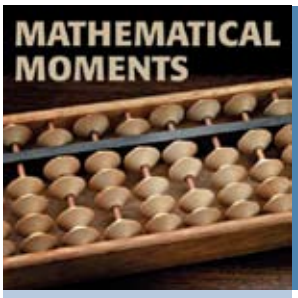

Sailing Faster

A lot of work takes place on the water in competitive racing. Yet there's also a great deal of work done on land designing a boat's hull and sails years before the starting gun ever sounds. Much of the process of creating a 20-ton vessel that must move efficiently through air and water involves mathematics–specifically the theory of fluid flow. In fact, roughly 40 million equations are used in the design of today's America's Cup yachts to ensure that their crews sail the fastest boats possible.

Yacht design, which often blends seemingly contradictory constraints such as making a boat both light and strong, is done mainly with computers, where it is easier to test designs than on the water. A boat's surface is approximated by smaller surfaces that can be manipulated algebraically during the design process. These smaller approximating surfaces are defined with functions called *splines* (made up of pieces of polynomials) and are combined, often using curvature as a measure, in a way that smoothes the interfaces where the surfaces connect. There is little room for error: A difference of just one percent in speed translates to minutes, in races where seconds matter.

For More Information: "Design Optimization for the International America's Cup Class," Frank DeBord, Jr., John Reichel, Bruce Rosen, and Claudio Fassardi, http://www.sailboat-technology.com/links/SNAME-2002.pdf.

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