The Tornado was designed in 1966 by Rodney March and was adopted as an International Class in 1967.
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INTRODUCTION

This is a one-design class. The intention of these rules is to ensure that the boats are as alike as possible in all respects affecting performance. Everything that is not actually stated as permitted or optional shall be prohibited.

Hulls, Hull Appendages, Rigs and Sails are measurement controlled. Variations are permitted within the specifications in “Section F – Rig” and “Section G – Sails”.

Tornado hulls and masts shall be manufactured for sale by licensed manufacturers.

A Tornado shall be equipped in accordance with “Section C- Conditions for Racing” of these class rules.

Owners and crews should be aware that compliance with rules in Section C is NOT checked as part of the hull and mast certification process.

Rules regulating the use of equipment during a race are contained in Section C of these class rules, in ERS Part I and in the Racing Rules of Sailing.

This introduction only provides an informal background and the International Tornado Class Rules proper begin on the next page.
PART I – ADMINISTRATION

Section A – General

A.1 LANGUAGE
A.1.1 The official language of the class is English and in case of dispute over translation the English text shall prevail.
A.1.2 The word “shall” is mandatory and the word “may” is permissive.

A.2 ABBREVIATIONS
A.2.1 ISAF International Sailing Federation
MNA ISAF Member National Authority
ITA International Tornado Association
NTA National Tornado Association
ERS Equipment Rules of Sailing
RRS Racing Rules of Sailing

A.3 AUTHORITIES
A.3.1 The international authority of the class is the ISAF which shall co-operate with the ITA in all matters concerning these class rules.
A.3.2 Notwithstanding anything contained herein, the certification authority has the authority to withdraw a certificate and shall do so on the request of the ISAF.
A.3.3 The ISAF and the ITA accept no legal responsibility in respect of these class rules or any claim arising there from.

A.4 ADMINISTRATION OF THE CLASS
A.4.1 ISAF has delegated its administrative functions of the class to MNAs. The MNA may delegate part or all of its functions, as stated in these class rules, to the ITA.
A.4.2 In countries where there is no MNA, or the MNA does not wish to administer the class, its administrative functions as stated in these class rules shall be carried out by the ITA which may delegate the administration to an NTA.
A.4.3 Official measurers or international measurers who carry out certification control and/or equipment inspection of the Tornado class shall be registered with the ITA.

A.5 ISAF RULES
A.5.1 These class rules shall be read in conjunction with the ERS and RRS.
A.5.2 Except where used in headings, when a term is printed in “bold” the definition in the ERS applies and when a term is printed in “italics” the definition in the RRS applies.

A.6 CLASS RULES VARIATIONS
A.6.1 ISAF Regulation 10.11 applies.
A.7 CLASS RULES AMENDMENTS
A.7.1 Amendments to these class rules shall be proposed by the ITA and are subject to the approval of the ISAF in accordance with the ISAF Regulations.

A.8 CLASS RULES INTERPRETATION
A.8.1 Interpretations of class rules, except as provided by A.8.2, shall be made in accordance with ISAF Regulations.

A.8.2 In the event of a conflict between the text of a class rule and Section H.1 Official Plans or the measurement form, the text of the class rule shall take precedence.

A.8.3 Any interpretation of class rules required at an event may be made by an international jury constituted in accordance with the RRS. Such interpretation shall only be valid during the event and the organising authority shall, as soon as practical after the event, inform the ISAF, the MNA and the ITA.

A.9 INTERNATIONAL CLASS FEE AND ISAF PLAQUE
A.9.1 The licensed hull builder shall pay the International Class Fee, which shall be 3% of the builder's selling price (without VAT) for a standard Tornado without sails, on every pair of hulls, or hull kit, built whether or not the boat is subsequently measured and registered.

A.9.2 Half of the amount of the International Class Fee shall be paid on any single hull built for replacement or other purpose.

A.9.3 The ITA shall, having received the International Class Fee, send two numbered ISAF Building plaques and a measurement form to the licensed hull builder. The plaques shall be permanently affixed to the hull transoms by the builder prior to delivery to the owner.

A.9.4 An official International Class Fee receipt shall be issued to the builder by the Association. These shall be numbered consecutively.

A.9.5 The International Class Fee receipt shall be delivered by the builder to the owner on delivery of the hulls, or hull kit.

A.10 SAIL NUMBERS
A.10.1 Sail numbers shall be issued by the MNA, unless otherwise delegated per A.4.1 or A.4.2.

A.10.2 Sail numbers shall be issued in consecutive order starting at “1”.

A.10.3 No two boats in the class registered in the same country shall have the same sail number.

A.10.4 Personal sail numbers that are issued in compliance with RRS G.1.1(c) and registered with the ITA are permitted.

A.11 HULL CERTIFICATION
A.11.1 A certificate shall record the following information:

(a) Class

(b) Certification Authority

(c) Sail number issued by the certification authority
(d) Owner
(e) **Hull** identification
(f) Builder/Manufacturers details
(g) Date of issue of initial **certificate**
(h) Date of issue of **certificate**

**A.11.2** Templates used for **certification** shall be issued by the ISAF.

**A.12** **INITIAL HULL CERTIFICATION**
**A.12.1** For a **certificate** to be issued to **hulls** not previously **certified**:
(a) **Certification control** shall be carried out by an **official measurer** who shall complete the appropriate documentation.
(b) The documentation and **certification fee**, if required, shall be sent to the **certification authority**.
(c) Upon receipt of a satisfactorily completed documentation and **certification fee**, if required, the **certification authority** may issue a **certificate**.
(d) Payment for the **official measurer**’s service is the responsibility of the **boat owner**.

**A.13** **VALIDITY OF CERTIFICATE**
**A.13.1** A **certificate** becomes invalid upon:
(a) the change to any items recorded on the **hull certificate** as required under **A.11**
(b) the date of expiry
(c) any structural alteration, replacement of components or repair to the **hulls** other than permitted routine maintenance
(d) any alteration to **corrector weights** (see C.6.1 WEIGHT)
(e) withdrawal by the **certification authority**
(f) the issue of a new **certificate**

**A.14** **HULL RE-CERTIFICATION**
**A.14.1** The **certification authority** may issue a **certificate** to previously **certified** **hulls**:
(a) when it is invalidated under A.13.1(a),(b)(c), or (d) after receipt of the old **certificate**, and **certification fee** if required
(b) when it is invalidated under A.13.1 (e), at its discretion
(c) in other cases, by application of the procedure in A.12

**A.15** **RETENTION OF CERTIFICATION DOCUMENTATION**
**A.15.1** The **certification authority** shall:
(a) retain the original documentation upon which the current **certificate** is based
(b) upon request, transfer this documentation to the new **certification authority** if the **hulls** are exported
Section B – Boat Eligibility

For a boat to be eligible for racing, the rules in this section shall be complied with. Certification control and equipment inspection shall be carried out in accordance with the ERS except where varied in this part.

B.1 CLASS RULES AND CERTIFICATION

B.1.1 It is the responsibility of the owner to see that the boat, its spars, sails and equipment are correctly measured and to ensure that they thereafter comply with the class rules.

B.1.2 The boat shall:
(a) be in compliance with the class rules
(b) have a valid hull certificate
(c) have a valid mast certificate
(d) have valid certification marks as required
(e) have a completed, signed and dated Measurement Form

B.1.3 A certificate may be refused even if the specific requirements of the class rules are satisfied. The official measurer shall report on the Measurement Form anything, which he considers, departs from the intended nature of the design on the boat, and shall not sign the Form. A copy of the incomplete Form together with a full explanation of the points in question shall be immediately sent to the ITA Secretariat and the ISAF for a ruling in writing.

B.1.4 A boat may be disqualified or have its certificate withdrawn if low resistivity is found, which the official measurer believes cannot be explained by normal metal fastenings or fittings.

B.1.5 All certified boats shall be liable to re-measurement at the discretion of the certification authority or by an international jury constituted in accordance with the RRS at an event, but only by an official measurer. Any boat, re-measured and found not to comply with the class rules, may be disqualified.

B.2 FLOTATION CHECKS

B.2.1 The hulls shall carry a satisfactorily flotation check confirmation.

B.3 CLASS ASSOCIATION MARKINGS

B.3.1 A valid class association sticker, if required by the ITA or and NTA, shall be affixed to the hull in a conspicuous position.

B.3.2 The sail number and national letters of the boat shall be indelibly marked in letters with minimum height of 50mm on to the outside of the port transom.

B.4 NON-COMPLYING BOATS

B.4.1 Boats built using prohibited materials shall remain illegal. However, they shall be permitted to race in the club and local events for evaluation purposes, provided that they are registered with ITA (not the MNA) and also provided:
(a) Both hulls are indelibly marked on the outside of the transoms with a letter ‘X’ and with a number allocated by the ITA.
(b) The mainsails have a letter `X' of size and position in accordance with boat the class rules. The letter `X' shall be either in addition to or instead of national letter(s).

