2024 OFFSHORE RACING RULE (ORR™)

A Handicap Rating System for Offshore Boats

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ORR OWNER'S QUICK START GUIDE*

(*The Quick Start Guide is meant to be used as a help guide for owners and for informational purposes only: it is not to be considered part of the ORR Rule Book).

Brief

The Offshore Racing Rule (ORR) is owned and administered by the Offshore Racing Association (ORA). The ORA is the Rule Authority.

The ORR predicts relative time allowances between boats to permit boats of different sizes, types and ages to compete with the fairest ratings possible.

The ORR is an objective rule. Its ratings are based on the measurement of the speed-related features of sailboats and on the use of the ORR Velocity Prediction Program (VPP) that then calculates the speed potential of each boat at any combination of wind speed and course direction by assessing the measured data. The ORR VPP is a set of algorithms developed through the latest specific fundamental scientific research for its ongoing development.

ORR is intended to be a non-type forming measurement rule that fairly rates properly designed and prepared boats which are equipped for offshore racing. It must be clearly understood by all who use the ORR that it is not a development rule and therefore is not intended for sailors who are looking to "beat" the rule. In order to discourage attempts to design boats "to the rule", the algorithms of the VPP are non-public and only limited access is allowed for trial certificates. ORR is updated on a regular basis by using the latest research to keep ahead of the latest design developments.

The ORR Rulebook provides details about measurement, rule restrictions, ratings and the requirements to race under ORR. Owners, Persons In Charge (PIC), sailors, designers, sail-makers and builders should consult the rulebook in preparation to be rated and scored under ORR. This Quick Start Guide provides an overview to help those interested individuals understand what is needed to race under ORR.

1. Scope of Rule

The ORR is intended to rate a broad diversity of sailing boats for competition. ORR purposely imposes some limits to ensure reasonably close racing or because there is insufficient science. For example ORR does not rate multi-hull boats (multihull boats are rated under ORR-MH) or kite sails.

2. Certificates

Valid ORR measurement certificates are required to compete and be scored. ORA, the Rule Authority is also the rule owner and administrator, has contracted with the National Authority (US Offshore) to train and certify measurers, collect and process boat data and issue valid certificates under ORA guidance. US Offshore a division of US Sailing acts as the approved Rating Authority for the ORA and for the ORR Rule. The guide along with the rulebook is written to help owner/PIC and all interested individuals through the process of measurement and certification.

3. Getting Started

The ORR requires a full description of the geometry of hull, rig, sails and underwater appendages (keel, centerboard, daggerboard(s)); how the boat sits in the water (to get length, weight, wetted area, etc.) and the stability of the boat (resistance to heeling.)

The owner/person in charge should contact US Offshore who will provide necessary information and refer them to a trained and certified measurer in their geographic area. The owner/PIC should familiarize himself with this guide and contact a measurer to begin the measurement process. For boats with a valid ORCi Certificate, that may be sufficient information for a "Fully Measured" ORR certificate. Expired ORCi, IMS or AMERICAP certificates may be acceptable pending approval of the Chief Measurer. Boats shall only be measured by official measurers certified by the National Authority with the approval of the ORA.

No Measurer, assistant, nor Rating Office staff shall participate in the measurement or processing of measurements of a yacht owned, designed or built, wholly or partly, by himself or in which he is an interested party, or in which he has acted as a consultant or has a vested interest. Except for reasonable and brief clarification of points in the Rules, this applies to any consultation or advice on rating values regardless of whether or not any payment is involved.

4. Hull Measurement Ashore

The owner/person in charge is responsible for preparing the boat for measurement ashore. The surface of the hull will be surveyed with an instrument that provides the detailed description necessary for the calculations in the
VPP. If the boat has a "sistership" that has been fully measured, the requirement for hull surveying may be waived by the chief measurer. Hull surveying may also be waived if the designer of the boat supplies the "lines" in a suitable electronic format. In the latter case, measurement checks will be conducted.

5. Measurement Afloat

The owner/person in charge is responsible for preparing the boat for measurement afloat. This means following the instructions for Measurement Trim; basically a list of what shall and shall not be on board when measured. The measurer will measure the freeboards of the boat and conduct an inclining test to establish the stability.

6. Rig and Sail Measurement

The owner/person in charge is responsible for declaring to the US Offshore certified measurer all spars and sails that he proposes to carry on the boat and make them available for measurement, if needed. The principal dimensions of the rig: masts, booms, poles, sprits and sail attachment points shall be measured. The dimensions of the sails will be measured to derive the sail areas used for rating calculation as per ORR requirements.

7. Configuration Changes

If there are any changes to the canoe body, the appendages, the rig, the sails and/or equipment carried on board, or anything that might change the boat's rating, the owner/person in charge is responsible to declare those changes to the Rating Authority. Any existing certificate becomes invalid if a change is declared.

8. Stability Requirements

Participation in ORR races may be restricted on the basis of the Stability Index (Capsize Screen), derived from the boats LPS, maximum beam, displacement (weight) and sailing length.

For boats with movable ballast, participation in ORR races may be restricted on the basis of the Knock Down Recovery Factor (KRF). The KRF represents the ability of a boat to recover from a knockdown with the movable ballast located to leeward

9. Restrictions While Racing

The purpose is to prevent boats being raced in hull, rig and/or sail configurations that are different from how the boat was measured and rated or are out of the scope of what the ORR rule permits.

Specific examples include:

- Movement of ballast, fixtures and accommodation
  Running the engine for propulsion
- Changes in fuel and water tankage beyond normal use
- Use of stored energy in ways other than those explicitly permitted
- Rotating masts
- Altering the location of the mast step
- Trim and use of sails not consistent with how they were measured and rated

10. Measurement Types

Fully measured boats bear the notation "FULL MEASUREMENT". If the boat has a sister ship that was measured in-water, those measurements may be used, subject to a review by ORR administration. In such a case the resulting ORR certificate will be labeled "PARTIAL MEASUREMENT". These certificates are based on sister ship (Partial Measurement) supplemented by a recent freeboard measurement ("recent" is determined by the Chief Measurer) and sail certificates from either the sail loft or measurer.

Be aware that some Organizing Authorities require "FULL MEASUREMENT" certificates

11. Scoring

ORR Rule corrected times are only reported to whole seconds.

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PART I – GENERAL

1.01 Administration.

The Offshore Racing Association (herein denoted as ORA) is the rule owner and the Rule Authority for administration of the Offshore Racing Rule (ORR). The ORA is responsible for the development and promotion and implementation of the rule. The NATIONAL AUTHORITY (US OFFSHORE) collects boat data, trains measurers and performs certificate processing for ORA, all measurers are approved by ORA. Any data collected or supplied will become the property of ORA and be used for rule administration, certificate production, rule development, research and use in ORA products.

1.02 Rule Philosophy.

The ORR predicts relative time allowances between boats to permit boats of different sizes, types and ages to compete with the fairest ratings possible.

The ORR is an objective rule. Its ratings are based on the measurement of all the speed-related features of sailboats and on a Velocity Prediction Program (VPP) that calculates the speed potential of each boat at any combination of wind speed and course direction. The VPP is a set of algorithms developed through systematic research that use fundamental scientific methods.

ORR is intended to be a non-type forming measurement rule that fairly rates properly designed and prepared boats which are equipped for offshore racing. It must be clearly understood by all who use ORR that it is not a development rule and therefore is not intended for sailors who are looking to "beat" the rule. In order to discourage attempts to design boats "to the rule", the algorithms of the VPP are non-public. ORR will be updated on a regular basis to stay ahead of design developments.

3. ORR Certificates

Valid certificates are required for racing in ORR. The ORR certificate will provide the most basic information about a boat, its measurements, and its ratings. Certificates are issued by a NATIONAL AUTHORITY (US OFFSHORE). A rating certificate is automatically invalidated by a change of ownership or to a change to any of the rated dimensions, weights or parameters of the yacht. Contact the NATIONAL AUTHORITY rating office for information on restoring the certificate to valid status.

If a boat has a valid ORCi Certificate that should be sufficient measurement information for an ORR certificate. Expired ORCi, IMS or AMERICAP certificates may be acceptable pending approval of the Chief Measurer.

Trial certificates are available. The purpose of experimental/trial certificates is to assist owners in making informed decisions on how to configure their boats. The purpose is not to reverse-engineer the methods in the ORR VPP. Therefore, the number of certificates that can be acquired is limited, at the discretion of ORA or the ORR Chief Measurer.

There are two levels of measurement for certificates:

3.1. Measurement Level.

1.03.1.1 Full Measurement.
ORR Certificates issued on the basis of full ORR measurement shall bear the notation "FULL" on the certificate.

1.03.1.2 Partial Measurement
Any certificate which is based on less than full ORR measurement shall bear the notation "SISTER/PARTIAL" or after 1 January 2017 "PARTIAL" on the certificate.

To obtain a Partial Measurment ORR certificate, the following information shall be provided:

1) From January 1, 2018 - all new sails submitted for inclusion in an ORR Certificate shall have sail certificates measured and signed by an ORA certified measurer for the mainsail, largest headsail, and largest area (each) symmetrical and asymmetrical spinnaker(s). The dimensions described in ORR Rule 10 shall be provided. Most sail lofts have US-IMS certified measurers

2) From January 1, 2018 - At the discretion of the ORR Chief Measurer the freeboards may be required to be measured by an ORA or UMS certified measurer. This applies for nonstandard hulls or for standard hulls with significant freeboard variation from design norms, the measurer shall also provide righting moment. An ORR in water measurement check list can be found at Appendix 2

3) Rig (Spar) dimensions may be owner/PIC declared.

4) Prop type and number of blades. E.g. folding, feathering, fixed.

5) Maximum crew weight. If left blank, an ORR default maximum weight will be supplied.

1.03.2 Certificate Types. There are five categories of ORR certificates.

1.03.2.1 Standard Certificate/Offshore Certificate

1.03.2.2 Inshore Certificate.

Is available when sails, sprit/pole length, crew weight and/or Measurement Inventory items are different from those on the standard certificate, intended to be used for inshore buoy racing events.

1.03.2.3 Double Handed Certificate

Is available when sails, sprit/pole length and/or crew weight are different from those on the standard certificate. The Double Handed/Shorthanded certificate shall be valid only for racing in classes, or divisions of classes, for no more than 2 in crew.

1.03.2.4/5 One Design or Level Design Certificate

Is available to boat classes of the same design types that have Class Association Rules and Regulations. Upon ORR Certificate application, qualified One Design or Level Class boats will be assigned a certificate type and the same rating will be given all boats in the approved class. **See Part XI**

1.04 Measurement

Boats shall be measured by official measurers certified by the National Authority. No Measurer, assistant, nor Rating Office staff shall participate in the measurement or processing of measurements of a yacht owned, designed or built, wholly or partly, by himself or in which he is an interested party, or in which he has acted as a consultant or has a vested interest. Except for reasonable and brief clarification of points in the Rules, this applies to any consultation or advice on rating values regardless of whether or not any payment is involved.

• Survey using an HMI, Hull Measuring Instrument, or by using a scanning device approved by ORA and administered through the ORA approved National Authority.
• Designer supplied lines, in ORA approved format, which will be checked for validity by an ORR authorized measurer following procedures specified by ORA and administered through the National Authority.
Rig dimensions shall be measured by an certified ORR/ORA measurer.

- Sails can be measured by a National Authority trained and certified employee of a sail loft. Standard certificates will be provided to the National Authority for all sails and are subject to validation by an official measurer.
- Boats will be measured in-water, subject to the conditions and requirements specified by the ORA for ORR.

1.05 Rule Dates. All rule dates shall be recorded and maintained on the Rating Certificate.

1. **Age Date**. This date shall be the month and year of launching which shall be defined as date of first inclining unless the owner provides documentary evidence that the boat was launched at an earlier date, completed and equipped for sailing.

2. **Series Date**. The National Authority may authorize a Series Date, being earlier than the age date, for an unmodified series-produced boat if it is satisfied that the boats of the series are built to close tolerances in molds or jigs. The Series Date shall be the Age Date of the earliest boat of the series. Series Dates shall be based on boats of a series built in the production molds or jigs and not on prototypes which were not built in the same molds or jigs. The Series Date may be changed as a result of a boat being modified from the original model, or conversely built on an older design.

3.**Keel Date**. This date shall be the month and year of the manufacture of the keel. Generally this will be the same as the Age Date of Series Date except when the keel is replaced or modified. The ORR Chief Measurer has the final authority to rule on whether any such modification is sufficient to change the Keel Date.

4. **Hull Modifications.** Hull modifications shall require plan review by the chief measurer and will require hull re-measurement. Modifications except as permitted below shall result in the assignment of a new Age Date which shall be as defined in 1 above, following the completion of the modifications. The following are permitted without a change of Age Date:

- Changes that do not affect the canoe body.
- New appendages or fairing of existing ones.
- Removal of bumps outside the canoe body outer skin.
- Filling of hollows (e.g., in the IOR after width area).
- Forward or aft extensions or reductions of the fair surface of the hull, limited to modifications only within 0.10*LOA of the forward and/or aft end(s) of LOA.

The total of modifications to the canoe body surface shall not exceed 20% of the total surface prior to modification as determined by the Measurer. After review by the Revalidation Authority, the Measurer shall verify on the boat the boundaries of the proposed changes before and after the work.

5.**Measurement Inventory (Flotation) Date**. Measurement Inventory Date shall be the date of the most recent occasion on which the boat was measured afloat.

6.**Measured Date.** Measured Date shall be the date that the most recent measurement was completed.

7.**Issued Date.** Issued Date shall be the date that the current certificate was issued from the Rating Office of the National Authority.

8.**Dimensional Units.** Dimensional equation units are US customary.

PART II – GENERAL LIMITS AND EXCLUSIONS

2.01 Hull Type

This rule is intended to be used for the rating of monohull boats only. Hulls in which the canoe body depth in any cross section, except within 0.05*LOA of the keel, decreases when moving from shear towards centerline shall not be rated under this rule.

2.02 Stability

2.02.1 Stability Index (Capsize Screen) – Fixed Ballast Boats: A boat's eligibility for entry in ORR races that use World Sailing Offshore Special Regulations Categories 0, 1 or 2 or US SER Stability Index (Capsize Screen) may be limited on the basis of her Stability Index (Capsize Screen), at the option of the race organizer.

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

Where, US Standard measurement units are used:

LPS = Limit of Positive Stability, the heel angle at which the righting arm is zero.

CI = 18.75*(2.0-MB/(DSPM/64)^.3333)

SI = (((12.0*(DSPM/64)^.3333+LSM0)/3.0)-30.0)/3.0

CI shall not be taken as greater than 5.0
SI shall not be taken as greater than 10.0.

The following table provides the recommended minimum stability index (capsize screen) for various categories of races:

Offshore Race Category World Sailing (OSR), US (SER)		Recommended Minimum Stability Index (Capsize Screen)
0	(NA)	120
1	(Ocean)	115
2	(Ocean)	110
3	(Coastal)	103

2.02.2 Moveable and Variable Ballast Boats For a boat incorporating water ballast or a canting keel, eligibility for entry in ORR races of World Sailing Offshore Special Regulations Categories 0, 1 or 2 National Authority Safety Equipment Requirements (US SER) may be limited by the race organizer on the basis of Knockdown Recovery Factor (FKR) and other requirements as recommended below.

Notwithstanding the maximum length limit of 24m in the standard, this Appendix invokes International Standard ISO 12217-2, Small craft –Stability and buoyancy assessment and categorization – Part 2: Sailing boats of hull length greater than or equal to 6m. The functions FKR (Knockdown Recovery Factor) and FIR (Inversion Recovery Factor) are defined in ISO 12217-2.

2.02.2.1 Boat Condition

In the calculation of stability data:

(a) Deck and other enclosed volume above the sheerline and cockpit volume shall be taken into account.
(b) Mass shall be taken as the most restrictive case of either Minimum Operating Mass or Loaded Arrival Condition as defined by ISO 12217-2, paragraph ~~3~~ 3.5

2.02.2.2 General Standards

In the assessment of ISO category for boats fitted with moveable and/or variable ballast, ISO 12217-2, paragraph 6.1.4 b) shall not apply. Boats shall comply with paragraphs 6.2.3, 6.3.1 and 6.4. Calculations shall be for the ballast condition that results in the most adverse result when considering each individual stability requirement. ISO 12217-2 Annex C, paragraph C.3.3, first sentence, the word 'may' is replaced with 'shall'. ISO 12217-2 Annex C, paragraph C.3.4 shall not be used in the calculation of righting lever.

2.02.2.3 Knockdown Recovery

Boats with moveable/variable ballast shall comply with the following minimum values of Knockdown Recovery Factor (FKR) calculated in accordance with ISO 12217-2 paragraph 6.6.4. The lesser of FKR_{90} and FKR_{-90} shall be used:

OSR Category	0	1, 2	3	4
US SER Category		Ocean	Coastal	Nearshore
FKR	**1.0**	**0.9**	**0.8**	**0.7**

Boats with age date prior to 11/04 may seek dispensation from this section by application.

2.03 Appendages

Boats may race under ORR subject to the following limitations on appendages:

2.03.1 Keel foils must be solid in profile and have an attachment to the hull at the boat centerline.

2.03.2 The keel may have an end plate, winglets, a midline centerboard and/or a trim tab.

2.03.3 The keel may be canting (keel rotating around root hinged to hull at boat centerline) and the boat will then be subject to restrictions pertaining to boats with movable ballast canting keels.

2.03.4 Keels may have trim tabs. The axis of rotation of the trim tab shall be in the center plane of the keel.

2.03.5 The boat may have a skeg, one or two normal rigid-surface midline rudders or off-midline, coupled, non-retractable and retractable twin rudders

2.03.5.1 Flexible fairings between a rudder and nearby skeg or attached keel are permitted.

2.03.6 Off centerline dagger boards are permitted. All dagger boards shall have a single straight line axis from the top of the board root to the end of the board tip. The axis is defined as the position of the leading edge of the foil from root to tip as viewed from in front of the foil and the trailing edge as viewed from behind.

7.The boat may have a propeller connected to an engine and the usual instrument transducers.

2.03.8 Centerboard and dagger board movement is restricted to motion up or down either in a straight line or around a single fixed pivot. Dagger boards may be permanently angled up to 15 degrees from the vertical 90-degree angle created when the boat is in its upright position with 0 degrees of heel.

2.03.8.1 Flexible centerboard or dagger board slot fairing closures are permitted.

2.03.8.2 Centerboards must be arranged for fore and aft motion except the angular motion resulting from minor movement around the pivot pin.

Excluded are:

2.03.8.3 Centerboard and dagger board openings or slots arranged to cause or permit angular motion of the centerboard or dagger board in order to alter the angle of attack while sailing and any other schemes for achieving the same result.

2.03.9 Other off-centerline appendages, not meeting the above restrictions, are permitted provided:

2.03.9.1 These appendage(s) are arranged so that only a single "Other Appendage" may be deployed on each side of the boat. This may a pair of appendages that are symmetrical about centerline or a single appendage that moves from side to side but operates symmetrically about centerline. Any such appendage shall be a single rigid surface without other movable parts or sections such as trim tabs and shall be fixed in rotational orientation with respect to the hull.

2.03.9.2 No part of an appendage extends more than 0.05*LOA below the upright measurement trim flotation plane regardless of whether the appendage is retracted, fully deployed, or any intermediate location.

2.03.9.3 Scaled drawings, or 3D CAD file, are provided to the rating office depicting:
a) Cross section of the boat through the location of the appendage(s) showing the appendage fully deployed, retracted and if movable, path of movement.
b) Plan and Profile views of the boat and appendage(s)

2.03.9.4 The measurer has supplied:
a) OAspan: Shall be the span of the extended appendage measured from the root chord leading edge, along the curvature, if any is present, or as directed by the Chief Measurer.
b) OAchord: Shall be the average chord length of the appendage.
c) OAthick: Shall be the average thickness.
d) OAangle: Shall be the angle of the appendage with the horizontal axis when the boat is upright with no heel angle. If the appendage is curved the angle is measured with a line connecting root chord to tip chord, or as directed by the Chief Measurer.
e) OAXoffset: Shall be the longitudinal distance of the root chord leading edge from the stem.
f) OAYoffset: Shall be the distance of the root chord from the centerline of the boat.
g) OAZoffset: Shall be the distance of the root chord above or below the offset file datum.
h) Movable ballast measurements under ORR Appendix 7.2 if any appendage is not fixed while racing.

2.03.9.5 The appendage(s) are reviewed and approved by the ORR VPP Committee.

2.03.10 The maximum vertical lift of all appendages, calculated by the ORR VPP for each combination of wind speed and wind angle, shall not exceed 33% of DSPS.

2.04 Speeds under Power

Boats shall be capable of speed under power with racing propeller in smooth water without assistance of wind, in knots, of not less than L^0.5 knots where ORR L is in feet or 1.811*L^0.5 knots where L is ORR L in meters in order to qualify for any Propeller Installation Projected Area (**PIPA**) greater than zero.

2.05 Propeller Shaft

The propeller shaft exposed to water flow is circular in cross section.

2.06 Weights and Ballast

2.06.1 Except for the stability and trim ballast of the hull, all weights measured under this rule shall be the true weight associated with proper structural engineering and no weights shall be artificially increased through ballasting.

2.06.2 No boat shall be rated under ORR if any material having a density greater than that of lead (specific gravity = 11.35) is used as ballast in any form or location on or within the boat.

PART III – OWNER/PERSON IN CHARGE (PIC) RESPONSIBILITIES

3.01 Owner or Person In Charge (PIC) Signature

Before any certificate under this rule is valid it must be signed by the owner or the PIC of the boat which may or may not be the same person, the term owner or PIC may be used interchangeably through the Rule Book. The name of the individual who signs the Certificate shall also be printed on the Certificate. By this signature the owner or PIC signifies that he or she understands their responsibilities under all parts of the ORR Rule. A copy of the signed certificate shall be kept onboard the boat for which it was issued.

