Tippecanoe Boats
4305 Nordum Rd.
Everson, WA 98247
1-800-206-0006
www.modelsailboat.com
International: ph/fax 1-360-966-7245
e-mail fun@tboats.com
Made in USA

T37 Racing Upgrade Package

The innovations in this kit are thanks to Carl Buchan, Bates McKee, Jonathan McKee, Peter Shorett and others who have taken T37 sailing to the next level. Carl Buchan and Jonathan McKee are Olympic Gold Medal winning skippers and well known skippers throughout the Northwest and beyond. Allan Van Ness and John Ive have contributed hugely to the success of the T37 with their innovations in numbering on sails, superlative hull finishes and bringing a wonderful Corinthian spirit of friendly competition to the sport of T37 Racing. John Ive is responsible for creating the latest rudder design among other innovations. As the T37 designer, I just try to keep abreast of the latest ideas from all of the creative people who are racing their T37s. This version of the T37 Racing Upgrade Kit represents the compilation of all these ideas which have been combined and tested and have proved to produce a very fast rig that can be easily adjusted for every sailing condition. Enjoy!

Happy Sailing,

Carbon Fiber Boom and Vang System
Sail Trim Systems
Double-throw Sheeting System
HS645MG Ultra-Torque servo
(optional 5645MG servo, D645MW or 7954SH servo)

T37 Radio Control Racing Sloop

Top Quality Materials:

3/4 oz.Nylon spinnaker cloth sails with heat cut edges
Solid Brass fittings
West System™ marine epoxy
Full Radio Control Gear

Strong lightweight hull - when the hull is completed it is so strong that a 150 pound adult can stand on it!

Superior sailing performance!
Excellent maneuverability and speed.
Sails in heavy seas in exposed waters or glides across calm protected areas.

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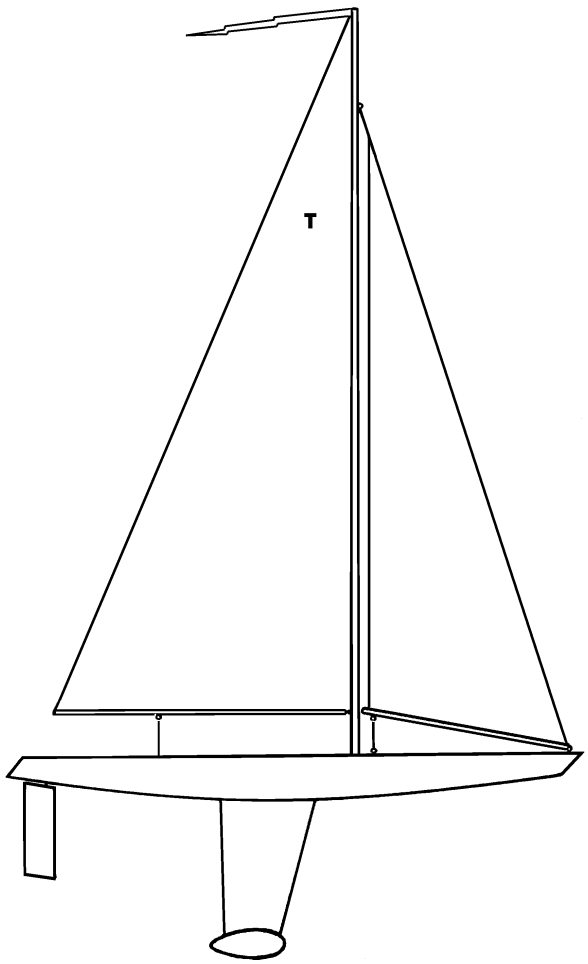
T37 Racing Sloop - Racing Upgrade Version



Fast Sailing and elegant, the T-37 is ideal for regatta racing as a one design class. It is a great boat to start a sailing club with because of its excellent performance and very affordable price. For six or more boats ordered together, group prices are available. The T37 will provide years and years of exciting sailing. Complete Radio Control gear is included. Size AA Batteries are required. The kit includes everything except paint and varnish. Free technical support is provided with every kit. Please call us if any questions arise as you assemble your T-37. The T37 is a sanctioned racing class in the AMYA (American Model Yachting Association).

Contact us for more information on how to form a group and how to organize regattas. Send us pictures and news for our web site, www.modelsailboat.com. Our favorite pictures of T37s sailing are in the section of our web site called “Owners’ Pictures”. You will find your hull number on the Certificate of Authenticity. Thanks for purchasing a Tippecanoe boat.

Happy Sailing!
Will Lesh

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www.modelsailboat.com
Call toll free
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T37 Racing Upgrade Yacht Contents:

This kit includes:

pre-thickened epoxy resin (plastic container)
clear epoxy resin (plastic container)
epoxy hardener (glass container)
phenolic thickening powder (reddish powder)

11 small epoxy brushes
2 syringes for measuring epoxy
3 plastic spoons
clear label markings for syringes
pipe cleaner

2 side pieces of hull
bottom piece of hull
deck
RC deck (the punch-out in main deck: 5-1/4 x 2-3/4 in.)
2 keel pieces
transom
2 rudder pieces
4 keel support webs

2 ballast castings

carbon fiber mast tube (44-1/2 in. x .240)
1 piece of nylon tubing (7 in. long)
mainsail
jibsail
masthead streamer
nylon forestay tube (42 in.)
2 pieces of mahogany veneer (1/4 in. x 38 in.)
thin stainless steel rod (1/16 in. x 36 in. long)

carbon fiber mast extension tube (4 in. x .240)
carbon fiber main boom (17-1/2 in.)
carbon fiber jib boom (13 in.)
1/8 inch diameter black carbon fiber tubing (16 inches)
cedar strip (1/8 inch x 1/8 inch x 14 inches)
black heat shrink tubing (1/4 inch x 9 inches)

mahogany veneer for bow deck (1 in. x 1-7/8 in.)
mahogany veneer for transom (2 in. x 4-3/4 in.)

50 pound Spectra - white (6 feet)
90 pound Spectra - white (25 ft.)
6 inches marine waterproof adhesive backed velcro (fuzzy piece and hook piece)
elastic thread - white (8 feet)
double sided servo tape (3/4 in. x 6 in. white)
double sided rudder port tape (3/8 in. x 9 in. brown backing)
double sided hatch tape (3/8 in. x 36 in. orange backing)
clear lexan piece (1/2 in. x 2-1/2 in.)

9 round brass rigging eyes (1 extra)
brass tube (3 inches x 1/4 inch inside diameter)
1/2 inch wrapped carbon fiber sleeve (3.1 inch outside diameter)
1-7/8 inch wrapped carbon fiber sleeve (3.1 inch outside diameter)
7 black marine grade vinyl grommets (1/4 inch inside diameter, .53 outside diameter)
3 inch mast tube sleeve (black - .30 inch outside diameter)
5 inches total of thin brass rod (1/16 in. diameter)
9 brass screw-eyes (1 extra)
1 brass screw-eye with brass sleeve liner
2 small brass rigging eyelets
2 brass and stainless fishing style sheet clips
4 white nylon bowsies (2 extra)
2 stainless steel machine screws (panhead, 1 1/4 in., 10-24)
2 stainless steel nuts (10/24)
rudder control arm (brass, short, with ss set screw)
stainless steel rudder shaft (3/32 in. x 5-3/8 in.)
rudder servo control arm (white)
sail servo control arm (brass, long)
allen wrench
mahogany for bow (wedge shape 1/2 in. x 3/4 in. x 2-1/2 in.)
#53 drill bit
4 stainless steel sheet metal screws (1-1/2 in. long, size six)
carbon fiber barney post tube (.281 inch diameter x 1-1/16 inch long)
carbon fiber rudder tube (.281 inch diameter x 1-1/16 inch long)
inner carbon fiber rudder sleeve (.156 inch diameter x 7/8 inch long)
yellow rubber tube/gasket for rudder (.185 inch diameter x 3/4 inch long)
clear heat shrink tubing (1-1/4 inch x 3/16 inch inside diameter)
U-shaped brass turning tube
1/2 ounce lead cone shaped weight (CAUTION: LEAD - NOT FOR USE BY AGES 12 OR UNDER)

2.4 ghz RC transmitter and receiver,
1 HS422 rudder servo or equivalent
1 HS645MG ultra torque servo (or HS5645MG upgrade, D645MW, or HS7954SH upgrade)
Die-cut Mylar Hatch Pieces in 8-1/2 x 11 in. sheet
booklet of assembly instructions - assembly diagrams - sailing tips - Certificate of Authenticity

You will need:

paper towels
sheet of plastic or kitchen wrap for table
thin vinyl disposable gloves
clean paperboard 12 oz. concentrated juice can
black Sharpie permanent marker pen
exacto type knife or similar
sharp scissors
production paper 100, 120, 150, 220 grit
dust mask or respirator for sanding
pencil, 12 in. ruler, 36 in. straight edge
10 push pins
60 straight pins
3/4 in. wide masking tape
(blue 3M painters tape recommended)
regular pliers and needlenose pliers
tweezers (optional)
2 clamps
4 clamping blocks 4 in. x 2 in. x 3/4 in.
paint (see page 27)
varnish (see page 27)
paste wood filler (optional)
brushes for paint and varnish
1/16, 3/32, 1/8, 3/16, 7/32 diameter drill bits
13/64 in. diameter drill bit (or substitute 7/32 bit)
very small philips screw driver
vice (optional)
12 size AA batteries (standard or rechargeable)
electric drill
petroleum jelly, silicone grease or similar substance
1 lake or bay

T37 Radio Control Racing Yacht Assembly Instructions

The best way to use these instructions is to read through the first section, “Working with Epoxy”. When you are ready to start working, begin with the section “Assembling the Hull”. Read a step all of the way through and then go back to the beginning of that step and start to work. Do the same for each step since sometimes there are important tips given later in the step that may affect all of the work that you are doing on that step.

Color pictures of the assembly process can be helpful at **www.modelsailboat.com/t37a.html**

See the two T37 BUILDING VIDEOS on YouTube by searching for “T37 Assembly” and for “T37 Builders Guide” on www.youtube.com One video is showing the quick and easy build (T37 Assembly Parts 1 + 2), the other video is more involved (T37 Builders Guide). Both are excellent. Below the video screen is a drop down list of the different chapters so you can jump to just the section you are working on as you build your T37. In the video discussion on tools you might want to use, the only tool you really need is some sort of drill - either an electric drill or a hand drill - and a phillips screw driver, pliers and sandpaper. The other tools can be nice, but are not necessary.

Refer to the excellent customer created T37buildlog.blogspot.com for great tips and build pictures!

For the T37 Class Rules which spell out what can and cannot be changed on the boat to still have the boat qualify to race in the T37 One Design Class go to www.modelsailboat.com/class.html . If you build the boat following the instructions in this assembly booklet, your boat will qualify as an official T37 and can be raced with all of the other T37’s.

Working with Epoxy

Epoxy is easy to work with. Here are some basic ideas to keep in mind.

1) Preparation. Find a nice, flat, clean working surface with good lighting above it. Cover the surface with a piece of clear polyethylene plastic or black polyethylene, or split open a large garbage bag and tape it down. Epoxy will not stick to these types of plastic when the epoxy hardens.

2) Keep everything absolutely clean. Use lots of paper towels. If you spill a drop of epoxy, wipe it up before you put your hand or a tool in it. Don’t let anything that you are handling get sticky. Keeping everything clean will make your job go faster and smoother.

3) Avoid contact with the skin. Prolonged contact with the skin can cause an allergic reaction in some people that initially shows up as a rash. The hardener is the most apt to cause a reaction since it is more caustic than the resin. Wipe off any epoxy very thoroughly with paper towel if epoxy touches your skin. Wash with soap and warm water after finishing the job. Soap and warm water only work when there is a very small amount of epoxy on your hands. More aggressive solvents like acetone or lacquer thinner are hard on the skin and can be absorbed through the skin,

so it is better to avoid using these, although they do dissolve epoxy resin before it has set off. Use of aggressive thinners dries your skin out and makes it more likely to develop a sensitivity to the epoxy resins. Always work in a well ventilated area.

4) Avoid Breathing the Thickening Powder or Sanding Dust. The reddish phenolic thickening powder that is included should be handled carefully. Spoon the powder out of its container gently with a plastic spoon so as to avoid the powder becoming airborne. Always close the container when it is not in use. When sanding down the pre-thickened epoxy after it has set up hard, avoid breathing the sanding dust. The thickening agent that has been added to the pre-thickened epoxy is a colloidal silica which is a form of powdered glass. The sanding dust from sanding this material should not be breathed. Likewise, it is best not to breath wood dust from sanding. Serious respiratory problems can be caused by breathing dust, especially the silica dust. Long term exposure to dust has been shown to be a significant cause of serious respiratory illnesses including throat and lung cancer. Wear an appropriate respirator or filter mask and work outdoors when possible or in a well ventilated area.

5) Are gloves a good idea? Thin surgical type gloves, vinyl or latex, are a good option. Unpowdered is the better choice. The only problem with gloves is that it is hard to wipe off any epoxy that gets on the gloves. When the gloves start getting a little sticky, put on new gloves. I often work without gloves, but I am very careful not to get any epoxy on my hands.

6) Temperature is crucial. Temperature affects how quickly the resin sets off. The ideal temperature is 70 degrees Fahrenheit. This gives you about 30 minutes of good working time after mixing the resin. After 30 minutes you will notice that the resin is becoming stiffer and harder to spread evenly and to work with. It is important not to be interrupted when you have mixed up a batch of resin. For every ten degrees of temperature increase, the epoxy sets off twice as fast. For instance, at 80 degrees you only have 15 minutes of working time. If you live in a warm climate, glue up your hull in the evening after the heat of the day is over. In warm temperatures, never work in direct sunlight.

If it's winter and you work in an unheated shop, you will find your epoxy may not have set fully even after sitting overnight. Epoxy will harden very slowly in temperatures under 50 degrees and you may have to take your boat inside to get the epoxy really hard.

If you move wood from a colder temperature to a warmer temperature you may get bubbles in your epoxy. Wood has a lot of air in it. When wood is warmed up, the air expands and over the next few hours the air flows out of the wood. If your epoxy is still liquid or still sticky, you may get large bubbles in the epoxy. It is time-consuming to pop these bubbles because you have to do it every few minutes as they keep forming. Once the epoxy is partially set and no longer sticky to the touch, bubbles will not form. It is best to wait until this point before increasing the temperature. You may also have a problem with bubbles if the boat pieces are stored in an unheated area and you bring the pieces into a heated room just before starting to work. Allow the wood several hours to adjust to the room temperature before beginning. Even small temperature increases of 10 degrees to 15 degrees can cause bubbling. When wood is cooling down, air is being drawn into the wood which causes no problems.

In colder temperatures the epoxy resin can be very thick and hard to work with because of the cold temperature. In this case it is good to have a light bulb or spot light next to which you can hold the epoxy (within 1 or 2 inches) to warm it up while mixing. You will notice that when the epoxy gets to a certain temperature, around 95 degrees, it gets super liquid, just like water, a little more heat and it starts putting off a bit of vapor, a little more heat and it will set off suddenly hard in your can. The actual chemical reaction of the epoxy setting off creates its own heat. If the epoxy is setting off quickly, or if you have a large amount of epoxy all together in your mixing pot and not spread out over a larger surface area, the process of the epoxy starting to set off can generate enough heat that the whole mass will heat itself up and in a few seconds be hard and actually smoking. Remember that adding heat while you are mixing to make the resin more fluid will re-

duce the time you have to work with the epoxy before it starts to harden.

7) Set up everything before mixing the epoxy. Have everything prepared and set up before mixing the epoxy. Once you have mixed the epoxy, don't rush, but work quickly and efficiently.

8) About the Epoxy. Epoxy is a two part glue. It does not get hard by exposure to air. It gets hard because of the chemical reaction between the resin and the hardener.

In the epoxy supplies you will find (1) a small glass jar of hardener, (2) a plastic container of unthickened clear epoxy resin, and (3) a plastic container of pre-thickened resin. The pre-thickened resin has been pre-mixed with colloidal silica powder, which, of all the possible additives, is the additive that makes the epoxy the easiest to work with and results in mixtures that spread smoothly and have no sag. Colloidal silica is also the strongest of the additives. The last material that is included in your kit is (4) a reddish phenolic thickening powder. This phenolic powder is ideal for mixing into the pre-thickened resin to make it even thicker. When you are mixing up a batch of resin that you want to be fairly thick so it will not run, you will first mix the pre-thickened resin with the correct amount of hardener and then you will add in phenolic powder until you get the right final consistency. For most applications the final mixture should be thick enough that it will not sag (like mayonnaise). At other times it is easier if the final mixture is slightly less thick. The instructions will give a clear indication of how thick you want the final mixture for the specific task you are working on.

9) Mixing the epoxy. The ratio of resin to hardener is very important for the epoxy to set up correctly. *Mix 5 parts resin to 1 part hardener.* A good mixing pot is made by cutting off the top half of a 12 oz. concentrated frozen orange juice can. These cans are made of paperboard and can be easily cut with a sharp knife. Be sure to rinse and dry the can thoroughly.

We measure our epoxy with syringes. Two syringes are provided. Use one syringe for the clear resin and a second for the hardener. Cut short the tips of these two syringes with a sharp knife, leaving a tip that is just 1/2 in. long. This makes the opening in the tip wide enough that the resin or hardener will flow through easily. To measure resin, place the tip of the syringe in the resin and pull the plunger up to suck the desired amount of resin into the syringe. Use the hardener syringe in the same way. Label the syringes clearly and only use the resin syringe for resin and the hardener syringe for hardener. If the pre-thickened resin is difficult to draw up into the resin syringe due to the pre-thickened resin being cold and more viscous than usual, warm the pre-thickened resin slightly to room temperature.

Mark a scale on the side of each syringe. Use the adhesive backed graduated marking stickers. Cut in half and trim the edges of each graduated sticker to the black outline. Peel off the backing and stick onto each syringe. Be careful to align the bottom edge of the sticker with the bottom of the plunger inside the syringe when the plunger is pushed all of the way down. The sticker that is marked only halfway up is for the hardener syringe. Alternatively, find Diagram A on page 50. The scale in Diagram A shows how to mark your syringes with small lines spaced 1/8 in. apart. Mark every fifth line with a heavy dark line. Use a sharp knife to cut the marks into the side of the syringe and then rub over the marks with a permanent magic marker. Wipe the excess marker ink off the surface of the syringe while it is still wet leaving the ink only in the grooves cut by the knife.

There are five small marks to each large mark. When you are mixing, you will fill the resin syringe to the first large mark and the hardener syringe to the first small mark. This would give the right mixture of 5 parts resin to 1 part hardener. If the instructions call for 6 large marks of resin, then you would measure 6 large marks of resin and mix in 6 small marks of hardener to get the right mixture. Unlike polyester resin, more hardener does not necessarily make the mixture set off faster, it just makes the epoxy weaker. If the mixture is really wrong, or if you leave out the hardener, the result will never set up at all. Be careful not to lose count in the middle of measuring! Mix thoroughly for 2 or 3 minutes. Use the brush for mixing. Mix under a lamp if it is cold and the consistency of the clear epoxy seems very thick.

