

Seahorse

International Sailing

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Design

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The light way but a hard way

Top Italian designer Maurizio Cossutti is fighting a determined battle to prove that a smaller and more nimble ORC design can compete without shovelling half a tonne of lead into the bilge...

The Next story

It was in 2013 when Marco Bertozzi, owner of a nice 1983 Peter Norlin IOR Two Tonner, having spent time sailing on Alberto Rossi's TP52 *Enfant Terrible* and the Maxi 72 *Stig*, started thinking about a new boat that would give him a similar modern experience but that would fit in ORC Class C. The smallest ORC division had long been successful hunting ground for our designs, winning several championship titles – an all-new design was an attractive proposition and in late 2013 we started work on a new 37-footer.

The new boat was initially conceived to be the lightest design in its class at about 5,400kg displacement; however, following the 2013 ORC rule change we were unfortunately forced to make the boat much heavier, adding some 500kg in the bilge to stay competitive. Our earlier 37s, *Low Noise*, *Scugnizza* and *Sugar*, did go on to win races and championships, but having filled their bilges with lead the boats were now a long way from my original concept.

So for 2014 and starting with a clean sheet of paper (old school) I sketched my first impressions for a completely new design, a boat now weighing 5,200kg (15% less than the previous M37/NM38), with lower freeboards, a shallow 10cm-high coachroof and a long and wide open cockpit. From those early sketches we had soon developed some hull lines and section details, while inside the new boat would be much more open, just four main bulkheads plus four longitudinal 'benches'.

The target for the new boat was the 2014 ORC Europeans in Valencia, in the smaller of the two classes split by GPH.

Under the GPH-only divisions in 2014 it was still possible to 'downgrade' older but heavier and more powerful 40-footers like the *Sinergia 40*, reducing sailplan and sometimes adding a little more weight; we knew that up against this kind of competitor, and our own now heavier M37 *Low Noise*, in Valencia good upwind speed in medium conditions would be essential.

We also discussed the new project with our Finnish client Jani Lethi, owner of the successful GS42 *Audi*. Two months later, Jani having now sold his GS42, the two of us were sitting in Venice Airport in front of two glasses of a nice prosecco; by the end of the bottle we'd decided to fast-track the Next adventure, confirmed sponsorship from Audi Finland and named the boat *Audi Quattro*.

Alto Adriatico in Monfalcone was chosen as the builder, a yard famous for building wooden yachts which had just branched out into composite construction. So project #250 began during the 2013 Christmas holidays... but to get to Valencia time would be tight.

Platform

A suite of initial candidate hulls were trialled using the Windesign 6 VPP, and then further investigated by Alberto Porto of PortoRicerca performing detailed CFD simulations, with Clay Oliver helping on CFD-VPP interfacing. After confirming the likely wind conditions in Valencia we decided to use the NM38 (*Scugnizza/Sugar*) as our benchmark since she is known to be fast around 12kt+ TWS.

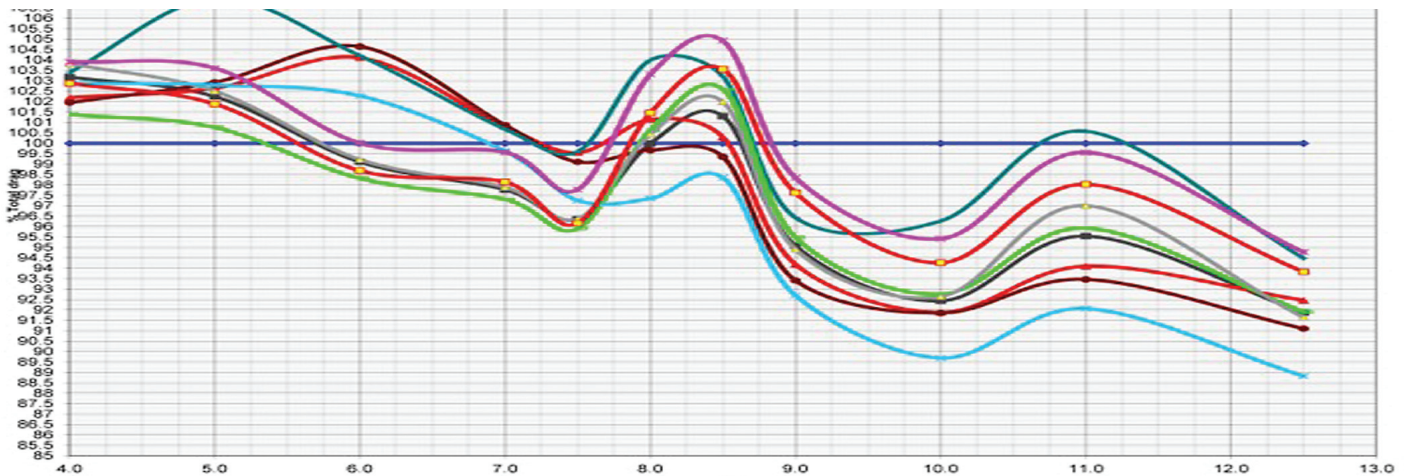
The driving concept was to sacrifice a bit of sail area to allow a more powerful hull, in order to hang on against the 40-footers on the first beat... before hopefully outperforming them downwind. Meanwhile, we were working closely with North Sails Italy designer Luca Cattozzi to find the extra power that we would need when the wind did drop below our target range.