Responsibility for Compliance - The owner or PIC shall have the primary responsibility for ensuring compliance with the ORR rules.

Owner/PIC responsibilities are divided into three categories.

- Responsibilities prior to and during measurement.
- Responsibilities after measurement.
- Responsibilities while racing.

3.02 Owner/PIC Responsibilities: Measurement.

The owner/PIC is responsible for arranging measurement with the NATIONAL AUTHORITY (Rating Authority).

3.02.1 Measurement Ashore

a) He shall present the boat for measurement ashore in an accessible location, clear of obstructions, properly chocked and leveled (see 5.01 for details).

b) If the boat is of a class for which "sister ship" hull measurements are available, hull measurement may not be required. The owner/PIC shall inform the measurer of any modifications that have been made so that the measurer may determine whether, and to what extent, the hull standard applies to the boat. The owner shall make the boat available ashore for the checking of any measurements that the measurer may require.

c) If the boat is of a class for which designer lines hull measurements have been validated, full hull measurement may not be required. The owner/PIC shall inform the measurer of any modifications that have been made so that the measurer may determine whether, and to what extent, the designer lines hull standard applies to the boat. Certain minimum measurement verification is required. This includes measurement of the as-built freeboard to centerline of the canoe body plus any additional measurements as determined by National Authority. The owner/PIC shall make the boat available ashore for the checking of these measurements or any others that the measurer may require.

3.02.2 Measurement Afloat

a) He shall on another occasion make the boat available at a suitable location agreed with the measurer so that flotation measurements may be taken.

b) He is responsible for preparing the boat in measurement trim as specified in 5.02.2. He shall declare to the measurer the weight and location of all ballast, except that contained in the external keel or centerboard. He shall, together with the measurer, complete and initial the Measurement Condition Check List & Inventory (See Appendix 2).

c) If the boat is fitted with a drop keel and/or a movable appendage which is to be locked for measurement and racing under 6.06.3, the owner/PIC shall be responsible for ensuring that a positive locking and locating device is fitted at the time of measurement. If the device is to be freed for cruising or at other times when the boat is not racing the device must be of a form that will positively locate and retain the keel in one predetermined position.

3.02.3 Sail Areas Owner/PIC is responsible for declaring to the measurer all spars and sails that he proposes to carry on the boat and the location in which he proposes to set them, so that they may be properly measured.

3.02.4 Hull Construction and Spar Material Owner/PIC is responsible for declaring to the measurer the type of hull construction and material of which the hull and spars are built.

3.03 Owner/PIC Responsibilities after Measurement.

3.03.1 It is the Owner/PIC responsibility to declare to the rating authority any changes made to the boat, its rig, or its equipment which could change any of its measurements under the rule. All changes of tankage, fixed or portable, must be reported and appear on the measurement inventory.

Such changes could 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 affects the trim or flotation of the boat.

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

f) He shall be responsible for ensuring that all sails other than storm sails have been measured by an official measurer (Full Measurement and Measurer Verified) and do not contravene the values stated or permitted for them on the Rating Certificate.

g) Changes to the shape of the boat's hull and/or appendages. Note that changes to the hull may cause the boat to lose the benefits of age under the rules (See Appendix 6).

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

i) Changes to the Elements of Pitch Gyradius (see 8.13) including hull, deck and appendage construction, spars, accommodation and rig configuration, etc.

3.03.2 One-Design Rating or Level Design Rating.

Where a boat has a One-Design Rating or Level Design Rating (see Part XI) it is the Owner/PIC responsibility to ensure that the boat is at all times maintained within the class rules. The class rules shall always be aboard the boat. Should any changes be made to the boat that are not permitted within the class rules the owner/PIC shall inform the Rating Authority and the ORR One-Design/Level Certificate becomes invalid immediately.

PART IV – ORR RESTRICTIONS WHILE RACING

The owner/PIC is responsible for ensuring that the ORR Rule Book is aboard the boat and that all members of the crew fully understand and comply with the limitations which apply while racing.

4.01 Crew Weight Limit.

The owner/PIC shall be responsible for insuring that the weight of the crew, weighed in light street clothes, on board the boat for any race does not exceed the Maximum Crew Weight printed on the Rating Certificate and any excess shall automatically suspend validity of the Certificate.

2. Crew Limitations on Professionals. (OPTIONAL)

For those race organizations that wish to offer events with limitations on the number of professionals on board while racing, the following option is offered as a method. This paragraph is not in force unless it is specifically included in the Notice of Race by the race organizer.

2.1. **Competitor Groups.** Two competitor Groups shall be defined as set forth in the World Sailing (International Sailing Federation) Sailor Classification Code; i.e. Group 1 (amateur), Group 3 (professional). For more information go to: http://members.sailing.org/classification.

2.2. **Boat Owners.** For the purpose of the regulations below, an Owner is defined as one who, to the satisfaction of the Race Committee, demonstrates at least a one-third partner interest in the ownership of the boat on which the person competes.

2.3. **Professional Crew Limitations.** Group 3 competitors shall be limited as follows:

a) Including those of Owner status, the number of Group 3 competitors aboard a boat while racing shall not exceed the limits as given in the table below.

LOA (feet)	LOA (meters)	Limit	LOA (feet)	LOA (meters)	Limit
26.0 - 34.99	7.925 - 10.665	2	56.0 - 62.99	17.069 - 19.200	6
35.0 - 41.99	10.668 - 12.799	3	63.0 - 69.99	19.203 - 21.333	7
42.0 - 48.99	12.802 - 14.932	4	70.0 - 76.99	21.336 - 23.467	8
49.0 - 55.99	14.935 - 17.066	5	77.0 - 100.00	23.470 - 30.480	9

b) Except for Owners/PIC's and emergencies involving the safety of the boat or crew, Group 3 competitors are prohibited from steering while racing.

4.03 Shipping, Unshipping or Shifting of Ballast, Fixtures and Accommodation.

Note: See also ORR Appendix 7 exclusion for boats rated with water ballast or canting keel.

The removal for racing of fixtures and items of accommodation which were aboard for in-water measurement or identified as Elements of Pitch Gyradius is not permitted.

Attention is called to Rule 51 of the Racing Rules of Sailing (RRS) - Moving Ballast: "All movable ballast shall be properly stowed, and water, dead weight or ballast shall not be moved for the purpose of changing trim or stability. Floorboards, bulkheads, doors, stairs and water tanks shall be left in place and all cabin fixtures kept on board".

Note that unwarranted quantities of stores, including fuel and water, shall be considered as ballast under this rule.

4.04 Movement from Stowage While Racing.

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 a contravention of RRS 51.

4.05 Engine and Propeller.

The owner/PIC is responsible for ensuring that when the engine is run for any purpose the propeller does not rotate.

4.06 Drop Keels and Movable Appendages.

The owner is responsible for ensuring that any locating device for a locked drop keel or movable appendage, called for by the rule, is at all times in place while racing. If for any reason such a device is removed during a race the owner shall declare the fact to the race committee and withdraw on completion of the race.

4.07 Tankage.

Tanks which are always to be empty when racing may be declared as such and shall be empty at the time of measurement providing each declaration is entered on the rating certificate and the owner accepts responsibility that these limitations will be observed. Voids in the keel or any other appendage shall be declared at the time of measurement and shall be treated as tankage.

Tankage, fixed or portable, located within fifteen percent LOA of the stern shall be declared "empty when racing" for boats not rated with movable ballast.

4.08 Energy Storage

Unless modified by the Race Organizing Authority the prohibition on the use of stored energy while racing - RRS 52 Manual Power - shall not apply to trimming, hoisting, reefing, furling or dousing of sails, adjusting of backstays and running rigging. Please refer to ORR Appendix 7 for boats rated with movable ballast (water ballast or canting keel).

4.08.1 The use of stored power for the hoisting of mainsails, or the reefing or furling of sails need not be declared.

4.08.2 Boats using stored power solely for the adjustment or operation of backstays shall declare this to the Rating Authority. There will be no rating change.

4.08.3 Boats using stored power for the adjustment or operation of running rigging other than as noted in Rules 4.08.1 and 4.08.2 shall declare this to the Rating Authority and shall result in a rating adjustment.

PART V – PREPARATION FOR MEASUREMENT

FREEBOARD MEASUREMENT PROCEDURE

To secure an accurate and fair measurement, it is necessary to have close co-operation between owner and Measurer. It is desirable, therefore, that the owner be reasonably familiar with the requirements below.

5.01 Hull Measurement Ashore.

The hull and appendage measurements (Part VI) and propeller installation measurements (Part VII) shall be taken ashore with the boat exactly level athwartships and approximately in the same longitudinal trim which it might reasonably be expected to assume when afloat in measurement trim.

1. The boat shall be presented for measurement ashore in an accessible location, clear of obstructions (see 5.01.2 below), properly and firmly chocked and leveled as above. The weight of the boat shall rest on the keel except as is necessary to chock the hull as above. A centerboard locked to prevent movement for racing shall be in its locked position and measured as a keel. Rigging shall be slack. All appendages shall be fitted and any fairings, as permitted under 2.03.7.3, shall be in place.

2. The hull will be surveyed with a Hull Measuring Instrument (HMI) or approved laser scanner (LS). In either case the machine will be set abeam the hull and relocated fore and aft along the length of the hull, both port and starboard. Measurement points will be recorded from the deepest part of the hull or appendage up to the sheer line.

3. Clearance for the operation of the HMI or Laser System must be provided around the hull, in the construction of the cradle and the means of supporting the keel. Nominally, clear areas (including the ground surface) are required 1.5m (4 ft.) forward and abaft the hull and 2.0m (6 ft.) on either side of the hull. With some HMIs the minima are 60cm (2 ft.) forward and abaft the hull and 1m (3 ft.) on either side. The Measurer should be consulted for details. Cradle support struts and athwartships cradle bulkheads can usually be accommodated, but longitudinal cradle bulkheads and keel support channels prohibit reaching required measurement points.

4. **Sheer Point**. At any measured station, the sheer point is the highest point, in the vicinity of the hull/deck join, where a tangent at 45 degrees can be rested on the hull. See Appendix 3.

5. **Sheer Line**. The sheer line is defined as the line passing through the sheer points defined above.

5.02 Measurement Afloat.

Inclined stability and freeboards shall be measured on one occasion with the boat afloat in measurement trim (see 5.02.2 below). Normally, the boat's spinnaker pole(s), or if not available the mainsail boom, will be required for suspending the inclining weights (see Part VIII) and a dinghy or raft must be available for use by the Measurer. The owner or the owner's Authorized Representative (see Appendix 2, Measurement Inventory Form) must be present for flotation measurement.

1. **Floatation Measurements**
   - 1.1. **Specific Gravity (SG)**: The specific gravity of the water shall be measured at this time and recorded as SG. The water shall be sampled from a level 0.3m (one foot) below the surface.
   - 1.2. **Freeboard Measurements**
     - 1.2.1. **FFM** shall be the average of port and starboard freeboards measured vertically from the water level
     - 1.2.2. **FAM** shall be the average of port and starboard freeboards measured vertically from the water level

5.02.2 Measurement Trim: The owner or his representative will put the boat in measurement trim by following the procedure defined below. The Measurement Inventory set out in Appendix 2 shall be used to ensure and record compliance with the requirements. No substitutions are permitted during measurement afloat.

5.02.3 Boats shall be dry in light ship condition without crew and shall include the following:

a) Internal ballast, if any, which shall be fixed below the cabin sole, or as low as possible at any station and fixed to the hull structure to prevent movement.
b) Batteries
c) Fixed and/or essentially permanent interior accommodation, hatch covers and floor boards.
d) Fixed and/or essentially permanent machinery, electrical and plumbing systems
e) Outboard motor when it is stowed aboard in appropriate stowage
f) Mast, boom, spinnaker pole and/or sprit, if any, fully rigged as for racing.
1. Masts shall be raked aft to the limit of their adjustment. Where this limit is forward of the vertical the mast shall be set vertical.
2. Masts that are adjustable in height shall be in the highest position.
g) Standing rigging and fittings.
1 All standing rigging and related fittings used whilst racing shall be attached in their normal positions.
2. Running rigging forward of the mast and all halyards and lifts shall be taken to the foot of the mast and hauled tight.
3. All other pieces of running rigging abaft the mast shall be taken to their aftermost position and hauled tight.
4. All halyard tails shall be taken to their normal working positions. If the halyard weight varies significantly along its length, the tail shall be on the cabin floor for the inclining experiment, with the halyard fully hoisted and attached to a light messenger line.
5. A halyard may be used as a topping lift.
h) Rudder, wheel/tiller and steering gear, fitted complete as for racing.
i) Keel and any bulb, fitted complete as for racing.
j) Centerboard(s) and drop keels shall be fully raised. If any drop keel or movable appendage is to be locked when racing it shall be so locked and the locking device shall be in place.
k) All fixed electronics, instruments, compasses, lights, antennas and masthead devices.
l) All halyards as for racing.
m) Boom running rigging and any vang, as for racing. Booms shall be secured at the low points of P and PY, as the case may be.
n) Hydraulic systems including hydraulic tanks shall be full for measurement and shall remain full when racing.
o) Pulpits, stanchions and lifelines.
p) Mattresses, berth cushions, settee seat cushions and backrests, and permanently installed tables, doors on/in their normal position.
q) Permanently installed stoves, heaters or other electrical devices.

5.02.4 Specifically excluded from Measurement Trim is the following:

a) Water and the liquid contents of any tanks or voids in the keel or any other appendage. Fuel tank shall be as empty as possible (recommended) or filled to its capacity ("pressed-up"), distance from stem and condition at measurement recorded. Any liquid recorded in the tank is deducted from the displacement, and the trim recalculated, and freeboard measurements are adjusted accordingly.

b) Any sails, including storm and emergency sails.

c) Sheets, blocks, winch handles and other running rigging, except as in 5.02.3 above.

d) All portable safety gear, including fire extinguishers and liferaft(s).

e) Decorative throw pillows, sleeping pillows and any other bedding, towels, etc.

f) All cooking and eating utensils, portable heaters and compressed gas bottles

g) Any food or stores.

h) All tools, spares and stores.

i) Miscellaneous portable and personal gear, books, navigation tools, etc.

j) Anchors and anchor ropes, including both chain and fiber.

k) Dock and mooring lines and any other cordage.

l) Outboard engines without appropriate stowage and portable fuel containers.

5.02.5 For boats with LOA > 24.0 m (79 ft.) items listed in 5.02.6 when impracticable to be removed from the boat, may remain aboard with their weight recorded. Freeboards and stability measurements shall then be adjusted by subtracting recorded items. This procedure shall be verified and approved by the ORR Chief Measurer.

5.02.6 Measurement inventory shall be recorded as follows:

5.02.6.1 Permanently Installed equipment (included in Lightship trim)

a) Interior Ballast: description, weight, distance from stem, height from the waterline.

b) Batteries: description, weight, distance from stem, height from the waterline.

c) Engine: manufacturer, model.

d) Tanks: Use, type, capacity, distance from stem, height from the waterline, condition at measurement.

e) Miscellaneous: description, weight, distance from stem, height from the waterline (boiler, air-conditioning, heating etc.).

5.02.6.2 Portable Equipment (Each item's weight to be recorded)

Can be revised to differentiate between Offshore events and Inshore (buoy racing) events requirements. Default values (shown in parenthesis) will be used should you choose not to inventory your specific equipment.

a) Anchor(s) (16 lbs.)

b) Anchor(s) chain and rode

c) Tools (15 lbs.)

D) Spares (0 lbs.)

e) Safety equipment: weight- PFD"s, harnesses, emergency signaling, ditch bag, EPIRB, throw-able/MOM/Lifesling, first aid kit (for a complete list please reference US SER or World Sailing OSR's) (15 lbs.)

f) Deck equipment: weight - Sheets and guys and any running rigging not carried permanently on spars, winch handles, deck blocks, used in sailing the boat. (20 lbs.)

g) Fire Extinguishers. (10 lbs.)

h) Life Raft(s) and location (0 lbs.)

i) Emergency steering equipment (0 lbs.)

5.03 Mast and Rig Weight.

Assessment of pitch gyradius (Part VIII) requires measurement and/or the classification of various features of the boat. It is strongly encouraged that masts which qualify as carbon be measured for total rig weight and vertical center of gravity, prepared as specified in 9.13.

PART VI – HULL

HULL MEASUREMENT

6.01 Principle of Hull Measurement.

It is the principle of hull measurement under the ORR that the "lines" of the hull and appendages are recorded in considerable detail so as to yield, in combination with measurements afloat, hydrostatic data sufficiently accurate for rating purposes.

6.02 Hull Offset File.

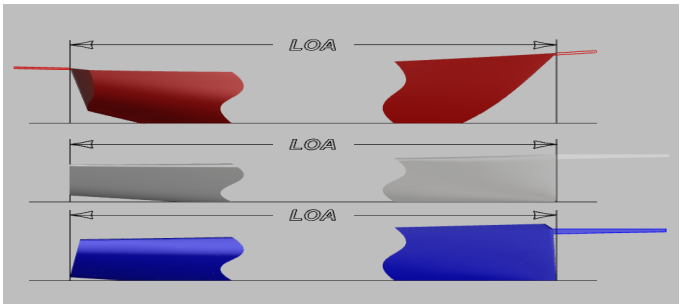
The Hull Offset File as processed by the ORA/rating authority shall define the boat's hull for the purpose of calculating a valid ORR Certificate until such time as there may be a change to the actual hull (including appendages).

6.03 Re-measurement.

A hull which has been modified will normally require hull re-measurement. A hull which has not changed shall not be re-measured and processed except where the Rating Authority is satisfied that reasonable evidence of error exists.

6.04 Length Overall (ORR LOA-Hull Length). **(Drawing courtesy James Teeters)**

The ORR Length Overall (LOA) is defined as the longitudinal distance between the aftermost point and the foremost point on the hull(s), excluding fittings. The ORR length overall shall be measured to include the whole hull, but not spars or projections fixed to the hull such as chainplates, bowsprits, boomkins, pulpits, pushpits, outboard rudders etc.



6.05 Maximum Beam (MB).

The maximum beam of the boat as taken from the measured offset file.

6.06 Definitions of Keels.

A boat's keel configuration shall be determined by its characteristics and shall be classified as one of the following.

6.06.1 Fixed Keel. A boat shall be classified as fixed keel when no part of the keel is adjustable when racing so as to alter the boat's maximum draft.

6.06.2 Centerboard. A boat shall be classified as centerboard when she is fitted with a centerboard(s) and/or a dagger board (s) which can and may be moved when racing to modify the boat's total draft. The total weight in air of such boards shall be less than 0.05*DSPM.

3. **Drop Keel**. A boat shall be classified as drop keel when she is fitted with a board or boards which can and may be moved when racing to modify the boat's total draft and where the total weight in air of such board(s) is equal to or more than 0.05*DSPM.

6.06.4 Wing Keel. A boat shall be classified as wing keel if the keel meets specific criteria in the Guide to ORR Measurement.

6.07 Limitations on Centerboards

6.07.1 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.

6.07.2 The longitudinal movement of the center of gravity of a Drop Keel when it is being raised or lowered (CBLD) shall not exceed 0.06*L.

6.07.3 A boat equipped with a centerboard or drop keel which fails for any reason to fulfill the requirement of 607.1 and 607.2 above, shall be given dispensation if the board or keel can be fixed in a predetermined position and shall be so fixed both for measurement and at all times when racing. Such a boat shall be classified and measured as a fixed keel boat for rating purposes.

HULL DERIVED CHARACTERISTICS

6.08 Measurement Trim.

The boat is measured afloat in a convenient location according to the rules for condition of loading as set forth in 5.02.2 for the purpose of defining "local" measurement trim. At the time of flotation measurement, the local Specific Gravity is measured and recorded as SG.

Measurement Trim for rating calculations is the trim derived in the VPP by converting flotation at local SG to a normalized flotation at a standard SG equal to 1.02528 (nominal seawater).

6.09 Sailing Trim.

Sailing Trim shall be the plane of flotation derived from Measurement Trim by the addition of weight to represent a crew (8.11) and a practical minimum of gear.

6.10 Sailing Length (L).

The Sailing Length (L) is an effective sailing length which takes into account the hull form at the ends of the boat, both above and below the plane of flotation in Sailing Trim.

6.11 Displacement (DSPM & DSPS).

DSPM and DSPS are the weight of the boat in Measurement Trim and Sailing Trim respectively.

6.12 Wetted Surface (WSS).

WSS is the area of the immersed hull surface in upright Sailing Trim.

6.13 Maximum Draft Including Keel (DHK).

The maximum draft of the hull including fixed keel (DHK) shall be the vertical distance from the Sailing Trim plane of flotation to the lowest point of the hull or fixed keel, whichever is deeper.

6.14 Maximum Draft Adjusted for Centerboard (DHKA).

DHKA is the maximum draft of the hull including fixed keel adjusted for the centerboard and is the draft used for rating purposes.

PART VII – PROPELLER

7.01 General Requirements.

The hydrodynamic drag of the propeller installation shall be taken into account by the Velocity Prediction Program and will be determined from the Propeller Installation Projected Area (PIPA) only if the propeller is at all times ready for use and shall not be retracted, housed, or shielded except by a conventional strut or aperture nor in such a position as to be clear of the water under normal sailing conditions.

7.02 Propeller Types.

7.02.1 Folding Propeller. To qualify for measurement a "folding" propeller shall be a standard model in series production, unaltered, having a minimum of two blades that fold together pivoting on an axis at right angles to the shaft line when not being used for propulsion.

