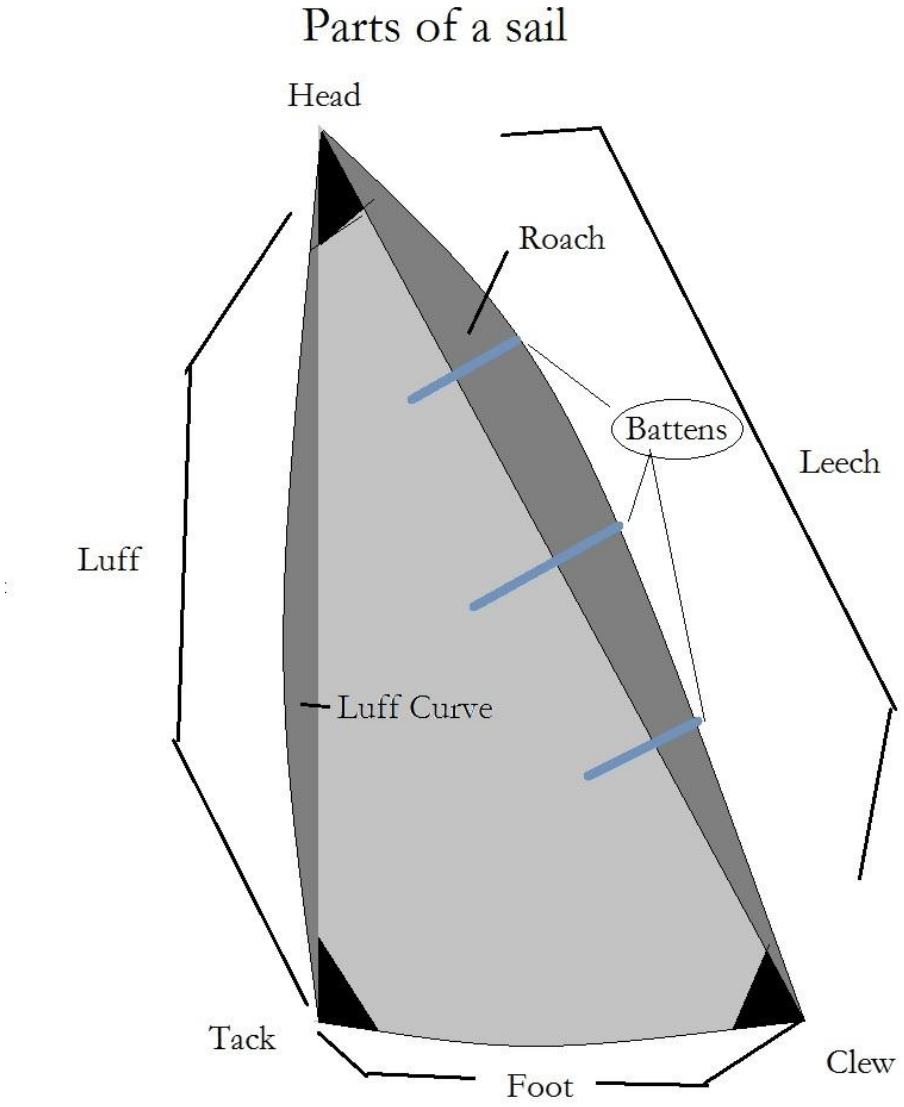
WRMYC
Sailboat BALANCE and TRIM
Tuning the AMYA Soling 1 Meter ™

1. **Objective:** balanced boat FOR CONDITIONS, but with slight weather helm (allows boat to point/ crab to windward better). AN unbalanced boat means you have to use more rudder to steer the course- "drag"= slow. You want to have to use the rudder the least amount possible.

2. First- Terms you should know and use:



Center of lateral resistance:

If you were to attach a line and drag the boat sideways, moving it fore and aft until you found a point of attachment where the boat pulled perfectly sideways. That point (vertically) is the Center of Lateral Resistance. Represented by the RED line the photo.

Location of this point is affected by:

The hull- the forward section and the aft section are not as deep in the water. IF you adjusted weight in the boat (Example:- moved the battery or sail servo forward or aft, the CLR changes.