B.4.2 The International Class Fee as stated in A.9 shall be paid in respect of each experimental boat although such a boat remains illegal.

B.4.3 Such illegal boats will not be permitted to race in qualifying open meetings of any kind, National Championships, European Championships, World Championships or the Olympic Games unless approved by the ITA and the ISAF.
Part II – Requirements and Limitations

The crew and the boat shall comply with the rules in Part II when racing. In case of conflict Section C shall prevail.

The Class Rules in Part II are closed class rules, where anything that is not specifically allowed in Class Rules is prohibited.

Equipment control and equipment inspection shall be carried out in accordance with the ERS except where varied in this Part.

Section C – Conditions for Racing

C.1 GENERAL
C.1.1 RULES
(a) The ERS Part I – Use of Equipment shall apply.
(b) The Appendix C - ITA Championship Rules shall apply.
(c) RRS 49.1 is changed as follows: Competitors may use trapeze systems to position their bodies outboard. When using a trapeze system a competitor shall keep at least one of his feet in contact with the hull.
(d) RRS 50.4 shall not apply

C.2 CREW
C.2.1 LIMITATIONS
(a) The crew shall consist of two persons.

C.3 PERSONAL EQUIPMENT
C.3.1 MANDATORY
(a) Each crew member shall wear at all times when racing, a personal buoyancy device capable of keeping the crew member and all of his/her personal equipment afloat.

C.3.2 OPTIONAL
(a) Trapeze harnesses for each crew member
(b) All other personal equipment

C.4 ADVERTISING
C.4.1 LIMITATIONS
(a) Advertising shall only be displayed in accordance with Category C of the ISAF Advertising Code.

C.5 PORTABLE EQUIPMENT
C.5.1 FOR USE
(a) Optional
1) Magnetic compass(es)
2) Mechanical timing device(s)
3) Electronic devices that provide timing, heading, and heading memory but which do not transmit or receive data.

C.6 BOAT
C.6.1 WEIGHT
(a) The minimum total weight of the Assembled Hulls, Hull Appendages, and Rig, as defined in Sections D, E, & F of these class rules, shall be 155 kg, when in dry condition.

C.6.2 CORRECTOR WEIGHTS
(a) Corrector weights of lead shall be attached on the outside of the main beam and shall be removable for the purposes of measurement when the boat weight, as specified in C.6.1, is less than the minimum requirement.
(b) The total corrector weight shall not exceed 5kg. This shall apply to boats first registered after February 1977.

C.6.3 FLOTATION
(a) The builder shall certify that the boat with full racing equipment, and with both hulls swamped, shall support 160kg. If the boat is found at any time not to comply with this requirement, the certificate shall be invalid.

C.7 HULLS
C.7.1 FITTINGS
(a) Use
1) Any device for adjusting the main beam strut or tie shall remain locked while racing.

C.8 HULL APPENDAGES
C.8.1 FITTINGS
(a) Rudder retention devices
(b) Rudder pins or pintles
(c) Rudder gudgeons
C.8.2 LIMITATIONS
(a) Only two centreboards and two rudders shall be used during an event, except when a hull appendage has been lost or damaged beyond repair. Such replacement may be made only with the approval of the race committee. The race committee shall then remove or cross out any event limitation mark attached to the replaced hull appendage.
1) The two centreboards shall be fitted in the centreboard cases, one in each hull.
2) The two rudders shall be hung on the transoms, one on each transom
3) The rudder retention devices shall retain the rudders, in the event of capsize.
4) The rudders shall, when fore/aft, be in the centre plane of each hull.
C.9 RIG
C.9.1 MODIFICATIONS, MAINTENANCE AND REPAIR
(a) The rig shall not be altered in any way except as permitted by these class rules.

C.9.2 FITTINGS
(a) Forestay tension/rake adjustment device or fitting
(b) Shroud tension/rake adjustment devices or fittings

C.9.3 LIMITATIONS
(a) Only one set of spars and standing rigging shall be used during an event, except when an item has been lost or damaged beyond repair.
(b) Replacement may be made only with the approval of the race committee. The race committee shall then remove or cross out any event limitation mark attached to a replaced spar.

C.9.4 MAST
(a) Use
1) The mast shall be stepped on the centreline of the boat
2) When stepped, the mast datum point shall be not more than 90mm above the top of the main beam.
3) The vertical centre line shall intersect the main beam in any position to which the mast may be rotated.
4) There shall be a mechanical stop to prevent the tack of the mainsail from coming below the upper edge of the lower limit mark.

C.9.5 BOOM

C.9.6 BOWSPRIT
(a) Use
1) The bowsprit shall be attached to the main beam either on the front edge or the underside at the centre of the beam.
2) The bowsprit shall be fixed in a fore and aft position and stayed from the gennaker tack block position and its mid-section to the hulls. It shall not be adjusted while racing.
3) The bowsprit may be attached to the forestay by means of a forestay extension strut.
4) The bowsprit tip shall not be moved off the centreline while racing.

C.9.7 STANDING RIGGING
(a) Use
1) Standing rigging shall not be adjusted while racing.

C.9.8 RUNNING RIGGING
(a) Use
1) Running rigging shall be led externally to the mast.
2) Except as limited in C.9.8.a.1 above, running rigging may be led at the option of the crew.
3) At least one foot of each crew member using the trapeze gear must be in contact with the hull.

C.10 SAILS
C.10.1 LIMITATIONS
(a) The sail plan shall consist of 1 mainsail, 1 jib and 1 gennaker.
(b) 1 mainsail, 1 jib and 1 gennaker shall be used during an event, except when a sail has been lost or damaged beyond repair. Such replacement may be made only with the approval of the race committee. The race committee shall then remove or cross out any event limitation mark attached to a replaced sail.
(c) Tell tales are permitted; their number, placement, and materials are optional.

C.10.2 MAINSAIL
(a) IDENTIFICATION
The national letters and sail numbers shall comply with the RRS except where prescribed otherwise in these class rules.
(b) USE
1) The sail shall be hoisted on a halyard. The arrangement shall permit hoisting and lowering of the sail at sea.
2) The luff bolt rope shall be in the spar sail groove.
3) The sail shall not have a double luff or other fairing device.
4) The sail shall be set within the limit marks on the mast.
5) The sail shall be loose footed.

C.10.3 JIB
(a) USE
1) The sail shall be set on the forestay.
2) The tack shall not extend more than 500mm below the intersection of the forestay with the forestay strops. A device shall be used to prevent adjustment of the tack below this point.

C.10.4 GENNAKER
(a) USE
1) The sail shall be set between the mast and bowsprit.

Section D – Hulls
D.1 PARTS
D.1.1 MANDATORY
(a) Hulls
(b) Front Beam
(c) Rear Beam
(d) Trampoline
D.1.2 OPTIONAL
(a) Bulkheads
(b) Sub-decks

D.2 GENERAL

D.2.1 RULES
(a) The hulls shall comply with the class rules in force at the time of initial certification.

D.2.2 CERTIFICATION
(a) See Rule A.13.
(b) An MNA may appoint one or more persons at a manufacturer to certify hulls built by that manufacturer in accordance with the ISAF In-house Certification guidelines.

D.2.3 MODIFICATIONS, MAINTENANCE AND REPAIR
(a) The hulls, bulkheads, and sub-decks shall not be altered in any way except as permitted by these class rules.
(b) Holes for the installation of fittings may be made in the deck; such holes shall not be bigger than necessary to attach the fitting.
(c) Routine maintenance such as filling, sanding, painting and polishing is permitted without re-measurement and re-certification.
(d) Limited by compliance with class rule E.3, fairing the forward bottom end of the centreboard slot to fit the leading edge of the centreboard is permitted without re-measurement and re-certification.

D.2.4 DEFINITIONS
(a) The hull datum point shall be the centre of the hole in template No. 5, when template No. 5 is placed as described in D.6.4.a.ii.

D.2.5 IDENTIFICATION
(a) Each hull shall carry the ISAF Plaque permanently placed on the transom.

D.2.6 BUILDERS
(a) Professional builders of the Tornado shall be only those recognised and registered by the ISAF; and hulls, or hull kits shall only be built for sale by these builders.
(b) Recognition shall be subject to review and withdrawal by the ISAF. Professional builders shall be required to satisfy the ISAF through the ITA and the relevant National Authority of their competence to build the Tornado.
(c) Additional professional builders may be recognised by the ISAF at the recommendation of the ITA and the relevant National Authority, provided that a requirement can be shown for an additional source.
(d) Bona fide amateur builders shall be permitted to build not more than one boat a year, and this boat shall be for their own use.
D.3 **HULLS**

D.3.1 **MATERIALS**

(a) The hulls shall be made only of one or more of the following materials: wood, glass fibre, foam plastics, plastic fibres with a modulus of elasticity less than 100,000 kg/cm², resins, paints, glues and metal fastenings.

