EL TORO MAST RAKE

Paul Tara, 2014

Physics: Rake is the fore-and-aft angle the mast makes to the vertical. It controls the fore-and-aft position of the center-of-effort (CE) of the sailplan. More rake moves the CE aft, allowing the boat to point higher, but also increases weather helm and rudder drag. Less moves the CE forward, decreasing weather helm and allowing more control. Class rules prohibit changing rake while racing, but do not control the location of the daggerboard trunk. Thus, for any given boat, wind strength, and mast-sail combination, there is an optimum rake. Because boats differ, rake is most accurately calculated by measuring the actual angle the mast makes to the vertical.

Guidelines:

- Older boats have their trunks further forward and more restrictive mast partners – they can't carry as much rake. A boom angling up is slow, especially in light air. The greater the distance from the bridle to the end of the boom, the greater the sheet tension required for a given boom angle. More rake = more twist; less rake = less twist.
- Rake is adjusted inversely to wind strength: *more in light air, less in breeze.* Generally, sail with the maximum rake that can be carried without control problems. Too much rake will result in excessive weather helm, and a strong tendency for the boat to round up and get caught in irons. The rudder angle required to sail a straight, close-hauled course should not exceed 5-7° (tiller around two inches off centerline).
- To measure rake:
  1. Level the boat fore-and aft (use a spirit level on the trunk cap).
  2. Step the mast, place a protractor with a plumb line from its point of origin against the aft face of the mast. Measure the angle of rake in degrees. Older boats: 5-7°; newer: 10-14°.
- Avoid fussing. Find a default rake and shift mast blocks only if conditions change dramatically.
- Caught with too much rake? Keep the boat flat, or even heeled to weather. Raise the board 2-3". Less board reduces weather helm drag, less drag results in better VMG.