**

WATER BALLAST

N/A

CENTERBOARD

N/A

ORC
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2011
IMS Measurement Certificate

Certificate

Number **140303**
ORC Ref **XXX00017043**
Issued On **10/1/2011**
VPP Ver. **2011 0.99**
Valid until **31/12/2009**

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SAILS (Maximum Areas)

Mainsail	**HB**	**MGT**	**MGU**	**MGM**	**MGL**	**MSW**		**Area**	**Area (r)**	**Formula**
	0,190	1,25	2,17	3,62	4,72	24,30		56,05	57,13	P/8 · (E + 2·MGL+ 2·MGM + 1.5·MGU + MGT + 0.5·HB)
Jib/Genoa	**JH**	**JGT**	**JGU**	**JGM**	**JGL**	**JL**	**LPG**			
	0,11	0,72	1,35	2,53	3,65	15,58	4,73	38,55		0.1125·JL·(1.445·LPG+2·JGL+2·JGM+1.5·JGU+JGT+0.5·JH)
Symmetric	**SL**	**SMG**	**SF**							
	15,41	8,72	8,16					110,54		SL · (SF + 4·SMG) / 6
Asymmetric	**SLU**	**SLE**	**ASL**	**AMG**	**ASF**				**Area (r)**	
	15,68	14,46	15,07	6,08	8,04			81,28	84,93	ASL · (ASF + 4·AMG) / 6

MEASUREMENT INVENTORY

Measurer **KALL**
Date **23/04/2008**
Comment

Id	Item	Weight	Distanc	Description
01	Anchor	4,5	4,35	ANCHOR
02	Anchor	4,0	4,35	ROPE
00	Tools	0,0	0,00	

Id	Item	Maker	Model
06	Engine	YANMAR	

Id	Item	Weight	Description
05	Deck Gear	15,0	PORTABLE DECK GEAR

MEASUREMENT INVENTORY

Id	Item	Tank Use	Tank Type	Capct	Dist.	Condt	Description
07	Liquid Tank	WATER	RUBBER	150,0	6,90	0,0	WATER
08	Liquid Tank	FUEL	STEEL	80,0	8,55	10,0	FUEL

Id	Item	Weight	Distanc	Description
03	Battery	0,0	7,55	80 Ah
04	Battery	0,0	7,55	120 Ah

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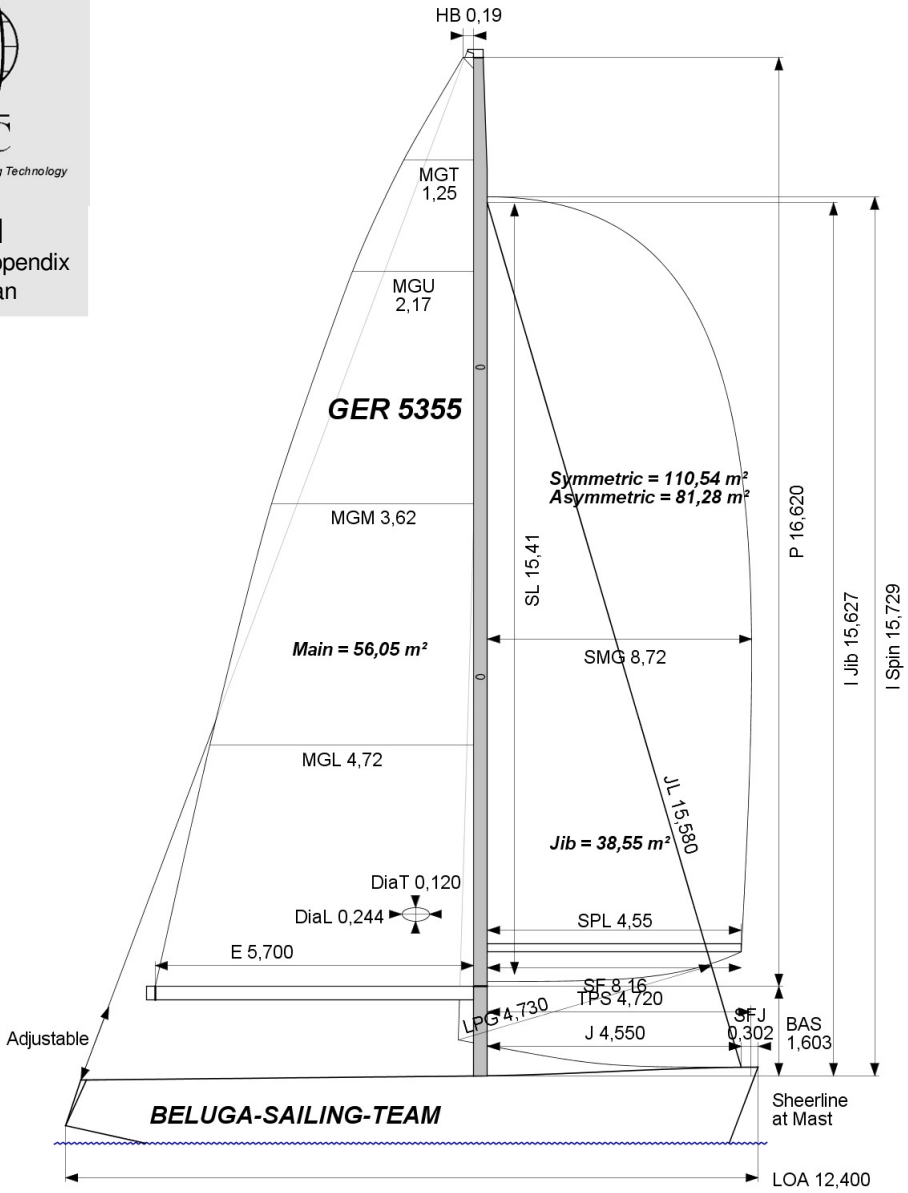
2011
Certificate Appendix
Sail Plan