The keel- location, angle and weight balance of the keel fore and aft affect the CLR.

The rudder- move the rudder back, or lower in the water, or higher, or shorten it- and you change the CLR.

The center of power, represented by the blue line. This is what is most affected by sail and rig setup.

If the center of power (C/P) is BEHIND the CLR (and the rudder is straight) - the boat rounds up to the wind- weather helm. AHEAD of CLR, and she has lee helm- turns away from the wind.

Affected by:

1. mast position and rake. More rake moves the CP back in the rig, forward the opposite. So- too much rake = weather helm.
2. Power relationship between the main and jib. More power in the jib reduces weather helm, more in main adds weather helm.

The best way to affect performance is to adjust the fullness of the sails, and therefore the power. This is done through TWO basic controls:

- controlling the tension on the foot of the sail (outhauls), and
- controlling the tension on the leech of the sail (backstay for jib; boom vang for main.

Additionally, the leeches of the sails are affected by sheet tension- to see this, lay the boat on her side, ease the vang so that there is little/ no tension; then gradually pull the sails in to close-hauled. Crack the sheets off about 1/8"- watch the leech of the main open up. So, you must take that into account when tensioning the boom vang. (You want a little play so the vang can lift about 1/2" or so while eased out- thiis play will dissappear with the sails sheeted in close-hauled.

How you use this power differential to correct the helm (weather or lee helm) will be discussed later.

a.

Center of lateral resistance- combination of hull, keel, rudder as it sits in the water. Affected by weight positioning and weight trim- stern up/ down.

b. **Center of power/ drive (C/D)**- about 20% of the way back in the mainsail.

In the drawing- "CLR" (blue) is the center of lateral resistance, "C/D" (red) is the center of drive in the sail plan.

c. A boat **is "balanced"** when these match. It will go to windward *close-hauled* with almost zero rudder input. This IS easier to sail, but not necessarily faster. Most racing sailors like the boat to "seek the wind"- gradually to windward after about 5 or 6 boat lengths.

- BALANCED, UNTIL- the sails change (sheeting IN or out)- or the wind increases or decreases, or the attitude (bow down or up) changes, due to battery position, or other weight factors.

Changing C/D- many ways: This is good- the rudder acts as a brake, slowing the boat down.

wind increases- C/D moves forward, boat heels, rudder less "bite" - turns to windward

wind decreases- C/D moves back, boat stands up, turns to leeward

SO: 1. ease sails: will fall off/ turn away from wind/ to leeward = decreased *weather helm.*

2. trim sails: boat will turn up/ turn toward the wind/ to windward = increased *weather helm.*

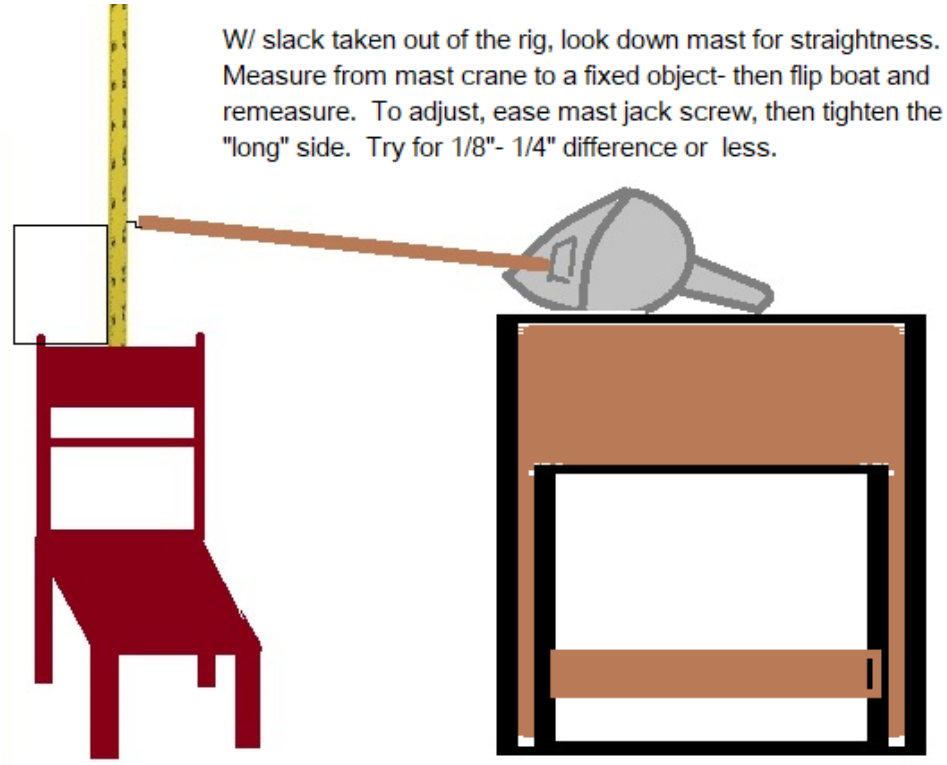
Objective: balanced boat FOR CONDITIONS, but with slight weather helm (allows boat to point/ crab to windward better). AN unbalanced boat means you have to use more rudder to steer the course = "drag"- slow. **You want to have to use the rudder the least amount possible.**

