

The Laser - History

The Laser was launched to the public in 1971 at the New York Boat Show. It was designed by Bruce Kirby with simplicity and performance in mind, and quickly became the quintessential one-design. The Laser is sailed all over the world, and there have been over 160,000 Lasers built as of May, 1998. There are currently builders in Rhode Island, USA, England, here, and there. At 13 feet 10.5 inches long with a 12.5 foot waterline and 76 square feet of sail, the Laser has enough power to glide in extremely light air and blast along in a stiff breeze.

The Laser's flush deck, minimal beam (4.5 feet) and low freeboard (12 inches) were designed to keep the hull weight to a minimum (average 130 lbs) and to allow simple car-topping and easy handling on shore by women and junior sailors. The innovative "place for your feet" cockpit means the boat ships very little water, and comes up completely dry when righted after a capsize. The Laser's two-piece mast and sleeved sail are in keeping with the goal of simplicity, and also help to make car topping simple.

In the mid-80s the Laser Radial Rig was developed and in 1988 the Laser Women's World Championship was sailed in the new Radial Rig for the first time. The Radial mast uses the same top section as the "full rig", and a shorter and more bendy bottom section. The sail is 18% smaller (62 sq. feet) than the full rig, but the center of effort of the sailplan is much lower. This means the Radial rig generates more power relative to heeling force than the full rig and so for lighter sailors allows performance and handling far better than they can achieve with the full rig. When it is quite windy, the Radial rig is faster upwind!

The Laser Radial is unquestionably the best training boat for Laser Olympic aspirants who are still growing. In fact, the winner of the 1993 Radial World Championship, Ben Ainsle from England, went on to win a silver medal in the 1996 Olympics in the Laser. The Laser Radial is also a great boat for Europe Dinghy sailors who want to do as much close racing as possible. The Laser Masters events are very well attended and enjoyed by keen and competitive veterans of the class who have built friendships around the world over the years of their Laser sailing.

Recent rigging innovations make the Laser easier and more enjoyable to sail, and better to race. One used to have to stand up in the boat after the leeward mark and jump down on the boom while taking the slack out of a 3-1 vang to get enough tension! Now, with an 8-1 slippery spectra line swiveled vang, more than enough can be pulled on from a hiking position. Tillers with rollers allow a helm with great feel. Loops in the outhaul allow it also to be adjusted while hiking.

Laser racing is arguably the most competitive and close sailboat racing in the world. Still, the real beauty of a Laser lies in its invitation to go sailing for the pure joy of it. With no standing rigging to bother with, no obstacle course of fittings to bruise and cut, no cockpit full of water, the bare essentials of tiller, mainsheet, and sailor can come together to feel the magic of the wind and water cast its spell.

Teaching Tip: Teach self-coaching

The Laser, because it is a light, high-performance singlehanded boat, is the perfect place for sailors to really learn how to coach themselves (see article by Hall, SW May '97). A common theme while you are teaching Laser sailing should be "why, and how might this apply to other boats?" Never pass up an opportunity to teach more about steering with sails, or weight, or about balancing the helm. Always encourage students to describe what they FEEL when something is (or isn't) happening for them, the sensations in their hands, feet, butt, eyes, ears, gut. The Laser teaches the fundamentals of sailing like no other boat. The challenge is helping students learn to feel and understand the lessons.

Boat Preparation

(See Bourdow "Laser- from the experts) (text only)

Old Boats

Very old boats need a few things done right away. Replace the plastic cleats with aluminum ones on the boom, cunningham, and traveler. Take the hiking strap off and wrap it once around the plastic plate that holds it down and screw it back in. Take the bailer off and make sure it works properly. When re-installing or replacing, apply a thick bead of silicone all the way around the inside lip of the bailer so it is sealed to the hull and has maximum suction.

