

Seahorse

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Coming men, coming fleet
– MOD 70s are instant hit

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Above: Alinghi's 2007 America's Cup-winning helmsman Ed Baird driving the 2011 Quantum Racing TP52 en route to one more Audi MedCup win. Quantum's designers, Botin & Carkeek, have dominated the MedCup for the past five years, and the influence of this TP52 pedigree is obvious in Shaun Carkeek's new 40-footer (opposite) – seen in build at McConaghy Boats in China

Surprise entrant

Shaun Carkeek is celebrating the first birthday of his new design business with this highly foxy-looking new 40-footer...

The Carkeek 40 is timely for two different reasons. Not only does the design further define a trend towards stylish, contemporary and attractively priced grand prix-style yachts below 50ft, but it is especially important to our own office to confirm the values of performance-with-style that we intend to become synonymous with Carkeek Design Partners. Our latest design – in a lengthy series of successful grand prix yachts – goes to Key West in January with high hopes of success, both on the water and among potential new clients...

I have been anxious to launch this concept for some years. Finally the conditions came together after I had joined the New York YC technical committee, earlier in 2011, where discussions were already underway for a new High Performance Handicap Race Boat Rule (HPR) – to promote continuum sailing in grand prix style

boats. As it happened, our 40ft concept embodied many of the key features that HPR is intended to promote. Since then four new Carkeek 40s have been sold.

From the outset the objective was to provide a good all-round boat, equally at home around the cans and offshore. Easy to transport, rig, tune and drive in all conditions and sea states. And at an attractive price. An iconic raceboat to provide the type of sailing experience that many owners have been pursuing for years.

The key features of the yacht include:

- carbon pre-preg/Nomex construction
- high-modulus carbon rig and rigging (GL/ISO compliant)
- modern square-top sailplan
- twin topmast backstays with deflectors
- to fit a standard 40ft platform container
- optional quick-release/lifting cassette keel system
- optional two-part rig (for simpler transportation)
- rotating hull cradle for easy loading

Our design development continued the theme of recent successful designs including the TP52/IRC52 *Hooligan* (ex-ETNZ) and *Vesper* (ex-Quantum Racing). Accurate design input data is the key with these fast modern designs and we spent considerable time working on weather data and typical course modelling. We analysed a variety of the most popular regatta venues (as well as

some of our more comparable potential competitor designs!).

Design lessons and know-how gained over the years in the TP52 and GP42 classes played a particular part in understanding the balance requirements for this new 40. There are a number of production 40s already out there, yet they differ widely in concept and market positioning, as well as in terms of the balance between outright performance and (usually) IRC rating.

The Carkeek 40 is a powerful yacht, light but long on the waterline to deliver accessible high performance across the range. The key hull ratios are, in fact, quite similar to current TP and GP-style yachts (stability issues encountered in several GP42s have been addressed).

Once a provisional righting moment was nominated our baseline designs were assessed through VPP predictions vs IRC trial TCCs, together with a first approach to optimising other parameters vs TWS and TWA targets. In this initial stage we took care to work closely with our first owners and their representatives before making big decisions.

Once the basic concept was better defined we were then able to calculate a provisional righting moment curve. The righting moment defines all of the basic loads and so this provided our structural engineers with a decent starting point;



CARKEEK 40

LOA	12.2m
LWL	11.45m
BMAX	3.8m
DSPL (empty)	3,850kg
DRAFT	2.9m
UPWIND SA	108m ²
DOWNWIND SA	245m ²
IRC TCC	1.235 (in IRC trim)
	1.265 (in HPR trim)

once this was underway a preliminary weight study was produced based on the boat's increasingly detailed specification.

Having defined the broader parameters we then conducted an intensive period of hull refinement using all of our latest CFD-VPP technology. Throughout this process the sailing balance of the boat remained a priority (the need to work closely with the sail designer is essential at this stage).

Our in-house CFD evaluation involved a balance of Panel CFD and RANS CFD codes. Today this is an efficient and productive way of designing and testing such a hull, as long as the right tools are chosen for each and every task. For example, there was daily hull development (for flat water) taking place using our panel codes, backed up with weekly checks where more complex sea-keeping/RAW studies using RANS codes took place on selected hulls only. (Our own CFD studies performed during the past six months have shown us that when designing hulls within relatively tight design constraints there are normally only small deviations when you proceed to RAW testing in waves).

For the appendages further CFD optimisation studies were undertaken, again using our own codes and optimisers, with perceived optimum appendage size and location then being confirmed using a more specific balance-oriented VPP.

High-quality integration of all this hydro and aero data allows for extremely accurate speed prediction, with the percentage variance with respect to real data primarily dependent upon variances in wind gradient.

Another high priority in this project was a good synergy between the sail designer/yacht designer/sailing team to create sail crossovers and inventories to match the intended use. Similarly, a deck layout was developed that takes a lot from our best TP52 work, being

both ergonomic and also successful in terms of weight concentration – the key driver for the aft location of the pedestal system.

Builder

Following a lengthy evaluation we asked McConaghy Boats to build the new boats. McConaghy have a superb track record using the most modern technologies and also understanding the less usual concept of the semi-custom production raceboat.

The hull and deck are both built in CNC-machined female moulds. This hull and deck tooling is securely mounted on steel strongbacks, all solidly constructed to withstand elevated temperature cure cycles. The moulds themselves are built using SP carbon pre-preg to ensure rigidity, repeatability and vacuum integrity throughout a demanding build process.

Lay-up of the hull and deck is also all in pre-preg carbon, with a Nomex core. Bulkheads, structural components and the other interior accommodations are also laminated in pre-preg carbon/Nomex – all fabricated in McConaghy's impressive clean room using a fixed, heated vacuum table plus purpose-built component tooling (for engineering many of these key elements we employ a range of FEA tools including Abaqus and Nastran/Patran).

Inside the boat many of the exposed interior surfaces are finished in attractive clear-coat carbon, with AwlGrip satin used in the higher traffic areas amidships.

The new boat's structural engineering was led by Giovanni Belgrano and Andy Kensington, who both worked closely with us on our previous successful TP52 programmes. The final design is delivered to customers to ORC Cat 1 and with both ISO and GL plan approval.

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