Keel design was driven by the fact that the form stability of our more powerful hull allowed us to rely less upon mechanical stability and so we could avoid the rating penalties associated with excessive draft. We would, however, ensure a low overall CoG through good construction.

We ended up with a semi-trapezoid fin with 2.0m draft and generous lateral area and volume (fuller sections) for lift in light air. The keel chosen was CNC-machined from a lead casting over a stainless steel internal structure.

The rudder was the now classical deep draft blade with carbon stock. For reasons of weight a tiller system was preferred to wheel steering.





Opposite: Quattro no longer... the 3rd iteration of Cossutti's Next 37 goes afloat for 2016. The initial hull study (top, upright resistance vs speed) was conducted at the end of 2013 using Cossutti's NM38 as the benchmark (horizontal blue line). The hull chosen (red with yellow dots) proved superior at speeds from 5.5kt to 7.8kt and over 8.8kt. Stumpy or what... Audi 2014 (above left) shows off an ORC keel du jour. The same year the team raced the ORC Europeans with A-sails and spent the regatta being forced wide downwind (right)

Construction

With the possibility of a short run of series-built boats, it was decided to make CNC-machined moulds for the hull and deck. Lamination utilised a 'classic' vacuum-consolidated process using epoxy resin – but instead of using glass or carbon over PVC foam, we used basalt fibre, a more environmentally friendly reinforcement material with intermediate mechanical properties (and cost) midway between glass and carbon.

Sadly, the light construction, plus the absence of interior fit-out and a light carbon rig, meant that to achieve the necessary displacement (lighter than our competitors but under the ORC calculation far from light) a large amount of lead would once again have to go into the bilge. With this in mind I decided that we might as well save some money and go for a simpler and cheaper steel structure linking the mast, keel and chainplates instead of a more modern composite solution. This steel system is similar to what we had employed on production boats as well as on the ORC one-off *Katariina*.

Sailplan

As the idea was to trade off sail area for hull power, we naturally tried to compensate with a more efficient sailplan, opting for a square-top main supported by a refined and light Hall Spars mast with double backstays. For forestay adjustment we chose a TP52-style solution, with a hydraulic ram to allow us to change rake while sailing – in my opinion the rating cost of an adjustable headstay is outweighed by the gains from optimal rudder angles and more consistent boat balance.

But the real gamble was the downwind inventory: under the ORC rule our lighter displacement brought with it additional wetted surface and so we made the aggressive choice (in ORC C) of a masthead genacker on a fixed bowsprit instead of a classical spinnaker.

Theoretical CFD simulation reassured us that against heavier, relatively slow boats the more efficient A-sail configuration would allow us to hang on in typical 12-16kt TWS conditions against a

traditional spinnaker-plus-pole while enjoying a nice advantage in lighter airs.

Our light Hall Spars mast was fitted with swept-back boomerang spreaders but, given that we had already reached the limit of usable weight saving, we opted for low-windage traditional rod rigging instead of the lighter but larger-section composite alternative.

