



Coaching guide for the rota-moulded Polyethylene International Topper

Two years on, what have we learnt about racing the new grey rota-moulded Polyethylene International Topper?



The new grey boat was introduced after exhaustive testing to ensure performance was as close as possible to the original, red-decked injection-moulded Polypropylene hulls.

Two years on, it's clear the aim of comparable performance has been achieved, with a few subtle differences that most one-design dinghy classes experience whilst improving the building process.

Topper coaches are now beginning to understand these differences after observing them on the water in a variety of conditions. They are learning how to maximise the speed of the new grey boat.

BACKGROUND

When the Topper was first designed in 1969 and then re-designed in 1977 in Polypropylene as a safe and robust youth training boat, Ian Proctor purposefully designed the lines and sail plan to carry an element of windward (weather) helm. This ensured that if the helm let go of the tiller or fell out, the boat would swiftly head harmlessly up to wind and stop.

As the class has developed over the years into the popular youth pathway racing class that it is today, this trait is not so desirable and can make sailing the Topper hard work in a breeze.

Typically, sailors (of all sizes) need to apply large amounts of kicker and downhaul tensions, possibly raise the daggerboard, and hike hard to help offset the inherent weather helm.

The enforced change to the building method presented an opportunity to slightly reduce the amount of weather helm the boat carries, making it easier to handle the boat in higher winds without the same need for large kicker and downhaul tensions upwind.

Observations of sailing the new grey boat

Many Topper coaches today graduated from the Topper class themselves, so have a thorough knowledge and feel of how to trim and set up the rig for all conditions for the red boat, however, not many have yet had the opportunity to experience sailing the new rota-moulded grey boat.

One coach who has been enjoying sailing the new boat in training sessions, alongside his son Tristan, is Luke Shaw, RYA North Topper Regional Training Group Coach. Working with the International Topper Class Association (ITCA (World)) and Topper International Ltd, Luke and Tristan have been helping to gain more understanding of the subtle differences in technique required to get the best out of the new grey boat.

We have also been speaking to Matthew Wallis, who coaches the Topper fleet at Vikings SC in Malta, about their experiences with the new boat.

Upwind

Sailing the grey boat for the first time, Luke and Tristan noted 'The boat is better balanced and smoother in and out of tacks with minimal speed loss - unless the tack is rushed!'



'The sail set-up is slightly different as less kicker and downhaul are generally needed as there is less weather helm. The rudder feels lighter, making it easier to feel the boat and steer more accurately.'

Matthew adds, 'The vang and downhaul are definitely needed to be applied later in the wind range especially when dealing with the Mediterranean waves...the sailors are noting that they are actually applying next to no downhaul when sailing in the waves'. Luke reports: 'We think the (grey) boat doesn't require quite as much kicker in the medium winds.'

The key seems to be watching the creases developing in the middle part of the mast. If sailors use the same tension as they did in a red boat I think they will see significantly more creasing than they would have done previously (overbend creases), which to me, suggests they may be over-flattening the mid-third of the sail'.

However, Luke added: 'Sailors need to be careful of going too much the other way, especially in the lighter sub-10 knot conditions. The sail can get too deep and draggy and lack some feel on the tiller. When this happens, to avoid over-sheeting, Tristan's solution is to pull on a bit more kicker until he feels that (compared to other boats) the balance is right between speed and pointing, and he's happy again. He then takes a visual reference of the distance between the blocks to repeat the setting'.

Tacking Technique

Coaches used to say that to tack the original red hulled Topper, you just had to drop the tiller – again a result of the weather helm, often requiring additional use of the rudder to correct the heading out of the tack.

Luke's on-the-water findings are: 'Tristan and I are seeing/feeling a definite advantage in tacking and the (grey) boat rewards good technique.'

This provides more confidence to take advantage of a couple of quick short tacks for shifts or positioning, which wouldn't have felt possible in the red boat.'

Matthew and his sailors are also finding that substantial gains can be made when they are tacking properly and that 'The boat is also more responsive to any change in turning due to the effect of (less) weather helm'.

Hiking position tip

One tweak Luke and Tristan implemented was to replace the elastic holding the toe-strap up at the back of the daggerboard case with pre-stretched rope, pulling it as far forward and up as possible.

Luke: 'I found the toe-strap position wasn't quite where I wanted it upwind, was pulling me back more than I would like, and I had to angle myself uncomfortably forward to get the best fore & aft trim.'

Tying the front of the strap up to the p-clips at the base of the main sheet block pulls the strap a good 10cm or more forward, allowing the helm to hike out flat and at maximum 90° extension from the cockpit. This does however use up most of the slack in the strap, leaving less for adjustment for shorter sailors.

Daggerboard

Once the wind hits 20 knots plus, or as soon as sailors are struggling to keep the boat flat and having to ease the sail for significant periods of time, it's still possible to apply too much kicker – creating weather helm and making tacking more difficult. In these conditions, Tristan still finds that playing with the height of the daggerboard can help keep the boat driving, although he may raise it a little less than the deck-level guide he used in the red boat.

Why does it perform this way – what's changed?

Taking note of these observations, the next step was to see if a detailed measurement of the old and new boats bore out these findings.