(b) Aramid (Kevlar) or other high modulus core materials require prior approval of the ISAF. The criteria for permitting these materials shall include: structural properties, cost, and durability.

(c) Metal fastenings shall be of stainless steel or aluminium.

D.3.2 **CONSTRUCTION**

(a) The skin shall not project beyond the transoms, which shall be flat and square across the hulls.

(b) The centre plane of each hull and its centreboard case shall coincide.

(c) Each hull shall have
   1) one shroud attachment point on the outer topsides
   2) one forestay strop attachment point
   3) one bowsprit attachment point

D.4 **BEAMS**

D.4.1 **PARTS**

(a) MANDATORY
   1) Main beam
   2) Main Beam Strut and Tie
   3) Mast step
   4) Aft Beam

(b) OPTIONAL
   1) Main and Rear beam bulkheads
   2) Main and Rear end caps

D.4.2 **MATERIALS**

(a) The main beam and rear beam extrusions shall be made of aluminium alloy.

(b) The strut and the tie shall be made of either stainless steel or aluminium.

(c) The materials for beam attachment straps and compass holders are optional.

D.4.3 **CONSTRUCTION**

(a) The main beam and rear beam shall each be one continuous straight tube of constant section along their lengths.

(b) The main beam shall be oval in section with a common radius front and rear.

(c) A rear beam extrusion incorporating an integral mainsheet track shall only be permitted if the design has been submitted to and approved by the ISAF.

(d) An aluminium or epoxy composite bulkhead casting is permitted inside the main beam at the position of the mast step.
(e) Aluminium longitudinal or transverse bulkheads are permitted at any point within the main and rear beams.

(f) The mast step shall be in a fixed position. (Not a jack or adjustable)

(g) Holes for the installation of fittings may be made in the beams; such holes shall not be bigger than necessary to attach the fitting.

(h) The ends of the main and rear beams shall be perpendicular to their length.

(i) The main beam shall be fitted with a strut and tie

1) The tie shall be flat stock the leading edge of which may be may be rounded, but not sharpened.

2) The strut shall be of circular cross-section.

### D.4.4 DIMENSIONS

<table>
<thead>
<tr>
<th></th>
<th>minimum</th>
<th>maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Main Beam</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wall thickness</td>
<td>2 mm</td>
<td>2.35 mm</td>
</tr>
<tr>
<td>Major Diameter</td>
<td>130 mm</td>
<td>135 mm</td>
</tr>
<tr>
<td>Minor Diameter</td>
<td>90 mm</td>
<td>91 mm</td>
</tr>
<tr>
<td>Corner Radius</td>
<td>45 mm</td>
<td>-</td>
</tr>
<tr>
<td>Strut diameter</td>
<td>24 mm</td>
<td>-</td>
</tr>
<tr>
<td>Deflection w/o mast being stepped</td>
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<td>15 mm</td>
</tr>
<tr>
<td>Tie thickness</td>
<td>3 mm</td>
<td>-</td>
</tr>
<tr>
<td>Tie leading edge radius</td>
<td>-</td>
<td>1.5 mm</td>
</tr>
<tr>
<td>Distance of underside of the tie below the strut</td>
<td>235 mm</td>
<td>255 mm</td>
</tr>
<tr>
<td>Distance of junction of tie and main beam from centreline</td>
<td>1000 mm</td>
<td>1100 mm</td>
</tr>
</tbody>
</table>

| **Rear Beam**          |         |         |
| Wall thickness, excluding traveller track | 2 mm    | 2.35 mm |
| Major Diameter         | 130 mm  | 135 mm  |
| Minor Diameter w/o traveller track | 89 mm   | 91 mm   |
| Minor Diameter w/ traveller track     | 106 mm  | 108 mm  |

### D.5 TRAMPOLINE

#### D.5.1 MATERIALS

(a) Materials for the trampoline are optional, except that Aramid (Kevlar) or any similar fibre shall not be used.

#### D.5.2 CONSTRUCTION

(a) A single trampoline shall cover the area between the main beam, rear beam and inner sheerlines. The trampoline may be wrapped around the beam to form a sleeve, which shall not incorporate any padding.

(b) Lacing eyes are permitted.

(c) Holes are allowed in the trampoline.

1) The area of each hole shall be taken as the area of the enclosing rectangle. This area shall exclude the total area of the spaces that accrue between the woven elements, the warp and the weft, of the trampoline.

2) The intersection of warp and weft shall not be knotted, welded, or in any other way treated to space the warp and weft apart.
(d) A gennaker bag is permitted. If it is integrated into the trampoline and has an opening in the top of the trampoline, it shall be considered a bag, and is not subject to Rule D.5.2 (a), and is not included in the area limitation of Rule D.5.2 (d).

(e) Storage bags or pouches, subject to Rule D.5.2 (a), are permitted and are not included in the area limitation of Rule D.5.2 (d).

D.5.3 DIMENSIONS

<table>
<thead>
<tr>
<th></th>
<th>minimum</th>
<th>maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gap around the trampoline perimeter</td>
<td></td>
<td>130 mm</td>
</tr>
<tr>
<td>Total area of holes in trampoline</td>
<td>2 mm</td>
<td>0.1 sqm</td>
</tr>
<tr>
<td>Distance of trampoline and any lacing from the nearest surface of the beam</td>
<td></td>
<td>185 mm</td>
</tr>
</tbody>
</table>

D.6 ASSEMBLED HULLS

D.6.1 BUOYANCY

The builder shall certify that the boat with full racing equipment, and with both hulls swamped, shall support 160kg.

D.6.2 CONSTRUCTION

(a) The hulls shall be joined by a main beam and a rear beam without fairings.
(b) There shall be no beam or strut attached to the hulls other than the main beam and rear beam and there shall be no beam or strut connecting the main beam and rear beam.
(c) The main beam and rear beam shall be let into the deck and rigidly attached to the hulls; but shall be easily removable.
(d) There shall be no trampoline or other covering whatsoever in front of the main beam or behind the rear beam except that the trampoline material may be wrapped round the beams. The trampoline shall not overlap the inner sheerlines of either hull.
(e) Sealing strips of any suitable material for the centreboard slots are permitted.
(f) A mainsheet traveller system is permitted if the traveller runs in a substantially straight line vertically and horizontally along the rear beam only. The track shall be considered to be substantially straight if the departure from a straight line is not more than 10mm.
(g) A jib sheet traveller system is permitted to be attached to the main beam. The jib traveller system is free of material restrictions.
(h) The line of each half of the forestay strop shall not pass above the inner sheerlines when the boat is rigged.

D.6.3 FITTINGS

(a) MANDATORY
   1) Shroud attachment fittings
   2) Forestay strop attachment fittings
   3) Bowsprit attachment fittings
   4) Trampoline attachment fittings
(b) OPTIONAL
1) Foot loops, toe straps, trapeze gear, and any line for retaining crew position on the boat.
2) Centreboard retention fittings
3) Running rigging blocks, fairleads, and cleats
4) Compass holders
5) Inspection hole(s) provided that the watertight integrity of the hulls is maintained and covers are capable of resisting accidental dislodgement.

D.6.4 DIMENSIONS
(a) The hulls shall be inverted. The bow template shall be applied with the projections touching the skin, and:
1) Template No. 5 shall be positioned 5 metres from the aft edge of the bow template and shall touch the skin at the keel and be equidistant from the sheerlines.
2) The bow template shall be adjusted to bring the inscribed datum line in coincidence with a base line, which shall be horizontal and pass through the datum point at the centre of the hole in template No. 5.
3) The remaining measurement templates shall be positioned 0, 1, 2, 3.3 and 4.2 metres from the aft edge of the bow template. Each template shall touch the skin at the keel and at each station the template shall be equidistant from the sheerlines.
(b) Each of the templates positioned 0, 1, 2, 3.3, 4.2 and 5 metres from the aft edge of the bow template shall touch the hull at, either the centreline inscribed on the template, or within the raised section on the template, and on both sides of the inscribed centreline.
(c) The base line shall pass through the holes in the templates and shall clear template positions 1, 2, 3.3 and 4.2.
(d) The sheerlines at all stations shall not be above or below the tolerance marks on the templates.
(e) The major axis of the sections shall be parallel to the sheer.
(f) With the deck crown template normal to the deck and square across the hull, the clearance between deck and template shall be not more than 5mm except in way of recesses or pads for ports and fittings.

