

1. Background

I can't promise that there are no mistakes in here. I've done my best, but you must be prepared for the possibility that some things said in this document may be confusing, or that the parts specified may not turn out to be ideal. I update it when I can, and I believe it's the best knowledge that I have at this time, but this is entirely a volunteer effort. If you're willing to accept my suggestions, then my requirement is that you're prepared for there to be mistakes, and to not be upset with me or hold me responsible if they end up affecting you. Among other things, I don't know the condition of your boat, so if there are parts of it that aren't structurally up to this work, that is your responsibility.

There are some basic assumptions about how you attach hardware to fiberglass (hulls) and aluminum (spars) which aren't specific to this documents purpose, but are essential. Please refer to the "mounting techniques" at the end of this document, and understand that while these tasks are fairly simple, they must be done correctly to avoid damaging your boat, or having the mounting become weak over time and ultimately fail.

2. Verify that your boat meets the basic assumptions

Most boats that I have seen have the following:
a spinnaker pole ring on the front a couple feet above the boom
a fairlead on the front of the mast about 10 feet below the top, for the topping lift to run through

If your boat doesn't have these, you'll have to work with APS to figure out the pole ring part #, and order a 3rd "spinnaker sheet fairlead" to use as the topping lift fairlead.

3. Make some choices

There are three choices for launching systems, which you have to choose between; bag, sock, and tube. The "turtle" bag is the original, if your boat doesn't have spinnaker yet, it is set up for this. This is the hardest system to learn how to use, so you also have the option of going with the sock or the tube. These function identically. The differences are: the tube is professional, looks sharp, is class legal, and is absurdly expensive (\$550 or so plus a lot of labor). The sock is cheap, looks a little silly, and is not class legal – however, we have made provisions for allowing it at the 2005 World Championships, and other North American regattas are not measured, so nearly all boats have something or other on them that is not legal.

This document is written assuming you will use the sock. There is an addendum at the bottom for what to do differently if you use the bag. If you use the tube, you will need professional help to get it installed, and otherwise, everything here is the same for it, except that you skip the part about mounting the sock.

This is also written assuming you will use the single-ended topping lift, only because it is simpler, and it will probably be a while before you are experienced enough that you adjust the topping lift frequently. There is also an addendum at the bottom on how to do the double-ended topping lift. The benefit of the double-ended topping lift is 3-fold; it is easier to reach because it is on the deck near the shroud, instead of in front of the mast. It is easier to pull, because it has a 2:1 purchase, and finally, it is actually possible to reach it from the trapeze.

4. Order all the Standard Parts

I went to APS, and worked with a guy named John Maloney. He knows dinghy parts well, and now thanks to my order, knows Laser II upgrades well. Here's a list of the parts I ordered. Some of the parts on my part list are repeated under a few categories for ease of understanding. Note: Some of these prices may be out of date.

Also, when you order the pole-ring, make sure you get the larger one (roughly 1.5" diameter), otherwise, the newer pole end fittings won't fit into it. Note: your mast may already have a pole ring.

