World Leader in Rating Technology

OFFSHORE RACING CONGRESS

International Measurement System

IMS 2006

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INTERNATIONAL MEASUREMENT SYSTEM

A Handicapping System for Cruising/Racing Yachts

Published by the

Offshore Racing Congress

World Leader in Rating Technology

The IMS provides elapsed time corrections for a broad range of sailing yacht types utilising speed predictions from computer models based on fundamental principles of hydro- and aerodynamics. The ORC will manage the system, changing it as improvements in speed prediction are developed.

The search for speed prediction improvement will be a continuing process leading to prompt system changes as improvements are identified. The ORC will also act to encourage developments which lead away from excessive cost or increase safety or the suitability of yachts for cruising.

Note: The formulae of the IMS Velocity Prediction computer program (VPP) are extensive and no attempt is made herein to document all details. The full statement of IMS Rule speed prediction and time allowance formulae is the VPP, available to designers and others (see Publications secttion or www.orc.org).

PAGE DATES & MARGIN BARS

Page dates indicate month & year of the General Meeting at which any rule changes noted on the page were agreed or, in the case of the table of Contents and Index of Symbols, the most recent page revision. The earliest year in the current edition is Nov/98.

Solid margin bars denote rule changes.
Broken margin bars denote editorial corrections or rearrangements.

2006

IMS Rule

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AFPV	Aft Freeboard Point Vertical Offset	506.2(d)
AMG	Asymmetric Spinnaker Mid Girth	822
AMS 1	Area Maximum Section	523
AMS 2	Area Maximum Section Attenuated for Depth	523
APB	Aperture Width Bottom	606
APH	Aperture Height	606
ASF	Asymmetric Spinnaker Foot	821
ASL	Asymmetric Spinnaker Luff (see also SLU & SLE)	820.2(c)
APT	Aperture Width Top	606
B	Effective Beam	521
BCW	Base Crew Weight	712
BAL	Boom After Sheeting Limit	808.2
BALY	Boom After Sheeting Limit, Mizzen	833.2
BAS	Main Boom Above Sheerline	807
BASY	Mizzen Boom Above Sheerline	832
BD	Boom Diameter, Main	809
BDY	Boom Diameter, Mizzen	834
--	Batten Adjustment	828
--	Batten height, Mainsail	825
--	Batten height limit, Mizzen	837
BLRI	Ballast-Leeward Recovery Index	205.3
BTR	Beam Depth Ratio	520
CANT	Cant Angle -- Canting Keel	App. 10.2
CBDA	Centerboard Center of Gravity Drop	513.4
CBDB	Ditto, Additional Centerboard	513.4
CBDH	Centreboard Effective Hull Draft	531.3
CBLD	Centerboard Center of Gravity Movement	512.2
CBMC	Centerboard Mid Chord	513.5(b)
CBRC	Centerboard Root Chord	513.5(a)
CBTC	Centerboard Tip Chord	513.5(c)
CGW	Crew and Gear Weight	715
CGWL	Longitudinal Center of Gravity of Crew and Gear Weight	716
CGWV	Vertical Center of Gravity of Crew and Gear Weight	717
CPW	Chainplate Width	810.3
CW	Crew Weight	712
D	Effective Draft	527
DA	Dynamic Allowance	App. 8
DCW	Declared Crew Weight	713
DH	Effective Hull Draft	529
DHK	Maximum Draft Including Keel	528
DHKA	Draft of Keel and Hull Adjusted	531.1
DSPM	Displacement in Measurement Trim	524
DSPS	Displacement in Sailing Trim	524
E	Foot of Mainsail	808.1
EB	Distance Between Masts	835
EC	Foot of Mainsail, Corrected	826.2(b)
ECE	Effective Centerboard Extension	531.
ECM	Extension of Centreboard Measured bellow Hull or Keel	513.1
ECMA	ECM Adjusted for Keel or Hull Shape above Centreboard	531.2
EDL	Strut Drive Length	607.1
EDM	Effective Diameter Main Mast	853
EDMB	Base Effective Main Mast Diameter	854
EDMC	Effective Diameter of Main Mast Corrected	855
EDMY	Effective Diameter Mizzen Mast	857
EHM	Effective Height of Main Mast	852
EHMY	Effective Height Mizzen Mast	856
ESL	Exposed Shaft Length	605.2
EY	Foot of Mizzen	833.1

FA	FAM adjusted to nominal seawater	515
FAM	Freeboard Aft, Measured	402.3(b)
FF	FFM adjusted to nominal seawater	515
FFM	Freeboard Forward, Measured	402.3(a)
FFPS	Forward Fbd Point above Offset File Flotation Datum	App. 1
FFPV	Forward Freeboard Point Vertical Offset	506.2(c)
FSP	Forestay Perpendicular	814
GO	Forestay Outrigger	805.3
GPH	General Purpose Handicap	100
GSA	Gauge Surface Area, Inclining Manometer	702
GW	Gear Weight	714
HB	Headboard of Mainsail	824
HBI	Height of Base of I	517
HBS	Spinnaker Headboard	818
HBY	Headboard of Mizzen	836
HMI	Hull Measurement Instrument	502
IG	Height of Genoa Hoist	805.1
IM	Foretriangle Height	845
IPA	Installation Projected Area	608.1
ISP	Height of Spinnaker Halyard	805.2
IY	Height of Mizzen Mast	829
J	Base of Foretriangle	803
JL	Longest Luff of Jibs	815
JR	Jib Roach	813.3
KCDA	Keel Centreboard Depth Adjustment	513.2
KEDA	Keel Endplate Depth Adjustment	528
L	Sailing Length	518
LIST	List Angle -- Moveable Ballast Yachts	App. 10.1 & 2
LL	Luff Limit of Spinnaker	847.5
LOA	Length Overall	507
LP	Longest Perpendicular of Jibs, Rated	846
LPG	Longest Perpendicular of jibs	813
LPIS	Longest Perpendicular of Inner Jib	813.4
LPP	Lines Processing Program	514
LPS	Limit of Positive Stability	205.1
LSM0 LSM1 LSM2 LSM3 LSM4	Second Moment Lengths in various conditions	519
MB	Maximum Beam (nominal)	App. 1
MCG	Mast Vertical Center of Gravity	725.2
MDL1	Maximum Longitudinal Dimension of Main Mast	805.6
MDL1Y	Maximum Longitudinal Dimension of Mizzen Mast	830
MDL2	Longitudinal Dimension of Main Mast at Head	805.9
MDL2Y	Longitudinal Dimension of Mizzen Mast at Head	830
MDT1	Maximum Transverse Dimension of Main Mast	805.5
MDT1Y	Maximum Transverse Dimension of Mizzen Mast	830
MDT2	Transverse Dimension of Main Mast at Head	805.8
MDT2Y	Transverse Dimension of Mizzen Mast at Head	830
MGL	Mainsail Girth, Lower	826.1
MGLY	Mizzen Girth, Lower	838
M GM	Mainsail Girth, Mid	826.1
MGMY	Mizzen Girth, Mid	838
MGML	Limit of MGM	826.2
MGMLY	Limit of MGMY	838
MGT	Mainsail Girth, Top	826.1
MGTY	Mizzen Girth, Top	838
MGU	Mainsail Girth, Upper	826.1
MGUY	Mizzen Girth, Upper	838
MGUL	Limit of MGU	826.2
MGULY	Limit of MGUY	838
MSF	Minimum Spinnaker Foot	847.6
MSL	Minimum Rated Spinnaker Luff	847.5

MSMW	Minimum Rated Spinnaker Maximum Width	847.4
MSW	Mainsail Weight	827
MSWL	Longitudinal CG of MSW	719
MSWV	Vertical CG of MSW	720
MW	Mast Width	805.4
MWT	Mast Weight	725.1
MXJL	Maximum Jib Luff	812.8
MXLPG	Maximum Longest Perpendicular of Jibs	812.10
OSW	Weight of Other Sails	721
OSWL	Longitudinal CG of Other Sails	722
OSWV	Vertical CG of Other Sails	723
P	Mainsail Hoist	806
PCS	Performance Curve Scoring	100
PHD	Propeller Hub Diameter	603.2
PHL	Propeller Hub Length	603.3
PIPA	Propeller Installation Projected Area	608
PL	Pendulum Length, Inclining Manometer	702
PLM	Pendulum Length, Measured Inclining Manometer	702
PRD	Propeller Diameter	603.1
PSA	Propeller Shaft Angle	605.1
PSD	Propeller Shaft Diameter	605.8
PY	Mizzen Hoist	831
RM	Righting Moment	709
RMC	Righting Moment Corrected	709
RMS	Race Management Software	100
RM2	Righting Moment per Degree in Sailing Trim at 2 degrees heel	710
RM20	Ditto 20 Degrees Heel	711
RM40	Ditto 40 Degrees Heel	711
RM60	Ditto 60 Degrees Heel	711
RM90	Ditto 90 Degrees Heel	711
RSA	Reservoir Surface Area, Inclining Manometer	702
SAFP	Stem to Aft Freeboard Points	506.2(b)
SF	Symmetric Spinnaker Foot Length	821
SFFP	Stem to Forward Freeboard Points	506.2(a)
SFJ	Stem to forward end of J	803.1
SG	Specific Gravity, Flotation Measurement	402.1
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SL	Symmetric Spinnaker Luff/Leech Length	820
SLE	Asymmetric Spinnaker Leech	820.2(a)
SLU	Asymmetric Spinnaker Luff	820.2(b)
SMB	Maximum Beam station distance from stem	701.2
SMG	Renamed AMG 1/1/03	822
SMW	Symmetric Spinnaker Maximum Width	819
SPL	Spinnaker Pole Length	804.2
SPS	Height of Spinnaker Pole Stop	805.11
--	Stability Index	205.2
ST1 - 5	Propeller Strut Dimensions	605 & 601
T	Effective Hull Depth	522
TH	Taper Hollow	853
TL	Tapered Length of Main Mast	805.7
TLY	Tapered Length of Mizzen Mast	830
TPS	Tack Point, Spinnaker	804.3
TR	Reduced Draft, Any Single Section	530
TRCB	Centerboard Reduced Draft	531.5
TRMAX	Reduced Draft, Maximum	530
VPP	Velocity Prediction Program	513.3
VMG	Velocity Made Good	100
W1-4	Weights, Inclining	705
WB	Weight of Boom	725.4
WBV	Water Ballast Volume – see App. 10 of IMS Rule Book	
WCBA	Centerboard Weight	513.3
WCBB	Ditto, Additional Centerboard	513.3
WD	Weight Distance, Inclining Weights	703

WSM	Wetted Surface, Measurement Trim	525
WSS	Wetted Surface, Upright Sailing Trim	525
Y	Prefix or Suffix Letter to Denote Mizzen Symbols	--
YSD	Mizzen Staysail Depth	841
YSF	Mizzen Staysail Foot	840
YSMG	Mizzen Staysail Mid Girth	84

A BRIEF HISTORY OF THE IMS

In January, 1976 the Offshore Committee of US Sailing adopted a resolution calling for the development of a new "Handicapping System" to take its place alongside the IOR for those yachtsmen who "prefer a 'handicap' rule as opposed to a 'design' rule." The system was developed in a response to the mandate of that resolution.

The system was then called the Measurement Handicap System or MHS. The name was intended to suggest that it is a formula based on measurement of physical characteristics rather than observed racing performance of yachts and that it is of the handicap type as distinguished from the design or development type. It is a system in the sense that it provides for measuring and the calculation of predicted speeds and intrinsically provides for derivation of time allowance without the use of separate tables or time multiplying factors.

The intent of the system as set down before starting the development work may be summarised as follows:

- Weigh each factor used in the formulae to accord with its effect on speed.
- Reduce obsolescence caused by the design of yachts which beat a rule and thereby render older yachts not competitive.
- Devise a system which is designer-proof in the inception if possible, but by correction as this proves necessary.
- Provide fair time allowance for yachts of the dual-purpose type (for cruising and racing). It is intended that production yachts of good design should be able to compete with custom yachts.

The system was based on the research at MIT of the H. Irving Pratt Ocean Race Handicapping Project. Commodore Pratt before his death took a keen interest in the research and it was in large part because of this interest that the project was carried to completion. The research led to the development of a hull measuring device making it possible to use integrated parameters instead of the surrogate single point measurements which had previously been a persistent frustration in controlling measurement loopholes and obtaining accurate values for rule parameters.

A major part of the research was the development of a Velocity Prediction Program (VPP) based on the towing of a series of hull forms systematically modified to test the effect on speed of the performance parameters. This important tank test data was contributed by Delft University in the Netherlands.

Work continues on refining the speed predictive formulae and on the best means of deriving time allowance based on speed predictions, work largely made possible by the contributions of technologists and yachtsmen from many countries.

The intention is that the system should not offer opportunities for exploitation. It would be quite remarkable, however, if there were no oversights. When and as they appear, they are corrected as quickly as possible. The existence of full hull lines data files permits making formula changes when necessary without new hull measurements, thereby giving more latitude and freedom in this respect than was previously possible, the purpose being to protect the existing fleet rather than foster investment in a new rule-beating yacht.

In November 1985 the Offshore Racing Congress adopted the System as a second international rule to stand alongside the International Offshore Rule (IOR) and to provide time allowances for cruiser/racer type yachts not effectively rated by the IOR. To accord with its international status the system was renamed the International Measurement System (IMS).

PART 1 - GENERAL

100. Introduction to IMS Time Allowances and Scoring.

The International Measurement System (IMS) provides elapsed time corrections for a broad range of sailing yacht types utilizing speed predictions from computer models based on fundamental principles of hydro- and aerodynamics. The IMS measurements and computations yield predictions of each yacht's speed in various wind speeds and directions. The speed predictions are converted to a table of time allowance handicaps displayed on the yacht's rating certificate (see Appx. 1).

Prediction of wind directions and wind speeds is not required in order to use IMS time allowances. If a race committee or a race sponsoring organization does not wish to predict such conditions the General Purpose Handicap (GPH) shown on IMS certificates may be used. This is the average of the Circular Random time allowances at 8 and 12. Alternative single number methods include also Time-on-Time with the TMF based either on GPH to ILC number.

If it is desired to predict wind conditions it should be borne in mind that results will be better to the degree that actual conditions approach predicted conditions and worse to the degree that they depart from them.

A full table of boat speeds expressed as seconds per mile for various mixes of wind directions and speeds are shown on the certificate (see Appx. 1). Where wind-averaging is noted, the figures are produced by averaging speeds symmetrically distributed about the nominal wind velocity to reflect conditions experienced during normal racing. In addition to GPH and the major table of 10 points of sail and seven wind velocities, time allowances are given for several prepared course types. Some useful definitions are listed below:

Wnd/Lwd VMG: Equal legs of optimum beat and optimum run.

Olympic 6-leg: Three legs optimum beat, one leg optimum run, and two legs reaching 135 degree true wind angle. Each reaching leg is 0.707 times the length of the beat and run legs, which are of equal length. It is the basis for the Inshore Performance Line scoring selection.

Circular Random: A hypothetical course type in which the boat circumnavigates a circular island with the true wind velocity held constant. It is used as a basis for several time allowance options displayed on the Certificate.

Non-Spinnaker: Circular random course type (see second paragraph from top), but calculated without the use of a spinnaker. Intended for use in races where the following restrictions apply to all yachts: a) setting of a spinnaker is prohibited, b) the entire luff of one jib is attached to the forestay, c) the clew of the jib may be poled out opposite the boom only with the yacht's rated spinnaker pole, d) an inner staysail with LPG less than 110% J is permitted to be set flying and e) a mizzen staysail for which the yacht is rated is permitted.

Ocean for PCS: A composite course, the content of which varies progressively with true wind velocity from 30% Windward/Leeward, 70% Circular Random at 6 knots to 100% Circular Random at 12 knots and 20% Circular Random, 80% reach at 20 knots. It is intended for use only with Performance Curve or Performance Line Scoring.

Performance Line Scoring: A scoring scheme which approximates the full accuracy of Performance Curve Scoring, but does not require computer calculations, as the two given scoring factors (PLT & PLD) yield corrected times with simple multiplication and subtraction.

Triple-Number Scoring: The Triple-Number scoring system is a popular form of variable time-on-time scoring which is fully explained on page 72.

Full explanations of the IMS time allowances, scoring procedures and optional scoring software, including Performance Curve Scoring (PCS), are given in the ORC publication "IMS Race Guide".

101. Administration.

The sole authority for the International Measurement System is the Offshore Racing Congress and the Rule shall be maintained and administered at ORC discretion. The ORC may change or amend the IMS and any of its related rules from time to time and administer these through Rating Authorities as determined by the ORC. It is not possible for the Rules to cover every eventuality nor to anticipate every innovation in design and construction. The Congress therefore reserves the right to refuse rating or to award such rating as it considers appropriate and to interpret clauses of the Rules at any time. The ORC Chief Measurer may at any time issue interpretations (only) of the IMS and Measurement Rules and any such interpretations shall be published and then deemed final unless and until overruled by the Management Committee of the Congress. Changes to a rule may be approved by Congress by electronic vote.

The substance of any design feature or innovations presented for measurement or interpretation shall be made available to any person on request.

102. Rating Certificates.

Rating Certificates may be issued by the ORC or designated Rating Authorities with the recognition of the ORC using ORC certified computer software. A levy as determined by the ORC shall be paid for all Certificates issued.

1. The measurer shall report to his Rating Authority anything which he considers to be unusual or to be against the general interest of the IMS. The Rating Authority may withhold the certificate pending an examination of the case and issue a certificate if approval is subsequently obtained from the O.R.C.

2. To be valid the certificate must bear the name or stamp of the ORC or Rating Authority. The Rating Authority for the continuing maintenance and revalidation of the certificate shall be that for the area in which the yacht is normally stationed and shall be identified on the certificate as Revalidating Authority. When certificates are issued by other Rating Authorities, they shall immediately forward copies to the Revalidating Authority identified on the certificate. No yacht shall have more than one valid IMS rating certificate at any one time.

3. A rating certificate is automatically invalidated by a change of ownership or a change (see for example 303) to the yacht. These changes must be notified immediately to the yacht's Revalidating Authority or to the Rating Authority of the area in which waters the yacht is lying, as appropriate. This Authority shall withdraw, and may re-issue, the Certificate.

4. When the appropriate Authority, as in 3 above, has reasonable evidence that, whether or not by her own fault, a yacht does not conform to her Certificate, or that she should never have received a certificate, it shall withdraw the Certificate, subject to the provisions below, and may check the measurements of the yacht and correct the Certificate as required and may re-issue it.

   a) When the yacht is not under the jurisdiction of a race committee, the Authority may withdraw the Certificate, and shall inform the owner or his representative in writing of the reasons for this withdrawal.

   b) When the Authority intends to withdraw a Certificate while the yacht is under the jurisdiction of a race committee, it shall report the matter to the race committee which shall then proceed under the RRS.

5. Rating Certificates shall be of the form shown in Appendix 1.

6. The Measurement Inventory (see Appendix 2) shall become part of the rating certificate. The original shall be held by the Revalidating Authority and a photo-copy countersigned by the Revalidating Authority shall be returned to the owner as page 2 of the rating certificate.

7. It shall remain in force until the yacht is re-measured afloat and shall be identified with page 1 of the current certificate by the Measurement Inventory Date on page 1. Upon change of ownership the new owner shall, in the presence of a measurer, check the fixed weights, ballast, engine and other items listed on the Measurement Inventory. The yacht need NOT be put in measurement trim. Upon satisfactory completion of the check, a photocopy of the original shall be endorsed:

   REVIEWED ON CHANGE OF OWNERSHIP

   Signed: ..... Owner. ..... Measurer. Date..../..../....

   Upon receipt of an endorsed inventory the Revalidating Authority may issue a revalidated certificate.

8. A copy of the current Rating Certificate shall always be on board the yacht.

9. The period of validity of the certificate shall be at the discretion of the Revalidating Authority but shall not exceed one year. The certificate is required to be revalidated annually by written application from the owner to the Revalidating Authority. The Revalidating Authority must be satisfied that no change has been made to the yacht in any of the rule parameters and if not so satisfied, shall order any appropriate re-measurement.

10. The Revalidating Authority shall supply a copy of any rating certificate to any person on payment of a copying charge.

103. Certificate Types.

1. Full Measurement.

IMS Certificates issued on the basis of full IMS measurement shall bear the notation "BASED ON FULL MEASUREMENT" at the top of the certificate.