7.02.2 Feathering Propeller. To qualify for measurement a "feathering" propeller shall be a standard model in series production, unaltered, having a minimum of two blades that pivot so as to substantially increase pitch when not being used for propulsion.

7.02.3 Solid Propeller. To qualify as "solid" a propeller shall be a standard model in series production, unaltered, having a minimum of two fixed blades of normal elliptical shape and a maximum width of not less than .25 times the propeller diameter measured across the driving face of the blade on a chord at right angles to the radius of the blade. Pitch shall not be greater than the propeller diameter. Hub and blade area projected into a plane at right angles to the shaft line shall not be less than .2 times the propeller diameter squared. If any of these conditions are not fulfilled the propeller is to be measured as a folding propeller except that if the projected area requirement is

confirmed by template and the pitch requirement is confirmed by inspection, all other conditions shall be deemed to have been fulfilled.

7.03 Installation Types.

The propeller installation shall be classified according to the following rules:

7.03.1 In Aperture. To qualify as an "in aperture" installation, the propeller must be solid or three-bladed and entirely surrounded (in the vertical plane of the shaft line) by the keel, skeg, and/or rudder.

7.03.2 Strut Drive. To qualify as "strut drive" the drive train shall be enclosed in a strut and the unit incorporating drive train and strut shall be of a standard model in series production. The surface and shape of the unit may be faired (e.g., with fillers) provided that its function is in no way impaired and none of the dimensions required for measurement of the unit are reduced relative to those as manufactured.

7.03.3 Out of Aperture. Shaft exposed

7.03.4 Out of Aperture. Shaft not exposed.

7.04 Propeller Measurements

7.04.1 PRD: diameter of the propeller disc.

7.04.2 PHD: smallest dimension through the shaft centerline of the projected area of the propeller hub
.
7.04.3 PHL: distance from the shaft end of the propeller hub to the intersection of the blade axis and shaft.
7.04.4 PBW: propeller blade width measured across the driving face of the blade on a chord at right angles to the radius of the blade.

7.04.5 PSA: angle between the centerline of the propeller shaft and a tangent to a hull buttock line 0.15 m (0.5 ft.) off the hull centerline midway between the axis of the propeller blades and the point where the propeller shaft emerges from the hull. Any unfairness or reverse inflection shall be bridged to yield a fair approximation of the slope of the hull body in way of the propeller shaft.

7.04.6 PSD: minimum propeller shaft diameter exposed to water flow including that part of the shaft within the strut hub.

7.04.7 ESL: length of the exposed shaft measured from the center of the propeller (the intersection of the blade axis and shaft) to the point at which the shaft center line emerges from the hull or appendage. For a boat with a Series Dates 1/1985 or later, **ESL** shall be the lesser of **ESL** as defined above or the length of the line **8.0*PSD** below the shaft axis and parallel to it measured from the blade axis to the fair line of the aft edge of the keel.

7.04.8 EDL: distance, measured along and in prolongation of the propeller shaft, from the center of the propeller to the aft edge of any other strut or fin (except the rudder blade) forward of the propeller.

7.04.9 ST1: minimum projected thickness of the strut at any point between the hull and the shaft.

7.04.10 ST2: minimum width of the strut, (including the strut hub) measured parallel to the shaft.

7.04.11 ST3: maximum width of the strut, measured parallel to the shaft, not above a line **0.3 * PRD** above the shaft centerline.

7.04.12 ST4: smallest dimension through the shaft centerline of the projected area of the strut hub within **ST2** of the aft end of the strut hub.

7.04.13 ST5: distance, measured perpendicular to the propeller shaft at the forward end of **ST2**, from the centerline of the shaft to the hull or fair continuation of the hull.

7.04.14 If any of **ST1 – ST4** measurements for the strut drive installation has been increased by the fairing of the standard production unit, **ST1 – ST4** shall be recorded as manufactured.

7.04.15 APH: maximum height of the aperture opening measured at right angles to the shaft line.

7.04.16 APT and **APB**: maximum widths of the aperture opening measured parallel to the shaft line at distances not less than **PRD / 3.0** above and below the shaft line.

7.04.17 Required measurements for each of propeller installation type:

a) In Aperture: **PRD, APH, APT, APB, PBW**
b) Strut Drive: **PRD, EDL, ST1, ST2, ST3, ST4, ST5, PBW**
c) Out of Aperture Shaft not exposed: **PRD, PHD, PHL, PSA, PSD, ESL, PBW**
d) Out of Aperture Shaft exposed: **PRD, PHD, PHL, PSA, PSD, ESL, ST1, ST2, ST3, ST4, ST5, PBW**

See Appendix 10 for Propeller measurement drawings

PART VIII – STABILITY AND PITCH GYRADIUS

8.01 Inclining Tests.

An inclining test will be performed with the boat in lightship measurement trim while floating in calm water with no person aboard and is not affected on any side by lying to a mooring. Except for inclining apparatus including spinnaker pole(s) as specified below the boat shall be in measurement trim as detailed in 5.02.2. In the case of a boat fitted with a centerboard or drop keel which is not locked to prevent movement for measurement and racing, the inclining tests will be carried out with the centerboard or drop keel fully raised. The boat shall be inclined as detailed below:

8.01.1 The boat shall be inclined as detailed below:

8.01.1.1 An approved electronic inclinometer connected to a computer or a manometer shall be positioned athwartships on the boat where it can be read by the measurer, who shall be stationed off the boat.

8.01.1.2 Two poles shall simultaneously be positioned on the port and starboard sides, at a defined position from the stem approximately at the Longitudinal Center of Flotation (LCF). The poles are to be suspended outboard in order to provide arms for supporting weights and shall be arranged normal to the boat's centerline in as nearly horizontal position as is possible while also allowing sufficient clearance to prevent the weights from touching the water. The poles shall be approximately J, SPL or .8*TPS in length and the boat's pole or poles shall normally be used when available. If a boat's pole is not used it shall not be on board.

8.01.1.3 A set of weights shall be prepared (see 8.05). The weights shall be recorded in kilograms when the boat is measured in meters. The weights shall be measured and recorded to a level of precision not less than 0.1 of a kilogram. If water containers are used as weights the scales used for measurement shall be regularly tested to ensure that they are accurate.

8.01.1.4 When the poles are rigged and all the weights suspended on the starboard side the datum on the manometer shall be marked. In the case of an electronic inclinometer with continuous sampling, the heel angle shall be recorded and the average taken.

8.01.1.5 The weight shall be transferred to the port side, the measurer recording the weight transferred and the manometer read. In the case of an electronic inclinometer, the heel angle shall be recorded and the average taken.

8.01.1.6 All the weights shall be suspended on the starboard side once again and the datum on the manometer or inclinometer heel angle verified following the procedures in 8.01.1.4. and 8.01.1.5.

8.01.2 Alternatively and when approved by the ORR Chief Measurer, the boat may be inclined using the boat's boom in place of spinnaker poles as detailed below:

8.01.2.1 An approved electronic inclinometer connected to a computer or a manometer shall be positioned athwartships on the boat where it can be read by the measurer, who shall be stationed off the boat.

8.01.2.2 The boom shall be positioned horizontal on the centerline. A small diameter center reference line shall be rigged at gooseneck height from the mast to the backstay or other aft structure on centerline.

8.01.2.3 The boom shall be swung outboard without weights to starboard and fixed in place with the boom end approximately at the LCF. If unable to position the boom end at the LCF then the actual longitudinal distance from the stem to the weight position shall be recorded.

8.01.2.4 The heel angle to starboard with no weights on the boom shall be marked on the manometer or recorded with an electronic inclinometer.

8.01.2.5 The weights then shall be suspended from the boom, and the datum on the manometer shall be marked. In the case of an electronic inclinometer, the heel angle shall be recorded, and an average taken.

8.01.2.6 The procedures of 8.01.2.3 through 8.01.0.5 shall be repeated on the port side and again on the starboard side.

INCLINING MEASUREMENTS

8.02 Pendulum Length (PL).

Pendulum Length Measured (**PLM**) shall be the length of the manometer from the center line of the fluid reservoir to the centerline of the gauge cylinder; it shall be recorded in millimeters to one place of decimals and shall not be less than 2000.0mm. Gauge surface area (GSA) shall be the surface area of the manometer gauge. Reservoir surface area (**RSA**) shall be the surface area of the fluid reservoir. PLM, GSA and RSA shall be common to all readings. PL shall be obtained from the formula:

PL=PLM/ (1+GSA/RSA)

Note: Where an ORR approved electronic inclinometer is used instead of a manometer, PLM is conventionally recorded as 9000; GSA and RSA as 1.0.

8.03 Weight Distance (WD)

8.03.1 WD shall be the horizontal distance from the point of attachment of the starboard weight to the point of attachment of the port weight. It shall be measured with the weights distributed equally on the two pole ends. The weights shall be attached so that the weight distance is constant for all tests. The weight distance shall be of the order of maximum beam (MB) +2.0*SPL.

8.03.2 When the boom is used for the inclining test, the distance from the weight bearing point on each side to the centerline reference line shall be recorded and added together for the **WD**.

8.04 Pendulum Deflections (PD)

PD shall be the deflection on the manometer gauge after each weight of the set has been moved, from the datum established in 8.01.4 above. They shall be recorded in millimeters and shall be within the limits given in 8.05 below.

8.05 Weights (W)

W shall be the total weight suspended from the port pole for each reading of the manometer. The weight shall be of suitable magnitude to ensure that the largest PD is within +/- 0.01*PL of 0.105*PL (i.e ~ within 10% 0f 6 degrees total heel) for boats with LOA >12.5M (41.0 ft.) and +/-0.01*PL of 0.125*PL (i.e ~ within 8% 0f 7 degrees total heel) for boats with LOA <= 12.5M (41.0 ft.)

RIGHTING MOMENT -- MEASUREMENT TRIM

8.06 Inclining Slope (SLOPE)

The slope of the straight line through the inclining weight vs. pendulum deflection is determined. (e.g. PD/W)

8.07 Righting Moment (RM).

RM=WD*PL*0.0175/SLOPE

8.08 Righting Moment Corrected (RMC).

8.08.1 For boats with fixed keels or centerboards locked to prevent any movement: RMC=RM.

8.08.2 For movable boards or drop keels, RMC is adjusted for the movement of the board/keel.

RIGHTING MOMENT AND WEIGHTS -- SAILING TRIM

8.09 Righting Moment per Degree in Sailing Trim at 2 degrees Heel (RM2).

RM2 shall be calculated from the displacement and vertical center of gravity in Measurement Trim by the addition of weight for the mainsail (MSW), crew, gear and other sails at their established centers of gravity.

8.10 Righting Moments by Heel Angle (RM2, RM20, RM25, RM40, RM60 and RM90).

These are the Sailing Trim righting moments at 2, 20, 25, 40, 60 and 90 degrees of heel (with all crew on the boat's centerline) divided by the heel angle in degrees. The VPP uses these to establish the righting moment vs. heel angle curve for the boat. This stability curve is augmented by moving Crew Weight to the weather rail when appropriate, by dynamic stability effects, and by movable ballast.

8.11 Rated Crew Weight and Base Crew Weight (BCW)

Rated Crew Weight is the weight of crew with which a boat is rated. It is the weight used in calculating boat speeds and ratings within the ORR VPP. This weight may be an ORR default value or a declared value subject to some limitations.

Rated Crew Weight is used as the maximum permissible crew weight for racing. Any boat racing with a crew weight in excess of RCW is not in compliance with its ORR certificate (see 4.01.)

A Base Crew Weight (BCW) is calculated for each boat. BCW is determined by the formula:

BCW (lb.) = (DSPM/2240/ (.01*LSM0)^3/254)^.375*(RM/(DSPM*MB)/.00571)^.4*LSM0^1.55*7.6

In the above formula, DSPM is displacement in Measurement Trim and MB is the Maximum Beam taken from the hull offsets. RM is the righting moment per degree in standard water in measurement trim with the VCG effect of inclining weights removed. LSM0 is an effective sailing length in Measurement Trim.

In the absence of a crew weight declaration by the owner, the BCW will be used as the Rated Crew Weight. The owner may, by "owner declaration" (see 8.12), adjust his boat's maximum allowed crew weight up or down from BCW.

8.12 Declared Crew Weight (DCW).

8.12.1 Standard/Offshore and Inshore Certificates

Declared Crew Weight (DCW) shall not be taken as less than the greater of 251.75 Kg (555.0 lb.) or 0.65 times the calculated base (BCW) for the boat. If DCW is greater than 1.2 times the calculated base, the excess weight, DCW - 1.2 x BCW, will not be included in the sailing displacement for the boat. Furthermore, that excess weight will be placed, for the purpose of crew contribution to stability (see 8.09), at a location 25% greater than the VPP calculated crew arm.

8.12.2 Double Handed Certificates

Declared Crew Weight (DCW) for double handed certificates may be taken as less than 251.75 Kg (555.0 lbs.) or .65 times Base Crew Weight (BCW). The ORR certificate will display the ORR type as "Shorthanded".

PITCH GYRADIUS

8.13 Elements of Pitch Gyradius

The following elements of the pitch gyradius calculation shall be determined by examination of the boat and recorded on her certificate. Where deemed appropriate, a declaration from the owner

may be substituted for examination of one or more elements, but all elements are subject to examination at any time in cases of doubt.

1. Hull and Deck Construction. Owners are reminded of their obligations under ORR 3.02.4. Hull and deck construction shall be classified as one of the types below. Note that limited amounts of high strength carbon edge capping of bona fide hull structural frames, girders and stringers, and as localized reinforcement on bulkhead faces in way of chain plate attachments, will not affect the hull construction category provided it is used below decks between 0.3LOA and 0.7LOA aft of the stem.

SOLID: Non-cored, solid E-glass, metal or wood hull and deck, but including also E-glass decks with core material. Where the construction is of wood, the minimum density of any layer shall not be less than 300 kilograms per cubic meter.

CORED: Hull skin of E-glass (see above) or wood, but incorporating a core material of less density than the skin.

LIGHT: All other construction types, but excluding the incorporation of any carbon fiber (see below).

CARBON: Where carbon fiber has been incorporated anywhere in the construction of the hull and/ or deck.

HCMB: In addition to recording the appropriate construction type as above, where a honeycomb core has been incorporated in hull or deck construction, this shall also be recorded.

8.13.2 Rudder Construction. Rudder construction shall be classified as one of the following:

STANDARD: Neither rudder nor rudder post contain any carbon fiber.
CARBON: Rudder and/or rudder post contain carbon fiber in any amount.

3. Forward Accommodation. Where the bow forward of the mast is fully fitted out as a separate sleeping or living space built of solid construction, including bunks (pipe berths do not qualify), personal gear stowage, etc., the boat shall be classified as having Forward Accommodation which shall be recorded on the Certificate.

8.13.4 Number of Spreader Sets. The number of sets of mainmast spreaders shall be recorded on the Certificate.

8.13.5 Jumper Struts. Where the mainmast incorporates jumper struts, this shall be recorded on the Certificate.

8.13.6 Number of Runners (Inner Backstays) and Adjustable Inner Forestays; see 9.12.4.

8.14 Assessment of Pitch Gyradius.

The VPP assesses the added resistance of the hull resulting from sailing in wind-driven waves using a routine which estimates a base pitch gyradius. The pitch gyradius is an indicator of how spread the weights of a boat are. A small gyradius indicates that the weights are relatively concentrated. In general, the higher the gyradius is, the greater the added resistance. Adjustments are made to the base gyradius according to the following recorded characteristics of the boat:

8.14.1 If Mast Weight (MWT) and Mast Center of Gravity (MCG) have been recorded, the gyradius contribution of the mast is assessed as compared to that of a hypothetical base aluminum mast and a corresponding mathematical gyradius adjustment is made.

8.14.2 For a boat with a carbon mast measured afloat before 01 Jan 2000, and where MWT and MCG are not recorded, the base gyradius shall be adjusted by a default mast gyradius increment.

8.14.3 If MWT and MCG are not recorded, the gyradius is increased in accordance with the number of spreader sets, jumper struts, adjustable inner forestays and running backstays.

4. Further gyradius adjustments are made for:

a) Mizzen mast,
b) Hull construction: SOLID, CORED, LIGHT, CARBON, HONEYCOMB,
c) Age Date,
d) Forward Accommodation,
e) Carbon fiber rudder construction.

PART IX – RIG

1. Rig Restrictions

9.01.1 Boats shall have substantial, bona fide mainsails. No boat shall be rated under ORR if P+BAS is less than the greater of .96*IG or .96*ISP.

2. Rotating and/or pivoting masts are prohibited from ORR.

3. A boat must have a bona-fide forestay. That forestay may be adjusted while racing if declared as such on the rating application and will be rated as an adjustable forestay. **The forestay shall remain attached at all times while racing.**

4. **Adjustment of Rigging.** Adjustment of rigging while racing is not permitted with the exception of the following which are permitted to be adjusted while racing. All rig elements stated below shall be declared as fixed or adjustable for rating purposes.*

a) Forestays.
b) Main Backstays.
c) Runner Backstays.
d) Mizzen Backstays.
e) Check stays.
f) Forestays attached to the foremost mast above 0.225*IG above the sheerline
*For the purposes of safety, i.e. an exceptional adjustment of a stay to cure a fault is allowed

9.01.5 Rigging Plan.

Stays which are declared as adjustable while racing shall be confirmed by the Measurer and shall be recorded as follows:

9.01.6 Adjustable Forestay. When the forestay itself is adjustable this shall be recorded as "adjustable forestay".

9.01.7 Adjustable Backstay. When the uppermost backstay is adjustable this shall be recorded as "backstay adjustable".

9.01.8 Adjustable Forestay and Backstay. There is no restriction on having simultaneously an adjustable forestay and an adjustable backstay. There is an appropriate rating adjustment in the VPP.

9.01.9 Running Backstays. Where there are one or more pairs of backstays below the uppermost backstay (inner backstays, runners, checkstays, etc.), these shall be recorded as "runners". The number of pairs, based on the attachment points on the mast, shall also be recorded (see also 8.13.6). A secondary runner tension adjuster, leading to the mast approximately perpendicular to the runner itself, shall not be counted.

9.01.10 No boat shall be rated under ORR if any spar is built wholly or in part of any material other than wood, aluminum alloys, steel alloys or fiberglass reinforced plastic, except as provided below:

a)The restrictions of this section do not apply to booms and spinnaker poles.

b) If the mast is constructed substantially of carbon in section throughout its entire length. In such case carbon fiber reinforced plastic is permitted for masts as well as integral moldings, spreaders, and jumpers.

9.01.11 Permanently bent spars are not permitted. A spar that will straighten when stresses imposed by the rigging are removed does not constitute a permanently bent spar.

9.01.12 Movement of Mast at Deck or Step. Altering the height, fore and aft position, or transverse location of the mast at the step or deck while racing is not permitted.

RIG MEASUREMENT

9.02 Sail and Rig Measurement.

All spars and standing rigging, adjustable or fixed, must be available to the Measurer for measuring or checking marked dimensions and declarations made as to the use of these while racing (see also 3.02.3).

9.03 Painted Measurement Bands.

Measurements may be taken to locations defined by painted bands, of black or other contrasting color, only when these bands are in place at the time of measurement. Where measurements are taken to such bands any movement of the bands or a failure to display them while racing shall invalidate the rating certificate.

FORETRIANGLE

9.04. Base of Foretriangle (J).

J shall be the foretriangle base measured horizontally from the foreside of the mast at its lowest point above the deck or coach-roof to the center line of the foremost tack point on which headsails, other than **Large Roach Headsails (LRH)**, are set (the center line of the luff of the foremost headsail, if the headsail is to be set flying), extended if necessary, to intersect the level of the sheer line, or to a bowsprit if used. Where there is the capacity for the mast to be moved at the deck, J shall be measured with the mast at the aftermost limit of adjustment unless a 1 in. (25mm) contrasting band is provided. In this case J shall be measured to the aft edge of the band and the forward face of the mast may not move aft of this point. **JLRH** shall be the foretriangle base for any Large Roach Headsail (LRH) and shall be determined in the same manner as J but to the LRH tack point.

9.04.1 Stem to Forward End of J (SFJ)

SFJ shall be the horizontal distance from the forward end of J to the forward end of LOA (negative if a bowsprit is used).

9.05 Spinnaker Pole and Spinnaker Tack Point (SPL & TPS).

9.05.1 The boat's spinnaker configuration shall be declared by the owner and recorded as one of four (4) permitted types:

a) Symmetric: all spinnakers are symmetric, spinnaker pole(s) allowed.

b) Centerline Asymmetric: no spinnaker pole or whisker pole allowed, spinnakers shall be tacked on the centerline of the boat.

c) Centerline Asymmetric with pole: A declared spinnaker pole or whisker pole whose length does not exceed J may be carried for the purpose of winging out a headsail headsail to weather and shall comply with 10.05 f).. Spinnakers shall be tacked on the centerline of the boat.

d) Asymmetric: asymmetric and symmetric spinnakers allowed, spinnaker pole(s) allowed.

1. **Spinnaker pole length (SPL)** the horizontal distance from the forward face of the mast spar, ignoring any fittings and tracks, measured on or near the centerline of the boat, to the extreme outboard end of the spinnaker pole.

2. **Tack Point of Spinnaker (TPS).** TPS shall be the horizontal distance from the foreside of the mast at its lowest point above the deck or coach roof to the point of attachment at deck level of the foremost tacking point of an asymmetric spinnaker or to the extreme forward end of any bowsprit in its maximum extended position.

MAIN MAST AND BOOM

9.06 Mast Measurements.

Measurements shall be taken parallel to the axis of the spar with the spar straight.

