Mast tracks, masts & sails

Over recent years there has been an ongoing effort to eradicate the mast track and mast tip failures sometimes experienced by sailors; some of the possible solutions to this have created other rumours and ideas; some of which have gained traction on social media.

This article is to update everyone on what has been done to date; what is being done and what the future holds....

Before we get into any detail it is just worth re-iterating that the MUSTO Skiff Class Association (MSCA) enjoys an excellent relationship with the class builder, Ovington Boats (OB), and no change to the product would ever occur without agreement between all parties.

The objective of the MSCA and OB is to provide a high-performance dinghy that is robust and fun to sail and that enjoys a low cost of ownership. Sailors want to sail; not spend time repairing their boats and having to work to pay for them so the MUSTO Skiff has been developed to meet those needs and is a very affordable class to sail due to the extremely low maintenance required to keep the boat on the water.

Another benchmark of the boat is that other high-performance dinghies are typically 30% more expensive to insure than the MUSTO Skiff; this is a measure that tells us that we have less breakage (or crashes) than other high-performance dinghies.

Over the years the class in partnership with the builder has made many minor changes to the specification of the product to improve areas where we have seen minor breakages. These have been detailed here: http://www.mustoskiff.com/sub-pages/product-evolution.htm

The two remaining niggles in the product are the mast track failures and the vulnerability of the mast tip. Whilst the frequency of these breakages is difficult to gauge it is our objective to address them to further improve an already excellent off-the-shelf high-performance dinghy.

Solutions to these two issues are varied and the main thrust has been working in partnership with the mast supplier Selden. However, discussion has also been developed to consider an alternative supplier should we be unable to reach a solution with Selden.

In some corners, this discussion has then developed further along the lines of “if we are going to have a new mast we may as well have a new sail at the same time ...” although we are not necessarily going to have a new mast some parties extended the prospect in this direction.

This discussion has been ongoing as skippers meetings at world championships; in the interests of supporting the comments OB offered to produce a new sail for review at no cost to the class. Subsequently the appetite for a new sail amongst some sailors within the class was not equal and a whole series of debates raged on various social media platforms and is still on-going on the forum: See http://www.mustoskiff.com/phpBB3/viewtopic.php?f=4&t=2808

At this point OB and the MSCA are re-stating that the original objectives of this project are to be followed.

That is ... we are in the process of seeking to improve the robustness of the mast and mast track. The MSCA has given OB a mandate to do this through a vote in the on-line survey and 87% supported OB in evaluating a new supplier for the mast ... not the sail.

Given that there is clearly some interest, and opposition, to the prospect of a revised mainsail (Design objectives to be determined) it is proposed that the MSCA seeks to test the interest in giving OB a mandate to develop a new mainsail through the 2017 on-line survey. That way the whole class gets a say on the matter not just a handful of sailors in a skippers meeting.

Should the vote go in favour of a new mainsail a series of prototypes would be tested through 2018 and, if ready, a vote for acceptance could be conducted at the end of 2018 with new sails being available early 2019. That would be the earliest, and it could take longer depending on the tests. It is also worth noting that depending on the brief for the sail design this could have a knock-on effect on the mast; although it is recommended that any new sail design would be required to work with the existing mast.

So ... at this point there is no further work on a new sail until the class has voted at the end of this season; so the focus remains on rectifying the problems with the mast.

