

The Detroit Regional Yacht-Racing Association PHRF Committee Velocity Prediction (VPP) and Rating Prediction (RPP) Program

The DRYA velocity prediction (VPP) and rating prediction (RPP) program is calculated from measurements of loa, lwl, sail area (fore triangle + main triangle) and displacement. This value is modified with an empirically determined factor (FACT) to correct for the hull characteristics, appendages, and rig properties as indicated in the listing at the end. **Getting a correct FACT is the critical step in calculating a proper VPP.** A stroll through a boat yard in November convinced me that visual comparisons of hulls, keels, and rudders is very useful in evaluating relative speed potentials. Modern racer/cruisers with VPP's of 450 and above tend to have a FACT of 0.95 while those below 450 the FACT approaches a value of 1.0. **The RPP is obtained by subtracting 400 from the VPP value.**

The basic calculation was developed from the 5.5 meter measurement rule in Marchaj* and the MORC calculation of racing length. The DRYA VPP values vary with length, sail area and displacement exactly the same as IMS calculations.

Calculated RPP ratings can be used to rate new boats and to compare PHRF ratings of old and new boats by calculating the FACT ((PHRF+400)/(VPP)). The calculation is useful because it focuses discussion on specific design areas that can be evaluated by inspection of boats. The RPP program is especially powerful in determining the deltas for boats of similar vintage and design, where the FACT values are similar.

The constant in the VPP equation was determined by a linear regression fit to 25 Detroit fleet PHRF handicaps selected for reliability. The ratings covered the range from -60 to 231.

$$\text{VPP(sec/nm)} = \text{FACT} * 6176 / ((0.7 * \text{loa} + 0.3 * \text{lwl})^{0.5} * (\text{SAD})^{0.25}) \text{ (units are feet and pounds)}$$
$$\text{RPP(sec/nm)} = \text{VPP} - 400$$

where $\text{SAD} = ((I * J) / 2 + (P * E) / 2) / (\text{displacement} / 64)^{0.66667}$ (64lb is the weight of a cubic foot of seawater)

* C. A. Marchaj, "Sailing Theory and Practice", Dodd, Mead & Co., New York, (1964)

BASIC RPP PROGRAM SUGGESTED FACTORS

FACT in calculation = 1.00 plus values shown below. For VPP below 400 the FACT is almost always 1.0.

HULL:

GENERAL; IOR about '73 +.015, about '82 +.01, new +.005; IMS 0, MORC -.03, CCA 0,
OLD DESIGNS e.g. long overhangs etc +.03
FREEBOARD; low -.005 to -.01, medium 0, high +.005 (**Hobbie 33 & Santana 35 -.01 vs Tarten 10 +.01**)
BEAM; -.02 to +.02 (**narrow is fast (Hobie 33) but wide allows crew to ballast a light displacement boat**)
BOW; sharp -.005 to -.01, full +.005 to +.01 (**full Cal 25,36**) (**sharp Hobie 33, later IOR, new racer/cruisers**)
STERN; sharp +.005 to +.01, full -.005 to -.01 (**sharp early IOR**) (**full MORC, IMS, new racer/cruisers**)
CONSTRUCTION; solid +.005, cored 0, carbon etc -.01
INTERIOR; cruising +.005, IMS minimum 0, striped out -.005

KEEL:

OLD fashioned full thick keel +.03
FIN; std tapered 0, thick +.005, thin -.005, inverted taper -.005, **Santa Cruz turbo design -.01**
elliptical -.005, shark fin (**CC35-1**) +.005, wing +.005,
Sheel +.01, IMS fin and bulb -.01, shoal draft +.01 to +.03

RIG:

Non bending mast 0 (**cal 25**), old bendable mast -.01 (**Santana 35**), new bendable mast -.02 (**J 41**)
new fractional rig -.02 to -.03, carbon mast -.01

NOTE: A factor value of .01 represents a 1% change in boat speed and a factor change of -.01 reduces the rating by approximately 5 s/nm.

A +10% variation in input values will result in the following rating changes: DISPL +6 to +9 s/nm, SAIL AREA -8 to -15 s/nm, LOA -10 to -20 s/nm

Send comments and suggestions to Tom Schreiber. E-mail tpschreib@aol.com

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