<table>
<thead>
<tr>
<th>Hulls</th>
<th>minimum</th>
<th>maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>inverted and horizontal, with templates in place, the clearance between skin and:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>stem template</td>
<td>10 mm</td>
<td></td>
</tr>
<tr>
<td>any template above central projection</td>
<td>10 mm</td>
<td></td>
</tr>
<tr>
<td>central projection of template position 0</td>
<td>3 mm</td>
<td></td>
</tr>
<tr>
<td>central projection of templates positions 1; 2; 3.3; 4.2 and 5 (per D.6.4.b)</td>
<td>2 mm</td>
<td></td>
</tr>
<tr>
<td>Aft most point of hull to aft end of bow template</td>
<td>5085 mm</td>
<td>5096 mm</td>
</tr>
<tr>
<td>Aft surface of the transom, at sheerline level, forward of the aft most point of the hull</td>
<td>30 mm</td>
<td>50 mm</td>
</tr>
</tbody>
</table>
### Hulls - upright and assembled

<table>
<thead>
<tr>
<th>Description</th>
<th>Measurement 1</th>
<th>Measurement 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Difference between deck centreline separation and keel centreline separation immediately aft of main beam</td>
<td>2610 mm</td>
<td>2630 mm</td>
</tr>
<tr>
<td>Deck centreline separation</td>
<td>10 mm</td>
<td></td>
</tr>
<tr>
<td>Difference between diagonal lengths, measured from the tip of each bow to the aft edge of the opposite transom at the inner sheerlines</td>
<td></td>
<td>25 mm</td>
</tr>
<tr>
<td>Clearance between deck and template at any point along length of hull</td>
<td>5 mm</td>
<td></td>
</tr>
<tr>
<td>Radius at sheer, measured perpendicular to both the deck and the topside</td>
<td>12 mm</td>
<td></td>
</tr>
<tr>
<td>Aft edge of main beam from stem head length datum, as inscribed on the bow template</td>
<td>3095 mm</td>
<td>3115 mm</td>
</tr>
<tr>
<td>Forward edge of rear beam from stem head length datum, as inscribed on the bow template</td>
<td>5324 mm</td>
<td>5344 mm</td>
</tr>
<tr>
<td>Shroud attachment point distance aft of aft most edge of main beam, measured along the sheer to the point of intersection with the plane of the shrouds</td>
<td>708 mm</td>
<td>728 mm</td>
</tr>
<tr>
<td>Distance between the outer surface of shroud chain plate and the outer surface of the topside</td>
<td>-</td>
<td>15 mm</td>
</tr>
<tr>
<td>Forestay strop attachment point forward of aft edge of main beam</td>
<td>1965 mm</td>
<td>1980 mm</td>
</tr>
<tr>
<td>Forestay strop attachment points from sheerline</td>
<td></td>
<td>50 mm</td>
</tr>
<tr>
<td>The main beam and rear beam lower surfaces below the inner sheerlines</td>
<td>25 mm</td>
<td>35 mm</td>
</tr>
</tbody>
</table>

---

**Section E – Hull Appendages**

**E.1 PARTS**

E.1.1 MANDATORY

(a) Centreboards

(b) Rudders

(c) Tillers

(d) Tiller connecting bar

E.1.2 OPTIONAL

(a) Tiller extension

**E.2 GENERAL**

E.2.1 RULES

(a) Hull appendages shall comply with the class rules.

E.2.2 MODIFICATION, MAINTENANCE, AND REPAIR

(a) Hull appendages shall not be altered in any way except as permitted by these class rules.

(b) Routine maintenance such as filling, sanding, painting and polishing is permitted without re-measurement and re-certification.

E.2.3 CERTIFICATION
(a) An official measurer shall certify the centreboards and rudders.

(b) An MNA may appoint one or more persons at a manufacturer to certify hull appendages built by that manufacturer in accordance with the ISAF In-house Certification Guidelines.

(c) No certification is required for tiller connecting bars and tiller extensions.

E.2.4 MANUFACTURERS

(a) No licence is required.

E.3 CENTREBOARDS

E.3.1 RULES

(a) Two centreboards shall be fitted in the centreboard cases, one in each hull.

E.3.2 MATERIALS

(a) The centreboards shall be made only of one or more of the following materials: wood, glass fibre, foam plastics, plastic fibres with a modulus of elasticity less than 100,000 kg/cm², resins, paints, glues and metal fastenings.

(b) The pivot bushing materials are optional.

E.3.3 CONSTRUCTION

(a) The centreboards shall have no moving parts.

(b) The cross-section of each centreboard shall be symmetrical about its fore and aft centreline.

(c) The pivot point in the centreboard shall be aft of the line of the underwater leading edge of the centreboard.

(d) Each centreboard shall be capable of being raised completely so that the centreboard does not project below the line of the bottom of the hull.

(e) The central plane of the centreboard case shall coincide with the central plane of the hull.

E.3.4 FITTINGS

(a) Pivot bushings

E.3.5 DIMENSIONS

<table>
<thead>
<tr>
<th></th>
<th>minimum</th>
<th>maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>With centreboard fully lowered</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distance from aft end of bow template to intersection of keel line and centreboard leading edge</td>
<td>2465 mm</td>
<td>2485 mm</td>
</tr>
<tr>
<td>Clearance of the underwater profile of each centreboard from the centreboard template, both ends of which shall touch the hull at the centreline of the bottom of the hull</td>
<td>0 mm</td>
<td>10 mm</td>
</tr>
<tr>
<td>Distance aft of pivot point from leading edge E.3.3.c</td>
<td>-</td>
<td>100 mm</td>
</tr>
<tr>
<td>Centreboard height from head to tip</td>
<td>1150 mm</td>
<td>-</td>
</tr>
<tr>
<td>Centreboard thickness at keel line</td>
<td>25 mm</td>
<td>29 mm</td>
</tr>
<tr>
<td>Centreboard thickness at any point</td>
<td>-</td>
<td>29 mm</td>
</tr>
<tr>
<td>Centreboard width measured from forward corner to aft corner.</td>
<td>-</td>
<td>600 mm</td>
</tr>
</tbody>
</table>

E.3.6 WEIGHTS
The weight of each **centreboard** | minimum | maximum  
--- | --- | ---  
| | | 5kg  

**E.4 RUDDERS & TILLERS**

**E.4.1 RULES**

(a) Two **rudders** shall be hung on the transoms, one on each transom.

**E.4.2 DEFINITIONS**

(a) The forward top edge of the template shall be on the centreline of the bottom of the **hull** or the extension of that line.

(b) The leading edge of the **rudder** shall not be in front of the transom at the centreline of the bottom of the **hull**.

**E.4.3 MATERIALS**

(a) Materials for the **rudder** blade are optional, except that Aramid (Kevlar) or any similar fibre shall not be used.

(b) Materials for **rudder** heads, **tillers**, and **tiller** connecting arm are optional.

(c) Metal fastenings shall be of stainless steel or aluminium.

**E.4.4 CONSTRUCTION**

(a) **Rudder** blades shall pivot to the full down position.

**E.4.5 FITTINGS**

(a) Mandatory

1) 2 gudgeons  
2) 2 pins or pintles  
3) 2 rudder retention fittings

(b) Optional

1) Pivot and pivot lock fittings

**E.4.6 DIMENSIONS**

| Clearance of the profile of each **rudder** blade from the rudder blade template, measured with rudder in fully down, centred fore-and-aft position | minimum | maximum  
--- | --- | ---  
| | 0 mm | 10 mm  
| Distance from the face of the transom to the pivot line of the **rudder** | - | 50 mm  

**E.4.7 WEIGHTS**

| The minimum weight of each complete **rudder** assembly comprising blade, stock and tiller | minimum | maximum  
--- | --- | ---  
| | 3kg | -  

Tornado Class Rules 2015 Version 1.0
Section F – Rig

F.1 PARTS
F.1.1 MANDATORY
(a) Mast
(b) Boom
(c) Bowsprit
(d) Standing Rigging
(e) Running Rigging

F.1.2 OPTIONAL
(a) Bowsprit-to-forestay extension strut
(b) Gennaker retrieval system

F.2 GENERAL
F.2.1 RULES
(a) The mast and its fittings shall comply with the class rules in force at the time of certification of the mast.
(b) The boom, bowsprit, standing and running rigging shall comply with the class rules.

F.2.2 MODIFICATIONS, MAINTENANCE AND REPAIR
(a) Spars shall not be altered in any way except as permitted by these class rules.
(b) Holes for the installation of fittings may be made in the mast spar; such holes shall not be bigger than necessary to attach the fitting.
(c) Routine maintenance is permitted without re-measurement and re-certification.