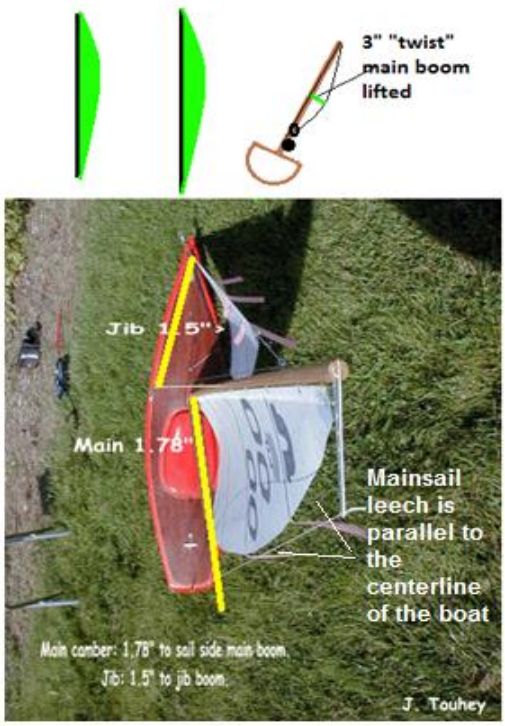
All of this assumes that the mast is close to straight vertical relative to the waterline, and that keel and rudder are in the right place- keel 16" back from stem, rudder forward edge 31-1/4" aft of stem, etc.

3. Tuning the Soling

MAST- make sure it is upright side to side, and straight. Adjust using either turnbuckles or your screw eyes (shorten or lengthen by turning- go to LONG screw eyes so you have more adjustment.)

Here is the way to accurately measure mast vertical and centering taking into account the keel- most keels are not mounted exactly vertical!!





4. Set the boat up:

Rake = Orange line **48- ¾" from stem to jib hoist. This is a starting point, many boats sail best w/ the rake from 48-1/2" to 49".**

Red angle = **mast is 90 degrees to waterline (look at the boat in flat water- see the reflection of the mast - does the actual mast extend straight to the reflected image of the mast?-** straight up and down. **BUT- it <u>LOOKS</u> like it is raked forward depending on where it is placed on the stand.**

Blue line = **mast butt is centered** at 18" aft of stem. This is the **center hole in the *mast step***.

Sailing upwind- *Closehauled*: (see picture above right)

Main boom aimed at transom corner; the mainsail *chord* (camber) is adjusted initially using the *outhaul* so the mainsail *leech* is parallel with the center line of the boat.

Jib - boom aimed at shroud; the jib "chord" (camber) is adjusted using the outhaul so the *leech* of the sail is parallel with the center line of the boat. Tart where the deepest point of the jib leech juuuust touches the spreaders.