2. Club Measurement.

The IMS Club Measurement programme has been replaced by the ***ORC Club*** programme as provided in the separate ***ORC Club*** rule booklet. In any instance where certificates are issued under the ***ORC Club*** rules, but still issued in the former IMS Club format, the following shall apply.

a) Except for One-Design certificates, any certificate which is based on less than full IMS measurement shall bear the notation, BASED ON CLUB MEASUREMENT.

b) If the inclining test has been performed for any yacht requesting an IMS Club Certificate, the certificate shall be issued on the basis of the resulting inclining test measurements.

c) A yacht which in fact has full and current IMS measurement shall not be issued a certificate designated as based on IMS Club Measurement.

3. One Design Measurement.

IMS Certificates issued on the basis of one-design rules corresponding to the provisions of Part 9, Procedures for IMS One-Design Status, shall bear the notation "BASED ON ONE DESIGN RULES" at the top of the certificate.

104. Standard Hulls.

Where a number of hulls of the same model are built in GRP using the same moulds, it is desirable that certificates for unmodified sister hulls of the model be produced from a standard hull data file, making additional field measurements of identical hulls unnecessary. Provided that the Rating Authority is satisfied that the hulls are moulded to close tolerances, a single standard offset file should be used for the certificate processing of qualified sister hulls. Where the construction method may give rise to variation in the height of hull freeboard points, before a standard offset file is issued, the Rating Authority shall be satisfied that hulls are manufactured in a way that minimises such possible variations.

105. Measurement -- General.

The term "measurement" shall be taken to include also identification as to type, category, number, material, construction, etc. as may be determined by examination or declaration.

Only Certified Measurers appointed by the ORC or, with the approval of the ORC, by the Rating Authority shall measure a yacht for rating. A Measurer shall not measure a yacht of another Rating Authority without the permission of that Authority. The Measurer shall maintain records of all notes, sketches and worksheets used in preparing the measurement input submitted to the Rating Office.

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. In considering measurement procedures, measurement equipment and dimensions or points measured, the Measurer shall follow only that advice issued by and through the authority of the ORC Measurement Administration and not advice from any other party.

Subject to the practical constraints of approved measurement equipment, measurements required under the IMS are intended to fairly represent the actual characteristics of the yacht as they may relate to performance. It is a general principle of measurement under this Rule that measurements shall not be taken to points "artificially" or otherwise shaped to misrepresent performance related characteristics or geometry of the yacht (see also 208.1). In cases of doubt, measurements may be taken so as to produce the least favorable ratings.

106. Units of Measurement.

Measurements, unless otherwise specified, shall be taken and recorded to the nearest value as follows:

Where measurement is in the metric system dimensions, including headboards and battens, shall be in meters to three places of decimals except that dimensions of sails shall be to two places of decimals. Weights shall be in kilograms to one place of decimals. In the imperial system, dimensions of sails shall be taken in feet to one place of decimals. All other measurements shall be in feet to two places of decimals. Weights shall be measured in pounds. Constants or dimensions given in the text or formulae shall be converted in accordance with the appropriate alternatives printed in the Rule. Measurements shall be taken from the yacht wherever practicable but where this is unduly difficult the Chief Measurer may approve the use of plans or other such sources of information as he considers reliable.

Intermediate stages of calculation shall use the full capacity of the computer to run out decimal places. The printout on the rating certificate shall be rounded to a suitable number of decimal places, but the full value will be carried forward into subsequent calculations.

107. Endorsement of Plan Approval.

Where the yacht has received plan approval (ORC Special Regulations 3.1) the owner shall be responsible for providing the Revalidation Authority with a copy of the Plan Approval Certificate. The Rating Certificate shall then be endorsed in the section provided.

108. 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 yacht was launched at an earlier date, completed and equipped for sailing.

2. **Series Date**. A Rating Authority may authorize a Series Date, being earlier than the age date, for an unmodified series-produced yacht if it is satisfied that the yachts of the series are built to close tolerances in moulds or jigs (see also 104, Standard Hulls). The Series Date shall be the Age Date of the earliest yacht of the series. Series Dates shall be based on boats of a series built in the production moulds or jigs and not on prototypes which were not built in the same moulds or jigs. Rating Authorities are entitled to modify the Series Date as a result of a boat being modified from the original model, or conversely built on an older design.

3. **Hull Modifications.** Hull modifications shall require plan review by the Revalidation Authority and hull remeasurement. 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:

   - Change outside the canoe body.
   - Fairing of new appendages.
   - Removal of bumps outside the canoe body outer skin.
   - Filling of hollows (e.g., in the IOR after girth 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 yacht the boundaries of the proposed changes before and after the work.

   The canoe body shall be defined as the hull surface of the yacht, including transom, continued to the centerline tangentially from the point of final inflection into the keel and skeg.

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

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

6. **Issued Date.** Issued Date shall be the date that the current certificate was issued from the Rating Office.

PART 2 - GENERAL LIMITS AND EXCLUSIONS

201. IMS Regulations.

Unless otherwise prescribed by the Sailing Instructions, the IMS Regulations shall apply to races conducted under the IMS. Where the owner has filed an Accommodation Certificate with the Rating Office, the Rating Certificate shall be endorsed as to Racing or Cruiser/Racer Division.

202. Size/Rating Limits.

1. The recommended limit of rated performance is the ILC Maxi overall ILC Limit (ILC WEIGHTED AVERAGE) as current for the year of the start of the event.

2. No minimum size for yachts to be rated under IMS is presently specified.

203. Rig.

1. No yacht shall be rated under IMS if the upper end of any rigging is attached to the mast below a point 0.225*IG above the sheerline (see 802), except that there may be a temporary support to the mast near the spinnaker pole when the spinnaker is set.

2. No yacht shall be rated under IMS if P+BAS is less than the greater of 0.96*IG or 0.96*ISP.

3. Deleted Paragraph

4. Not withstanding provisions of the IMS Regulations, no yacht shall be rated under IMS 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 in (a) and (b) below.

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

   b) only provided the mast is substantially of carbon in section throughout its entire length, then for masts (including integral mouldings, such as tangs) and, when fitted to carbon masts, spreaders, jumper, carbon fiber non-sandwich reinforced plastic is permitted. Mast construction is considered as “sandwich” where in any point of the structure there is a core of lighter materials between the fiber layers, the thickness of which exceeds the total thickness of the fibre reinforced laminate walls or the density of which is less than 300 kg/m^3.

5. 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.

6. Rotating masts are excluded for yachts measured under the Rule. Masts shall be structurally continuous (non-articulating) from the masthead to the step. Masts that are not stepped on the keel shall not be pivoted fore or aft while racing.

7. Forestay and Shrouds. To qualify for measurement under this rule, a yacht must be fitted with a bona-fide forestay. Forestay and shrouds shall be connected by conventional turnbuckles, toggles or link-plates. The mast may be steadied to balance a slacked off backstay only by use of a headsail halyard and its proper winch.

8. A device for measuring jibstay tension is permitted provided that it is incapable of adjusting the stay and has a possible movement of no more than 5mm.

9. Roach, slab or flattening reefs are permitted along the foot only. Mainsails and mizzens, provided that they have no battens and can be completely roller furled along the luff, may be roller reefed along the luff. Cunningham holes are permitted.

10. Double luffed sails (those with thick or wrap-around luffs, not spinnakers) are not permitted except as specifically permitted by Rule 812.6.

204. Appendages.

Note: See also IMS Appendix 10 exclusion for yachts rated with water ballast or canting keel.

1. There is no provision in this system for rating yachts fitted with foils, appendages, etc. other than a midline keel, solid in profile, (which may have an end plate or wings), midline centerboard(s), a skeg, a normal rigid-surface rudder or off-midline, coupled, non-retractable twin rudders, a bona fide propeller installation and the usual instrument transducers. Yachts having any other appendages will not be rated under IMS. Trim tabs are permitted only if locked and not used whilst racing.

2. There is no provision in this system for rating yachts fitted with any but normal centerboards moving up or down either in a straight line or around a single fixed pivot. Excluded are:

   a) Centerboards arranged for fore and aft motion except the motion resulting from conventional pivoting around a pin located in the conventional position.

   b) Centerboard openings or slots arranged to cause or permit angular motion of the centerboard in a sense to alter the angle of attack while sailing and any other schemes for achieving the same result.

   c) Conventional flexible centerboard slot fairing closures are permitted.

3. Conventional flexible fairings over the rudderpost are permitted.

205. Stability.

1. Limit of Positive Stability (LPS): A yacht shall not be issued a valid IMS certificate if her IMS upper Limit of Positive Stability is less than 103.0 degrees.

2. Stability Index: As provided under IMS Regulations 201, a yacht's eligibility for entry in IMS races of ORC Special Regulations Categories 0, 1 or 2 may be limited on the basis of her Stability Index as noted in the "Limits and Regulations" section of her IMS Rating Certificate (see Appx 1). Stability Index is calculated as follows.

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

   Where, in imperial units:

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

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

3. Ballast-Leeward Recovery Index (BLRI): For a yacht incorporating water ballast or a canting keel (see Appx. 10), eligibility for entry in IMS races of Special Regulations Categories 0, 1 or 2 may be limited on the basis of Ballast-Leeward Recovery Index (the value of BLRI on the Rating Certificate) as recommended below.

   a) The BLR Index represents such a yacht's relative ability to recover from a knock down with sails aback, i.e., knocked down with all water ballast or canting keel to leeward. BLR Index is calculated as follows:

      BLR Index = (RA90*DSPS/(2*SA*CE))*0.333 + 0.5

      Where, in metric units:

      RA90 is the righting arm, 90 degrees heel, IMS Sailing Trim.

      DSPS is the IMS Displacement in Sailing Trim.

      SA is the geometric area of the IMS rated sailplan, i.e., mainsail and foretriangle.

      CE is the Center of Effort of the IMS rated sailplan, i.e., mainsail and foretriangle.

      (all taken with full leeward cant or leeward ballast tankage full, windward empty)

   b) The Limits for minimum BLR Index are specified according to Special Regulations Race Category (0, 1 & 2) and vary with IMS sailing length in Sailing Trim, "LSM1" (see IMS 518). They are therefore displayed on the Certificate as SRCat0 Minimum and SRCat1&2 Minimum. The limits are calculated as follows.

      SR Category 0: Minimum = 0.90 + 0.007*(LSM1 - 5)

      SR Categories 1 & 2: Minimum = 0.75 + 0.007*(LSM1 - 5)

206. Speed Under Power.

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

207. Hull Type.

This rule is intended to be used for the rating of monohull yachts only. Hulls in which the canoe body depth in any section decreases towards the center line shall not be rated under this rule.

208. Weights and Ballast.

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. No yacht shall be rated under IMS if any material having a density greater than that of lead is used as ballast in any form or location on or within the yacht.

209. Stanchion Bases.

Stanchion bases shall not be situated outboard of the edge of the working deck (see 510).

210. Hull Surfaces.

No yacht shall be measured, rated or raced under this rule that has a specially textured surface on the hull and/or appendages the purpose of which is, or could be, to reduce drag.

PART 3 - OWNER'S RESPONSIBILITIES

301. Owner's Signature.

Before any certificate under this rule is valid it must be signed by the owner of the yacht. The name of the individual who signs the Certificate shall also be printed on the Certificate. By this signature the owner signifies that he or she understands the owner's responsibilities under all parts of the IMS Rule, a copy of which shall be aboard while racing.

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

When the person in charge of the yacht while racing is not the owner, he shall be equally responsible for compliance.

Owner's responsibilities are divided into three categories.

- Owner's responsibilities prior to and during measurement.
- Owner's responsibilities after measurement.
- Owner's responsibilities whilst racing.

302. Owner's Responsibilities: Measurement.

The owner is responsible for arranging measurement with the ORC Rating Authority for the country in which his yacht is presently stationed.

1. Measurement Ashore.

   a) He shall present the yacht for measurement ashore in an accessible location, clear of obstructions, properly chocked and leveled (see 401 for details).

   b) If the yacht is of a class for which standard hull measurements are available, hull measurement may not be required. The owner 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 yacht. The owner shall make the yacht available ashore for the checking of any measurements that the measurer may require.

2. Measurement Afloat.

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

   b) He is responsible for preparing the yacht in measurement trim as specified in 402.2. He shall declare to the measurer the weight and location of all ballast, except that contained in the external keel or centerboard, and all other items mentioned in 402.2(h). He shall, together with the measurer, complete and initial the Measurement Inventory and Check List (See Appendix 2).

   c) If the yacht has portable tanks he shall declare their size and intended location.

   d) If the yacht is fitted with a drop keel and/or a movable appendage which is to be locked for measurement and racing under 512.3, the owner 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 yacht is not racing the device must be of a form that will positively locate and retain the keel in one predetermined position.

3. Sail Areas.

   The owner is responsible for declaring to the measurer all spars and sails that he proposes to carry on the yacht and the location in which he proposes to set them, so that they may be properly measured.

4. Hull Construction and Spar Material.

   The owner is responsible for declaring to the measurer the type of hull construction and material of which the hull and spars are built.

303. Owner's Responsibilities after Measurement.

1. It is the owner's responsibility to declare to the rating authority any changes made to the yacht, its rig, or its equipment which could change any of its measurements under the rule (see 102.3). 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 affect the trim or flotation of the yacht.

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

   f) The owner shall be responsible for ensuring that all mainsails all spinnakers, and all jibs with battens or with LPG greater than 1.1*J bear the official ORC sail stamp and are marked by the Measurer as required under 801.2. He shall also be responsible for ensuring that the sails and these marked dimensions do not contravene the values stated or permitted for them on the Rating Certificate.

   g) Changes to the shape of the yacht's hull and/or appendages. Note that changes to the hull may cause the yacht to lose the benefits of age protected concessions under the rules (See 108).

   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 724) including hull, deck and appendage construction, spars, accommodation and rig configuration, etc.

2. One-Design Rating. Where a yacht has a One-Design Rating (see Part 9) it is the owner's responsibility to ensure that the yacht is at all times maintained within the class rules. The class rules shall, together with the usual Measurement Inventory, be considered as part of Page 2 of the IMS Rating Certificate and shall always be aboard the yacht. Should any changes be made to the yacht that are not permitted within the class rules the owner shall inform the Rating Authority and the IMS Rating Certificate becomes invalid immediately.

304. Owner's Responsibilities while Racing.

The owner is responsible for ensuring that the IMS Rule Book is aboard the yacht and that all members of the crew fully understand and comply with the limitations which apply whilst racing.

Sails shall only be set in those areas declared for measurement, and no sail shall be carried on board that exceeds the limiting dimensions for such a sail as shown on the rating certificate, nor is of a shape or has features not permitted by the rule.

305. Restrictions on Masts.

1. Movement of mast at deck and step. Altering the location of the mast at the step or deck whilst racing is not permitted. However, a natural movement of the mast at the deck not exceeding 10 per cent of the greatest fore and aft or transverse dimension of the mast at that point is permitted.

2. Adjustment of Rigging. Adjustment of rigging whilst racing is not permitted except as specifically set forth below.Otherwise all means of adjustment must be positively locked and/or bound up to prevent accidental adjustment whilst racing. The following adjustment is permitted while racing except where an element of rigging has been declared not adjustable for rating purposes:

   a) For purposes of safety, i.e. an exceptional adjustment of a stay to cure a fault.

   b) Where a mast is rigged with all spreaders clearly swept aft, the forestay of that mast may be adjusted, but if it is, no stays abaft that mast may be adjustable.

   c) Inner forestays attached to the foremost mast between 0.225*IG and 0.75*IG above the sheerline.

   d) Main backstays.

   e) Runner backstays.

   f) Mizzen backstays.

306. Restrictions on setting and Sheeting of Jibs.

1. Tack Points of Jibs.

   a) When a jib is set under a spinnaker or inside another jib, it shall not be tacked in such a position that, if the sail were trimmed flat along a parallel to the center line of the yacht, its clew would fall abaft the LP line (see b below).

   b) The LP line is defined as a line abaft and parallel to the foremost headstay and separated from it by the dimension of LP printed on the Rating Certificate. The foremost headstay is defined as the line joining the upper measurement point of IG and the forward measurement point of J.

   c) If a jib is set under or abaft another headsail, it shall not be so tacked that, if trimmed along a parallel to the center line of the yacht, more than 50 per cent of its area would fall abaft the foreside of the mast.

   d) No tack pennant greater than 0.762m (2.5 ft) may be used on a jib when set flying.

   e) No jib shall be so tacked that the forward end of any batten is aft of the center line of the mast.

2. Sheeting of Jibs.

   Jibs 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 coachroof, or to the main boom, within the measurement limits (see 808.2) or to the spinnaker pole when the pole is set on the opposite side from the main boom but may not be sheeted to any other spar or outrigger.

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

307. Restrictions on setting and Sheeting of Spinnakers.

1. Setting of spinnakers.

   a) Deleted Section.

   b) Spinnaker Pole. The outboard end of the spinnaker pole shall be used only on the windward side of the yacht (i.e. that opposite to the main boom). A spinnaker pole shall only be used with its inboard end attached to the mast (foremast if there is more than one mast).

   c) Notwithstanding failure to meet the definition of a spinnaker (see 816) a bona fide jib (see 812) for which the yacht has been measured 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

         or

      2. When all spinnakers aboard have been damaged beyond repair during the race.

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

   d) Battens shall not be used in spinnakers.

   e) Adjustable leech lines are not permitted in symmetric spinnakers.

   Where a measurement band is used as the upper end of SPS the center line of the pole at the mast may not be carried above this height except when actually gybing.

2. Sheeting of Spinnakers.

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

   b) A spinnaker may be sheeted to any part of the rail or deck or to the main boom, within the measurement limits (see 808.2), but to no other spar or outrigger.

   c) Struts, spools 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.

3. Tacking Spinnaker on Centerline

   Where the spinnaker configuration is classified as Asymmetric Tacked on Centerline (i.e., no pole allowed on board -- see 804.1b), the spinnaker shall be tacked as close as possible to the deck level or its forward extension and sheeted on the same side as the boom, except when when gybing or maneuvering. No means of moving the tack point upwards shall be permitted. A single tack pennant not longer than 0.762m (2.5 ft) may be used, but a pennant shall not be adjustable except for hoisting, lowering and gybing the spinnaker.

308. Restrictions on Setting and Sheeting of Mainsails.

Mainsails shall be either fully secured at the foot or fully loose footed and shall remain so whilst 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.

1. Spare Mainsails are not permitted to be carried on board.

2. Storm Trysails.

   These, as distinguished from loose-footed mainsails, must be materially smaller than a normal close-reefed mainsail and of a strength consistent with their purpose viz. use in extremely severe weather (see ORC Special Regulations 4.24(b). Aromatic polyamides and other high modulous fibers shall not be used in the storm trysail.

3. Headboard Carriages.

   These are permitted only if the sail is set and trimmed in a manner consistent with the way HB was measured (see 824).

309. Restrictions on Setting and Sheeting of Mizzen Staysail on Yawl or Ketch.

1. Sheet Leads. 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.

2. 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).

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

4. 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.

310. Halyard Messengers.

Halyard Messengers are permitted while racing.

311. Engine and Propeller.

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

312. 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 whilst racing. If for any reason such a device is removed during a race the owner shall declare the fact to the race committee on completion of the race.

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

Note: See also IMS Appendix 10 exclusion for yachts 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 Section 51 of the 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 shall be considered as ballast under this rule. Any liquid carried on board in excess of 2.5 litres of drinkable fluid per person per day of racing, in the tanks or in other containers, and any fuel in excess of the quantity needed to motor for 12 hours is not permitted. Race Organizers may waive this requirement by so specifying in the Notice of Race.

314. 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. One fuel tank normal for the installation shall, however, be operable if the yacht is to qualify for PIPA greater than 0.0. The condition of this tank shall be governed by Rule 402.2(i) at the time of measurement. Voids in the keel or any other appendage shall be declared at the time of measurement and shall be treated as tankage.

315. 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.

316. Energy Storage.

Other than bilge pumps, no device, unless permitted under RRS 52 Manual Power, may be used whilst racing which derives assistance from energy stored to do work.

317. Limit of Crew Weight.

Unless this rule is specifically exempted in the sailing instructions the owner shall be responsible for ensuring that the weight of the crew, weighed in light street clothes, on board the yacht for any race does not exceed the Maximum Crew Weight printed on the Rating Certificate.

PART 4 - 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.