Trim all of the brushes before getting started. Trim the brushes with a pair of scissors so the bristles are only half as long as they were before you trimmed them. This makes the brushes much easier to use.

10) Clear Coating. Epoxy resin can be used either clear (clear resin and hardener mixed together in a 5 to 1 ratio) or thickened so it will not sag (pre-thickened resin and hardener mixed together in a 5 to 1 ratio and then the phenolic powder added to get the right final consistency). Clear epoxy is used to coat the wood surfaces where you will be gluing them together before spreading on the thickened resin. West System TM epoxy resin is specially formulated to be very liquid so it can soak into the wood. The clear resin soaks into the wood so your joint will be as strong as the wood itself. Thickened resin alone will not sink into the wood so it is just trying to cling to the surface and the joint is not nearly as strong as when the wood has first been coated with the clear epoxy. In cold weather you will get the best penetration when you heat the clear resin slightly which makes it thinner. This also makes it easier to paint onto the surface. The coating of clear resin should not set up before putting on the thickened resin. Remember that epoxy does not dry like a conventional glue, it hardens through a chemical reaction that does not require any air. The more epoxy there is at any point, the faster it will harden because it creates more chemical heat in a thicker mass than it does when it is spread out thin. If you coat something with epoxy and then let the epoxy harden before putting more epoxy on top, there can be a problem with adhesion because sometimes a waxy surface film forms on epoxy when it hardens. This film can be easily wiped away with warm water on a rag, but the whole issue is avoided by applying subsequent layers of epoxy on top of the first layer while it is still sticky. Epoxy that has been in the mixing pot for a while can be mixed with a new batch of epoxy as long as the first batch has not gotten lumpy or partially coagulated like gooey jello. Mixing a new batch on top of an old batch will prolong the life of the first batch but will also make the second batch set off more quickly. Try to mix only what you think you will be using in the next five or ten minutes, or in the next immediate step. Throughout the instructions, appropriate amounts are indicated for each process.

11) Thickened epoxy. The pre-thickened mixture of epoxy resin provided in the large plastic container contains epoxy resin and colloidal silica powder mixed together. Shake this container thoroughly before opening to make certain that the silica powder and the resin are completely mixed. If the consistency is not entirely even when you open the container, stir the contents until the resin and the silica powder are evenly mixed together. This pre-thickened mixture does not have any hardener in it and will never get hard by itself without the addition of hardener in the 5 parts resin to 1 part hardener ratio. This ratio remains the same (5 resin : 1 hardener) for the pre-thickened resin as for the clear unthickened resin. In mixing up a batch of thickened resin, first measure the amount of pre-thickened resin into your mixing container, then measure the correct amount of hardener into your mixing container. **Make certain never to forget the hardener!** Stir thoroughly for one or two minutes until completely mixed. Use one of the brushes you have trimmed for stirring. Be certain to get all of the mixture around the edges of the container mixed thoroughly. This mixture using the pre-thickened epoxy is considerably thicker than a mixture using clear resin, but it is not yet thick enough to work with because it will still run and sag. By adding the right amount of the phenolic powder you can now thicken your mixture to any consistency you desire. Usually we will thicken it to the point where it does not sag at all. After the phenolic powder is mixed in, you can take a little scoop of this thickened epoxy mixture on your brush with a little tail hanging down and the tail will not drip, it will just hang there indefinitely. The blob on your brush will not change shape, it will just sit on the brush without any sign of slumping or sagging. If the brush is left alone the lump of resin will harden in pretty much the shape and position that it was in when you scooped it out of the mixing pot. This quality of the thickened epoxy of not sagging or moving is very important because you do not want the epoxy to sag or run away from where you put it when you are gluing up the boat. If you mix too little of the phenolic powder in, the thickened mixture will still sag. If you mix too much of the phenolic powder in, the resulting mixture will be so thick, dry and stiff that it will be difficult to spread evenly or

smoothly. The ideal mixture shows no signs of sagging, but is still creamy and smooth and spreads just like mayonnaise. In fact, aim for a consistency just like mayonnaise and you will find that working with the epoxy is indeed just as easy as spreading mayonnaise. As you add in phenolic powder, the epoxy seems to stay fairly runny, so you add in a larger amount, still runny, and then again a larger amount, still runny, and then just as you are concluding that it takes a lot more than you expected and now you add even more, all of a sudden the mixture is way too stiff and dry. The consistency doesn't seem to change much as you begin to add the powder, but as you get close to the right mixture, a small amount of powder makes the consistency change quite a lot. If at the end you have added too much powder and it is looking as though the mixture will turn out too stiff when the powder is all mixed in, you can step outside and dump the excess powder out before it is mixed in. Do not begin to use your mixture until it is the right consistency and does not sag at all. The thickened mixture is mixed and spread using the same brush as you have just used on the clear mixture. A second batch of epoxy can be mixed right in on top of the previous batch if the previous batch is not getting hard yet. If you are going to let your mixing pot set up hard, so you can use it again, smooth the bottom of the pot out with the brush and remove the brush from the pot.

12) Fillets. Conventional glue cannot fill gaps. Two pieces of wood have to be fit tightly together for conventional glue to hold. Epoxy is entirely different and has great strength as a material in itself and is excellent for filling gaps. Epoxy thickened with colloidal silica is even stronger than unthickened epoxy. Fillets are a strong and convenient way of joining two surfaces together. The fillet is the curve of epoxy filling the angle between the two surfaces (Diagram B). Fillets are made using the pre-thickened epoxy, mixing this with hardener and then adding enough phenolic powder that the mixture will not sag. A plastic spoon can be useful for smoothing the fillets. The mixture in making a smooth fillet should be thick enough not to sag, but still of a consistency like smooth ice cream where little irregularities will fade back into the generally smooth surface. If the mixture is too dry it is hard to get it smooth, and all of its self-leveling characteristics will be lost.

13) More information. This is all the information that you need to work successfully with epoxy. The processes used in constructing the T37 are identical to many of the processes used in constructing full size boats. Building the T37 is excellent practice before starting a larger project, such as a kayak, a strip plank canoe or a full size racing or cruising sailboat. If you want to read more, the best book on boatbuilding with epoxy is "The Gougeon Brothers on Boat Construction - Wood and WEST System Materials" first published in 1979 and available from the Gougeon Brothers, at 1-866-937-8797. The Material Safety Data Sheets for the WEST TM epoxy materials and fillers are available at the Gougeon Brothers' web site www.westsystem.com The epoxy resin is 105 resin, the hardener is 205 hardener, the phenolic powder is 407 filler, and the colloidal silica which is already pre-mixed in the pre-thickened resin is 406 filler. We pre-mix the 406 colloidal silica powder in the 105 resin because the silica powder can pose additional hazards to work with due to the ease with which it can become airborne. The 407 phenolic powder is much safer to work with. The fastest way to access the MSDS sheets (Material Safety Data Sheets) is to enter the product number, "msds" and "west" in the Google search engine.

14) Glue and Epoxy. The words glue and epoxy will be used interchangeably throughout the instructions. The words set, set up, hard, hardened will be used to indicate when the epoxy is hard enough that you can't dent it with your fingernail. The word pre-thickened does **not** mean that the resin mixture has already had hardener added, it only means that it has had a filler powder added. Without hardener, the pre-thickened resin will never get hard. When working with epoxy, work in a relaxed way, but also work quickly and efficiently when a batch of epoxy has been mixed up.

Assembling the Hull

1) A Brief Overview. More detailed instructions follow. You will assemble the hull by taping the 2 sides, the bottom and the transom (the back of the boat) together with masking tape. Coat with clear epoxy for 1/2 in. on either side of where the pieces come together. Mix thickened epoxy so it will not sag. Spread an epoxy fillet along the joints.

The deck will be put in place without epoxy to hold the sides of the hull in the correct position while the epoxy fillets set up. The epoxy sets up overnight. After the fillets joining the sides and bottom and transom have gotten hard, the deck will be taken off. The next step will be to glue the deck on permanently.

To glue the deck on, clear coat inside the top edges of the side pieces of the hull. Clear coat the bottom side of the deck around the edges and clear coat the edges of the deck. Mix a slightly droopy mixture of thickened epoxy. Spread the thickened epoxy along the top edges of the sides inside the hull. Slide the deck into place and tape it. Flip the hull upside down. The epoxy along the sides will slide down inside to form a strong bond between the deck and sides.

The next morning remove the masking tape and your hull is complete. Any voids can be easily filled with a thickened mixture of epoxy.

2) Beginning. The hull pieces are mahogany plywood cut out with a CAD/CAM system to a precision of one 1000th of an inch. Part of the dynamics of the cutting process is that some of the edges may be left feathery or slightly rough. On the smaller parts there are tabs holding the pieces into the sheet of material. Use a matt knife or exacto blade to free any parts where they were not cut all of the way through. Where the parts are only held by small tabs, the tabs will usually break easily as you push the parts out. Push the pieces out from the front side pushing them back and out through the rough side. Sand the edges of all of the parts, the small parts and the large parts with 120 grit sandpaper so the edges are smooth and the remains of the tabs are sanded off. Save the RC deck that punches out of the cockpit opening in the main deck. The RC deck is 5-1/4 in. x 2-3/4 in. with rounded corners and two small holes drilled in it. After pressing out the precut pieces, save the scrap wood as you may want to cut a couple of additional small pieces from this scrap later on.

There are 5 pieces that make up the hull shape: the deck, two sides, bottom, and transom. (The transom is the back of the boat.) Find these 5 pieces. On the deck either side can face up. Choose whichever side you like the best on the deck based on grain patterns and coloration. Put a big X in pencil on the side of the deck that you have decided should be the bottom side so you won't forget which side goes up when gluing the deck in place.

On each of the other pieces identify the side which is smoothest, free of significant defects and most attractive. On the rougher side of each piece put a big "X" with a pencil somewhere towards the bow end of the piece where the mark won't be seen after the hull is assembled. (The bow is the front end of the boat.) On the side pieces remember that you need a starboard side and a port side, so don't mark both pieces on the same side of the piece! On the side pieces each end of the piece is slanted. The bow is the end that is slanted more and that is wider. A few boats have been built with the front end of the sides at the back of the boat. It actually looks pretty neat, and sails perfectly well, but I suspect it might not be quite as fast in some conditions, and technically it is probably not class legal, although that might not become an issue if the boat was not winning lots of races. We have never had to make a ruling on this point. The "X" mark will keep you from gluing up the pieces with the wrong side facing out. It is a good idea to mark the side pieces with a "B" at the bow as well and mark the bottom edge of the side "bottom" and the top edge "deck". Go ahead and mark the two pieces for the keel with an X on the rough side at this time also. Mark the rudder pieces as well. (The rudder is made from the two pieces that have the J-shaped groove routed into them). The transom piece has a round hole on the top edge. The hole goes towards the starboard side of the boat.

Most builders are ready to get going and assemble the hull at this point, and this is the way we usually proceed. However, it is worth considering the advantages of taking a little extra time at this point to put a quick coat of varnish on the outside surfaces of the deck and sides if you are

planning on leaving these bright with a varnish finish. I do get a lot of questions about epoxy fingerprints on the bare wood and whether the fingerprints will show under the varnish. There is no definitive answer to this question, but the safest answer is to sand the fingerprints until they are almost invisible, and then they will not show through the varnish. If you sand the bare wood and brush on one coat of varnish before starting to glue the hull together, then any epoxy fingerprints will not get into the surface of the wood and will not affect the color of the wood. Avoid getting varnish into either of the round holes in the deck. Avoid getting varnish on the edges of any of the pieces or on the inside surface of any of the pieces. If you choose to varnish at this point, sand the wood thoroughly with 220 grit sandpaper and choose a good quality, amber color, gloss, exterior varnish. Marine varnish is especially good for UV protection, but overall your T37 will not get the same UV exposure as a full sized yacht which tends to be outside year round. Trying to apply your final varnish finish at this early point is not practical since there will definitely be a need for more sanding after assembling the hull. Varnishing at this early stage is just to protect the sides and deck from any blemishes caused by the epoxy getting on the surfaces and needing to be sanded out.

3) Setting up. There are two ways to proceed here. Many boats have been built successfully each way. Read through both approaches and choose which you prefer:

First Approach: Take one side piece of the hull, place it on your table with the X marking the rough side facing down. A series of push pins will assist in holding the hull in the proper position while the hull pieces are taped and glued together. This step indicates how many push pins to use and where to place them, however there is no reason not to use additional push pins if you feel this would be of assistance. After the glue is set, the push pins will be removed. It is best to have the surface of the deck very slightly (perhaps 1/32 inch) below the top edge of the sides everywhere after the deck is glued on, because then the sides can be easily sanded down to be exactly level with the deck. You don't want to sand the deck down much to match the sides since you might sand through the top layer of veneer on the deck, so it is best not to have the deck higher than the edges of the sides. This same consideration applies to the bottom piece, although because of the angle of the sides the bottom piece is less likely to be proud of the edges of the sides.

Measure forward approximately 5 in. (inches) along the bottom edge of the side piece from the bottom back corner. Measure up from the bottom edge of the side piece the thickness of the bottom plywood (just over 1/8 inch). Take a push pin and push it through the side piece at this point so that it sticks out 1/8 in. on the inside of the piece. Place a second push pin 12 in. forward from the bottom corner of the transom and just over 1/8 in. up from the bottom edge. Place a third push pin 18 in. forward from the bottom corner of the transom and just over 1/8 in. up from the bottom edge. Place a fourth push pin 23 in. forward from the bottom corner of the transom and just over 1/8 in. up from the bottom edge. Place a fifth push pin 29 in. forward from the bottom corner of the transom and just over 1/8 in. up from the bottom edge.

Along the top edge of the same piece measure forwards from the top corner of the transom 5 in., 12 in., 19 in., 25 in., and 32 in. and place push pins at each of these points located a little more than the thickness of the deck in from the top edge of the side piece. Check to make sure all of the push pins are sticking through on the inside of the piece approximately 1/8 in, but no more, especially along the deck edge where they will make the deck too high if they stick through too far because of the angle of the sides. It is best to have the surface of the deck very slightly (perhaps 1/32 inch) below the top edge of the sides everywhere after the deck is glued on). Put push pins in the other side piece of the hull in the same way, once again making sure you are going from the outside of the piece (the finish side), pushing the push pins through to the inside. If you use this approach, the thin 1/8 inch square by 20 inch long strip of cedar will not be used.

Second Approach: Take one side piece of the hull, place it on your table with the X marking the rough side facing up. Measure forward approximately 5 in. (inches) along the bottom edge of the side piece from the bottom back corner. Measure up from the bottom edge of the side piece 1/8 in

(so far the same). Now, instead of using the push pins to support the bottom and the deck while gluing up the hull, you will use 3/4 inch long pieces of the thin 1/8 inch square by 20 inch long strip of cedar. Start by cutting this thin piece of cedar into 3/4 inch pieces. You will need 20 individual pieces. Measure forward approximately 5 in. (inches) along the bottom edge of the side piece from the bottom back corner. Measure up from the bottom edge of the side piece the thickness of the bottom plywood (just over 1/8 inch). Draw a short pencil line parallel to the edge of the side at this point. We will draw all of the pencil lines for positions of the cedar tabs and then we will glue the cedar tabs in place at these pencil lines.

Draw a second line 12 in. forward from the bottom corner of the transom and just over 1/8 in. up from the bottom edge. Draw a third line 18 in. forward from the bottom corner of the transom and just over 1/8 in. up from the bottom edge. Draw a fourth line 23 in. forward from the bottom corner of the transom and just over 1/8 in. up from the bottom edge. Draw a fifth line 29 in. forward from the bottom corner of the transom and just over 1/8 in. up from the bottom edge.

Along the top edge of the same piece measure forwards from the top corner of the transom 5 in., 12 in., 19 in., 25 in., and 32 in. and draw lines at each of these points located a little more than the thickness of the deck in from the top edge of the side piece. Ideally the lines along the deck edge will be very slightly farther in from the edge than the lines along the bottom edge of the side piece because of the angle of the sides which will force the deck to be slightly higher when resting on the cedar tabs. It is best to have the surface of the deck very slightly (perhaps 1/32 inch) below the top edge of the sides everywhere after the deck is glued on, because then the sides can be easily sanded down to be exactly level with the deck. You don't want to sand the deck down much to match the sides since you might sand through the top layer of veneer on the deck, so it is best not to have the deck higher than the edges of the sides. This same consideration applies to the bottom piece, although because of the angle of the sides the bottom piece is less likely to be proud of the edges of the sides. Draw your pencil lines on the other side piece of the hull in the same way, once again making sure you are drawing on the inside of the side piece (the side with your X marking it as the inside).

Now the small cedar tabs are ready to be glued in place with the surface of the tab that is nearest the edge of the side lined up along your pencil line at each mark. If you are patient, you can use the epoxy included in your kit to glue on these tabs. Measure out 10 drops of resin and 2 drops of hardener for this small job. For each drop of resin pull more resin into the syringe each time before squeezing out one drop, otherwise you will probably get a squirt of resin by the time you are trying to squeeze out your third drop. If you heat the mixture over an incandescent lightbulb as you stir, the setting time can be reduced to about 20 minutes. Too much heat and the mixture will be hard before you can apply it. Using CA (cyanoacrylate also called super glue) can make this step much faster and somewhat easier as long as you don't glue your fingertips onto the sides. CA is not included in the kit. (Any brand of CA or Super Glue should work fine. Our favorite brand of CA is called 2P-10. Medium thickness works best for most jobs. You definitely want the 2P-10 accelerator as well for this brand. As soon as you hit the CA with the accelerator, the CA sets up in about 5 seconds. Before spraying the accelerator, you have quite a bit of positioning time.)

Although the push pin system is easy and fast, there are three advantages to the cedar tab system. First, there are no push pin holes in the sides to be filled in later with epoxy. This can be a consideration if you are thinking of varnishing the sides as well as the deck. Second, the tabs are less likely to be knocked out of position, whereas the push pins can be dislodged if the side piece is not handled carefully while gluing up. Third, the cedar tabs can be shaved down easily if the tabs are going to hold the deck up too high (that is if the deck is going to be standing proud of the top edges of the sides and likewise if the bottom piece is going to be held so its surface sticks out beyond the bottom edge of the sides.) A sharp utility knife, or sharp chisel tip, can easily slice off very thin slivers of the cedar tabs to get the tabs just the right thickness for the deck or bottom piece to sit at just the right height. Moving the push pins is less desirable since you would be creating another set of holes. The advantage of the push pins is that the epoxy fillet on the inside of the

hull may be slightly easier to spread smoothly when the fillet does not have to run over a cedar tab. Both systems work fine, although we are tending to lean slightly more towards the cedar tabs having heard back from many builders over the years and their preferences. If you don't have CA and don't want to wait for glue to dry, then use the push pin system. It works fine.

