WHAT ABOUT PORPOISING?

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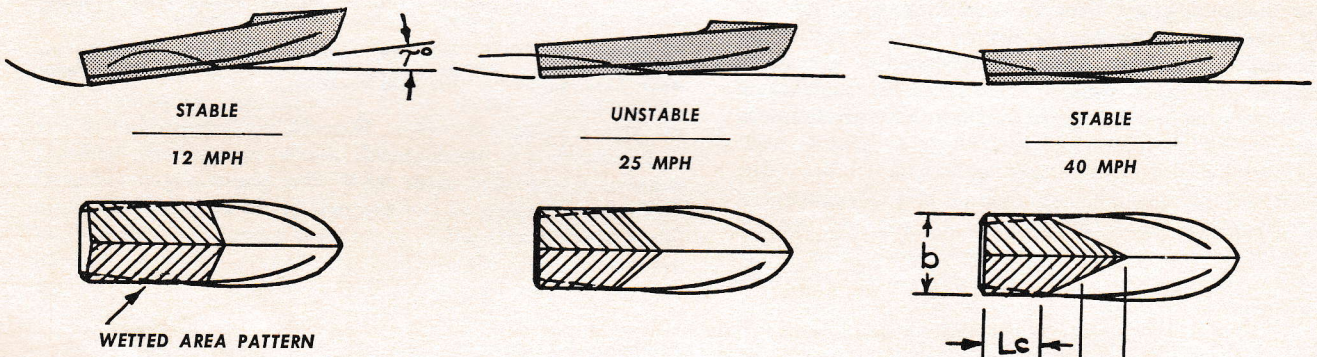
DIAGRAMS BY THE AUTHOR



The speed of a conventional planing hull can usually be improved by shifting the center of gravity toward the stern, especially under conditions of light loading. But optimum load distribution for the most speed and efficiency often results in porpoising—that galloping action which we occasionally observe in outboards and in some of the wilder, devil-may-care racing inboards. Here is some new information to enable even the layman to determine the limits of stable operation in terms of center of gravity location.

Fig. 1. *Sometimes a hull porpoises while passing through a certain range of speeds, but regains stability with higher speeds. "φ" is symbol for trim angle of boat, "L" for wetted length, "C" for chine and "K" for keel.*

To illustrate the limitations imposed by porpoising, suppose for a moment that we have decided to abandon all thoughts of comfort and to do everything possible to make the family runabout go faster with its present engine-propeller combination. On first impulse, we might remove all non-essentials and strip her down to the lightest possible weight. We will soon find, however, that this is a losing game. Unless she was nearly overloaded in the beginning, we are sure to be disappointed at the small improvement in speed. Moreover, assuming the center of gravity location to be unchanged, the amount of speed improvement for each pound removed will diminish as the hull becomes lighter. Worse yet, under light loading, if we remove more weight at the stern so as to cause the center of gravity location to be shifted forward, we may actually lose ground and cause the boat to be slower.

The trouble is that as we unload, the operating trim angle becomes smaller and smaller with only a slight reduction in wave-making drag, and almost no reduction at all in skin friction drag. If the center of gravity happens to be shifted forward, there will be an increase in wetted length and a corresponding increase in skin friction.

If we are to realize the full advantage of unloading, we must also move some of the load aft to increase the trim angle and thus obtain a shorter wetted length. As this is done the speed improvement will be more gratifying, but long before we get the center of gravity far enough aft to achieve an optimum trim angle and maximum efficiency, the boat will begin to porpoise. Beginning at this point, the

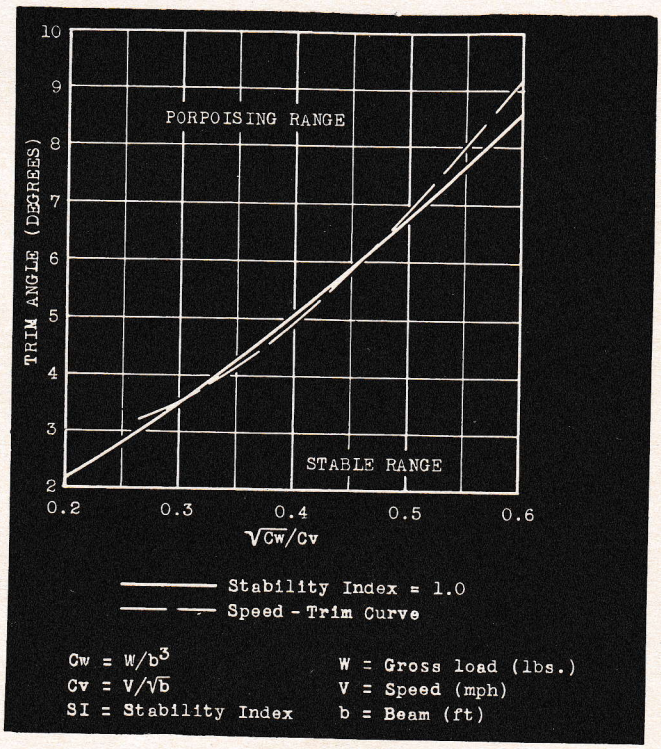


Fig. 2. *Comparison of the porpoising limit (SI = 1.0) for a typically loaded 10° deadrise surface with the known speed-trim curve.*