F.2.3 CERTIFICATION
(a) An official measurer shall certify the mast.
(b) Each mast shall have a permanent, unique, and clearly visible identifying code on the starboard side of the mast spar.
(c) An MNA may appoint one or more persons at a manufacturer to certify masts, and/or other rig items built by that manufacturer in accordance with the ISAF In-house Certification Guidelines.
(d) No certification is required for the boom, bowsprit, standing and running rigging.

F.2.4 MANUFACTURER
(a) Mast manufacturers shall be licensed by ISAF.
(b) All mast moulds shall be approved by ISAF.
(c) No licence is required for the manufacture of booms, bowsprits, standing and running rigging.
F.3 MAST

Aluminium Masts built before 1 December 2004 are not governed by this section F.3 Mast. See instead, Section III, Appendix B – Aluminium Masts.

F.3.1 MATERIALS

(a) Mast Spars and spreaders shall be made of commercial grade HT T600 or T700 carbon fibres.

(b) The materials for a mast tiller are optional

F.3.2 DEFINITIONS

(a) The mast datum point shall be the lowest point of the mast spar.

(b) The sail groove heights shall be measured from the mast datum point.

(c) The mast spar taper point shall be at the forestay rigging point.

(d) The diamond stay height shall be the distance between the mast datum point and the diamond stay upper rigging point.

(e) The diamond stay lower rigging point shall be measured from the mast datum point.

(f) The diamond stay upper and lower rigging points shall be positioned fore-and-aft by measuring from the aft edge of the mast spar.

(g) The spreader rigging points shall be positioned for-and-aft by measuring from the aft edge of the mast spar.

(h) The location of the mast tiller is optional and may be either above or below the gooseneck.

F.3.3 CONSTRUCTION

(a) The mast spar shall include a fixed sail groove, which shall be integral with the spar and shall be of the same material.

(b) The mast spar shall have one web.

(c) The mast spar shall be adequately sealed against water between the upper limit mark and lower limit mark.

(d) The mast spar cross-section dimensions shall be constant from the mast datum point to the mast spar taper point.

(e) The mast spar shall be tapered along the leading edge from the mast spar taper point to the upper point.

(f) The mast spar taper shall be constant from beginning to end.

(g) The mast spar taper cross-section dimensions shall be measured at the upper point.

(h) The mast spar shall have a stainless steel through-bar tapped into the mast spar section to provide the spreader rigging points. This through-bar shall be centered on the centreline of the mast spar.

(i) The upper end of each diamond stay shall be attached to this through-bar by means of a 6mm stainless steel bolt on each side of the mast spar.

(j) The mast spar shall have a stainless steel through-bar tapped into the mast spar section to provide the diamond stay upper rigging points.
The mast spar base shall be fitted with a 10mm stainless steel centre bolt to provide the diamond stay lower rigging point. Diamond stay tension shall be adjusted by turning this centre bolt.

The gooseneck fitting shall be fastened to the mast spar with the upper edge of the gooseneck fitting in line with the lower point. The gooseneck fitting shall prevent the sail from coming below the lower point.

A mast tiller fitted to the mast shall be removable. The mast tiller location is optional.

The mast spar may have integral reinforcement sufficient for mounting the gooseneck, Cunningham cleats, gennaker halyard cleat, or mast tiller.

### F.3.4 FITTINGS

(a) Mandatory:
1) one pair of foil section spreaders with round adjustable rake arms and fittings
2) one masthead fitting, which shall include the mainsail halyard sheave and locking device
3) gennaker halyard guide
4) gennaker halyard block with attachment
5) gooseneck fitting
6) heel fitting
7) diamond stay attachment fittings
8) diamond stay adjustment fittings

(b) Optional:
1) mast tiller
2) mechanical wind indicator(s)
3) mast may be have reinforcement pads at fitting attachment points

### F.3.5 DIMENSIONS

<table>
<thead>
<tr>
<th></th>
<th>minimum</th>
<th>maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper point height</td>
<td>-</td>
<td>9294 mm</td>
</tr>
<tr>
<td>Lower point height</td>
<td>379 mm</td>
<td>-</td>
</tr>
<tr>
<td>Forestay height</td>
<td>7230 mm</td>
<td>7240 mm</td>
</tr>
<tr>
<td>Sail groove</td>
<td></td>
<td></td>
</tr>
<tr>
<td>lower point height</td>
<td>758 mm</td>
<td>762 mm</td>
</tr>
<tr>
<td>upper point height</td>
<td>838 mm</td>
<td>842 mm</td>
</tr>
<tr>
<td>Shroud height</td>
<td>7230 mm</td>
<td>7240 mm</td>
</tr>
<tr>
<td>Diamond stay height</td>
<td>6698 mm</td>
<td>6702 mm</td>
</tr>
<tr>
<td>lower rigging point</td>
<td>-31 mm</td>
<td>-35 mm</td>
</tr>
<tr>
<td>upper rigging point fore / aft location</td>
<td>60 mm</td>
<td>64 mm</td>
</tr>
<tr>
<td>lower rigging point fore / aft location</td>
<td>40 mm</td>
<td>45 mm</td>
</tr>
<tr>
<td>Trapeze height</td>
<td>7230 mm</td>
<td>7240 mm</td>
</tr>
<tr>
<td>Spreader length</td>
<td>394 mm</td>
<td>-</td>
</tr>
</tbody>
</table>

length, measured from the centre of the attachment hole for rigging point to inner edge of the bearing surface for the diamond stay
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>height, measured to the <strong>spreader rigging point</strong></td>
<td>3398 mm</td>
<td>3402 mm</td>
</tr>
<tr>
<td>distance between port and starboard <strong>rigging points</strong></td>
<td>95 mm</td>
<td>97 mm</td>
</tr>
<tr>
<td><strong>rigging point</strong> fore / aft location</td>
<td>111 mm</td>
<td>113 mm</td>
</tr>
<tr>
<td><strong>Gennaker</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>hoist height</td>
<td>-</td>
<td>8180 mm</td>
</tr>
<tr>
<td>halyard bearing surface distance from <strong>mast spar</strong></td>
<td>-</td>
<td>100 mm</td>
</tr>
<tr>
<td><strong>Gooseneck fitting height above datum point</strong></td>
<td>375 mm</td>
<td>379 mm</td>
</tr>
<tr>
<td><strong>Mast spar</strong> fore-and-aft dimension</td>
<td>134 mm</td>
<td>135.5 mm</td>
</tr>
<tr>
<td><strong>Mast spar</strong> transverse dimension</td>
<td>72 mm</td>
<td>73 mm</td>
</tr>
<tr>
<td>Distance from fore side of the <strong>mast spar</strong> to aft side of mast spar web</td>
<td>115.8 mm</td>
<td>117.3 mm</td>
</tr>
<tr>
<td><strong>Mast spar</strong> taper fore-and-aft dimension</td>
<td>98 mm</td>
<td>99 mm</td>
</tr>
<tr>
<td><strong>Mast spar</strong> taper transverse dimension</td>
<td>56 mm</td>
<td>57 mm</td>
</tr>
<tr>
<td><strong>Mast spar</strong> taper divergence from string line</td>
<td>-0.5 mm</td>
<td>0.5 mm</td>
</tr>
<tr>
<td><strong>Mast spar</strong> deflection when loaded with 50 kg at the diamond stay upper <strong>rigging point</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transverse:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>at <strong>gennaker hoist height</strong> + - 20mm</td>
<td>53 mm</td>
<td>57 mm</td>
</tr>
<tr>
<td>at diamond stay height + - 20mm</td>
<td>102 mm</td>
<td>106 mm</td>
</tr>
<tr>
<td>at <strong>spreader height</strong> + - 20mm</td>
<td>94 mm</td>
<td>98 mm</td>
</tr>
<tr>
<td>Fore-and-aft:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>at <strong>gennaker hoist height</strong> + - 20mm</td>
<td>21 mm</td>
<td>25 mm</td>
</tr>
<tr>
<td>at diamond stay height + - 20mm</td>
<td>41 mm</td>
<td>45 mm</td>
</tr>
<tr>
<td>at <strong>spreader rigging point</strong> + - 20mm</td>
<td>38 mm</td>
<td>42 mm</td>
</tr>
</tbody>
</table>

F.3.6 **WEIGHTS**

(a) The **mast** shall be weighed for **certification** in a horizontal position supported at the **lower point** and the **upper point**

1) with mandatory **mast fittings** attached
2) with diamond stays attached
3) with Cunningham lines coiled at the **mast** heel

<table>
<thead>
<tr>
<th></th>
<th>minimum</th>
<th>maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mast tip</td>
<td>6.3 kg</td>
<td>-</td>
</tr>
<tr>
<td>Mast</td>
<td>14.4 kg</td>
<td>-</td>
</tr>
</tbody>
</table>

F.4 **BOOM**

F.4.1 **MATERIALS**

(a) The **boom spar** shall be made of an aluminium alloy.
(b) The **boom spar** maybe be anodized, painted or powder coated

F.4.2 **CONSTRUCTION**

(a) The **boom spar** shall be an inherently straight continuous extrusion of constant section throughout its length.

