

4 Up and down

It's not just extra speed that's appealing. Stepped hulls have two other big plus points – longitudinal stability and low running angles. On a non-stepped hull at very high speed, the front part of the boat is right out of the water, and its entire weight is supported by a rather small amount of hull just ahead of the transom.

Porpoising – the up and down oscillations of the bow – starts when something lifts the bow higher than its natural running angle. This could be a wave or, on outdrive boats, over enthusiastic bow-up trim in search of even more speed. The increased angle of attack produces increased lift, taking the hull further out of the water. But lacking sufficient speed to keep it



Top row: ready for take-off – the Sunseeker XS2000 and its stepped hull. Left: speed is of the essence – modern raceboats regularly pass 140mph.

there, it then falls back – pivoting around the only bit that's still in the water. Down comes the bow. The sudden increase in lift forward raises the bow again and the cycle repeats. These oscillations can be quite small and stable – or large, divergent and very scary! In the days when shaftdrive was the only drive, the fact that the bow-up attitude

further increased the downward angle of the thrust line was another disadvantage. Thrust should be horizontal; the hull produces lift. Outdrives, of course, don't have this problem.

It doesn't take long to deduce that it would be better if the boat was supported more evenly along its length – and we're back to the stepped hull again.

Spreading the support reduces porpoising, and because the more efficient hull produces the same amount of lift with a smaller angle of attack, the running angle is reduced too, so the helmsman has a better view. Which gives the lie to Spode's 3rd law, that any solution produces another problem of equivalent or greater magnitude. So far, so good.

5 Some snags

Having done all this inventing, it would be a shame not to build the thing. It's when we start talking production that costs come up. From a structural point of view, each step is effectively a hinge point that has to be stabilised and reinforced. The complex shape means that everything from making the plug to producing the finished mouldings is going to take more time, require more material and need a lot more care than usual. But assuming we can overcome these difficulties, we may have a winner.

Testing shows that the boat runs very fast, very straight and rides superbly. It also has less tendency to porpoise than a conventional hull as the weight is now distributed fore and aft rather than just sitting on a single surface right at the back. Even if the forward step comes out of the water occasionally, we still have the back two in. The running angle is also flatter and the forward view better – a big plus in a high-speed boat.

The boat also banks inwards less than a conventional hull. Come really tight turns, everything goes pear-shaped: it obviously

has far less grip on the water at the back, and the stern can be broken out quite easily, leading to a big slide and the danger of a barrel roll. Less grip aft isn't that surprising with the transom not so far immersed now. Thankfully, we find that moving the weight back and not trimming the drives in helps. The boat doesn't bank inwards as much, so aeration of the outer prop isn't a problem.

More worrying is a feeling of skittishness in all turns. Some head scratching and sketches on a napkin over lunch show that the forward-swept steps, while providing excellent airflow under the boat, cause the

centre of pressure to move about depending on bank angle. The solution is to revert to straight steps or rearward-facing steps.

Satisfied with our development programme, the only remaining question is whether to go into production. Oh, and the small matter of taking on Fountain, Donzi, Monte Carlo and the rest in the marketplace. Which takes us right back to the beginning: why the resurgence of interest in this 1920s technology? It could be money – enough people sufficiently wealthy to pay a premium for the slight edge in performance – except that the muscle-boat fraternity have always been prepared to shell out serious money for extra speed. It could be that modern stepped hulls are a vast improvement on the originals, except they don't seem to be. Or it could just be fashion. In which case we needn't look for a reason at all – 'rational fashion' must be the ultimate oxymoron! Nice though, that in this case it's based on sound scientific principle. **MBY**



Left: the stepless Cigarette, Don Aronow's world beater from 1969. Below: 20 years later, Fabio Buzzzi was the boss.