End-for-end the mast sections. Drill out the rivets holding the plastic pieces on/in. For the top section, you should be able to get the bottom piece off and then slide the collar off. To get the top piece out, put a big screwdriver or wrench in the tube and stand it up quickly. The tool will punch the cap out. Measure carefully and put the collar on the other end. The plug at the end of the bottom section is removed the same way, and the vang tang and gooseneck are switched to the other end, being careful to line them up well. When re-riveting the fittings, be sure to use zinc chromate or ample silicone to prevent corrosion. This job can be done quite quickly and will more than double the life of the spars.

Leaks

Leaks should be tracked-down and fixed. Water in a boat makes it heavier, harder to sail, gain weight over time, and weakens the hull and deck. The soap-bubble & bike

pump test is the best way to locate a leak. First plug the breather hole under the hiking strap. Apply suds to the deck at all fittings, joints, etc. Hold the bike pump or a vacuum in reverse on the stern plug hole and blow air into the boat. Where there are bubbles, you found a leak!

Fittings may need new silicone. If you can't find the leak anywhere, it is usually either the maststep, centerboard case, or hull-deck joint where the bailer meets the cockpit. These should be fixed by someone knowledgeable with resin and fiberglass work. Another place some boats leak is the hull-deck joint under the rails. A thin bead of resin should solve this.

Boats with inspection ports tend to leak there. Vaseline can help seal the threads. If the sailor uses the port often, consider replacing it with a new one with a fresh gasket.

The rudder

First check that the rudder is as close to vertical as allowed (78 degrees) If not, file the rudder where it meets the pin of the rudder head until it is right. The bolt which comes supplied to hold the rudder blade in the head is way too small. Get a 5/16" bolt and nylock nut and crank it pretty tight, so you can just rotate the blade up for beach launching. 1/8" Spectra is best for the downhaul, lead it up over the top front cross pin and out the back of the tiller slot, where it makes a 180 degree turn and comes forward along the tiller with a purchase loop before the cleat. Doing this keeps it from rubbing on the deck. For boats with old tillers, make sure they fit tightly in the rudder head by adding tape if necessary, and make sure they clear the traveler cleat. Aluminum ones can be bent up slightly if they don't.

The tiller

The length of the tiller does make a difference. For smaller sailors, a tiller 1-3" longer than the end of the cockpit is good, because a longer tiller means added leverage for steering. The extension should reach to just short of the middle of the daggerboard case. Be sure to check the universal for nicks and cracking, and replace it before the next regatta if it's not solid. For bigger sailors, a shorter tiller allows a longer extension and more travel of the helm, but it causes more load on the steering arm when there is helm.

The daggerboard

Needs a rope handle, either horizontal with two holes, or vertical with one hole in the

middle of the board and ¼" line twisted around itself then taped together. The bungee should be ¼" and run all the way to the bow eye on the starboard side, with lots of tension. This is so the cunningham is easy to cleat while the board is still up approaching the leeward mark on port tack. The bungee is also an IMPORTANT SAFETY item that is often neglected - it holds the board in during a capsize!! Make sure it is tight enough.

Rigging

The mainsheet

Most top sailors use the metric size between ¼" and 5/16", 10mm. Yale light or something similar runs through the blocks nicely. 44' with an eight knot 4" from the end leaves a short tail to grab if it is let out to the ratchet accidentally.

The new autoratchets are great and really help the sheet go out for aggressive downwind sailing. Mainsheet cleats are also good, especially for getting the vang on. The little Ronstan minis aren't too painful to sit on and hold the sheet well.

The vang

A swivel at the base is necessary, ideally one with bearings that rotates easily. Some swivels have ¼" pins, so the vang tang needs to be drilled out to accept this. The other way to go is to get bushing washers and use a standard 3/16" pin, so the vang can be taken from boat to boat easily. The pin may bend a little, so it is good to have a few spares. 3/16" Samson spectra should be tied so when the bowline purchase hits the block at max ease it causes a little tension on the boom. This ensures a full range of travel. (If there is so much slack that the vang is easy to hook into the boom, it won't be possible to get enough vang tension in breeze.) A slip-knot loop handle is a must, and some people have a tail after that to tie to the daggerboard so it can always be reached. (see diagram)

The outhaul

3/16" Samson spectra with two thimbles, 22' a hitch around the long part (from cleat to mast) included in the knot that holds the front thimble works great to keep the whole thing up. (Diagram)

The clew tie

Many sailors are used to either a bolt-roped foot or an outhaul car, something that makes the clew travel along the boom without going up. It's important to teach that the clew tie effectively makes a track for the clew, and tying it snugly to the boom is the hallmark of a careful job rigging. 1/8" Samson spectra 30" Three laps around boom allows tying a square knot tight enough. McLube the boom and tie down before every race day so it slides well.