9.06.1 Height of Headsail Halyard (IG). For boats that have a headsail attachment above IG, IGA shall be the height of the highest headsail attachment point to the foreside of the mast structure above the level of the deck as defined in 9.08. Both IG and IGA will be used in calculating rating

9.06.1.1 Height of Upper Headsail Halyard (IGA). For fractionally rigged boats that have masthead and fractional attachment points. IGA shall be the highest headsail attachment point to the mast structure at the foreside of the mast to the level of the deck as defined in 9.08. Both IG and IGA will be used in calculating the rating.

9.06.2 Height of Spinnaker Halyard (ISP). For masthead and "normal" fractionally rigged boats ISP shall be the height of the uppermost spinnaker halyard. It shall be measured from the underside of the spinnaker halyard, when drawn horizontally forward from the mast, to the level of the sheer line abreast the mast as defined in 9.08.

9.06.2.1 Height of lowest Spinnaker Halyard (ISPA). ISPA shall be the height of the lowest spinnaker halyard attachment to the mast structure above the level of the deck as defined in 9.09. Both ISP and ISPA will be used in calculating the rating. ISPA may be the same as ISP.

9.06.2.2 Height of the Large Roach Headsail Halyard (ILRH) shall be the height of the highest attachment point of the ILRH to the mast structure above the level of the deck as defined in 9.08. ILRH will be used in calculating the rating when an LRH is declared for racing.

3. **Forestay Outrigger (GO).** GO shall be the horizontal distance from the upper point of measurement used to determine IG to the after side of the mast or vertical projection of the after side of the mast.

4. **Mast Width (MW).** MW shall be the minimum fore and aft width of the mast to be found at any point below the top of IG and above the lower spreader.

5. **Maximum Transverse Dimension of Mainmast (MDT1).** MDT1 shall be the maximum thickness of the mast in the athwartships direction occurring above 0.5*P.

6. **Maximum Longitudinal Dimension of Mainmast (MDL1).** MDL1 shall be the maximum thickness of the mast in the fore and aft direction occurring above 0.5*P.

7. **Taper Length (TL).** TL shall be the distance from the highest point at which MDT1 or MDL1 occurs, whichever is lower, to the upper measurement point for P.

8. **Upper Transverse Dimension of Mainmast (MDT2).** MDT2 shall be the minimum thickness of the mast in the athwartships direction below the upper measurement point for P.

9. **Upper Longitudinal Dimension of Mainmast (MDL2).** MDL2 shall be the minimum thickness of the mast in the fore and aft direction below the upper measurement point for P.

If the thickness of a mast (constructed of materials other than wood) in the athwartships direction is less than MDT1, or in the fore and aft direction is less than MDL1, at any point below the highest points at which they occur, the smallest athwartship value found shall be substituted for MDT1 and the smallest fore and aft value found shall be substituted for MDL1, except that any bona fide luff groove shall always be included. Any such substitution shall not affect the definition of TL. Excluding a luff groove device, no hollows in section are permitted. Any addition of material to the base mast section shall consist of the same primary structural material as the mast itself. The MDL measurements shall include any bona fide luff groove or track attached directly to or integral with the mast. Any secondary luff groove device otherwise attached shall not be included and the relevant boom and mainsail measurements shall be increased by the longitudinal dimensions of the device as determined by the Measurer.

9.07 Mainsail Hoist (P).

P shall be the measured length of the hoist of a headsail headed mainsail. It is the distance along the afterside of the mainmast from the highest level to which the head of the sail, or any part of a headboard carriage abaft the track or mast groove, may be set to the lowest position of the tack. The highest point shall be taken as the top of the highest sheave used for the main halyard, or to the lower edge of a one-inch measurement band. The lowest position of the tack shall normally be the fair extension of the top of the boom or any external track or groove.

1.If a sliding gooseneck is used, measurement is to be made with the boom at the extreme bottom of the slide unless the lowest sailing position of the foot of the sail (boom or boom track) is marked by the upper edge of a one-inch measurement band around the mast. The top of the boom (or track) shall not be carried below this point when the mainsail is set, except when actually putting in or shaking out a reef in the mainsail.

2.In the event that the tack of the sail is carried below the boom, its lowest position shall be marked by the upper edge of a one-inch measurement band around the mast from which the low point of P shall be measured.

9.08 Height of Deck.

The height of deck used as a datum for sail area measurements shall be the sheer line abreast the mast.

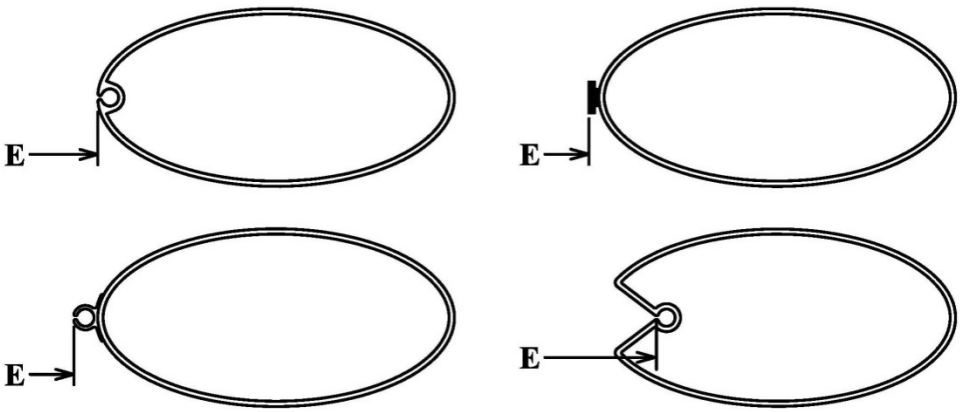
9.09 Boom above Sheerline (BAS).

BAS shall be the distance between the low point used in the determination of P and the level of the deck as defined in 9.08.

9.10 Foot of Mainsail (E & BAL).

1. Foot of Mainsail (**E**). E shall be the length measured along the boom from the aft side of the mast including any external track or groove, or its fair extension parallel to the axis of the mast, to the aftermost position to which the sail is permitted to extend. Where this latter point is inside of the boom end, it shall be located by the inner edge of a one inch measurement band around the boom.

Any part of the mast which extends abaft the aft side of the track or mast groove shall be ignored in determining E.



2. **Sheeting Limit** (**BAL**). BAL shall be the distance from the outer measurement point of E to a contrasting measurement band denoting the limit on the boom beyond which no lead for the sheeting of headsails shall be attached. In the absence of such a band BAL shall be measured to the boom end. BAL shall not exceed 0.152 m (0.50 ft.).

9.11 Boom Diameter (BD).

BD shall be the maximum dimension of the main boom measured in section inclusive of any structure used to stiffen the boom. A boom with a BD in excess of 0.05*E is not permitted.

9.12 Chainplate Width (CPW).

CPW shall be the distance between the centers of the bearing points of the chainplates for the upper shrouds of the mainmast.

9.13 Rig Weight and Center of Gravity (MWT, MCG & WB).

Rig Weight and Center of Gravity (MWT, MCG & WB) as outlined in 9.14 is optional for all masts. However, ORA strongly encourages the mast be weighed together with its standing rigging and recorded as MWT for accuracy; otherwise a default weight is used for the calculations.

The main mast, together with its standing rigging, shall be weighed and the weight found recorded as **MWT**.

1. The vertical center of gravity shall be determined relative to the lower measurement point of P and recorded as **MCG**.
2. As appropriate to the size of the mast, the values for MWT and MCG may be found either by measurement at the single point of the center of gravity of the mast and rigging or by measurement of tip and butt weights separately, followed by calculation of the values to be recorded.
3. The Boom construction shall be noted as "light" or "heavy" depending on the material and method used in construction and recorded as **WB.**
4. All measurements above shall be taken with the components dry and the spars fitted only with components with which the boat will actually race as specified below.
5. The mast shall be completely rigged with standing rigging, running backstays, permanent backstays, spreaders, jumpers, lights, antennae, instrument displays and their mounting brackets, wiring, luff groove device and all other permanently attached fittings, including those turnbuckles which are not permitted to be adjusted while racing.

6. Excluded from measurement shall be running rigging (except the backstay), checkstays, rigging adjusters of any type (hydraulic or otherwise) and any associated blocks and tackle, boom vang and reefing tackle. Halyard messengers of not more than 4mm diameter and weighing not more than 15 grams per meter and only sufficient for convenient re-leading may be used to replace internal portions of running rigging.

7. All wiring, messengers and standing rigging shall be in their proper attached positions, and any slack stretched down and secured along the length of the mast with light material, such as lanyards or tape, with any tails hanging free at the butt.

8. Headboard, luff slides, spinnaker pole cars and any other adjustable devices shall be at their lowest limit of travel.

MIZZEN MAST AND BOOM

9.14 Height of Mizzen Mast (IY). IY is the height measured along the foreside of the mizzen mast from the deck as defined in 9.08 to the higher of:

9.15.1 The center of the highest eyebolt or eye used for a mizzen staysail;

Or

9.15.2 The intersection of the foreside of the mast with the highest strop used for the halyard of a mizzen staysail.

9.15 Mizzen Mast Diameters and Taper Length (MDT1Y, MDL1Y, MDT2Y, MDL2Y & TLY).

Mizzen diameters and taper measurements are as for main masts (ref. 9.06.5 through 9.06.9).

9.16 Mizzen Hoist (PY).

PY is the measured length of the hoist of a headsail headed mizzen sail. The method by which this is measured shall follow that used for the hoist of the mainsail (see 9.07).

9.17 Boom above Sheerline (BASY).

BASY shall be the distance between the low point used in the determination of PY, and the level of the deck as defined in 9.08.

9.18 Foot of Mizzen.

9.19.1 Foot of Mizzen (EY). EY is the measured length along the boom from the aft side of the mizzen mast including any external track or groove, or its fair extension parallel to the axis of the mast, to the aftermost position to which the sail is permitted to extend. The method by which this is measured shall follow that used for the foot of the mainsail (see 9.10).

9.19.2 Sheeting Limits (BALY). BALY is the distance from the outer measurement point of EY to any bale on the mizzen boom provided for the lead of any mizzen staysail sheet, limited as for BAL.

9.19 Mizzen Boom Diameter (BDY).

BDY shall be the maximum dimension of the mizzen boom measured in section inclusive of any structure used to stiffen the boom.

9.20 Distance between Masts (EB).

EB is the distance at deck level between the after-sides of the mainmast to the fore-side of the mizzen mast.

PART 10- SAILS

All sails must be available to the Measurer for measuring or checking marked dimensions and declarations made as to the use of these while racing (see also 3.02.3 & 9.01).

SAIL RESTRICTIONS

1. Construction

10.01.1 The term "sail" shall be taken to include the headboard, tabling, bolt and foot rope or tapes. It shall not include cringles which are wholly outside the sail.

10.01.2 Openings in the sail, in addition to the normal cringles and reefing eyelets, are permitted provided that the sail is flat in the vicinity of the openings.

2. Sail Inventory

10.02.1 A boat while racing shall not carry on board more sails of each type than the numbers below unless modified by the Race Organizing Authority:

Large headsails	**5**
or 4 Large headsails plus *1 Large Roach headsail	**4+1=5**
Small headsails	**5***
***Spinnakers**	**5**
Mainsails	**1**
Storm Trysails	**1**
Storm jib (headsail)	**1**
Heavy -Weather jib (headsail)	**1**
Mizzens	**1**
Mizzen Staysails	**3**

- **Large headsails** are those having an LPG greater than 1.1*J with a half-width equal to or less than 50% of the foot measurement.
- **Large Roach headsails (LRH or"Tweener")**are those headsails with LPG or LRHLP greater than 1.1*JLRH with a LRHSHW greater than 50% of the LRHSF, but with LRHSHW less than 75% of LRHSF. Sails in this category must be measured as both a spinnaker and a headsail. Sails in this category must be flown outside any other sails that are set.
- **Small headsails,** including inner forestaysail's, are those having an LPG less than or equal to 1.1*J.
- ***Where the largest headsail for which a boat is rated is a Small Headsail, the total number of headsails allowed shall be the Small Headsail maximum plus two plus a one Large Roach Headsail.

- The specifications of storm and heavy weather sails are those of the World Sailing Offshore Special Regulations Governing Offshore Racing, section 4.26.3.

*A Non-Spinnaker rating as listed on the certificate will not include Spinnakers or Large Roach Headsails in the rating calculation.

10.03 Trimming of Sails.

All sails must be set and trimmed in a manner consistent with the way they are measured. A sail shall not be constructed in such a manner that any portion may be completely detached.

10.04 Double Luffed Sails.

Double luffed sails (those with thick or wrap-around luffs) are not permitted.

10.05 Restrictions on Setting and Sheeting of Headsails

a) Large and small headsails, and Large Roach headsails shall be tacked approximately on centerline when they are tacked forward of the forestay.

b) Small Headsails, tacked between the forestay and the mast, may be tacked outboard of the boat's centerline and if a spinnaker is set, shall be tacked inside of the spinnaker.

c) Only if no spinnaker is set may two headsails be set on the same tack point.

d) Bloopers - A large headsail, tacked approximately on centerline, may be set outside a spinnaker if
a. The boat's Age or Series Date is earlier than Jan 1, 1985
b. The boat is rated for a spinnaker Pole and not rated with a bowsprit
c. The boat is not rated with spinnaker configuration Centerline Asymmetric
d. The Large headsails set on the opposite side as the spinnaker pole
e. No tack pennant is greater than 0.76m (2.5 feet).

e) Headsails may be sheeted to any part of the deck or rail, but to no fixed point higher than 0.05*B above the deck or coach roof, or to the main boom, within the measurement limits (see 9.10.2) or to the spinnaker pole or whisker pole when the pole is set on the opposite side from the main boom. Headsails may not be sheeted to any spar or outrigger set to leeward unless both the Organizing Authority elects to allow their use and they are declared and rated under 10.05.f). This changes RRS 55.3 (a).

f) Organizing Authority may elect to allow non-Large Roach Headsails set to leeward connected to Whisker Poles (attached to the mast) or Outriggers (attached to the hull). This changes ORR 10.05 (e) and RRS 55.3 (a).

g) No headsail may be set in conjunction with any other headsail so as by any means to simulate a double clewed or double luffed headsail. (For example, except when changing sails, no two headsails may be carried simultaneously in a luff groove device and sheeted on the same side of the boat.)

10.06 Restrictions on Setting and Sheeting of Spinnakers

a) The outboard end of the spinnaker pole shall be used only on the windward side of the boat. A spinnaker pole shall only be used with its inboard end attached to the mast (foremast if there is more than one mast).

b) When a bona fide headsail is set on a spinnaker or whisker pole (see 10.16) for which the boat has been measured it may be set and sheeted as a spinnaker where either of the following conditions apply:

1. In heavy weather when no other sail is set in the foretriangle and the apparent wind is abaft the beam when winging out a headsail with a pole or
2. When all spinnakers aboard have been damaged beyond repair during the race.

A headsail so set may have either its tack or clew to the spinnaker pole.

c) Spinnakers shall be sheeted from only one point on the sail.

d) A spinnaker may be sheeted to any part of the rail or deck or to the main boom, within the measurement limits (see 9.10.2), but to no other spar or outrigger.

e) Struts, spools, jockey poles or similar devices used solely for the purpose of keeping the spinnaker guy away from the windward main or foremast shrouds are permitted but are not to be used for any other purpose.

Where the spinnaker configuration is classified as Centerline Asymmetric (i.e., no pole allowed on board – see 9.05.1b), the spinnaker shall be tacked on the centerline of the boat and sheeted on the same side as the boom: except for periods short duration when the spinnaker may be sheeted on the opposite side of the boom (as an example: while in the process of headsailing, approaching a mark or avoiding another boat).

10.07 Restrictions on Setting and Sheeting of Mainsails

a) Mainsails shall be either fully secured at the foot or fully loose footed and shall remain so while racing. A mainsail secured at the foot shall be provided with a bolt rope, track or tunnel slides, or similar boom attachment that prevents the foot from lifting away from the boom. A loose-footed mainsail shall be sheeted only from a single clew.

b) Spare mainsails are not permitted to be carried on board.

c) Storm trysails, as distinguished from loose-footed mainsails, must be materially smaller than a normal close-reefed mainsail and of strength consistent with their purpose for use in extremely severe weather. (See World Sailing Offshore Special Regulations 4.26.3: aromatic polyamides, carbon and similar fibers shall not be used in a trysail or storm headsail but spectra/dyneema and similar materials are permitted).

10.08 Restrictions on Setting and Sheeting of Mizzen Staysails on Yawl or Ketch

a) Mizzen staysails may be sheeted to the rail or hull, and to the mizzen boom within the measurement limits (whether or not the mizzen is set) but they may not be sheeted to any other spar or outrigger.

b) Mizzen staysails must be three-cornered (head, tack and clew). The tack or tack pennant must be secured abaft the point of intersection of the afterside of the mainmast with the main deck and also must be secured directly to and no higher than the rail cap, deck or cabin top (includes dog house top).

c) Not more than one mizzen staysail may be set at the same time.

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

SAIL MEASUREMENTS

10.09 Tension and Wrinkles in Sails

When measuring sails it is required that sufficient tension be applied between measurements points as to remove all wrinkles across the line of measurement and must include the fabric length between measurement points.

10.10 Measurement Points at Corners of Sails

Measurement points at the corner of a sail shall found as below. Measurement points shall be at the extreme outside of a bolt rope, wire or fabric at the sail edge.

a) Tack Point. The intersection of the foot and the luff, each extended as necessary.

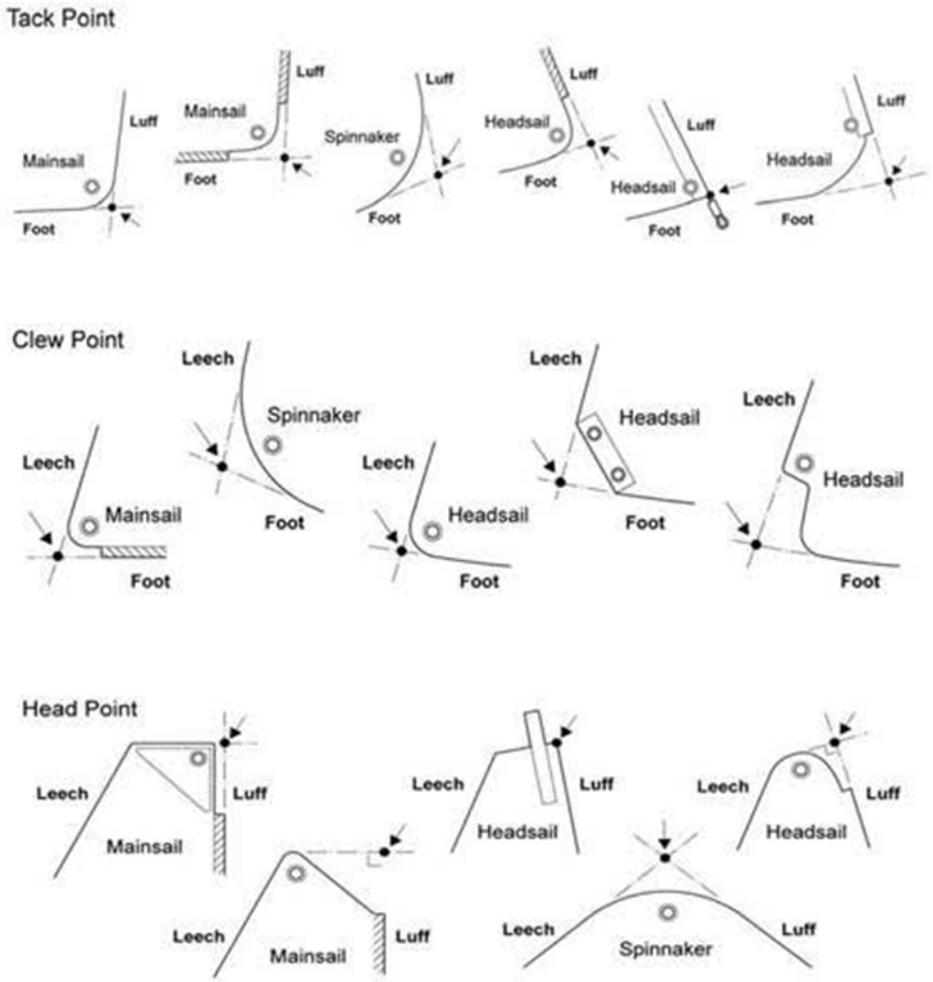
b) Clew Point. The intersection of the foot and the leech, each extended as necessary.

c) Head Point.

(1) Mainsail: The intersection of the luff, extended as necessary, and the line through the highest point of the sail at 90° to the luff.

(2) Headsails: The intersection of the luff, extended as necessary, and the line through the highest point of the sail, excluding attached pennants, strops, etc., at 90° to the luff.

(3) Spinnaker: The intersection of the luff and the leech, extended as necessary.



MEASUREMENT OF HEADSAILS*

10.11 Luff Length JLU shall be the straight line distance from the headsail head point to the headsail tack point. For Large Roach Headsails (LRH) this dimension shall be **LRHJLU.**

10.12 Longest Perpendicular of Headsails (LPG).

10.12.1 Headsails shall be measured on the perpendicular from the luff (outside edge of the sail and/or luff rope) to clew (intersection of the lines of the foot and leech). A wrap-around headsail shall be measured on the perpendicular from the line of junction of the wrap-around parts to the clew.

10.12.2 LPG shown on the rating certificate shall be the value for the greater of the largest area headsail, other than LRH, carried on the boat or largest area headsail for which the boat is rated.

10.12.3 LRHLP shall be the LPG of the Large Roach Headsail measured as defined in 10.12.1.

10.13 Headsail Widths

10.13.1 From any specified point on the leech of a headsail, the width is defined as the distance from that point to the nearest point on the luff of the headsail.