4) Taping the Sides and Bottom. Our favorite tape and probably the easiest to use is the blue 3M painters masking tape. Ordinary masking tape will work fine as well. 3/4 inch or 1 inch tape is the best width to use. Avoid an old roll that is starting to stick to itself. Do not use a powerful tape like duct tape since the tape would damage the wood when pulled off. Test your masking tape on a small piece of the scrap plywood to make sure that the tape will hold fairly well but not damage the wood when pulled off.

Do not leave the hull in the sun while the tape is still in place since the sun may make the tape difficult to remove. Tape the hull close to the time when you are ready to glue it together since masking tape may become difficult to remove when attached for more than 24 hours. In other cases the tape will start to let go after 24 hours.

Cut 44 pieces of tape each 3 in. long. There are 22 pieces for each side. Take one side of the hull and the bottom piece. Begin at the very back of the boat. Line up the back corner of the side with the back edge of the bottom. Put a 3 in. piece of tape on the bottom, hold the side in place and wrap the tape up over the side. The bottom of the boat sits between the sides of the boat. The bottom piece rests against the push pins where they come through the side pieces or against the cedar tabs if you have used the cedar tab system. The push pins in the sides do not go into the bottom piece. The bottom is held in the proper curve from bow to stern by resting against the tips of the push pins or against the cedar tabs. The outside surface of the bottom piece should be flush with the bottom edges of the sides. (see Diagram C) Work forwards spacing the tapes every 2 in. These tapes are going across the joint between the bottom and the side, (perpendicular to the joint, not lined up with the joint). Put tapes on until you reach the bow. If you pull any tape off, throw it away and use a new piece since the adhesive will not hold a second time. If the tape is not sticking well enough, rub the tape on firmly using a hard object such as your fingernail or the back of a spoon. Don't get the tape stuck so tight that it will be pulling wood grain off when removed, but you definitely do not want the tape to release before the epoxy holding the sides in place has set up.

Begin taping the second side at the back of the boat in the same way as the first side. Tape all along the side. At the bow, tape the two sides together with two pieces of tape going across from one side to the other. Check to make sure the bow is lined up straight with the rest of the boat while taping. Check again after taping to make sure the bow has stayed aligned and is not slanting off to one side. Cover the entire bow with cross tapes, but do not let any of the tapes stick out above the top edge of the sides where the deck must fit on. Later on, where the two side pieces come together at the bow, the bow will be completed by gluing on the 2 1/2 inch by 3/4 inch wedge shaped piece of mahogany. After gluing on, this mahogany piece will be sanded down to merge smoothly with the sides and come to a smooth point at the front. The two side pieces may be held apart slightly by the bottom piece at the bottom corner of the bow. This is not a problem. Nor is it a problem if there is a slight gap between where the bottom of the boat ends at its forward end and where the two sides meet together at the bow. This whole bow section will be filled with a fillet of epoxy on the inside.

Run a piece of tape lengthwise along the chine between the push pins. (The chine is the joint between the sides of the hull and the bottom.) Every part of the joint between the bottom and the sides should now be covered with tape on the outside.

Press the tape on very securely from the outside with one hand while supporting the hull by pushing from the inside with the other hand. You do not want the tape to release during the gluing process because you will not be able to apply new tape to any surface that is wet with epoxy since the tape will not stick.

Cut two pieces of tape 8 1/2 in. long for the transom. The transom fits inside the sides of the

hull and sits on top of the back edge of the bottom piece. (see Diagram D) The surface of the transom should be flush with the back edges of the sides and the bottom. The top edge of the transom will be 1/8 in. below the top edge of the sides. The round hole in the transom goes on starboard side. Apply one of the 8 1/2 in. pieces of tape running across the transom from side to side with an equal amount sticking out each side and just level with the bottom edge of the transom. Put the transom in place and wrap the tape around the sides pulling the sides into place. Use the second piece of tape level with the top edge of the transom and wrap it tightly around the sides. Don't worry if the transom is not fit perfectly. The transom piece that you are working with now just provides a stiff backing for the mahogany veneer that later on covers up the transom.

Cut two 3 inch pieces of tape and tape perpendicularly across the joint between the transom and the bottom of the boat holding the bottom of the boat up tight against the bottom edge of the transom. Now run a piece of tape parallel along the joint between the transom and the bottom of the boat. Press all of this tape firmly in place. Make sure the tape is not sticking above the top edge of the transom where the deck will sit.

5) Fitting the Deck. This is a trial run. Fit the deck gently so you don't disrupt the masking tape holding the sides and bottom. Place the deck about 3/4 inch back from where it will end up. Slide the deck forward into place using the natural wedge shape of the bow to push the sides of the hull apart. The deck will rest on the ends of the push pins that are sticking through the top edge of the sides (see Diagram E) or on the cedar tabs. Pull the sides apart slightly to get the back of the deck to fit down into position between the sides. The surface of the deck should be flush with the top edges of the sides or slightly below the top edges. The back of the deck should sit on top of the transom piece. Check the bow of the boat looking from in front of the boat to make sure the bow is lined up straight and not skewed to one side or the other.

Getting your hull to be perfectly aligned can be a bit of a trick if the pieces of plywood have taken on a shape of their own due to changes in temperature or humidity. The actual shape of the hull is not going to affect the sailing ability of your yacht in any significant way, but for aesthetic reasons it is nice to get the bow plumb and the deck level. If you have any question about the hull being true and even, it is a good idea before gluing to mock up a system with weights to hold your hull perfectly true while the glue sets up. Once the epoxy sets up the hull shape will be permanent.

With the deck in place on the hull, flip the boat upside down on a flat table surface. It is a good idea to have your work table covered with saran wrap taped down at the four corners. Use any type of weight that will reach across from one side of the hull to the other side so the weight is pressing down on the edges of the sides not on the middle of the bottom. Books can work fine, or you can use short pieces of wood that reach across from side to side with weights sitting on the pieces of wood.

Weights can also be pushed up against the side of the bow or leaned against the bow to move the bow into alignment so the bow is straight up and down. Now you have a good system for getting everything aligned and held in alignment while the epoxy that holds your hull together is getting hard. After completing your weighting system, remove the weights and remove the deck from the hull.

Remove the deck. If there is someone to help you when it comes to gluing the deck in place, it does make this step a lot easier to have an extra set of hands, although it is possible to do it alone. For now, remove the deck from the hull.

Cut 8 pieces of masking tape 5 inches long and set these pieces aside for when you are putting the deck into place after spreading the epoxy fillets in the hull.

6) Gluing up the Hull. Review Part A, "Working with Epoxy". Perhaps the three most important tips to remember are:

1) Make sure you won't be interrupted in the middle of the process.
2) Work in a cool part of the day if it is a hot climate, and never work in direct sunlight.
3) Don't forget to put the deck in place while the epoxy joining sides and bottom is setting up!

Measure into your mixing container 3 large marks of clear resin using the resin syringe and 3 small marks of hardener using the hardener syringe. Use a brush to stir. Stir thoroughly for 1-2 minutes.

Brush the clear epoxy that you have just mixed onto the inside of the hull all along the joints where the sides and the bottom meet. Cover all the wood within 1/2 inch of the joint. Clear coat where the transom meets the bottom and the sides. Do not coat within 1/4 inch of where the deck will sit since you do not want the deck to be glued on in this step. Clear coat the two sides where they meet at the bow, again being careful not to coat anywhere where the epoxy will have contact with the deck. The clear epoxy should be brushed on fairly thin. Most of this clear coat should soak into the wood. You don't want a heavy coating of clear epoxy because the clear epoxy is runny and may make your fillets of thickened epoxy sag.

Now we will switch to the pre-thickened resin. Measure out 10 large marks of pre-thickened resin. If the prethickened resin is too thick to pull easily into the syringe, try warming the prethickened resin slightly. If still too thick, add a small amount of the clear resin to thin the prethickened resin (the clear resin and the prethickened resin are both composed of the same resin). Measure 10 small marks of hardener into your mixing container. This partially thickened mixture can be mixed right on top of any clear resin that is left in the mixing container. Stir thoroughly. You want to work quickly now, since this large a batch of epoxy will start to generate its own heat through the chemical process. Add enough red phenolic powder so that you have a consistency similar to mayonnaise or Dairy Queen soft ice cream. You want a mixture that *does not sag or droop at all*, but still spreads smoothly and evenly and is not at all dry or stiff. Adding too much red phenolic powder will make the epoxy less strong and harder to spread smoothly. Test the mixture by taking a scoop of it on the brush. Is it staying still or is it starting to sag? If it is starting to sag, add a little more phenolic powder. *The final mixture should still be creamy and smooth, but it should not sag at all.* Look at it on your brush and count to 30. If it moves in this short amount of time, you will find that it will sag away from your joints before setting up.

Spread the mixture quickly along the joints between the bottom and the side forming a fillet that covers about 3/8 in. up the side and 3/8 in. out onto the bottom. Right at the joint the fillet is its thickest, probably close to 1/4 in. thick. Do the easiest places first. Get the bulk of the epoxy out of your mixing can fast with the brush, placed approximately correctly. Then go back and smooth the fillet out a bit still using the brush and fill in any places where the fillet is too thin. Don't try to be too neat since what you do here will not show, but you do need to be fast.

With the remainder of the epoxy in your mixing can, run a fillet with the brush around the transom and up the bow on the inside where the two sides meet. You should have the right amount of epoxy for the entire job. Try to gage how thick to put on the epoxy by how much area you have

covered and how much epoxy you have left. If you have extra epoxy, spread the epoxy a little bit thicker. If you are short, take some epoxy from where it is the thickest. Use up all the thickened resin. Now that the resin is placed, take the plastic spoon and smooth the fillet by dragging the back side of the plastic spoon along the fillet shaping the fillet into a smooth curve. Excess epoxy will be pushed out to either side of the spoon. This excess epoxy can be carefully cleaned off with the epoxy brush and moved to any area where the coverage is too light. To make the fillet less thick, tilt the spoon so that you are using an area closer to the tip of the spoon. If you need to mix up one extra mark of thickened epoxy at this point, go ahead, but work quickly. When the epoxy has begun to set up, the fillet will be hard to smooth and it is best to leave it alone at this point. To keep your T37 lightweight for racing, remember to make the fillets pretty small (tip of the spoon or slightly bigger than the tip of a popsicle stick) and then remove the ridges of extra epoxy that are away from the fillets. For cleaning off the excess epoxy beside the fillet, it also works well to use a "wood chisel" made from a tongue depressor sanded to a chisel tip or from a wooden ice cream sample spoon or the like. Epoxy is very strong material. It only takes a little epoxy to make your T37 super strong! Just what you have done with the clear epoxy probably would be very strong.

Now you are ready to put the deck in place. **The deck must be put in place before the epoxy on the bottom and the sides has gotten hard since the deck holds the sides of the hull in the correct position.** If the hull were to set up without the deck in place, the hull would be the wrong shape and the deck would never fit. You will not glue the deck in place at this stage, we will just fit the deck and tape it in place to hold the hull in the proper shape while the fillets on the bottom and sides set up hard. Since you will need to remove the deck later in order to apply the epoxy that will attach the deck in place, make certain at this point that there is no epoxy that will be touching the deck. If there is any epoxy that might touch the deck wipe it off carefully with a paper towel. In the next step, when you glue the deck in place, you will complete the fillets at the top of the bow and at the top edge between the sides and the transom. For now make certain the deck does not get partially glued on. Tape the deck firmly in place. Don't put any pressure on the bottom while taping on the deck. If you used push pins, check that the 6 push pins that align the bottom are still in place, that the transom is still inside the side pieces, and that the bow is still lined up. Flip your boat deck side down on the flat table with saran wrap under the boat. Add the weights as you did before to hold everything in alignment and leave your hull to set up.

The next morning check the epoxy in the fillets by poking it with your fingernail. It should be hard like glass. If it is not completely hard, do not pull off any tape. Put the boat in an over-heated room if the epoxy is not set off completely. When the epoxy is entirely hard, gently pull off all of the tape. Remove the push pins along the bottom edge of the hull by twisting and pulling out. If the heads pull off, use pliers to grip the steel part of the pin and twist and pull out. Leave the push pins in place along the deck edge of the hull since they will be needed for holding the deck in position while it is being glued on.

7) Clear Coating Inside the Hull. Although it is not necessary, I like to clear-coat the inside surface of the bottom piece of the hull and part way up the sides. However, you do not want to clear-coat where the mast step will be located beneath the mast hole in the deck, or anywhere where the keel or keel webs will be glued in, or where the rudder column will be glued in. Leave a circle one inch in diameter uncoated beneath the mast hole in the deck (the center of this circle should be 1 1/2 inches in front of the keel slot). Do not clear-coat from one inch in front of the keel slot to one inch behind the keel slot across the entire width of the bottom (from side to side). This area all around the keel slot and from side to side of the boat will be clear-coated when the keel and the keel support webs are glued in. The resin which will be fastening the keel in place will have the best adhesion to the wood surface when the clear-coated surface is still fresh and has not set up. Do not clear-coat the area on the bottom immediately under the rudder access port in the deck at the back of the boat. We will be gluing in a wooden rudder column in this area and again the adhesion will

be best if this area has not been previously clear-coated. If some area has been clear-coated and the clear coating has set up and later you want to either clear-coat again or glue something down, it is important to wipe the area with a paper towel dampened with warm water and then with a dry paper towel to remove any waxy residue that may have formed on the clear-coated surface. The waxy residue will definitely interfere with adhesion. After wiping the surface, sand it lightly to ensure maximum adhesion. It is best not to let clear coating set up before gluing something down on top of the clear-coated area. Keep your coating of clear resin very thin, just enough to saturate the surface of the wood with very little build-up on the surface.. Epoxy is heavy, and boats want to be light!

Remove the deck from the hull. Mix one large mark of clear resin with one small mark of hardener for clear coating the inside bottom piece of the hull. The clear coating should be brushed on in a thin coat. It makes a smoother surface if you apply clear coating to the entire area and then brush over the clear-coated area several times. If the resin is starting to set up on the surface, you will want to stop brushing over it. Although it is not necessary since the sides are less likely to get water on them, you can clear-coat the inside surfaces of the sides of the hull. Keep the clear coating very thin otherwise the additional clear coating will just add unnecessary weight. You definitely should not clear-coat near the top edges of the sides since that is the area where you want good adhesion when you glue on the deck in the next step. The deck can be glued on immediately after clear coating the inside of the bottom, so you should be able to use the same epoxy brush and the same mixing container.

8) Gluing on the Deck. There are many different approaches to each step in building your T37. Before gluing on your deck, read through this entire step to the end where you will find Ron Knight's comments on gluing on the deck. Ron is a retired heart surgeon and the present Commodore of the Pacific Northwest Model Yacht Club (pnmyc.org). Ron has built a number of T37s and his refinements and tips are all very worthwhile.

Cut 8 new pieces of masking tape 5 inches long and set these pieces aside for holding the deck in place while it is glued on.

Mix 2 large marks of clear resin with 2 small marks of hardener. Stir thoroughly. Clear coat the top insides of the hull in a band 3/8 in. wide along the top edge of the sides. Clear coat the top edge of the transom and the inside of the transom down 3/8 in.. Clear coat the *inside* surface of the deck (marked with an X) along the edge in a band 3/8 in. wide and across the back.

Mix 7 large marks of pre-thickened resin with 7 small marks of hardener. Mix these right on top of any clear epoxy that you have left in your container. Stir thoroughly. Add phenolic powder, but not as much as before since now you want a mixture that can sag slightly. You don't want this mixture runny, you just want it so that over 15 minutes it will move slightly and settle onto the deck after you flip the boat over and gravity is pulling it down. Spread a little less than half of this mixture along the outside edge of the deck and across the back of the deck where you have clear coated. Quickly spread the remainder of this mixture inside the sides along the top edge where you have clear coated and along the top edge of the transom. Slide the deck into place. The deck should sit on the tips of the push pins that are sticking through the sides. Tape the deck securely in place with 4 pieces of masking tape on each side. The surface of the deck should be flush with the top edges of the sides of the hull. The bottom of the deck at the back should be touching the top edge of the transom. Use tape here if necessary.

Flip the hull upside down onto a flat surface coated with plastic that the epoxy cannot stick to and voila! you are done.

While the boat sits overnight, the partially thickened epoxy on the sides will sag down onto the deck, creating a fillet on the inside between the sides and the deck. One final reminder - make sure your whole boat is on plastic so it does not glue itself to the table.

The next morning remove the masking tape and the push pins along the deck edge.

Ron's ideas, below, are good ideas for making the most competitive T37 allowable. As per class rules, it is not permissible to sand the deck dimensionally thinner than it is supplied in the kit

unless you are adding a wood veneer surface in which case the final thickness of the deck must be comparable to the original thickness of the deck and the weight must be the same or greater than the original deck as supplied.

Notes from Ron Knight, Commodore of the PNMYC on gluing on the deck:

ADVICE ON ATTACHING T37 DECK WITH THE CLEAT SYSTEM "Using the cleat system, as described by Dan Newland (in Dan's YouTube video "T37 Builder's Guide"), for the deck streamlines and makes easier several parts of building the hull of the T37. Before doing the final deck attachment, take a little piece of the 1/8" thick plywood and test each cleat so that the top if the test piece is even with or very slightly below the top edge of the hull side. If the test piece is "proud," use a razor blade or emery board or very sharp chisel (whatever works) to shave the cleat down so that the test piece is even with or below the hull edge top. ""When you do the final attachment of the deck to these cleats and the hull sides, you should use very little epoxy. As long as there is a continuous bead (only 1/16-1/8" wide) of thickened epoxy along the inside top edge of the hull side and on top of each cleat, there will be a good joint. However, in minimizing epoxy and fillets, I think (as does Will) that it is important to always paint, first with clear epoxy, all the bare wood where the new epoxy is going. It soaks in and, when the thickened epoxy goes on next, the two epoxies bind with epoxy down into the wood and one gets a better joint with less total epoxy. This is important, because any excess weight above the water line is detrimental to righting moment. All the weight saved in the hull and rigging will then go into lead ballast on the bottom of the hull, under the radio deck at the back of the keel, where it will contribute to righting moment and bring the total weight of the completed boat (with electronics and batteries) up to the minimum 5 pounds required for racing within the Class Rules. Next day, after the deck is bonded, there will be a groove between the top edge of the hull side and the deck. Use a toothpick to drizzle thin or very slightly thickened epoxy into this groove to further seal the joint. Except, if you are going to use the single veneer strip to cover this joint, then this last step isn't necessary, as the groove will be filled when the veneer is attached. Before the veneer is attached or after the groove is filled with hardened epoxy, sand the hull side pieces down even with the deck. For this step it is VERY important to always sand with hard, flat sanding blocks."

Good advice from a very well respected heart surgeon and experienced T37 Builder!