| Qty | Part | Old P/N | New P/N | Each | Total |
|--------------------------|---|---------|-----------|---------|----------|
| Sheet Gear | | | | | |
| 1 | Clamcleat - Port (Spin Sheet) | 34-05-2 | C218MK1AN | \$12.35 | \$12.35 |
| 1 | Clamcleat - Stbd (Spin Sheet) | 34-06-2 | C217MK1AN | \$12.35 | \$12.35 |
| 2 | Camcleat (Spin Sheet) | 35-60-2 | H423 | \$15.50 | \$31.00 |
| 2 | Fairlead (Spin Sheet) | 40-11-3 | V12110 | \$11.50 | \$23.00 |
| Halyard Gear | | | | | |
| 4 | Deckstrap (for block, and halyard) | 30-10-0 | V30100 | \$1.17 | \$4.68 |
| 3 | Swivel bullet-Block (at the deck) | 12-38-2 | H082 | \$8.15 | \$24.45 |
| 1 | Harken small carbo-cam cleat | n/a | H423 | \$15.50 | \$15.50 |
| 1 | Harken micro-wire fairlead | n/a | H284 | \$4.80 | \$4.80 |
| 1 | Sheave Box (in mast) | 14-03-2 | V14032 | \$15.00 | \$15.00 |
| Topping Lift Gear | | | | | |
| 1 | Fairlead (on the mast) | 40-11-3 | V12110 | \$11.50 | \$11.50 |
| 1 | Becketed Clamcleat (Topping Lift) | 80-23-0 | C211MK1AN | \$10.60 | \$10.60 |
| Storage | | | | | |
| 2 | Deckstrap (for mounting sock mouth) | n/a | H201 | \$75.75 | \$151.50 |
| Lines | | | | | |
| 45 | Spin Sheet (45' x 3/16" Spectra) | n/a | SMUL316G | \$0.31 | \$13.95 |
| 21 | Topping Lift (21' x 5/32" Pre-Stretch) | n/a | MRSPS532L | \$0.26 | \$5.46 |
| 50 | Spin Halyard (50' x 3/16" Spectra) | n/a | SMUL316BL | \$0.31 | \$15.50 |
| Hardware | | | | | |
| 1 | Spin Pole (with eyestraps and end fittings) | | | | \$190.00 |
| 1 | Swivel Micro Block | | | | |
| Total | | | | | |
| 2 | eyestraps belly chord block eyestraps | | h281 | \$0.80 | |
| 2 | belly chord blocks | | h225 | \$7.60 | |
| 1 | cheek block - trapeze | | RF20151 | \$8.45 | |
| | | | | | \$541.64 |

5. Get all the other stuff

Once the parts arrive from APS, go get all the other supplies you'll need. I can't remember all the widths and lengths of the screws. So, I brought all the APS stuff into the hardware store to play with all the screws and bolts. Make sure it's all stainless steel.

First of all, since the halyards run inside the mast, you do not want to screw the hardware into the mast; you want to use rivets. Buy a hand riveter for \$10 and a bunch of different size rivets (thicknesses and grab-lengths). You will need different sizes based on the different pieces of hardware, and whether they go into the back/side of the mast (single-walled) or the front of the mast (double-walled).

Also, you need screws, bolts, washers and nuts for the hardware that goes on the deck. For all the hardware that goes on the gunwales, use bolts, washers and thread-locking nuts (the kind with plastic inside to lock the nut to the bolt).

Also, you'll need a "spinnaker doinker". This is a piece of equipment that catches the spinnaker sheets, preventing them from wrapping under the bow when you set and douse. Vanguard offers a 12" length of 5/8" thick shockcord, with plastic caps. You can fashion something yourself however, it just has to be flexible. I use the Vanguard piece b/c I haven't taken the time to come up with something better.

Hopefully you have or can borrow a cordless drill and a set of bits. Trust me, cordless drills make this process much easier.

If you want to put the spin pole on the trolley system, you'll also need about 16' of 3/8" shock cord.

Finally, get a tube of marine sealant to plug all the holes that you drill into the hull. If you can, find one that has a cap that will allow you to close the tube and use the rest later (this sounds simple, but most tubes have a thin mouth that fills and clogs after the first use).

6. Add the mast hardware

First, thread the spin halyard. If you can borrow a "fishing tape" or just buy a cheap one, it will make your life easier. It is easier to thread the halyard before the sheave is in place. A fishing tape is a spool of stiff wire for "fishing" cables through walls - electricians use them. You can probably get one from Home Depot for \$10 or so. Lay the mast down, and run the fishing tape through the lower halyard exit hole, until it reaches the upper sheave-box opening. Attach the halyard to it, and pull it through.

Then run the halyard through the sheave box, and assemble the sheave box around it. This involves putting the sheave in the box, and then putting the axle through the box and the sheave. This will fall apart until it has been mounted, it is actually the mast that holds the axle in place. If the holes are already there (as they were in my case), rivet the halyard sheave box into its slot. If not, drop the box into its slot, and use it to mark the mast for where to drill the holes for the rivets.

Add the pole ring, the topping lift clam-cleat and topping lift fairlead on the mast in their places (according to the mast diagram). Hopefully these also all already are pre-drilled for rivets. The holes for the pole ring will be in the wrong place, the design of the boat requires you to stand up to attach the pole on the ring - this is too difficult. you will have to drill your own holes for the ring, put it about 3" higher than the boom goose-neck, but on the front side of the mast. At this lower height, you can set the pole while sitting down, which is much more stable than having to stand up to do so. Note: If you want to do a double-ended topping lift adjuster, you can skip the clam-cleat on the mast.