Boom vang then adjusted such that (wind filling the sails) the boom juuuust barely lifts with finger pressure. This allows about 3" of "twist" measured from the backstay WITH the bow down and mainsheet eased.

Chords: (Yellow) More for lighter air. Usually never less.

Set to starting settings, then go sailing.

Soling 1 Meter Tuning Record

Adjustment	Control	How To Measure	Start Point	YOU Date	YOU Date	YOU Date	YOU Date
Mast Position	Mast hole	Forward, middle	Middle				
Jib swivel Position	Swivel to deck	Forward, middle	Middle				
Mast Rake	Jib Halyard	Jib halyard connector at the mast fitting, to stem	48-3/4"				
Mainsail Draft/chord	Main Outhaul	Mainsail foot deepest draft	1-1/2"				
Jib Draft	Jib Outhaul	Jib foot deepest draft	1-7/8"				
Main Close Hauled	Mainsail sheet	Center of mainsail boom end inside deck	**2-1/4"**				
Jib Close Hauled	Mainsail sheet deadend	Center of jib boom end inside deck	**3-1/4"**				
Mainsail Twist	Boom Vang	Ease Mainsheet, lift boom @ center, measure deepest point of leech to backstay	**3"**				
Jib Twist	Backstay deflection	Deepest point about at spreader end	**3" TO 3-1/2"**				
Jib Cloth Tension	Uphaul	"slip" up/ down	**1/4"**				
Mainsail Cloth	Downhaul	"slip" up/ down	**1/4"**				

Sailboat BALANCE and TRIM Part II

Tuning the Soling 1 Meter to conditions

5. **Adjusting the boat:** get to the pond early!!

HELM:	First:	Then:	Then:	Finally:
Set everything up on the numbers.	Adjust outhauls so leeches are parallel to the C/L of the boat	Adjust sheets so the booms are right	Adjust vang so upper main leech is 3-1/2" off center w/ sheets eased	Go sailing- then-
Too much weather helm or gusty conditions cause boat to round up:	Ease jib chord/ outhaul (power up jib) **Sail**	Reduce mainsail chord – tighten outhaul (de-power main) **Sail**	Ease main boom **slightly** beyond aft corner **Sail**	Trim jib in to about 2" off center when closehauled
Most common wrong <u>settings</u> if boat is <u>"slow"</u> vs. others on same tack	Check your basic settings; if ON the basic settings:	Too much backstay- too little "*twist*" Ease 1/16"	These are FLAT sails- no chord = no power - Not enough draft/ chord in the sails.	Are you pinching?? Trying to point too high on the wind?? Bear off a little see if you go faster.
"Twist"	Function of **vang** (mainsail) and **backstay** (jib) settings	Too little twist = boat slow and or slow to accelerate	Too much twist = boat doesn't point	
Boat slower than others on same tack or downwind side by side:	Using too much rudder- set radio to soft settings after the start…	…do everything to use LESS RUDDER -Adjust trim -Steer "soft"	Ease the backstay and boom vang to add jib and mainsail twist	Power up both sails chord by ¼" then ½"
Boat gets caught in *irons* repeatedly: **<u>Less than 15 MPH</u>** winds	Don't steer so aggressively through the tack!! Ease the sails quickly as the boat goes through the wind; draw them in slowly	Trim the jib boom position relative to the mainsail- IN- slightly inside of the shroud chainplate.	Ease the jib outhaul to "fatten" the jib- add a LITTLE tension to the jib cloth / move the draft fwd.	Ease the mainsail boom position relative to the mainsail- OUT- slightly outside of the aft transom corner.
Boat gets caught in *irons* repeatedly: **<u>Greater than 15 MPH</u>** winds	Ease the sails quickly as the boat goes through the wind; draw them in slowly	Trim the jib boom position relative to the mainsail- IN- 1" inside of the shroud chainplate.	Add tension to the jib AND mainsail cloth / to move the draft fwd.	Ease the mainsail boom position relative to the mainsail- OUT- wel outside of the aft transom corner.

Get the boat set up to make it fast, and allow focus on good starts, tactics, and strategy.