SAILS INVENTORY

MAINSAIL

Id	HB	MGT	MGU	MGM	MGL	MSW	Area	Measurer	Meas.Date	Manufacture	Material	Comment
109691	0,190	1,20	2,15	3,64	4,72	28,50	55,97	BALSER	17/06/2010	NORTH	Carbon	REs
76968	0,190	1,25	2,17	3,62	4,72	24,30	56,05	BALSER	27/08/2010	NORTH	Carbon	new 2010

JIBS / GENOAS

Id	JH	JGT	JGU	JGM	JGL	LPG	JL	Ovrlp	Area	Measurer	Meas.Date	Manufacture	Material	Comment
134772	0,10	0,65	1,25	2,40	3,53	4,64	15,57	102%	37,03	HANNEM	20/05/2009	NORTH	Carbon	1L 227176
134763	0,08	0,66	1,27	2,40	3,54	4,66	15,57	102%	37,17	HANNEM	29/07/2009	NORTH	Carbon	1M-H '2009
134769	0,10	0,64	1,24	2,39	3,51	4,65	15,56	102%	36,88	HANNEM	20/05/2009	NORTH	Carbon	1M-H 227179
109699	0,06	0,66	1,28	2,44	3,56	4,63	15,42	102%	36,95	BERTIL	10/06/2009	QUANTUM	Carbon	JIB TOP
136856	0,11	0,72	1,35	2,53	3,65	4,73	15,58	104%	38,55	BALSER	07/06/2010	NORTH	Carbon	LM 2010
109688	0,10	0,61	1,19	2,31	3,44	4,59	15,57	101%	36,04	BALSER	15/04/2010	QUANTUM	Carbon	C3
76655	0,11	0,72	1,34	2,52	3,65	4,72	15,56	104%	38,42	BALSER	27/08/2010	NORTH	Carbon	MH 2010