Here is the timeline of the issues

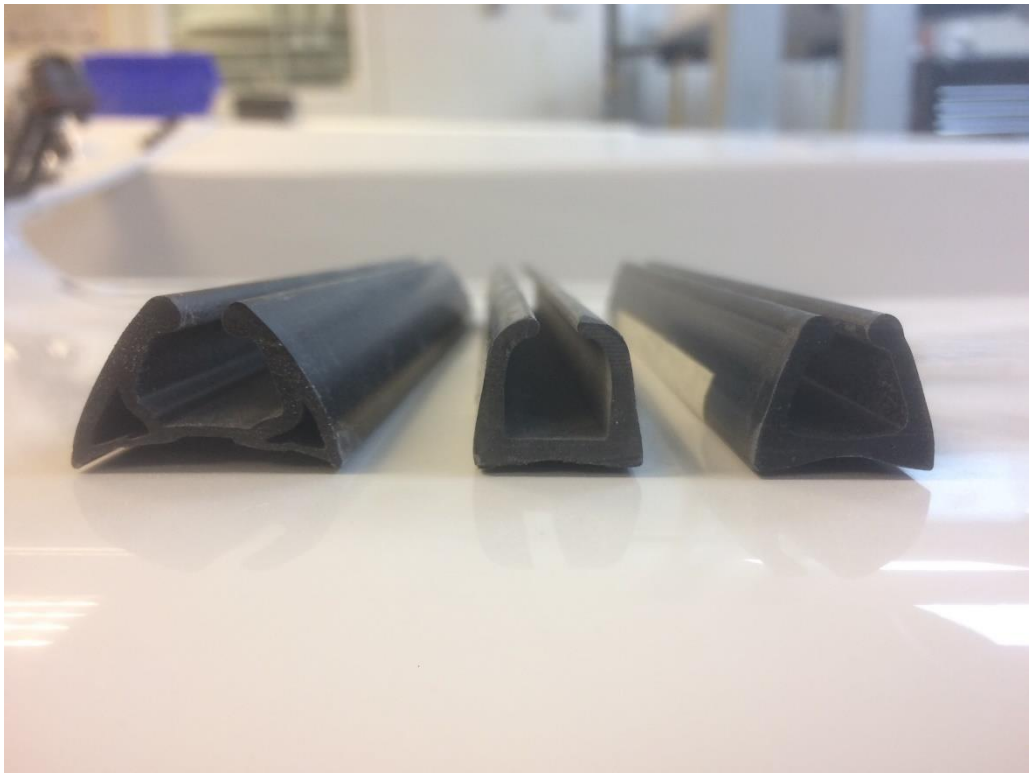
1999 – 2010 Boat is pretty robust and we see minimal levels of breakage; nothing more than any other high-performance dinghy ... some minor changes to specification: see http://www.mustoskiff.com/sub-pages/product-evolution.htm
2008 - A plastic bolt rope introduced to make hoisting the sail easier
2011 – We start to see a number of breakages of the mast track
2012 – Survey done on batten end position at Weymouth – no significant variance found
2013 – Topic started on Forum http://www.mustoskiff.com/phpBB3/viewtopic.php?f=4&t=2123
2013 – Samples taken of mast track material made and variances found by ACO test facility; Selden advised of the material changes
2013 – Defective extrusions of track found on broken examples; Selden scrap some stock of the defective track and we hope the issue is resolved
2014 – Class give Ovingtons the mandate to evaluate an alternative mast supplier through the class survey
2015 – Skippers meeting in Perth brings up the suggestion of a new mainsail if a new spar is the solution (no minutes were recorded of this meeting)
2016 – CST start the design process of a test mast that will seek to replicate the characteristics of the current mast.
2016 – Test Selden mast produced with alternative track (limited testing done in 2016 although no defects shown) Skippers meeting in Carnac again discusses the new mast/sail and this topic starts http://www.mustoskiff.com/phpBB3/viewtopic.php?f=4&t=2808
2017 – Selden test mast suffers track failure in typical failure mode
2017 – Selden test mast will be re-tracked with track from OB supplied track and re-test started ...
2017 –CST design sign-off and mast will start evaluation
2017 – Mainsail to be modified with alternative batten end pockets
2017 – September – Class survey will canvas opinion on new mainsail development

A Selden test mast has been in use for 12 months; the test mast was first used by Rick Perkins at a windy Nationals in Scotland and then used by various sailors over the remaining summer and winter period. It was then used by John Mcaffe (OB) through the spring and at the recent world championships in Palma. It would be fair to say this mast has taken above average punishment in this period. The tube is still as good as new and the track has seen two failures; both happening in extreme conditions. As ever with these tests it is impossible to draw scientific grade conclusions without a standard control mast being put through the exact same testing but it is our collective opinion that the standard mast may have seen more problems ...

The Selden test mast had the following deviations from a standard mast:

1) **Added mast tip hoop strength** (Circumferential stress or hoop stress, a normal stress in the tangential (azimuth) direction). The standard mast has a laminate layer to add hoop strength that ends just above the kite halyard block; at the time the mast was designed in 1999 it wasn't considered necessary in the tip. It is now viewed that this would strengthen the tip to add this additional layer all the way to the tip. This adds "toughness" to the tip and will prevent some of the failures seen to date. The increase in weight is near zero and the change in tip stiffness in the taper section above the kite block is negligible; modelled to be in the region of 3%, in this section. It would be possible to reduce this 3% to zero through changing the layup of the mast but this would then restart the testing cycle and delay any benefit for another year.
2) **Different mast track.** The standard mast has S3/4 track and the test mast has S2 track. The S2 track is the track used by other high-performance classes and has a smaller cross-sectional area; this reduction is area is expected to provide more room for the batten pocket protectors and create less fulcrum forces when the mainsail is fully out. The S2 track is modelled to add 0.5% to the fore/aft stiffness and 0.25% sideways ... negligible. The S2 track is very similar in design to the track used on the 49er which is made by a different manufacturer.

