## Mini40 – design, innovation & evolution  provided by Andy McCulloch

The following article has been drafted to explain to new comers to the class the steps that have been taken over the past 10 years to bring the Mini40 class boats to their current stage of sophistication & performance.

Savage

In the late 80's, I had my first involvement in designing and building multihull race boats, having cut my teeth on a number of monohulls. The first design was a Trimaran called *Savage*, which was designed to conform to the mid size class of the time in France, which called for a boat 1500mm long. Looking back, this boat was fairly innovative for its time, with a single crossbeam tying a Carbon/Kevlar hull platform together. As you would expect, the learning curve was very steep, but a great number of lessons were learnt from this early experience, including a better understanding of the high loadings that this configuration of boat applies to the hull platform. These loadings resulted in a catastrophic hull failure midway down the inside of one of the floats on one occasion, a failure which was exactly the same as the one experienced on Pete Goss's Phillips Challenger recently. As is the case with Pete's boat, re-engineering the hull design solved the problem but left me with a desire to better understand the structural loads on the boat, a factor which has always since driven the engineering of the designs.

Not long after the Savage had whetted my appetite for the sheer speed and fun of sailing the multihull boats, I was heavily involved in bringing the Mini40 class into the UK. Stealing mercilessly from the boys in France, a number of skippers started bashing Glass Fibre designs such as the *Cobra* and *Pirhana* round the lake, having a great deal of fun as we all learnt how to sail the things. As is always the way, we all thought we could design a better boat and merrily set of to prove that despite our lack of experience we could do a better job than the experienced French designers. Oh – the naivety of youth! – let us say that it turned out to be a bit more to it than we first thought…..

My first foray as with a Catamaran called *Runaway Train* – it seemed so obvious, the power weight ratios were better, it was easier to build, it had to be the right choice. The resulting boat, although quirky and difficult to set up, was undoubtedly quick….. in a straight line. Going round corners was another question. We tried all sorts of tricks, played with the sail-plan balance, someone even fitted trim tabs, all to no real avail. The damn thing was good fun, but not really the right solution for round the cans racing. The final straw came to me at a UK National Championships meeting when the entire fleet were wiped out, and I mean wiped out, by Mark Beighton sailing a home grown Trimaran called *Mongoose*.

This boat was very simple, built from balsa with a light glass fabric skin it kicked in at about 6½ lbs, was stiff – AND COULD TACK – wow! – we were all very very impressed.

Furious building activity followed, and by the next season the cats had disappeared from the fleet & Tris ruled the roost.

Personally, I put the *Freight Train* design together looking to address all the problem areas that we had come across, ie: the ability to tack quickly, the need to tolerate being slightly overweight, and above all, being easy to sail. To this end, the boat was given a fairly wide main hull form which facilitates the boat tacking, large (210% of displacement) floats, to make it forgiving, and plenty of volume to allow for those 'perhaps just a little more glue' moments during construction. I stayed with the single crossbeam arrangement (as on the *Runaway Train*) to continue to exploit he torsional resistance efficiency of this system, but this time made sure the floats has enough compressive resistance to avoid the failure I had seen on the *Savage*.

My first boat was from carved foam with a light glass skin, came in at 6½ lbs and was a delight to sail. I could now tack as fast as the monohulls, the boat accelerated well, and above all, was easy to sail. I started to get some results. Simply by having a reliable boat, that it was possible to drive it hard without the fear of capsize allowed me to beat most of the fleet, most of the

time. At long last, Mark, with his now Mark 3 *Mongoose*, had someone to race against, and it was a very close thing - As we both improved, we found we could sail the boats closer & closer to the 'red line' and the sight of the two boats powering upwind both with the centre hulls clear of the water became familiar.

We also found out that we had caught the French development up, which was proven when Chris Jackson took the *Freight Train* over to the French Championships and walked away with second place and a satisfied grin.

So where to go from here – the drive was clearly to go lighter, make the hull platform stiffer, and learn how to sail the things! With regards to the design path, I had only once concern with the *Freight Train*, and that was the downwind speed in very light airs (<5kts true). In these conditions the *Mongoose* was faster by perhaps 1-2% and although I could usually recover any lost ground upwind, I did not like the fact that I had to worry about the downwind legs. I decided to join Mark with the *Mongoose* and put together the *Express Train* to his design, with a few tweaks to reduce the height of the centre hull which I considered more than required. This put us on a level playing field and led to all sorts of fun out on the track as we fought for the prizes.


Express Train

After a year of racing the *Mongoose* (with which I managed to finally beat the French), I wanted to explore the possibility of squeezing the last few bits of performance out of the platform, and started to draw the *Ghost Train*. I was looking to take the best bits of the *Mongoose*, and refine the platform to leave a no holds barred, absolute out & out race boat. Due to the hard racing that we had enjoyed with the old boats, I now felt that there was no need to 'make it friendly' and dismissed the ease of sailing aspect from the design calcs. This involved reducing the spare volume in the floats, going as high tech and light as we dared, and concentrating on a very simple, optimised boat. A basic criteria was that every part of the boat had to have more than one function (to save weight) and that the engineering performance of the platform would take precedence over things such as ease of access.

