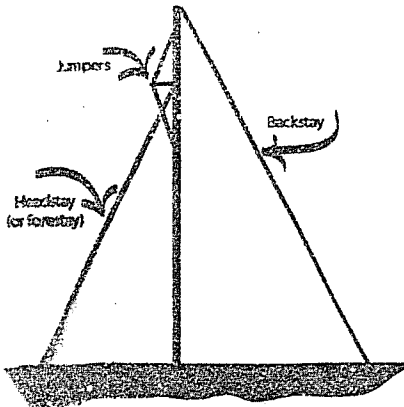


Tuning the L-16 Mast



Principles

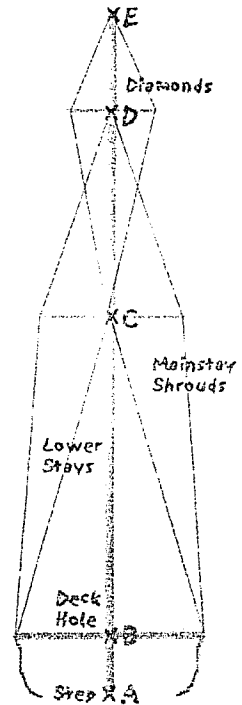
1. After stepping the mast the first task is to ensure that the mast is straight laterally. It must be straight. No ifs and buts, no curves or snakes.
2. The headstay controls the rake.
3. The backstay controls the curve of the mast.
4. The jumpers control the amount of curve achievable in the mast.

Lateral Tuning of the Spars

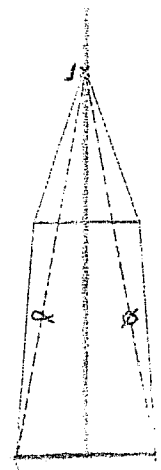
1. The headstay (forestay) and backstay have no effect on the lateral tuning.
2. The mainstay, lowers, diamonds and jumpers affect the lateral tuning of the mast.

Before Hoisting the Sails

1. The theoretical objective is to have A, B, C, D, and E in a perfectly straight line.
2. The step automatically controls the position of the mast at point A.
3. It is difficult to see whether A through E are in a straight line without the sails on as the mast will bend when under sail and the stays come under tension.
4. The mast must have the ability to move backwards and forwards in the opening in the deck.



5. The opening in the deck needs to be in the form of a slot. The opening in Etude's deck needs to be assessed as it may permit too much lateral movement. It is preferable to alter the width of the frame around this opening by either shortening the forward and aft wooden members or by adding second pieces on top. Do not attempt to wedge the mast as it comes through the deck as this will prevent the mast from moving fore and aft.
6. Ensure that the mast is central in the boat. The easiest way of doing this is to hoist a steel tape on the jib halyard (not the main). ∞ and \emptyset should be the same length. When applying tension, make sure that equal tension is applied to each side.
7. Adjust the turnbuckles on the mainstays to ensure that J (D) is central in the boat.
8. If a "twist" in the deck is suspected, a theodolite can be used to plumb the mast in very calm conditions. The keel will always hang vertically. Using a theodolite is considered extreme.
9. The tension on the mainstay should enable a lateral movement of about 4.25" as a maximum.
10. When there is no lateral movement in the mainstay then it will be too tight and a compression break in the mast may occur.
11. At this stage Point D will be effectively central in the boat. The deck opening will have just enough room to permit the mast to move back and forward. The tension on the mainstay will be just about right.