401. Hull Measurement Ashore.

The hull and appendage measurements (Part 5) and propeller installation measurements (Part 6) shall be taken ashore with the yacht 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 yacht shall be presented for measurement ashore in an accessible location, clear of obstructions (see 2 below), properly and firmly chocked and leveled as above. The weight of the yacht 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 204.2(c) and 204.3, shall be in place.

2. A Hull Measuring Instrument (HMI) incorporating a tripod base will be set abeam the hull and relocated from station to station along the length of the hull, both port and starboard. At each station, a taut string (or two wires) will be extended from the HMI to the hull surface, recording measurement points from the deepest part of the hull or appendage up to the sheer line.

3. Clearance for the operation of the HMI 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.

402. Measurement Afloat.

Inclined stability and freeboards shall be measured on one occasion with the yacht afloat in measurement trim (see 2 below). Normally, the yacht's spinnaker pole(s) will be required for suspending the inclining weights (see Part 7) and a dinghy or raft must be available for use by the Measurer. The owner or the owner's Authorised Representative (see Measurement Inventory Form, Appx. 2) must be present for flotation measurement.

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.

2. Measurement Trim: The owner or his representative will put the yacht 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.

    a) The yacht shall be completed and equipped for sailing.

1. All standing rigging and related fittings used whilst racing will be attached in their normal positions. Running rigging forward of the mast and all halyards and lifts shall be taken to the foot of the mast and hauled tight. All other pieces of running rigging abaft the mast shall be taken to their aftermost position and hauled tight. 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, attached to a light messenger. A halyard may be used as a topping lift.
2. One set of sheets and guys and any running rigging not carried permanently on spars and other portable deck gear used in sailing the yacht shall be stowed abaft the mast on the cabin sole.

b) Booms shall be secured at the low points of P and PY, as the case may be. From 1/1/2002, no spinnaker pole shall be aboard while measuring freeboards. 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.

c) From 1 January 1986 no sails shall be aboard. Yachts measured prior to 1986 may have been measured with sails aboard as detailed in the International Offshore Rule (IOR), Appendix 7.

d) All mattresses, cushions, and pillows must be aboard during measurement and shall be stowed in their normal bunks. Safety gear, not to exceed the requirements of Offshore Special Regulatins Race Category 4, navigational and cooking equipment shall be aboard and all portable gear normally stowed aft of the foremost mast shall be in its normal position for racing. All portable gear normally stowed forward shall be placed abaft the foremost mast on the cabin sole for measurement, unless otherwise specified in this Rule.

e) No clothing, bedding, food, stores, dinghy, man-overboard pole or liferafts shall be on board.

f) Additional equipment on board during measurement shall be itemised in the Measurement Inventory.

g) The yacht's head shall not be depressed through lying to a mooring.

h) Ballast shall be fixed below the cabin sole, or as low as possible at any station and sealed to the hull structure to prevent movement. The yacht shall not be ballasted in such a manner as to induce list. Anchors and chain shall be secured in clearly marked stowage. Yachts shall be measured with at least one anchor. (Where a yacht has thereafter to carry any extra anchors to comply with sailing instructions those anchors shall be properly secured forward of the foremost mast whilst racing.) The batteries shall be secured in their proper stowage. The foregoing items shall be in, and not moved from, these stowages whilst racing except that the anchor and chain may be moved for the purpose of anchoring. The weights of these items and their distances from the stem will be recorded on the Measurement Inventory. (Where the height of the stowage is unusual it shall be noted.) Anchor rope shall not be forward of the foremost mast.

i) All tanks shall be empty at the time of measurement, except where the Measurer has authorized otherwise as follows. In the case of a yacht meeting the requirements of IMS Regulations Part 4 – Cruiser/Racer Division, where a fuel tank lies wholly aft of the main mast and not higher than the minimum required hard bottom height for a settee (see IMS Regulations 409.2), then to avoid having to pump the fuel to empty the tank, the tank may instead be filled and pressed up for measurement. In this case, the capacity of the tank and the type of fuel shall be recorded for the purpose of making an adjustment to the freeboard heights found under 402.3 below. Any such adjustment shall be made in increments of equal value to both FFM and FAM, reflecting the “sink” effect on Measurement Trim resulting from the weight of the fuel aboard.

The calculation shall be performed only by the Rating Office based on the weight required to sink the yacht 1mm (displayed as SINK on the Certificate). No adjustment shall be made in trim or measured Righting Moment. The fact that a tank was full, the fuel type, capacity and freeboard increment shall be recorded in the COMMENTS section of the Certificate.

j) Hydraulic systems including hydraulic tanks shall be full for measurement and shall remain full when racing.

k) Bilges and other areas where water may collect shall be dry. There must be no effort to artificially moisten decks, rig, equipment or gear.

l) No one shall be on board while flotation measurements are being taken.

m) 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 for measurement and the locking device shall be in place.

n) Painted measurement bands on masts and booms shall be in place.

o) If an outboard motor, where it is the yacht's engine, is to be carried when racing it SHALL BE provided with a proper locker and/or mounting bracket. It shall be in this stowage at the time of measurement and at all times when racing. This stowage shall not be such that the center of gravity of the motor is forward of the foremost mast on any yacht inclined or re-inclined after 1 JAN 1983. The condition of separate tankage shall be controlled by sub-para (i) above.

3. Freeboard Measurement: The vertical height above the waterplane of the port and starboard, fore and aft freeboards shall be separately measured to the Freeboard Points (see 506.2) recorded and permanently marked at the time of hull measurement ashore.

a) Freeboard Forward Measured (FFM) shall be recorded as the average of the respective port and starboard freeboards forward.

b) Freeboard Aft Measured (FAM) shall be recorded as the average of the respective port and starboard freeboards aft.

403. Sail and Rig Measurement.

All sails, 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 302.3, 304 & 305.2).

404. Painted Measurement Bands.

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

405. Pitch Gyradius.

Assessment of pitch gyradius (Part 7) requires measurement and/or the classification of various features of the yacht . Masts which qualify as carbon shall be measured for total rig weight and vertical center of gravity, prepared as specified under 725. Other elements of pitch gyradius require counting of spreaders, jumpers and runners, the classification of hull construction, rudder construction and accommodation. With regard to construction, owner or builder declarations will normally be accepted, but in cases of doubt, tests may be required.

PART 5 - HULL

501. Principle of Hull Measurement.

It is the principle of hull measurement under the IMS 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. Depending on the size of the yacht and the complexity of hull and appendage geometry, in the order of 700 measurement points may be recorded. It is considered an attribute of the system that the exact location of measurement points is, to a large degree, at the discretion of the Measurer and cannot be accurately anticipated (see also 105).

502. Hull Measurement Instrument (HMI) and Lines Processing.

Only hull measurement data obtained and processed with an ORC approved Hull Measurement Instrument (HMI) and ORC certified software may be used to produce a valid IMS Certificate. The hull measurement data recorded in the field is rendered in the form of a Hull Offset File by means of approved ORC Rating Office software and operations which shall be taken as intrinsic to the hull measurement process, including editing of HMI field data files and, as authorized by the Rating Office in certain circumstances, the inclusion of manual measurements of limited modifications to hull or appendages. Both the HMI field data file and the Hull Offset File shall be permanently retained.

503. Hull Offset File.

The Hull Offset File as processed by the ORC Rating Office shall define the yacht's hull for the purpose of calculating a valid IMS Rating Certificate until such time as there may be a change to the actual hull (including appendages).

504. Remeasurement.

A hull which has been modified will normally require hull remeasurement. A hull which has not changed shall not be remeasured and processed except where the Rating Authority is satisfied that reasonable evidence of error exists. Where it is determined that there is sufficient evidence to undertake remeasurement to validate a yacht's certificate values, the following procedures shall be observed:

1. The yacht shall be set up in trim identical to that for the current measurement except where trim itself is deemed not to comply with measurement procedures, in which case trim shall be corrected.

2. Measurement station spacing shall be identical to that of the current measurement, except where a deficiency is identified in the spacing and/or location of stations in the current measurement. In this case, original station locations shall be fully replicated and any suspected deficiency rectified by adding stations to produce a comprehensive measurement file for evaluation and possible editing by the Rating Office.

3. Two measurers shall work together and the certificate produced on the basis of the new measurements shall replace the previous certificate, except as may be provided for scoring purposes under Appendix 5.

505. Machine Hull Measurement.

A hull shall be measured only when the Measurer is satisfied that it has been prepared in compliance with the requirements of 401.

The Measurer will follow the procedures for set-up and operation of the HMI for hull measurement as set forth in the respective HMI Measurement Manuals for the two approved instrument types.

1. Prior to commencing machine measurement the Measurer shall locate as accurately as possible the vertical centerplane of the hull, marking the centerline on the hull as may be appropriate for guiding the measurement process. The Freeboard Points as defined under 506 shall be established and permanently marked prior to machine measurement. These points shall be recorded exactly with the HMI.

2. The HMI shall be used to record measurement points defining the hull surface at each selected section from the previously identified centerline to the sheerline or highest point of any bulwark or intersection of the transom and topsides. Outboard rudders shall be included. Rubbing strakes, cove mouldings and hull fittings shall normally be ignored. The sheer points as defined under 508 shall be recorded.

3. As detailed in the HMI Measurement Manual(s), the machine shall be positioned such that all points recorded lie on a hull section normal to the centerline of the hull.

4. Points shall be recorded and sections shall be selected and spaced longitudinally as may be judged appropriate to define the varying geometry of the hull surface. The distance of each section from the forward end of LOA shall be recorded. Stations shall be recorded on both sides of the hull, not necessarily in the same hull section.

   In no case shall the distance between adjacent stations on the same side of the hull be greater than 0.10*LOA nor that between adjacent stations on opposite sides of the hull be greater than 0.05*LOA. For measurements from 1/1/01, within the forward 15% of LOA, between stations on opposite sides, spacing shall not be greater than 0.025*LOA.

5. Except at sections specified in the HMI Measurement Manual(s), stations will normally be selected in a sequence alternating between port and starboard sides of the hull. Exceptions are sections where “double stations” are required; i.e., there shall be recorded both port and starboard stations at exactly the same distance from the forward end of LOA at double stations.

6. Where hull measurement Validity Gauges are available, two shall be used, one placed forward, the other aft. They shall be placed plumb longitudinally and transversely, fixed securely to prevent any movement and shall remain in place throughout measurement. Double stations are required in way of Validity Gauges which, where possible, should be located at Freeboard Stations (see 506).

7. When submitting field hull measurement data, the Measurer shall include a schematic diagram of the hull profile including the stations recorded.

506. Freeboard Stations and Freeboard Points.

Freeboard stations shall be established forward and aft, in which stations shall be located the freeboard points to which the flotation freeboards, FFM and FAM, are referenced (see 402.3).

1. The forward freeboard station shall normally be established approximately 0.5m (1.5 ft) aft of the stem. The aft freeboard station shall normally be established at the aftermost section at which the hull could be girthed without crossing the transom.

2. Freeboard Points: At freeboard stations, freeboard points shall be established, normally at the sheer point, to provide unobstructed measurement of FFM and FAM. Where not located at the the sheer point, FFPV and/or AFPV (see c and d below) shall be recorded. Freeboard points shall be permanently marked for future flotation measurements as in 505.1 above.

   a) Stem to Forward Freeboard Points (SFFP): SFFP shall be the horizontal distance from the forward end of LOA to the station of the forward freeboard points.

   b) Stem to Aft Freeboard Points (SAFP): SAFP shall be the horizontal distance from the forward end of LOA to the station of the aft freeboard points.

   c) Forward Freeboard Point Vertical Offset (FFPV): FFPV shall be the vertical distance from the level of the sheer points in the forward freeboard station to the level of the freeboard points.

   d) Aft Freeboard Point Vertical Offset (AFPV): AFPV shall be the vertical distance from the level of the sheer points in the aft freeboard station to the level of the freeboard points.

507. Length Overall (LOA).

The length overall of a yacht will be measured to include the whole hull, but not spars or projections fixed to the hull such as chainplates, bowsprits, boomkins, pulpits, etc. It will be measured from:

1. A point forward being the forwardmost of the following points:

   a) The stem of the yacht, whether carried above the deck level or not.

   b) The bulwarks of the yacht where these are extended above the stem.

2. A point aft, being the extreme after end of the hull and bulwarks or taffrail of the yacht whether at, above, or below deck level. Rubbing strakes at the stern will be included. If rudder and/or push-pit extend abaft this point, neither one nor the other will be included.

508. Sheer Point.

The sheer point at any measurement station shall be defined by the following rules:

1. The sheer point shall normally be the lowest point on the topsides of the hull where a tangent at 45 degrees can be rested on the hull. The sheer point shall not, however, be taken to any point that is above the lowest level of the deck, or its extension where it intersects the topsides at that station. Where any bulwark or rubbing strake is fastened to the yacht, it shall be ignored in determining the sheer point.

2. Where any bulwark is a fair continuation of the line of the topsides of the yacht the sheer point shall be taken on the hull surface at the level of the lowest level of the deck at the station projected through the bulwark.

3. Where the sheer point at any measurement station, as defined above in .1 or .2, is more than 0.05*MB inboard of a vertical tangent to the hull at that station, the sheer point at that station will be at the point on the hull a distance of 0.05*MB inboard from the vertical tangent to the hull.

4. A bulwark shall be interpreted to mean any rail or part of the topsides extending above the lowest level of the deck at that station.

The level of the deck at any transverse station shall be taken to be the lowest level to which the yacht is rendered watertight at that station.

Abreast a well or cockpit the sheer point shall be taken to the bulwark provided that this bulwark is in all respects a fair continuation of the hull surface. The sheer line on the bulwark shall be a fair continuation of the sheer line forward and/or aft of a well or cockpit.

509. Sheer Line.

The sheer line is defined as the line passing through the sheer points defined above. The sheer line defined above will be used for all applicable references under the rule. In yachts where the transom slopes down and aft, the aft end of the sheer line shall be where the stern drops away from a straight edge placed upon the deck at the sheer line. A shallow step, notch or similar discontinuity designed to clarify the point at which the stern drops away may be incorporated for the purpose of locating the aft end of the sheerline.

510. Edge of the Working Deck.

The edge of the working deck is defined as the most outboard point on the deck at the sheerline.

511. Definitions of Keels.

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

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

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

3. Drop Keel. A yacht 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 yacht's total draft and where the total weight in air of such board(s) is equal to or more than 0.05*DSPM.

4. Wing Keels. A yacht shall be classified as wing keel (see also 528) if the width of the keel increases with increasing depth unless, in all sections, below the point at which the width starts to increase with increasing depth:

   a) The keel can be girthed without hollows below the point of maximum width.

   and

   b) A straight line connecting the outboard point on the lowest line of maximum width and a point on the centerline a distance equal to the maximum width above the point of maximum depth lies entirely within the keel.

512. Limitations on Centerboards

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.

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.

3. Any centerboard or drop keel which fails for any reason to fulfill the requirement of 512.1 and .2 above, or is to be fixed for any other purpose, shall be capable of being fixed in a predetermined position and shall be so fixed both for measurement and at all times when racing. A yacht with a centerboard or drop keel so fixed shall be classified and measured as a fixed keel yacht for rating purposes.

513. Measurement of Centerboards.

In yachts having a centerboard or drop keel, the following measurements are required in addition to the hull measurement.

1. Centerboard Extension (ECM). The Measured Extension of the Centerboard (ECM) shall be the vertical distance from the lowest point of the hull or fixed keel, whichever is deeper, to the lowest point of the centerboard in its fully lowered position. In the case of tandem centerline centerboards, ECM shall be taken for the centerboard that produces the greatest effective centerboard extension.

2. Keel-Centerboard Depth Adjustment (KCDA). Keel-Centerboard Depth Adjustment for keel or hull shape above a centerboard (KCDA) shall be the vertical distance from the lower measurement point for DHK to a point directly above the point of maximum thickness of the centerboard in its fully lowered position on a buttock line on the keel or hull offset 2.5 times the maximum thickness of the centerboard from the centerline.

3. Centerboard Weight (WCBA). WCBA shall be the weight of the centerboard or drop keel in air. Where there is more than one board the weight of the additional board shall be recorded as WCBB.

4. Centerboard Center of Gravity Drop (CBDA). CBDA shall be the vertical distance through which the center of gravity of the centreboard or drop keel can be lowered. When there is more than one board the figure for the additional board shall be recorded as CBDB.

5. Centerboard Chords. Three centerboard chords shall be measured horizontally with the centerboard in the same position as that in which ECM was determined.
   a) Centerboard Root Chord (CBRC). CBRC shall be taken at the upper measurement point of ECM.
   b) Centerboard Mid Chord (CBMC). CBMC shall be taken at 0.50*ECM below the upper measurement point of ECM.
   c) Centerboard Tip Chord (CBTC). CBTC shall be taken at 0.85*ECM below the upper measurement point of ECM.

HYDROSTATIC DERIVATIONS

Note: To the degree that units of measure are relevant to the mathematical expressions in this section, formulae are based on constants in imperial units.

514. Lines Processing Program (LPP) and Velocity Prediction Program (VPP).

Time allowances (handicaps, ratings) displayed on IMS Rating Certificates are calculated by a series of ORC certified computer programs distributed to ORC Rating Offices. The fundamental rating programs are the LPP, which primarily calculates hydrostatics, and the VPP, which primarily determines, based on measurement input, optimum sailing speeds for a yacht at various true wind angles and true wind velocities. The formulae of the LPP and VPP are extensive and no attempt is made herein to document all details. The full statement of the IMS Rule speed prediction and time allowance formulae is the VPP itself.

The ORC makes the LPP and VPP available as a software package to designers and others for an annual subscription fee. The ORC Office should be contacted for subscription details.

The LPP accepts processed data in the form of a set of hull offsets obtained from measuring machine encoded data. It also accepts flotation measurements and inclining experiment data. From these, it calculates all hull characteristics required by the VPP. The heart of the LPP is a hydrostatic program that calculates, for example, displacement, the yacht's vertical center of gravity (see Part 7), sailing length, wetted surface, beam/depth ratio, etc.

515. Measurement Trim.

The yacht is measured afloat in a convenient location according to the rules for condition of loading as set forth in 402.2 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 by the LPP from converting flotation at local SG to a normalised flotation at an SG equal to 1.02528 (nominal seawater). Thus, all hydrostatic calculations for rating purposes derive from the plane of flotation in nominal seawater.

516. Sailing Trim.

Sailing Trim shall be the plane of flotation derived from Measurement Trim by the addition of weight to represent a crew and a practical minimum of gear (see 712 - 723). For flotation measurements on or after 1 January 1986, an addition shall be made to represent the weight of the sails (see also 402.2(c).

517. Height of Base of I (HBI).

Height of Base of I is the calculated freeboard in Sailing Trim at the base of IG and is used to establish the height of the center of effort of the sailplan.

518. The Sailing Length (L).

The Sailing Length (L) is an effective sailing length which takes into account the hull form at the ends of the yacht, both above and below the plane of flotation in Sailing Trim. L is a weighted average of lengths for three conditions of flotation: two with the yacht upright and one with the yacht heeled. The upright condition (LSM1) is for the yacht floating in Sailing Trim. The heeled condition (LSM2) is for the yacht at an angle of heel 2 degrees) at Sailing Trim displacement. The "sunk" condition (LSM4), as defined under 519, approximates trim at speed with the hull in the trough between bow and stern waves. L is taken into account by the Velocity Prediction Program in determining hull resistance.

Formula for Sailing Length (L): $L = .3194*(LSM1 + LSM2 + LSM4)$

519. Second Moment Length (LSM).

The lengths for the three conditions of flotation from which L is calculated are second moment lengths derived from immersed sectional areas attenuated for depth and adjusted for appendages. A sectional area curve that does not come to zero in a regular way forward of the aftermost measured section will have a triangular volume appended to extrapolate the curve to zero. The length of the appended volume ("tail") equals the square root of twice the measured sectional area attenuated for depth of the last measured station (or last measured canoe body station for canoe body LSMs). In sunk condition (LSM4), trial tails are put on all stations in the aft quarter of the boat and the one that produces the longest LSM is used. To emphasise the character of the hull shape toward the ends the second moment of the square root of the sectional area curve is used instead of a simple sectional area curve. To emphasise the character of the hull shape close to the line of flotation the immersed sectional areas are

attenuated for depth. The LPP calculates LSMs taken from the canoe body without appendages and from the full hull with appendages. The final LSM0, 1, 2 , 3, and 4 (used to calculate IMS L as above) are the averages of full hull and canoe body LSMs.