The cunningham

3/16" Samson spectra with two loops. There are diagrams with three loops, but the added friction offsets the purchase gain. The top bowline placement is critical for max travel. (Diagram)

The traveler

3/16" vectran, 9'. A large loop bowline that the line runs through with a single hitch allows the loop to be pulled very tight and is relatively easy to unrig. (Diagram)

Hiking strap

May need to be shortened so there is room for enough adjustment. A 10-12" between the aft edge of the cockpit and the strap is good.

Strap bungee

1/8", about 2' depending on strap. Makes a loop through strap and under traveler behind cleat. A square knot will eventually come undone. Tie overhand knots in each tail and push them tight against the square knot.

Strap Adjuster

6' of 3/16" pre-stretch (spectra is too slippery), looped around and back. (See diagram)

Battens

Those little ends like to come off and get stuck in the sail. Glue them on

Tell tales

Three sets - one for upwind near the luff, one in the middle of the top 1/3 of the sail, and one for by the lee two feet in from the leach. Light yarn works nicely because it isn't too

jumpy.

Wind Vane

A windvane or long yarn in front of the mast is great for light air when it's shifty and for learning angles downwind.

Rigging Up

Rigging the Laser

A Laser sail flapping in the wind is getting old quickly. The batten pockets are screaming, the cloth is deteriorating, and the stitching is strained. When possible, the sail should go up only when ready to go sailing, and should come down when the boat won't be sailed for a while.

The hardest place to rig is with the boat already in the water.

1. Check stern plug!
2. Launch
3. Daggerboard in, but not bungee on yet - it will be in the way of the mast step
4. Tiller into rudderhead and tied before getting on boat. This reduces chance of losing rudder while putting it into the gudgeons. Rudder on
5. Mainsheet rigged completely through boom
6. Outhaul through boom cleat and back eye with tail free and ready, and purchase loop laid out on deck around maststep
7. Mast together - a wrap or two of packing tape so the pieces fit tightly is good. The rivet should be pointed directly back. Get the collar just started in the bottom section and stand the mast up. Lift it and lightly tap it down on the ground. The weight of the top section will push it into the bottom section with a few taps. If the mast has a permanent bend, DO NOT STRAIGHTEN IT, flip the ends (see setting up the Laser)
8. Sail on mast, battens in, vang pinned on
Rigging Tip - put pin through from port to starboard so the last part of the cunningham doesn't catch on the ring-ding.
9. Rig cunningham
10. Step mast - if there are many boats in the water side by side so the boat can't be pulled along the dock, this is a two person job: one person is on boat behind mast step on knees to hold mast butt in place and help pull mast up, while other person walks mast upright and steps on bow pushing mast up.

11. Rig the tail of the cunningham through the eye and cleat immediately and pull a little tension on. This helps keep the sail from twisting on the mast, and ensures that in the unlikely event of a water landing the mast doesn't come partially out and destroy the maststep. Make sure the bowline handle tied in the tail of the cunningham only allows enough slack for the luff tension to be released and no more. IF THE BOAT CAPSIZES WITHOUT ENOUGH CUNNINGHAM AND THE MAST COMES OUT A LITTLE WHILE RIGHTING, THE MASTSTEP TUBE WILL BREAK.
12. Most people put the boom on the gooseneck pin, then try to catch the flapping clew and rig the outhaul while standing on the poopdeck. It likes to fall off that little pin, and having it on makes the sail want to fill, compromising balance. Instead, stand in the cockpit and bring the end of the boom forward so it reaches the sail easily without it filling. Rig the outhaul set at max ease, and rig the clew tie down. Then push the boom back and put it on the pin, being careful to get the parts of the cunningham around or on one side of the gooseneck properly.
13. Hold boom down and put vang key in boom. On the way off the boat, tie the board bungee to the bow eye - YOU'RE DONE!