7. Add the Deck Hardware

7.1. Deck-top hardware

See section 13 for locations.

I found it's actually easier to do this with the mast up, but the boom and spin pole off the boat. That'll let you see where all the lines will lie when you're sailing. **DO NOT FORGET TO ADD SEALANT TO ALL HOLES YOU DRILL IN THE DECK!!!!**

Start with the hardware for the spin sheets. Put the guy clam-cleats on the gunwale forward of the shroud-straps. Make sure you put the right one on each side, the guy will enter the clam-cleat from the outside-in. Add the fairleads to the gunwale aft of the shroud straps, and

then add the cam-cleats on the deck, inboard of the fairleads. The measurement drawings show pretty well where it's legal to add the parts. For the parts on the gunwale, drill as vertically as possible from the top down through both the deck and hull, there's some space between them. Use long bolts, with washers and lock nuts on the bottom of these bolts to secure the hardware.

Next, add the doinker. If you want to use a piece of shock cord, lay it through the bow U-bolt (with most of the length forward of the padeye) and screw down a deckstrap over it to hold it down.

7.2. Cockpit hardware

Take a look at the diagram in section 13.2 to help understand all of this.

Instead of shackling all these blocks to the eye-straps, just tie them with very small diameter line (2mm), preferably spectra. Tying saves the cost of shackles, and lets you get the blocks really close.

Add an eye-strap at the bottom of the cockpit, below the mast halyard exit, with a micro block on it, this is the turning block for the spin halyard. It allows you to run the halyard out of the mast, and back to the skipper. Get this as low as possible. Orient it so that when the block is tied to it, the path through the block will be vertical (without having to twist it). Tie it with as little slack as possible, also to keep it low.

Screw an eye-strap to the cockpit floor about 1" to starboard and 2" aft of the ratchet block. Orient it from side to side, so the halyard can run cleanly through it in a fore-aft direction. Screw the cam cleat with wire fairlead (you'll have to put the cam cleat on the fairlead base yourself) in 4" forward of the eye-strap, and directly in line between the eye-strap and the bullet block. Screw another eye-strap on the port side of the floor, opposite the one on the starboard side. Orient it so that when you shackle a bullet-block to it, the halyard can run fore-aft through the block. Wrap rigging tape tightly around this shackle to keep it standing up. Finally, screw the last eye-strap to the aft bulkhead, about 2 inches to starboard of the aft hiking strap anchor. Make it fairly low, no more than 1" above the floor. You want it to be low enough to be clear of the hiking strap ties. To this you will shackle a bullet-block, so orient it such that the line will pass through the bullet-block side-to-side. Wrap rigging tape tightly around the shackle so that the block always stands out directly forward from the bulkhead, instead of hanging down. This will help insure that the line always runs cleanly through it.

Untie the stopper knot you had tied in the halyard. Run it down to the turning block and back to the cam cleat and eye-strap. Then through the aft eye-strap (from starboard to port), and through the port eye-strap (from aft to forward). Re-tie the stopper knot.

8. Rig up the boat!

Put the boom on and hang the aft end from the main halyard. Tighten down the main sheet to lock the boom into place.

If you went with the launch tube or sock (we'll just call the sock a launch tube for these purposes), you'll need to run a belly cord. Run the halyard through the rear bullet-block, then through the port bullet-block, then through the launch tube. When not sailing, tie it off to the bow U-bolt. This routing system makes it so you never have to stow the halyard - whether the kite is up or down, there isn't enough left over to tangle or be in the way.