9) Sanding the Hull and Deck. Always sand with the grain and never across the grain. Be careful not to sand through the first layer of veneer on the plywood. Sand the entire hull with 100 grit production paper to remove any bumps of epoxy or edges of plywood that stick out too far. Bevel the bottom edges of the hull to a slight curve where the sides join the bottom. As a later step, we will fill in any voids along these edges with a thickened resin mixture. We will also build the bow out to a point by gluing on the 2 1/2 inch long wedge shaped piece of solid mahogany and then shaping it. After gluing on the bow piece (Step #13), we will sand the entire hull again, starting with 100 grit and progressing up to 220 grit.

Along the edges of the deck, there will be a narrow strip of mahogany veneer epoxied to the deck to cover the joint between the deck and the sides. Sand any high points along the edge of the deck flush with the deck so the strip of veneer will lie flat on the deck surface. Don't worry about voids since these will be filled with a thickened mixture when the veneer is glued down. Any bumps of hardened epoxy along this edge will be a problem as they will prevent the veneer from laying flat. Push pins through the veneer are used for clamping the veneer in place. It is hard to push the push pins through a thick build-up of hard epoxy. Sand off any heavy buildup of epoxy along the deck edge.

Sand the deck smooth with 150 grit, then 220 grit production paper.

10) Cutting and Fitting the Mahogany Veneer. All of the veneer work can be skipped entirely if you are doing a fast build. The edges of the deck can be slightly rounded, the edge grain of the plywood coated with clear epoxy and the hull paint wrapped up onto the deck surface about 1/4 inch. This can look very nice. If you decide to take this approach, varnish the deck before painting the hull so when you tape off the deck to paint the hull you will get a clean line between the varnished surface and the painted surface. Use the very highest quality tape for this purpose. You

might even talk to a local sign painter about what tape to use!

If you go with the veneer plan, the results are quite attractive. There are four pieces of veneer: two long 1/4 inch strips of veneer, one piece 1 inch wide by 1 7/8 inch and one piece 1 5/8 inches wide by 4 3/4 inch. The 1" wide piece is for the bow plate. The 1 5/8 inch wide piece is for the transom. The long strips will run along the edge of the deck (on the top surface of the deck) where the sides and the deck meet. (see Diagram F) The veneer covers up the joint between the deck and the sides. Try to avoid splitting the veneer, although, the epoxy will fill in small splits when you are gluing the veneer in place, and the final effect will be fine. Sharp scissors may work better than an exacto knife for cutting the veneer, although an exacto knife can work quite well also.

First, let's discuss how the bow of the boat will be finished off. Right now the bow of the boat is formed by the two pieces of 1/8 inch plywood coming together so they touch each other or almost touch each other at the bow. Where these two side pieces come together, the bow is roughly 1/4 inch wide along the front edge, or slightly wider if the two sides are not quite touching everywhere. The front of the bow is more or less flat, not pointed, where the two sides meet. The final bow shape will be formed by the wedge shaped piece of solid mahogany 2 1/2 inches long that will be glued on the front of the boat where the sides come together. The wedge shaped piece is wider than necessary so that it can be sanded down to exactly match the sides after being glued in place. If your sides are even farther apart at the bow, and the wedge shaped piece is not quite wide enough to be flush with each side, you can fill in beside the wedge shaped piece with some thickened epoxy to fair out the bow. The wedge shaped piece makes a nice pointed bow to the boat. The other component of creating the bow is the piece of veneer that goes on the surface of the deck and covers up the very front of the deck where the two side pieces of the hull meet and where the solid mahogany wedge makes a point at the front of the boat. We will make this veneer bow plate out of the 1 inch wide piece of mahogany veneer. Mark the veneer by holding it in place on the deck at the front of the boat and marking with a pencil from underneath. Make the front end of the bow plate pointed because in a later step we will add the solid mahogany wedge shaped piece that comes up underneath this bow plate to build the bow out to a fine entry. The shape of your bow plate should be the shape you eventually want the bow to be, not the shape the bow is now (see Diagram G). Cut the bow plate out using scissors on the straight lines and an exacto knife on the inside of the curve. When cutting the curve, cut towards the center of the curve from each side, cutting inwards from the veneer edges, to avoid splitting.

For the mahogany veneer transom, use the 1 5/8 inch wide piece of veneer 4 3/4 in long. Hold this piece of veneer up against the transom with one edge flush with the deck. Mark this veneer along the remaining three sides and cut it to shape so it sticks out just 1/16 of an inch on the two sides and the bottom. These edges will be sanded smooth after the epoxy has hardened.

Sand the transom surface smooth so the transom veneer will lie flat with no bumps under it. This makes it easier to glue on the veneer and the finished job will look much smoother.

11) Steaming the Mahogany Veneer. The long, thin strips of mahogany veneer that curve along the edge of the deck need to be steamed and bent to shape before they are glued in place otherwise it is difficult to make them lie flat while gluing them down. The process is to steam these veneer pieces and then very quickly bend them to the shape of a curve that is identical to the curve along the outside edge of the deck and then to hold the veneer pieces down flat in place along this curve. First lay your boat upside down on a flat surface to which you can stick tape without damaging the surface. The surface should be near where you will be boiling the water to steam the veneer. Run a line of masking tape along the outside of the deck, sticking the tape down to your flat surface. Formica makes a good surface to use. It is not a good idea to use the wood surface on a nice piece of furniture since the masking tape may pull off the finish. On the tape, mark the position of the bow and stern with a pen or pencil. Now move the boat sideways enough that you can make the curve for the second side with the tape stuck down to the flat surface without the two lines of tape crossing each other. Mark the position of the bow and stern on the second line of

tape for the second edge. Get a series of weights ready to hold down the veneer strips in place after they are taken out of the pan and bent to the curve. Glasses or mugs work well placed upside down on the veneer strip so the edge of the glass or mug holds the strip in place. Glasses are convenient since you can see through them to see that the veneer strip is following the curve as marked by the tape and that the inside edge of the veneer strip is not lifting up. You will need about 15 weights per side, using more weights is sometimes better.

Now you are ready to steam the veneer strips. It is quite easy to steam these pieces in a regular sauce pan, or if you have a pressure cooker use that. It is easiest to use a pan with a diameter of 8 inches or more, but a smaller pan will work as well. Place 1 inch of water in the bottom of the pan. Curl the veneer strips so they go around inside the pan above the water. Usually the pressure of the veneer strips against the outside of the pan will keep the veneer strips from sliding down into the water. As much as possible do not have the veneer strips covering each other up. Put a tight fitting lid on the pan and bring the water to a rapid boil. Continue to boil vigorously for about ten minutes. After ten minutes the veneer strips will be ready to be taken out and bent to shape. Take out one veneer strip while continuing to steam the second strip by keeping the pot boiling. Very quickly lay the limp veneer strip down along the inside of your curve of tape and weight the veneer strip down about every inch so that the inside edge of the veneer strip does not lift up off the flat surface. Towards the back where the veneer is not being asked to curve as much you may be able to use fewer weights. When the first strip is bent around the curve and held flat against your flat surface with the weights, take out the second strip and bend it to shape for the second side. Allow these strips to dry slightly before gluing them in place on the deck. Keep the strips bent to shape and weighted down for the entire time before gluing them onto the deck or else the strips will start to lose their curve. Alternatively it also works to boil the veneer strips with the strips submerged in water. The strips will take longer to dry out after bending if they are boiled instead of being steamed, but sometimes they will bend more easily.

Another interesting approach is to use a steam iron, set to the highest heat and the steam function. Starting at the end of the veneer strip that will be at the back end of the boat, place the end of the mahogany strip in place along your marks on a flat surface and weight this end. Then in about 6 inch segments, iron and bend and weight in place the veneer strip until the entire strip is curved to the correct shape and weighted to stay in place while it dries. For this approach it is best to use a pencil line for your curve, rather than masking tape. A formica surface works well, or any surface that will not get too saturated with water. Of all the systems, I think this probably is the easiest and yields the best results since there is almost no time between the steaming process and the weighting since you are only doing small sections at a time.

With all of the steaming systems, you can expect some spring back, so it works best to curve the veneer slightly more than the final curve required to fit along the edge of the deck. If you get too much spring back, so the piece is not curved enough to match the edge of the deck, start again with the steaming and get a tighter curve, rather than struggling to get the piece to bend while gluing it in place. Size AA batteries stood on end can work well for weights when using the ironing system, but you need about 30 AA batteries per side spaced about 3/4 inch apart. If using this system (with all of the batteries!), do one side, let it dry thoroughly, and then do the second side. The top side of the veneer may be stained by the batteries so plan on using the side of the veneer that has been face down against the table. AA batteries will take too long to use as weights with any system other than the ironing system, since the veneer piece will cool too much during the weighting process.

12) Gluing the Mahogany Veneer in Place. When gluing the veneer in place, use regular straight pins (the same as are used in sewing) to hold the veneer down while the epoxy sets. The straight pins are thin and can be used close together to hold the veneer down. Fairly rigid straight pins are easier to use than really thin pins, also a big head makes the pins easier to push in - a plastic head on a straight pin can be ideal. For me the easiest way to push the straight pins in is to grasp the straight pin 1/4 inch above the pointed end in the tip of a pair of needlenose pliers and use the

needlenose pliers to push the pin through the veneer and into the deck.

Prepare to glue the veneer bow plate and deck edge strips in place. Plastic gloves are almost a necessity for this step. The bow plate will stick out further in front of the boat than the sides of the boat do. In Step #13 we will fill in this area beneath the bow plate by gluing on the 2 1/2 inch long wedge shaped piece of solid mahogany and then shaping it to bring the bow out to a nice fine leading edge. Mix 1 large mark of clear resin with 1 small mark of hardener. Clear coat the deck for the bow plate and along both edges of the deck for the edge veneer. Clear coat the transom for the mahogany veneer. On top of the resin remaining in your mixing container, mix one large mark of pre-thickened resin with one small mark of hardener. Mix in phenolic powder to thicken the resin to a consistency like mayonnaise where there is no sag, but the mixture is still creamy and smooth. Spread the thickened mixture along one edge of the deck in a band ¼ inch wide. Spread under the bow plate area. Place the bow plate. Use two straight pins to hold the bow plate down. Start the first 1/4 inch wide strip of veneer with one end against the bow plate. Put the first pin through the veneer and into the deck 1 inch back from the front end of the veneer. Put the pins through the veneer closer to the inside edge of the veneer because it is the inside edge that tends to want to lift up as you bend the veneer around the curve of the deck. Put a pin through the veneer into the deck every inch to hold the veneer in place (see Diagram H). Use the needlenose pliers to grasp the straight pins about 1/4 inch from the tip of the pin to push the pin through the veneer and into the deck. If you get some small splits in the veneer, the epoxy will push up and fill these and by the time you sand and varnish, they will not be noticed. However, you do want to try to avoid large splits. Cut off the veneer strips at the back end of the boat with scissors after they are attached. It is easiest to leave a small overhang to sand off later.

Apply the second veneer strip to the second side in the same manner. Mix one large mark of pre-thickened resin and one small mark of hardener and add phenolic powder for the second side. Fill any voids under the veneer along the edges of the boat with thickened epoxy. Wipe off any thickened epoxy that is on top of the veneer since the thickened epoxy will not dry to a clear color. Scrape excess epoxy out of the corner between the inside edge of the veneer and the deck with a scrap piece of veneer, being careful not to dislodge any of the pins. Where there is clear epoxy on the deck and on the veneer, the wood surface will look darker than the surrounding wood. However, when you varnish, the varnish will turn all of the wood to the same shade.

Glue the mahogany veneer on the transom in the same way you have glued on the edge veneer. If you have enough extra epoxy from the veneer along the edges of the deck use this epoxy if it is not starting to set up, or else mix one large mark of pre-thickened epoxy resin with one small mark of hardener and then add the phenolic powder to thicken. Use a combination of push pins and straight pins to hold the transom veneer in place.

13) Building the Bow. Where the sides come together at the bow, the next step is to glue the wedge shaped mahogany piece (2 1/2 inch by 1/2 by 3/4 inch) onto the front of the boat to form the bow (Diagram J). This wedge shaped piece does not go inside the boat between the two sides, it just glues onto the very front of the boat. First sand the front edges of the two sides flat where they come together so the mahogany piece can fit in flush against the front edges of the sides. This sanding is mostly to remove any bumps of epoxy that might hold the mahogany piece out of place. Be careful not to damage the thin veneer of the bow plate where it sticks out in front of the boat during this sanding. Now sand one end of the piece of wood for the bow to an oblique angle so that the wood fits right up against the veneer bow plate. The piece of mahogany should lie flat against the front edges of the sides of the boat where the sides meet at the bow with the deck end of the piece of mahogany fitting snugly up against the underside of the thin veneer bow plate. The piece of mahogany should be long enough that it sticks down slightly below the bottom of the boat. The mahogany piece is quite a bit wider than it really needs to be. This is for two reasons. The first reason is that some builders may not get the sides of the boat together as tightly at the bow as you have managed to do, and so we have left this mahogany piece a little wide so it will still cover the edges of the sides even if they are not so close together. The second reason for the

piece of mahogany being wider than it needs to be is that it is easier to glue on a wider piece and then sand it down than it is to glue on a closely fit piece which may slide sideways during the gluing so that it no longer covers the area that needs to be covered. The mahogany piece will be sanded to a tapered shape that matches the hull shape and is flush with the sides of the hull after it is glued in place and the epoxy has hardened. For now you are just gluing the unshaped mahogany piece onto the bow. One final note that has occasioned some questions is whether the veneer bow plate can be glued on after the mahogany bow piece is in place. The order of these two steps can be reversed. There are some advantages to gluing the veneer bow plate on first. When you glue on the mahogany bow piece after gluing on the veneer bow plate, the excess glue from gluing on the bow piece will fill any space between the bow piece and the veneer bow plate if you don't have the angle on the top of the mahogany bow piece exactly right to fit snugly up against the veneer bow plate. If you do things in the opposite order, the top of the mahogany bow piece may need sanding down to be flush with the deck, and, if you sand too far, you may sand through the top layer of veneer on the deck plywood. The only disadvantage to applying the veneer bow plate first is that you have to be careful not to bump and break the thin veneer bow plate before the mahogany bow piece has been added.

Place your boat upside down on the table with the deck against the table. Place saran wrap under the bow so you do not glue the front of your boat to the table. Mix 20 drops of clear resin and 4 drops of hardener. Use the usual syringes to count out the individual drops by squeezing the plunger very gently. I frequently flip my mixing pot upside down and use the bottom of the mixing pot for these small amounts of epoxy. Clear coat the edges of the plywood at the bow where the sides come together and the bottom of the veneer bow plate. Clear coat the back side and top of the piece of wood you are gluing onto the bow. After clear coating, mix 1 large mark of pre-thickened resin and 1 small mark of hardener. Add phenolic powder to thicken until there is almost no sag. Spread the thickened epoxy up the bow and along the bottom side of the thin veneer bow plate. Press the mahogany wedge shaped piece that you are gluing into place on the bow.

After the epoxy has set, sand the bow to shape with 100 grit production paper and then sand the entire hull smooth with 100 grit paper and then 150 grit and finish with 220 grit.

14) Fairing the Hull. Mix 1 large mark of clear resin with 1 small mark of hardener. Clear coat any exposed plywood edges along the chine where the sides and the bottom come together. After clear coating, mix 1 large mark of pre-thickened resin with 1 small mark of hardener and add phenolic powder to thicken the mixture to the point where it is still creamy, but will not sag. This mixture will be easier to use if it is not too thick. Fill any gaps along the chine (where the sides and bottom meet) (see Diagram I). Fill around the transom. Use a left over edge of veneer to smooth the thick-

ened resin mixture after it is applied so you will have less sanding to do later. Fill in over the push pin holes in the sides of the hull.

15) Assembling the Keel Halves. Here you will need two clamps and four flat clamping blocks each approximately 4 in. x 2 in. x 3/4 in.. Cut four pieces of plastic sheeting or saran wrap just a little bigger than your clamping blocks. Tape the plastic to the clamping blocks on the side that will be against your work so the blocks will not be glued to the keel. Put the two keel halves together with the finish side of the plywood facing out on each half. Align the two halves carefully with each other. To make certain the two halves will stay aligned while clamping, we will use two push pins pushed through the top half of the keel into the bottom half. Push one push pin through the top layer into the bottom layer of the keel at the bottom back edge of the keel under where the keel bulb will attach. Press the second push pin firmly through the top layer into the bottom layer of the keel near the top edge of the keel. Take the pieces apart and mark the inside of each piece with a big X if you haven't already marked them. Mix 2 large marks of clear resin and 2 small marks of hardener. Spread clear epoxy on the inside of each keel piece. Mix 3 large marks of pre-thickened resin with 3 small marks of hardener on top of any clear resin mixture you have left in the mixing pot. Add phenolic powder to thicken the mixture slightly to make a fairly runny mix. Spread the thickened mixture evenly on one keel half. Place the two halves together, align the two halves carefully with each other. Insert the push pins in the same holes as before to hold the keel halves lined up. Clamp with your clamping blocks on each side of the keel with the plastic between the keel and the blocks. Place one clamp 2 1/2 in. down from the top of the keel and the second clamp 2 1/2 in. up from the bottom of the keel. The push pins will help to keep the keel halves lined up. It will also help to have each clamp lined up exactly straight and not at an angle. (see Diagram M)

Inspect to make sure there are no gaps. Apply more clamps with clamping blocks and plastic if necessary to close any gaps.

16) Shaping the Keel. With 100 grit production paper bevel the forward edge of the keel so that it has a fairly fine entry but with somewhat rounded sections right behind the entry and beveled back about 3/4 of an inch from the leading edge. Sand the back edge of the keel so that it has a very fine, thin trailing edge that is beveled forwards about two inches before the keel reaches its full thickness of 1/4 inch. (A belt sander can work well on this step.) Fairing the keel in further from the edges may weaken the keel. To race in the Official T37 Class, the keel must maintain a thickness of 1/4 inch for at least one inch of chord length at the bottom of the keel and for at least one and a half inches of chord length at the top of the keel. All up and down the keel one quarter of the total chord length from the front edge of the keel to the back edge of the keel must maintain a minimum thickness of 1/4 inch. The profile from the side of the keel cannot be altered. Do not bevel the top tabs which stick out and will sit inside the hull, and do not bevel the curved bottom shape where the ballast casting attaches. Sand the keel smooth with 220 grit paper. Drill out the two holes in the bottom of the keel where the ballast attaches using a 3/16 inch drill bit.

17) Attaching the Ballast Casting. Mix 1 large mark of clear resin and 1 small mark of hardener. Clear coat the bottom of the plywood keel where the ballast casting attaches. Clear coat the edges of the plywood where the ballast attaches.