The second moment lengths are:

LSM0 is for the yacht in Measurement Trim floating upright.

LSM1 is for the yacht in Sailing Trim floating upright.

LSM2 is for the yacht in Sailing Trim floating with 2 degrees heel.

LSM3 is for the yacht in Sailing Trim floating with 25 degrees heel.

LSM4 is for the yacht in a deep condition such that compared to Sailing Trim it is sunk 0.025*LSM1 forward and 0.0375*LSM1 aft, floating upright.

Formula for Second Moment Lengths (LSM), (where s is an element of sectional area attenuated for depth and x is length in the fore and aft direction):

LSM = 3.932*((∫x^2*s^0.25dx)/(∫s^0.25 dx)-((∫x*s^0.25 dx)/(∫s^0.25 dx))^2)^0.5

520. The Beam Depth Ratio (BTR).

The Beam Depth Ratio shall be the effective beam (B) divided by the effective hull depth (T). The canoe body BTR is taken into account by the Velocity Prediction Program in determining residual hull resistance.

Formula for Beam Depth Ratio (BTR):
BTR = B/T

521. The Effective Beam (B).

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

Formula for Effective Beam (B), (where b is an element of beam; e is the Naperian base, 2.7183; z is depth in the vertical direction; and x is length in the fore and aft direction):

B=3.45*((2.0/3.0*∫∫b^3*e^(-10z/LSM0) dzdx)/(∫∫b*e^(-10*z/LSM0) dzdx))^0.5

522. Effective Hull Depth (T).

Effective Hull Depth shall be a depth-related quantity for the largest immersed section of the hull. It is derived from the area of the largest immersed section attenuated with depth for the yacht in Sailing Trim floating upright (AMS2) divided by B.

Formula for Effective Hull Depth (T):
T = 2.07*(AMS2/B)

523. Maximum Section Areas.

Maximum section areas are used for the derivation of Effective Hull Depth (T).

Maximum Section Areas:

AMS1 is the area of the largest immersed section for the yacht in Sailing Trim floating upright.

AMS2 is the area of the largest immersed section attenuated with depth for the yacht in Sailing Trim floating upright.

Formulae for Maximum Section Areas, (where b is an element of beam; e is the Naperian base, 2.7183; and z is depth in the vertical direction):

AMS1 = maximum of $\int b\,dz$ over length

AMS2 = maximum of $\int b*e^{(-10*z/LSM0)}\,dz$ over length

524. Displacement (DSPM & DSPS).

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

525. Wetted Surface (WSM & WSS).

WSM and WSS are the area of the immersed hull surface in Measurement Trim and upright Sailing Trim respectively. The wetted surface of a centerboard is calculated by the trapezoidal rule using ECM, CBRC, CBMC and CBTC (see 513).

526. Aerodynamic Drag of Hull.

The aerodynamic drag of the hull is taken into account by the Velocity Prediction Program and for this purpose the effective projected area is taken as Effective Beam (B) times Freeboard Weighted Average (FBAV) multiplied by a fraction of the IMS beam, by LSM1 and by the sine of the apparent wind angle. FBAV shall be weighted as 0.625*FF + 0.375*FA and include the freeboards at all hull measurement stations. The freeboards for this purpose are taken from the Sailing Trim waterplane to the uppermost hull measurement point within the station, including any bulwarks. The heel angle and the crew on the rail are also taken into account in the calculation of aerodynamic drag.

527. Effective Keel Draft (D).

The Effective Draft (D) of a keel, centerboard, or keel- centerboard combination shall be its effective projection below the hull and shall be taken into account by the Velocity Prediction Program.

Formula for Effective Draft (D):
D = the greater of 0.92*TRMAX and 0.92*TRCB

528. 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.

Where a keel has been classified Wing Keel, the Effective Keel Draft (D) is adjusted by a Keel Endplate Depth Adjustment (KEDA) of not less than zero. The adjustment is based on two shape functions taking into account the span of the winglets, the draft at the point of maximum span and the maximum draft, DHK0. The VPP uses D to calculate induced drag due to keel side force.

529. Effective Hull Draft (DH).

The Effective Hull Draft (DH) is the depth of a section in the form of a half ellipse having the same area as the immersed sectional area below the Sailing Trim plane of flotation and a width/depth ratio equal to BTR.

530. Maximum Reduced Draft (TRMAX).

1. The Reduced Draft (TR) at any section over the length of the hull is calculated from the relationship between the local DH and the local DHK.

2. The Maximum Reduced Draft (TRMAX) is the maximum value of TR found over the length of the hull.

531. Draft.

1. The Draft of Hull Including Fixed Keel Adjusted (DHKA) is determined by the formula:

   DHKA=DHK-KCDA.

2. The Measured Extension of Centerboard Adjusted (ECMA) is determined by the formula:

   ECMA=ECM+KCDA.

3. Centerboard Effective Hull Draft (CBDH) is DH taken at a fore and aft location approximating that of the trailing edge of the centerboard in its fully lowered position.

4. The Effective Centerboard Extension (ECE) is ECMA modified by the relationship between ECMA, DHKA and CBDH. The formula for Effective Centerboard Extension (ECE), where tanh is the hyperbolic tangent:

   ECE=ECMA*tanh(0.5*(ECMA/(DHKA-CBDH))^0.5+0.2*(ECMA/(DHKA-CBDH))^2)

5. The Centerboard Reduced Draft (TRCB) is calculated in the same manner as TR from the relationship between CBDH and DHKA+ECE.

PART 6 - PROPELLER INSTALLATION

601. 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. For twin propeller installations, see 608.5.

Where a yacht does not comply with the requirements below, PIPA shall be set to 0.0.

1. The propulsion unit shall be an inboard engine and the yacht's speed capability shall comply with 206, Speed under Power.

2. The propeller shall at all times be ready for use and shall not be retracted, housed or shielded except by a conventional strut or aperture.

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

602. Propeller Types.

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.

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.

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.

603. Measurements Required for Propellers.

1. Propeller Diameter (PRD). PRD shall be the diameter of the propeller disc.

2. Propeller Hub Diameter (PHD). PHD shall be the smallest dimension through the shaft centerline of the projected area of the propeller hub.

3. Propeller Hub Length (PHL) PHL shall be the distance from the shaft end of the propeller hub to the intersection of the blade axis and shaft.

604. Installation Types.

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

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.

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. The measurements ST1 - ST4 recorded for a faired unit shall be those of the unit as manufactured. Where a unit does not qualify as above, all ST values except ST4 shall be set to 0.0. For qualified units, where ORC standard dimensions are provided, they shall be used in place of measurements.

3. Out of Aperture. All other propeller installations qualify as "out of aperture". Where the strut of an otherwise out of aperture installation is in the form of a molded housing, integral with the hull, enclosing essentially the full length of the shaft as well as the void between the shaft and the hull, the installation type shall be designated as “housed shaft” and the measurement prescriptions of 605 shall apply.

605. Out of Aperture.

1. Propeller Shaft Angle (PSA) PSA shall be the 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. This angle approximates the angle between the propeller installation's shaft axis and the water flow past it. 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.

2. Exposed Shaft Length (ESL). ESL shall be the 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 Hull 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. A pipe enclosing the shaft, that is indistinguishable from a shaft except for the fact that it does not rotate, shall not disqualify measurement of the shaft for ESL. If the shaft is not supported by a strut, positioned adjacent to the propeller hub, ESL shall be recorded as zero.

3. ST1. ST1 shall be the minimum projected thickness of the strut at any point between the hull and the shaft.

4. ST2. ST2 shall be the minimum width of the strut, (including the strut hub) measured parallel to the shaft.

5. ST3. ST3 shall be the maximum width of the strut, measured parallel to the shaft, not above a line 0.3*PRD above the shaft centreline.

6. Strut Hub Diameter (ST4). ST4 shall be the 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. Strut Clearance (ST5). ST5 shall be the 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.

8. Propeller Shaft Diameter (PSD). PSD shall be the minimum propeller shaft diameter exposed to water flow including that part of the shaft within the strut hub.

606. In Aperture.

1. Aperture Height (APH). APH shall be the maximum height of the aperture opening measured at right angles to the shaft line.

2. Aperture Widths (APT and APB). APT and APB shall be the 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.

607. Strut Drive.

1. Strut Drive Length (EDL). EDL shall be the distance, measured along and in prolongation of the propeller shaft, from the center of the propeller (defined in 605.2) to the aft edge of any other strut or fin (except the rudder blade) forward of the propeller. If any fairing or fin extension lies between the forward profile of the strut drive as manufactured and the forward measurement point of EDL, the advice of the ORC Chief Measurer shall be sought.

2. ST1. ST1 shall be the minimum projected thickness of the strut at any point between the hull and the shaft line (see also 604.2).

3. ST2. ST2 shall be the minimum width of the strut, (including the strut hub) measured parallel to the shaft (see also 604.2).

4. ST3. ST3 shall be the maximum width of the strut, measured parallel to the shaft, not above a line 0.3*PRD above the shaft centreline (see also 604.2).

5. Strut Drive Hub Diameter (ST4) ST4 shall be the smallest dimension through the shaft centerline of the projected area of the drive hub at its interface with the propeller hub (see also 604.2).

6. Strut Drive Clearance (ST5). ST5 shall be the 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.

608. Propeller Installation Projected Area (PIPA).

1. Installation Projected Area (IPA). For all propellers installed out of aperture and not on a strut drive, IPA shall be determined by the formula:

   IPA = (0.04+(sin(PSA))^3)*(PSD*(ESL-ST2-PHL)+ST4*(ST2+PHL))+0.03*(ST5-0.5*ST4)*ST1

   a) For a folding or feathering pusher propeller installed out of aperture PIPA shall be determined as follows:

      If the propeller is folding or two-bladed feathering:

      PIPA = IPA + 0.65*(0.9*PHD)^2

      If the propeller is feathering of three or more blades:

      PIPA = IPA + 0.70*(0.9*PHD)^2

For a folding propeller PHD shall not be taken greater than 3.5*PSD in the above.

For a feathering propeller PHD shall not be taken greater than 4.0*PSD in the above formulae.

b) For a solid pusher propeller installed out of aperture PIPA shall be determined by the formula:

If the solid propeller is two bladed:

PIPA = IPA + 0.10*(PRD)^2

If the solid propeller has 3 or more blades:

PIPA = IPA + 0.12*(PRD)^2

Note: Except for housed shaft installations (see 604.3), for any out of aperture installation, if ESL is less than PRD, PIPA shall be multiplied by 0.5.

2. For propellers of any type installed in an aperture PIPA shall be taken as the least of the values determined by the formulae:

PIPA = 0.07*(PRD)^2
PIPA = 0.07*(APT/.4)^2
PIPA = 0.07*(APH/1.125)^2
PIPA = 0.07*(APB/.4)^2

3. For strut drive propeller installations PIPA shall be determined as follows:

a) For a folding or a two-bladed feathering propeller:
PIPA = 0.06*ST1*(ST5-0.5*ST4)+0.40*(0.8*ST4)^2

b) For a feathering propeller of three or more blades:
PIPA = 0.06*ST1*(ST5-0.5*ST4)+0.42*(0.8*ST4)^2

c) For a solid two bladed propeller:
PIPA = 0.06*ST1*(ST5-0.5*ST4)+0.10*(PRD)^2

d) For a solid three or more bladed:
PIPA = 0.06*ST1*(ST5-0.5*ST4)+0.12*(PRD)^2

For the purpose of the strut drive calculations above, ST4 shall not be taken as greater than ST4MAX.

ST4MAX shall be taken as not less than 0.1 nor greater than the lesser of
(4*10^-5*L^3-0.0011*L^2+0.0125*L+0.05) or 0.2.

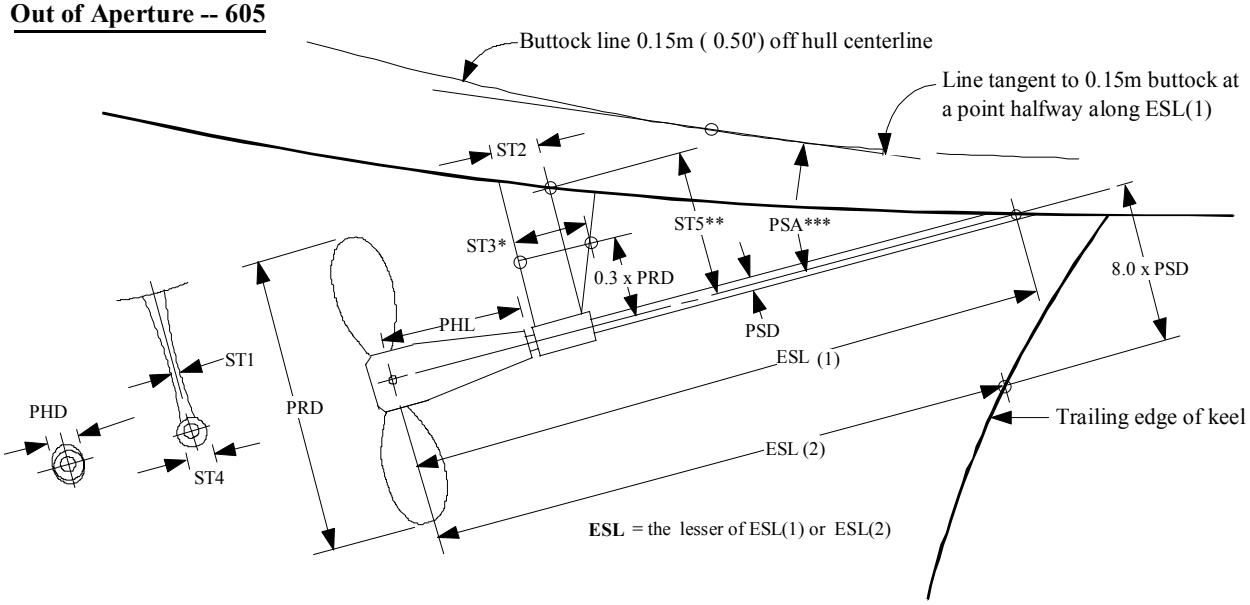
Note: For any strut drive, if EDL is less than 1.5 * PRD, PIPA shall be multiplied by 0.5.

4. For tractor propellers of any type installed out of aperture PIPA shall be zero.

5. The IMS has an input to signify twin propeller installations. If this is indicated, PIPA is doubled for any type of installation or propeller.

Propeller Installation Measurement

Out of Aperture -- 605



***ST3** is the maximum strut width measured parallel to the propeller shaft found not more than 0.3 x PRD above the shaft centerline.

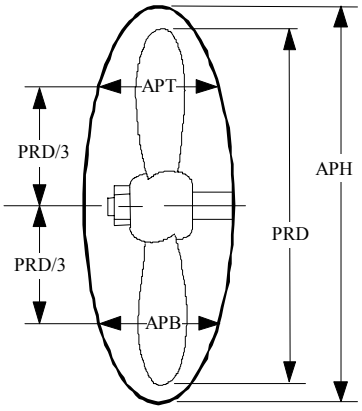
****ST5** is measured perpendicular to the shaft centerline from the hull to the shaft centerline at the forward end of ST2.

*****PSA** (Propeller Shaft Angle) may be measured in two steps:

1. Angle between shaft centerline and level datum line
2. Angle between buttock tangent line and level datum line

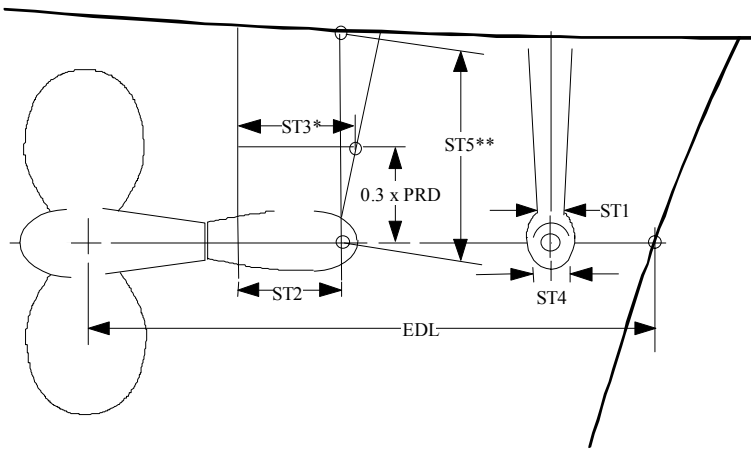
Add angles to arrive at PSA.

In Aperture -- 606



APT and **APB** are the maximum aperture widths measured parallel to the propeller shaft, found not less than PRD/3 above and below the shaft centerline.

Strut Drive -- 607



PART 7 - STABILITY AND PITCH GYRADIUS

701. Inclining Tests.

Inclining tests shall be made to determine the righting moment of the yacht. Except for inclining apparatus including spinnaker pole(s) as specified below the yacht shall be in measurement trim as detailed in 402.2. In the case of a yacht 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 yacht shall be inclined as detailed below:

1. A manometer, to the specification circulated to rating authorities, shall be positioned athwart the yacht where it can be read by the measurer, who shall be stationed off the yacht.

2. Two poles shall simultaneously be positioned port and starboard at the MB station (SMB from the stem) and suspended outboard to provide arms for supporting inclining weights. The poles shall be arranged normal to the yacht's centerline and as nearly horizontal as is possible but allowing sufficient clearance to prevent the weights touching the water. The poles shall be approximately SPL in length and the yacht's pole or poles shall normally be used when available. If a yacht's pole is not used it shall not be on board.

3. A set of weights shall be prepared (see 705). The weights shall be recorded in pounds when the yacht is measured in feet and in kilograms when the yacht is measured in meters. The weights shall be measured and recorded to a level of precision not less than 0.1 of a pound or 0.2 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.

4. When the poles are rigged and all the weights suspended on the starboard side the datum on the manometer shall be marked. Where an electronic inclinometer is used, the datum position may be recorded four times in succession.

5. The weights shall be transferred one by one to the port side, the measurer recording the weight transferred and the manometer reading in each case. As an alternative, all weights may be transferred at once to the port side, and the resulting angle recorded four times in succession.

6. All the weights shall be suspended on the starboard side once again and the datum on the manometer verified.

INCLINING MEASUREMENTS

702. 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 millimetres 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 ORC approved electronic inclinometer is used instead of a manometer, PLM is conventionally recorded as 9000; GSA and RSA as 1.0.

703. Weight Distance (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 MB+2.0*SPL.

704. Pendulum Deflections (PD1...PD4)

shall be the deflections on the manometer gauge after each weight of the set has been moved, from the datum established in 701.4 above. They shall be recorded in millimetres and shall be within the limits given in 705 below.

705. Weights (W1...W4)

shall be the total weight suspended from the port pole for each reading of the manometer. They shall be of suitable magnitude to ensure that:

a) the largest PD is within +/- 0.01*PL of 0.105*PL for yachts with LOA > 12.5 m and (from 1/1/98) +/-0.01*PL of 0.125*PL for yachts with LOA <= 12.5 m

and

b) the intermediate values are approximately equally spread over the range.

706. Deleted section.

RIGHTING MOMENT -- MEASUREMENT TRIM

707. Statistical Fit

The slope of a least squares fit straight line through the inclining weight vs. pendulum deflection is determined iteratively, plotting in turn each of the five possible combinations of four selected data points, as referenced to the fifth point. In the example below, the "datum" point is the reference.

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

SLOPE=(4.0*SUMXY-SUMY*SUMX) / (4.0*SUMXSQ-SUMX^2)

Of the five alternative plots, that yielding the fit with the highest correlation coefficient determines RM

708. Righting Moment (RM).

RM=WD*PL*0.0175/SLOPE

709. Righting Moment Corrected (RMC).

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

2. For movable boards or drop keels: RMC=RM+0.0175*(WCBA*CBDA+WCBB*CBDB)

RIGHTING MOMENT AND WEIGHTS -- SAILING TRIM

710. 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 Crew and Gear Weight (CGW), Mainsail Weight (MSW) and Other Sail Weight (OSW), if required, at their established centers of gravity (CGWV, CGWL, OSWV, OSWL, MSWV and MSWL).

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

These are the Sailing Trim righting moments at 2, 20, 40, 60 and 90 degrees of heel (with all crew on the yacht's centerline) divided by the heel angle in degrees (this is **not** the slope of the righting moment curve, except at 2 degrees). This division is done to keep the magnitude of the numbers reasonable. The VPP uses these to establish the righting moment vs. heel angle curve for the yacht. The VPP uses this curve to iteratively "sail" the boat, adding the effect of dynamic stability and augmenting stability by moving Crew Weight to the weather rail in those conditions of sailing for which the added stability improves performance.