Rigging on dolly, dock, beach, or grass

1. Begin with step 6, do not rig mainsheet
2. When rig is up with cunningham and outhaul on, rig mainsheet backwards through ratchet, front boom block, eyestraps, and back block. Tie a slip-knot. Now the sail can rotate in front of the boat if necessary, but the sailor can sheet in from the ratchet to get the boom around the parked camels and other obstacles in the boatpark.
3. Daggerboard is placed with the top forward edge in the aft bottom corner of the cockpit. This prevents the tip from breaking when the bow is lifted for launch - a very good habit
4. If the boat will be launched down a ramp, rig the tiller and rudder together tied down, and place rudder blade under traveler, with tiller pointed forward and traveler tight. Slide rudder back until nut on rudder head is held forward by traveler. If wind allows, finish rigging mainsheet. Wheel boat down ramp and when transom reaches end, turn boat 45 degrees and put one foot against dolly wheel, reach back and drop rudder in.
5. If the edge of the ramp is well carpeted, the bow can be set down off the dolly and the board dropped in too, and the bungee can even be tied. If not, the bow is set in the water and the boat turned sideways to the ramp to put the board in. If

the wind is blowing away from the ramp, the advanced technique is to simply step on and push off, putting the board in while floating away from ramp. It's important to stress that efficiency and etiquette on the ramp will earn respect and help prevent congestion.

4. If the boat will be launched from a shallow beach with the wind offshore, leave the mainsheet as is (with slipknot) and put the rudder in the gudgeons with the blade up (the bolt should be big and tight enough that it stays up). Wheel the boat backwards into the water and slide off dolly, push rudder down a little and step on to drift away from beach with boom out in front of boat. Put blade in when deep enough and when clear push rudder down and go head to wind to finish rigging mainsheet.
7. The most difficult launch is off a shallow beach with the wind onshore. This often means there are waves to contend with, and one has to sail upwind with very little blade or rudder in the water. Wheel the boat along the beach to begin on the lifted tack away from beach if there is limited area to the side (a pier, breakwall, moorings, etc.) Rig the mainsheet completely, and put the boat just off head to wind on the correct tack. Put the daggerboard in and tie the bungee to hold it up. Put the rudder down just below horizontal. Wheel the boat into the water bow first, being careful to keep it just slightly off the wind so the boom doesn't hit the board. When the boat is floating, turn the front of the dolly into the wind and slide the boat forward off the dolly. It helps to have someone hold the dolly back as the boat is slid forward. Push the board and rudder down as far as possible, step in and balance well since there's not a lot of rudder in the water.

Returning to shore

1. The most difficult condition is again an onshore breeze. The rudder downhaul is undone and a check that the rudder will kick up is performed. The 8 knot in the becket tail of the mainsheet is untied while still well away from the beach or dock. The mainsheet is unstrung from the traveler block, but that tail is held in the mainsheet hand along with the sheet from the ratchet. This allows the boom to be sheeted in for a moment if necessary. (If it becomes necessary to beat again, simply tie a slip knot in the tail, let go, and sheet from the ratchet.) When boat is lined up upwind of landing place, let tail go and pull mainsheet through ratchet all the way out of boom. The boom will rotate in front of the boat, and allow a slow approach to the beach or dock. Lift daggerboard out completely, reach back and kick rudder almost all the way up, and turn boat sideways to beach. Get out on WINDWARD side. If approaching a dock, the blades can be left down until after the turn, when pulling the daggerboard up will help the boat slide gently to the dock.