Sand the flat inside surface of the ballast to shiny metal. Clear coat this surface. Sand the wet epoxy into the metal with 220 grit sandpaper. Plastic gloves are a help here. This process ensures that there is no oxidation between the metal and the epoxy and gives maximum adhesion. (Oxidation happens almost instantly on a metal surface.) Mix 2 large marks of pre-thickened resin with 2 small marks of hardener on top of any clear resin mixture you have left in the mixing pot. Add phenolic powder to thicken the mixture to a consistency of mayonnaise with no sag. Spread the thickened mixture on the bottom of the keel fin where the ballast attaches. Use the two stainless steel machine screws to hold the ballast in place. The screws run through one zinc casting, through

the plywood keel fin and through the second zinc casting. Screw the nuts on loosely. Align the castings with the shape of the bottom of the keel fin. Tighten the machine screws with a phillips screw driver. Fill the holes over the nuts and screw heads with thickened epoxy until flush with the surface of the casting. Fill any gaps around the edges of the castings with thickened epoxy. Smooth with an excess strip of veneer so you will not have too much sanding to get a smooth finish.

18) Fitting the Keel. In the next step you will glue in the keel, the keel support webs and the RC deck. First put everything in place to see how it will fit. Slide the keel into the hull from the bottom. Put the front tab in first and then the back tab. Center the keel so that each tab has an equal amount of overlap at the front and back of the keel slot. Support your hull so the keel can hang down freely below the hull. It is good to be able to sight from in front of the boat or from the stern to see if the keel needs to be pushed right or left to be straight (see Diagram N). Set your boat up so that if the keel is not hanging exactly straight down, you will be able to slide something against it from one side or the other to hold it straight while the epoxy sets up. A square or a small level is handy - or you can get the keel straight by eye if you are good at judging angles.

Place the four keel support webs in place inside the boat. The keel support webs are the small pieces approximately 2 1/2 in. by 3/4 in. They run across the boat with the square end butted up against the top of the keel inside the hull. The curved end goes down and to the outside of the hull. Two keel support webs go on each side of the keel. Space the keel support webs approximately 3 1/2 in. apart from each other. (see Diagram O) The keel support webs do not reach out to the side of the hull. Be certain that there is no hardened epoxy beneath the keel support webs, since this would hold them up too high and the RC deck which sits on top of the keel support webs would also be higher which might not leave enough space for the servos beneath the cockpit

cover. If there is any hardened epoxy beneath where you have located the keel support webs, either move the webs sideways slightly or chip off the epoxy with a chisel. If the hardened epoxy is just out towards the chine, you can sand off the bottom outside end of the keel support web enough that it sits flat on the bottom of the boat. The top edges of the keel support webs should be flush with the top edge of the keel inside the hull. The keel support webs will be glued in with a very thick epoxy mixture at the same time as gluing in the keel. The thick epoxy mixture will hold the keel support webs upright while the epoxy sets.

The RC deck sits on top of the keel support webs right underneath the cockpit opening. The RC deck is approximately the same shape and size as the cockpit opening. The RC deck will be glued in at the same time as the keel and the keel support webs. In the gluing process, you will want to lower the RC deck down through the cockpit opening and set it gently on top of the keel support webs. Fashion 2 handles out of masking tape and stick them to the top surface of the RC deck. You will be able to hold the RC deck by these masking tape handles while lowering it into place.

19) Gluing in the Keel. Remove the RC deck, keel support webs and the keel from the hull. Mix 2 large marks of clear resin with 2 small marks of hardener. Clear coat the top of the keel. Clear coat the bottom of the hull on the inside all around the keel slot. Clear coat out to both sides of the hull on the inside of the hull in the area from the front of the keel slot to the back of the keel slot. Clear coat the plywood edges inside the keel slot. Clear coat the bottom of the RC Deck (the less finished side). Clear coat the keel support webs leaving a little bit at the top uncoated so you can grab them. Place the keel in place in the hull. Make sure that the slanted edge of the keel is towards the front of the boat and that the back edge is perpendicular to the deck (i.e. straight up and down).

Mix 8 large marks of pre-thickened resin with 8 small marks of hardener. Thicken with phenolic powder until the mixture does not sag. This should be one of your slightly thicker mixtures. Remember this mixture has to be thick enough to support the keel support webs so they do not slump over sideways before the epoxy is set. However, you do still want the mixture to spread easily and smoothly. Apply the epoxy with the brush. Use an ample amount of thickened epoxy all around the keel where it comes up through the hull to form a wide fillet between the keel and the inside of the bottom of the boat. Do a fillet on both sides of the keel, in front of the keel and behind the keel. Quickly smooth the fillets using your third plastic spoon.

Check the keel from the bow or from the stern to be sure it is properly aligned and not tipping sideways (Diagram N). Push something against the bottom of the keel from one side or the other if the keel is not hanging straight down.

Lay thickened epoxy down on the bottom of the hull inside where the keel support webs will sit. Put the keel support webs in place with the square end against the keel where it comes up inside the hull. The round cornered edge faces down and out towards the side of the hull. (Diagram O). Tweezers are helpful for positioning the keel support webs.

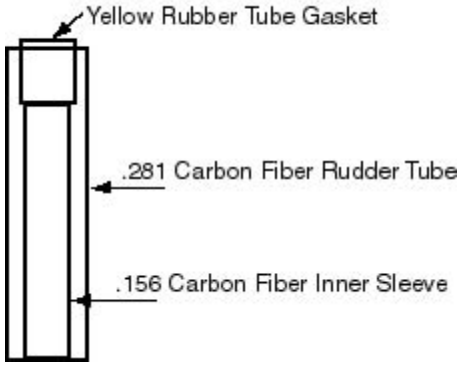
Mix an additional 2 large marks of pre-thickened resin with 2 small marks of hardener. Thicken with phenolic powder as before. On the *bottom* side of the RC Deck, place the thickened epoxy along the centerline and out to the sides over where the keel support webs will make contact. Use ample epoxy since it is hard to tell exactly where the keel support webs will be. Holding the masking tape handles on the top surface of the RC deck, set the RC Deck down gently on the keel and keel support webs. Press the RC deck down very gently into place so it is touching the top of the keel and keel support webs and is not being held up by the thickened epoxy. If the RC deck is too high the servos will not fit beneath the cockpit cover.

Check the keel alignment a final time to make sure the keel is still straight and aligned with the centerline of the boat. Leave everything to set overnight. Make sure your boat doesn't get nudged by the cat while the keel is setting up!

20) Installing the Rudder Tube. The rudder tube comes up inside the boat to a level that is higher

than the waterline so that water cannot run into the boat beside the rudder shaft. In many conditions the level of the rudder tube keeps all water out. However, when sailing in large waves, every time a wave crest passes the back part of the boat, the crest will be higher than the top of the rudder tube inside the boat and water will be forced up along the rudder shaft and into the boat. This is where a rubber gasket becomes important in keeping your boat dry. The rubber gasket seals the space between the rudder shaft and the rudder tube. Filling the rudder tube with a light synthetic grease is also helpful in keeping out water and will also make it easier for the rudder servo to turn the rudder. The rubber gasket will be at the top of the rudder tube. With the gasket at the top of the rudder tube, it would be easy to replace the rubber gasket if you ever needed to replace it.

There are 3 parts to the completed rudder tube: the larger diameter carbon fiber outer tube (just slightly over 1 inch long and .281 inch outside diameter), the carbon fiber inner sleeve liner (7/8 inch long and .156 inch outside diameter), and the yellow rubber tube gasket material (3/4 inch long with an outside diameter of .185 inch). The inner carbon fiber sleeve liner will be glued into the larger diameter carbon fiber rudder tube so that the two tubes are flush at the bottom end. This will leave space for the yellow tube gasket to be pushed into the top of the larger diameter carbon fiber rudder tube. The yellow tube gasket is extra long so you can hold onto it when pushing and twisting it into place. Later the excess yellow tube will get cut off. One consideration to keep in mind when gluing everything together is not to get too much epoxy into the inside of the inner rudder tube sleeve or inside the yellow rubber tube gasket. The yellow rubber tube gasket is primarily held in place by being a very tight fit rather than being held in place by the epoxy.



When installing the rudder tube, it is helpful to use the stainless steel rudder shaft to hold the rudder tube in the correct position and to check to make certain that the rudder tube is being glued in straight and not tipping forward or back or to one side or the other. DO NOT CONFUSE THE THINNER 1/16 INCH DIAMETER STAINLESS STEEL ROD WITH THE THICKER 3/32 INCH ROD FOR THE RUDDER. The stainless steel rudder shaft is the larger diameter (3/32 inch) stainless steel rod (shiny silver color) which measures 5-3/8 inches long (or longer). File or sand the ends of the rudder shaft so they are smooth with no sharp edges to catch when sliding the shaft into place in the rubber tube gasket. You do not want to have the rudder shaft permanently glued into the rudder tube when the epoxy sets up hard. To prevent the rudder shaft from getting glued in permanently, wax the stainless steel rudder shaft very thoroughly by rubbing the stainless steel rudder shaft repeatedly against a wax candle. Make certain not to miss any surface area on the rudder shaft! The epoxy will not be able to stick to the waxed stainless steel as long as you have waxed every bit of the shaft thoroughly.

It is quite easy to glue the rudder tube into your boat at the same time as gluing the parts of the rudder sleeve together. Mix 10 drops of clear resin with 2 drops of hardener. Stir thoroughly. Coat the outside of the smaller diameter carbon fiber tube with epoxy. Slide this smaller diameter carbon fiber sleeve up into the larger diameter 1 inch sleeve so that the bottom edges of each carbon fiber sleeve are lined up. From the top, force the yellow rubber gasket tube into the top of the larger diameter carbon fiber tube twisting and pushing until the yellow gasket tube slides in and hits the top of the inner carbon fiber sleeve liner. With a sharp knife cut off the yellow tube so that it sticks out from the top of the carbon fiber tube just 1/16th of an inch. Cut against a scrap of wood or plywood so as not to dislodge the yellow tube that is inside the rudder tube while cutting off the excess yellow tube. Now the assembled rudder tube is ready to be installed in your T37.

Slide the waxed stainless steel rudder shaft into the top of the rudder tube starting at the end with the yellow tube gasket. The rudder shaft will be a very tight fit in the yellow tube gasket. Slide the rudder shaft down through the rudder tube so that half the rudder shaft is sticking out below the tube and half is sticking out above the tube. Mix ten additional drops of clear epoxy with 2 drops of hardener. Coat the inside bottom surface of the boat around the rudder hole. Coat the

outside surface of the rudder tube. Mix two large marks of pre-thickened epoxy with two small marks of hardener. Thicken to a smooth, no sag consistency with sufficient phenolic powder that a glob of the mixture does not start to slump off the brush when held up for a count of 30. The mixture should still be somewhat self levelling and not dry or putty like.

Position the rudder tube inside the boat with the waxed stainless steel rudder shaft sticking down through the rudder hole in the bottom of your boat. The yellow rubber gasket tube should be at the top of the rudder tube. Heap the thickened epoxy up against the outside surface of the rudder tube evenly all around the rudder tube and let the epoxy slump down against the inside bottom of the boat forming a thick fillet in a collar around the rudder tube and attaching the rudder tube strongly to the bottom of the boat. Don't be shy about using a lot of epoxy here. The amount of weight you will be adding is minimal, and you want a strong rudder post for sailing in all conditions! A little dab won't quite do it here! Remember there will be a considerable amount of sideways force on the top of the rudder tube and you want the base of the rudder tube to be firmly attached to the hull so as to be able to take this sideways load. This means a big thick fillet all around the rudder tube. (CA/super glue will not work here!)

It is very important now to get the rudder shaft straight so that when the epoxy holding the rudder tube sets up hard, the rudder will be straight and true. The rudder shaft should be perpendicular to the deck, not tipping forward or back and not tipping to either side. Site the rudder shaft carefully. Using a small plastic square on the deck can be helpful. Site from the back of the boat to make certain the rudder shaft is lined up exactly with the back edge of the keel. Cut a three inch piece of blue masking tape. Put the tape across the rudder port opening in the deck with one edge of the tape against the rudder shaft where the rudder shaft sticks up. Put the tape on the side of the rudder shaft that the shaft tends to lean towards or in front of the rudder shaft if the rudder shaft tends to lean forwards. Use a second piece of tape to keep the rudder shaft from leaning in a second direction if necessary. If you think your work surface or the boat might get jiggled before the epoxy sets up hard (feline influence?), use more pieces of tape to further stabilize the rudder shaft while the epoxy sets up hard. Site from the back once more, lining up the rudder shaft with the back edge of the keel. A rudder tipped to one side or the other will still work, but you may as well get the rudder and the keel lined up. You are not going to change this very easily later. Recheck everything in five minutes, in ten minutes, in twenty minutes and in 30 minutes! Keep the door closed until the epoxy is set up so nothing can bump your boat!

After the epoxy has set up hard enough that the position of the rudder tube won't be disturbed, you can check to make certain that your epoxy has stayed in position up against the rudder tube and has not all slumped down into a thin puddle on the bottom of the boat due to being too runny. There is no harm in mixing one additional large mark of pre-thickened resin with one small mark of hardener and adding to the fillet around the rudder tube.

It is important <u>not</u> to try to remove the stainless steel rudder shaft until the epoxy holding the rudder tube is set up hard like glass. If the epoxy is still somewhat flexible because it is not entirely set up, the epoxy will hold onto the stainless steel shaft and not let it go. The epoxy must be very hard, fully set, and then the waxed stainless steel shaft will be able to break free. Grab the top or bottom of the stainless steel shaft with pliers and twist with a sudden movement to free the shaft. Once the shaft has twisted free of the epoxy bond, you should be able to pull the shaft out of the rudder tube. The pliers will scar the surface of the shaft so it is no longer smooth. Make sure to laminate this abraded part of the shaft down in the rudder when gluing up the rudder so that the part of the shaft that is rotating inside the rubber tube gasket at the top of the rudder tube and inside the rudder tube will spin easily and smoothly. Don't scrape up any more of the shaft than necessary with the pliers.

21) Assembling and Shaping the Rudder. The two rudder halves are each approximately 6 in. long x 2-1/8 in. wide. Each rudder half has a groove cut in it. Bend the 5-3/8 inch (or longer) 3/32" stainless steel rod (shiny silver color) in a smooth curve at one end so that it fits into the groove. The stainless steel rod (stainless steel rudder shaft) sticks out the top of the rudder. You will want to

glue the stainless steel rudder shaft in place at the same time as gluing the two halves of the rudder together, otherwise the glue from gluing the two rudder halves together would squeeze out and fill in the groove that has been cut for the rudder shaft, making it impossible to put the rudder shaft in place later.

Position the two rudder halves so they are lined up with each other. Hold the two halves in place by pushing a push pin through the two halves near the top of the rudder and a second push pin through the two halves near the bottom of the rudder. It is easiest to clamp the rudder halves together onto a flat board or onto a flat table surface. Put plastic under the rudder halves so they are not glued to the board or to the table. Use a long narrow clamping block covered with plastic on the top side of the rudder pieces with one or two clamps to clamp the two halves of the rudder together. Make certain that you have the silver stainless shaft not the thinner yellow brass rod!

There are several systems for ensuring that the rudder shaft stay centered between the two halves of the rudder so that the shaft is lined up with the flat plane of the rudder and not coming out of the top of the rudder at an angle relative to the flat plane of the rudder. The simplest system is if the shaft is fairly tight in the slot and can be aligned by hand so that it will stay centered between the two halves and parallel to the clamping board or table surface. A second system is to place little shims under the shaft close to where it emerges from the top of the rudder and also at the top end of the shaft and then to add small weights to hold the shaft down against the shims. The pages of a paperback novel or a catalogue can also work well with the top end of the rudder shaft stuck in between the pages of the novel at the right distance from the conclusion of the novel so that the shaft is held at just the right height above the table (the novel is lying flat on the table with the cover facing up and the rudder shaft inserted parallel to the spine and in fairly close to the spine- the Yacht Racing Rules book works well also and may impart some of its knowledge in the process).

Mix 1 large mark of clear resin with 1 small mark of hardener. Take the two halves of the rudder apart and coat the inside surface of each half with the clear resin mixture. Coat inside the groove with clear epoxy. Mix 1 large mark of pre-thickened resin with 1 small mark of hardener on top of any clear resin mixture you have left in the mixing pot. Add phenolic powder to thicken slightly to make a fairly runny mix. Coat the inside surface of one half of the rudder with the thickened mixture. Place the two halves of the rudder together.

Put the push pins back into place to hold the two halves of the rudder in alignment. Push the stainless steel rod down into place in the groove in the rudder and cover this with thickened epoxy and smooth over the rod where it is set into the rudder. Clamp the two halves of the rudder together with the clamp and clamping block. Make certain the clamping pad is completely covered with plastic where it is in contact with the resin and the rudder! Clean off any epoxy you can get to, where it has squeezed out. Try to keep epoxy from running up along the stainless steel rudder shaft at the top of the rudder where the rudder shaft leaves the rudder.

Allow the epoxy to harden overnight. If both sides of the rudder are smooth enough, then you are ready to sand the rudder. If you need to fill over the rudder shaft on either side mix 10 drops of resin to 2 drops of hardener, stir, add a small amount of phenolic powder and use this mixture to fill over the rudder shaft. When this epoxy has set, sand the rudder so the front edge is slightly beveled to a point 1/4 inch behind the front edge. Bevel the back edge gradually forwards to 1 inch forwards of the back edge. The trailing edge of the rudder can be very thin, while the leading edge should be smooth and rounded like the front edge of an airplane wing (see the “Rudder Cross-section” diagram on the second page of the Assembly Diagrams at the back of the instructions.) Chip off any epoxy that has adhered to the stainless steel rudder shaft above the top of the rudder, but try not to scratch or sand the rudder shaft itself since the rudder shaft should be kept round and smooth. Measure the stainless steel rudder shaft so it sticks up above the rudder 1-1/2 inches. Clip the excess stainless shaft and round and polish the end.

22) Clear Coating the RC deck, and around the Main Deck Openings. Mix 2 large marks of clear resin and 2 small marks of hardener. Clear coat for 1/2 inch on the deck all the way around the

cockpit opening. Clear coat the edge of the plywood in the cockpit opening. Clear coat for 1/2 inch on the deck around the rudder access port. Clear coat the edge of the plywood in the rudder access port. Clear coat the edges of the Radio Control deck. Clear coat with a fairly thick coating the surface of the Radio Control deck. Apply the Proof of Authenticity Label at the back of the deck. The surface of the Radio Control deck must be very smooth for the servo tape to stick firmly. When clear coating on a horizontal surface, you will not get runs and sags and a thicker application can result in a very smooth glossy surface. After these surfaces have set up hard, use a paper towel moistened with warm water to wipe off any of the waxy build-up that often occurs on clear-coated surfaces. Wipe dry with a clean paper towel.

