

Hull Speed

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Overview

What is "hull speed"?

If there was ever a seed for debate within the boating community, this is it. (We shouldn't limit this to boat owners, as designers and builders also periodically get into the fray.) Ironically, "hull speed" is virtually irrelevant to any technical discussion of speed and power.

First, here is what "hull speed" is not. It is not the "terminal velocity of a boat or ship. It is not where a boat "climbs the bow wave uphill". It is not the boat's "design top speed".

Correlation with wavelength

Numerically, it is a speed (in knots) equal to 1.34 times the square root of the waterline length (in feet). This formula is nothing more than the calculation of the speed of any regular wave for a given wavelength. This is valid for any medium – sound, light, water. In the context of waves generated by boats and ships, the thinking is that there is something significant about the speed where the wavelength equals the waterline length. This thinking is not altogether incorrect, just a bit over-dramatic.

Every boat operating in the displacement mode generates a bow wave system, as well as one at the stern. As boat speed increases, the wave systems grow in length and go in and out of phase with each other. This phase change contributes to the humps and hollows of the resistance curve. (It is also what makes a bulbous bow work, as the bulb's own wave system offsets and dampens the bow wave.)

The "hull speed" calculation tells us nothing about the amplitude of the hump, nor of the magnitude or shape of the underlying resistance curve – it only gives us a theoretical speed where we might find the hump. (A more thorough analysis would show us that there are a number of hull characteristics that affect the magnitude and location of the "hull speed" hump – principally the prismatic coefficient and transom immersion.)

Designing to hull speed

The existence of a hump near "hull speed" means that this can indeed be a place where speed gets expensive, but it is not some physical limit that cannot be surpassed. After all is said and done, "hull speed" is really a speed to avoid if at all possible – since we would want to *seek out a resistance hollow, and not a hump, for efficient operation.*

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