10.13.2 Non-Large Roach Headsails

10.13.2.1 JMGL, JMGM, JMGU shall be the widths, as defined in 10.13.1 above, from respectively 25%, 50%, and 75% of the leech length from the clew point. JH is the head width.

10.13.2.2 JLE shall be the straight line distance from the headsail head point to headsail clew point.

10.13.2.3 JLU, JLE, LPG, JMGL, JMGM, and JMGU shall be measured for each headsail and recorded on that headsail's sail certificate.

10.13.2.4 The JLE for the largest area headsail shall be shown on the certificate.

10.13.3 Large Roach Headsails (LRH)

10.13.3.1 LRHQW, LRHHW, LRHUW, LRHTW shall be the widths, as defined in 10.13.1 above, from respectively 25%, 50%, 75%and 87.5% of the leech length from the clew point. LRHHB shall be the head width.

10.13.3.2 LRHLE shall be the straight line distance from the headsail head point to headsail clew point.

10.13.3.3 LRHSHW shall be the distance between the midpoints of luff and leech measured along the shortest path on the surface of the sail.

10.13.3.4 LRHHSF shall be the distance from tack point to clew point measured along the shortest path on the surface of the sail.

10.13.3.5 LRHLU LRHLE, LRHLP, LRHQW, LRHHW, LRHUW, LRHTW and LRHHB shall be measured for each headsail and recorded on that headsail's sail certificate

10.14 Forestay Perpendicular (FSP).

FSP shall be the larger of either:

10.14.1.Twice the maximum dimension, measured at right angles to the longitudinal axis, of a luff groove device; or

10.14.2 The largest dimension of the doubled portion of a wrap-around headsail measured at right angles to the luff line when opened out.

10.15 Longest Luff of Headsails (JL).

The length of the luff shall normally be the distance between the lowest part of the sail on the luff at the tack point and the highest point of the sail on the luff at the head point. JL shall be recorded as the largest such dimension found on the headsails, other than LRH, carried on the boat. JL will not be taken as less than the .9 times the square root of I squared plus J squared. The same applies to LRH sails using substitution JLRH, ILRH LRHLU.

MEASUREMENT LIMITATIONS ON HEADSAILS

10.16 All headsails are subject to the following limitations:

10.16.1 Rule 50.4 of The Racing Rules of Sailing is modified as follows. The half-width (50%) of a headsail measured from half-luff to half-leech shall not exceed 50% of the length of the foot. Except for the following:

(1) One measured and declared Large Roach Headsail subject to 10.02, measured as both a headsail and a spinnaker with both measurements supplied to the rating authority.

(2) Headsails of LPG less than or equal to 1.1*J whose widths have a greater than 50% width to foot ratio are subject to 10.13.

10.16.2 Except in non-overlapping self-tacking headsails no clew boards may be used in headsails.

10.16.3 No headboards may be used in headsails.

10.16.4 Except that battens are not permitted in headsails of LPG greater than 1.1*J, battens may be used in headsails of less than 1.1*J.

10.16.4 A boat may use a luff groove device provided that such luff groove device is of constant section throughout its length and is either essentially circular in section or is free to rotate without restraint. Any permitted device on the forestay other than hanks shall be measured for FSP (see 10.14).

10.16.5 Headsails may be sheeted from only one point on the sail except in the process of reefing the sail. (Thus quadrilateral or similar sails or sails in which the sailcloth does not extend to the cringle at each corner are excluded.)

DEFINITION OF SPINNAKERS

10.17 Symmetric Spinnakers.

To be classified as a symmetric spinnaker a sail must meet the following criteria:

10.17.1 The luff and leech (see 10.21) must be of equal length.

10.17.2 The sail must be symmetric, in shape, material and cut, about a line joining the head point to the center of the foot.

10.18 Asymmetric Spinnakers.

To be classified as an asymmetric spinnaker a sail must meet the following criteria:

10.18.1 The luff shall be at least 5 percent longer than the leech (see 10.21).

10.18.2 The half-width (see 10.23) shall not be less than 75 percent of the foot length (see 10.22).

MEASUREMENT OF SPINNAKERS*

10.19 Spinnaker Headboard (HBS).

HBS shall be the maximum width of a spinnaker headboard, which shall not exceed 0.05*J.

10.20 Spinnaker Max Width (SMW).

SMW for a symmetric spinnaker shall be the spinnaker maximum width, whether at the foot or across the body of the sail between points on the luff and leech equidistant from the head point. Spinnaker Luff and Leech (SL & ASL).

10.20.1 Symmetric Spinnaker Luff and Leech **(SL**).

SL shall be the greatest distance of a symmetric spinnaker luff or leech measured along the shortest path on the surface of the sail between between the head point and the clew point or the head point and the tack point.

10.20.2 Asymmetric Spinnaker Luff (**ASL**).

a) SLU shall be the length of the longer edge (luff) of an asymmetric spinnaker measured along the shortest path on the surface of the sail between head point and the tack point.

b) SLE shall be the length of the shorter edge (leech) of an asymmetric spinnaker measured along the shortest path on the surface of the sail between head point and the clew point.

c) ASL shall be calculated from the following formula:

ASL= 0.5*SLU + 0.5*SLE

For symmetric spinnakers, where stiffening is used to widen the angles at the tack and clew beyond an included angle of 110 degrees the greatest length of any such stiffening along the foot, measured from the clew, shall be added to the luff length to determine SL.

10.21 Spinnaker Foot Length (SF & ASF).

Spinnaker foot length shall be the distance from tack point to clew point measured along the shortest path on the surface of the sail. For a symmetric spinnaker, the distance shall be recorded as SF. For an asymmetric spinnaker, the distance shall be recorded as ASF.

10.22 Asymmetric Spinnaker Half Width Length (AMG).

AMG shall be the distance between the midpoints of luff and leech measured along the shortest path on the surface of the sail.

10.23 Measurements for Spinnaker Area

For calculation of sail area the dimensions of HBS, SMW, AMG, SF, ASF, SL and ASL shall be from the spinnaker with the largest area carried on the boat, but also see 10.43.5 for rated minimum SMW, AMG, SF, ASF, SL and ASL.

MEASUREMENT LIMITATIONS ON SPINNAKERS

10.24 All spinnakers are subject to the following limitations:

10.24.1 A sail shall not be measured as a spinnaker unless the half width is 75 per cent or more of the foot length.

10.24.2 Battens (including the inflatable type) shall not be used in spinnakers.

10.24.3 Adjustable leech lines are not permitted in symmetric spinnakers.

MEASUREMENT OF MAINSAILS*

10.25 Mainsail Head – see Rule 10.10 Measurement Points at Corner of Sails.

10.26 Mainsail Clew – see Rule 10.10 Measurement Points at Corner of Sails.

10.27 Mainsail Cross Widths - Each cross measurement shall be the distance from the leech measurement point, as defined below, to the nearest point on the fore edge of the sail including the bolt rope. The points on the leech from which the cross measurements are taken shall be determined bridging any hollows in the leech with straight lines.

10.28 Mainsail Half-Point of Leech - The half-point of the leech shall be determined by folding the head to the clew and the quarter and three-quarter leech points by folding the clew and the head to the half-point leech. The seven-eighth leech point is determined in a similar fashion.

10.29 Mainsail Widths (TW, MGT, MGU, MGM, & MGL).

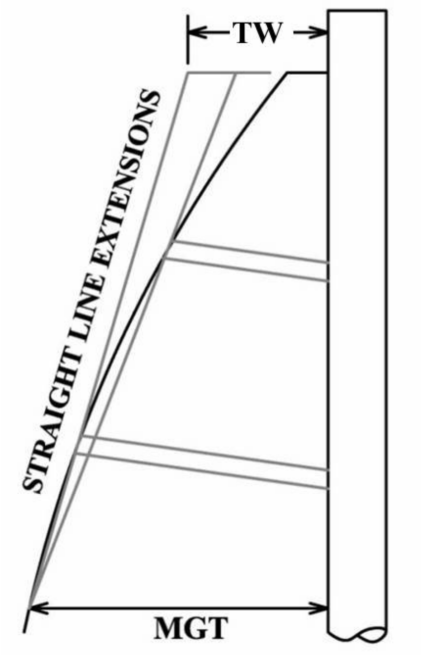
The Mainsail is measured with width at the top (TW) and four widths found on the leech between head and clew: at 1/4 (MGL), 1/2 (MGM), 3/4 (MGU) and 7/8 (MGT) leech heights. Points on the leech are found by folding the sail as per the Equipment Rules of Sailing (ERS) procedures. If there is a batten above the 7/8 (MGT) leech point, then the top width (TW) measurement is increased taking in account effect of a batten positioned at this height on the mainsail.

10.29.1 Mainsail Headboard (TW)

Where the center line of the top batten pocket is not situated above the MGT leech measurement point, TW shall be the maximum fore and aft dimension from the luff of the mainsail, projected if necessary, to the extreme aft edge of the leech measured across the widest part of the headboard. If the widest point of the headboard is in doubt, the highest of the widest points shall be used. If no headboard is fitted, then TW shall be the dimension taken perpendicular to the luff of the mainsail, or its fair projection, to the extreme aft edge of the leech, or its fair projection, across the bearing surface of the head cringle or strop.

10.29.1.1 Top Batten above MGT – TW Determination

Where the center line of a batten pocket is situated above the MGT leech measurement point, TW shall be measured as diagrammed below and recorded if Metric in meters to two decimals or if Imperial in feet to one decimal. A straight-line extension of a line from the leech measurement point of MGT through the outer edge of the leach of the batten pocket above MGT giving the greatest value for TW shall determine the aft measurement point for TW.



10.29.2 MGT, MGU, MGM and MGL shall be the length of the widths of the mainsail taken at points 7/8, 3/4, 1/2 and 1/4 of the leech from the clew respectively, measured in accordance with 10.28.

10.30 Mainsail Area Moved to 10.36.4

10.31 Mainsail Weight (MSW).

MSW shall be the dry weight of the mainsail not including battens (see also 2.06.1). The value of MSW for any calculation shall be the smallest found on any mainsail used for racing.

10.32 MEASUREMENT OF MIZZEN*

The rules for Mainsail Widths and limits apply to Mizzens by appropriate substitution and using 10.23, 10.24, 10.25, 10.26, 10.27 and 10.27.1 substuting 'Y" for the appropriate Mizzen Sail measurements as MGTY, MGUY, MGMY, MGLY, MSWY, and TWY.

10.33 Batten Adjustment

No device other than a normal leech line shall be employed to adjust the curvature of any Mainsail or Mizzen batten.

MIZZEN STAYSAIL

10.34 Mizzen Staysail Foot (YSF).

Mizzen staysails shall be three-cornered. YSF is the distance measured along the edge of the foot of the mizzen staysail from tack to clew. For measurement purposes, the foot shall be taken as the shortest side. YSF shall be the largest such dimension found on the staysails carried on the boat.

10.35 Mizzen Staysail Depth (YSD).

YSD is the shortest distance that can be measured across the mizzen staysail from head to foot. For measurement purposes the head shall be taken as the junction of the two longest sides. YSD shall be the largest such dimension found on the staysails carried on the boat Staysail Half Width (YSMG).

10.35.1 YSMG is the distance measured on the surface of the sail between the half points of the two longest sides. YSMG shall be the largest such dimension found on the staysails carried on the boat.

- *See Appendix 9 for sail measurement drawings

RATED ELEMENTS OF THE AERODYNAMICS MODEL

Sail and rig dimensions are used by the Velocity Prediction Program to create an aerodynamic model of the sail plan and rig from which it calculates lift and drag factors to determine the heeling and propulsive force of the sails in different wind velocities and points of sailing.

10.36 Sail Plan Rated Areas.

For the purpose of the aerodynamic model, areas are calculated as follows.

10.36.1 Foretriangle: The area of the foretriangle is determined as IM*J/2.

10.36.2 Headsails: Non-Large Roach and Large Roach Headsails

10.36.2.1 Non-Large Roach Headsail area is determined as follows:

Additional Definitions
Luff Length Above LPG Line: UpperLuff = JLU - LowerLuff
Luff Length Below LPG Line: LowerLuff = JLU -SQRT(JLE*JLE-LPG*LPG)
MLP = The maximum of (LPG + FSP) or 0.95*J (see 10.38)

Locations of Girths along Luff above LPG
ZJGM =Upperluff/2+(MLP/Upperluff)*(JGM-LPG/2)
ZJGL = ZJGM/2+(MLP-JGM)/ZJGM*(JGL-(LPG +JGM)/2)
ZJGU = (Upperluff+ZJGM)/2+JGM/(Upperluff-ZJGM)*(JGU-JGM/2)
ZJGT = (Upperluff+ZJGU)/2+JGU/(Upperluff-ZJGU)*(JGT-JGU/2)

Non-Large Roach Headsail Area =((JH+JGT)/2)*(UpperLuff-ZJGT) + ((JGT+JGU)/2)*(ZJGT-ZJGU) + (JGU+JGM)/2)*(ZJGU-ZJGM) + ((JGM+JGL)/2)*(ZJGM-ZJGL) + (JGL+LPG)/2*(ZJGL-0) + LowerLuff*LPG/2 + JibLuff*FSP

10.36.2.2 Large Roach Headsail areas are determined as follows:

Additional Definitions
Luff Length Above LRHLP line: Upperluff = LRHLuff-LowerLuff
Luff Length Below LRHLP line: LowerLuff = LRHLuff-SQRT(LRHLE*LRHLE-LRHLP*LRHLP)

Locations of Girths along Luff above LRHLP
ZLRHHW = Upperluff/2+(LRHLP/Upperluff)*(LRHHW-LRHLP/2)
ZLRHQW = ZLRHHW/2+(LRHLP-LRHHW)/ZLRHHW*(LRHQW-(LRHLP+LRHHW)/2)
ZLRHUW = (Upperluff+ZLRHHW)/2+LRHHW/(Upperluff-ZLRHHW)*(LRHUW-LRHHW/2)
ZLRHTW = (Upperluff+ZLRHUW)/2+LRHUW/(Upperluff-ZLRHUW)*(LRHTW-LRHUW/2)

Area_Jib = ((LRHHB+LRHTW)/2)*(Upperluff-ZLRHTW) +
((LRHTW+LRHUW)/2)*(ZLRHTW- ZLRHUW+
((LRHUW+LRHHW)/2)*(ZLRHUW-ZLRHHW)+
((LRHHW+LRHQW)/2)*(ZLRHHW-ZLRHQW) +

(LRHQW+LRHLP)/2*(ZLRHQW)+
LowerLuff*LRHLP/2
Area_Spin = (LRHLU+LRHLE)/2*(4*LRHSHW+LRHF)/3/2
LRHSHW_Ft_Ratio = LRHSHW/LRHF
Jin_Factor = 1 - (SIN(RADIANS(90 * (LRHSHW_Ft_Ratio - 0.51) / (0.75 -0.51)))) ^ 2
Spin_Factor = 1-Jib_Factor

Rated LRH Area = Area_Jib*Jib_Factor+Area_Spin*Spin_Factor

10.36.3 Spinnakers:

a) Symmetric Spinnaker: For the purpose of the aerodynamic model, the area of a symmetric spinnaker is determined as SL*(0.5*SF + 2*SMW)/3.

b) Asymmetric Spinnaker: For the purpose of the aerodynamic model, the area of an asymmetric spinnaker is determined as ASL*(0.5*ASF + 2*AMG)/3.

10.36.4 Main and Mizzen: Mainsail area is determined by trapezoidal integration of the mainsail widths TW, MGT, MGU, MGM, MGL and E, along the mainsail hoist, P. The mid-widths are located vertically by following the sail measurement procedures in the ORR Rule Book as per 10.27, 10.28 and 10.29. as stated in the Equipment Rules of Sailing (ERS).

Additional Definitions
zMGM = P/2+(E/P)*(MGM-E/2)
zMGL = ZMGM/2 +(E-MGM)/ZMGM*(MGL- (E+MGM)/2)
zMGU = (P+ZMGM)/2+MGM/ (P-ZMGM)*(MGU-MGM/2)
zMGT = (P+ZMGU)/2+MGU/ (P-ZMGU)*(MGT-MGU/2)

Mainsail Area =(TW+MGT)/2*(P-zMGT) + (MGT+MGU)/2*(zMGT-zMGU) + (MGU+MGM)/ 2*(zMGU-zMGM)+ (MGM+MGL)/2*(zMGM-zMGL) + (MGL+E)/2*(zMGL-0)

The mizzen area is calculated by the method given above for the mainsail, substituting the corresponding mizzen values.

10.36.5 Mizzen Staysail: The area of a mizzen staysail is determined as:
Area = YSD*(2*YSMG + YSF)/4.

10.37 Foretriangle Height (IM).

IM = (IG + IG*(GO - MW)/ (J – GO + MW))

10.38 Longest Perpendicular of Headsails, Rated (LP).

LP shall be taken as the greatest of LPG + FSP or 0.95*J.

10.39 Rated Limits

For the purpose of calculating the aerodynamic model, the following limits apply.

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

10.39.2 J: J shall not be taken as less than IM/4.

10.39.3 LP: LP shall not be taken as less than (.95 *J)

10.39.4 Any SPL,TPS or JLRH used for rating purposes shall not be less than J.

10.39.5 ISP-ISPA ISP shall not be taken as less then IG on masthead boats or "normal" fractionally rigged boats. ISPA shall not be taken as less than IG on fractionally rigged boats that have masthead and fractional attachment points for spinnakers and/or genoas.

10.39.6 Minimum Headsail Area: Headsail Area (10.36.2) of a boat's largest headsail shall not be taken as less than 95% of the Foretriangle Area (10.36.1).

10.39.7 Minimum Spinnaker Area: Spinnaker area shall not be taken as less than:

Minimum area = 1.1875*(ISP^2 + SPL^2) ^0.5*SPL

(SPL is replaced with TPS above for boats rated as centerline asymmetric.) This minimum area is the same as a spinnaker with SL = 0.95*(ISP^2 + SPL^2) ^0.5 and SMW = SF = AMG = ASF = 1.5*(SPL or TPS)."

10.40 Aerodynamic Drag of Masts.

The aerodynamic drag of the masts shall be taken into account by the Velocity Prediction Program and will be determined from the Effective Height of Mainmast (EHM), the Effective Diameter of Mainmast (EDM), the Effective Height of Mizzenmast (EHMY) and the Effective Diameter of Mizzenmast (EDMY).

10.41 Aerodynamic Drag of Rigging and Spreaders.

The aerodynamic drag of the rigging is calculated by deriving an effective diameter from the rigging default weight (see 725.6), divided by the specific gravity of steel and four times IM. This value is then multiplied by IM to obtain an effective rigging windage area which is corrected to take into account the effect of spreaders. Where the mast does not have bona fide spreaders, the drag for spreaders is omitted and that for rigging reduced.

10.42 Effective Height of Mainmast (EHM).

EHM is the greater of P + BAS or IM

10.43 Effective Diameter of Mainmast (EDM).

EDM = (0.5*(EHM-TL)*(MDT1+MDL1) +0.25*TL*(MDT1+MDL1+MDT2+MDL2))/EHM

For the purpose of calculating EDM, the following limits apply:

MDL1 shall not be taken as greater than MDL1max.

MDL1max shall equal the lesser of 0.036*(RM25*IG) ^0.25 or 2*MDT1.

MDT1 shall not be taken as greater than (0.036*(RM25*IG) ^0.25)*(MDT1/MDL1).

MDL2 shall not be taken as greater than 2*MDT2.

Where the measured value of MDL1 exceeds MDL1max, the value of any excess shall be added to the mainsail widths MGL, MGM, MGU and MGT for the purpose of calculating mainsail area (see 10.42.4).

Where, in the taper of any mast presented for measurement and built after 1/1/97, a hollow is found in the fore and aft profile (see **TH** on the Certificate), EDM shall be calculated as follows:

EDM = (0.5*(EHM-TL)*(MDT1+MDL1) +0.25*TL*(MDT1+MDT2+2.2*MDL2))/EHM.

10.44 Effective Height of Mizzenmast (EHMY).

EHMY = PY + BASY

10.45 Effective Diameter of Mizzenmast (EDMY).

EDMY = (0.5*(EHMY-TLY)*(MDT1Y+MDL1Y)+0.25*TLY*(MDT1Y+MDL1Y+MDT2Y+MDL2Y))/EHMY

For the purpose of calculating EDMY, MDL1Y and MDL2Y shall not be taken as greater than 2 times MDT1Y and MDTY2 respectively.

PART XI – PROCEDURES FOR ORR ONE DESIGN OR LEVEL DESIGN CERTIFICATE STATUS

11.01 Distinction between ORR One Design and ORR Level Design certificates.

11.01.1 To qualify for an ORR One Design certificate a minimum of five (5) boats in class-legal configuration shall be fully ORR measured. For those boats, the resulting 12 knot W/L 50-50 ratings shall be within 0.25% of one another. The One Design certificate shall be based on the average of ORR measurements.

11.01.2 To qualify for an ORR Level Design certificate a minimum of five (5) boats in class-legal configuration shall be fully ORR measured. For those boats, the resulting 12 knot W/L 50-50 ratings shall be within a band 0.25% to 0.50% of one another. The Level Design certificate shall be based on the fastest 12 knot W/L 50-50 rating.

11.02 Action by a Class Association for National One Design or Level Design Recognition

11.02.1 In requesting an ORR One Design or Level Design status a Class Association shall apply to the Rating Authority providing the following**:**

a) A complete set of Class Rules, which shall include at minimum:

- The official name of the class.