712. Crew Weight (CW).

A maximum crew weight is calculated for each yacht. The owner may, by "owner declaration" (see 713), adjust his yacht's maximum allowed crew weight up or down within calculated limits. The LPP and VPP take this crew weight into account. Where no declaration of crew weight has been made, Base Crew Weight (BCW) used in the LPP/VPP and the maximum for racing, shall be a default value 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.

713. Declared Crew Weight.

Declared Crew Weight (DCW) shall not be taken as less than the greater of 555.0 lb. or 0.65 times the calculated default for the yacht. Nor shall DCW be taken as greater than 1.2* the calculated default. Yachts with DCW greater than default do not get credit for the extra crew being above the yacht's sailing trim VCG. These yachts will have sailing trim calculated with default crew weight, but the full DCW will be used in calculations that move crew onto the rail in optimising performance to sailing conditions.

714. Gear Weight (GW).

GW is determined by the formula: GW =.16*BCW

715. Crew and Gear Weight (CGW).

CGW is determined by the formula: CGW = CW + GW

716. Longitudinal Center of Gravity of Crew and Gear Weight (CGWL).

CGWL is taken as 0.10*LSMO abaft the longitudinal center of buoyancy in Measurement Trim.

717. Vertical Center of Gravity of Crew and Gear Weight (CGWV).

CGWV is taken as 0.05*LSMO+1.20ft above the Measurement Trim plane of flotation.

718. Mainsail Weight (MSW).

See 827 for Mainsail Weight measurement.

For mainsails measured prior to 1/1/88 that have never been weighed (hence MSW is zero):

Default MSW (lbs.) = 0.125*DSPM/64.

719. Longitudinal Center of Gravity of Mainsail Weight (MSWL).

MSWL is taken as 0.03*LSM0 ft. abaft the longitudinal center of buoyancy in measurement trim.

720. Vertical Center of Gravity of Mainsail Weight (MSWV).

1. For yachts inclined in 1/1/86 or later, MSWV is taken as 0.33*P+BAS+HBI above the Measurement Trim plane of flotation.

2. For yachts inclined prior to 1/1/86, the mainsail was on the boom during the inclining test and the yacht's VCG is adjusted to reflect hoisting it from that measured location; MSWV is taken as 0.33*P.

721. Weight of Other Sails (OSW).

OSW is determined by the formula: OSW(lbs) = 22.4*(0.1*LSM0)^2.

722. Longitudinal Center of Gravity of Other Sails (OSWL).

OSWL is taken as 0.095*LSMO ft. forward of the longitudinal center of buoyancy in Measurement Trim.

723. Vertical Center of Gravity of Other Sails (OSWV).

OSWV is taken as 0.012*LSMO- 1.05 ft above the Measurement Trim plane of flotation.

PITCH GYRADIUS

724. Elements of Pitch Gyradius.

The following elements of the pitch gyradius calculation shall be determined by examination of the yacht 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 IMS 302.4. Hull and deck construction shall be classified as one of the types below. Note that limited amounts of High Strength Carbon (see IMS Regulations Appendix I) edge capping of bona fide hull structural frames, girders and stringers, and as localized reinforcement on bulkhead faces in way of chainplate 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 kg/cu/m.

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. See IMS Regulations 203.1(d) for restrictions which may apply to the use of honeycomb.

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 yacht shall be classified as having Forward Accommodation which shall be recorded on the Certificate.

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

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

6. Number of Runners (Inner Backstays) and Adjustable Inner Forestays; see 810.2.

725. Rig Weight and Center of Gravity (required for carbon masts; optional for other masts).

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

2. The vertical center of gravity shall be determined relative to the lower measurement point of P and recorded as MCG.

3. 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.

4. The weight of the boom shall be separately recorded as WB.

5. All measurements above shall be taken with the components dry and the spars fitted only with components with which the yacht will actually race as specified below.

   a) The mast shall be completely rigged with standing rigging, running backstays, spreaders, jumpers, lights, antennae, wiring, luff groove device and all other permanently attached fittings, including those turnbuckles which are not permitted to be adjusted while racing.

b) Excluded for measurement shall be running rigging, 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.

c) 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.

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

6. Default Mast and Rigging Weight and VCG.

Default Mast Weight:
DMW = (((.00083*IG*(IG+HBI))+(.000382*IG*TML)))*(YP)^0.5 (lbs)

Default Mast VCG:
DMVCG = 0.415*(IG+P+BAS)/2 -BAS (ft) above BAS

Default Rigging Weight:
DRW = LRW+JRW (lbs)

Default Rigging VCG:
DRVCG = (0.372*IG*LRW+0.5*(P+BAS+0.85*IG)*JRW)/DRW - BAS (ft) above BAS.

Default Mast+Rigging Weight:
DMW+DRW (lbs)

Default Mast+Rigging VCG above BAS:
(DMW*DMVCG+DRW*DRVCG)/(DMW+DRW) (ft).

Where:

LRW (Lower Rigging Weight) = 0.000155*IG*YP (lbs)
JRW (Jumpers Rigging Weight) = 0.000027*(P+BAS-0.85*IG)*YP (lbs) (0 for masthead)
YP = (((RM25 * 25) + CARM * CW * cos(25°)) / (CP/2))
TML (Top Mast Length) = 0 on masthead and P + BAS - IG on fractional
RM25 = Righting Moment per degree at 25° heel
CARM = Crew Righting Arm
CW = Crew Weight
CP = Calculated Chainplate Width : Max(0.46 * J, 0.135 * IG)
"Masthead" is defined as an IG >= 0.95*(P + BAS).

726. Assessment of Pitch Gyradius.

The VPP assesses the added resistance of waves using a routine which takes heeled canoebody geometry (LSM1, LSM4, B, BTR, LCB, L/B and Longitudinal Center of Flotation), boat speed, true wind angle, the yacht's estimated pitch gyradius, and true wind strength as inputs and returns a resistance due to pitching in waves. The pitching resistance varies from zero at a 90 degree beam reach to full strength at 45 degrees off the true wind. The wave spectrum is implied according to the true wind speed as determined in the method used to handicap the race.

A base gyradius is taken as: GYRADIUS = 0.222 * (LOA + CANOEL) / 2, where:

CANOEL = 0.3194 * (2. * CANOELSM1 + YCANOELSM4)

Note: "CANOE" is the canoe body stripped of appendages.

Adjustments are made to the base gyradius according to the following recorded characteristics of the yacht.

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.

2. For a yacht measured afloat with a carbon mast prior to 15 November 1995, where MWT and MCG are not recorded, the base gyradius shall be adjusted by the Default Mast Gyradius Increment (DMGI) given by:

   DMGI = -0.005*(ML/L)^2.
   ML shall be taken as the greater of (IM+HBI) or (P+BAS+HBI)

3. Where MWT and MCG are not recorded, the number of spreader sets (including jumpers -- one or zero), adjustable inner forestays and running backstays (see 810.2(c)) are totaled. Gyradius is increased by 0.002*CANOEL multiplied times the number by which the above total is less than 6. This total is not taken less than zero.

4. If a yacht has a mizzen mast, Gyradius is increased by 0.002*CANOEL.

5. An adjustment is made for the classification of hull construction as follows.

SOLID:	0.016*CANOEL is added to Gyradius.
CORED:	0.008*CANOEL is added.
LIGHT:	No adjustment.
CARBON:	0.005*CANOEL is subtracted.
CARBON FOR C/R	0.010*CANOEL is subtracted.
HONEYCOMB:	0.006*CANOEL is subtracted where applicable in addition to adjustments listed above.

6. For each year the yacht's Age Date is less than 1989, 0.002*CANOEL is added to Gyradius, with a maximum addition of credit for 8 years (an Age Date prior to 1981 is taken as 1981).

7. If the yacht has Forward Accommodation, FWD ADJ = 0.004 (see 11 below).

8. If the yacht's rudder construction is carbon fiber, 0.003*CANOEL is subtracted from Gyradius.

9. If a yacht with grandfathered materials (see IMS Regulations 203) makes hull modifications resulting in a new Age Date (see 108.3), but retains any pre-existing prohibited materials,0.006*CANOEL is subtracted from Gyradius. This provision shall not apply to any materials prohibited under IMS Part 2, which are not allowed in any circumstance.

10. If the yacht complies with IMS Regulations Part 4, Cruiser/Racer Division Accommodation Regulations, C/R ADJ = 0.006 (see 11 below).

11. Any FWD ADJ (726.7 above) and any C/R ADJ (726.10 above) shall be added together and the sum reduced according to an indicator of performance potential, i.e., sail area / volume ratio. The resulting Accommodation Gyradius Increment is calculated as follows:

    ACC GYR INCR = (C/R ADJ + FWD ADJ) * ((0.6763 * L + 19.6926 – SA/VOL)/(0.2263 * L + 2.6926)).
    The term multiplying (C/R ADJ + FWD ADJ) shall be neither negative nor greater than 1.0.

    SA/VOL = (AREA MAIN + AREA GENOA) / (DSPS/1025)^0.66666.

    ACC GYR INCR * CANOEL is added to Gyradius.

PART 8 - RIG AND SAILS

801. General.

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.

1. Conflicts may exist between these rules and the Racing Rules of the I.S.A.F. and National Authorities; in such cases the IMS rules will govern, but when not in conflict, the rules of the I.S.A.F. shall be observed.

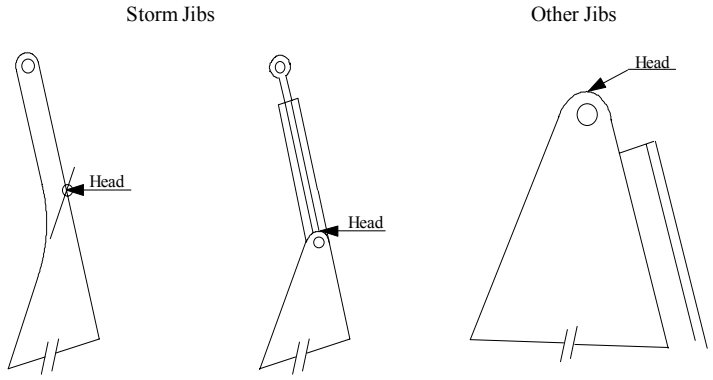
   In addition to the prescriptions herein, the measurement instructions and definitions of IMS Appendix 4, Sail Measurement, shall apply.

   Measurements of all sails required to be measured must be measured with such tension between measurement points as will remove all wrinkles across the line of measurement and must include the fabric length between measurement points.

   Any device or sail construction which, in the opinion of the Measurer, is used to artificially shorten a sail luff (e.g., JL, IMS 815) for measurement such as, but not limited to, nylon braid lightly seized to the luff independent of the bolt rope, is not permitted and shall be removed before measurement.

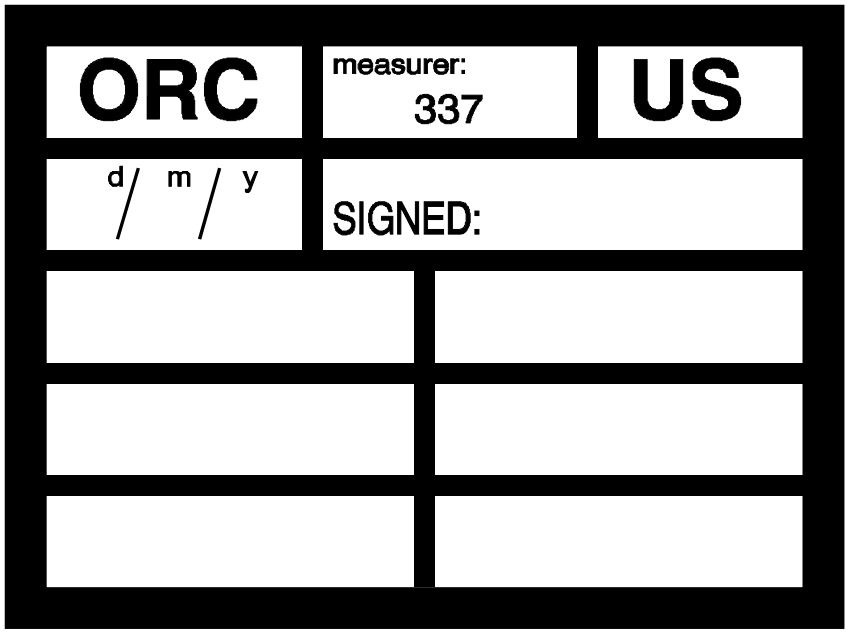
   Measurement points at the corner of a sail shall be the intersection of the adjacent sides projected except in the case of the head of a jib which shall be determined in accordance with the diagrams below. For jibs other than storm jibs, the head measurement point is the highest point of the sail. In the case of a storm jib the head measurement point is the lower of the highest point of the sail or the intersection of the adjacent sides projected. All other measurement points shall be at the extreme outside of rope, wire or fabric of the sail's edge.

   Measurement points at the heads of Jibs.



2. Measurement and Marking of Sails. All sails shall be available for measuring and those marked shall include all spinnakers, all mainsails and all jibs with LPG greater than 1.1*J (or the largest jib carried aboard if equal to or smaller than 1.1*J). The measurer shall mark the sails with an ORC approved stamp (See example below) issued by his Rating Authority, enter the measurements found, sign and date them.

ORC Sail Measurement Stamp



The dimensions to be recorded are:

Mainsails: HB, MGT, MGU, MGM, MGL, MSW
Jibs: LPG, JL, JR
Spinnakers -- Symmetric: SL, SMW, HBS, SF
Asymmetric: SLU, SLE, AMG, ASF

The Measurer shall not apply the ORC Sail Stamp to any sail which does not comply with the appropriate definitions and restrictions for that sail as set forth in Part 8.

802. Height of Deck.

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

FORETRIANGLE

803. Base of Foretriangle (J).

J shall be the actual foretriangle base measured horizontally from the foreside of the mast at its lowest point above the deck or coachroof to the center line of the foremost stay on which jibs are set (the center line of the luff if the foremost jib 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.

803.1 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).

804. Spinnaker Pole and Spinnaker Tack Point.

1. The yacht's spinnaker configuration shall be declared by the owner and recorded as one of three permitted types:
   a) Symmetrical spinnakers only, spinnaker pole allowed.
   b) Asymmetrical spinnaker, no spinnaker pole allowed aboard the yacht while racing, any spinnaker to be tacked only on the centerline of the yacht.
   c) Both asymmetric and symmetric spinnakers allowed, spinnaker poles allowed.

2. **Spinnaker Pole Length (SPL).** SPL shall be the length of the spinnaker pole when forced outboard in its fitting on the mast and set in a horizontal position athwartships, measured from the center line of the yacht to the extreme outboard end of the pole and any fittings used when a spinnaker is set.

3. **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 coachroof 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.

MAINMAST AND BOOM

805. Mast Measurements.

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

1. **Height of Genoa Halyard (IG).** IG shall be the genoa height measured from the point of attachment of the forestay to the mast structure, or the intersection of the center line of the forestay with the foreside of the mast where the point of attachment is internal, to the level of the deck as defined in 802.

2. **Height of Spinnaker Halyard (ISP).** 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 802.

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 thwartships 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 thwartships 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 thwartships 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 thwartship value found shall be substituted for MDT1 and the smallest fore and aft value found shall be substituted for MDL1, except that any *bono 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.

10. MDT1Y, MDL1Y, TLY, MDT2Y and MDL2Y shall be measured on mizzenmasts of yawls and ketches in the same manner as set forth in .5 to .9 above.

11. **Height of Spinnaker Pole (SPS).** SPS shall be the maximum height on the mast of the inboard end of the spinnaker pole above the sheerline abreast the mast. It shall be measured to the center line of the pole when set at the highest point on its track or to the underside of a painted measurement band on the mast. SPS is not permitted to exceed 0.27*ISP.

806. Mainsail Hoist (P).

P shall be the measured length of the hoist of a jib 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.

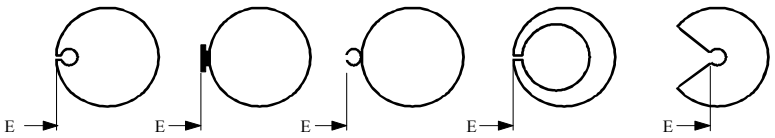
807. Boom above Sheerline (BAS).

BAS shall be the distance between the low point used in the determination of P and the level of the deck as defined in 802.

808. Foot of Mainsail.

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.).

809. 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.

810. Rigging Plan.

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

1. Forestay Tension Control.

a) Where the uppermost backstay is adjustable, this shall be recorded as “forestay adjustable aft”.

b) Alternatively, where the forestay itself is adjustable (see restrictions under 305.2(b)), this shall be recorded as “forestay adjustable forward”.

c) Where neither the uppermost backstay nor forestay itself is adjustable, this shall be recorded as “forestay fixed”.

2. Fore and Aft Stays Below the Uppermost Backstay.

a) Where there is an adjustable inner forestay, this shall be recorded as "inner forestay adjustable".

b) Where there is a permanent inner forestay which is only disconnected when gybing, this shall be recorded as "inner forestay fixed".

c) 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 724.6). A secondary runner tension adjuster, leading to the mast approximately perpendicular to the runner itself, shall not be counted.

3. 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.

HEADSAILS, DISTINCTIONS BETWEEN JIBS AND SPINNAKERS

811. Headsails.

1. The word headsail is defined as a sail set in the foretriangle. It can be either a spinnaker or a jib.

2. Distinction between Spinnakers and Jibs.

a) A sail shall not be measured as a spinnaker unless the mid girth is 75 per cent or more of the foot length.

b) No jib may have a mid girth measured between the mid point of the leech and the nearest point on the luff of more than 50 per cent of the LPG except when all rated headsails in the inventory have an LPG of 1.1*J or less (see 813.3).

DEFINITION OF JIBS

812. A jib is defined as any sail, other than a spinnaker, set in the foretriangle, subject to the following limitations:

1. Except as provided in 811.2 (b) and 813.3, in any jib the mid girth measured between the mid point of the leech and the nearest point on the luff shall not exceed 50 per cent of the LPG nor shall the length of intermediate girth at 25 per cent and 75 per cent of the leech from the head exceed values similarly proportional to their distance from the head.

2. The distance, measured on the surface of the sail, between the midpoint of the foot and the midpoint of the luff shall not exceed 0.55 of the length of the leech.

3. Except in non-overlapping self-tacking jibs no clewboards may be used in jibs.

4. No headboards may be used in jibs.

5. Except that battens are not permitted in jibs of LPG greater than 1.1*J, battens may be used in jibs only if the number of battens is limited to four, which must be arranged with approximately equal spacing between head and clew (see also 306.1(e).

6. Notwithstanding the restrictions of 203.10, a yacht may use:

   a) A double luff jib that wraps around the forestay and/or

   b) 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 814).

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

8. No jib shall have a JL (see 815) exceeding MXJL. (IG^2+J^2)^0.5. (Use IM if IG=0.0).

9. Aromatic polyamides, carbon fibres and other high modulous fibres shall not be used in the storm jib.

10. No jib shall have an LPG greater than the value of MXLPG (LP - FSP).

MEASUREMENT OF JIBS

813. Longest Perpendicular of Jibs (LPG).

1. Jibs 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 jib shall be measured on the perpendicular from the line of junction of the wrap-around parts to the clew.

2. LPG shown on the rating certificate shall be the largest such dimension found on the jibs carried on the yacht.

3. Jib Roach (JR), where permitted (see 811.2 (b), shall be measured as the maximum excess of the three girths as defined in 812.1. JR multiplied by 1.5 shall be added to LPG for the purpose of calculating the sail area. An excess in any of the girths shall not exceed 10% of the maximum defined in 812.1.

4. The Longest Perpendicular of Inner Jib (LPIS) shall be the greatest distance between the clew of any jib and the foremost headstay, measured perpendicular to the stay, which occurs because of tacking such jib inside another headsail. This dimension is required only where the dimension LP is to be established by a jib which is so set.

814. Forestay Perpendicular (FSP).

FSP shall be the larger of either:

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

or

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

815. Longest Luff of Jibs (JL).

JL shall be the length of the luff of the jib measured along the edge of the sail from tack to head. JL shall be recorded as the largest such dimension found on the jibs carried on the yacht.