F.4.3 **FITTINGS**

(a) The following fittings are permitted:

1) Mainsheet system
2) **Clew** attachment
3) Outhaul system
4) Gooseneck attachment
5) Mast rotation controls

F.4.4 DIMENSIONS

<table>
<thead>
<tr>
<th></th>
<th>minimum</th>
<th>maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boom spar, excluding fittings, shall pass through a circle of diameter</td>
<td>-</td>
<td>100 mm</td>
</tr>
</tbody>
</table>

F.5 BOWSPRIT

F.5.1 MANUFACTURER
(a) Manufacturer is optional.

F.5.2 MATERIALS
(a) Bowsprit materials are optional.
(b) Bowsprit spar stay materials are optional.
(c) Bowsprit-to-forestay extension strut materials are optional.
(d) Gennaker retrieval system materials are optional.

F.5.3 CONSTRUCTION
(a) The forward end of the bowsprit spar shall be plugged or capped, and blunt.

F.5.4 FITTINGS
(a) MANDATORY
1) Gennaker tack block
2) Stays from the bowsprit spar gennaker tack block position and the bowsprit mid section to the hulls
3) Attachment point fittings for the jib tack and/or jib luff tension
(b) OPTIONAL
1) Attachment point fittings for the bowsprit-to-forestay extension strut and jib sheet.
2) A gennaker retrieval system may be attached to the bowsprit or be integral to the construction of the bowsprit. It shall be suitable solely for the purpose of containing the gennaker and shall not violate rule D.6.2.d.

F.5.5 DIMENSIONS

<table>
<thead>
<tr>
<th></th>
<th>minimum</th>
<th>maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bowsprit spar diameter</td>
<td>38 mm</td>
<td>-</td>
</tr>
<tr>
<td>Distance of bearing surface of the gennaker tack lead from the forward edge of the main beam, measured with the gennaker halyard pulled tight and the bowsprit fitted to the boat in its normal sailing position</td>
<td>4000 mm</td>
<td></td>
</tr>
</tbody>
</table>

F.5.6 WEIGHT

<table>
<thead>
<tr>
<th></th>
<th>minimum</th>
<th>maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bowsprit spar, gennaker retrieval system, fasteners,</td>
<td>2.2 kg</td>
<td>-</td>
</tr>
</tbody>
</table>
**tack** block, halyard/tack line block, internal **tack** line and brace stays

<table>
<thead>
<tr>
<th>F.6</th>
<th>STANDING RIGGING</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>F.6.1 MATERIALS</strong></td>
<td></td>
</tr>
<tr>
<td>(a) The standing <strong>rigging</strong> shall be of stainless steel; and except for diamond stays rod <strong>rigging</strong> is not permitted.</td>
<td></td>
</tr>
<tr>
<td>(b) All standing <strong>rigging</strong> shall be circular in section and shall have no fairings.</td>
<td></td>
</tr>
<tr>
<td>(c) Diamond stays shall be of stainless steel rod <strong>rigging</strong>.</td>
<td></td>
</tr>
<tr>
<td><strong>F.6.2 PARTS</strong></td>
<td></td>
</tr>
<tr>
<td>(a) MANDATORY</td>
<td></td>
</tr>
<tr>
<td>1) one forestay, shroud, and trapeze line attachment fitting</td>
<td></td>
</tr>
<tr>
<td>2) one forestay</td>
<td></td>
</tr>
<tr>
<td>3) one forestay strop, which shall lie on the centreline of the boat</td>
<td></td>
</tr>
<tr>
<td>4) one pair of shroud wires (2 shroud wires)</td>
<td></td>
</tr>
<tr>
<td>5) one pair of diamond stays (2 stays)</td>
<td></td>
</tr>
<tr>
<td><strong>F.6.3 FITTINGS</strong></td>
<td></td>
</tr>
<tr>
<td>(a) MANDATORY</td>
<td></td>
</tr>
<tr>
<td>1) <strong>rigging</strong> link or screw for each shroud</td>
<td></td>
</tr>
<tr>
<td>2) two 6mm rigging bolts for diamond stay upper ends</td>
<td></td>
</tr>
<tr>
<td>3) one 10mm centre rigging bolt for the diamond stay lower ends</td>
<td></td>
</tr>
<tr>
<td>(b) OPTIONAL</td>
<td></td>
</tr>
<tr>
<td>1) <strong>rigging</strong> screws or turnbuckles</td>
<td></td>
</tr>
<tr>
<td>2) shackles</td>
<td></td>
</tr>
<tr>
<td>3) shroud adjuster plates</td>
<td></td>
</tr>
<tr>
<td>4) lashings</td>
<td></td>
</tr>
<tr>
<td><strong>F.6.4 DIMENSIONS</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>minimum</td>
</tr>
<tr>
<td>Diamond Stay Rod <strong>Rigging</strong> Diameter</td>
<td>2.9 mm</td>
</tr>
<tr>
<td>Shroud, Forestay, and Forestay Strop Diameter</td>
<td>3 mm</td>
</tr>
<tr>
<td>Point of intersection of the lines of the forestay and each half of the forestay strop from a straight line joining the inner sheerlines where they intersect the plane of the forestay bridle. This measurement shall be taken with the forestay strop in a vertical plane and with an upward force of not less than 2kg and not more than 6kg applied vertically at the centreline of the <strong>boat</strong>.</td>
<td>838 mm</td>
</tr>
<tr>
<td><strong>F.6.5 WEIGHT</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>minimum</td>
</tr>
<tr>
<td>Forestay, forestay strop, shrouds and shackles, <strong>rigging</strong> links and shroud adjusters used to attach these to the mast and the hulls.</td>
<td>1.7 kg</td>
</tr>
</tbody>
</table>
F.7 RUNNING RIGGING

F.7.1 MATERIALS
(a) Materials are optional.

F.7.2 PARTS
(a) MANDATORY
   1) Mainsail halyard
   2) Mainsail sheet
   3) Jib halyard
   4) Jib sheets
   5) Gennaker halyard
   6) Gennaker sheets
   7) Gennaker tack line
   8) Trapeze lines
   9) Cunningham lines
(b) OPTIONAL
   1) Mast rotation control lines
   2) All other running rigging is optional.

F.7.3 Fittings
(a) fitting locations are optional
(b) fitting materials are optional
(c) blocks, fairleads, cleats, fittings and attachment points are optional

Section G – Sails

G.1 PARTS
G.1.1 MANDATORY
(a) Mainsail
(b) Jib
(c) Gennaker

G.2 GENERAL
G.2.1 RULES
(a) Sails shall comply with the class rules.
(b) The ITA will accept proposals for new sailcloth materials to be added to “Appendix A – Approved Sailcloth List” once each year.

G.2.2 MODIFICATIONS, MAINTENANCE AND REPAIR
(a) Sails shall not be altered in any way except as permitted by these class rules.
(b) Routine maintenance, such as repairing minor tears, is permitted without re-measurement.

G.2.3 SAILMAKER
(a) No licence is required.
(b) The sailcloth manufacturer and sailcloth type of the **body of the sail** shall be indelibly marked near the **head point** by the sailmaker, together with the date and his signature or stamp.

G.2.4 CERTIFICATION
(a) An **official measurer** shall **certify** the sails.
(b) An MNA may appoint one or more persons at a manufacturer to **certify sails** built by that manufacturer in accordance with the ISAF In-house Certification Guidelines.

G.2.5 SAIL ROYALTY LABEL
Sails certified after 21st January 2014 shall have permanently fixed at the tack, a class royalty label. Labels shall be purchased from the ITA and the label shall not be transferred from one sail to another.

G.3 MAINSAIL
G.3.1 IDENTIFICATION
(a) The class insignia shall conform to the dimensions and requirements as detailed in RRS Appendix G.

G.3.2 MATERIALS
(a) The **body of the sail** and **secondary reinforcement** shall be of polyester **woven ply** and/or **laminated ply** listed in “Appendix A – Approved Sailcloth”.
(b) **Primary reinforcement**, **batten pockets**, and **tabling** may be of any polyester **woven ply** and/or **laminated ply**.
(c) **Stiffening** may be of any material, except that Aramid (Kevlar) and carbon fibre are not permitted.
(d) **Windows** may be of any transparent polyester **ply**. The **ply** may have polyester reinforcement threads.
(e) **Attachments** may be of any material, except that aramid (Kevlar) or other high modulus tape or rope is permitted for reinforcement only within 80mm of the **luff**.