23) Clear Coating the Keel and Rudder and Filling around the Keel on the outside. Mix 1 large mark of clear resin and 1 small mark of hardener. Flip your yacht upside down. Clear coat the front and back edges of the keel where the edges of the plywood grain are exposed. Clear coat the front and back edges of the rudder where the edges of the plywood grain are exposed. With your boat still sitting upside down, fill in around the base of the keel in front and in back and along the sides where the keel goes through the bottom of the hull. A sharply pointed stick or a pencil point can work well for running a thin bead of epoxy along the sides of the keel where the sides of the keel join the bottom of the boat. Mix one large mark of clear epoxy and one small mark of hardener and use this mixture to brush a very thin clear coat over the entire keel, going back over the edge grain at the front and back edges of the keel where the epoxy has sunk in. There are painting options given in the Painting and Varnishing section for different ways to coat the ballast casting, but generally clear coating the ballast casting with epoxy is a good approach. Clear-coat the ballast bulb and sand the resin into the surface of the zinc casting. Brush over the entire keel and ballast casting to further smooth the clear-coated surfaces. Mix one large mark of clear resin and one small mark of hardener for clear coating the rudder unless you have enough resin mixture left over from clear coating the keel.

24) Installing the Mast Sleeve Tube. Slide the longer mast tube section into the mast hole in the deck in front of the cockpit opening. Position the tube so the mast is vertical. With the mast tube in the boat, mark a circle with a 1 in. diameter, centered around the base of the mast on the bottom inside of the boat with a pencil. After drawing the circle, remove the mast.

The mast sleeve tube will be set into the deck and epoxied into the bottom of the boat so that no water can enter the boat at the mast hole since the mast sleeve tube will be sealed with epoxy at the deck and where the mast sleeve tube sits on the bottom of the boat. The mast sleeve tube should stick up above the deck about 1/16 inch. It is better not to have the mast sleeve tube flush with the deck, because the bottom of the stainless steel boom vang loop which pivots around the mast might scrape the deck if the mast sleeve tube does not stick up a slight amount above the deck. Sand the mast sleeve tube shorter if necessary so it does not stick up above the deck much more than 1/16 inch. Put the sanded end of the mast sleeve facing down so this end will be covered with epoxy in the bottom of the boat, in case this end is not as neat as the original end.

The mast sleeve tube is set in a mound of thickened epoxy on the bottom of the boat (Diagram P). It is crucial not to glue the base of the mast into the mast sleeve tube during this process. Wrap several wraps of blue masking tape around the longer mast tube section at a point 2 inches up from the bottom end of the tube. The tape will keep the mast tube from sliding all of the way down into the mast sleeve tube and should keep the bottom of the mast tube out of the epoxy gluing the mast sleeve tube to the bottom of the boat..

Mix 20 drops of clear resin and 4 drops of hardener. Clear coat within your circle on the bottom of the boat. Mix 2 large marks of pre-thickened resin and 2 small marks of hardener. Add phenolic powder to get a fairly stiff mixture. Place a mound of the thickened epoxy heaped up to about 3/8 in. thick within the circle. Work quickly so the epoxy does not start to set off before you finish. Slide the mast sleeve tube down through the deck opening and push the bottom of the mast sleeve tube straight down into the mound of epoxy until the mast sleeve tube is resting on the bottom of the boat. Slide the bottom of the mast into the mast sleeve tube. Use a square on the deck to get the mast square with the deck from side to side and almost square from front to back. Let the mast lean backwards just the slightest amount, about one degree of rake (backwards slant). When the mast sleeve tube is correctly positioned, slide the mast out of the mast sleeve tube very carefully so as not to disrupt the position of the mast sleeve tube!

After the epoxy at the bottom of the mast sleeve tube has set up, mix 5 drops of clear resin with 1 drop of hardener. Use the tip of something sharp to drag a small bead of epoxy around the top of the mast sleeve tube between the mast sleeve tube and the surface of the deck to seal the mast sleeve tube at the deck.

Congratulations on your progress so far!

Varnishing and Painting

1) Varnishing the Deck. Any oil-based or polyurethane based exterior clear varnish is suitable. We generally choose a gloss varnish, rather than a satin finish. Do not use a water-based exterior varnish, because it will not bring out the true beauty of the wood and will not, in our experience, be nearly as durable. Marine varnish is excellent for durability and elegance, although the real advantage of marine varnishes is the greater UV protection. Since your T37 will not be moored outside throughout the entire year, the UV factor is relatively less important than on a big boat. Prepare the deck by sanding with 220 grit paper. Hand sanding is much safer than machine sanding since it is extremely easy using power equipment to sand right through the surface veneer. Always sand with the grain and never across the grain. Any sanding scratches created by sanding across the grain will be accentuated by the varnish, even though not really visible before varnishing.. Any residue of epoxy on the surfaces to be varnished needs to be sanded until it is almost invisible or there may be a slight color difference beneath the varnish where the epoxy saturated the wood to a different degree than the varnish. A combination wood stain and filler can be used on the deck, although typically we don’t use a stain on the boats we build and the stain will not go on evenly where there

is any epoxy on the deck. Any epoxy residue or fingerprints needs to be sanded until no longer visible if using a wood stain before varnishing.

But wait! What about the round hole behind the cockpit! Not to worry! Varnish first and then at a later step, we will epoxy in the carbon fiber tube that will go in this hole.

Varnish the mahogany veneer transom at the same time as the deck. Follow the instructions on your varnish container. When varnishing the hull, keep dust and movement of air in your drying room to a minimum until the varnish is tack-free. Sand lightly with 220 grit between each coat of varnish. Two or three coats should give a nice finish. As many as six or eight coats can be applied to achieve a perfect finish. If you are planning on varnishing the deck and painting the hull, it works very well to put on several coats of varnish and then to tape off the deck and paint the hull. When you have finished painting the hull, pull the tape off the deck, run a piece of 220 grit sandpaper very lightly along the edge of the deck to clean up the line between the paint and the varnish, and then sand the deck lightly and apply the final coat of varnish. This is the best way to get a very sharp line between the painted surface of the hull and the varnish on the deck.

2) Painting the Hull and Keel. One approach is to use a wood filler on the hull to fill the wood grain. Most available wood fillers are combined with stains. Follow the directions on the filler/stain can. Another approach is to use a dark paint to paint the hull and then to apply several coats of varnish over the paint, sanding between each coat. This results in a very smooth job and makes it unnecessary to use a filler. (If you varnish over a light colored paint, the color of the paint will change and be very much more yellow with lighter and darker patches.) A couple of coats of paint will do a fairly nice job without using filler or varnish over the top, although you will see somewhat more wood grain through the paint. A slightly different approach is to varnish the entire hull and then to paint the keel and the rudder.

It is also possible to clear coat the sides and bottom of the hull with epoxy. This is a good approach if you are planning on painting your hull a light color. If you decide to clear-coat the sides and bottom of the hull, keep this clear coating of epoxy very thin, brush it out as thin as possible, otherwise the epoxy coating will run and sag and you will have to do a lot of sanding to get a smooth surface. Brush over this coating several times to smooth the surface, but not applying any more resin after your first thin coat. Check to make sure none of the clear coating epoxy on the sides is running down and making drips on the deck. Don't add any more weight than necessary!! Make certain your boat will not glue itself to your work surface by setting the boat upside down on blocks. It is best that the blocks do not stick out past the edges of the deck or else the blocks may become glued on. The trick with clear coating is to keep the coating thin. First of all, you don't want to add a lot of unnecessary weight to the boat, and, secondly, a thicker coating of resin will always sag and run. To get the clear coat to go on in a thin coat, the resin and hardener mixture has to be somewhat warm and the resin and hardener mixture has to be applied quickly so it does not begin to set up. If the temperature is warm, it is best to mix just one large mark of resin and one small mark of hardener at a time. If the temperature is cool, it is helpful to warm the resin and hardener mixture slightly by stirring it under a lightbulb or a spotlight until the mixture changes from the consistency of honey to the consistency of maple syrup. Do not overheat the mixture or the chemical hardening process will be launched into high gear and the mixture will thicken before you can use it because it will have started to set up. If you are planning on staining your hull and then varnishing it, do not clear coat the hull. A stain will not work over clear-coated wood. If you are going to varnish the hull, you can varnish over the clear-coated finish, but, having tried both approaches, my inclination is usually not to clear-coat before varnishing. DO NOT CLEAR COAT THE HULL WHEN THE AIR TEMPERATURE IS WARMING UP! Wood pores contain lots of air. When the air in the wood is warming up, the air expands and is pushed out of the wood. The air being expelled from the wood will cause lots of little bubbles in the surface of the epoxy. Even if you keep brushing the bubbles out, more and more bubbles will continue to form. Always clear coat when the air temperature and the wood surface are both cooling down.

Easier than coating with epoxy is using a high build primer. Using a primer in place of clear

coating with epoxy can often result in a lighter boat and less work. Primers seem like an extra step, so why not just start with paint right away? The answer is that primers save work. Primers are designed to build very quickly so they can give a very smooth surface after one or two coats. Primers also sand very easily, and here they have a big advantage over clear coating with epoxy, because epoxy is much tougher and does not sand easily. There is some advantage to the epoxy clear coat in that the surface will be slightly better protected against dents, but it is considerably more work to coat with epoxy and the finished surface will be very similar after painting. For a complete introduction to using primer, our YouTube video “Using Primer When Painting by Tippecanoe Boats” will tell you everything you need to know. While on YouTube, check out Dan Newland’s video, “Varnishing and Painting the T37”. There is lots to learn here about getting a perfect finishing job. For a simpler approach refer to the YouTube video, “T37 Assembly Part 2” which gives excellent techniques for spraying with a spray can and even demonstrates what happens when you do not use the right techniques!

On the ballast casting, a good approach is to coat the zinc casting with clear epoxy sanded into the surface of the zinc while the epoxy is still wet. This will give good adherence before painting although the epoxy will need to be wiped with a damp cloth after it is hard and sanded lightly before painting. It is also possible to use a metal primer on the ballast casting instead of clear coating with epoxy. After priming or clear coating, you can paint with the same paint that you use on the rest of the hull. Some paints may adhere to the zinc casting without a primer, although others may have problems. Zinc can be etched before painting by brushing on vinegar. Allow the vinegar to sit for 20 minutes before wiping the vinegar off with a damp paper towel and then drying. This process makes the zinc more receptive to paint and works well before a primer also.

For the hull an oil-based exterior gloss enamel is excellent. An epoxy-based enamel is another good choice. Latex is less suitable. Tape off the varnished deck along the edge so paint will not get on the varnish. Blue 3M painters masking tape is excellent here. Make sure the varnish is thoroughly dry before putting tape on the deck surface. On the rudder, tape off the stainless steel tiller shaft above the rudder plate to avoid getting paint on the rudder shaft where it has to slide through the hull. Paint the rudder at the same time as the hull.

Follow the instructions on your paint container. Usually two coats are sufficient. Either brushing or spraying is suitable. If you spray, cover the entire deck area with plastic taped down around the edges so as not to get paint spray on the deck. It is sometimes easier to get a finer finish with spraying, but remember to spray successive light coats allowing the paint to dry between coats, otherwise the paint will run and sag. Brushed on coats should be thin also to avoid runs.

If you want to add a waterline stripe or paint with a different color paint below the waterline, use a high quality 3M blue masking tape or the even higher quality 3M green painters masking tape to tape off your lines between paint colors. The waterline is 1/4 inch back from the break in the bow and 1/8 inch forwards from the back bottom edge of the transom. A vinyl automotive striping tape can also make a very clean waterline stripe or transition between two different colors.

Installing the Rudder and Radio Control

1) First Considerations. There are two servos included in the T37 Kit. One servo has the number HS-422 on the top. The second servo has the number HS-645MG on top (unless you chose to upgrade further to the optional digital HS5645MG, digital D645MW, or the digital HS7954SH). The 422 servo is less powerful and should be used for the rudder. The balanced rudder takes only a very small amount of force to turn, whereas the sails require considerably more force to sheet in on a windy day.

2) Making the Rudder Linkage Rod. Find the thinnest stainless steel rod 1/16 inch in diameter and 36 inches long. Start by clipping off the flattened section of rod at each end of the 36 inch piece if there is a flattened area stamped with the grade of the stainless steel. These rods are 316 stainless steel, the highest grade of stainless for salt water exposure. Carefully measure and cut a piece of

the rod to be exactly 16 5/16 in. long. Most pliers have a cutting edge that will cut the rod easily. Make a mark 5/16 in. from one end. Make a perpendicular bend at this mark. Make the bend very sharp and square, not a gentle curved bend. The best way to get the bend really clean and sharp is by making the bend in a vice and then tapping the rod lightly with a hammer while it is still in the vice to get the bend into a sharp 90 degree angle.

Find the smallest diameter (1/8 inch) carbon fiber tube. Cut a 12 inch piece of this tube. Carbon fiber tubing is relatively easy to split when cutting. To reduce the chance of the tubing splitting, wrap the tube tightly in two or three layers of blue masking tape around the tube before cutting. Mark the tape with a Sharpie permanent marker for your cut and cut through the tape and tube together. As an extra step, you can tape the carbon fiber tube firmly to a thin piece of wood. If the tube is taped firmly enough to a thin stick of wood, you won't even know when you have cut through the tube, since there will be no pulling or tearing at the end of the cut. We recommend a hacksaw with very fine teeth or a hobby saw with very fine teeth. If you don't have a fine blade already, it might be worth the few dollars it would cost to pick one up from the hardware store. If you buy a chrome-molybdenum alloy blade - it will cost more than a standard blade but it will last five times longer. After buying one, you'll never purchase any other kind of blade! But if you can't find one of these, any fine-tooth hacksaw blade will do. While cutting carbon fiber tubing, hold the tubing firmly with one hand against the edge of a table or work bench. Do not clamp the carbon fiber tube in a vice since there would be far too great a chance of splitting the tubing with the pressure of the vice. Carbon fiber tubing cannot be cut with a knife.

Slide the 12 inch long piece of 1/8 inch diameter carbon fiber tube onto the 1/16th inch stainless steel rod into which you have just put one bend. Sliding the carbon fiber tube onto the stainless rod cannot be done after the second bend is put into the stainless steel rod! Do NOT remove the carbon fiber tube while making the second bend!! The carbon fiber rod stiffens the rudder control rod so it will not flex in ultimate sailing conditions under load.

Measure 15 1/2 in. *from the first bend* in the stainless rod and make another mark. Make a second bend at this mark with both bends lined up with each other (parallel and bending in the same direction!). Do not try to unbend the rod after bending it because it is sure to break. The end with the longer section bent down goes to the back of the boat and attaches to the rudder control arm on the rudder.

3) Installing the Rudder. (See Diagram R) Find the brass rudder control arm that comes in the parts bag. The stainless steel socket head screw tightens with the allen wrench which is included in the parts bag.

Filling the rudder tube with a light synthetic grease is helpful in keeping out water and will make it easier for the rudder servo to turn the rudder smoothly. The carbon fiber tubes and the yellow synthetic rubber gasket are impervious to every known lubricant so you can use any lubricating material for this purpose. Slide the rudder shaft up through the rudder tube in the hull until the top of the shaft sticks out 1/8 inch above the yellow rubber gasket on the inside of the hull.

The rudder control arm (brass) can be installed with the brass arm on top and the silver hub facing down, or, if there is a clearance issue, the rudder control arm can be installed with the silver hub facing up and the brass arm underneath. Slip the end of the rudder linkage rod that has the longer perpendicular section down through the small hole at the end of the rudder control arm. Slide this assembly, with the rudder control arm going first, in through the cockpit opening and back to the rudder shaft. Slide the large hole in the center of the rudder control arm over the top of the rudder shaft. The rudder control arm should be pointing towards the port (left) side of the boat with the head of the socket screw toward the starboard (right) side of the boat, and the linkage rod leading forward.

Slide the rudder all of the way up so the rudder itself is 1/16" from touching the bottom of the hull. Check to make sure there will be adequate clearance between the top of the rudder and the hull when the rudder is turned at a 45 degree angle on either side. With the rudder set straight, and the rudder control arm perpendicular to the centerline of the boat, tighten the socket screw in

the front of the rudder control arm with needlenose pliers initially by grasping the outside of the screw head. To tighten the socket head screw really tight, use the allen wrench in the rudder access port. Using the allen wrench, tighten the socket screw as tight as you are able to get it so it will not slip on the stainless steel rudder shaft.

4) Fitting the Remote Control Gear. The two servos, one to control the rudder (HS422) and one to control the sails (645, 5645 or 7954), will mount on the RC deck in the cockpit. (See Diagram S). The servos will be attached to each other with double-sided servo tape and then mounted to the RC deck with double-sided servo tape. Wipe the servo deck carefully with a paper towel dampened with warm water and then wipe dry with a clean paper towel to remove any waxy build-up from the epoxy setting up. The servo tape will not adhere if there is any waxy build-up left. The servo tape is ¾ inch wide double sided tape. It is a thicker, slightly spongy tape, usually a solid color, most often white. The battery pack will sit just to the stern of the two servos. The receiver will attach to the RC deck to the stern of the battery pack with velcro. The off/on switch will be attached with velcro to the underside of the deck at the back edge of the cockpit opening. The battery pack is held from sliding side to side by two screw-eyes on the outside edges of the RC deck in the holes that are predrilled and with velcro on the RC deck and on the flat surface of one side of the battery pack. Screw screw-eyes into these holes in the RC deck now.

The servos must be mounted on the RC deck as shown in Diagram S. Be certain with both servos that the end of the servo on which the control arm mounts is facing the correct way. The rudder control servo is in front with the control arm hub to the port side of the boat (left side when facing forward). The sail control servo is behind the rudder control servo with the control arm hub also to the port side. The two servos are facing with the control hubs in the same directions, and the two servos are slightly offset from each other by 3/8 inch. Tape the two servos to each other with the double sided servo tape and place them roughly in position on the RC deck. Do not stick the servos to the RC deck at this point!

5) Mounting the Servo Control Arm for the Rudder. Plug the switch into the receiver and the battery pack into the switch as shown in the instructions with the RC gear. Install batteries in the battery pack and in the transmitter. Roll the batteries in place in the battery holder until they make contact. Make sure your batteries are charged up! If they are rechargeable batteries, they are occasionally sold with no charge in them and should be charged up before being used. If the servos have white circular discs or other types of servo horns mounted on top of them, remove the discs or servo horns by removing the screw in the center and prying up on the disc or horn. You will not use these discs or servo horns. Plug the servo wires into the receiver with the black wire towards the edge of the receiver. Switch on the receiver. Switch on the transmitter. Center both servos by sliding the trim levers on the transmitter to the center positions. The trim levers are small sliding switches which adjust the position of the servos a small amount, not the large control levers which really control the servos. The sails should be controlled by the control stick that moves up and down and the rudder controlled by the stick that moves back and forth sideways. The rudder servo should be on Channel 1 and the sail servo should be on Channel 3. If you need to switch the servos, just switch the servo wires where they plug into the receiver. Find the servo control arm and mount it on the top of your rudder servo (the forward servo) with the arm pointing to the port side perpendicular to the centerline of the hull. The screw on top of the servo control hub takes a very small Phillips screw driver. Slide the end of the rudder control linkage rod down into place through the farthest out hole on the servo arm.