In practical terms, this led to small cutouts in the top of the main hull (which is subject to
large torsional loads), double D section carbon beams, and careful detailing of the parts of the boats that provided the structural support to the rig. The original plan was to only build two boats, one for myself and one for Mike Dann, who works professionally manufacturing Carbon Fibre spars, with the intention of running a development programme.

Attention to detail was all important, and resulted in a very stiff platform which we could put on the water at just under 6 lbs. The changes from the *Mongoose* in hull form were fundamentally a reduction in rocker in both the main & float hulls (to reduce the tendency to pitch, and a flattening of the body sections from the half round form on the *Mongoose*. Attention was paid to controlling the distribution of buoyancy on the float hull, to ensure the boat would behave itself when flying the centre hull upwind.

On its first outing it was apparent that we had got it something like right, it was fast out of the box. As we had predicted, the boat was very lively, responsive and rewarding to sail. The down side of it was that in more than 15kts apparent, it would bite if you got it wrong, especially with a big rig up:

For the benefit of those who have little experience of sailing multis I should perhaps explain what I mean – let us take the situation when approaching the windward mark and you are due to ease off to a broad reach. Good practice in multi's is to ensure that you ease the sails before you bear away – the difference between the designs is that the *Freight Train* is tollerant enough to allow you to not ease off first, and would reluctantly stay on its feet, whereas the *Ghost Train* would bury the float tip and nosedive.

In some ways the rest is history, Mike Dann & myself raced the boats hard for a few months taking the UK & French championships, and slowly more and more people started to learn to sail the design. Unfortunately, it also attracted some skippers who were not really ready for the boats narrow tolerance level, who found themselves struggling to sail the boat.

Recently, a number of UK skippers have fitted floats with more rocker (a type favoured in France where the windspeeds tend to be lower) and have found that they make the boat more tolerant to sail. As is often the way with these things, the price that they pay is that the boat is not quite as quick as the original in windseeds >5kts true.

I trust that this piece throws some light of the design evolution over the past few years, but it would not be complete with a mention of the other multi designs that are available. The first is a Mini40 called *Route 9*, which I drew as a basic box section trimaran a few years ago as a starter boat for budding Mini40 sailors. Based on simple plywood box sections, I built the prototype and sailed it under a stolen Marblehead swing rig, just to prove it could be done. The boat proved to be easy to sail, and remarkably quick considering its basic form. As regular skippers will know, a vice free boat which is easy to sail will often beat a quirky superstar – this boat embarrassed a good few of those!

Ghost Train

The other design in the stable is the *Midnight Oil*, which is a 2m Trimaran based on the successful *Ghost Train* concepts. To my knowledge, I do not know of this design being built as yet and as such cannot vouch for its performance. As one last fling, I can also offer my latest thoughts on the original catamaran platform, in the shape of a design called *Ginger* , but potential builders should be aware of all the problems we had in the early days.

These designs are available from the following places:

**Freight Train** Traplet Publications Reference number MAR 2394, cost £8.50 **(US $12.00)** These plans are very comprehensive, giving details of construction, radio layouts, sailplans etc.

**Ghost Train** direct from Andy McCulloch- cost £15.00. **(US $21.00)** Line drawings of platform, equipment layout and sailplans. No construction detail.

**Route 9** direct from Andy McCulloch – cost £10.00 **(US $14.00)**

**Midnight Oil** Traplet Publications Ref: MAR 2607 cost £8.50 **(US $ 12.00)** basic line drawings of boat & Top suit sailplan only

**Ginger** direct from Andy McCulloch – cost £10.00 **(US $ 14.00)** Line drawings of hull platform only.

In conclusion to the above, I should perhaps mention that a number of people have approached me regarding the availability of hulls for the *Ghost Train*. I have spoken to Mike Dann, who moulded our own boats, he tells me that the moulds are now a bit tired, but he would be prepared to restart production if we could get at least five orders. The price of the mouldings would be:

| | in Glass | in Carbon |
|---|---|---|
| Floats | £50.00 each **(US $ 71.00)** | £75.00 each **(US $ 107.00)** |
| Main Hull | £75.00 **(US $ 107.00)** | £100.00 **(US $ 143.00)** |
| Cross beams | £75.00 pair **(US $ 107.00)** | £100.00 pair **(US $ 143.00)** |

All the above plus post & packing

Although these prices are not as low as I would like, I can personally vouch for the quality of moulding that Mike produces which is in keeping with the pedigree of the boat. Should you be interested in purchasing a set of mouldings, please mail me on andy.mcculloch@orange.co.uk

**EDITOR'S NOTE: United Kingdom "Pounds" converted to approximate U.S. "Dollars"**