12. You are now ready to hoist the sails and start the next part of tuning the lateral straightness of the spar.

After Hoisting the Sails

1. There has to be sufficient wind to tune the mast under sail. Twelve to fourteen knots is ideal.
2. Under sail, hard on the wind, look up the front of the mast from near the deck and see if the lower (Point C) lines up between Point B and D.
3. Never look up the aft side of the mast as the main sail will distort the line of view.
4. In the case that point C sags away, then tighten the lower stay on the windward side.
5. In the case that Point C bows, then ease the lower stay. When easing, make sure that there is sufficient thread to make the adjustment. Six full turns of thread are required as a minimum.
6. Tack over and repeat the process with the lower stays.
7. You will now have Points A, B, C, and D in a straight line, all held by the mainstays and the lower stays.
8. To adjust the diamonds you will wish you had wings.
9. Sight up the front of the mast when the boat is hard on the wind and see if Point E is in perfect line with Points B, C and D.
10. If the top of the mast falls away, then the diamond needs to be tightened. If the top of the mast pops out to windward then the diamond needs to be loosened.
11. Unfortunately, adjusting the diamonds requires a ladder and this has to be done in calm waters. After the adjustments have been made then the results need to be re-evaluated under sail again.
12. This task may become laborious, but be patient.
13. After the diamonds are tuned then the mast will be straight laterally on each tack.
14. Remember to wire all of the turnbuckles and tape them to prevent them from working loose.
15. Before each race check the mast to ensure that it is straight laterally. This is critical to performance.

End Effect

1. The actual result is that the mast is straight laterally from Point B through E.
2. The lateral straight line will be laying over slightly to leeward. This is fine. The concept of the mast rigging makes it impossible for the mast to be truly central in the boat, on both tacks, in heavier air.

Rake of Spar

1. The correctness of the rake can best be determined by the performance of the boat going to windward.
2. Optimum condition is a very very slight weather helm on the tiller.
3. If the boat is allowed to sail itself then it should tend to slowly round up into the wind.
4. If the weather helm is excessive the mast needs to be brought forward by lightening the headstay.

Setting the Sails

Initial setting

Genoa

1. Hoist Genoa so tack is about four inches off the deck and there is a trace of wrinkles in the luff.

Controls

Genoa

1. Backstay – controls sag in forestay.
2. Tack downhaul – enables draft to be moved forward and aft.
3. Block car – controls twist in sail.
4. Sheet tension – fine tunes the slot.
5. Leech tension line – eliminates flutter in the leech (fine tuning).

Main

1. Hoist to top then bring down sufficient for the headboard to clear the backstay "the black mark... its top 29' below the top of the sheave used for the main halyard." (L-16 Class Rules, Part II Section 6-a, item #7). Pull outhaul to a mild setting (no wrinkles or creases).

Main

1. Backstay – bends mast and moves draft fore and aft in upper two-thirds of sail.
2. Cunningham – moves draft fore and aft in bottom one-third of sail.
3. Outhaul – controls shape of shelf.
4. Boom vang – eliminates twist in mainsail and enables it to function like a door.
5. Mainsheet tension – controls the position of the leech.
6. Traveler – controls the boom angle.
7. Leech tension line – eliminates flutter in the leech.

Aids

Genoa

1. There should be a minimum of three telltales on the luff on both sides. If there are more, they must not touch each other.

Main

1. Wool streamers attached to the end of the two upper battens.

Objectives

Genoa

1. To have luff of sail splitting the wind over its full length.
2. Position draft correctly.
3. Create a parallel slot.

Main

1. Position draft correctly.
2. Set draft at correct depth.
3. Set leech so it is not stalling or too loose.

Initial Rough Tune

Genoa

1. Set so either the leech is 3" from the end of the spreader or the foot is just touching the base of the shrouds, whichever happens first.

Main

1. Pull main in until the topmost leech telltale is about to stall.

First Fine Tune Sweep

Genoa

1. Move car until all telltales break simultaneously (quick method – have crew push down or down).
2. Assess the position of the draft. In light air it should be central to aft. In moderate air it should be central. In heavy air it should be forward. Draft is controlled by downhaul.
3. Ensure that slot is parallel. If not, adjust sheet tension.

Main

1. Assess draft, move it with backstay and Cunningham.
2. Set outhaul to create appropriate depth of shelf.
3. Tighten boom vang.
4. Check and adjust main sheet so the top telltale is just off pole of sail.
5. Set traveler – majority of time in center position. In light air carry it higher. In heavy air it can be moved down. The boom can be to windward in light air but the lower batten must never be above windward.

Second Fine Tune Sweep

Genoa

1. Repeat first tune making fine adjustments.

Main

1. Repeat first tune making fine adjustments.

Helm Test

Pressure check

1. Minute amount of weather helm is o.k., lee helm is never o.k.
2. Perfection is balance.

Remedies

1. Weather helm – flatten both sails.
2. If boat seems sluggish, ease both sails (all adjustments).
3. If this is not successful then fore and aft position of mast should be adjusted.

