BOAT SPEED: WHAT DETERMINES IT?

BOAT SCIENCE: HOW DO HULLS FROM DIFFERENT MAKERS COMPARE?

With the development of more sophisticated design and measuring tools, marine architects are able to accurately determine how fast hulls of various designs move through the water. There is no "voodoo" in these calculations, as America's Cup yacht designers MUST be confident that these speed calculations are exact.

All of the America's Cup Yacht syndicates have enormous R & D budgets and employ the best-of -breed designers whose sole focus is to design fast boats. As a result, these marine architects have conducted the most sophisticated testing and developed the most advanced design software ever. Their efforts have yielded the newest and best information on how to design fast boats.

All yacht designers agree that "wetted surface" is one of the design parameters that significantly influences the speed of all types of boats. Manolo's research further indicates the amount of wetted surface is the most important determinant of a rowing shell's speed and accounts for over 80% of the shell's total drag. Older rowing shell designs, and even some newer racing shell designs, falsely promote a longer waterline as "the" critical parameter affecting speed. This theory of "longer water line equals more speed" is true for power boats capable of much higher average speeds but not for rowing shells. Shells just don't go fast enough to justify the extra wetted surface a long water line necessitates.

Another design parameter that affects hull speed is "Wave" drag. Wave drag is responsible for about 20% of the total drag. This type of drag has less effect on rowing shells due to their relatively low speeds but it should not be ignored in the design process. A rowing shell moves through the water creating waves as it pitches up and down and surges fore and aft with the rower's movement to the stern for the blade entry and toward the bow on the pull through. Designers are able to minimize the negative effects of pitch and surge by the redistribution of the hull's longitudinal volume. As a result boats can and have been designed with shorter water lines with less wetted surface and yet row like a boat with a considerably longer water line!

The accompanying Comparative Data Chart shows how Vespoli hulls stack up against the competition. These data/measurements on the non-Vespoli shells were taken directly from actual boats and were gathered by an independent company whose only business is 3-D digitized hull measurements. This company uses extremely sophisticated laser measurement instruments, the same used to determine whether America's Cup yachts are in compliance with the strict "Deed of Gift" specifications. These data were used in the precise calculations that determined surface area and wetted surface data. These are accurate and unbiased numbers.

EIGHT OARED HULLS: Comparative Data*

8+ HULLS	Vespoli EXL	Vespoli EL	Vespoli EM	Vespoli ES	Empacher	Pocock	Hudson	Resolute
Displacement (kgs)**	833 - 899	807 - 834	715 - 783	660 - 734	899	899	899	899
Average Crew Weight (lbs)	185 - 205	175 - 190	150 - 175	130 - 155	205	205	205	205
Average Crew Weight (kgs)	85 - 95	80 - 86	68 - 80	60 - 71	95	95	95	95
Wetted Surface (Square Ft.)	***96.6 - 100.2***	***96.2 - 99.8***	***87.3 - 93.5***	***85.7 - 91.8***	***101.3***	***102.4***	***101.2***	***101.2***
Wetted surface (Square m)	8.978 - 9.314	8.942 - 9.278	8.113 - 8.687	7.963 - 8.531	9.411	9.518	9.411	9.404
Water Line Length (m)	16.841 - 16.891	16.723 - 16.767	16.54 - 16.68	15.963 - 16.044	16.917	17.455	16.91	16.791
Water Line Beam (m)	0.579 - 0.586	0.557 - 0.562	0.542 - 0.553	0.512 - 0.521	0.564	0.551	0.576	0.573
Hull depth (m)	0.182 - 0.192	0.185 - 0.195	0.162 - 0.178	0.165 - 0.182	0.182	0.177	0.182	0.183

* Measurements taken by independent metrologist **Weight of hull, oars, coxswain, electronics and boat