DEFINITION OF SPINNAKERS

816. Both symmetric and asymmetric spinnakers are permitted, as defined below.

1. For measurement as a symmetric spinnaker a sail must have the following characteristics:
   a) The luff and leech (see 820.1) must be of equal length.
   b) The sail must be symmetric, in shape, material and cut, about a line joining the head to the center of the foot.
   c) The mid girth (see 822) shall not be less than 75 percent of the foot length (see 821).
2. For measurement as an asymmetric spinnaker a sail must have the following characteristics:
   a) The luff shall be at least 5 percent longer than the leech (see 820.2).
   b) The mid girth (see 822) shall not be less than 75 percent of the foot length (see 821).

MEASUREMENT OF SPINNAKERS

817. Spinnakers shall be measured with such tension as will remove all wrinkles across the line of measurement. Adjustable leech lines are not permitted in symmetric spinnakers and battens are not permitted in any spinnaker.

818. Spinnaker Headboard (HBS).

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

819. Spinnaker Maximum Width (SMW).

1. 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.
2. Prior to 1/1/2001, the recorded measurement on which asymmetric spinnakers were rated was not AMG (see 822), but instead SMW defined as follows: the measured value of SMW for an asymmetric spinnaker shall be the longest perpendicular to the Luff to be found by measuring from any point on the Leech (see 820.2) across the body of the sail. Any asymmetric spinnaker for which SMW was originally recorded may be remeasured for AMG.

820. Spinnaker Luff and Leech (SL & ASL).

1. Symmetric Spinnaker Luff and Leech (SL).

   SL shall be the greatest length of a symmetric spinnaker luff and leech measured along the edges of the sail from head to foot.

2. Asymmetric Spinnaker Luff (SLU) and Leech (SLE).
   a) SLU shall be the length of the longer edge (luff) of an asymmetric spinnaker measured along the edge of the sail from head to tack.
   b) SLE shall be the length of the shorter edge (leech) of an asymmetric spinnaker measured along the edge of the sail from head to clew.

c) ASL shall be calculated from the following formula:
ASL= 0.6*SLU+0.4*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.

821. Spinnaker Foot Length (SF & ASF).

Spinnaker foot length shall be the distance from tack to clew measured in 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.

822. Asymmetric Spinnaker Mid Girth Length (AMG).

From 1/1/2001, the recorded measurement on which asymmetric spinnaker area is calculated shall be AMG (replacing SMW -- see 819.2). AMG shall be the distance between the midpoints of luff and leech measured in the shortest path on the surface of the sail.

823. For calculation of sail area the dimensions of HBS, SMW, AMG, SF, ASF, SL and ASL shall be the largest of such dimensions found on any of the spinnakers carried on the yacht, but also see 847 for rated minimum SMW, AMG, SF, ASF, SL and ASL.

MAINSAIL

824. Mainsail Headboard (HB).

Where the center line of the top batten pocket is not situated above the MGT leech measurement point, HB 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 HB 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. Any stiffening used to extend the leech beyond a reasonable roach shall be added to HB. HB has as a limit the greater of 0.04*E or 0.152m (0.5 ft). Where HB exceeds the HB Limit, EC shall not be taken as less than E*(HB/(0.22*E)+0.818).

825. Top Batten Upper Limit – Determination of HB

Where the center line of the top batten pocket is situated above the MGT leech measurement point, HB shall be measured in accordance with Appendix 4.6.

826. Mainsail Girths (MGT, MGU, MGM, & MGL).

1. MGT, MGU, MGM and MGL shall be the length of the girths 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 Appendix 4, para. 2.2.4. The values recorded for MGT, MGU, MGM and MGL shall be the largest to be found on any mainsail used on the yacht.

2. Mainsail Girth Limits.

   a) MGUL and MGML are the limits of MGU and MGM respectively.

   MGUL shall be taken as 0.38*E
   MGML shall be taken as 0.65*E

b) MGT shall not exceed 0.22*E and MGL shall not exceed 0.90*E.

Where any girth exceeds its limit, EC shall be increased as required to eliminate the excess. Otherwise EC shall be equal to E.

3. The rules for mainsail girths and limits apply to mizzens by appropriate substitution.

827. Mainsail weight (MSW).

MSW shall be the dry weight of the mainsail not including battens (see also 208.1). The value of MSW for any calculation shall be the smallest found on any mainsail used for racing.

828. Batten Adjustment

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

MIZZEN SAILS

Where noted, rules under the Mainsail section apply also to mizzens by substitution of the corresponding mizzen values.

829. Height of Mizzen Mast (IY).

IY is the height measured along the foreside of the mizzen mast from the deck as defined in 802 to the higher of:

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

   or

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

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

Mizzen diameters and taper measurements are as for main masts (ref. 805.10).

831. Mizzen Hoist (PY).

PY is the measured length of the hoist of a jib headed mizzen sail. The method by which this is measured shall follow that used for the hoist of the mainsail (see 806).

832. 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 802.

833. Foot of Mizzen.

1. Foot of Mizzen (EY). EY is the measured length of the foot of the mizzen sail. The method by which this is measured shall follow that used for the foot of the mainsail (see 808).

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.

834. 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.

835. Distance between Masts (EB).

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

836. Mizzen Headboard (HBY).

HBY shall be the maximum fore and aft dimension from the luff, 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. By substitution, the HB limit applies to HBY.

837. Mizzen Top Batten upper limit.

The center line of the top batten pockets shall not be situated above the MGTY leech measurement point.

838. Mizzen Girths (MGTY, MGUY, MGMY & MGLY).

Mizzen girth measurements are as for mainsail girths (ref. 826.3).

839. Mizzen Battens.

Mizzen batten requirements are as for mainsail battens (ref. 828).

MIZZEN STAYSAIL

840. 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 yacht.

841. 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 yacht.

842. Mizzen Staysail Mid Girth (YSMG).

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

RATED ELEMENTS OF THE AERODYNAMICS MODEL

843. 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.

844. Sail Plan Rated Areas.

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

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

2. Jib: Where JL has been recorded, the area of the jib is determined as JL*(LP)/2. Where JL has not been recorded, the area is determined as (IM^2+J^2) ^0.5*(LP)/2.

3. Spinnakers:

   a) Symmetric Spinnaker: For the purpose of the aerodynamic model, the area of a symmetric spinnaker is determined as 0.6*(SL*SMW-0.25*SL*(SMW-SF)). For the purpose of displaying spinnaker area on the Certificate, the convention 0.94*(SL*SMW-0.25*SL*(SMW-SF)) is used.

   b) Asymmetric Spinnaker: For the purpose of the aerodynamic model, the area of an asymmetric spinnaker is determined as 0.72*((0.5*ASL*ASF) + (0.66*ASL*(AMG - 0.5*ASF))). For the purpose of displaying spinnaker area on the Certificate, the convention 1.0*((0.5*ASL*ASF) + (0.66*ASL*(AMG - 0.5*ASF))) is used. Note that where an asymmetric was measured for SMW as in 819.2, SMW shall be substituted for AMG in these area formulae.

4. Main and Mizzen: Mainsail area is determined by trapezoidal integration of P, E, MGT. MGU. MGM, MGL and HB:

   Area = (P/4*(E+MGL)/2)+(P/4*(MGL+MGM)/2)+(P/4*(MGM+MGU)/2)
   +(P/8*(MGU+MGT)/2)+(P/8*(MGT+HB)/2)

   Where EC is greater than E, it shall be substituted for E in the calculation above (see 826.2b). Where the value for any girth has not been recorded, the corresponding girth limit is substituted. The mizzen area is calculated by the method given above for the mainsail, substituting the corresponding mizzen values.

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

845. Foretriangle Height (IM).

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

846. Longest Perpendicular of Jibs, Rated (LP).

LP shall be taken as the greatest of LPG+JR*1.5+FSP or J or LPIS.

847. Rated Limits.

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

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

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

3. LP: LP shall not be taken as less than J.

4. JL: JL shall not be taken as less than 0.95*(IM^2+J^2)^0.5.

5. SMW:

   a) For a symmetric spinnaker, SMW shall not be taken as less than the greater of 1.8*J or 1.8*SPL.

   b) For an asymmetric spinnaker measured for SMW (see 819.2) the limits for AMG apply to SMW (see 847.7 below).

6. SL & ASL: SL & ASL shall not be taken as less than the spinnaker Luff Limit (LL).

   LL = 0.95*(ISP^2+J^2)^0.5

   The minimum value for SL is printed on the certificate as MSL.

7. SF & ASF:

   a) For a symmetric spinnaker, SF shall not be taken as less than the greater of 1.8*J or 1.8*SPL and SF shall not be taken as greater than SMW.

   b) For an asymmetric spinnaker, ASF shall not be taken as less than the greatest of 1.8*J, 1.8*SPL or ASF + (1.8*TPS - ASF)/3. For an asymmetric tacked on centerline (see 804.1(b), where ASF is recorded as zero, then ASF shall be taken as equal to 1.8*TPS.

8. AMG: AMG shall not be taken as less than the greatest of 1.75*J, 1.75*SPL or AMG + (1.75*TPS – AMG)/3. For an asymmetric tacked on centerline (see 804.1(b), Where AMG is recorded as zero, then AMG shall be taken as equal to 1.75*TPS.

848. Forestay Tension Control.

Where a yacht has been recorded as having the means to control forestay tension while racing (see 810.1) and has not been recorded as having runners (see 810.2(c), the jib lift coefficients are increased in the aerodynamic model in indirect proportion to the distance between the upper measurement point of P and the upper measurement point of IG.

849. Adjustable Stays Below the Uppermost Backstay.

Where a yacht has been recorded as having the means to adjust stays below the below the uppermost backstay while racing (see 810.2), the mainsail lift coefficients are increased and the drag coefficients decreased in the aerodynamic model. Where a yacht has been recorded as having runners (see 810.2(c), a full increase of the jib lift coefficients is applied (see IMS 848 above).

850. 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).

851. 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.

852. Effective Height of Mainmast (EHM).

EHM is the greater of P + BAS or IM

853. 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 girths MGL, MGM, MGU and MGT for the purpose of calculating EC (see 826.2b) and mainsail area (see 844.4).

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.

854. Deleted section

855. Deleted section

856. Effective Height of Mizzenmast (EHMY).

EHMY = PY + BASY

857. 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 9 - PROCEDURES FOR IMS ONE-DESIGN STATUS

901. Action by a Class Association.

1. In requesting IMS One-Design status a Class Association shall apply to its ORC Rating Office (hereinafter called RA), providing the following:

   a) The official name of the class.

   b) Name and address of designer and all builders of the class.

   c) The number of yachts of the class built and sailing.

   d) Details of at least 5 yachts available for full IMS measurement, including full One-Design class measurements for each yacht.

   e) An undertaking that when IMS One-Design status is agreed, any yacht claiming an individual IMS certificate shall be excluded from racing in the class.

   f) A complete set of Class Rules, which shall include at least:

   - Rig, Sail, Propeller installation and Freeboard class limit dimensions in accordance with IMS measurement methods.
   - Class requirements for condition of yacht for flotation measurement.
   - Pro Forma Class Certificate of One-Design Compliance.

   g) Details of variations within the class, regardless of whether the variants are included for consideration of IMS One-Design status.

   h) A copy of the current Constitution of the Class Association.

902. Action by the Rating Authority (RA).

1. The RA shall on the receipt of an application:

   a) Study the Class Rules to determine if IMS One-Design status is possible.

   b) Arrange to measure the hull(s) of the yacht(s) to establish a standard offset file (see 104). Where there is more than one builder, at least one hull of each builder should be measured.

   c) Check and note the flotation and trim of the yachts in One-Design measurement condition. The class rule specification for flotation should include IMS flotation freeboards.

   d) Where necessary make suitable adjustments to the condition of the yachts, status of tankage, stowage of gear, etc. to bring them into line with the requirements of the IMS for measurement afloat. The Class Rules shall give the limits of flotation and the IMS One-Design certificate will be based on the upper limits.

   e) Measure each yacht afloat as required by the IMS Rule in the trim determined in (d) above.

   f) Check the One-Design rig and sail measurements. Rig dimensions given in the Class Rules must add up to give IMS sail measurements.

   g) Using the Standard Offset File, the standard sail measurements and individual flotation and inclining measurements, compute an IMS certificate for each of the yachts measured.

2. Determination of the IMS One-Design Certificate:

   a) If the RA is not satisfied that the Class Rules and measurement provide sufficient control of the yachts of the class, it may at this time notify the Class Association that it cannot proceed.

   b) After the completion of the action required in 902.1, the RA shall send the following documents to the ORC Office as a formal application.

   - Class Rules.
   - Any plans referenced in the Class Rules.
   - Details of how and by whom measurement is being controlled.
   - The RA's proposed Standard Offset File together with all information and measurement files from which the offset file was derived.
   - . copy of the proposed IMS One-Design Certificate for the class.
   - Identity of yachts from which the flotation data were derived, together with the measurement data.
   - A copy of the proposed Measurement Inventory (see Appendix 2).
   - Brief summary supporting the proposed certificate.
   - Proposed method of getting existing yachts into the class.
   - A One-Design Application fee as determined by the ORC.

903. Action by the IMS One-Design Sub-Committee.

1. The Committee shall study the documents sent from the RA and satisfy themselves that:

   a) Measurement is sufficiently controlled by the Class Association.

   b) The class rules require measurement procedures that adequately control:

   - Hull, deck, keel and rudder shape.
   - Hull, deck, keel and rudder weights and the location of the CG of the completed yacht.
   - The rig dimensions and the weight and CG of the completed mast and rigging.
   - The standardisation of other items, such as engine and propeller installation and all items that may affect ratings.

   c) The measurements that produced the proposed IMS One-Design Certificate have been carried out according to the IMS Rules.

2. If they intend to award IMS One-Design status, they shall define the IMS One-Design Certificate that represents values deemed appropriate for the class.

3. When recommending IMS One-Design status for the class, they shall inform the RA, including a copy of the proposed IMS One-Design Certificate. The RA shall advise the Class Association, accordingly.

4. When the proposed IMS One-Design Certificate is accepted by the Class Association, it shall be published by the ORC.

904. Administration of IMS One-Design Certificates.

1. IMS Certificates produced in accordance with One-Design Status shall bear the notation "Based on: ONE-DESIGN RULES".

2. A One-Design Certificate may be issued by a RA when:

a) The Class has been awarded IMS One-Design status by the ORC.

b) The RA has received from the Class Association a certification signed by the owner and measurer to the effect that the yacht has been measured to and complies with the Class Rules, accompanied by a fee, to be determined by the RA, to cover the cost of administration of the RA and also of the ORC levy for the certificate.

c) All sails have been marked in accordance with Rule 801.2.

Note: The above provisions do not obviate the responsibility of the Rating Office to satisfy itself that a yacht complies with its Rating Certificate.

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

4. Yachts changing Country of Registration.

a) If the owner is a member of the Class Association, he shall inform the new RA of his continued membership.

b) If the owner does not belong to the Class Association, an IMS One-Design Certificate shall not be issued.

905. Changes to IMS One-Design Certificates.

1. One-Design Certificate handicaps can be expected to change from time to time due to either changes in the Class Rules or in the IMS calculations.

2. The sponsoring RA shall maintain sufficient data on the IMS measured yachts of the class to enable calculation of current certificates when changes are made.

3. Where Class Rules are changed, re-measurement may be necessary at the discretion of the sponsoring RA.

4. A yacht which does not hold a valid class certificate or comply with class rules shall not hold a valid IMS One-Design Certificate.

5. The ORC reserves the right to interpret clauses of the IMS Rule and to change the rules for IMS One-Design status at any time.

APPENDIX 1 - IMS RATING CERTIFICATE

1. **Time Allowances.** For information on Time Allowances, see section 100.

2. **Measurement Data.** Definitions of Measurement Data, preceded on the Certificate by alphabetic symbols, may be referenced through the Index of Symbols at the beginning of this book.

3. **Calculated Data.** Calculated data (e.g., hydrostatics) are also identified by symbols and their derivations may be referenced through the Index of Symbols at the beginning of this book.

4. **Rule References for Notational Information on the IMS Certificate.** References for notational data are given below, starting at the top of the Certificate and generally moving from left to right.

Certificate No. -- IMS Rating Certificate number as assigned by an ORC Rating Authority.
Based on: -- Certificate Type: Full Measurement or One-Design Rules (103).
Not Valid After -- Certificate validity expiry date (102.8).

YACHT DESCRIPTION (box).

Name -- yacht name.
Sail No -- sail number assigned by a regional authority or state (Special Regulations 4.01.1).
Class -- Rating Authority's abbreviation for production series or "custom", "none", "proto",etc.
LOA -- see Index of Symbols.
Beam (MB) -- see Index of Symbols.
Designer -- designer's name or abbreviation.
Builder -- builder's name or abbreviation.
Rig -- nominally descriptive; not specifically related to rating calculations.
Keel/CB -- rated as keel or centerboard (511).
PropInst -- rated propeller installation type & propeller type (602 & 604).
FwdAccom -- Yes or No; any rated accommodation forward of the mast (724.3 & 726.7).
Spin -- rated spinnaker configuration, symmetrical, asymmetrical (804).
HullCnst -- classification of hull construction, rated pitch gyradius (724.1 & 726.5).
RudCnst -- rudder construction, carbon or other, rated pitch gyradius (724.2 & 726.8)
BoomMtl -- boom material, light or heavy, rated pitch gyradius (724.7 & 726.10
Forestay -- forestay tension control while racing, rated sail control (810.1 & 848).
InrFsty -- stays below hounds, rated sail control (810.2 & 849); surrogate rig gyradius (726.3).
Spreadrs -- number of spreader sets, rated surrogate rig gyradius (726.3).
Jumpers -- yes or none, rated surrogate rig gyradius (724.5 & 726.3).
Runners -- number of sets, rated sail control (810.2 & 849) & surrogate rig gyradius (726.3).
Dates -- **AGE** (108.1) and **SERIES** (108.2) may affect ratings (see e.g., 726.6) and requirements under the IMS Regulations (201) and ORC Special Regulations.

LIMITS AND REGULATIONS.

Limit of Positive Stability -- Meets Requirement for valid certificate or Fails (205.1).
Minimum Displacem't -- IMS Regs 202 minimum is shown, followed by "meets"or "fails".
Maximum Crew Weight -- Rated/declared maximum permitted while racing (317, 712& 713).
Stability Index -- Rated Stability Index (205.2 & IMS Regs 201).
SC/R Heavy Items Pitch Adjustment -- See Appendix 9
Measurement Inventory -- Date must match date on Page Two of IMS Certificate (102.6).
Accommodation Length -- Basis for IMS Regs Accommodation Specs (IMS Regs 304 & 404).
Accom Certificate -- IMS Regs Accommodation Cert. on file, if any (201), and DA.
Plan Approval -- Endorsement, if any, of Plan Approval on file (107 & ORC Spec Regs 3.1).
Anchor(s) Weight and Distance Weight and distance from stem of the anchor.
Applied Age Allowance -- expressed in percentage of any IMS rating - See Appendix 8

SAIL AREA -- See 844.

IMS RATING CERTIFICATE No. 12345 — IMS AMENDED TO JANUARY 2006
Based on: FULL MEASUREMENT (Metric) — Offshore Racing Congress
Chelmsford, England
NOT VALID AFTER 12/2006 — GPH 590.5 — Copyright 2006

YACHT DESCRIPTION

Name:	PARAGON OF VIRTUE		
Sail No:	US-12345		
Class:	TRIPP 40		
LOA:	12.410m	Beam(MB)	3.630m
Designer:	TRIPP		
Builder:	CARROLL MARINE		
Rig:	FRACTIONAL SLOOP 150% Jib		
Keel/CB:	FIXED KEEL		
PropInst:	EXPOSED FOLDING		
FwdAccom:	NO	Spin:	SYMMETRIC
HullCnst:	LIGHT	RudCnst:	STNDRD
Forestay:	FIXED	BoomMtl:	HEAVY
Spreadrs:	3 Sets	InrFsty:	NONE
Runners:	NONE	Jumpers:	YES
Dates:	AGE:5/1991		

COMMENTS

RATING OFFICE:
Issued: 12/JAN/06
Measured: 22/MAY/91
OFFSHORE RACING CONGRESS
Tel: +44 1473 785 091
Fax: +44 1473 785 092
ORCclub@CompuServe.com

Revalidation Authority: US SAILING
Measurer: STIMSON

"I CERTIFY THAT I UNDERSTAND MY RESPONSIBILITIES UNDER THE IMS."

OWNER:.....