It's REALLY Windy

There are a few ways to go sailing on a really breezy day. One is to reef the sail. Take the top batten out, wrap the sail two or three times tightly and neatly around the mast, and rig up. A special 12' outhaul line, which allows 2-1 and then reaches the cleat without the purchase is best. It needs to be pulled quite tight, but won't be adjusted. The cunningham should be pulled very tight, and the daggerboard can be left up a little to balance the helm. Another way is to put two people on the boat, with one doing the tiller and the other the sheet. Remind sailors not to let the boom out too far downwind, and not to gybe because it can be hard to duck at just the right time with two people. Have a towline tied to the mast and coiled, just in case. The only way to get comfortable in the big breeze is to go do it, so don't let those days go wasted!!!

BOATHANDLING

Basic Posture

The tiller is held like a microphone overhand, and the mainsheet taken directly from the ratchet in all but light air running. Sit facing perpendicular to direction of boat, with feet and legs together. This basic "stance" is appropriate for all points of sail in nearly all conditions. Exceptions are moving forward in light air or moving back in very heavy air. Learning to sail fast downwind requires being comfortable in this position, i.e. not putting a knee down in the cockpit when sailing by the lee. This allows greater mobility and feel, and requires that the boat be sailed balanced, whereas putting a knee down makes it possible to sail in a stabilized but less efficient manner.

Coaching Tip: The knee-down habit is very hard to unlearn, and if it can be pre-empted by emphasizing the benefits of good body positioning, the sailor will be way ahead in the long run.

Sheeting in

With 44' of mainsheet, the ability to sheet in effectively is one of the most crucial fundamental skills of Laser sailing. The idea is to use as few pulls as possible, which means using both hands. The front hand sheets a big pull toward the stern while the

tiller hand reaches forward to grab and pull up and back (while holding extension) while front hand reloads, repeat... This skill is used to round the leeward mark, during starting, during puffy conditions, during 720s, and is handy in almost all boats with a tiller and mainsheet. It's important to teach sailors to use both hands, to be comfortable with the mainsheet in their tiller hand, to be able to steer while holding mainsheet in tiller hand, and to use big pulls.

Bearing off

Sailing Tip - before the weather mark, run the mainsheet to be sure there are no knots.

Easing sheet involves simply letting it run through the fingers. However, at the top mark an arm's length over the head in preparation ensures that the first five feet go out precisely. When it's windy, the boat won't bear off if it isn't flat or if the mainsheet isn't going out enough. Hike, hike, hike! The ability to get right down to a run and hook into a good wave is worth a lot of distance.

Drill: (Advanced). Round the weather mark and bear away right into a gybe, without stopping the turn. This is actually easier in some respects than carving hard down to a run and stopping the turn without gybing or deathrolling, and is a great skill to have.

Tacking

The Laser tiller extension is long, and will only fit past the mainsheet if it is "pushed through" exactly the right way. There are two styles of tack, the difference being when the hands are switched. Both begin by taking back foot out of strap and placing it over the top of the strap

Learning: Tiller is pushed to leeward, tiller extension is pushed through upper corner by mainsheet block, sailor goes to balls of feet facing forward (straddling strap) and continues through boat while rotating hips to new position. Tiller is held outboard and behind body and hips stay in front of tiller while they rotate. Hands are not switched, so sailor is now steering behind his back with front arm, holding mainsheet across lap in back hand. Back hand with mainsheet grabs tiller, then front hand takes sheet. It is possible to flatten after a roll tack or to hike when breezy in this configuration, and it allows the sailor to focus on his turn and on keeping the boat flat with proper sheet tension at end of tack. It is also the way he will come out of a heavy-air gybe, and so it's worth getting used to sailing the boat that way.

Drill: Sail a whole beat without switching hands

Advanced: Once the tacking is comfortable, the goal is to become more effective with weight movement. The only way to do this is to make the tiller/sheet hand switch during the tack, while moving through the boat. This requires more dynamic body movement, to be far enough forward to allow hands behind back to do their thing. This "switch on the fly" is a skill which will be carried to most boats, and is especially important for great college dinghy roll tacks.

Drill: A great way to practice the switch is in little or no wind, doing continuous roll-gybes, switching every time.