To rig the spinnaker pole trolley, you need an eye-strap on the top of your boom, about 1 foot forward of the aft end. Put the 16' length of shock cord through this eye-strap, and tie an 8-knot in it. Then run it around the mast above the pole ring, outside the diamond shrouds, and back to the same eye-strap - but before you put it through the eye-strap the 2nd time, put it through a micro-swivel block. Finally, put it through the eye-strap, and tie another 8-knot. You may have

pull some slack through and move the 8-knot forward to get more tension. You want it to be tight enough that the pole doesn't hang down and get in your way, yet loose enough that it doesn't make it more difficult to put the pole forward and get it on the ring. You now have a trolley. The mast-end of the spin pole should now be supported by the trolley. Tie the end of the topping lift that did not go through the pole ring (or to the micro-block) to the other strap on the spin pole to support the outboard end of the pole. At this point, run the spin pole up the trolley, as if you were setting the pole. It takes a bit of wiggling to get the block around the diamond shrouds. Clip the spin pole onto the pole ring, and pull the topping lift through the becketed clam-cleat on the mast to adjust the pole height. You should now be flying your pole, with no sail.

To stow the forward end of the pole, double a length of 3/16" shock-cord long enough to wrap around the boom, and tie a knot at the end of it. Put it through the eye-strap at the front of the boom, and then pull the knot through the loop at the other end of itself. It helps to put a stopper ball on this thing. To stow the pole, pull the ball/knot down, and jam it into the jaw at this end of the pole.

9. Set the chute!

On your first set, follow these instructions:

Put the boat on a starboard tack broad reach in an area where you won't run out of water anytime soon (give yourself plenty of time to do this the first time).

When ordered to, the crew takes the outboard end of the pole out of the securing device, puts the guy (the starboard side sheet for this set) through the outboard jaws of the pole, runs the pole up the trolley to the ring and clips it in. Adjust the topping lift to set the pole height.

Skipper hoists the sail. Pay attention to the halyard running through all of its fittings - if you get resistance, there is probably a twist in the halyard jamming at one of them.

Crew sets the guy into the clam-cleat and quickly pulls the slack out of it until the clew of the kite is against the pole and the pole is not touching the shroud. This should be done *while* the skipper is hoisting, so the pole is already a few inches off the forestay before the sail has filled up.

Crew takes the sheet (make sure the sheet is NOT in the port clam cleat), and sheets in to fill the sail.

Helmsman drives.

Crew adjusts the sheet and guy accordingly. Since the guy is in the clam-cleat, it does not need to be through the cam-cleat. I usually just adjust it by pulling up or back on the guy right behind the clam-cleat. If it is very windy, this might be difficult. In this case, the skipper tails the guy from aft of the fairlead while the crew pulls it from forward of the cleat.

Go fast.

10. Double-ended topping lift differences

You will get two clam cleats instead of just one. You will mount them on the deck, pointing towards the front of the mast, and just in front of the shrouds. You will get a harken micro-block (H224), and two harken air-cheek blocks (H416). You will rivet the cheek blocks to the base of the mast, angled so it is a straight shot for a line coming out of them, headed towards the two cleats, and orient these blocks so that the eye of the block is facing down. You will cut the line so that when the pole is on the ring, and lowered to 2' above deck-level, the topping lift going through the fairlead just reaches the ring. You will tie the regular block to this end of the line. Finally, you will run the remaining line from one cleat, through the corresponding cheek

block, through the regular block, then through the other cheek block and other cleat. Tie stopper knots with a 6" tail behind each cleat.

11. Turtle Bag Differences

You will skip the rear cockpit block and eye-strap, and the port cockpit eye-strap. Your boat probably has 5 small plastic fairleads around the front of the cockpit – if not, they are part# V30100; 3 go at the front 3 corners of the cockpit, and the other 2 go aft of the side corners by the length of the sides of the turtle bag.. You will run thing shock cord through the sleeves around the top of the turtle bag, and at each of it's 5 corners, you'll run it through the corresponding fairlead. You will run the hiking straps through the slits in the bottom of the turtle bag. You may have to cut a hole for the rope that anchors the hiking straps to exit in the front of the bag, and tie to it's existing eye-strap in the bulkhead. The turtle bag itself is part # V34072.

Here is more detail courtesy of Dave Fried, regarding adding the turtle bag: First screw the five deck-straps into the front of the cockpit. One dead center, about two inches down from the deck surface, one on either side, and the very front of the cockpit, about two inches down from the deck surface, and one on either side, about 6 inches back from the front of the cockpit. I strongly advise placing the turtlebag in the cockpit while mounting these deck-straps so you can see how the bag will sit while you attach them. Once the deckstraps are in place, put the bag whereit will go, and thread the shock-cord through the slots in the bag, and through the deckstraps. If you have front hiking straps (as I do), you will have to untie them from the deckstrap in the front of the cockpit, and then thread them through the bottom of the turtle bag. There will be two slots for them to enter the rear of the bag, and a hole to run the tie-off line through at the front of the bag.

