

Concerning the unusual longitudinal trim of the boat Scugnizza ITA-16639 during the ORC European Championship 2016 in relation to his outstanding performance shown by the results in the first races, an analysis on the ORC certificates has been performed.

The following two certificates have been evaluated:

- Number 166391 ORC Ref ITA00016857 Issued On 18/06/2015 used during the World championship 2015 in Barcelona
- Number 166391 ORC Ref ITA00020283 Issued On 30/06/2016 currently used during the European championship 2016 in Porto Carras

On the basis of the declarations of the measurers and Scugnizza crew, it has been assumed that:

- the hull geometry has not been changed in the time between the considered certificates
- the keel and/or the torpedo has not been moved in the time between the considered certificates
- the fin has recently been modified by enlarging the chords
- the moment unit trim for this boat is 11.5 kg*m/mm

Longitudinal trim (measurement trim)

2015 certificate FF 1.452 FA 1.135 equal to a difference of 317mm

2016 certificate FF 1.527 FA 1.047 equal to a difference of 480mm

The change in trim between the considered certificates is therefore 163mm. In order to obtain this, a moment of $163 \text{ (mm)} \times 11.5 \text{ (kg*m/mm)} = 1874 \text{ kg*m}$ should be applied. This equals to move a mass of about 180kg from the bow to the stern or to move aftwards for a meter a mass of 1874kg.

Displacement

2015 cert. Displacement = 5718kg with 346.3kg of bilge ballast positioned at 5.56 from the bow

2016 cert. Displacement = 6236kg with 125kg of bilge ballast positioned at 5.55 from the bow

Since 2015, the displacement has been increased by 518kg but the bilge weight has been reduced by some 221kg. Therefore, it can be supposed that about 740kg have been added to the keel.

The average increase in freeboard is about 7mm and if multiplied by the sink of the 2016 certificate (23.17kg/mm) equals to about 160kg of change in immersed volume. With such a big stern down trim this volume could be much larger because the stern sections are bigger than the bow sections. As a rough estimation it has been assumed a value of 220kg. However, the displacement has been increased by 518kg therefore 300kg of volume (0.3m^3) must have been added in the keel modification.

Conclusions

Based on the above findings the following conclusions have been found:

- Supposing that 740kg added to the keel have been placed 10cm aft the trailing edge, which can be estimated at 6.2m from the bow, then the distance between the bilge ballast location (5.55m) and the new location is about 0.7m and that would generate a moment of $0.7 \times 740 = 518 \text{ kgxm}$ about a 1/4 of what would be needed. Therefore, if the assumptions are correct, it remains partially unknown the way by which the centre of gravity has been shifted aft to generate such a noticeable stern down trim.
- The estimated volume that should have been added the keel in order to find equilibrium is noticeably large
- From on water observations there is little similarity between sailing trim and measurement trim and this is unlikely to be achieved simply by moving safety equipment and sails as forward as possible
- Performance wise Scugnizza seems to be clearly faster respect to what has been seen in Barcelona, despite an heavier displacement (8%), larger wetted surface (5%), evident stern down trim, slightly smaller sails