6) Installing the Radio Control Gear. Position the two servos on the RC deck as shown in Diagram S. Adjust the placement of the servos forwards towards the bow or backwards towards the stern slightly so that the rudder is exactly straight when the rudder control servo is in its neutral, centered position. Slide the sail control arm onto the servo towards the back of the boat. Make sure there is enough room for the outer end of the brass sail control arm to swing freely without hitting the starboard (right) side of the boat on the inside. Move the servos towards the port side until the end of

the brass sail control arm swings clearly without hitting the inside of the hull on the starboard side. (It is not necessary for the stainless steel rudder control linkage rod to be parallel to the centerline of the boat.) Trace around the correctly positioned servos with a pencil. With scissors cut a piece of servo mounting tape the full size of the bottom of each servo. Attach the mounting tape to the servos, remove the backing on the tape and place the servos exactly where you have marked with your pencil lines. Press the servos down firmly in place.

The servo tape is extremely powerful tape when used on a glossy smooth surface. There are four stainless steel screws to use in addition to the servo tape to hold the servos in place. After the servos are attached to the rc mounting deck with servo tape, drill pilot holes for the screws in the rc mounting deck using a 3/32 inch diameter drill bit. Refer to Diagram S on page 25. In this diagram you will see that four of the attachment holes in the servos show a small x indicating the head of a phillips head screw. These are the holes that will receive the screws. Drill pilot holes only beneath these four holes. The 3/32 inch bit should be long enough to drill the holes with the servos in place if you insert the drill bit in the drill chuck just 1/4 of an inch. When you screw the screws into place, tighten them just barely enough that they make snug contact with the top surface of the servo. By overtightening the screws you will be pulling one edge of the servo down in such a way that it will pry the bottom of the servo off the servo mounting deck.

For a final assurance that your servos will never be able to move, it is easy to build a low wall in front of the two servos and behind the two servos. With the more powerful digital servos, as well as with the 645MG servo, this can be a good idea. Cut two rectangles of the 1/8 inch plywood from some of the extra pieces around the edge. The rectangles should measure 1 inch by 1-1/2 inches. Round the top corners. Coat these two pieces with clear resin mixed with hardener where they will sit on the RC deck. Use a small amount of pre-thickened resin mixed with hardener (5 to 1) to create a small fillet holding each piece to the RC deck so that the longer side of the piece is sitting on the RC deck and each piece is right up against the servo, one in front of the front servo and one behind the back servo. Blue masking tape can hold these pieces in place while the fillets set up. The servos can still be removed, but the servos can never pull loose.

Set the battery pack in place. Mount the receiver up underneath the bow deck with a piece of the adhesive backed velcro. The switch can be mounted up underneath the deck at the front end of the cockpit opening with velcro. The switch should be mounted with the “On/Off” label just barely visible or you can peel off the on/off label and stick the label where it can be seen more easily. Wrap a short piece of the fuzzy side of velcro around the larger diameter towards the outer end of the antenna wire. Place a piece of the hook velcro up under the deck to hold the end of the antenna wire up under the deck.

The Double Throw Sheeting System

1. How It Works. The double throw sheeting system works like a reverse pulley system and allows you to let the jib and the mainsail out twice as far as the standard sheeting system. This is a considerable advantage when sailing directly downwind especially if you have a boom vang rigged to hold the main boom down and a downhaul on the jib boom to hold the jib boom down. The way the double throw sheeting system works is as follows. Instead of the end of the sheet line being tied off to the end of the sail control arm after the sheet line comes down through the deck, in the double throw system the sheet line comes down below the deck via the U shaped brass turning tube set in the transom, then runs forward and through a brass eye tied to the end of the sail control arm and then doubles back to tie off to a screw eye beneath the deck at the back corner of the cockpit opening. When the sail arm swings forward, twice as much sheet line is pulled in and when the arm swings back, twice as much sheet line is let out.

2. Attachment Point. The double throw sheeting system requires an attachment point at the back corner of the cockpit opening on the starboard side where you can tie off the end of the sheet line

inside the hull. For the attachment point, use a screw eye with a brass sleeve liner so the spectra sheet line cannot slip off the screw eye where the eye is clenched closed.

One system that works well is to take a very small block of wood and drill a hole in one side of the piece of wood for a screw eye with brass sleeve liner to screw into. This very small block of wood (approximately 1/2 inch by 1/2 inch by 1/4 inch thick) can be glued up under the back edge of the cockpit to the underside of the deck on the starboard (right) side of the boat (inside the boat).

Another, even simpler system is to mix a thickened blob of epoxy and to place the blob of epoxy up under the back corner of the cockpit on the underneath side of the deck on the starboard side. Stick the screw eye with brass sleeve liner into the blob of epoxy so that the eye of the screw eye is just partially exposed in the corner of the cockpit opening. Use a small piece of blue masking tape to hold the screw eye in place while the epoxy sets up. The goal here is to have the epoxy thick enough that it stays in place and holds the screw eye while the epoxy sets up, but not to have such a thick mixture that the epoxy will end up rough or having sharp barbs sticking out when it sets up. You don't want anything sharp that the sheet line can hang up on so you want the epoxy to still have that self leveling quality that it has as long as it is not mixed too dry from an excessive amount of phenolic powder.

3) Installing the U Shaped Sheet Leads in the Deck. The sheet leads in the deck are formed by upside down U fittings made from brass rod and inserted into the predrilled holes in the deck. The advantage of the upside down U fittings made from brass rod over screw eyes is that a sheet line can never wrap around this U shaped type of fitting and become caught. The U fittings are made using the 1/16th inch brass rod. The legs of the U fittings should be about 1/2 inch long from the tip of the U to the end of each leg. The U has to be bent in the right radius so that the legs will be spaced correctly to slide down into the holes in the deck. Find the 1/16th inch rod, either a single longer length or several shorter lengths. Grasp the brass rod with needlenose pliers at a point 1/2 inch from one end of the brass rod. Bend the rod into a tight U shape. Clip off this first U fitting so that the legs are equal length. Do the same to make two more U fittings. Try not to scar the inside surface of the U fitting where the spectra line will want to slide smoothly. Notch the sides of the legs of the brass U shape (where the legs will be slid into the deck) by grabbing with the cutting surface of a pair of pliers. The shallow notches will give the epoxy or ca something to grab onto.

Locate the double set of holes in the deck 2 inches in front of the mast hole, and the double set one inch behind the mast hole on starboard and likewise on port. Redrill these holes with a 1/16th inch bit to clear the holes of varnish. Glue the legs of the brass U shape into the deck with a drop of epoxy or "ca" (cyanoacrylate i.e. super glue). Let the epoxy or ca dry thoroughly before running the sheet lines! Holding the top of the U with needlenose pliers can help in forcing the legs of the U into the holes in the deck. Avoid scarring the inside surface of the U where the sheet line needs to slide smoothly.

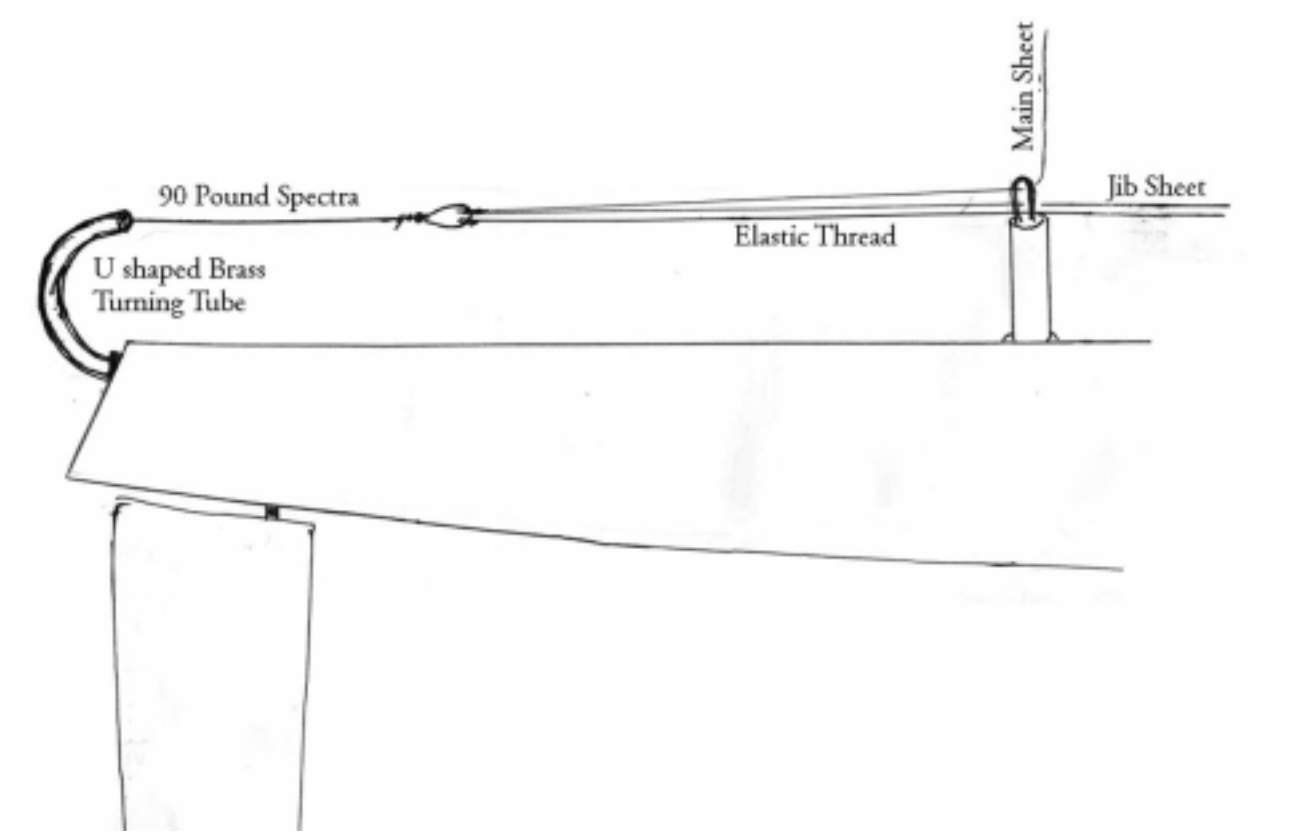
Screw a single brass screw eye into the furthest forward hole centered in the deck at the bow. Dipping the threads of the screw eye in epoxy before screwing the screw eye into place is a good plan. The screw eye should be lined up with the centerline of the boat (looking from the side of the boat, you will be looking through the eye from side to side).

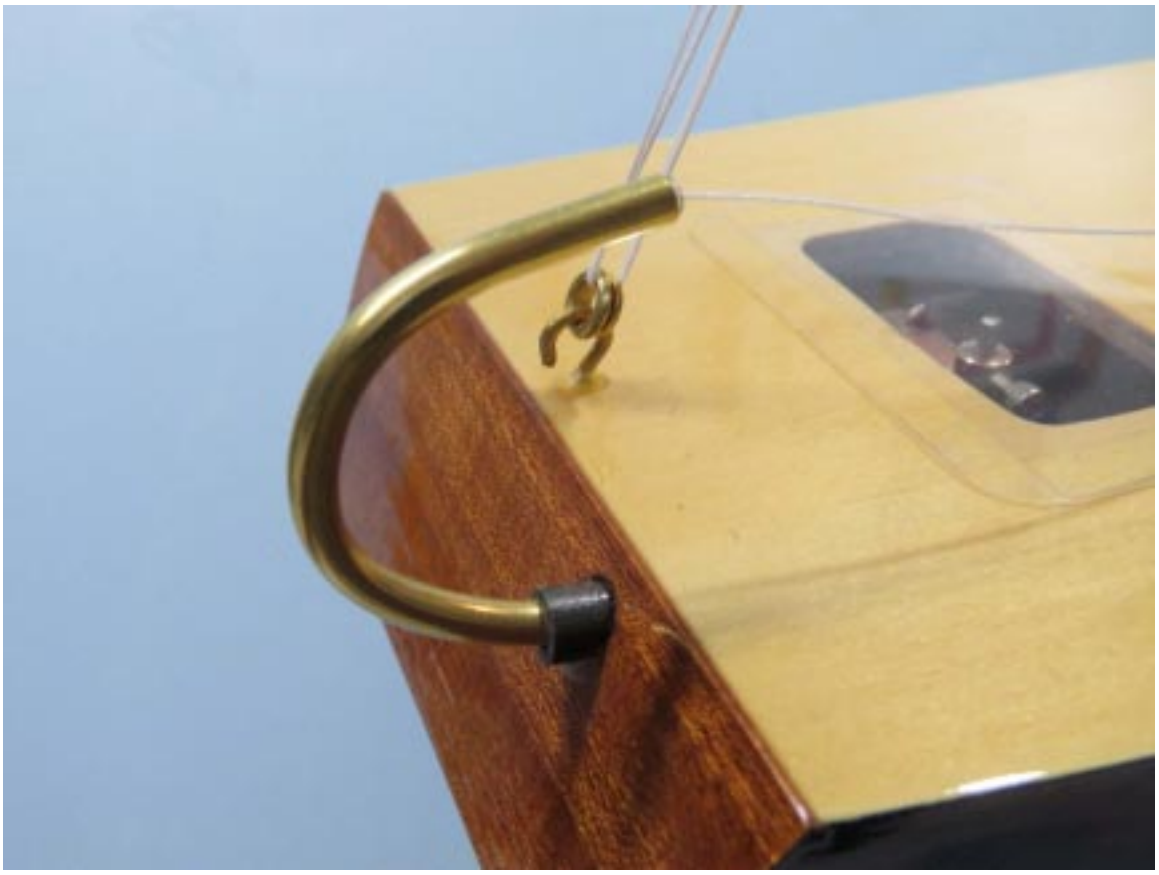
This is a good time to put the other two screw eyes into the deck as well so they will be ready later on. These screw eyes will both be opened enough that a round brass rigging eye can slide onto the screw eye. Before screwing these two screw eyes into the deck, grasp the eye of each screw eye with needlenose pliers and pry the eye open just enough for a rigging eye to slide onto the screw eye. Screw the first of these two open screw eyes into the hole in the deck that is about 4-1/4 inches back from the bow of the boat. It is important to dip the threads of this screw eye into epoxy so the screw eye will be glued into the deck since this screw eye takes the load of the jib pulling upwards. The open part of the eye on this screw eye should be pointing forwards

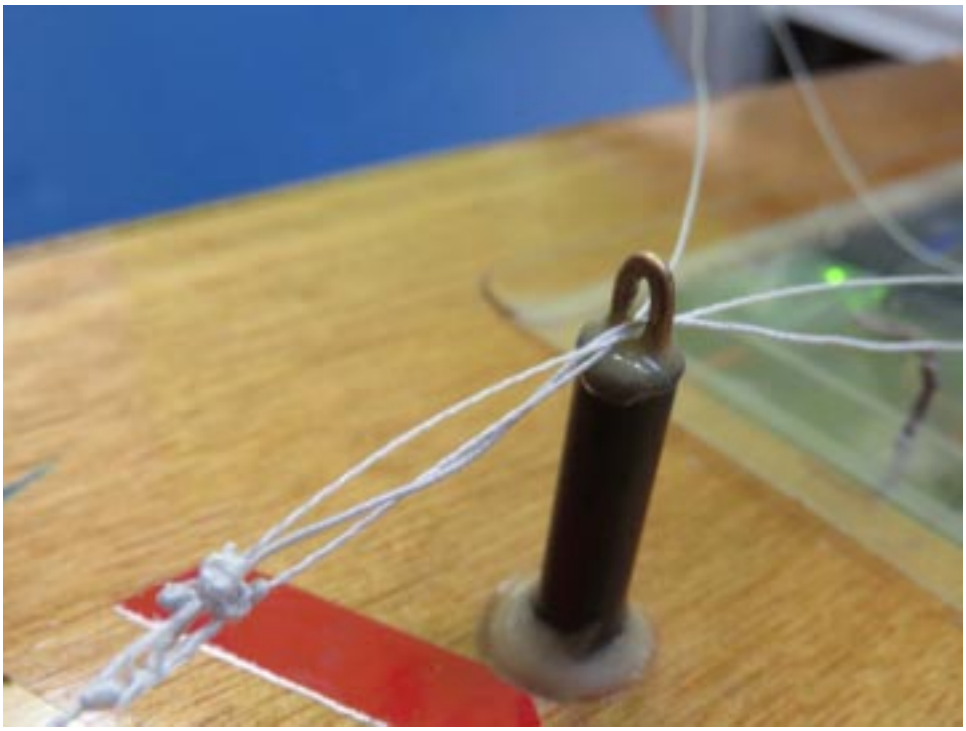
and the screw eye should be lined up with the centerline of the boat (looking from the side of the boat, you will be looking through the eye). Screw the second open screw eye into the hole in the deck centered at the back of the deck just forwards of the transom. Dip the threads of this screw eye in epoxy as well. Screw the screw eye in lined up with the centerline of the boat as before and with the open part of the eye pointing towards the back of the boat.

4) More Information About the Sheeting System. The current sheeting system for the T37 has been developed over a number of years of sailing and racing and has been perfected by a number of top skippers working in concert with each other. The sheeting system is great both for casual sailing and for racing skippers. Although the sheeting system does include a piece of elastic as a component, the elastic gives some advantage but is not necessary for the system to work correctly. In extremely light air the elastic pulls the sheets out from below deck and is especially effective in assisting the jib to go out more quickly. In slightly more wind, the wind blowing on the sails is more than adequate to pull the sheets out from below deck to let the sails go out. Even in extreme light wind without the elastic, the sails will both go out the full extent, although it might be a little bit longer before the jib goes out all of the way when the wind is barely perceptible. In racing, when you round the upwind mark, it is a big advantage if the jib instantly goes out the full amount as you turn downwind. The elastic makes just enough difference in a racing situation, that it is definitely a significant advantage!

Since the elastic is pulling against the sail servo when the sail is being pulled in, it is important to use only a very light elastic cord or elastic thread as it is called. The "Elastic Thread" is available at sewing stores like Joanne's Fabric and the like, or it is available from Tippecanoe Boats.