The deckplan was simple, with short transverse jib track and a German mainsheet system. Aside from the various Harken blocks and winches we filled the deck with soft-fibre loops and rings, delivering simplicity, light weight and the avoidance of supplementary reinforcements in the deck.

The first season

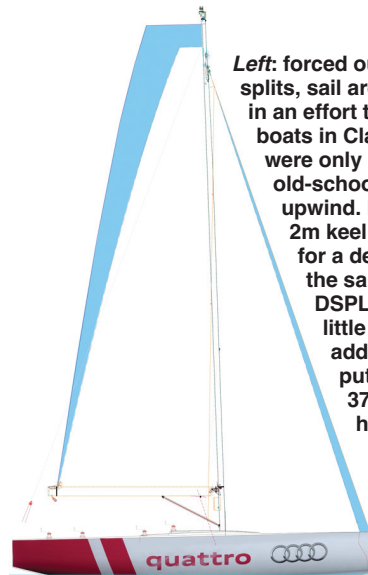
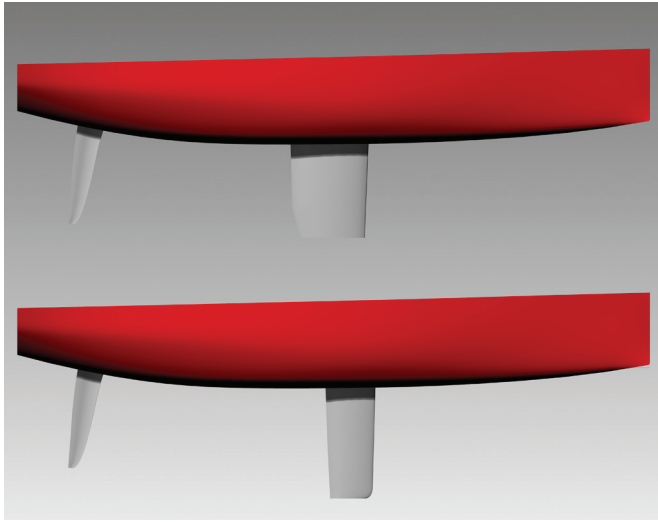
With the European championship scheduled for July 2014, launching the boat at the end of April was clearly a brave call for a passionate but Corinthian sailing team with a new and complex project. We were fortunate, however, to engage well-known Italian tactician and helmsman Enrico Zennaro to join the group to bring his considerable experience in setting up and debugging new boats. The first trials confirmed that we had some challenges to overcome upwind in light airs, while various small changes to the boat cost us valuable tuning time ahead of the Europeans.

As expected, in Valencia we faced a strong bunch of competitors, from detuned 40s like Pedro Campos's professional Sinergia 40 team, to the very refined Grand Soleil 39 *Morgan* and the Cossutti-modified Bénéteau 40.7 *Three Sisters*... To these were added our former world champion *Low Noise*, our M37 and some very competitive local X35s, X37s plus a well-optimised GS 37.

The opening coastal race was windy with big seas. Notwithstanding this was the first time *Audi* had encountered these conditions she showed sparkling performance upwind and down to finish a promising fourth.

The rest of the week delivered more typical Valencia thermal breezes in which we achieved some good but generally inconsistent





Left: forced out of Class C by new class splits, sail area was increased for 2015 in an effort to get in among the bigger boats in Class A and B. The changes were only partially successful as the old-school leadmines still sailed away upwind. For 2016 the original 'square' 2m keel (far left, top) was switched for a deeper fin (below); RM remains the same but with more draft the DSPL comes down by 400kg. A little more sail has also been added. Once again rating was put aside in an effort to get a 37-footer to the top mark with her heavier, larger rivals

performances, especially over 10kt TWS. But it was downwind where things got complicated... At the weather mark, while boats with traditional symmetric spinnakers were able to immediately go low for best VMG we were forced out wide to find the space to sail our own VMG angles. This is something that you cannot design your way around.

Our final result was eighth, below expectations, but not bad. Following a quick switch to an old-fashioned spinnaker arrangement the next appointment was the ORC worlds in Kiel, where, due to different class splits, *Audi Quattro* was forced to race with the real 40-42 footers; in a very light series this led to an unsatisfactory mid-fleet result.