Weight

General Principle

1. Never crowd the aft area of the cockpit.

Windward

1. Helmsman must always be on the high side.
2. Middle crew should be hard up against the bulkhead.
3. Foredeck crew should be forward of bulkhead.
4. In light air helmsman is in normal position even if the crew has to be on leeward side.
5. In extremely light air the helmsman comes into the cockpit but stays on windward side.
6. When the helmsman is in the cockpit try and reduce profile to wind to lessen drag. Yacht must always be heeled more than 10° when going to windward.

Leeward

1. Bunch all three crew in the center of the boat (around the lifting ring in floor – remember the shock cord principle).
2. In light airs the foredeck person should fly spinnaker from cabin top.
3. If the boom needs to be held out the foredeck person or middle person can sit on the boom and the other person flies spinnaker.
4. In heavy airs the person flying the spinnaker must be in the front of the cockpit.

Spinnaker

Packing

1. First set spinnaker can be stopped with rubber bands fed off an open ended bucket.
2. Spinnaker is flaked from one clew through the head down to the other clew if packing in cabin. Feeding it through the open ended bucket is another option.
3. Spinnaker is then stuffed in turtle and attached to bow.

Hoisting

1. Fasten the pole onto the intended guy and position horizontally.
2. Intended guy gets looped with one turn around the lazy windward winch.
3. Fasten downhaul, leaving pole resting against forestay in a horizontal position.
4. The spinnaker is hoisted very rapidly!
5. Pole is pulled several feet off the forestay and cleated in the jam cleat.
6. Rapid sheeting commences immediately.
7. The wind must fill the spinnaker starting at the base and progressing upward!

Setting

1. Pole is positioned roughly perpendicular to the wind.
2. Sheet is set so the luff is on the point of curling in.
3. Foredeck person furls the genoa.

Crew

Tacking

1. The person releasing holds the sheet on the winch drum and takes the sheet out of cam cleat, waits until jib backwinds to release.
2. Before tacking, leeward crew frees lines from tangles.
3. Releasing crew guides new lazy sheet.
4. If the hauling crew has everything under control the releasing crew member goes on rail as soon as possible if conditions warrant. *sets traveller*
5. Hauling crew waits for sail to come across the boat. Pulling prematurely results in sail wrapping around shrouds.
6. sheet is always wrapped clockwise around winch. Hauling crew hauls rapidly with 1-3 wraps depending on conditions.
7. Good technique to sheet in genoa is to pull on clew with outside hand and pull on sheet at winch with inside hand at final stages.
7. If the sail cannot be sheeted in all the way the winch should be used.
8. Before hauler returns to rail if conditions warrant the lazy sheet is draped around winch in preparation for next tack.

Mainsail

1. Main sheet should always be ready to be eased or released.
2. Helmsman needs to bear off to take a starboard tackers stern it is essential that the mainsheet be eased. In heavy air if mainsheet is not eased it will be impossible to change course further off the wind.
3. Best technique to release mainsheet is to start pulling on to ease pressure on cam cleat then quickly lift it out of cleat.

Traveler

1. In heavy conditions traveler is centered. It is extreme for helmsman to want the traveler below center.
2. If helmsman wants traveler below centerline then no adjustment needs to be made after traveler is set on both sides.

3. In light air it the traveler should be carried higher and must be adjusted immediately after each tack. This adjustment can be made by releaser just before going on the rail.
4. Resetting traveler can be easily forgotten on each tack consequently it can be helpful if after every tack if each crew member yells, "traveler".

Spinnaker

1. With Spinnaker gun 2 or three rubber bands are placed on the upper 2/3 of sail.
2. Turtle is mounted with aft edge over forward horn of mooring cleat.
3. Shock cord can be around mooring cleat or hooked on to the base of the forestay.
4. Halyard and 2 sheets are clipped on and halyard is lid over forward horn of mooring cleat, sheets are crossed over in front of halyard so that when halyard is kicked free, everything comes free.
5. Spinnaker halyard and two sheets are tightened going upwind.