- Name and contact information of designer and all builders of the class
- Rig and sail class limit dimensions in accordance with the Equipment Rules of Sailing (ERS) and when appropriate, ORR measurement methods.
- propeller installation and propeller type and size.

Class requirements for condition of boat for minimum weight measurement.

Current year valid Class Certificate of design compliance for each yacht requesting this status.

b) Details of variations allowed within the class.

11.03 The Rating Authority shall, on the receipt of an application.

a) Review the Class Rules to determine if ORR One Design or Level Design status is possible and submit those findings to the Rule Authority for its approval.

b) For Classes approved to seek One Design or Level Design certification:

- Establish a standard offset file. Where there is more than one builder, at least one hull of each builder should be measured.

- Fully measure a minimum of five (5) boats in class-legal condition.

c) Using the Standard Offset File, the standard sail measurements and individual flotation and inclining measurements, compute an ORR certificate for each of the boats measured.

11.04 Determination of the ORR One Design or Level Design Certificate.

Based on 11.01 determine whether the class qualifies for a One Design certificate, a Level Design certificate or neither.

11.05 Record Keeping.

After the completion of the actions required in Section 11, the Rating Authority shall maintain on file the following documents.

- Class Rules.
- Any plans referenced in the Class Rules.
- The Standard Offset File together with all information and measurement files from which the offset file was derived.
- Copy of the ORR One Design or Level Design Certificate for the class.
- Identity of boats from which the measurement data were derived.

11.06 Administration of ORR One Design and Level Design Certificates.

11.06.1 ORR Certificates produced in accordance with One Design or Level Design status shall bear the notation "Based on: ONE DESIGN OR LEVEL DESIGN RULES".

11.06.2 A One Design or Level Design Certificate may be issued by the Rating Authority when:

a) The Class has been awarded ORR One Design or Level Design status by the Rating Authority.

b) The Rating Authority has received from the Class Association a certification signed by the owner and US Sailing certified measurer to the effect that the boat has been measured to and complies with the Class Rules, accompanied by a fee. The fee is to be determined by the Rating Authority, to cover the cost of administration by the Rating Authority.

c) The Rating Authority has received the required sail certificates issued by an UMS or US Sailing certified sail measurer.

11.06.3 Revalidation shall be annual. The Class Association shall annually satisfy the Rating Authority of its continuing activity and control of class measurement compliance, providing a list of class members and boats with valid Class Certificates.

11.06.4 If One Design or Level Design status is granted to a class of boat, any boat claiming a unique individual ORR certificate that is not designated as a One Design or Level Design certificate for racing shall be excluded from racing in the One Design or Level Design Class or Section.

11.07 Changes to ORR One Design or Level Design Certificates.

11.07.1 One Design or Level Design Certificate handicaps can be expected to change from time to time due to changes in either the Class Rules or in the ORR rating calculations.

11.07.2 The Rating Authority shall maintain sufficient data on the ORR measured boats of the class to enable calculation of current certificates when changes are made.

11.07.3 Where Class Rules are changed, re-measurement may be necessary at the discretion of the Rating Authority.

11.07.4 A boat which does not hold a valid class certificate or comply with class rules shall not hold a valid ORR One Design or Level Design Certificate.

11.07.5 The Rule Authority reserves the right to interpret clauses of the ORR and to change the rules for ORR One Design or Level Design status at any time.

11.08 Race Organizing Authority Assignments and scoring of a One Design or Level Design Class

11.08.1 All yachts must have a current One Design or Level Design ORR certificate to qualify for a racing Class or section assignment.

11.08.02 For One Design Class or Level Design Class, or section to be considered for common rating used in scoring; a representative of the one design boat owners' class shall notify the race organizing authority in writing of the desire to race as one design or level design class, or section, for the race. The notification shall include a copy of the class rules and each registered boat must submit to the Race organizing authority a current ORR One Design or ORR Level Design Certificate.

Scoring (optional)

11.08.3 Section 1

For One Design and Level Design classes as shown on the current valid ORR certificate list for the same class of boats, the Race Authority recommends the following procedure for scoring:

1. For scoring within a class or section it is recommended that all boats be scored using Appendix A - RRS, with no handicap used in the scoring. (i.e. 1, 2, 3…)

   For overall fleet scoring the single valid One Design/Level Design handicap number for that specific ORR class should be used for all boats in that class as is certified by the Rating Authority.

11.08.3 Section 2

If a race authority desires to assign different types of boats to a One Design/Level Design Mixed Class or boats of the same type that don't have an ORR One Design or Level Design designation to a Class or Section (i.e. J-35's and T-35's combined class, J-44's single design boat class), then the Rule Authority recommends the following scoring options:

1. For scoring within the class or section it is recommended that the boats all be scored as if they had the same rating, using Appendix A - RRS, with no handicap used in the scoring. (i.e. 1, 2, 3…)

2. For overall fleet scoring - a common rating be established for all of the boats in that class or section. The suggested methodology is to use the boat with the fastest rated ORR certificate in the class or section and use that rating as the common rating for scoring all of the boats in that class or section against the overall fleet.

   Or

3. that each individual boat is scored within the fleet using its individual ORR certificate.

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HLP	LPG	Longest Perpendicular of headsails	10.12
	LPS	Limit of Positive Stability	2.02.1
	LRH	Large Roach Headsail	10.02, 10.13.3
	LRHLP	Large Roach Headsail Luff Perpendicular	10.13.3
	LRHHB	Large Roach Headsail Headboard	10.13.3
	LRHTW	Large Roach Headsail Top Width	10.13.3
	LRHUW	Large Roach Headsail Upper Width	10.13.3
	LRHQW	Large Roach Headsail Quarter Width	10.13.3
	LRHSHW	Large Roach Headsail Spinnaker Half Width	10.13.3
	LRHFoot	Large Roach Headsail Foot	10.13.3
	LRHLuff	Large Roach Headsail Luff Length	10.13.3
	LRHLeech	Large Roach Headsail Leech Length	10.13.3
	MB	Maximum Beam (nominal)	6.05
	MCG	Mast Vertical Center of Gravity	8.14.1
	MDL1	Maximum Longitudinal Dimension of Main Mast	9.06.6
	MDL1Y	Maximum Longitudinal Dimension of Mizzen Mast	9.16
	MDL2	Longitudinal Dimension of Main Mast at Head	9.06.9
	MDL2Y	Longitudinal Dimension of Mizzen Mast at Head	9.16
	MDT1	Maximum Transverse Dimension of Main Mast	9.06.5
	MDT1Y	Maximum Transverse Dimension of Mizzen Mast	9.16

	MDT2	Transverse Dimension of Main Mast at Head	9.06.8
UMS	ORR		
	MDT2Y	Transverse Dimension of Mizzen Mast at Head	9.16
MQW	MGL	Mainsail Width, Lower (1/4)	10.32.1
	MGLY	Mizzen Width, Lower (1/4)	10.37
MHW	MGM	Mainsail Width, (1/2)	10.32.1
	MGMY	Mizzen Width, (1/2)	10.37
MTW	MGT	Mainsail Width, Top (7/8)	10.32.1
	MGTY	Mizzen Width, Top (7/8)	10.37
MUW	MGU	Mainsail Width, Upper (3/4)	10.32.1
	MGUY	Mizzen Width, Upper (3/4)	10.37
	MSW	Mainsail Weight	10.33
	MW	Mast Width	9.06.4
UMS	ORR		
MWT	Mast Weight		8.14.1
	OA	Other Appendages	2.03.9
	P	Mainsail Hoist	9.07
	PIPA	Propeller Installation Projected Area	2.04
	PL	Pendulum Length, Inclining Manometer	8.02
	PLM	Pendulum Length, Measured, Inclining Manometer	8.02
	PY	Mizzen Hoist	9.17
	RM	Righting Moment	8.07
	RMC	Righting Moment Corrected	8.08
	RM2	Righting Moment per Degree in Sailing Trim at 2 degrees heel	8.09
	RM20	Ditto 20 Degrees Heel	8.10
	RM40	Ditto 40 Degrees Heel	8.10
	RM60	Ditto 60 Degrees Heel	8.10
	RM90	Ditto 90 Degrees Heel	8.10
	RSA	Reservoir Surface Area, Inclining Manometer	8.02
SFL	SF	Symmetric Spinnaker Foot Length	10.22
	SFJ	Stem to forward end of J	9.04.1
	SG	Specific Gravity, Flotation Measurement	5.02.1
	--	Sheer Point	5.01.4, Appendix 3
	--	Sheer Line	5.01.5
SLU/SLE	SL	Symmetric Spinnaker Luff/Leech Length	10.21
SLE	SLE	Asymmetric Spinnaker Leech	10.21.2(b)
SLU	SLU	Asymmetric Spinnaker Luff	10.21.2(a)

SMW	SMW	Symmetric Spinnaker Maximum Width	10.20
UMS	ORR		
	SPL	Spinnaker Pole Length	9.05.2
SI	CS (SI)	Stability Index (Capsize Screen)	2.02.1
	TH	Taper Hollow	10.49
	TL	Tapered Length of Main Mast	9.06.7
	TLY	Tapered Length of Mizzen Mast	9.16
	TPS	Tack Point, Spinnaker	9.05.3
	VPP	Velocity Prediction Program	1.02
	W	Weight for incline	8.05
	WB	Weight of Boom	9.14.4
	WBV	Water Ballast Volume	Appendix 7
	WD	Weight Distance, Inclining Weights	8.03
	WSS	Wetted Surface, Upright Sailing Trim	6.12
	YSD	Mizzen Staysail Depth	10.40
	YSF	Mizzen Staysail Foot	10.39
	YSMG	Mizzen Staysail Half Width	10.4

APPENDIX 1 - ORR RATING CERTIFICATE

Offshore Racing Rule Certificate

GLADIATOR **GBR11152X**

Certification #:	US42772	Type:	**Offshore**	Measurement:	Fully Measured
Issue Date:	12/19/2017			Meas. Date:	05/21/2016
Age Date:	05/01/2015	Valid:	**2017**	Flotation Date:	09/16/2017

Owner(s): **TONY LANGLEY**
1 ROGER WILLIAMS WAY
BRISTOL, RI 02809
US Sailing Member ID: 773273H

Offset File: gladiatorA.off
Units: Metric (meters, kgs)

Signature: **Copy Certificate Not Valid For Racing** Date: _____

NOTE: By signing this certificate the Person in Charge is certifying they have read and understand the requirements contained in the ORR Rule Book. A Signed copy of this shall be carried on board while racing.

Class:	TRANSPAC 52	Capsize Screen (SI):	143.30 deg	Keel Type:	FIXED KEEL
Builder:	PERSICO	ABS Plan:	False	C'board ECE:	0.000 M
Rig Type:	Fractional Sloop	Prop Type:	2 Blade Folding	Cant Angle:	0.0 deg
Spin Type:	Asym on Centerline	Prop Instal:	Strut or Sail Drive	List Angle:	0.0 deg
Crew Weight:	1,160 Kg	PIPA:	0.0056 M^2	Water Ballast:	0.000 M^3

Comment: 2017 FLOT, SCALE, MWT/MCG, GEAR Power Winches: None

Hull Data

LOA:	15.85 M
BMAX:	4.44 M
Measurement Trim	
FFM:	1.436 M
FAM:	0.054 M
SFFP:	0.600 M
SAFP:	15.860 M
RMC:	404.7 KgM
SG:	1.023
VCGM:	-1.434 M
LSM0:	15.091 M
Draft:	3.494 M
DISPmt.:	6943 Kg
Sailing Trim	
DISPst.:	8605 Kg
Wet Area:	45.0 M^2
Rated Len:	15.872 M
LSM3:	16.297 M
LSM4:	17.031 M
RM20:	405.9 KgM
LPS:	146.2 deg

Genoa/Jib

IG:	19.720 M
J:	6.200 M
LPGenoa:	6.300 M
FSP:	0.072 M
J Luff:	20.370 M
J MGT:	0.990 M
J MGU:	1.750 M
J MGM:	3.220 M
J MGL:	4.740 M
Area Jib:	67.4 M^2
ISP:	22.400 M
SPL/TPS	9.000 M
SL:	M
SMW:	M
SF:	M
Area Sym:	0.0 M^2
SLU:	25.510 M
SLE:	21.620 M
AMG:	13.720 M
ASF:	14.130 M
Area Asy:	271.0 M^2

Mainsail/Mast

GO:	0.279 M
MW:	0.279 M
P:	20.400 M
E:	7.100 M
HB:	1.990 M
MGT:	2.640 M
MGU:	3.600 M
MGM:	5.010 M
MGL:	6.110 M
Main Wt:	37.0 Kg
MDT1:	0.131 M
MDL1:	0.298 M
MDT2:	0.100 M
MDL2:	0.153 M
TL:	3.230 M
Mast Wt:	252.500 Kg
Mast VCG:	7.200 M
BAS	2.130 M
Fstay Adj.	
InFStay Adj.	None
Area Main:	97.9 M^2

Mizzen/Mast

EB:	0.000 M
PY:	0.000 M
EY:	0.000 M
HBY:	M
MGTY:	M
MGUY:	M
MGMY:	M
MGLY:	M
MDT1Y:	0.000 M
MDL1Y:	0.000 M
MDT2Y:	0.000 M
MDL2Y:	0.000 M
TLY:	0.000 M
YSD:	M
YSF:	M
YSMG:	M
Area Mizz:	0.0 M^2

General Ratings

General Purpose (GPH):	**436.0** SpM		
Closed Course (CI/Crs):	**1.236** TCF		
WW/LW 50:50:	**1.205** TCF		
WW/LW 60:40:	**1.207** TCF		
Ocean Non Spinnaker:	**1.212** TCF		
Offshore Offwind:	**1.244** TCF		
W/L 50:50 8kts:	**603.8**	CI/Crs 8kts:	**487.0**
W/L 50:50 12kts:	**487.0**	CI/Crs 12kts:	**385.0**
W/L 50:50 16kts*:	**424.3**	CI/Crs 16*kts:	**336.8**

* recommended for planing conditions

Custom Ratings [TCF: Time on Time; **SpM** (*seconds per mile*): Time on Distance]

Chicago Mac AP:	**1.250** TCF	Puerto Vallarta:	**1.234** TCF
Chicago Mac Offwind:	**1.244** TCF	Cabo San Lucas:	**1.235** TCF
Bayview Mac:	**1.227** TCF	Acapulco WW/LW:	**1.126** TCF
California Offshore:	**1.254** TCF	Acapulco Random:	**1.158** TCF
Pacific Cup:	**353.400** SpM	Acapulco WW/LW5:	**1.126** TCF
San Francisco Bay:	**1.250** TCF	Acapulco StatFit:	**1.141** TCF
Transpac:	**1.1584** TCF	Approximate	

Newport Bermuda Race (SpM):

6kt	8kt	10kt	12kt	16kt	20kt	24kt
677.1	**518.6**	**427.4**	**364.9**	**291.9**	**249.1**	**219.7**

Time on Time Scoring: Corrected Time = Elapsed Time x Time Correction Factor (TCF)
Time on Distance Scoring: Corrected Time = Elapsed Time + (**SpM** Scratch - **SpM** Yacht) x Course Distance

Closed Course: rating assumes equal distances at all wind angles (circular course.)
GPH: Average of Closed Course ratings for 8 and 12 knots wind.
WW,LW: sailing only upwind and dowind at optimum VMG angles
Ocean Non Spin: Ocean Course with no spinnaker.
Offshore Offwind: More weight given to offwind sailing angles.

APPENDIX 2 - MEASUREMENT TRIMS CONDITION CHECK LIST & INVENTORY

This check list is intended to help the owner and measurer prepare the yacht for measurement and to document measurement inventory items.

Each item will be initialed by the owner and measurer. The completed document will be returned to the US Offshore Office for retention.

The boat shall be dry, in light ship condition, and fully rigged without crew. The details of paragraphs 5.02.2, 5.02.3, 5.02.4, 5.02.6, 8.01.2 have precedence if discrepancies exist with this list.

No equipment, gear or other items are to be aboard during measurement.

Boat Name: _____ Sail Number:	**Initials**	
	Owner	**Measurer**
Measurement Trim - Equipment/gear included and required to be aboard (5.02.3):		
1. Internal ballast, if any, securely installed.		
2. Batteries securely installed.		
3. Fixed and/or essentially permanent interior accommodation, hatch covers, floor boards installed.		
4. Fixed and/or essentially permanent machinery, electrical and plumbing systems installed.		
5. Outboard motor when it is stowed aboard in appropriate stowage installed.		
6. Mast, boom, spinnaker pole and/or sprit, if any, fully rigged as for racing.		
- Masts raked aft to the limit of their adjustment.		
- Mast (P/PY) band and boom (E/EY) band PAINTED on.		
- Spinnaker pole not on board if not used for inclining. **(8.01.2)**		
7. Boom running rigging and any vang, fitted complete as for racing.		
- Booms secured at the low points of P and PY.		
- Booms horizontal and on the centerline.		
8. Standing rigging / fittings, fitted complete as for racing, attached in their normal positions.		
9. Running rigging and fittings, fitted complete as for racing.		
- All halyards as for racing.		

- Running rigging, halyards, lifts forward of mast taken to mast foot and hauled tight.		
- Running rigging abaft the mast taken to their aftermost position and hauled tight.		
- All halyard tails taken to their normal working positions.		
- If halyard weight varies significantly along its length, the tail shall be on the cabin floor during inclining, with the halyard fully hoisted and attached to a light messenger line.		
10. Rudder, wheel/tiller and steering gear, fitted complete as for racing.		
11. Keel and any bulb, fitted complete as for racing.		
12. Centerboard(s) and drop keels fitted and fully raised.		
- If locked when racing, it shall be so locked and the locking device shall be in place.		
13. Fixed electronics, instruments, compasses, lights, antennas, masthead devices. installed.		
14. Pulpits, stanchions and lifelines fitted.		
15. Hydraulic systems, including hydraulic tanks, full.		
16. Mattresses / cushions (dry) and permanently installed table, doors in their normal position.		
17. Permanently installed stoves, heaters or other electrical devices fitted.		
Measurement Trim - Additional items to be checked:		
1. **ALL** toilets, bowls, sinks, etc. **DRY**.		
2. **ALL** bilges, sumps and other possible areas where liquid may collect **DRY**.		
3. **ALL** lockers, drawers, cabinets, refrigerator/freezers, storage areas, shelves, etc. **EMPTY**.		

Measurement Trim - Equipment/gear excluded (5.02.4):		
1. **NO** crew or personnel on board.		
2. **NO** liquid in any tank (except hydraulic systems as above) or in any voids in the keel or any other appendage.		
- Fuel tank to be as **EMPTY** as possible (recommended) or **FULL**.		
3. **NO** sails, including storm and emergency sails.		

4. **NO** sheets, guys or other running rigging, except as in 5.02.3.; repeated in 6 - 9 above.		
4. **NO** blocks, winch handles, etc. or other portable deck, rig or sail handling equipment.		
5. **NO** portable safety or emergency gear of any type or category, including fire extinguishers, liferaft(s), emergency tiller, etc.		
6. **NO** decorative throw or sleeping pillows or any other bedding, towels, etc.		
7. **NO** cooking or eating utensils: pots, pans, plates, glasses, cutlery, etc.		
8. **NO** compressed gas bottles: propane/LPG. CNG, etc.		
9. **NO** portable heaters.		
10. **NO** food or stores.		
11. **NO** tools, spares or stores.		
12. **NO** clothing or personal effects.		
13. **NO** miscellaneous portable equipment or gear, books, navigation tools, etc.		
14. **NO** anchors, chains or rodes, of any type.		
15. **NO** fenders, dock lines, mooring lines or any other cordage.		
16. **NO** outboard engines without appropriate stowage.		
17. **NO** portable fuel containers.		