When roll tacking, a big roll with a big ease just before flattening is best. As the wind comes up, the boat can be rolled less. As the chop gets steeper, too much roll is ineffective because the boat slaps the waves while being flattened. When it's breezy, it's key to come out of the tack dead flat, so the right ease into and out of the tack become critical.

Light air

The big roll: moving butt out and back along deck by pushing with feet off side of cockpit helps the bow out of the water and around and begins the initial roll. Next is the big lean, and the smaller the sailor, the more aggressive she will need to be to roll hard enough. Sheeting in all the way at this time gives something on which to pull oneself back into boat, and helps load the mast to spring straight and cause the mainsheet to go out more than it would on its own. The roll tacker can grab the close handrail, the hiking strap, or the far handrail, whichever is most comfortable for her body size. The ability to launch herself uphill to the new high side makes or breaks the tack, and requires a coordinated combination of arm pulling and legs pushing. The goal should be to land with the butt past the side of the boat, over the rail, hands already switched and mainsheet quite eased (2-4 feet) The roll is too hard or the flatten to slow or the sheet too tight when the tiller must be pulled to weather to make the boat go straight out of the tack.

Heavy air.

The goal here is to be hiking on one tack, then hiking on the new tack, with no time in between. This requires hiking as long as possible at beginning of turn, leaping across to

have (old back) new front foot catch the strap as sail fills. The lower the shoulders are kept, the less movement is wasted. It may be necessary to ease a little sheet as the sailor comes out of the hike to keep the boat absolutely flat, and to ease even more to ensure that the boat tracks forward after tack. These things take time to develop, but should be secondary to the goal of hiking as long as possible into turn and then as soon as possible out of turn

Drill: The object is to get comfortable hiking as long as possible into turn. Head up while hiking as in the beginning of a tack. At last possible moment "leap/bounce up/get" butt onto deck. The idea is to wait as long as possible, and to get in as quickly as possible. The boat may get stuck in irons, that's ok. Bear off and repeat. Sailors will be surprised how far into the wind they can turn before the boat comes over on top of them. This is because while the sail is depowering, the actual turn is causing the boat to want to heel to the outside of the turn (to leeward)

Medium air

These tacks involve blending aspects of light and heavy air to achieve the right amount of hike, roll, ease, and hike.

Coaching Tip: Medium air tacks are a great place to teach sailors to be aware of the feedback mechanisms available to them, and how to make adjustments based on this input:

Lots of weather helm out of tack - means flatten sooner, roll less, or ease more

No speed out of tack - roll harder, come out lower, or both

Lee helm out of tack - sheet going out too far, or boat being overflattened

Gybing

Gybing a Laser takes a trick flick of the wrist, to keep the mainsheet from looping around the back corner of the boat when it goes slack as the boom comes across. This is true for a light-air roll gybe and a heavy-air planing gybe.

Light air

Reach to reach - Put the daggerboard all the way down, start turn with weight, letting the tiller follow the turn. Roll late enough that max roll occurs just before boat gets to new course. Flick and flatten.

During learning stages, switch hands after flatten as in tack, with goal of eventually switching while crossing boat.

There are two methods of run to run gybe in light to medium air:

1. Sheet in quickly so boom comes across with as little turn as possible, and come out on a broad reach. It's necessary to turn quite far or sheet in a lot or both, and then the boom needs to be pushed out again. Boat comes out of gybe with great speed.
2. Grab both parts of the mainsheet from the back and throw the boom across, maintaining course (some face forward, some backward). Major pro to this style is being able to continue straight down the course. However, the roll is not quite as aggressive. These gybes are consistent and reliable. Other style would be used if a course change (to get to a puff or protect a lane) were called for anyway.

Heavy air

Reach to reach - more speed means less apparent wind and an easier gybe. Being on a wave is best! It's key to have the board $\frac{1}{2}$ way up so the boat doesn't trip on it. Start turn down with the boat dead flat by easing sheet. Keep boat turning and flat, as leech flickers give a BIG TUG on sheet, then while crossing boat flick by simply placing hand in path of mainsheet near front boom block to "bump" it as it comes across. As boom comes across, turn back down the other way ("S turn") to help boat accelerate and reduce angle of apparent wind, reducing heeling moment. Most important is to hit new side with weight before sail fills.

