ORC

HPR – through the ORC lens

Part 1

In the weeks preceding our recent meetings in Puerto Rico the ORC was approached by the HPR group, in particular by co-ordinator Steve Benjamin, to exchange some views and offer, as Jim Teeters later commented, a 'second opinion' on the proposed new rule. We agreed to proceed with a technical analysis of the draft HPR rule, keeping an open mind towards a possible collaboration with the HPR organisers and US Sailing – both of which are now progressing.

I began this analysis using the world ORCi fleet database as my reference, extracting 30 boats that could be considered high-performance designs (those with higher Length/Volume (LVR) and SailArea/DSPL ratios) for a more detailed analysis. My sub-group of 30 included TP52s and GP42s, the well-known Judel-Vrolijk 72-footer *Rán*, the Soto 40, Farr 400 and also the base design HPR40. Fundamentally, my analysis is an attempt to understand the influence of the various individual parameters upon HPR as well as the variations with boat size.

The basic factors that make up HPR are LOA, corrected L, multipliers, bowls and penalties.

HPR is intended to be an open design development rule that its creators intend to be typeforming so as to encourage close racing. It is described as follows: 'HPR is a performance oriented, typeforming, continuum box rule which allows limited trading between the factors composing its formulation.' Broader HPR goals include:

- to encourage racing in good fast yachts that are fun to sail, safe and remain competitive for many years, including new builds and existing yachts.
- to be as inclusive as possible of the existing fleet and yet encourage new builds.

So the boats designed for the rule will – in theory – be similar, as typeforming is acute due to the 'bowl concept' being employed. However, in terms of protecting the existing fleet, designer Bruce Nelson sounds a note of caution: 'Development rules by their nature give a slight but real edge to the latest design technology as an incentive for owners, designers and builders to create faster boats to the rule. While they have an intent to protect the bulk of the fleet they create, they cannot, on an ongoing basis, protect boats that are not up to speed.' I believe this must be fully taken into account if HPR is to succeed; no successful rule of this kind can protect old boats beyond a certain point.

HPR is in fact a Base Boat rule that bears on a particular design, and produces penalties when specified parameters differ from those of that base boat. The base boat selected is indeed a truly fast hull, which then typeforms the fleet by encouraging dimensions close to that base.

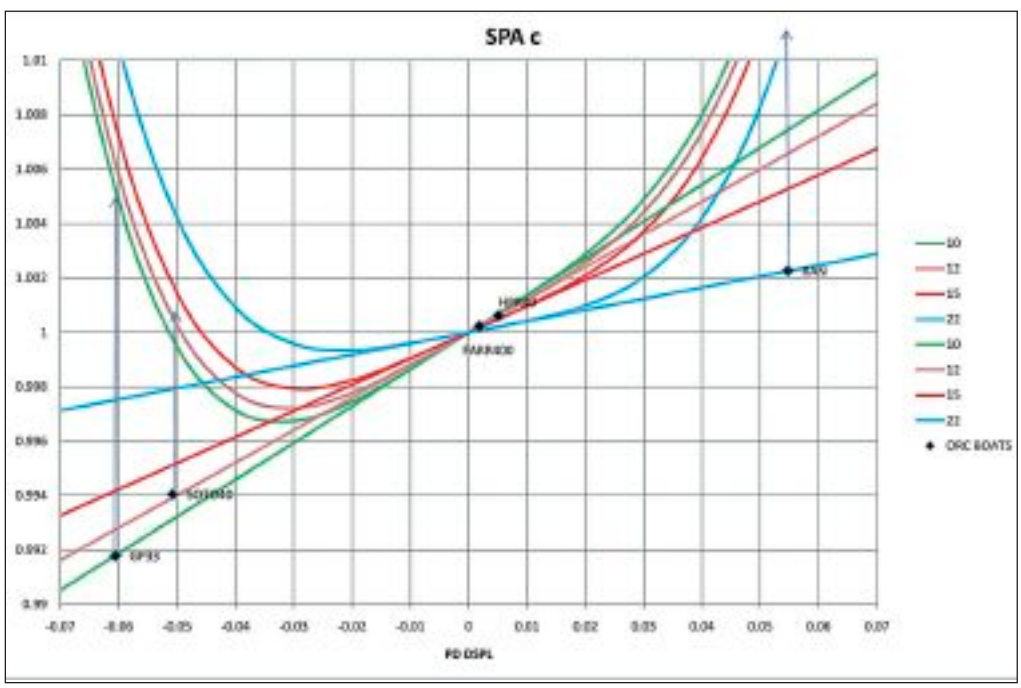
The dominant single item is rated length, L, which for new yachts is simply taken as LOA (LH); the other parameters of the base boat at that size are then derived as a scaled function of LH.

For existing and older designs LOA is corrected using an overhang factor, to take account of the fact that not all such boats were designed to exploit maximum waterline length versus LOA. However, it is my observation that the correction formulation currently proposed by HPR arbitrarily defines a correction blending the overhangs with forward knuckle height, and also fails to account for transom height – which is a very significant factor in the planing hull types that HPR is intended to promote.

A final linear HPR rating is achieved by multiplying L by the various correction factors. If measured dimensions correspond to those of the base boat the rating will equal L. The final handicaps produced by HPR are thus in linear metres which are converted to a Time-on-Time (TOT) handicap.

Currently HPR employs 12 correction factors to arrive at a rating: AGEc (Age allowance), BMc (BMAX), FRc (Freeboards), DRAc (Draft), VCGc (Vertical Centre of Gravity), Demptyc (DSPL), USAc (Upwind Sail Area), SPAc (Spinnaker Area), RHc (Rig Height), RMASTc (Robust Mast), CCFC (Construction Cost), EPc (engine-Propeller).

For each factor the difference between the actual value and the base value is determined and a corrector calculated. As the measured value deviates from the base value, it can be subject to an increasing penalty or decreasing credit. So some trading and variation is allowed for all these factors (when the measured value is the same as the base value, the corrector is 1.000). If the measured value indicates more boatspeed, the corrector will be greater than 1.000 and for a slower measured value, less than 1.000.



The coloured lines and bowl-shaped curves correspond to HPR L values for 10, 12, 15 and 22m. As a design deviates from the base value at the bottom-centre of the bowl, the penalty (to the right) or credit (to the left) escalates, as is seen for *Rán*, the Soto 40, and the GP33. In contrast, the HPR 40 and Farr 400 are close to the current HPR base values and do not accrue an escalated 'bowl' penalty. The precise positions of the bowls and the scale of the penalties are still being moved around as a final determination is made on HPR target values and appropriate allowances for an agreed typeform

The particular example shown here (*left*) is for the Asymmetric Spinnaker Area corrector (AYSO).

Note that smaller boats are more sensitive to spinnaker area variation, while they are less sensitive to upwind sail area variations. My own feeling here is that HPR's proposed sensitivity to spinnaker area variation should be checked thoroughly, as this is obviously one of the bigger factors in boat speed (by comparison, ORCi computes a 0.7% handicap increase for a 5% spinnaker area increase for a boat of 10m, less for a bigger boat).

Alessandro Nazareth, ITC chairman ❑