Throw the spinnaker in the turtle bag with all three corners sticking out. Stand on the starboard side of the boat (just this once, it'll help with my instructions, and once you see how the rig goes, you can figure out your own way to rig up your boat). Tie one end of the spin sheet to one clew of the sail. Take the other end and thread it from outboard to inboard through the starboard spin sheet fairlead, across the cockpit (in case you don't know yet, there's a continuous sheet), from inboard to outboard of the port spin sheet fairlead, outside around the port shroud, forward around the forestay, outside around the starboard shroud, and then tie it to the other clew. This will allow you to set around the shrouds. Some people prefer to set the chute under the jib, but that's minor.

12. Mounting Techniques

There are three types of mounting situations you will deal with in this document: Fiberglass with access to the both sides of the mounting point, fiberglass with access to only one side of the mounting point, and aluminum with access to only one side of the mounting point.

12.1. Fiberglass with exposed back

When mounting to fiberglass with access to both sides of the mounting point, you want to drill a hole that is exactly the diameter of the bolt, including the threads. You use a machine bolt, with a washer and nut on the reverse side. Partly this is because it is stronger, and partly it is because self tapping screws are very sharp, and you don't want to cut yourself on them later. You use a bolt that seats properly in the holes of the component it is mounting; often this will be beveled. Then length of the screw should enough to protrude 1/2" through the bottom of the

component it will be attaching. Finally, and this is essential, you must fill the hole with marine sealant before you bolt the component – this protects the exposed fiberglass and foam core from getting wet, which would cause it to turn to mush over time. Fill the hole from both sides.

12.2. Fiberglass with obscured back

When mounting to fiberglass with access to only one side of the mounting point, you want to drill a hole that is exactly the diameter of the bolt's shaft, i.e. not including the threads. You use a self tapping bolt. Then length of the screw should be enough to protrude ½" through the bottom of the component it will be attaching. Matching the drilled hole to the bolt shaft is essential; you need the thread to bite into the fiberglass, if your hole is too big, it will pull out. If the hole is too small, or you don't drill a hole, then the shaft will spread the fiberglass and crack it. Again, you use a bolt that seats properly in the holes of the component it is mounting; often this will be beveled. Finally again, and equally essential, you must fill the hole with marine sealant before you bolt the component – this protects the exposed fiberglass and foam core from getting wet, which would cause it to turn to mush over time.

