

Ask Bill Tytus – Short vs. Long Hulls

This is the first installment of a new online column, called “Ask Bill Tytus.” Throughout the year, Bill – who is president of Pocock Racing Shells and one of the leading experts in the racing shells industry – will use this column to answer questions on various rowing topics.

One of the hot topics in the rowing world today is the debate over short vs. long hulls. Top rowers and coaches around the country have been asking Bill this surprisingly complicated question: “Does the length of a racing shell make a difference in speed?”

The short answer to this question is no. In order to understand why, however, you must first understand some basic hydrodynamics.

Hydrodynamics is the study of things moving through water. It is not an intuitive science; it’s an empirical science based on painstaking measurement.

The research and study of hydrodynamics takes time and instrumentation, which is extremely expensive. The vast majority of what is known today has been developed by the navies of the world. In addition, America’s Cup sailing syndicates have also spent many millions of dollars on hydrodynamic research. Even after spending all this money there has been huge inconsistency in the performance of the boats. This is an indication of how much there is yet to learn about boats moving through water.



Bill Tytus training in Boston in the 1960s.

In addition to the expense of hydrodynamic research, racing shells have few dimensional similarities to other boats. So, although we might know something about aircraft carriers, destroyers and submarines, this knowledge is not always applicable.

This doesn’t mean that we can’t make meaningful hydrodynamic inferences for racing shells. It just means that we must be very careful with our hydrodynamic assumptions.

In designing racing shells, we must be primarily concerned with the aspect of drag, which is what slows the boat down. The two most significant kinds of hydrodynamic drag are friction and wave drag. Friction drag is the wet area of the boat dragging against the molecules of the water.

Wave drag, of course, is the resistance due to waves being made at the interface of the air and water. For example, submarines do not experience wave drag when they are fully submerged.

It is widely believed that 80-90 percent of racing shells' hydrodynamic drag is simple skin friction and that wave drag is the major part of the remaining 10-20 percent. Certainly it makes sense to first try to reduce friction drag since it is such a large part of total drag. At first glance, it would seem that a shorter boat might have less surface area in the water. And since friction drag is related to surface area, we would hope that the shorter boat would have less drag.

Friction drag, however, is not just a function of surface area only. It is actually a function of speed, surface area and a frictional co-efficient. Clearly, anything we can do to reduce surface area will reduce drag. Unfortunately, reducing the length of a boat also increases the co-efficient of drag. What this means is that if we shorten the boat, even though the surface area is less, the drag per unit of area is greater.

Even though wave drag amounts to a smaller proportion of total drag it must not be ignored. Wave drag is a function of speed over length. It is easily understood that when speed increases, the size of the boat waves grow, which increases drag. Perhaps not so obvious is that decreasing the length of a boat also makes the waves bigger. As crews push these boats faster and faster the wave drag not only increases, but becomes a bigger factor in total drag. This indicates that all things being equal, longer boats might be faster.

But, of course, all things are not equal and none of these factors by itself really tells the whole story. For example, one of today's popular eights has a length of 55.23 ft. and a wet area of 104.46 sq. ft. A Pocock V8 for the same crew is longer (57.06 ft.), but due to careful design work actually has a smaller wet area (103.9 sq. ft.).

Over the years, boat length has changed cyclically, just like fashion. History has never proven that shorter boats are more effective.

Bill Tytus has been the president of Pocock Racing Shells since 1985. He designs all the companies' boats and has a storied rowing back-ground. In 1969, he placed second in the Diamond Sculls event at the Henley Royal Regatta and was a member of the U.S. National Team from 1969-71. He is still active in the sport, teaming with Frank Cunningham for the past 13 years to coach elite scullers at Lake Washington Rowing Club

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