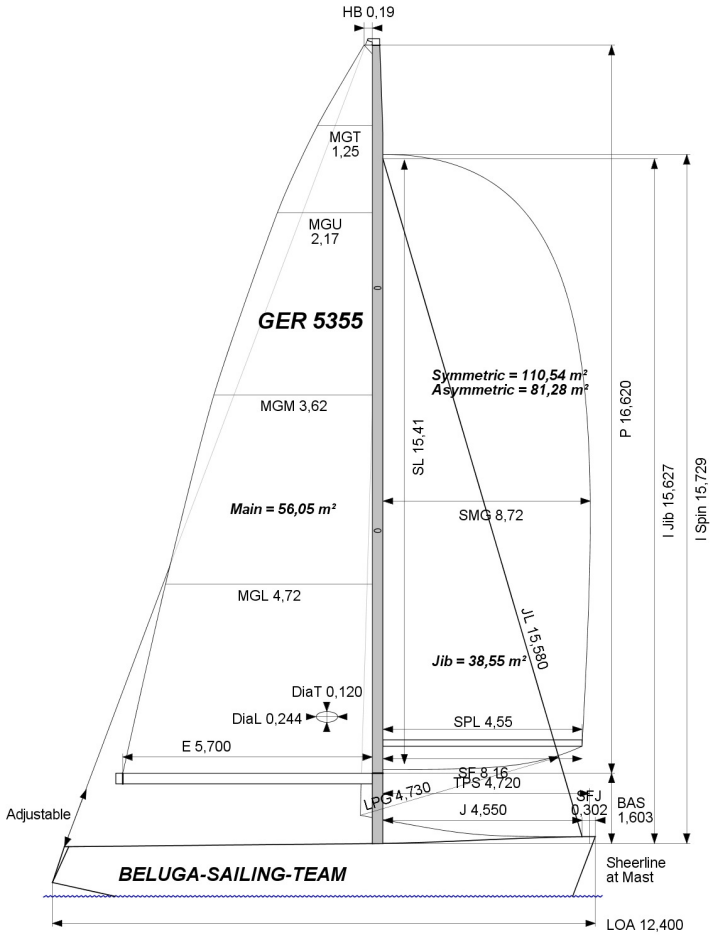
SYMMETRIC SPINNAKERS

Id	SL	SMG	SF	Area	Measurer	Meas.Date	Manufacture	Material	Comment
74937	15,46	8,43	8,12	107,81	HANNEMANN	20/05/2009	NORTH	Nylon	S1 0,5 227165
74924	15,46	8,27	8,12	106,16	HANNEMANN	20/05/2009	NORTH	Nylon	S2 0,5 227166
74921	15,46	8,48	8,14	108,37	HANNEMANN	20/05/2009	NORTH	Nylon	S4 0,9 227164
81204	15,41	8,72	8,16	110,54	BALSER	27/08/2010	NORTH	Nylon	S2 2010
1	15,50	8,21	8,38	106,49	NORTH	29/04/2010	NORTH	Nylon	S1

ASYMMETRIC SPINNAKERS

Id	SLU	SLE	ASL	AMG	ASF	Area	Kind	Measurer	Meas.Date	Manufacture	Material	Comment
3	15,68	14,46	15,07	6,08	8,04	81,28	asym	NORTH	19/05/2010	NORTH	Unknown	c0

ORC CLUB CERTIFICATE SAMPLE



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2011
ORC Club Certificate

Rating Office

ORC
Test Certificate

Space for Rating Office custom logo

Certificate

Number **140303**
Issued On **10/1/2011**
ORC Ref **XXX00017044**
VPP Ver. **2011 0.99**
Valid until **31/12/2009**

BOAT

Name **BELUGA-SAILING-TEAM**
Sail Nr **GER 5355**

GPH

575,5

CLASS

Class	**RODMAN 42**
Designer	**VROLIJK**
Builder	**RODMAN**
Series	**07/2002**
Age Date	**05/2003**
Age Allowance	**0,585%**

COMMENTS

KEEL POSITION MOVED 100MM AFT NEW KEEL 2009

HULL

Data File	**GER5355.dxt**	LOA	**12,400 m**
Offset File	**Beluga.off**	MB	**3,496 m**
Displacement	**6.340 kg**	Draft	**2,663 m**
IMS Division	**Cruiser/Racer**	Dynamic All.	**0,088%**
Fwd Accom.	**Yes**	Construction	**Solid**
Fiber Rigging	**No**	Aramid Core	**No**
Carbon Mast	**Yes**	Carbon Rudder	**No**
Anchor Wgt		Anchor LCG	
IMS L	**11,019**	Wetted Area	**29,42 m²** VCGM **-0,219**

Crew Weight

Declared	**835 kg**
Default*	**812 kg**
Non Manual Power	**No**

Special Scoring

	ToD	ToT
Double Handed	**579,9**	**1,0346**
Non Spinnaker	**607,0**	**0,9885**
N/S Perf. Line	**61,4**	**0,801**

Sails Limitations

Genoas **0** Spinnakers **4**
Jibs **5**

Spinnaker configuration

Symmetric:	**Yes**	**110,54**
Asymmetric:	**Yes**	**84,93**
Code Zero:	**No**	
Spin. Pole:	**Yes**	

PROPELLER

Installation **Strut** PRD **0,412**
Type **Folding**

CENTERBOARD

N/A

Stability

LPS (Measured):	**130,1°**
Stability Index:	**133,6**
OSR Category:	**0**

SCORING OPTIONS

	OFFSHORE COASTAL / LONG DISTANCE			INSHORE WINDWARD / LEEWARD		
Time On Distance	**575,5**			**630,7**		
Time On Time	**1,0426**			**1,0702**		
	PLT		PLD	PLT		PLD
Performance Line	**0,896**		**91,2**	**0,895**		**195,9**
	Low	Medium	High	Low	Medium	High
Triple Number	**1,0128**	**1,3276**	**1,5057**	**0,7739**	**1,0632**	**1,2349**

Owner

INDEX OF SYMBOLS

AA	Age Allowance	103.1
B	Effective Beam	100.7
BLRI	Ballast Leeward Recovery Index	106.4
BTR	Beam Depth Ratio	100.9
CI	Capsize Increment	106.2
CW	Crew Weight	102
DA	Dynamic Allowance	103.2
DSPM	Displacement in Measurement Trim	100.5
DSPS	Displacement in Sailing Trim	100.5
FA	Freeboard Aft (for default SG)	100.2
FF	Freeboard Forward (for default SG)	100.2
GPH	General Purpose Handicap	402.2
HBI	Height of Base of I	100.4
IM	Foretriangle Height	108.5
IMS L	Sailing Length	100.6
LPS	Limit of Positive Stability	106.1
LSM0-4	Second Moment Lengths	100.6
PIPA	Propeller Installation Projected Area	105.1
RA90	Righting Arm, 90 degrees	106.4
RM	Righting Moment	107
RMC	Righting Moment Corrected	107.3
SI	Size Increment	106.2
T	Effective Hull Depth	100.8
VCGD	Vertical Centre of Gravity from the offset datum line	100.10
VCGM	Vertical Centre of Gravity from the measurement trim waterline	100.11