MR JOHN B SAILOR
123 SPINNAKER LANE
PORTSMOUTH, RHODE ISLAND 02871

LIMITS AND REGULATIONS

Limit of Positive Stability:	MEETS REQ	Measurement Inventory:	18/MAY/91
Minimum Displacem't 3238kg:	MEETS REQ	Accom Lgth: RACE= 11.8	C/R= 11.8
Maximum Crew Weight:	815 kg.	Accom Certificate:	C/R DA= 0.00%
Stability Index:	122.0	Plan Approval:	YES
C/R HeavyItems Pitch Adjustm't	0.00000	Anchor(s) Weight: 0	Dist: 0.00
		Applied Age Allowance:	1.50%

NOTE TO OWNER: The range available to revise crew weight is 448- 826 kg.

TIME ALLOWANCES IN SEC/MI BY TRUE WIND VELOCITY & ANGLE (NOT WIND-AVERAGED)

Wind Velocity:	6kt	8kt	10kt	12kt	14kt	16kt	20kt	CHECKSUM
BEAT ANGLES:	44.3°	42.0°	39.4°	37.9°	37.2°	36.8°	36.7°	(274.3)
BEAT VMG:	933.5	786.8	725.5	691.7	671.3	659.1	650.9	(5118.8)
52°:	601.5	526.5	500.3	485.8	476.7	471.2	466.0	(3528.0)
R 60°:	565.2	504.4	482.3	469.6	461.3	455.9	450.0	(3388.7)
E 75°:	540.6	488.2	462.9	449.3	440.5	434.3	426.4	(3242.2)
A 90°:	543.5	486.0	456.4	440.7	426.4	417.8	407.4	(3178.2)
C 110°:	564.0	495.3	460.9	435.8	416.4	402.4	385.3	(3160.1)
H 120°:	599.2	513.7	473.2	444.7	421.5	401.7	370.3	(3224.3)
135°:	708.7	567.0	504.3	469.2	442.6	419.9	377.7	(3489.4)
150°:	858.0	671.1	564.6	507.0	472.5	446.5	403.8	(3923.5)
RUN VMG:	990.7	774.9	651.4	574.1	520.3	484.0	434.8	(4430.2)
GYBE ANGLES:	140.8°	144.4°	151.7°	162.1°	169.8°	174.1°	175.2°	(1118.1)

NOTE: To convert any time allowance above to speed in knots: Kt = 3600/TA

TIME ALLOWANCES FOR SELECTED COURSES (AFTER WIND-AVERAGING)

Wnd/Lwd VMG	981.5	795.2	698.3	640.7	602.9	577.9	547.9	(4844.4)
CircularRandom	800.8	652.4	574.0	528.7	500.5	481.6	456.9	(3994.9)
Ocean for PCS	910.6	718.4	610.4	543.5	499.0	467.4	424.1	(4173.4)
Non-Spinnaker	851.4	687.0	598.7	547.1	514.9	493.7	467.0	(4159.8)

SIMPLIFIED SCORING OPTIONS

	Time-on-Distance (sec/mi)	Time-on-Time TMF	Performance Line PLT	PLD	
OFFSHORE	590.5 (=GPH)	1.0161 (=600/GPH)	0.837	91.1	(Ocean)
INSHORE	655.4 (=ILC)	1.0299 (=675/ILC)	1.220	395.8	(Olympic)

Performance Line Corrected Time = (PLT x Elapsed Time)-(PLD x Distance)

TRI-NUMBER TMFS BY WIND RANGE

WINDWARD /LEEWARD	Low	Medium	High	CIRCULAR RANDOM	Low	Medium	High
	0.7746	1.0314	1.1908		1.0178	1.2791	1.4274

IMS AMENDED TO JANUARY 2006 VPP: 12/JAN/06 09:06:36
Cert No 12345 PARAIMS.DAT 12/JAN/06 08:49:52
OFF Meas'd: 22/MAY/91 PARAVIRT.OFF 05/JUN/92 15:08:30

CENTERBOARD AND DRAFT

ECM	0.000	CBRC	0.000	CBMC	0.000	CBTC	0.000	
WCBA	0.0	CBDA	0.000	KCDA	0.000	ECE	0.000	
WCBB	0.0	CBDB	0.000	ENDPLATE ADJ		(KEDA)	0.000	

PROPELLER AND INSTALLATION

PRD	0.434	PBW	0.120	PHD	0.044	PHL	0.153	ESL	0.979		
ST1	0.026	ST2	0.105	ST3	0.105	ST4	0.057	ST5	0.183		
PSA	18.000	PSD	0.028	PIPA	0.0036						

FLOTATION DATA

FFPS	1.372	AFPS	1.029	SFFP	0.614	SAFP	11.190				
FFM	1.228	FAM	1.009	FFPV	0.000	AFPV	0.000				
FF	1.229	FA	1.010			SG	1.023				

STABILITY DATA

W1	17.000	PD1	39.000	PLM	1516.000	PL	1502.792				
W2	34.000	PD2	75.000	GSA	28.274	RSA	3216.9				
W3	51.000	PD3	119.000	SMB	7.327	WD	12.025				
W4	68.000	PD4	156.000	RM	137.1	RMC	137.1				
RM2	141.5	RM20	132.2	RM40	112.6	RM60	79.2				
RM90	35.6	WBV	0.0	CREW ARM		(CRA)	1.757				

CALCULATED LIMIT OF POSITIVE STABILITY: 121.5 DEGREES
RATIO STABILITY CURVE AREAS, POSITIVE/NEGATIVE 3.286

HYDROSTATICS	MEASUREMENT TRIM		SAILING TRIM	
KEEL DRAFT	(DHK0)	2.305	(DHKA)	2.353
2ND MOMENT LENGTH	(LSM0)	10.013	(LSM1)	10.383
DISPLACEMENT (WEIGHT)	(DSPM)	5747	(DSPS)	6679
WETTED SURFACE	(WSM)	26.41	(WSS)	28.04
VCG FROM OFFSETS DATUM (For CLUB RM)			(VCGD)	-0.014
VCG FROM MEASUREMENT TRIM WATERLINE			(VCGM)	-0.091
INTEGRATED BEAM ATTENUATED WITH DEPTH			(B)	2.942
MAXIMUM SECTION AREA			(AMS1)	1.345
BEAM/DEPTH RATIO			(BTR)	4.344
EFFECTIVE DRAFT			(D)	2.057
2° HEEL (LSM2)	10.387	25° HEEL	(LSM3)	10.304
SUNK (LSM4)	11.997	AVG LENGTH	(L)	10.466
TRIM: 1mm/9.251m-kg		SINK:	1mm/19.584kg	

SAIL AREAS: MAIN+FORE+MIZZEN: 83.49 MAIN: 52.41
GENOA: 48.70 SYM: 103.69 ASYM: 0.00 MIZ'N: 0.00

FORETRIANGLE

IG	14.521	J	4.250	HB	0.220	TH	NO				
MW	0.189	FSP	0.066	MGT	1.24	TL	2.500				
GO	0.219	LPG	6.33	MGU	2.13	MDT1	0.103				
ISP	14.571	LP	6.40	MGM	3.65	MDL1	0.165				
IM	14.624	JL	0.00	MGL	4.78	MDT2	0.075				
HBI	1.085	JR	0.00	MSW	24.0	MDL2	0.089				
SFJ	0.000			P	15.505	MWT	0.0				
SPL	4.232	TPS	0.000	E	5.627	MCG	0.000				
SL	14.39	ASL		EC	5.636	BD	0.182				
SMW	7.64	AMG		BAS	1.886	CPW	2.900				
SF		ASF		SPS	2.456	BAL	0.153				

MIZZEN

IY	0.000	PY	0.000	HBY	0.000	TLY	0.000				
EB	0.000	EY	0.000	MGTY	0.000	MDT1Y	0.000				
YSD	0.00	ECY	0.000	MGUY	0.000	MDL1Y	0.000				
YSF	0.00	BASY	0.000	MGMY	0.000	MDT2Y	0.000				
YSMG	0.00	BALY	0.000	MGLY	0.000	MDL2Y	0.000				
		HBIY	0.000	BDY	0.000						

Triple-Number Scoring System

The simplified Triple-Number scoring system (see IMS certificate extract below) has proved popular with some fleets. The Triple-Number system provides a set of three time multiplying factors (TMFs) for each of two course types, a) Windward/Leeward and b) Circular Random. Within each of these two course types TMFs are given for three wind ranges; 1) Low Range, 2) Medium Range and 3) High Range. In practice, the course selection for a race is pre-specified and the race committee signals at the start the wind range to be used for scoring.

The TMFs displayed on the certificate are derived as follows. The three wind velocity ranges (Hi, Medium, Low) are each comprised of weighted averages of several Time Allowances (sec/mi) selected from the familiar seven IMS wind speeds. The "cookbook" recipe for proportions in each of the three wind ranges is given in the table below. The result is a form of wind-averaging for each of the three Triple Number wind ranges

Wind Speed:	6 kt	8 kt	10 kt	12 kt	14 kt	16 kt	20 kt
Low Range (less or equal 9 kts)	1 part	1 part					
Med Range (between 9 & 14 kts)		1 part	4 parts	4 parts	3 parts		
Hi Range (greater or equal 14 kts)					2 parts	3 parts	3 parts

Once a single weighted average sec/mi Time Allowance has been calculated for each of the three wind ranges, these are converted to a TMF by the formula TMF = 675/TA.

Note that the original TAs used for weighting the wind ranges are NOT taken from the wind-averaged IMS TAs, but from the non-wind-averaged ones. The non-wind-averaged Beat VMG and Run VMG TAs needed for Windward/Leeward are displayed on the IMS certificate. The non-wind-averaged Circular Random TAs are not currently displayed on the IMS certificate, but are internally available at the time the computer is calculating the Triple Number TMFs

SIMPLIFIED SCORING OPTIONS

	Time-on-Distance (sec/mi)	Time-on-Time TMF	Performance Line PLT	PLD	
OFFSHORE	590.5 (=GPH)	1.0161 (=600/GPH)	0.837	91.1	(Ocean)
INSHORE	655.4 (=ILC)	1.0299 (=675/ILC)	1.220	395.8	(Olympic)

Performance Line Corrected Time = (PLT x Elapsed Time)-(PLD x Distance)

TRI-NUMBER TMFS BY WIND RANGE

WINDWARD /LEEWARD	Low	Medium	High	CIRCULAR RANDOM	Low	Medium	High
	0.7746	1.0314	1.1908		1.0178	1.2791	1.4274

APPENDIX 2 - MEASUREMENT CONDITION CHECK LIST & INVENTORY

This check list is intended to help the owner prepare the yacht for measurement. Each item checked will be initialed by the owner and Measurer. The completed document will be returned to the Rating Office for retention. The yacht shall be completed and equipped for sailing. There shall be no sails aboard at the time of the check below deck.

		Initials Owner	Measurer
1.	All sails removed from the yacht.	_____	_____
2.	Ballast sealed to hull structure and anchors, chain and batteries fixed in clearly marked stowage.	_____	_____
3.	Heads, bowls, sinks, etc. are dry.	_____	_____
4.	Bilges and other possible areas where water may collect are dry	_____	_____
5.	Tankage and voids condition checked.	_____	_____
6.	Navigational and cooking equipment stowed as specified.	_____	_____
7.	No clothing, bedding, food or stores on board	_____	_____
8.	Mattresses, cushions and pillows stowed in normal position (dry)	_____	_____
9.	No portable equipment in front of the mast	_____	_____
10.	Safety gear stowed in normal position, but not forward of the mast	_____	_____
11.	All stowages opened and checked	_____	_____
12.	No liferaft or dinghy on board	_____	_____
13.	Centreboards raised unless to be locked down whilst racing	_____	_____
14.	Sheets, guys, etc. on cabin sole abaft the mast according to 402.2(a)2.	_____	_____
15.	Measurement bands PAINTED on spars	_____	_____
16.	All standing rigging tight	_____	_____
17.	Running rigging tight. Halyards led to the foot of the mast and tails to their normal operating position	_____	_____
18.	Running backstays aft and tight, running forestays to the mast	_____	_____
19.	Masts raked aft to the limit of adjustment, not forward of vertical	_____	_____
20.	Boom at low point, horizontal, centred and secured against movement	_____	_____
21.	From 1/1/02, no spinnaker pole(s) aboard while measuring freeboards	_____	_____

Signed ---------- (Owner) ---------- (Measurer)

Dated: ----------

Nov / 01

MEASUREMENT INVENTORY (Rating Certificate – Page 2)

Measurement Inventory Date
Flotation Measured:

YACHT NAME _____

SAIL NUMBER _____

FOR THE INFORMATION OF OWNER AND CREW:

With certain exceptions, the Rule requires the yacht to be measured with gear and fixtures aboard as when raced, in quantity, weight and location. The validity of the Rating Certificate is dependent on a true and proper completion of this inventory form and continued maintenance of the yacht in accordance with this Inventory.
Rule references: 102.6, 301, 302, 303, 313, 314, 315 and 402.2

The owner shall complete this inventory together with the Measurer and check and initial each item. If the owner is not present the following must be signed prior to issuing the rating certificate.

I authorise _____ as my representative and understand my responsibilities under the Rule.

Signed _____ (Owner)

1. Interior Ballast [302.2(b) & 402.2(h)]

	Description	Weight	Distance from stem	Initials Owner	Initials Measurer
a					
b					
c					
d					
e					
f					

2. Anchor(s) at least one on board and chains [402.2(h)]

a					
b					

3. Batteries [402.2(h)]

a					
b					

4. Tools

5. Engine (or o/b in fixed stowage) [402.2(o)] Make _____ Model _____

6. Tanks (including portable tanks, fuel, water, holding tanks, etc.) [402.2(i)] Owners declaration provided: Yes / No

	Use	Type	Capacity	Distance from stem	Condition at time of measurement	Initials Owner	Initials Measurer
a							
b							
c							
d							
e							
f							

7. List of items normally forward but placed on the cabin sole abaft the mast for measurement. [402.2(a) & 402.2(d)]

a _____

b _____

c _____

d _____

Total Weight _____

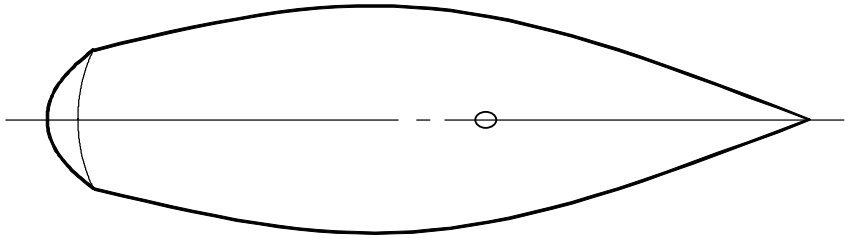
8. One set only of portable deck equipment on the cabin sole abaft the mast for measurement. [402.2(a)2]

Weight _____

9. Other major items and items unusual in weight, quantity or location [402.2(f)]

	Description	Number	Weight	Distance from stem
a				
b				
c				
d				
e				
f				
g				
h				
i				

10. Diagram major fixed items; ballast, tanks, etc. using line codes 1b, 6a, etc.



11. I, the Owner / Representative, certify that this is a true record of stowage at the time of measurement afloat

Block letters: _____

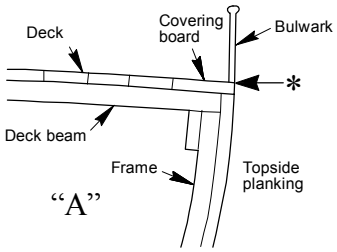
Signature: _____

Date: _____

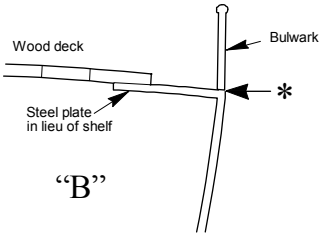
Measurer's Name and Signature
_____
_____

APPENDIX 3 – VARIOUS SHEER POINTS

* = SHEER POINT (See 508)



"A"



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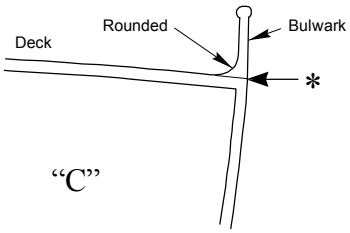

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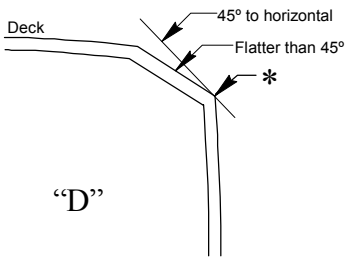

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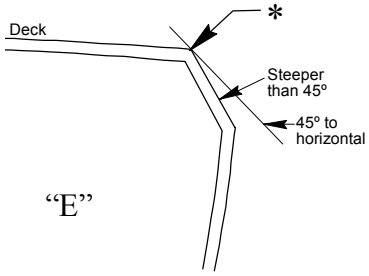

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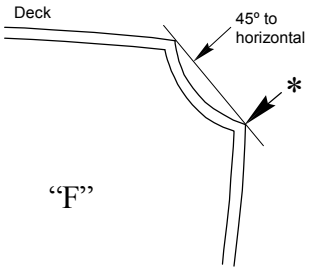

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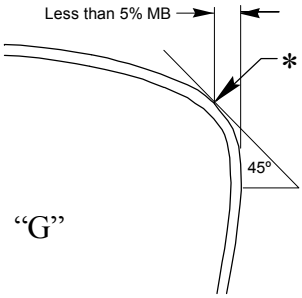

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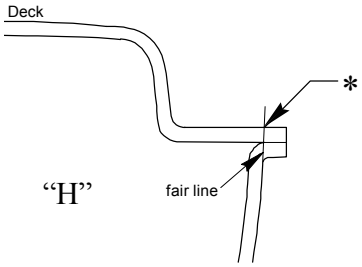

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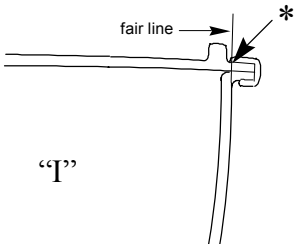

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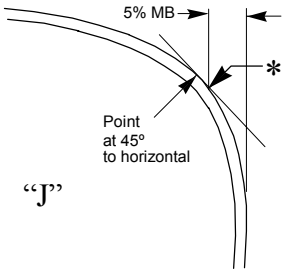

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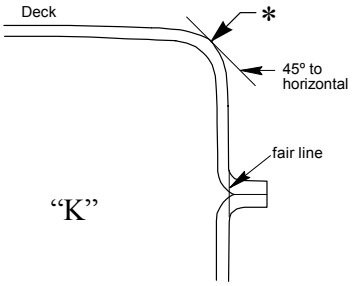

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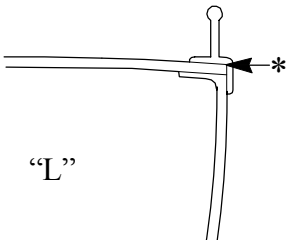


"L"

APPENDIX 4 - SAIL MEASUREMENT

1. **Construction.**

1.1 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.

1.5 In sails where, under the class rules, windows are permitted, or not specifically prohibited, the total area of the transparent material of such windows shall not exceed one per cent of the nominal area of the sail or 0.3*0.3m, whichever is the greater. The nominal area of the sail shall be taken as 1/2 (length of luff x length of foot). Windows shall not be placed closer to the luff, leech or foot than 150 mm.

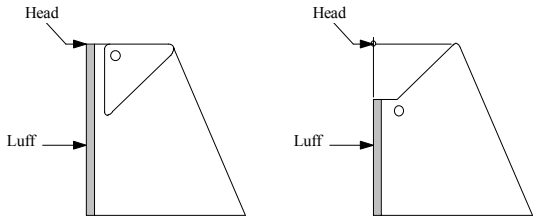
1.6 Openings in the sail, in addition to the normal cringles and reefing eyelets, are permitted provided that the sail is flat in the vicinity of the openings.

5. Sails to be dry when measured. Sails shall be measured in a dry state on a flat surface with just sufficient tension to remove wrinkles across the line of the measurement being taken.

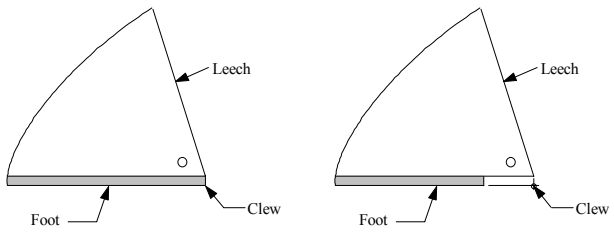
2. **Mainsail.**

2.1 Definitions.

2.1.1 Head - The head shall be taken as the highest point of the sail projected perpendicular to the luff or its extension.