2015 – Evo 1

But the big surprise came the following winter: while we were thinking about how to boost performance, the ORC decided to adopt a completely new concept for class splits at major events, based on predicted upwind speed, similar to the old IOR system but basically swapping metres for feet.

This system does not take account of downwind performance, but it does create more even fleets on the water and drives out some of the previously mentioned heavily optimised old 40ft upwind steamrollers. The downside, however, was that our relatively light and small 37-footer could no longer fit in the small boat Class C... even if we shortened the hull by cutting it!

We sat down with the Next team and quickly agreed, especially in light of what we learned during 2014, that if we could not slow the boat enough to fit into the small class, we should go in the opposite, more fun direction and make her substantially faster to try to keep up with the bigger boats.

I really have to thank Jani and his enthusiastic team who put in a great deal of hard work to take *Audi Quattro* to the next level. Now she would be a real turbo...

It was also decided to split development over two years. Year one included a new taller Hall Spars mast to accommodate a bigger, more fathead main, bigger masthead kites and slightly larger headsails. Since the consensus was that the boat was already really stiff, and the keel area sufficient, it was decided to postpone planned underwater changes for the following 2015-2016 winter.

You can see the differences in rig profile at the top of this page (right), and in her new configuration the boat was without doubt nicer, faster and more fun to sail. Next stop was the 2015 ORC Europeans during a glorious Estonian summer in Parnu.

At 37ft *Audi Quattro* was easily the smallest boat in the now combined Class A and B, so a mid-fleet finish was not embarrassing. However, in our post-regatta discussions there was a clear feeling that while our boat, despite being so much smaller, was as fast as, and sometimes even faster, than the X41s that dominated the regatta (the four X41s entered took the top four places overall...), the higher sail area/wetted surface ratio of the bigger and heavier designs was still a problem for us in light-medium conditions. A further upgrade was required.

2016 – Evo 2

So during the winter of 2015-2016 the hull parameters and underwater appendages were carefully revisited. The original 2013 CFD analysis was used to further validate our evolving VPP, and a series of new configurations was considered, progressively removing weight, adding sail and deepening the keel, all with little consideration of rating; we just needed to be closer to our rivals at the top mark if we were to be able to use our weight advantage downwind.

The upshot is that the Next 2016 configuration sees our boat 400kg lighter (a reduction of 8%), with a similar RM, a new keel fin with increased 2.36m draft and even more headsail area... all ingredients for an attractive meal. And last but not least, this year new sponsor Mercedes joins Offshore Team Finland, with an intimidating all-black livery to complete the picture.

This summer's ORC worlds in Copenhagen will tell if this radical choice will be successful and if the fight of our small and light David versus the big and powerful Goliath will go as we'd wish.

Elsewhere

An interesting footnote is that during last winter, having seen the more enjoyable sailing provided by our lighter-than-the-norm ORC design, several other owners approached us to perform a similar transformation on their designs – some from our office and some from other designers. Having inched them ever so slightly forward toward fast-is-fun sailing, the early feedback from these owners is so far very gratifying. But it would be nice to go much further. □

ALL CHANGE

There were big implications when in winter 2014-2015 the basis for class splits at ORC regattas was changed from GPH number to the newly introduced Class Division Length (CDL) factor.

Next was designed to be at the upper limit of the Class C small boat division (GPH<600) but with the new ruling there was no way of keeping the boat in class; I tried increasing weight, reducing sail area (not a nice choice...), cutting 1 or 2ft off the boat, but nothing really worked.

Plan B was to speed the boat up, move into the big boat class and try to be competitive against larger rivals and not get buried on the first beat. Of course during any optimisation we always compare rating and performance to identify the best compromise, but this was more a case of 'let's aim to compare loosely in performance with, say, an X-41 and only then try to optimise our rating'...

Interesting to note that this move toward faster boats was the driver of a great deal of boatyard activity that winter; for example, the Croatian Archambault 40 *Gringo* replaced her keel and rudder and then hacked away in pursuit of reduced displacement. Also, our own custom ORC37 *Katariina* replaced her rather strange original keel with what was simply the fastest foil possible while (just) remaining in Class C.