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THE UPPER LEECH TELLTALE

By Stuart Walker

Maximum forward thrust and highest pointing to windward (greatest VMG) are presumably achieved when the chord of the mainsail is least deviated from the centerline (is at the maximum possible angle of incidence) and when, simultaneously, flow remains 'attached' from luff to leech. The behavior of a leech telltale fixed near the upper batten is presumed to indicate this leech position in varying wind and wave conditions. A streaming telltale indicates that leeward surface flow is attached all the way to the leech; its just ceasing to stream that flow is attached up to the leech, i.e., at the maximum possible angle of incidence. Although all sailors attempt to achieve the same sail trim through the observation of leech telltale behavior, the actual leech position achieved varies widely.

The streaming of a leech telltale is affected not only by the angle of incidence of the sail (and particularly its leech section), but also by the shape of the upper sail. Attached flow is maintained (within limits) better along a full sail than along a flat one and this effect is more pronounced along a short section, particularly when that section is subject to frequent and abrupt changes in the angle of incidence due to pitching and rolling (as well as yawing) as typically occurs at the top of a sail. The fullness (draft, camber) of a sail depends upon its design and constructions, the curvature of the mast or stay upon which it is set, the stretching of its fibers with use, the stiffness of its battens, and the tension applied to its edges. And upper leech position, gauged to achieve an appropriate telltale effect and dependent primarily upon mainsheet tension, also determines lower leech position.

After two weeks of umpire activity at Savannah and Kingston, I was able to distinguish amongst the top Solings patterns of leech position which correlated with performance. All competitors achieved an approximately identical proportion of tell tale streaming in moderate air - typically 10-20% of the time in 6-12 knots and with increasing frequency up to, but not quite, continuous streaming in IS knots. However, actual leech positions varied and fell into three patterns:

1. One group, which performed least well and demonstrated, both defective pointing and increased leeway angle, trimmed the upper main leech open (at a low angle of incidence) and the lower leech open and flat. No portion of the leeward surface of the sail was evident from dead astern.
2. A second group, which performed better and demonstrated good pointing and leeway angle, but was slower than the winners, trimmed the upper leech closed (at a high angle of incidence) and the lower leech closed and hooked to windward. A significant portion of the lower leeward surface of the leech up to mid-height was visible from dead astern.
3. A third group, which performed best, holding as high as the second group but going faster, trimmed the upper leech closed and the lower leech open. None (or almost none) of the leeward surface of the leech was visible from dead astern.

Optimal performance correlated with an upper leech that maintained attached flow in a closed position and a lower leech that remained open despite the closing of the upper leech.

A closed upper leech correlated with pointing; the maintenance of attached flow in the closed position with speed. To bring the upper leech close to the centerline without stalling requires: 1) that the sail be designed and constructed so as to have full upper sections, 2) that the upper mast be relatively stiff, neither bending off or to leeward (which would flatten the upper sail), achievable by adjusting upper and lower shroud and backstay tension so that the mast bend desired is largely confined to the lower mast and that there is no tip fall off, and 3) that the upper batten be flexible, but not so flexible that the leech hooks (i.e. the upper batten should be changed with varying wind strengths).

An open lower leech, despite sufficient mainsheet tension to close the upper leech, correlated with acceleration and speed. To keep the lower leech from closing excessively requires: 1) that the sail be designed and constructed and sufficiently durable to be and to maintain flat lower sections, 2) that the lower mast be bent by a combination of upper shroud car positioning and backstay tension to flatten those lower sections, 3) that the lower shroud be tight enough to keep the mast laterally straight (except in waves), 4) that the outhaul be tensioned to the legal limit, 5) that the lower battens be stiff, 6) that sufficient Cunningham tension be applied to keep the draft of the lower sections forward of the midline, and 7) that sufficient vang tension be applied (in stronger winds) to stabilize the lower mast and increase its bend while tightening the upper leech.

The result of these basic adjustments is that more mainsheet tension can be applied and the leech brought up closer to the centerline without stalling the short upper sections or hooking the leech of its long lower sections.