The helm balance of all sailing boats is governed by the relative position of the 'Centre of Effort' (CoE) of the sail plan over the 'Centre of Resistance' (CoR) of the hull and foils, as shown in the diagram below. The CoE was always well aft of the CoR in the original red Topper, contributing to the weather helm (turning into the wind) that all Topper sailors are familiar with.

Other factors also affect the amount of helm experienced on the rudder, such as the degree of heel, the depth of the daggerboard, the draft position in the sail and how much twist is set in the mainsail leech – all of which are controllable by the sailor, but not the fixed rake distance. The daggerboard has been raked forward slightly, resulting in the leading edge sitting proud of the case, making it easier to grasp. With the daggerboard more upright the centre of resistance is slightly deeper and further forward. This has two effects, firstly it decreases weather helm slightly and secondly, it increases heeling resistance.



Comparative rake and mast position measurements between the two hull types indicate that the mast deck ring can be between 0 to 5mm further forward on the new grey boat, depending on the degree of hull shrinkage during cooling after moulding. Indeed, this may vary between boats in any injection moulded or rota-moulded hulls in any class.

Designing a hull for rota-moulding production is a tricky business, requiring an allowance of 5% shrinkage for the moulded hull to be released from the mould. To reduce the weather helm characteristic of the red Polypropylene boat, the rota-moulded hull was designed with the mast 4mm further forward, but after production, the resulting hulls after shrinkage came out between 0 and 5mm further forward.

However, measurements of the difference in mast rake (using the same mast) between the two hulls prove that the mast in a grey boat sits 130mm more upright (less rake), thus moving the CoE further forward and so reducing the amount of weather helm, as shown in the diagram (above right).



Red boat mast rake measured as 5430mm



Grey boat mast rake measured as 5560mm

You can watch how the new Topper is produced in the rota-moulding process as a single moulding, and how the complex mould tool comes apart to release the finished hull by scanning the QR code below or visit youtube.com/watch?v=uM4mBtR9km8.



For sailors and coaches, the difference in rake means that to achieve the same upwind mainsail leech tension as previously used on a red hull, the mainsheet blocks should now be set a further 130mm apart. This is a rough guide, and there may be conditions when greater leech tension is faster, but it serves as a good reference point for tuning.

A consequence of the difference in rake and, in turn, weather helm is that the need to de-power the main with heavy downhaul and vang tension, is pushed further up the wind range. This explains Tristan's, Luke's and Matthew's findings on the water.

Downwind technique

Luke and Tristan's experience in the grey boat downwind centres around gust response. 'The boat feels better balanced in the bigger gusts, although sailors may need to get used to moving backwards a little more quickly as it feels like there is a tendency for the nose to go down a fraction sooner than in the red boat.'

Matthew similarly reports: 'On a downwind the boats are quite even, but weight needs to be moved further aft when using the grey hulls to stop the submarining effect especially when sailing in waves.'

We investigated this with the builders, who said that in order to stiffen the foredeck area, the weight distribution of the hull has changed, with more foam laminate added to the bow, resulting in a 1kg weight addition to the front of the boat. This could account for Tristan's and others' findings, but it can easily be overcome by a shift in crew weight in big waves downwind.

Overall hull weight

There has been some discussion amongst some early adopters of the rota-moulded boats that they felt stiffer and a little heavier than their red counterparts. The much thicker Polyethylene laminate, composed of layers of plastic and foam, certainly looks and feels stiffer than the older red Polypropylene hulls, which could actually become softer with age and deformed if left sitting on a hard trolley.

ITCA (World) has carefully investigated the weight difference, weighing several hulls of both types. From sail number 48000 onwards, the injection moulded red hulls consistently came out at 48 - 49kgs. Weighing a selection of the rota-moulded hulls yielded a weight of 48.9KG.

The 0.9 kg difference the builders explain is due to the addition of the 3 inspection hatches and storage pots present in the newer grey hulls.

These useful and much-welcomed storage areas not only let the boat breathe and dry out in the unlikely event of any leaks (there is no hull deck joint to leak) but are an integral part of the build moulding process, allowing foam and heating fans to be applied exactly to the required areas. The venturi fans heat up the local areas of the hull mould where more strength is required, which then draws more of the plastic powder to the area, so thickening the laminate.

Topper's Russ Dent also pointed out that the grey rota-moulded hull can appear heavier when lifting it up onto a roof rack or high trailer as a result of the lack of a lip on the transom, resulting in an 'arms wide' lifting stance to grip the gunwales either side of the transom. This inherently weaker posture and lift can give an appreciation of the hull apparently feeling heavier.



Typical red hull weight.



Typical rota-moulded Polyethylene hull weight

Conclusion

Sailors transitioning from a red boat to the new style grey boat will notice subtle differences. With practice, sailors are likely to benefit from adjusting to this new stiffer boat, that has been designed to have less weather helm.

Reassuringly, for those who still have a red boat, the hard work to ensure comparable performance between the two hull types has paid off, ensuring that the Topper continues to be at the forefront of the youth racing pathway.

Armed with an appreciation of these subtle differences and the resulting changes in trim suggested, junior sailors will find the trim and technique best suited to the new grey decked Topper are more similar to that used in ILCA and 29er classes, making their transition into those boats more seamless and straight forward.





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