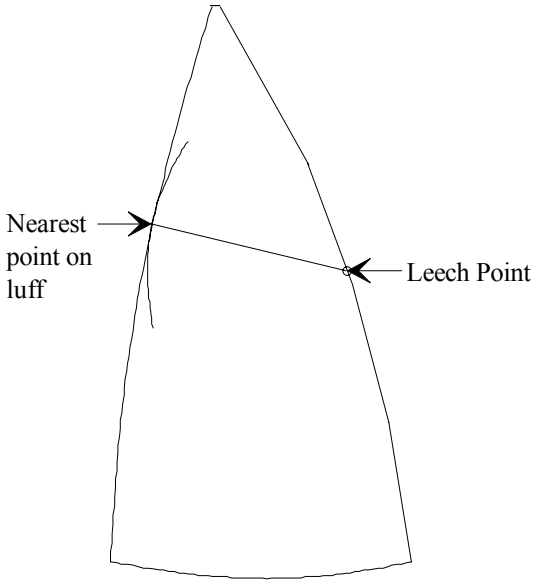


2.1.2 Clew - The clew shall be taken as the aftermost part of the sail projected to the foot of its extension.



2.2.4 Cross Widths. The cross measurements shall be the distance from the leech measurement points, as defined below, to the nearest point on the fore edge of the sail including their 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.

The mid-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 mid-point leech.



3. **Headsail.**

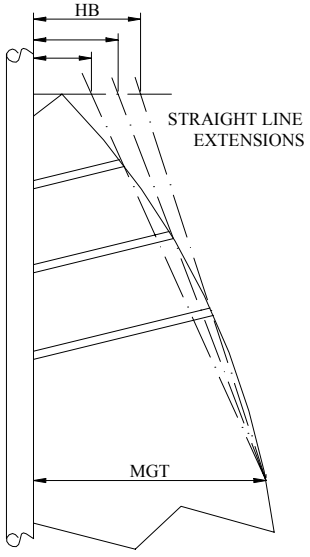
3.1 The length of the luff shall normally be the distance between the lowest part of the sail on the luff rope at the tack and the highest point of the sail on the luff rope at the head.

5. **Spinnakers.**

5.1 A symmetric spinnaker shall be measured folded along its centreline with the leeches together.

6. **Batten above MGT (see 825).**

Where the center line of a batten pocket is situated above the MGT leech measurement point (see 825), HB shall be measured as diagrammed below and recorded to the nearest cm (metric) or nearest tenth of a foot (imperial) as for sails (see 105). A straight line extension of a line from the leech measurement point of MGT through the outer tip of the batten above MGT giving the greatest value for HB shall determine the aft measurement point for HB.



APPENDIX 5 - RULES AND PROCEDURES FOR RACE ADMINISTRATION

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

1. Pre-race Inspection or Measurement.

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

a) When the nonconformance is considered to be minor and can be easily corrected, the yacht 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 remeasurement, 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 yacht 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 yacht 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 yacht shall receive a 50% place penalty in any race in which her rating was incorrect.

c) When a yacht's Certificate is withdrawn by a Rating Authority under the provisions of 102.4(b), the matter shall be referred to the protest committee which shall act in accordance with the RRS and may disqualify the yacht from all races in the series or take such other action as it deems proper.

d) The results of a race or series shall not be affected by measurement protests lodged after the prizegiving or such other time as the Sailing Instructions shall prescribe. Nothing in this paragraph shall bar action under the RRS concerning a yacht deliberately altered.

3. General.

a) When a yacht 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 504 for hull remeasurement).

b) The Rating Authority in whose waters the yacht is racing would normally be the "authority qualified" referred to in the RRS to resolve questions involving IMS certificates. A protest committee considering a protest involving an IMS 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 remeasurement shall be used to issue any new Certificate.

4. Double Measurement.

Double measurement shall apply to events requiring nomination of yachts by National Authorities or to other events as specified in the Notice of Race. Each National Authority nominating yachts for participation in events shall ensure that each yacht is completely measured as prescribed below. The certificate of a yacht which complies with this requirement shall bear the words DOUBLE MEASURED in the comments section only so long as compliance is maintained.

a) Flotation, inclining, rig and propeller installation shall be measured either twice in the same condition by different measurers or once by two measurers working together.

b) Sails shall be measured and marked by a fully certified measurer not solely authorised for sail measurement.

5. 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 yacht is remeasured and her resulting General Purpose Handicap (GPH) is faster by 0.75% or more, the yacht's Revalidating Authority shall investigate the circumstances and report its findings to the ORC 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 ORC Chief Measurer. Such reports may be made through the Rating Authority of the area of organizing authority's event..

6. Other Actions.

This Appendix only concerns actions with respect to yachts. 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 6 - ADMINISTRATIVE RATING PROTESTS

1. The Rating Authority in whose waters the yacht is lying would normally be the "authority qualified" referred to in the ISAF Rules to resolve questions involving IMS Certificates. A protest committee considering a protest involving an IMS 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 yacht's certificate without regard to whether the yacht was racing. An administrative protest shall be lodged with the Rating Authority in whose water the yacht is lying.

   b) Any person or organisation which has a valid interest in a yacht'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 yacht being protested and the address and telephone number of the protested yacht'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 yacht 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 remeasurement when required, the Rating Authority shall invalidate the yacht's certificate in accordance with 102.3 and so advise all concerned, including the local organisation within whose jurisdiction the yacht normally races.

   d) The Rating Authority may consult or refer the matter to the ORC Chief Measurer for advice and assistance. It shall make its decision based on the available evidence and may order remeasurement of the yacht in whole or in part (see 504 for hull remeasurement).

   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 yacht 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 yacht'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 yacht'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 ISAF Racing Rules. In the event that there is reasonable doubt as to the interpretation or application of the IMS, the ORC Chief Measurer shall be the "authority qualified" to resolve such questions.

APPENDIX 7 - ARITHMETIC WITHIN THE RULE

The formulae within the IMS follow full algebraic hierarchy.

This means that the order of calculation is:

1. Perform all exponents. (x^y).
2. Perform multiplication and division.
3. Perform addition and subtraction.
4. These operations are performed within each set of parentheses starting at the innermost.
5. Finally perform equals.

Numbers are shown with decimal points, thus; 2.56, 2.0, 0.75.

The following symbols are used:

* is multiply.	Thus;	2.0*4.0=8.0.
/ is divide by.	Thus;	6.0/3.0=2.0.
+ is plus. Thus;	4.0+4.0=8.0.	
- is minus	Thus;	3.0-1.0=2.0.
^ is to the power of.	Thus;	2.0^2.0=4.0 (2 squared).
		16.0^0.5=4.0 (square root of 16)
		27.0^(1/3)=3.0 (cube root of 27)

A>=B means;	A is not less than B.
A>B means;	A is greater than B
A<B means:	A is less than B.
A<=means:	A is not greater than B.

INT(A) means the integer part of A.

Thus if A = 6.123, INT(A)=6.
if A = 6.573, INT(A)=6.

Solution of formulae:

If L=(5.0+(8.0/2.0^2.0-2/(3.0+1.0)))*2.0
Then L=(5.0+(8.0/4.0-2.0/4.0))*2.0
Then L=(5.0+2.0-0.5)*2.0
Then L=6.5*2.0
Thus L=13.0

APPENDIX 8 - 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 six 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. The design variables considered appear in the formulae, a) - d), below.

Where applied, the calculated amount of credit will vary with point of sail and wind velocity. These credits are therefore applied individually to each respective time allowance cell in the large table on the Rating Certificate entitled, "Time Allowances in Sec/Mi by True Wind Velocity & Angle." The credit is also automatically carried forward into course time allowances in the table, "Time Allowances for Selected Courses", because these course time allowances are comprised of the appropriate proportions of various time allowances from the larger table. Likewise, any credit is carried forward into the General Purpose Handicap (GPH) and the "Simplified Scoring Options." The single value for DA which is actually displayed on the Certificate is that which was applied to GPH and is shown only to give a comparative reference to the average DA applied for the yacht.

For yachts which comply with IMS Regulations Part 4, Cruiser/Racer Division, the DA percentage credits are always fully applied to the time allowances. For other yachts, no DA is applied for the first three years of age (as defined in 2 below). Thereafter, DA is applied incrementally with only 20% of the full calculated DA being applied in the forth year and a further 20% in each of the following years until full DA is applied in the eighth year.

The various credits are derived from a statistical study of a fleet of Cruiser/Racers and Racers, based on IMS L to take into account a scaling factor. For each parametric ratio, an area in the Cartesian plane (Ratio/L) is fixed, limited by two boundary lines which represent a statistical approximation of the Cruiser/Racers and the Racers respectively. For a given “L”, a difference is calculated as the distance between the boundary limits. The individual contribution of each parameter for the given yacht will be the ratio of the distance between the individual yacht’s parameters relative to the Racer boundary line and the previously computed distance between the boundaries, with a cap value for each of the parameters. The credits are then calculated as follows:

a) Beating credit: Based on Beating Sail Area (BSA)/Volume, maximum 1.5%, and BSA/Wetted Surface. Maximum 1.5%, applied full strength VMG Upwind, then linearly decreased to zero at 70° True Wind Angle (TWA), varied with True Wind Speed (TWS) as follows:

   Credit = (BSA / Wetted Area Credit) * (20 - TWS) / (20-6) + (BSA / Volume Credit) * (TWS / 20)

b) Running credit: based on Downwind Sail Area (DSA)/Volume and DSA/Wetted Area. Maximum 0.3%, applied full strength VMG Downwind, then linearly decreased to zero at 90° TWA, varied with TWS as follows:

   Credit = (DSA / Wetted Area Credit) * (20 - TWS) / (20 - 6) + (DSA / Volume Credit) * (TWS / 20).

c) Length/Volume ratio. Maximum 0.5%, applied full strength to all TWA and TWS.

d) Draft / Length ratio, maximum 1.5%, applied full strength VMG Upwind, then linearly decreased to zero at 70° TWA.

2. Age Allowance (AA)

Independent of DA, an Age Allowance of 0.05% increase in time allowance is applied for a one-year old yacht. From the second year to a maximum of 20 years, the Age Allowance is calculated as:

AA = 0.00017*Age^3-0.011*Age^2+0.25*Age-0.35

The age used for Age Allowance is the earlier of Age Date or Series Date (see 108.1 & 2). The reference year is the current rule year. This allowance is applied to the time allowances of both Racing Division and Cruiser/Racer Division yachts.

APPENDIX 9 – CRUISER/RACER HEAVY ITEMS PITCH GYRADIUS ALLOWANCE SCHEME

This credit scheme is intended to allow for the greater pitching inertia of more fully fitted Cruiser/Racers. The form provided for the purpose of recording relevant items is shown in the table below.

The CENTRAL ZONE shall lie between 30%LOA and 65%LOA aft of the stem.

1. **Anchor** (and associated chain) gyradius contribution is established from the actual recorded weight and distance from the stem of the foremost anchor on board at the time of measurement. To be counted for gyradius adjustment the anchor must be placed in the forward 30% LOA and carried whilst racing in a locker or compartment accessible from deck, and not stowed within the yacht's cabin.

2. **Anchor Windlasses** will be recorded only if permanently installed. If hydraulic or electric, they shall be permanently connected to a hydraulic system, or to AC or DC on board current, of size and power commensurate to the size of the boat, and shall weigh no less than the greater of 2.9 *LOA - 17 (kg) or 15 kg (Dry weight). Qualifying anchor windlasses shall be operational in association with the anchor and chain recorded above, and will be credited with a gyradius increment of 0.0005*CANOEL.

3. **Air Conditioning, Water Heater, Desalinator.** Where fitted outside the Central Zone, these items shall each be credited with a gyradius increment of 0.00025*CANOEL, but not to total more than 0.0005*CANOEL.

   Minimum qualifying (dry) weight per item shall be the greater of:

Air conditioning system	19*LOA-210 (kg) or 25 kg
Desalinator	4.6*LOA-21 (kg) or 25 kg
Water Heater	5.5*LOA-53 (kg) or 12 kg

4. **Electric Generator** shall be recorded if placed outside the Central Zone, and connected to the main electrical system of the boat. The minimum qualifying weight shall be the greater of 17.5*LOA - 120 (kg) or 50 kg. A gyradius increment of 0.0005*CANOEL shall be credited for qualifying units.

5. **Bow Thruster.** If a bow thruster is installed and functioning at a distance not more than 25% LOA aft of the stem, a gyradius increment of 0.0005*CANOEL will be credited. The minimum qualifying weight shall be the greater of 6.4*LOA - 46 (kg) or 15 kg.

6. **Liferafts on Deck.** If carried aboard in all races (independently from the Special Regulations Category for a given race) and placed on deck or in dedicated deck lockers, outside of the Central Zone, a gyradius increment of 0.0005*CANOEL will be credited**.**

7. **Genoa Furler.** A gyradius increment of 0.0005*CANOEL will be credited provided the furler is used in association with one headsail only. The minimum qualifying weight shall be the greater of 2.7*LOA - 16 (kg) or 10 kg.

8. **Radars.** If a functioning radar unit is installed on the mast or spreaders (without contribution to MWT – see IMS 725) a gyradius increment of 0.0005*CANOEL will be credited. The same will apply to radar installations placed on a suitable structure within 10% LOA forward of the stern.

9. **Main Furler.** If MWT (see IMS 725) did not include mainsail roller furling equipment, such a unit where fitted will be credited with a gyradius increment of 0.0025*CANOEL. Only mainsails capable of being furled while racing shall be considered.

10. **Heavy Deck.** When a teak veneer or other heavy deck covering material is fitted to the deck structure over more than 50% of the working deck area (to include the forward 30% LOA zone), and has a nominal thickness of at least 9 mm and/or weight of 6 kg/m2, the gyradius increment will be 0.002*CANOEL. When the total deck skin weight (excluding stiffening but including coating) is in excess of 15 kg/m2 the gyradius increment of 0.0020*CANOEL will be credited even in absence of heavy coating.

11. **Inner Deck Headliners.** When inner deck mouldings and/or liners made of wood, metal or plastic, with a minimum panel weight of 3 kg/m2 are fixed to the inner side of the whole coachroof area as required by the IMS Regulations interior volume requirements, and not less than 50% of the remaining total deck area including 50% of the living/sleeping room forward of the forward mast, the gyradius increment will be 0.0015*CANOEL.

12. **High superstructures.** High superstructure must be found above the sheerline, with a minimum length of 0.15 *AL, and a minimum height above the sheer and minimum width of 0.075 *AL. The gyradius increment for high superstructures is 0.0005*CANOEL.

Use of Heavy Items in Pitch Gyradius

A - The total gyradius increment shall not be taken as more than 0.013*CANOEL, including the effect of anchor(s) and chain.

B - The gyradius increment will be added to the gyradius derived in IMS 724-726.

C - The heavy items shall be recorded in Section 8 of the Measurement Inventory by the measurer performing the flotation, or they can be self-certified by the yacht's owner.

HEAVY ITEMS GYRADIUS ADJUSTMENT FOR C/R

Tick YES for any item NOT located in the CENTRAL (30%-65%) LOA zone.

HEAVY ITEMS	CENTRAL ZONE	YES	Gyr Adj.
Anchor Windlass - Min. Weight 15 kg or 2.9 *LOA - 17 (kg)			0.0005
Electrical Generator - Min. Weight 50 kg or 17.5*LOA - 120 (kg)			0.0005
Air Conditioning / Water Heater / Desalinator (Specify how many are on board and outside the Central Zone) **-** Min. Dry Weights: Air conditioning system 25 kg or 19*LOA-210 (kg) Desalinator 25 kg or 4.6*LOA-21 (kg) Water Heater 12 kg or 5.5*LOA-53 (kg)			0.00025 each maximum 0.0005
Liferaft - if on deck or dedicated lockers outside Central Zone			0.0005
Genoa Furling - Min Weight 2.7*LOA - 16 (kg) or 10 kg			0.0005
Bow Thruster - Min. Weight 15 kg or 6.4*LOA - 46 (kg)			0.0005
Main Furler - (if not included in Mast Weight - MWT)			0.0025
Radar on mast - (if not included in Mast Weight - MWT)			0.0005
Radar on stern - (within 10% of LOA from Stern)			0.0005
Heavy Deck - Min. covering weight 6 kg/m2 over 50% of deck (to include the forward 30% LOA zone) or deck skin weight > 15 kg/m2			0.002
Inner Deck Headliners - Min. Weight 3 kg/m2 – over 100% of coachroof – 50% of deck			0.0015
High superstructure - Min. length 0.15 AL, Min. height above sheer and width 0.075 AL			0.0005
Note: if completed by a Measurer, all items present shall be copied onto Section 9, Page 2 of the Certificate (Inventory List).			

ANCHOR WEIGHT	
ANCHOR DISTANCE FROM BOW	
Note: the Anchor is counted only if it is placed in the forward 30% LOA and carried in a locker or compartment accessible from deck whilst racing, and not stowed within the yacht's cabin.	

APPENDIX 10 - WATER BALLAST & SPECIAL APPENDAGES

A yacht holding a valid certificate under this Appendix shall be deemed not to contravene IMS 313, Shifting of Ballast (nor RRS 51) with regard to the features rated hereunder.

Stability:

Rating Certificates for canting keel and water-ballasted yachts display both the Stability Index (see IMS Regulations 201) and also a Ballast-Leeward Recovery Index (BLRI). The BLR Index is related to a yacht's estimated ability to recover from a knockdown to windward where the moveable ballast is on the leeward side. Recommended BLR Index minimum limits and the formula for calculation of the BLR Index is given in IMS 205.3, General Limits and Exclusions, Stability.

The stability criteria for moveable ballast yachts (water ballast or canting keel) have been set to achieve similar levels of capsize resistance and recovery as conventional yachts. However the defining feature of moveable ballast yachts 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 yacht 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). When available, it is planned to display on the certificate of each moveable ballast yacht three values that define this situation for that specific yacht and provide a means of comparison with conventionally ballasted yachts of similar size.

1) the area under the righting moment curve to 90 degrees of heel with ballast to windward.

2) the area under the righting moment curve to 90 degrees of heel with ballast to leeward.

3) an average area under the righting moment curve of a selection of conventionally ballasted IMS yachts of a similar sailing waterline length (LSM1 on the certificate).

These values are not directly entered into the Stability Index or Ballast-Leeward Recovery Index (BLRI), but do offer an indication of the relative ease with which the vessel may be heeled to 90 degrees, both under normal sailing conditions and when "caught aback". Owners and crew should be aware of the different characteristics of moveable ballast yachts when the ballast is to windward AND to leeward.

Measurement:

Where the following provisions for water-ballasted yachts and special appendages are in conflict with IMS Part 2, General Limits and Exclusions, the provisions below shall take precedence. There is currently no provision for rating a yacht with both water ballast and a canting keel.

1. Water Ballasted Yachts

a) Water ballast tanks shall be symmetrical about the yacht's centerline and no provision for trimming the yacht fore and aft is permitted.

b) For measurement afloat (see 402), the yacht shall first be measured with ballast tanks empty and the full set of flotation and inclining measurements recorded as for conventional yachts.

c) The ballast tank(s) on the starboard side of the yacht 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 datafield 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 yacht 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 IMS 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 yacht full and that with both tanks empty in the respective sailing condition.

2. Canting Keel Yachts

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

b) For measurement afloat (see 402), the yacht shall first be measured with the keel on centerline and the full set of flotation and inclining measurements recorded as for conventional yachts.

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 yacht'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 yacht 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 IMS 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 yacht 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 also for centerboards under 204.2(b). The location and vertical extension of bilge boards shall be taken as part of the machine hull measurement procedure (see Part 5) and their draft determined from the Hull Offset File (see 503) at various angles of heel. Where Effective Keel Draft (see 527) for a bilge board at any angle of heel would exceed that otherwise determined by any other of the yacht's appendages, Effective Keel Draft for the yacht shall be incremented by the excess resulting from the bilge board.

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 moveable trim tab will be calculated on the basis of an adjustment applied to Effective Draft (see 527) intended to reflect a reduction in leeway angle.

Questions regarding the provisions of Appendix 10 shall be referred to the ORC Chief Measurer