Setting Spinnaker

1. Decision is made approaching weather mark to either bear away or gybe set.
2. On L-16s this is a very important decision as the boat cannot be effectively gybed with a genoa in place.

Bear away set

1. Once helmsman is confident he can lay the weather mark, spinnaker sheets are eased.
2. foredeck crew presets the pole position to mark for horizontal position.
3. Foredeck crew lowers pole to predetermined horizontal position.
4. Middle crew sets pole downhaul.
5. Foredeck person places guy in jaw and opens turtle for launching then returns to cockpit.
6. As boat rounds mark the middle person eases genoa.
7. Helmsman can release main, foredeck crew sets guy.
8. Crew not flying spinnaker hauls halyard fast.

9. Spinnaker flier sheets in so spinnaker fills from base upwards. This ensure no hourglass.

10. As soon as halyard is up to preset mark hoister goes to foredeck and furls genoa.

Furling genoa

1. Genoa is seized just aft of center and rolled away from wind, pulling down hard. Once rolled to forestay, jib furling is swung armslength around the forestay. This ensures that the line above shock cord wraps top of sail snugly.

2. Once secure furler sits on boom or sits on cabin top or cockpit as directed by helmsman.

Spinnaker take down directly into turtle

1. Unfurl genoa. Boat must always have 2 sails.

2. Stuffer takes position kneeling fore of forestay with backside braced against it.

3. grabs spinnaker near or at clew, prepares to gather.

4. Helmsman ensures boat is not on true reach.

5. Crew releases spinnaker halyard fast enough that the stuffer always has loose sail to gather, not too fast so that the sail gets away from stuffer.

6. Stuffer gathers sail between legs and then stuffs into turtle.

7. After spinnaker is in turtle halyard is positioned around front horn of mooring cleat and sheets crossed over in front.

8. Middle person releases pole downhaul and pulls up on uphaul, fastens sheets then halyard.

9. Stuffer clips pole and then returns to cockpit for rounding.

10. Cunningham, backstay reset

Gybing

1. **Keep spinnaker full at all times**

2. foredeck person goes to leeward side of mast to grab spinnaker sheet loosely. If sheet is too far away it will come to him.

3. Helmsman quarters boat down to 10 degrees from dead run. Calling "quartering" until "downwind"
4. During quartering, middle person pulls pole back and eases sheet to keep pole flung at mark.
5. Once downwind foredeck person releases pole from mast and sets sheet to pole and yells "ready" pole has sheets on both sides.
6. Skipper reaches for mainsheet and moves the boat to 10 degrees dead down wind calling out "gibing"
7. Foredeck person holds pole level hile moving it across the boat.
8. As boat passes through dead down main starts to cross boat. Skipper holds boom amidships for 2-3 seconds to enable spinnaker to stay full.
9. Foredeck crew releases new sheet and refastens pole to mast then comes back to cockpit.
10. Desired course can now be set by skipper hailing "quartering" with fliery adjusting pole forward and tightening sheet..

Tuning an L-16 Rig:

- 1) Set the head stay length so that a tape on jib halyard all the way up & measure to deck @ head stay is between 22.9 ft and 22.7 ft.
- 2) Adjust cap shrouds so mast is in center. Use jib halyard to measure the same distance to toe rail on each side. Then adjust lowers & uppers to get mast straight at the dock. Then sail in breeze and tension cap shrouds so that when boat is loaded up (with rail in water), the leeward cap shroud only can be moved laterally a couple of inches. Be sure to keep track of turns & do the exact same to both cap shrouds to keep mast in center. After cap shrouds are set, then adjust lowers & uppers to get mast straight. Eye up groove on backside of mast.
- 3) Adjust jumpers on soft side so mast will bend evenly when backstay is pulled.
- 4) Put tape on lower spreader at 3" & 6" in from tip. Trim genoa so that leech is between 2" & 4" off spreader tip. Use tape marks as guide for distance
- 5) Trim main with boom on centerline & top batten parallel to boom in light to medium air. As wind picks up ease traveler to centerline then ease sheet. (Never let traveler get below centerline).