Measurement Inventory						**Initials**
1. Internal Ballast						
	Description	**Weight**	**Dist. fm Stem**	**Ht above WL**	**Owner**	**Meas.**
a						
b						
c						
d						
e						
f						

2. Batteries							
Description		Weight	Dist. fm Stem	Ht above WL	Owner	Meas.
a						
b						
c						
4. Engine	Manufacturer		Model			

5. Tanks	Use	Type	Capacity	Condition	Dist. fm Stem	Ht above WL	Owner	Meas.
a								
b								
c								
d								
e								
f								

3. Miscellaneous (boiler, air-conditioning, heating etc.)						
Description	Weight	Dist. fm Stem	Ht above WL	Owner	Meas.
a						
b						
c						
d						

Additional Items to be Weighed and Inventoried	Initials

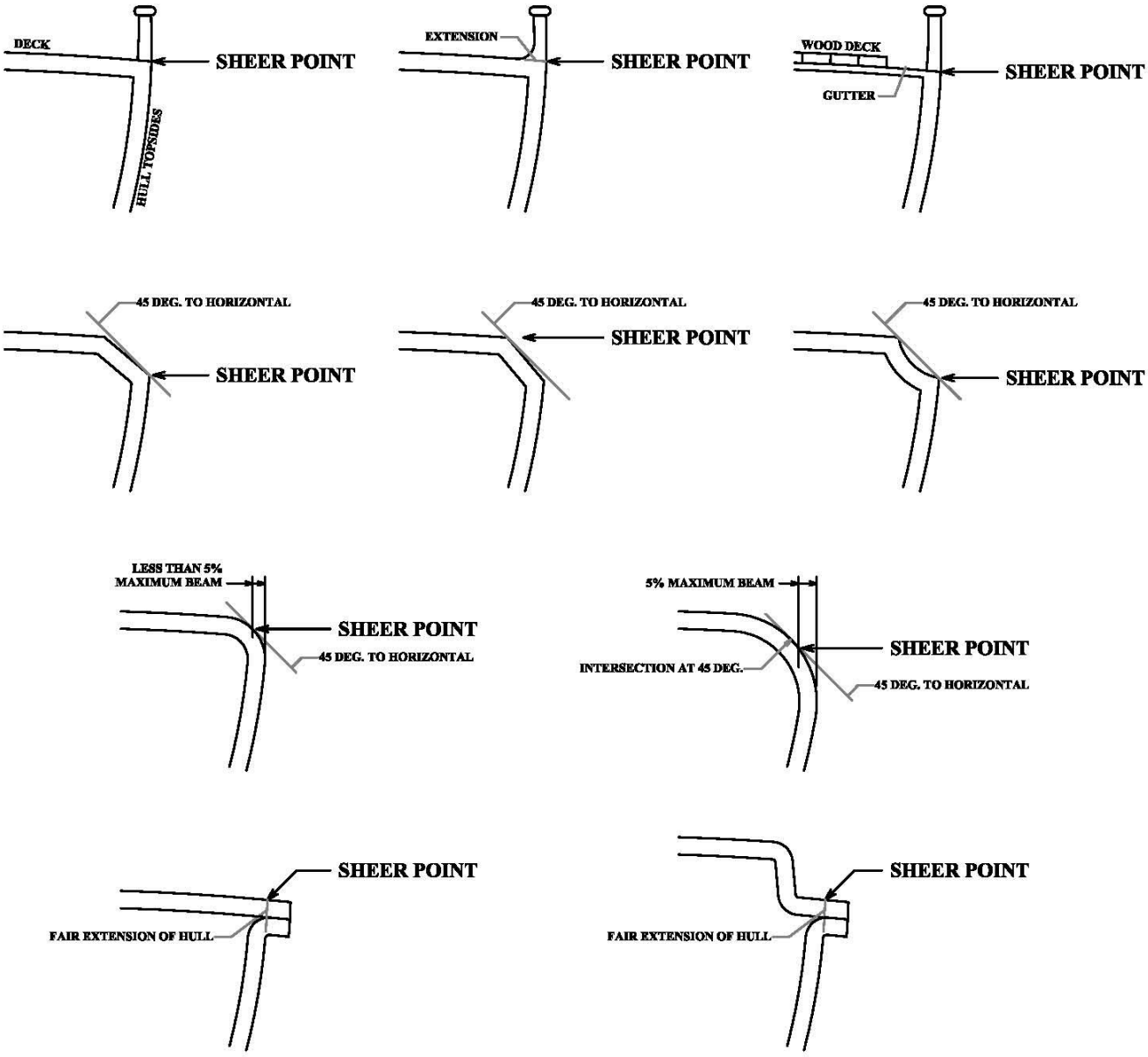
	Description	Weight	Owner	Meas.
a	Anchor (s):			
b	Anchor chain(s) and rode(s):			
c	Tools (max):			
d	Safety equipment:			
	- PFDs			
	- Harnesses			
	- Emergency signaling			
	- Ditch bag			
	- EPIRB			
	- Throw able PFB/MOM/Lifesling			
	- First aid kit			
	- Fire Extinguisher(s)			
	- Reference latest US SER or OSR for complete list			
e	Deck equipment:			
	- Sheets and guys			
	- Running rigging not carried permanently on spars			
	- Winch handles			
	- Deck blocks (used in sailing the boat)			
F	-Life raft (location above or below deck)			
G	-Spares (location below deck)			
H	-Emergency Steering Gear			

Signatures:

Owner: _____ **Date:** _____

Measurer: _____ **Date:** _____

APPENDIX 3 - Various Sheer Points



APPENDIX 4 - RULES AND PROCEDURES FOR RACE ADMINISTRATION

Unless otherwise prescribed by the Sailing Instructions, the following shall apply to races conducted under the ORR.

1. Pre-race Inspection or Measurement.

When, as a result of any pre-race inspection or measurement, it is determined that a boat does not conform to its ORR certificate:

a) When the nonconformance is considered to be minor and can be easily corrected, the boat may be brought into conformance with her certificate, or, when necessary, a new certificate may be issued.

The measurer appointed for the series shall report all such corrections to the protest committee.

b) When the protest committee considers that the nonconformance is major (even if it can be corrected) or that it cannot be corrected without requiring significant re-measurement, they shall act in accordance with RRS.

2. During a Race or Series.

When, as a result of an inspection, measurement, or protest during a race or series, it is determined that a boat does not conform to its certificate, the facts shall be referred to the protest committee which shall act in accordance with the RRS.

a) When the nonconformance is considered to be minor (whether or not the boat is issued with a new certificate), the original certificate shall be considered valid throughout the race or series.

b) When the nonconformance is not considered to be minor the boat shall receive a 50% place penalty in any race in which her rating was incorrect.

c) When a boat's Certificate is withdrawn by a Rating Authority the matter shall be referred to the protest committee which shall act in accordance with the RRS and may disqualify the boat from all races in the series or take such other action as it deems proper.

c) 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 shall prescribe. Nothing in this paragraph shall bar action under the RRS concerning a boat deliberately altered.

3. General.

a) When a boat is checked at an event or as a result of a protest, the measurement shall be checked using the rule as it was in effect at the time of measurement upon which the certificate is based (see 6.03 for hull re-measurement).

b) The Rating Authority in whose waters the boat is racing would normally be the "authority qualified" referred to in the RRS to resolve questions involving ORR certificates. A protest committee considering a protest involving an ORR certificate may submit questions to the Rating Authority which shall provide all reasonable advice and assistance to resolve the protest. The measurements resulting from a protest re-measurement shall be used to issue any new Certificate.

4. Investigation and Reporting of Rating Irregularities.

a) When, as a result of an action in a race or series or the withdrawal of a certificate by a Rating Authority, a boat is remeasured and her resulting General Purpose Handicap (GPH) is faster by 0.75% or more, the boat's National Authority shall investigate the circumstances and report its findings to the ORA which may take such further action as it deems proper.

b) Race and protest committees are asked to report all actions arising under 1(b), 2(b) and 2(c) above to the ORR Chief Measurer. Such reports may be made through the National Authority of the organizing authority.

5. Other Actions.

This Appendix only concerns actions with respect to boats. It does not limit in any way the rights and responsibilities of race and protest committees and of National Authorities to investigate or act with respect to individuals.

APPENDIX 5 - ADMINISTRATIVE RATING PROTESTS

1. The Offshore Racing Association shall be the Rating Authority referred to in the World Sailing Rules to resolve questions involving ORR Certificates. A protest committee considering a protest involving an ORR certificate may submit questions to that Rating Authority which shall provide all reasonable advice and assistance to resolve the protest.

2. Administrative Protests.

   a) The administrative protest procedure permits protests involving a boat's certificate without regard to whether the boat was racing. An administrative protest shall be lodged with the Rating Authority in whose water the boat is lying.

   b) Any person or organization which has a valid interest in a boat's certificate may lodge an administrative protest, provided that:

      - The protest is in writing and is signed and dated by the protestor;
      - The protest includes a detailed description of the alleged defects and a full statement identifying the protestor as having a valid interest;
      - The protest is accompanied by a copy of the certificate of the boat being protested and the address and telephone number of the protested boat's owner;
      - The protest includes a statement of the issues the protestor wishes to have resolved, identification of the applicable rules and any relevant evidence.

   c) The owner of the protested boat shall file a reply with the Rating Authority as soon as possible. If he elects to concede the protest or refuses to cooperate in providing for re-measurement when required, the Rating Authority shall invalidate the boat's certificate and so advise all concerned; including the local organization within whose jurisdiction the boat normally races.

   d) The Rating Authority may consult or refer the matter to the ORR Chief Measurer for advice and assistance. It shall make its decision based on the available evidence and may order re-measurement of the boat in whole or in part (see 6.03 for hull re-measurement).

   e) The decision of the Rating Authority shall determine any measurement and processing costs of deciding the protest and determine which party will pay, as follows:

      - When the correct General Purpose Handicap (GPH) of the protested boat is faster than the protested GPH by not more than 0.25%, the protestor will be responsible for the measurement and processing costs. The filing fee will not be counted toward payment of costs.
      - When the correct GPH is faster than the protested GPH by more than 0.25%, the measurement and processing costs will be borne (or shared) by the owner or the boat's Revalidating Authority depending upon the determination of responsibility for the defect. The filing fee will be returned to the protestor.

3. Redress from Actions of the Rating Authority.

   a) When an owner believes that his boat's certificate is being withheld unreasonably or that any related actions of the Rating Authority are unreasonable, he may seek redress by following the applicable procedures set out in 2. Administrative Protests above, stating the relevant facts and the relief or redress requested.

   b) The Rating Authority concerned shall appoint a committee to investigate, hear, and decide on the request following the procedures of the World Sailing Racing Rules. In the event that there is reasonable doubt as to the interpretation or application of the ORR, the ORA Chief Measurer shall be the "authority qualified" to resolve such questions.

APPENDIX 6 - DYNAMIC & AGE ALLOWANCES

1. Dynamic Allowance (DA)

Dynamic Allowance is an adjustment which may be applied to velocity predictions (i.e., time allowances) to account for relative performance degradation in unsteady states (e.g., while tacking) not otherwise accounted for in the VPP performance prediction model. DA is a percentage credit calculated on the basis of design variables deemed to be relevant in assessing the performance degradation and is applied (or not applied) as explained below. Even where applied, the result of the calculated credit may be zero. Examples of design variables considered appear below.

Where applied, the calculated amount of credit will vary with point of sail and wind velocity and course type. These credits are therefore applied individually to the various time allowances available within the ORR.

Typical design parameters for ORR Dynamic Allowance:

Length: Effective sailing length
Draft: Effective keel draft
SAup: Upwind sail area
SAdn: Downwind sail area
VOL: Volume of displacement (weight of boat divided by density of water)
WA: Wetted area of hull (including appendages)
Draft: Effective keel draft

Typical non-dimensional design factors for ORR Dynamic Allowance:

SAup / (VOL)^(2/3)
SAup / WA
SAdn / (VOL)^(2/3)
SAdn / WA
Length / (VOL)^1/3
Draft / Length

2. Age Allowance (AA)

ORR gives an Age Allowance credit to older boats in recognition that boat design does advance and boats do get old. This modest credit is applied as a function of how old the design of the boat is. Max credit is reached at 20 years of age. There is no increase in the credit for boats older than that.

The age used for Age Allowance is the earlier of Age Date or Series Date (see 1.05.1 & 1.05.2). The reference year is the current rule year. This allowance is applied to all boats.

ORR recognizes that a change in keel to a more modern design can improve a boat's performance beyond the factors, such as draft, wetted area and stability that are measured and rated. The age date of the keel is recorded and used to adjust the boat speed-predictions

APPENDIX 7 - VARIABLE BALLAST & SPECIAL APPENDAGES

A boat holding a valid certificate under this Appendix shall be deemed not to contravene ORR 4.04, Shifting of Ballast with regard to the features rated hereunder. RRS 51 is changed to permit canting the keel and/or shifting of water ballast. RRS 52 is changed to permit other than manual power to be used to cant the keel and/or move the water ballast.

Water ballast can be used to enhance the transverse stability of the boat and/or to change the fore and aft trim. ORR will measure and rate both effects. Canting keels are used to modify the transverse stability. There is currently no provision in ORR to handicap a boat equipped with both canting keel and water ballast used for transverse stability. ORR will, however, handicap a boat equipped with a canting keel and water ballast used for fore and aft trim.

Stability:

Rating Certificates for canting keel and water-ballasted boats display both the Stability Index (Capsize Screen) and also a Knockdown Recovery Factor (KRF). The KRF Index is related to a boat's estimated ability to recover from a knockdown to windward where the movable ballast is on the leeward side. Recommended KRF Index minimum limits and the formula for calculation of the KRF Index is given in ORR 2.02.2, General Limits and Exclusions, Stability.

The stability criteria for movable ballast boats (water ballast or canting keel) have been set to achieve similar levels of capsize resistance and recovery as conventional boats. However the defining feature of movable ballast boats is that, with the ballast deployed, they have an angle of list, i.e. a static heel angle that is not upright. Consequently the energy required to heel the boat to 90 degrees (i.e., spreaders in the water) is greater when heeling with the ballast to windward (normal sailing) than it is with the ballast to leeward (caught aback). Owners and crew should be aware of the different characteristics of movable ballast boats when the ballast is to windward as well as to leeward.

Measurement:

Where the following provisions for water-ballasted boats and special appendages are in conflict with ORR Part 2, General Limits and Exclusions, the provisions below shall take precedence.

1. Water Ballasted Boats

a) Water ballast tanks shall be symmetrical about the boat's centerline.

b) For measurement afloat (see 5.02), the boat shall first be measured with ballast tanks empty and the full set of flotation and inclining measurements recorded as for conventional boats.

c) The ballast tank(s) on the starboard side of the boat shall then be filled, pressed up and the resulting angle of list recorded.

d) The port ballast tank(s) shall then also be filled, pressed up and a full in-water measurement performed as in 1(b) above, except with all ballast tanks full. The full set of in-water measurements shall be recorded as was done for the tanks-empty measurement, except that the corresponding data field names include the suffix "W".

e) The starboard ballast tank(s) shall then be emptied and the resulting list angle recorded. The port and starboard list angles shall be reported to the Rating Office and where these are not approximately equal; the boat may be deemed not to comply with the provision above for symmetric ballast tankage. The average of the port and starboard list angles shall be recorded as **LIST** to the nearest tenth of a degree.

f) The ORR time allowance for each true wind angle and true wind velocity will be given as the faster of a comparison between calculated performance with ballast tankage on only the windward side of the boat full and that with both tanks empty in the respective sailing condition.

g) If water ballast tanks alter the fore and aft trim the rating office may require special measurement procedures. Contacting the rating office in advance of measuring is required for water ballasted boats. . The ORR time allowances will be adjusted to reflect the performance benefits of variable trim.

2. Canting Keel Boats

a) A canting keel may pivot laterally only about a longitudinal axis aligned with the centerline of the boat and no other movement is permitted. The maximum cant angles, port and starboard respectively, shall be symmetric.

b) For measurement afloat (see 5.02), the boat shall first be measured with the keel on centerline and the full set of flotation and inclining measurements recorded as for conventional boats.

c) The keel shall then be canted fully to starboard. The resulting list angle shall be recorded and the angle of the keel relative to the boat's centerplane also recorded. These measurements shall be repeated and recorded with the keel canted fully to port.

d) The port and starboard list angles shall be reported to the Rating Office and where these are not approximately equal; the boat may be deemed not to comply with the provision above for symmetric cant angles. The average of the port and starboard list angles shall be recorded as LIST to the nearest tenth of a degree. The average of the port and starboard cant angles shall be recorded as CANT to the nearest tenth of a degree.

e) The ORR time allowance for each true wind angle and true wind velocity will be given as the faster of a comparison between calculated performance with the keel fully canted to the windward side of the boat and that with the keel centered in the respective sailing condition.

3. Bilge Boards

Bilge boards with motion only up and down in a straight line are permitted, subject to the restriction of angular motion as provided for centerboards under 2.03.8. The location and vertical extension of bilge boards shall be taken as part of the machine hull measurement procedure (see Part VI) and their draft determined from the Hull Offset File (see 6.02) at various angles of heel.

4. Trim Tabs

A movable trim tab is permitted. The fitting of such a trim tab shall be recorded. The effect on performance of a movable trim tab will be calculated to reflect a reduction in leeway angle.

5. Other Appendages

See 2.03.09

APPENDIX 8 - Rule changes

Year	Rule changes and/or additions

2012	**1.03.2 and 8.12** Added Inshore certificates
2012	**1.05.3** added Keel Date
2012	**2.02.1** Stability Index/Capsize Screen. Removed lower limit on CI term
2012	**4.08** Tankage. Added tankage with 15% LOA of the stern must be declared "empty when racing" for non-movable ballast boats
2012	**10.13.6** Non-overlapping headsail half-width excess limited to 12% of respective base
2012	**10.45.5** Minimum spinnaker area defined
2014	**10.42.6** ISP: ISP shall not be taken as less then IG. (added)
2015	**5.02.3** Boats shall be dry in light ship condition without crew and shall include the following… (language change)
2016	**4.01** Bloopers (change added)
2016	**5.02.4** specifically excluded from Measurement Trim is the following**:** (language change)
2016	**Appendix 1** new certificate example added
2016	**Appendix 2** changed and new format added
2016	**Appendix 8** added
2016	**Added** better definition of dagger board shape
2016	**Formatting** index numbers reformatted
2016	**Storm Sail** amended to add "World Sailing" in 10.02.1, 10.07 (c) definition added, 10.16.7 deleted
2016	**Mainsail** widths language updated
2016	**Changed** 10.02.1 language added to allow small headsails to be set free flying.
2016	**Modified** 3.01 to allow PIC to sign the ORR Certificate
2017	**Changed** One Design language Part XI
2017	**Changed** Appendix 1 certificate layout
2017	**Modified** 1.03 added One Design/Level Certificate and scoring options
2017	**Modified** 10.06 Asymmetrical Spinnaker sheeted on same side as boom
2017	**Modified** 4.09 Use of stored energy
2017	**Modified** added Quick Start disclaimer, moved 9.12 to 9.01, numbered 9.0 to 9.20
2017	**Removed** blank boxes from measurement inventory in Appendix 2
2018	**Removed** 10.02.2 added replacement language to 10.02
2018	**Added** 10.02 Large Roach headsails > 50% half width
2018	**Modified** 10.16.1 to allow Large Roach headsail>50% half width

2018 **Modified** 2.02 from BLRI to KRF

2018 **Modified** 7.03 propeller definitions

2018 **General Modification** modified "Jib" to "Headsail" in Rule Book

2018 **Modified** Appendix 7

2108 **Modified** Appendix 2

2018 **Modified** document for inclusion of Vertical Lift Foils

2018 **Moved** Blooper Section from Part IV Restrictions to Part X Sails

2018 **Removed** references to headsail roach measurement in document

2018 **Changed** Girths to Widths to follow ERS

2018 **Added** Appendix 9 ERS Sail Measurment Drawing

2018 **Changed** 5.02.6 Measurment Inventory

2018 **Added** Appendix 10

2018 **Added** default weights in 5.02.6.2

2018 **Modified** 9.05.1 b and c to clarify language

2018 **Modified** 10.25 Mainsail measurement language

2108 **Modified** 9.04 J measurement added LRHJ

2018 **Added** 9.06.3.0 Height of LRH attachment point

2018 **Added 10.30** Mainsail Area Formula

2018 **Added** Headsail Area

2018 **Modified** 10.39 rated limits

2019 **Clarified** 4.08.3 Stored Power

2019 **Inclining Test** 8.01 and **Weight Distance** 8.03 expanded to include use of the boom

2019 **Clarified** 10.05 f) **Restrictions on Setting and Sheeting of Headsails**

2019 **2.03.9 Other Off Centerline Appendages**

2020 **5.02.3 f) –** added to include adjustable height masts

2021 **Added** limits on the amount of lift produced by foils

2021 **5.02.1** added freeboard definitions

2021 **10.13** added Large Roach Headsails (LRH) measurement definitions

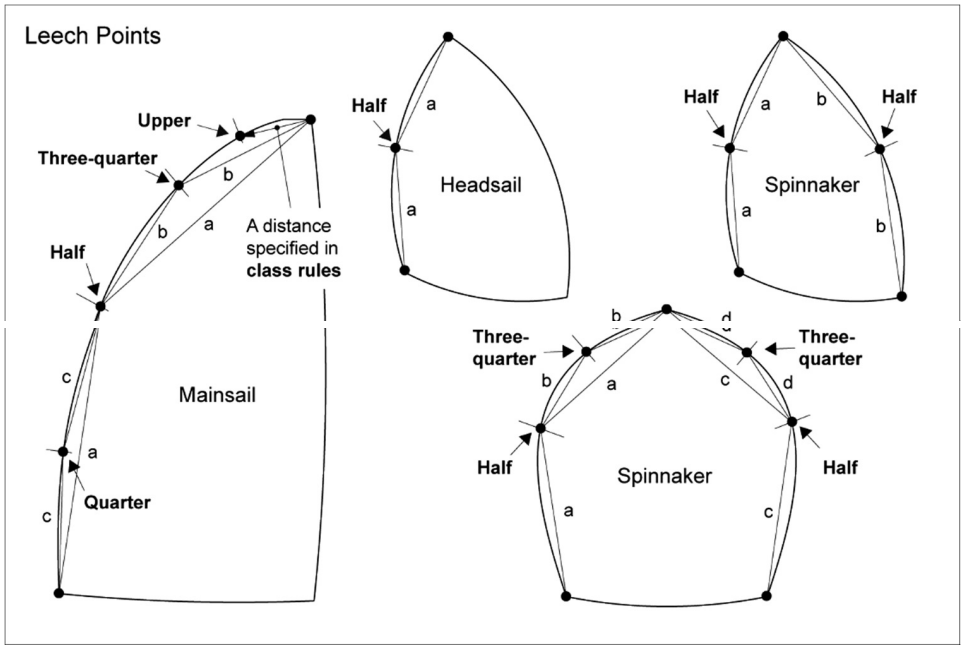
2021 **10.36** added Large Roach Headsails (LRH) rated area equation

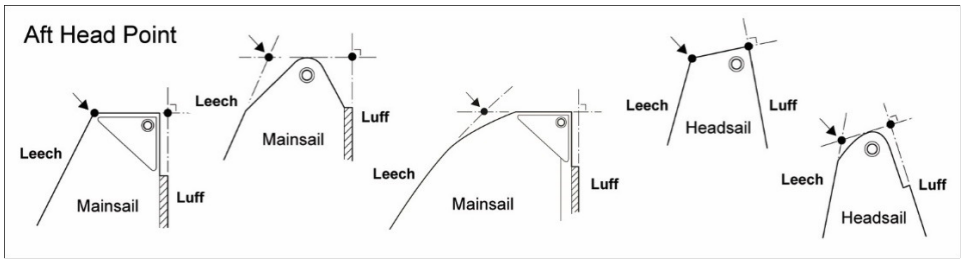
2021 **10.05** added provision for the race organizer to permit the use and rating adjustment for leeward outriggers/whisker poles set to leeward to trim headsails.