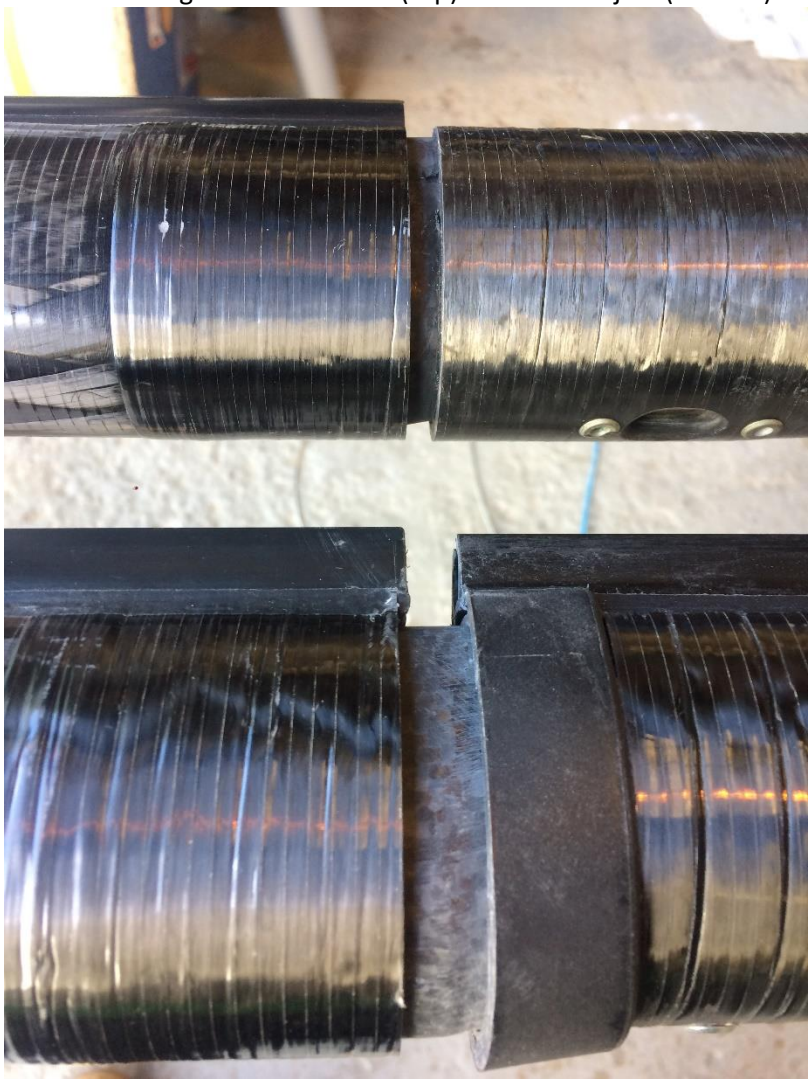
   The below photos shows the 3 tracks; from the left: S3/4, S2 & 9er



3) **Dry join between the tip and mid sections**. This had been trialled with the existing mast with the intention of having a 3-part mast which would ease the replacement of broken sections and the shipping of spare parts. It was however found that the dry join was not mechanically strong enough and the tip/mid mast join deformed under load damaging the mast; so the standard mast has reverted to a glued join at this point. However, the benefits of a dry join are still valid so Selden have changed the design of this join to make it stronger so it can be left dry.

   The test mast has had the plastic collar removed and the tube wound a further 20cm to replace the collar so that the join buts in the same mechanical way as the lower join by the spreaders.

   The below image shows the new (top) and the old join (bottom).



4) **Newer series 3 mandrel**; the mast is a Series 3 and this section is used in other classes. Selden has seen some compressive failures of the tubes in other classes but we had never seen these in our class but this newer mandrel was used. It is nominally the same but the radius of the section is softened at the rear of the mast. The bend characteristics are identical and the revised S3 mandrel has reduced failures in other classes. Because the new and old mandrels are slightly different in section, masts wound on the different mandrels would not be interchangeable in the case where a sailor broke one section and wished to replace it; you would have to ensure that any replacement part came from the same mandrel. Because we have had no problems and given the issues with servicing the customer base we plan to not adopt this change.

Items 1, 2 & 3 will be adopted as part of our standard product and we hope that these will go a long way to illuminating the failures we have seen to date.

However; every high-performance product is built to a series of compromises ...

Light, strong and affordable ... pick any two ...

The MUSTO Skiff does a good job of picking all 3 ... there will of course still be breakages that occur in extreme conditions, that is the nature of sport, but we are working to deliver the best possible package to keep everyone on the water, racing and having fun at regattas.

We will continue to monitor the issues and pursue the other options still under test.

We also await the vote of the MSCA members on any mainsail development in the 2017 on-line survey.

Summary:

1) Three specification changes will be made to the Selden Mast to improve both tip and track:
    a. Hoop strength to be added to the tip
    b. S2 track to become standard
    c. Upper join to be revised
2) Further testing will be conducted to improve the track and tip failures:
    a. 9er track to be evaluated
    b. Mainsail with alternative batten ends to be evaluated
    c. CST mast to be evaluated
3) A vote on a revised mainsail is to be conducted in late 2017 with an earliest possible introduction in 2019.
    a. Exact specification of sail on which we vote to be agreed
    b. Recommendation that the sail must work with the existing mast

Document written by Rick Perkins (MSCA) with key input from Chris Turner (OB), John Mcafee (OB), Paul Manning (MSCA), Paul Molesworth (MSCA), David Hayes (Selden Mast), Graeme Wilcox (Selden Mast)