G.3.3 CONSTRUCTION
(a) The construction shall be: **Soft sail, single ply sail**.
(b) **Sail reinforcement**
   1) **Primary reinforcement** is permitted within a distance of 595mm from each **sail corner**
   2) **Secondary reinforcement** is permitted within a distance of four times the limits prescribed for the **primary reinforcement** (2380mm) from each **sail corner**.
(c) The **sail** may have a maximum of ten (10) **batten pockets**.
(d) **Stiffening**
   1) A maximum of ten (10) battens are permitted, which
      i) shall not be of more than 30mm in width
ii) shall not protrude more than 100mm beyond the leech of the sail

iii) shall have no moving parts

2) A headboard is permitted

(e) The following are permitted: Stitching, glues, tapes, Cunningham eye and/or block, batten pocket patches, batten pocket elastic, batten pocket end caps, leech line with cleat, sail shape indicator stripes and items as permitted or prescribed by other applicable rules.

(f) The foot shall not be convex.

(g) The sail shall be loose footed.

(h) The leech shall not extend aft of straight lines between the batten pockets. Any hollows in the leech between width measurement points shall be bridged with straight lines for measurement.

(i) The sail shall have least one window. Additional windows are permitted. Window shape and size are optional provided that:

1) One window shall be of a size and shape that encloses a rectangle of minimum dimensions 800mm X 300mm. When so enclosed, the rectangle shall fit below a line 1500mm from, and parallel to, the foot.

2) The maximum height for any part of a window shall be a line 2000mm from, and parallel to, the foot.

G.3.4 DIMENSIONS

<table>
<thead>
<tr>
<th></th>
<th>minimum</th>
<th>maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Luff length</strong></td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Leech length</strong></td>
<td>-</td>
<td>8700 mm</td>
</tr>
<tr>
<td><strong>Top width</strong></td>
<td>-</td>
<td>800 mm</td>
</tr>
<tr>
<td><strong>Quarter width</strong></td>
<td>-</td>
<td>2260 mm</td>
</tr>
<tr>
<td><strong>Half width</strong></td>
<td>-</td>
<td>2000 mm</td>
</tr>
<tr>
<td><strong>Three-quarter width</strong></td>
<td>-</td>
<td>1500 mm</td>
</tr>
<tr>
<td>Extension of headboard from head point in any direction</td>
<td>-</td>
<td>220 mm</td>
</tr>
<tr>
<td><strong>Sail reinforcement</strong>, measured from sail corner measurement points</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Primary reinforcement</strong></td>
<td></td>
<td>595 mm</td>
</tr>
<tr>
<td><strong>Secondary reinforcement</strong></td>
<td></td>
<td>2380 mm</td>
</tr>
<tr>
<td>Distance from point on luff 1300mm below head to nearest point on leech</td>
<td>-</td>
<td>1270 mm</td>
</tr>
<tr>
<td><strong>Luff Perpendicular</strong></td>
<td>-</td>
<td>2355 mm</td>
</tr>
<tr>
<td><strong>Window safety rectangle height parallel to foot</strong></td>
<td>-</td>
<td>1500 mm</td>
</tr>
<tr>
<td><strong>Window height parallel to foot</strong></td>
<td>-</td>
<td>2000 mm</td>
</tr>
</tbody>
</table>

G.4 JIB

G.4.1 MATERIALS

(a) The body of the sail and secondary reinforcement shall be of polyester woven ply and/or laminated ply listed in “Appendix A – Approved Sailcloth”.

Tornado Class Rules 2015 Version 1.0  29
(b) **Primary reinforcement, batten pockets**, and **tabling** may be of any polyester **woven ply** and/or **laminated ply**.

(c) **Stiffening** may be of any material, except that Aramid (Kevlar) and carbon fibre are not permitted.

(d) **Windows** may be of any transparent polyester **ply**. The **ply** may have polyester reinforcement threads.

(e) **Attachments** may be of any material, except that Aramid (Kevlar) or other high modulus tape or rope is permitted for reinforcement only within 80mm of the **luff**.

G.4.2 **CONSTRUCTION**

(a) The construction shall be: **Soft sail, single ply sail**.

(b) **Sail reinforcement**

1) **Primary reinforcement** is permitted within a distance of 440mm from each **sail corner**

2) **Secondary reinforcement** is permitted within a distance of four times the limits prescribed for the **primary reinforcement** (1760mm) from each **sail corner**.

3) **Chaffing patches** are permitted.

(c) The **sail** may have a maximum of three (3) **batten pockets**.

(d) **Stiffening**

1) a maximum of three (3) **battens** are permitted, which

   i) shall not be of more than 20mm in width

   ii) shall have no moving parts

2) a corner board is permitted at the **clew**

(e) The following are permitted: Stitching, glues, tapes, Cunningham eye and/or block, corner eyes, zips, Velcro and sleeve **luffs**, **batten pocket patches**, **batten pocket elastic**, **batten pocket end caps**, **leech** line with cleat, **sail** shape indicator stripes and items as permitted or prescribed by other applicable rules.

(f) The **leech** shall in no place be convex.

(g) The **sail** shall have least one **window**. Additional **windows** are permitted. **Window** shape and size are optional provided that:

   1) One **window** shall be of a size and shape that encloses a rectangle of minimum dimensions 400mm X 300mm. When so enclosed, the rectangle shall fit below a line 1000mm from, and parallel to, the **foot**.

   2) The maximum height for any part of a **window** shall be a line 1500mm from, and parallel to, the **foot**.

G.4.3 **DIMENSIONS**

<table>
<thead>
<tr>
<th></th>
<th>minimum</th>
<th>maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Luff length</td>
<td>-</td>
<td>6300 mm</td>
</tr>
<tr>
<td>Luff Perpendicular</td>
<td>-</td>
<td>1680 mm</td>
</tr>
<tr>
<td>Foot round</td>
<td>-</td>
<td>80 mm</td>
</tr>
<tr>
<td>Sail reinforcement, measured from <strong>sail corner</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
measurement points

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary reinforcement</td>
<td>440 mm</td>
</tr>
<tr>
<td>Secondary reinforcement</td>
<td>1760 mm</td>
</tr>
<tr>
<td>Window safety rectangle height parallel to foot</td>
<td>- 1000 mm</td>
</tr>
<tr>
<td>Window height parallel to foot</td>
<td>- 1500 mm</td>
</tr>
</tbody>
</table>

(a) The "triangulation" method of measurement shall be used if the width of the sail at the head exceeds 50mm. For the purpose of this rule the width at the head shall be measured at right angles to the luff through the highest point of the sail on the luff to the line of the leech extended if necessary.

G.5 GENNAKER

G.5.1 MATERIALS

(a) The body of the sail and secondary reinforcement shall be of nylon or polyester woven ply listed in “Appendix A – Approved Sailcloth”.

(b) Primary reinforcement and tabling may be of any nylon or polyester woven ply.

(c) Attachments may be of any material, except that Aramid (Kevlar) or other high modulus tape or rope is permitted for reinforcement only within 80mm of the luff.

G.5.2 CONSTRUCTION

(a) The construction shall be: soft sail, single ply sail.

(b) Primary and secondary reinforcement is permitted at the sail corners and the recovery points.

(c) The following are permitted: Stitching, glues, tapes, corner eyes, recovery point eyes or webbing, and items as permitted or prescribed by other applicable rules.

(d) The number of recovery point eyes or webbing is optional.