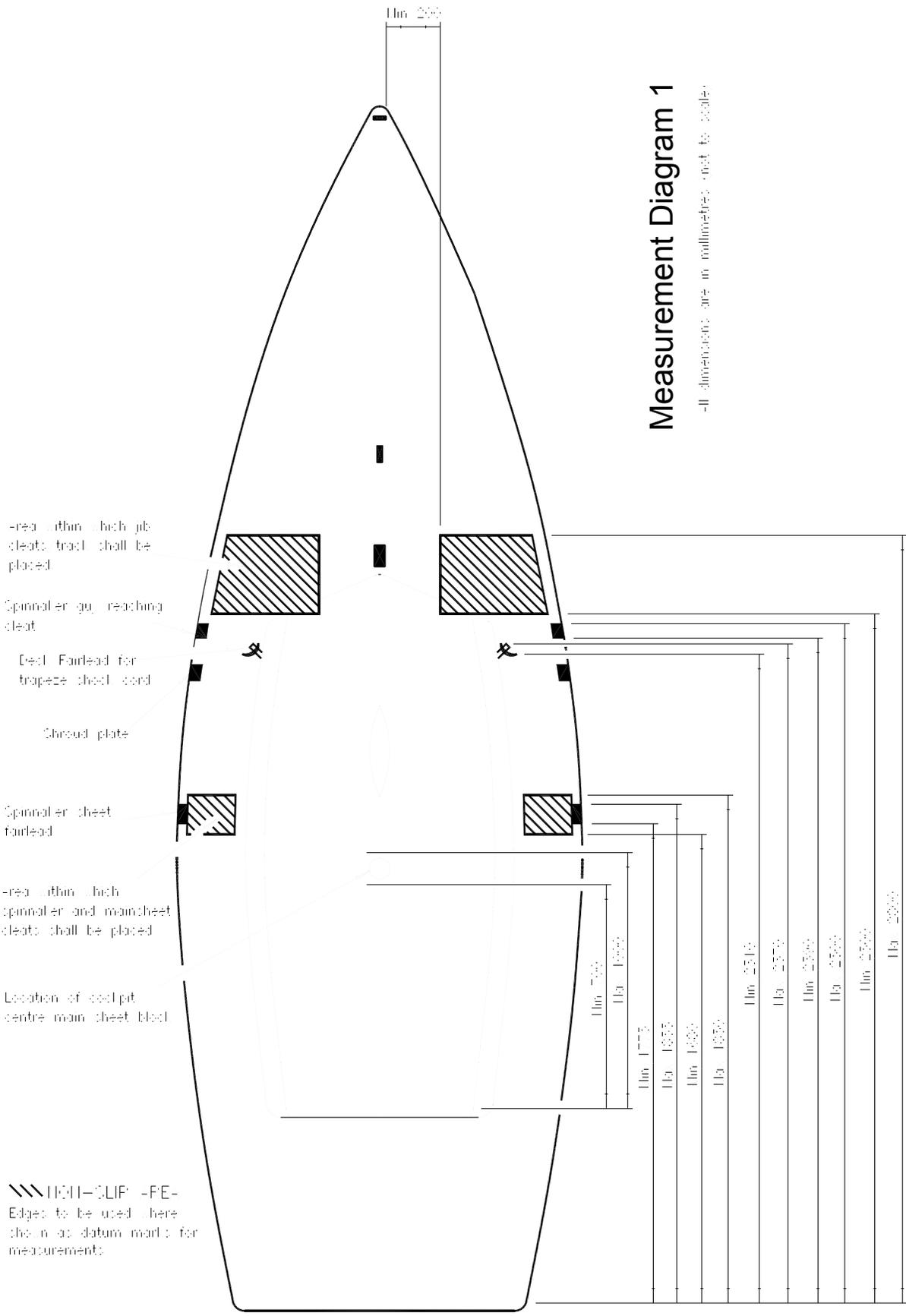
12.3. Aluminum

When mounting to aluminum, you use rivets. Rivets have two dimensions, the shaft diameter, and the grab-depth. You drill a hole that is exactly the diameter of the shaft, and you choose a rivet whose grab depth is at least ¼" deeper than the sum of the component you are riveting, and the material you are riveting to. Use aluminum rivets in nearly all cases; the two exceptions are the outboard eye-strap on the spinnaker pole, and the spinnaker pole ring on the mast – these carry tremendous load, and aluminum rivets might break. When drilling the spar, the filings that are created are a problem. It is best to take it off the boat. Regardless, it is a good idea to put a drop cloth under where you are drilling, to contain the filings. They are sharp and tiny, and can give a nasty splinter, or scratch up your hull. Also note, for the pole ring, you need 3/16" stainless steel rivets, and most of the rivet tools you can normally find, like at home depot, aren't strong enough to work these. You will just have to find someone who has a professional rivet tool, which is fine b/c it gets you out of having to buy a tool you're only going to need once.

13. Diagrams

13.1. Deck Fittings

(note: on my computer, I can not see the measurements in this diagram, but when I print it, I do see them - if you can see them, great. If not, try printing it)



Measurement Diagram 1

-All dimensions are in millimetres and to scale-

Area within which jib cleats track shall be placed

Spinnaker gun reaching cleat

Deck fairlead for trapeze sheet lead

Shoulder plate

Spinnaker sheet fairlead

Area within which spinnaker and main sheet cleats shall be placed

Location of cockpit centre main sheet block

/// HORN-CLIP -PE-
Edges to be used where shown as datum marks for measurements

- Hm 200
- Hm 1775
- Ha 1835
- Hm 1835
- Ha 1855
- Hm 2310
- Ha 2370
- Hm 2360
- Ha 2380
- Hm 2550
- Ha 2600

13.2. Cockpit fittings & halyard routing