Teaching Tip: Make an analogy: Gybing in heavy air is like catching an egg. Winning the egg toss means giving with the hands in the direction of the egg as it is caught. Catching the wind on the new gybe without capsizing requires reversing the turn to aim the boat more with the wind so it accelerates and the boat and rig can give as the sail fills - instead of the force of the wind pushing the boat over to leeward.

Run to run - These gybes are very challenging to do well in a Laser, because they require sheeting in a few feet quickly so the boom comes across. This adds load and makes the boat want to head up, so weight is critical to balance this force so the boat doesn't slow down or head up out of the turn. A little extra steering may be necessary, but once the boom starts coming across the gybe is like the reach to reach. These are perhaps the hardest maneuver in the Laser, but are essential for success racing in the breeze.

Mastering the move in a Radial rig can help even big sailors get better at the full rig gybe. Also, because the sailor must be so far back in the boat, it is difficult to switch hands behind the back while crossing boat. Trying to switch hands may also compromise the quality of the s-turn, so steering behind the back is done until things settle down and a switch is possible.

720

The 720 is about putting together a tack, bear-away, gybe, head up, tack...

There are two ways. As long as the sailor is able to bear away, it is best NOT to switch hands after the tack. Instead, the sailor should steer behind her back after the tack, so that coming out of the gybe she is ready to begin hiking and trimming in right away and can also steer precisely. This is the most critical part of the turn, so it is good to be ready to sheet in and hike.

In really heavy air, it may be necessary to tack and gybe normally, switching hands. The big challenge then becomes switching hands again after the gybe and starting to sheet in.

Teaching Tip: The way to learn 720s is to break the 360 in half: tack and bear away, get settled, then gybe and head up to a beat, gradually reducing the "get settled" time to nothing.

ADJUSTING CONTROLS

The vang

Mainsheet cleats are most useful for getting vang on. When sailing upwind, sheet in block to block and cleat mainsheet. With back foot push boom to leeward and down, hard. This bends the boom temporarily. With front hand, pull vang. The length of the tail and loop is very important. Too far back, and the sailor can't use his body and shoulders to pull, only his bent arm. Too far forward and it's hard to reach from a hiking position.

At max ease, there should be about 14" of line between the "hand" end of the loop and the vang cleat. This length depends a little on the sailor, but this is a personal fine-tune adjustment worth making.

Easing vang: Marks on the vang are helpful for reproducing settings while already going downwind. The best time to ease the vang though is before the weather mark. The distance between the boom blocks in back (amount of sheet showing) is a good gauge. The range will be from boom eased up to horizontal, to blocks only a few inches apart. From a full hike, ease sheet to desired setting, cleat and then pop vang off to let slack out and recleat line firmly when it won't go out further. With practice this can be done very quickly and accurately.

Cunningham

Should also be eased before weather mark. Right after easing vang, uncleat and toss line forward of cleat so it doesn't want to recleat. Reach forward and pull the one part that pulls all the others loose. If the cunningham is rigged with this part to starboard and it is marked with a marker, it is easy to find.

It's best to get it back on before leeward mark, but this is not always possible. In that case, a quick luff head to wind and a big pull using the legs against the front of the cockpit works well. It takes practice to do this effectively, but it is far better to give up a length performing the maneuver than to sail a whole beat tipped over with not enough cunningham. As with the vang, the position of the loop handle is critical. If there is too much slack in the system, the sailor will reach the end of her pull with legs extended before the grommet gets to the gooseneck. Keep reducing slack until the bowline at the cleat almost causes tension in the luff.

Drill: Vang & cunningham off, bear away to run. Sheet in up to a beat, vang on, cunningham on, repeat - both tacks

Outhaul

If the outhaul is rigged well, it should be easy to pull on while hiking. To ease, first grab the last part in front of the cleat and pull slack into the system. Sharply lift line out of cleat and let it out. It will be necessary to ease mainsheet a bit to keep the boat upright while doing this, and some top sailors with shorter arms actually stand up in the boat to have leverage and reach the thing.