G.5.3 DIMENSIONS

<table>
<thead>
<tr>
<th></th>
<th>minimum</th>
<th>maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Luff length</td>
<td>-</td>
<td>9150 mm</td>
</tr>
<tr>
<td>Leech length</td>
<td>-</td>
<td>8050 mm</td>
</tr>
<tr>
<td>Foot length</td>
<td>-</td>
<td>4250 mm</td>
</tr>
<tr>
<td>Head to Mid-foot</td>
<td>-</td>
<td>8750 mm</td>
</tr>
<tr>
<td>Half width – as defined by ERS G.7.5(b)</td>
<td>-</td>
<td>3450 mm</td>
</tr>
</tbody>
</table>

Section H – Official plans

The set of Official Plans is comprised of:
- 1b Construction details: (1 MAY 1968 amended 19 SEP 1968 and SEP 1975)
- 2b Panel offsets and deck jig: (2 APR 1968 amended 27 FEB 1968 and SEP 1975)
- 3b Details of fittings: (10 MAR 1968 amended 19 SEP 1968 and SEP 1975)
- 4a Bulkheads, rudder, and centreboard: (4 APR 1968)
- 5a Sail shape: (7 MAY 1968 amended SEP 1975)
- 6a Details of stitch and glue: (15 APR 1968 amended SEP 1975)

OFFICIAL TEMPLATES
The set of Official Templates is comprised of:
1. Bow template
2. Deck camber template
3. Hull templates #s 0, 1, 2, 3, 3.3, 4.2 and 5
4. Centreboard template; Rudder template

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PART III – APPENDICES

Appendix A
Approved Sailcloth LIST

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Cloth</th>
<th>Description</th>
<th>Weight/Film</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANY</td>
<td>Woven Polyester</td>
<td>Single Ply/Woven Ply</td>
<td>3.8 oz/NA</td>
</tr>
<tr>
<td>Bainbridge</td>
<td>Diax 90 &amp; 130 LSP</td>
<td>Pentex Laminate</td>
<td>1.5 mil</td>
</tr>
<tr>
<td>Challenge</td>
<td>MPX 06P</td>
<td>Pentex Laminate</td>
<td>1.5 &amp; 2.5 mil</td>
</tr>
<tr>
<td>Contender</td>
<td>APEN 06</td>
<td>Pentex Laminate</td>
<td>1.5 &amp; 3.0 mil</td>
</tr>
<tr>
<td>Contender</td>
<td>APEN 06, 09 &amp; 12</td>
<td>Pentex Laminate</td>
<td>1.5 mil</td>
</tr>
<tr>
<td>Dimension Polyan</td>
<td>PE 05, 10 &amp; 15</td>
<td>Pentex Laminate</td>
<td>1.5 mil</td>
</tr>
<tr>
<td>Dimension Polyan</td>
<td>FLEX 8 &amp; 13</td>
<td>Pentex Laminate</td>
<td>1.5 mil</td>
</tr>
<tr>
<td>Bainbridge</td>
<td>AIRX 650N, 700N, 720NS</td>
<td>Nylon</td>
<td>N/A</td>
</tr>
<tr>
<td>Challenge</td>
<td>ELITE 40, 45 &amp; PL42</td>
<td>Nylon / Polyester</td>
<td>N/A</td>
</tr>
<tr>
<td>Contender</td>
<td>DYNALITE/DYNAKOTE 75</td>
<td>Nylon</td>
<td>N/A</td>
</tr>
<tr>
<td>Contender</td>
<td>SUPERKOTE 75, 80, &amp; 90</td>
<td>Nylon</td>
<td>N/A</td>
</tr>
<tr>
<td>Dimension Polyan</td>
<td>7722 UCP</td>
<td>Polyester</td>
<td>N/A</td>
</tr>
<tr>
<td>Dimension Polyan</td>
<td>F50, F60, F75</td>
<td>Nylon</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Sailcloth List Policies
1. Only general availability versions of the cloths will be permitted; exclusive versions for particular sail lofts will not be permitted.
2. Sailcloth manufacturers shall provide a sample of each cloth to the ITA.
3. Sailcloth manufacturers shall notify the ITA of any change in cloth production
   a. The ITA will determine if the cloth will remain on the List
   b. If the cloth remains on the List, a new cloth sample shall be provided to the ITA prior to its use by Tornado sail makers

Grandfathering
1. Until 1 January 2007, sails made of sailcloth not [ever] listed in Appendix A - Approved Sailcloth may be used as follows:
   a. Sails measured, signed and dated prior to 1 January 2004 may be used without restriction
   b. Sails measured, signed and dated between 1 January 2004 and 1 December 2004
      i. and made of the following discontinued sailcloth may be used without restriction: Dimension Polyant 6611/6633 SCP and UCP 7722 SCP, or SCN 75 and 90
      ii. and not covered by (b)(i) above, may be used except at Continental Championships, World Championships, Olympic Qualification Events, Pre-Olympic Test Events
2. Sails made of sailcloth that has been deleted from the Approved Sailcloth List are legal for use in competition without restriction, provided that:
a. the sail has made prior to the date that the sailcloth was deleted from the Approved Sailcloth List; and has been properly labelled as required by class rule G.2.4.b
b. the sail has been certified by an official measurer as required by class rule G.2.5.
Appendix B – Aluminium Masts

Aluminium Mast Spars built before 1 December 2004:

1. Masts may be extruded only of aluminium alloys approved by the ISAF.

2. The mast shall be an inherently straight continuous aluminium alloy extrusion of constant section, with no cuts or added stiffening, such as to affect its stiffness or flexibility, with integral track, and of general shape shown in the diagrams. The exterior and interior surface shall be designed to be smooth. There shall be one web only, which shall be predominantly flat across the section. Dimension AC shall be not less than 132mm or more than 135mm and dimension DE shall be not less than 74mm or more than 76mm. The ratio of AB:AC shall not be less than 0.140 or more than 0.180. Dimensions AB and AC shall be measured from the aft edge of the extrusion "A", to forward surface of the web "B" or the forward surface of the extrusion "C". Dimension DE shall be measured externally. The wall thickness shall be not less than 1.8mm.

3. The extrusion may be tapered above a point 7190mm from the lower end of the mast extrusion and the track opened or cut away below a normally positioned sail entry point, but the shape shall be not otherwise altered.

4. Tapering shall be only achieved by cutting a single “V” slot down the front of the section, closing it and making a single continuously welded butt joint. The girth of the mast at the bottom edge of the top measurement band shall be not less than 240mm and the taper shall not be allowed:
   a. When viewed from the side, by more than 5mm from a string line stretched taut along the leading edge of the tapered section of the mast between the bottom edge of the top measurement band and the lower edge of the taper. This measurement shall be taken when the mast is horizontal with the major axis of the section horizontal.
   b. When viewed from forward, by more than 3mm from a string line stretched taut along the side of the tapered section of the mast, at its widest points, between the bottom edge of the measurement band and the lower edge of the taper. This measurement shall be taken when the mast -is horizontal with the major axis of the section vertical.

5. The forestay and shrouds shall be attached to the mast at a single point, within 20mm of the extrusion surface and not more than 7180mm nor less than 7165mm from the lower end of the mast extrusion.

6. The trapeze wires shall be attached to the mast and not to the standing rigging. The attachment point shall be not more than 50mm from the attachment point for the shrouds and forestay and may be the same point.

7. The mast shall be stepped on the centreline of the boat and its vertical centreline shall intersect the main beam in any position to which the mast may be rotated.

8. A measurement band shall be painted round the mast with its top edge not more than 390mm nor less than 375mm from the lower end of the mast tube extrusion. A second measurement band shall be painted with its bottom edge not more than 89 15mm above the sop edge of the first. (Measurement bands shall be in a colour contrasting with that of the spar).
9. When stepped, the lower end of the mast extrusion shall be not more than 90mm above the top of the main beam.

10. The mast shall be weighed in the following condition:
   a. Spinnaker halyard sheaves, Spinnaker halyard guides, gooseneck, and base fittings, which rotate with the mast shall remain attached to the mast.
   b. Running rigging and normally attached diamond rigging shall remain attached to the mast.
   c. Shrouds, forestay and trapeze wires and their shackles shall be removed from the mast.
   d. Halyards shall be fully hoisted and their tails shall be coiled and attached to the mast heel.
   e. Sail attachment fittings shall touch the upper halyard sheaves.

11. The mast, in the condition given in 14(i), shall weigh not less than 23kg.

12. With the mast in the condition given in 14(i), in a horizontal position supported at the bottom end of the extrusion and at the bottom edge of the top measurement band, the weight measured at the top band shall be not less than:
   a. 10.5kg for masts with internal jib halyards.
   b. 10.25kg for masts with external jib halyards and locking devices that are not connected to the mast in any way.

13. Mast jacks and adjustable mast steps are prohibited.

14. All masts manufactured from March 1st, 1997 shall be adequately sealed between the black bands to prevent water entering the section shown in the diagram as BC. All main halyards shall pass only up and down the mast track AB.

15. The bearing surface of the Spinnaker halyard leads shall be no higher than 1000mm above the bearing point of the forestay and shroud attachment point.

16. The mast shall carry one pair of diamond stays only, which shall be rigged below the hounds, and which shall pass over a spreader of unfaired round tube or rod of diameter 15mm minimum.

17. The diamonds shall be rigged between external tangs fastened to the outside of the mast. Diamond stays may be passed through a fairlead, permanently fixed to the mast above the lower tangs. The distance between the diamond attachment point on the upper tangs, and the attachment point on the lower tangs, or the fairlead, shall not be less than 6000mm. The distance between the diamond attachment point on any tang and the nearest fastening of that tang to the mast shall be not more than 75mm.

18. The materials for spreaders are optional.

19. The points of intersection of the diamond wires and the spreaders shall be not less than 790mm apart measured in a straight line.

20. Rod rigging is not permitted