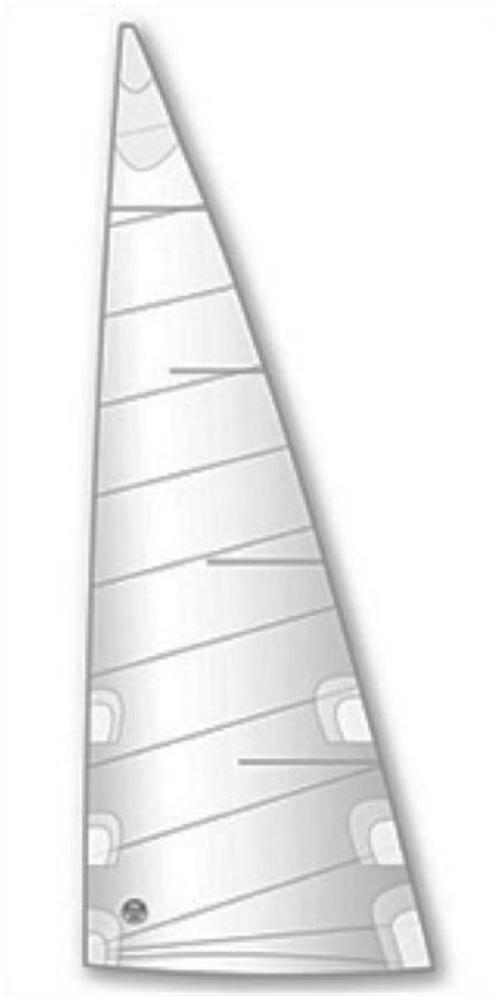


SUPER SAILS! - LESSON 4 - SAILS



Primary Goal: After this lesson, students should be able to determine the final piece of their sailboat design, the sails. After reviewing how sails generate speed for a sailboat, they will learn how to generate speed for their boat while also taking into account the many other factors affected by a boat's sail area.

Lesson Objectives:

- Students will review how sails are able to generate lift, and thus speed
- Students will learn the importance of and how to calculate Sail Area
- Students will learn about the Sail Area – Displacement ratio

Lesson Outline:

SUPER SAILS! - LESSON 4 - SAILS

- I. Intro
 - a. A sailboat uses her sails for propulsion by generating lift (upwind) or by blocking the wind and being pushed (downwind)
 - b. Just like a sports car is interested in a high horsepower – weight ratio, sailboats use a similar type of measurement to determine the potential speed, or acceleration, of the sailboat
- II. Sail Area
 - a. A sailboat's propulsion comes from the wind on her sails and is proportional to the area of all the sailboat's sails
 - a. This is measured by calculating the area of each of the sails and then simply adding those numbers together
 - i. The measurement of sail area is calculated using square feet
 - b. For more advanced courses you can discuss the measurements of *E* and *P* for the mainsail and *I* and *J* for the headsail
 - . It is also worth noting that actual sail measurements are more complicated because of the curvature shape of the sails
 - III. Sail Area – Displacement Ratio
 - . In order to compare sailboats with one another, we use the Sail Area – Displacement ratio
 - a. This shows how much power the sails generate compared to each pound of displacement
 - . Under this calculation, we are assuming that displacement is the sole limit of a boat's speed due to the reasons discussed in previous lessons
 - i. The calculation also involves dividing the displacement by 64. This is done because the weight of seawater is 64 lb/ cubic foot
 - b. The higher the ratio indicates a high performance sailboat usually designed for racing
 - c. Because of the large sail area, these boats are sometimes more difficult to handle and can become easily overpowered in high winds
 - . Low ratio – 8-13
 - i. Medium ratio – 14-20
 - ii. High ratio – 21-40+

Supplemental Resources:

Sailboat-Cruising.com: [Sail Area Calculations](#)

Cruising World: [How Sailboats Measure Up](#)

National Geographic Sailing and Wave Simulators:

<http://www.nationalgeographic.com/volvooceanrace/interactives/sailing/index.html>