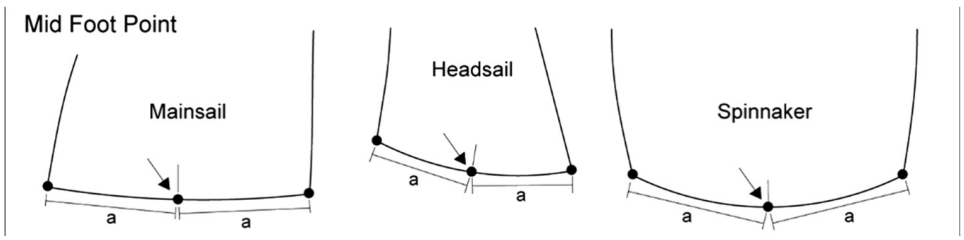
2024 **1.04** added recommendation for Measurement Afloat

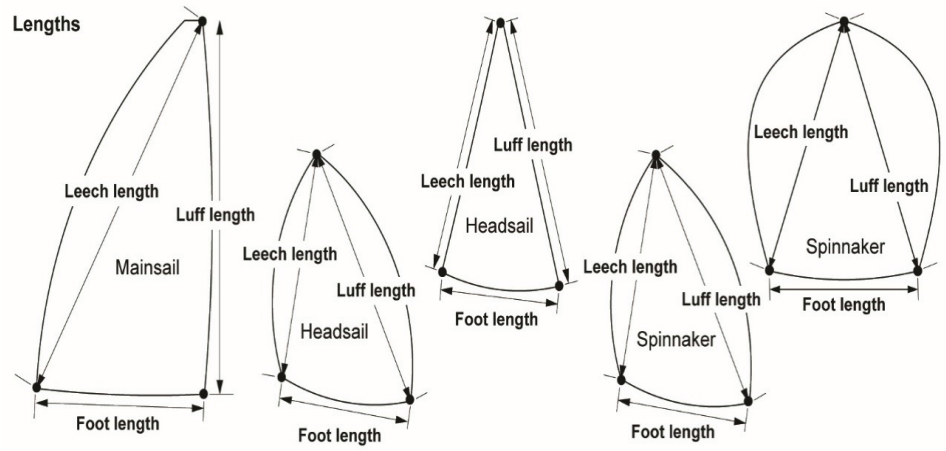
2024	**8.11 & 8.12**	Crew Weight determinations clarified
2024	**9.05.1**	Standardized definition of Spinnaker Pole Length (SPL)
2024	**10.2.1**	Removed “Staysail" from list of sail limitations
2024	**10.05**	Clarified definitions of headsails.

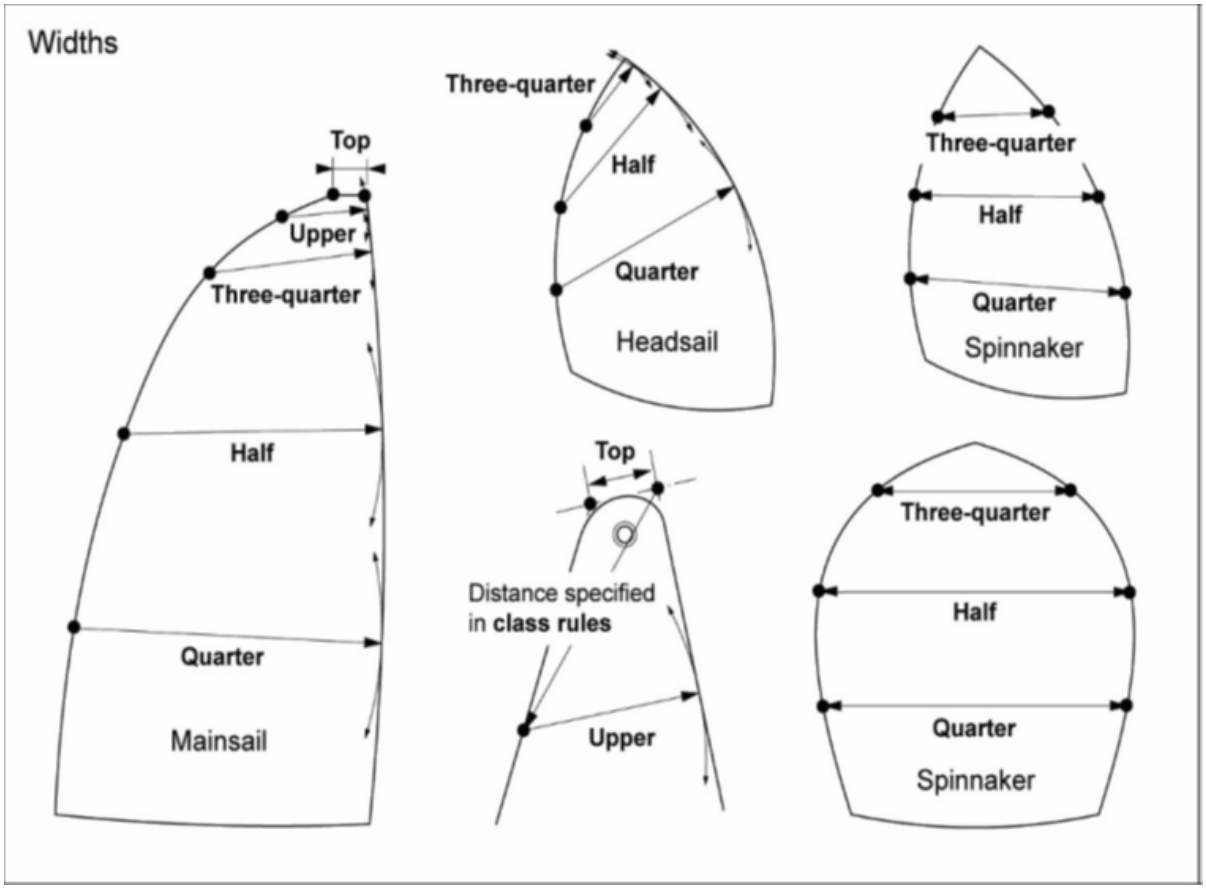
Appendix 9 – ERS Sail Measurment Drawings

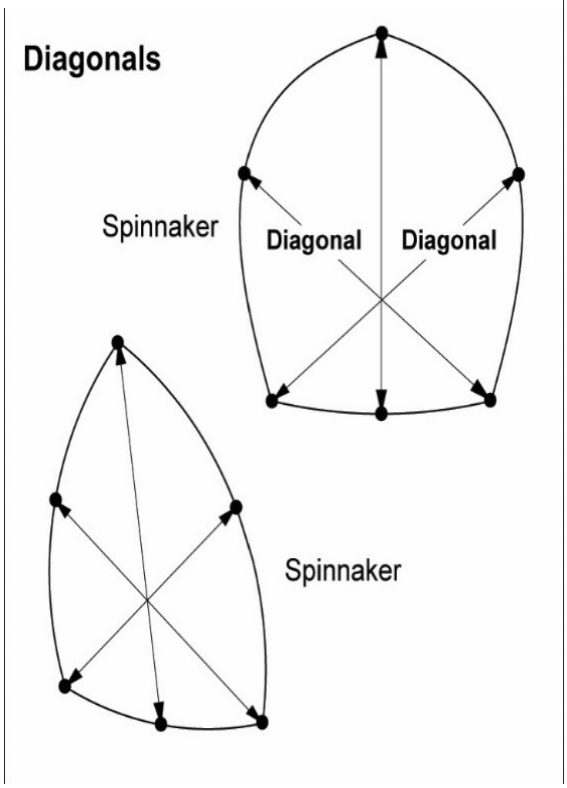


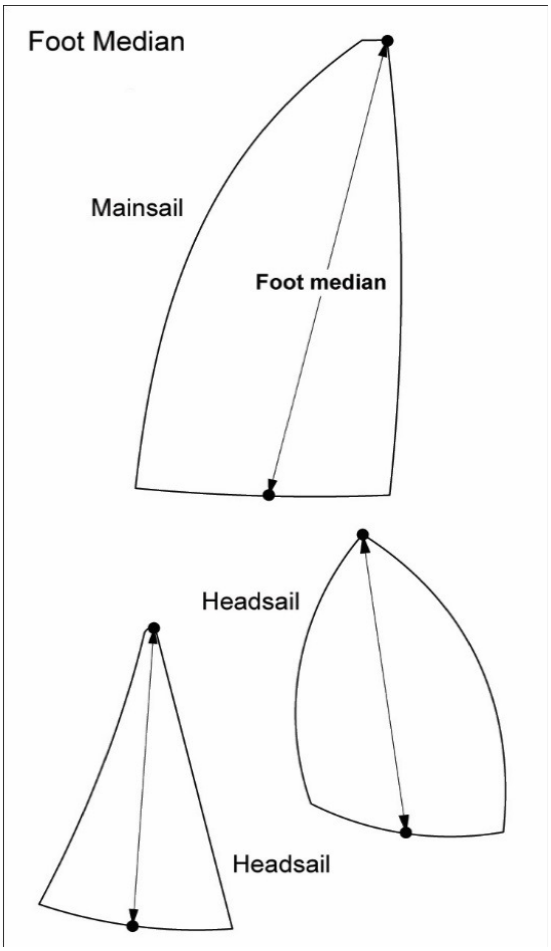


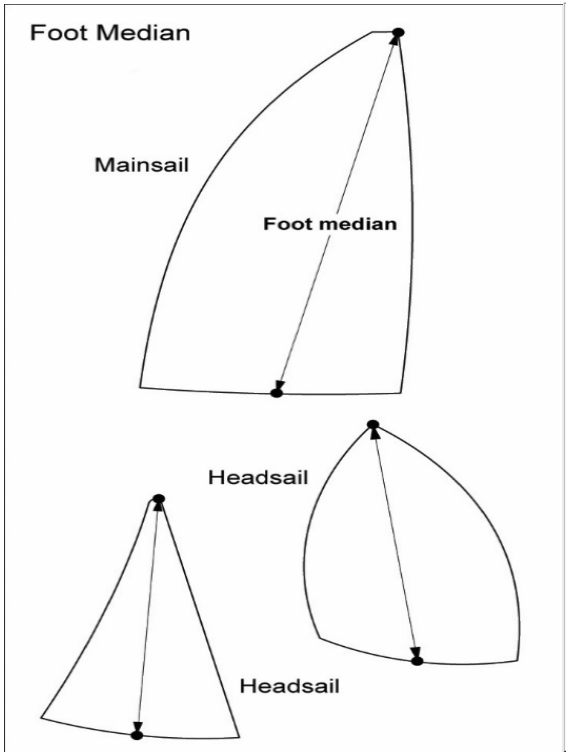


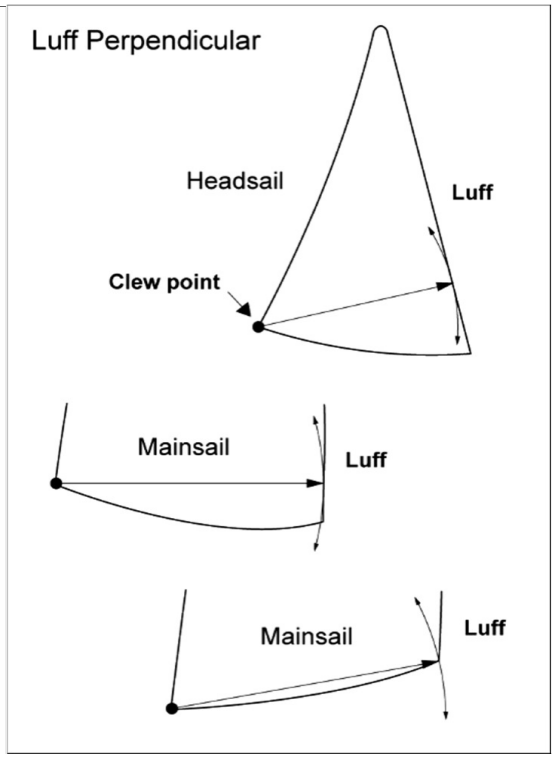

Lengths
Leech length
Luff length
Mainsail
Foot length
Leech length
Luff length
Headsail
Foot length
Luff length
Leech length
Headsail
Foot length
Leech length
Luff length
Spinnaker
Foot length
Leech length
Luff length
Spinnaker
Foot length


Widths
Top
Upper
Three-quarter
Half
Quarter
Mainsail
Three-quarter
Half
Quarter
Headsail
Three-quarter
Half
Quarter
Spinnaker
Top
Distance specified
in class rules
Upper
Three-quarter
Half
Quarter
Spinnaker



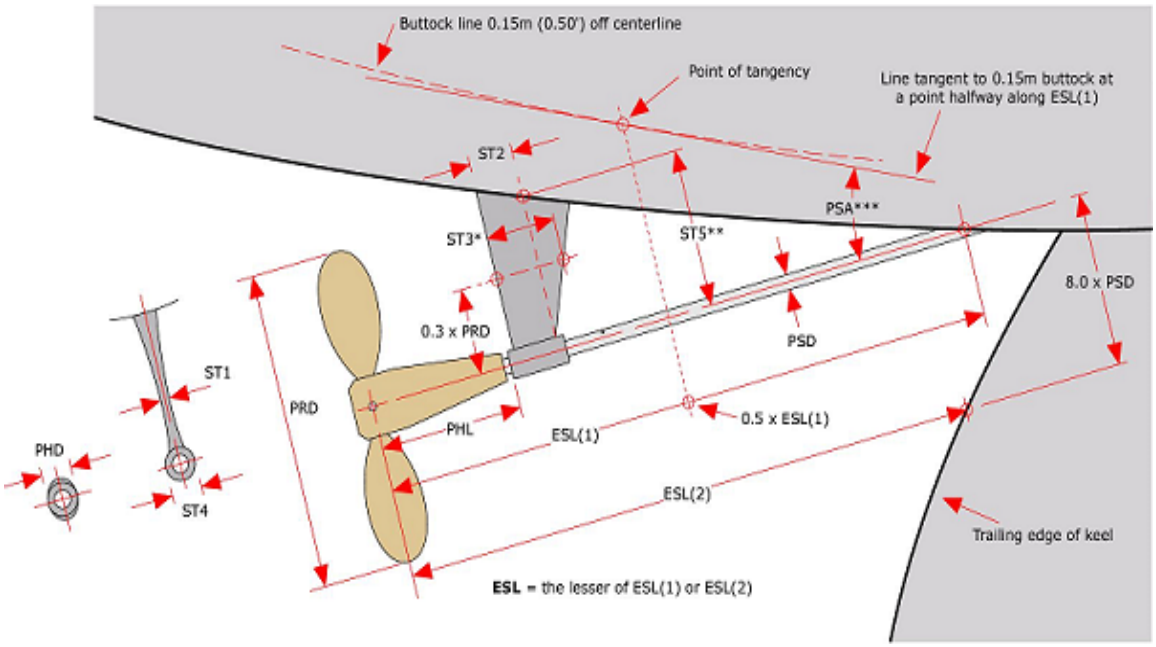




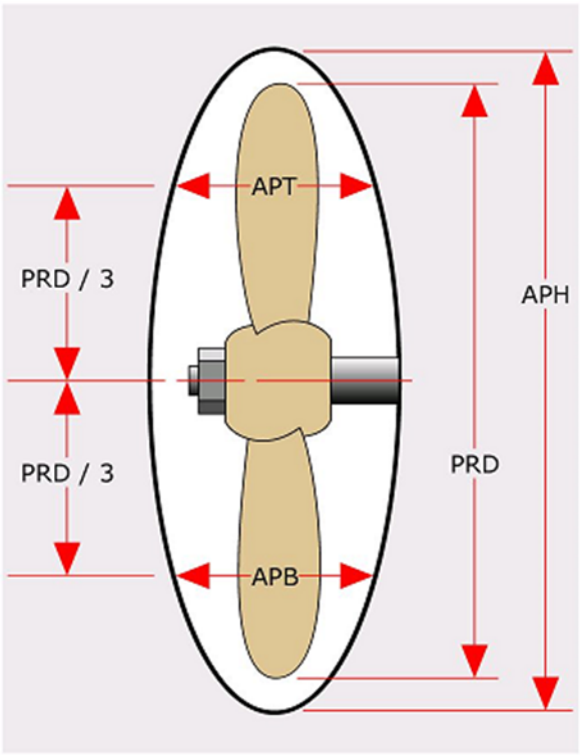


Appendix 10 **(drawings courtesy Eric Battinger)**

Out of Aperture with Shaft exposed with ORR PSA



In Aperture



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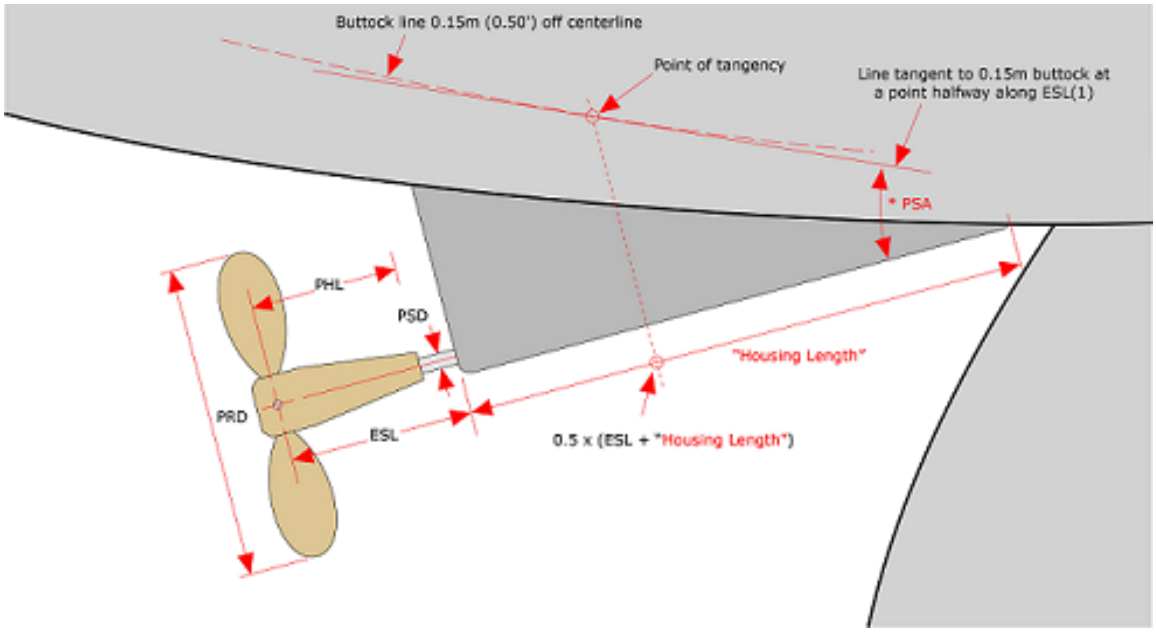
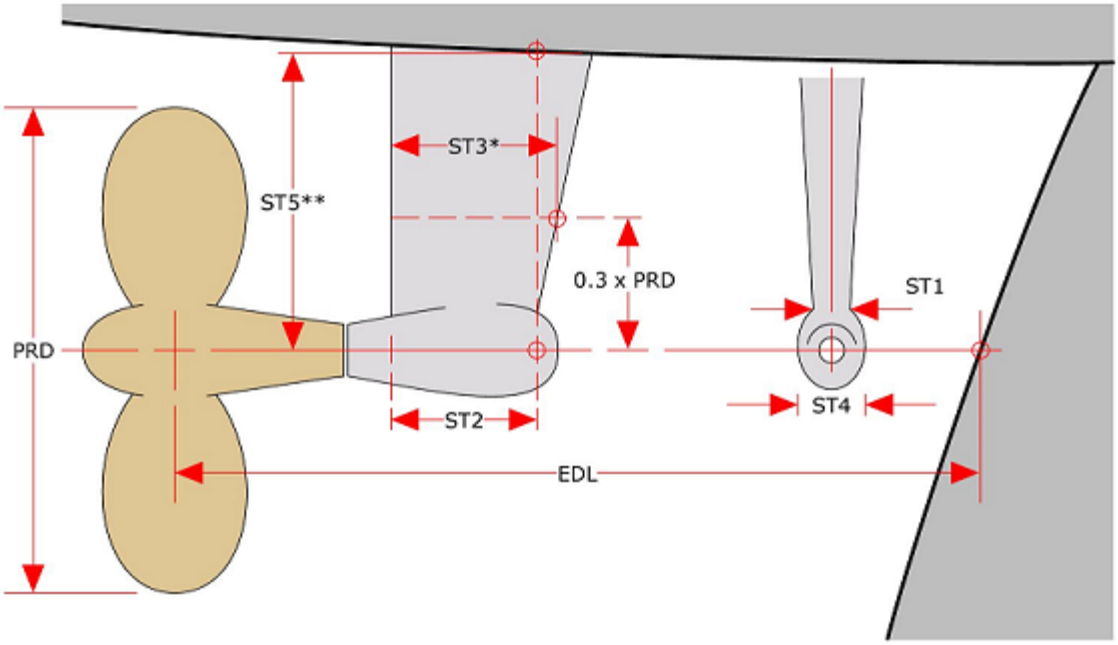


Strut Drive


ST3*
ST5**
0.3 x PRD
ST1
PRD
ST4
ST2
EDL