Strap

The strap is a critical control which tends to be neglected, even by some top sailors. A major aspect of downwind speed in the waves is the ability to be connected to the boat and to help direct it with feet, legs, and butt. The only way to do this on reaches is with a tight strap. When it's super windy, it's actually best to get the strap tight before the weather mark, and loosened again after rounding the leeward mark. In more moderate

conditions, it can be tightened after the weather mark and loosened before the leeward mark.

Board

The board is another control which should be done before the weather mark and after the leeward mark when it's super windy. Otherwise, as with the strap, after the top mark and before the leeward mark is fine.

The Rig & Sail

Understanding the Laser Rig

The mainsheet

The Laser mainsheet controls the angle of the boom until it is pulled over the corner of the boat, at which time it begins to also control mast bend. This is different from a stayed mast, on which the mainsheet controls leech tension but does not bend the mast enough to dramatically alter sailshape. As a result, as the Laser mainsheet is pulled tighter, bending the mast and flattening the sail, it reduces leech/batten hook or "return" and opens the leech. It is paradoxical that we call the Laser leech "open" when the cloth along the leech is pulled tightest (at max bend). This is opposite to a stayed mast, where a tighter mainsheet means a tighter leech means more hook. This is an extremely important thing to teach about the Laser rig and sail.

Conversely, easing the Laser mainsheet makes the sail fuller, causing more return in the leech and adding power. Again, this is opposite to a stayed mast, where easing the mainsheet opens the leech by twist, and reduces power (unless it is very light in which case power comes from flow)

A result of this situation is that we often find sailors "two-blocked", thinking that gives max power (tightest leech), when they should be eased one to two feet on the sheet to straighten the mast and make the sail fuller. The Finn and Europe dinghy masts, which are extremely tapered at the top, are very sensitive to sheet tension because of what it does to the top of the sail. It is possible to begin to develop this sensitivity in the Laser, though it is often overlooked.

Drill: Set up a boat on a dolly when there is some wind, with one person holding it flat. Have sailors stand behind the boat with the mainsheet, and sheet in. Have them describe what they see happening to the mast, fullness, shape, and "exit" of the sail

By-the-lee: a whole new thing

The other difference between the unstayed and stayed rigs is the ability to sail by-the-

lee. This may come naturally to Optimist sailors, but anyone else is likely to be baffled about it for a time. First, the physics: the analogy to draw is with "heating up" downwind in a spinnaker boat to generate more apparent wind and achieve better VMG. This works because when dead downwind there is little flow over the sails - the boat is literally being "pushed" by the wind, with no wing-like action going on. Broad reaching in a Laser isn't very effective, but sailing by the lee definitely is. The goal is to reverse the flow on the sail from the normal direction to a leech to luff direction. This achieves a few things:

1. The knife-edge entry of the leech gives the sail very undisturbed air, which stays attached for longer than a comparable angle of attack flowing first around the circular mast
2. When the sailplan is heeled to windward, by the lee flow encounters a "swept-back leading edge". This swept-back edge develops "roll-over vortices" which help keep flow attached abnormally long, not unlike the Concorde's swept-back delta wings (See Bethwaite, [High Performance Sailing](#), pp.365,366)
3. The boat balances nicely when sailed by the lee heeled to windward. Reverse flow can actually be achieved with the mainsheet in from perpendicular, allowing a course closer to dead downwind and therefore great VMG

- Article: Adams/Adamson "Zig-Zag Downwind"

Pop quiz: Should you sail lifts or headers downwind if sailing by-the-lee???

Answer - lifts!!!

Drill: Have students sail down the lawn with an arm out perpendicular to be the sail. Make sure they are sailing to get reverse flow (hand pointed closer to wind than shoulder), with the run square. Shift the wind until now they are sailing directly at the mark. Is this shift to the right or left, and would it be a lift or header if they were on the same tack going upwind?