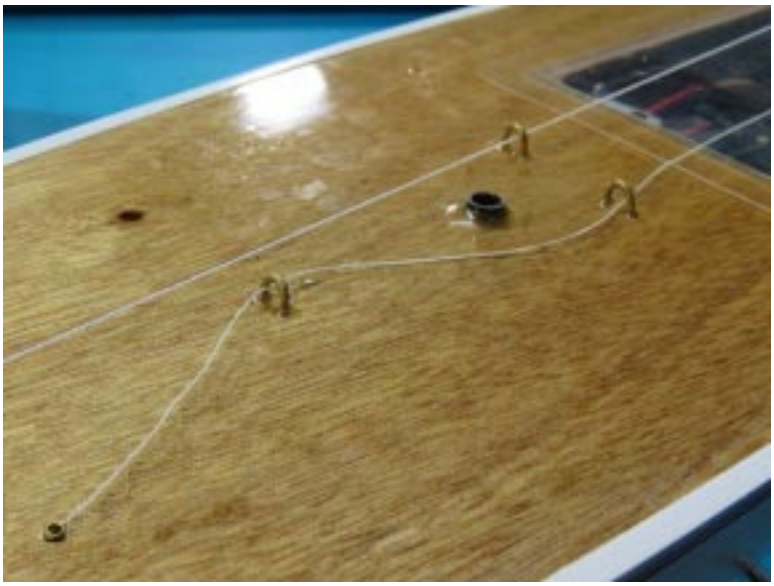


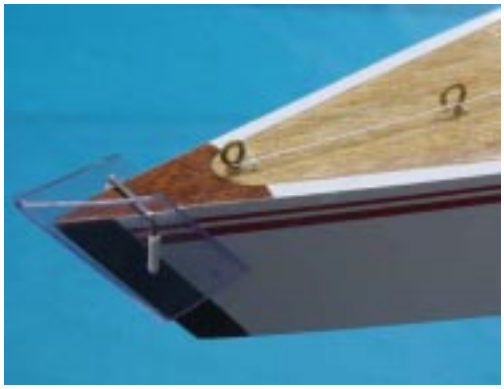
A quick preview of the entire sheeting system is helpful in anticipating how it will all go together. You have been introduced to how the double throw sheeting system works. Now we will outline the entire sheeting system. Starting at a point at the back corner of the cockpit opening, a single piece of 90 pound spectra is tied to a closed eye with brass sleeve liner epoxied up under the deck with the eye exposed enough to thread the spectra through. From this attachment point, the single piece of 90 pound spectra runs forwards and through a rigging eye tied to the end of the sail control arm which is mounted on the sail servo. From the eye on the end of the brass sail control arm, the 90 pound spectra turns and runs back towards the back of the boat beneath the deck and comes out from below deck by running through a U shaped brass turning tube set into the top edge of the transom. (The brass tube has an inner lining of nylon tubing for minimal friction with the spectra.) The spectra line exits from the brass U tube pointing forwards above deck. After passing through the brass U tube, the single spectra line has a loop tied in it. There will be two thinner spectra lines tied into this loop (the main sheet which controls the mainsail and the jib sheet which controls the jib). There will also be one end of the light elastic thread tied to the loop in the spectra. The elastic thread will pull the sheet line out from below deck and forwards from the brass turning tube when the wind is barely perceptible.

The U shaped brass turning tube could be glued directly into the hole in the transom using epoxy, however, if the brass turning tube was knocked hard enough from the side, it might damage the tube or at least break the epoxy bond on the brass. To avoid the chance for this to happen, we will first glue a 3/4 inch long carbon fiber tube into the hole in the top edge of the transom. Epoxy adheres extremely well to carbon fiber compared to brass. Once the carbon fiber tube is in place through the transom, with the outer end of the carbon fiber tube flush with the back of the transom, then the brass U shaped turning tube will slide into the carbon fiber tube. The outside diameter of the brass tube is a perfect fit for the inside diameter of the carbon fiber tube. Now if the brass U shaped turning tube gets knocked hard from either side, the brass tube will just rotate in the carbon fiber tube and there will be no damage. The brass tube is a very tight fit inside the carbon fiber tube, so the brass tube will stay securely in place unless it is bumped from the side.

The two light spectra lines and the elastic thread all run forwards together from the brass turning tube and pass through a brass loop on the top of the one inch high, vertical, carbon fiber barney post. The shorter of the two light spectra lines runs directly up to the main boom as the main sheet for pulling the mainsail in and letting it out. The longer of the light spectra lines runs forwards and through the brass staple set in the deck just behind the mast on the starboard side and then runs through the brass staple set directly in front of the mast. After passing through the second brass staple, this light spectra line goes up to the jib boom to control the jib sail for pulling in and letting out the jib sail.

The elastic thread passes through the brass loop on top of the barney post, and then runs forward through the brass staple set into the deck just behind the mast on the port side and then continues forwards to tie off at the unused screw-eye at the bow of the boat. The tension on the elastic thread should be quite light. When the sails are all of the way out, the elastic should be almost slack but just the very slightest amount stretched out. When the sails are pulled in all of the way, the elastic will be much more stretched out.



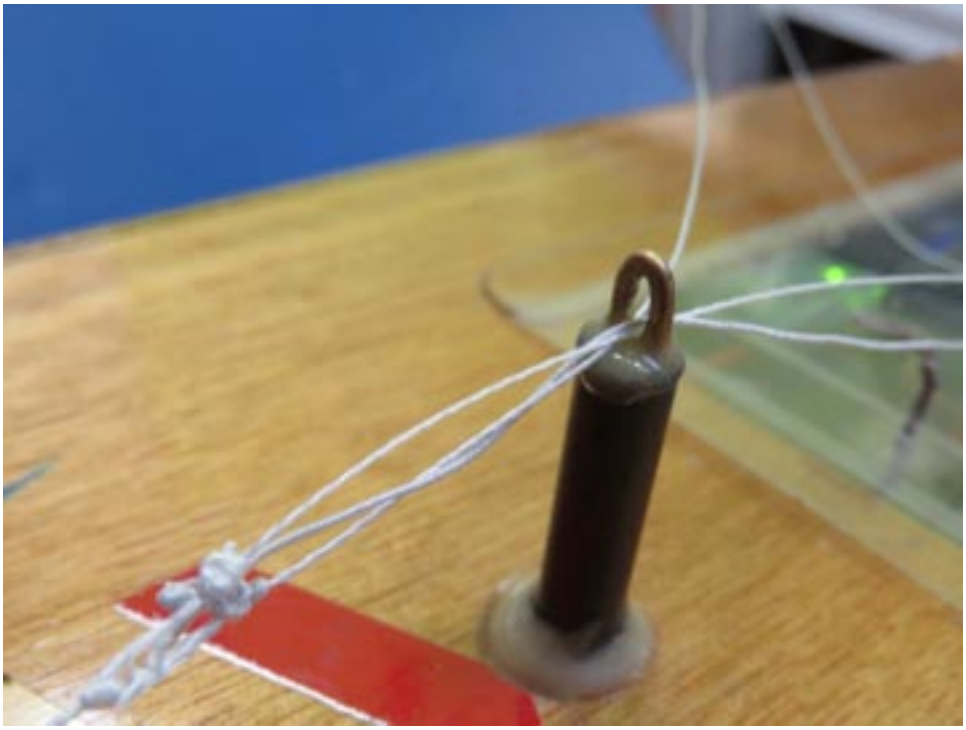


The next step will be to epoxy in the carbon fiber tube at the top edge of the transom. This is the carbon fiber tube into which the brass U shaped turning tube will slide to allow the sheet line to exit from below the deck. The carbon fiber tube epoxied into the top edge of the transom is exactly the correct inside dimension for the brass U shaped turning tube to slide into with a very snug fit. Before gluing in this carbon fiber tube, it is necessary to drill a hole for the carbon fiber tube. Drill the hole with a 1/4 inch drill bit. After drilling the hole, use the drill bit to enlarge the hole very slightly in all directions in order to make the hole big enough for the .254 carbon fiber tubing. Angle the hole in the transom so the hole points forwards to a point half way between the outer edge of the cockpit on the starboard side and the outer edge of the hull on the starboard side (in other words, halfway across the starboard side deck beside the cockpit opening). The hole has already been cut into the transom piece, before the transom veneer has been glued over the hole. The center of the hole is 1 inch in from the edge of the transom piece, but remember the transom piece is set inside the hull sides, so effectively the center of the hole is between 1-1/8 and 1-3/16 inches inside the outer edge of the side of the hull at the transom and down from the top surface of the deck by the thickness of the deck of just over 1/8 inch or 3 millimeters. Place blue tape over the area where you will be drilling. Press the tape on firmly to reduce the chance of the drill bit chipping out around the hole's periphery as you drill. Mark the spot to drill with a black sharpie permanent marker on the tape and then drill the hole, remembering to angle the hole

slightly towards the starboard edge of the boat, in other words, not quite parallel to the centerline, but the hole should be horizontal and parallel to the underside of the deck (not perpendicular to the transom). Drill using a 1/4 inch bit, remembering to drill at a slight angle (use a #F bit if you have one since it is slightly larger than 1/4 inch). Open the hole up enough with the 1/4 inch bit or with a round chainsaw file so that the 3/4 inch long carbon fiber tube will slide snugly into the hole. Leave the blue tape in place until after gluing in the carbon fiber tube.

The brass U shaped turning tube is angled slightly when we bend it so that the spectra line coming into the tube is at a slightly different angle than the spectra line when it leaves the tube. Because of this different entry angle to exit angle, there is a slight twist in the tube in addition to the obvious U Shape bend such that the tube will not quite lie flat on a table surface. Do not try to remove this twist by straightening the tubing! The spectra line coming from below deck enters the brass U shaped tubing coming from a point somewhat out to the starboard side of the boat. Above deck, the spectra line wants to exit the brass U shaped tubing pointing towards the barney post on the centerline of the boat. The longer arm of the U shaped turning tube will be slid into the carbon fiber tube in the transom and the shorter arm of the brass tube will be above the deck where the spectra exits the tube pointing forwards. Test the brass turning tube to make certain the spectra line slides easily through the tube without hanging up at the end where it will come out of the tube below deck. If necessary, use the point of a push pin to open up the inside hole of the nylon insert tubing so the spectra will slide through more easily without hanging up as it tries to leave the tube.

5) Gluing in the Barney Post Tube and the Carbon Fiber Tube in the Transom. The barney post is the second .281 inch diameter carbon fiber tube, 1-1/16th inch long (the first piece with exactly the same dimensions is used for the outer rudder post sleeve). On the barney post tube sand the bottom 1/4 inch to lightly abrade the part of the tube that will be glued into the deck so the epoxy will be able to get a better grip on the tube.



The carbon fiber tube that glues into the transom at the top edge of the transom, just flush with the bottom side of the deck, is approximately 3/4 inches long and exactly .254 inch outside

diameter. On this 3/4 inch tube, sand the entire outside surface of the tube so epoxy will have a better, slightly roughened, surface to adhere to.

The barney post tube glues into the round hole immediately behind the cockpit opening. The tube should fit snugly into this hole and when the inside of the hole is coated with epoxy, the tube should slide in even more easily. The tube will be slid into the hole so that on the bottom side of the deck, the tube will be sticking out approximately 1/8 inch (this measurement is not critical). By having the tube stick through the deck, we can put a bit of thickened epoxy on the bottom side of the deck to support the column from being pulled over sideways by the force of the mainsail. Additionally a little bit of clear epoxy can be added around the tube on the surface of the deck, if you choose to do so, but really the thickened epoxy beneath the deck should be adequate for the amount of strength required plus having thoroughly saturated the plywood edges of the hole inside the hole. Nothing runs through this tube so the thickened epoxy applied underneath the deck should be pushed up somewhat into the tube.

The top of the barney post tube must be kept free of epoxy for now so we can glue in a brass loop. It is easiest to glue the brass loop in at the same time as gluing in the barney post. Making the brass loop is the same as making the brass sheet U shaped staples, except that the legs of the U must be squeezed closer together, while still leaving a nicely rounded eye at the top of the upside down U. Both of the brass legs must be able to be inserted into the top of the barney post tube, without pushing out sideways on the tube. The tube would be easy to split if there is pressure from the brass legs pushing out sideways from inside the tube, so you do not want to force the legs down into the tube if the legs are not bent together enough.

Mix one half large mark of clear resin with one half small mark of hardener, stir thoroughly.

Leave the blue tape in place on the transom around the hole in the transom. Coat inside the hole in the transom with clear epoxy. At the same time coat the plywood edges inside the hole in the deck for the barney post. Use the pipe cleaner to coat these surfaces thoroughly and go over them a second and a third time since the edge grain of the plywood can absorb a lot of resin. Coat the bottom of the barney post where you have sanded the bottom 1/4 inch. Coat underneath the deck in a 1 inch diameter circle around the hole for the barney post. Slide the barney post into place in the hole so that the bottom end of the barney post sticks out under the deck by about 1/8 inch. A small bead of epoxy will form around the base of the barney post where it touches the deck. It is best to leave this bead in place, both for extra strength and because trying to wipe off epoxy usually results in a smear rather than a clean surface. Make sure your deck is level side to side and fore and aft so the bead stays even around the base of the barney post.

Mix one large mark of pre-thickened resin with 1 small mark of hardener.

Use the pipe cleaner to coat inside the transom hole with the pre-thickened mixture. At the same time, by reaching the pipe cleaner in through the hole, coat the bottom inside of the deck where the carbon fiber tube will be touching the bottom side of the deck. Coat the carbon fiber tube, being careful not to get epoxy inside the tube. Slide the tube into place so the outer end of the tube is flush with the transom surface on the bottom edge of the tube. The top edge of the tube will be slightly proud of the transom due to the angle of the transom. Some epoxy may get inside the tube as it is slid into place. Later on it is easy to run a 1/8 inch drill bit through the center of the carbon fiber tube to open up the inside end of the tube if it is blocked with epoxy. It is possible, but not as easy to free the outside end of the tube of epoxy because the outside end of the carbon fiber tube wants to be exactly the right inside diameter to receive the brass U shaped turning tube which has an outside diameter of 5/32 inch. Clean off any excess epoxy and remove the blue tape before the epoxy starts to set up, otherwise the blue tape may become entrapped under a thin layer of hardened epoxy and become difficult to remove cleanly.

On the barney post, fill the top end of the barney post with the pre-thickened epoxy mixture, coat the legs of the brass eye you have bent for the top of the barney post and slide the legs

down into the epoxy mixture inside the barney post. Add a little more of the epoxy mixture in around the top of the barney post. Keep the brass eye clear of epoxy so there will not be any sharp edges when the epoxy sets up.

With the remaining amount of pre-thickened resin you have mixed, add phenolic powder to thicken it further until you have a no sag consistency. Use this remaining thickened epoxy in a wad up underneath the deck on the bottom end of the barney post and around the barney post on the underneath side of the deck to give the barney post enough support below the deck to take the loads of the mainsheet pulling sideways on the barney post.

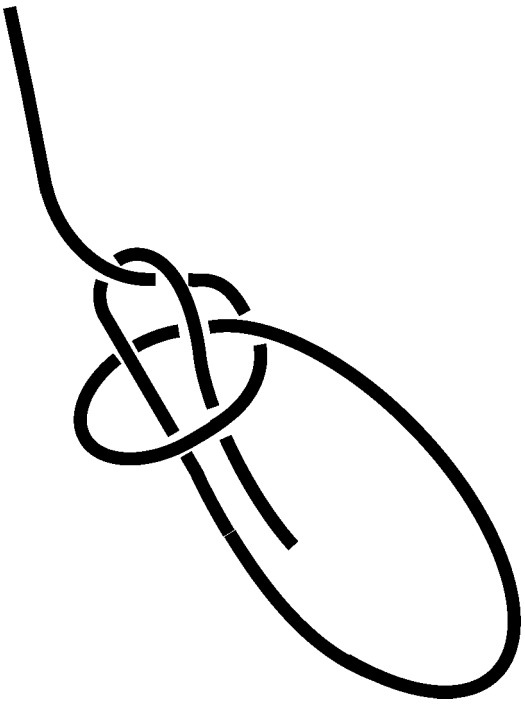
6) Attaching the Brass Sail Control Arm. Cut a 6 inch piece of the heavier 90 pound spectra line. Tie the middle of this spectra line to the round brass rigging eye around the groove around the perimeter of the eye. Tie four knots on top of each other pulled very tight or else the knots will skid out of the spectra line. Tie the round brass rigging eye through the hole in the end of the long brass arm on the sail control servo with a loop about 1/4 inch long. Tie four knots on top of each other or the knots will skid out of the slippery spectra line (square knots are good here).

Put batteries into your transmitter and into the battery pack for the receiver in the boat. Turn everything on. Move the sail control stick all of the way to one extreme so the sail control arm goes all of the way back to the full extent of its sweep. Slide the trim tab on the transmitter, beside the control stick all of the way in the same direction as the control stick to get the sail control arm to move even farther back. At this extreme, you want the sail control arm to be pointing right at the screw eye that you have epoxied into the back corner of the cockpit opening. Remove the screw holding the sail control arm in place on top of the servo and lift the arm up and reposition the arm so the arm is pointing right at the screw eye in the back corner of the cockpit opening. Push the arm down into place on the servo and replace the small screw that holds the arm in place on the servo.

7. Preparing the Sheets. Find the packet of spectra line. Compare the two pieces of spectra. One piece is 90 pound test breaking strength (two of these thread-like pieces should be able to pick you up!). The thinner piece is 50 pound spectra, (so it might take 3 or 4 pieces of this size spectra to lift your weight.) Take the 90 pound spectra and cut off a piece 35 inches long using a sharp knife or very sharp scissors. Tie a short loop in the end you have cut. The loop should be about 1/4 inch long. Start with a bowline to create the loop, and then tie multiple half hitches on top of the bowline to keep the knot from sliding. I can just hear someone saying, “Bowlines never slide.” That could have been me - before I ran into spectra. Any knot you can tie slides in spectra until you have about 4 additional knots locking the original knot to keep it from sliding!

If you think you may have gotten epoxy into the front end of the carbon fiber tube which you have glued into the transom, run a 1/8 inch bit in through the carbon fiber tube to clean the epoxy out of the forward end of the carbon fiber tube. Slide the longer leg of the brass U shaped turning tube into the carbon fiber tube that you have glued into the transom. Slide the brass tube into the carbon fiber tube until the beginning of the bend in the brass tube comes up against the outer edge of the carbon fiber tube. The brass tube is a very snug fit inside the carbon fiber tube, but once started the brass tube should slide in tightly.

Take the straight end of the spectra, the end without the loop, and slide the end through the U shaped brass turning tube in the back of the boat. Slide the end of the spectra down into the tube until the end comes out inside the boat where you can reach the end from the cockpit opening. Now run the end of the spectra line through the brass rigging eye that you have tied to the end of the sail control arm and finally, bring the end of the spectra line so it doubles back and run the spectra through the eye of the screw eye glued in place in the back corner of the cockpit opening. The spectra line will be tied off here, but first we need to measure the exact point at which it will be tied.



bowline

The measurement for the spectra needs to be exactly precise so you will want to put batteries back into your transmitter and into the battery pack for the receiver in the boat. Turn everything on. Move the sail control stick all of the way to one extreme so the sail control arm goes all of the way forward to the full extent of its sweep. Slide the trim tab on the transmitter, beside the control stick all of the way in the same direction as the control stick to get the sail control arm to move even farther forwards. On the spectra line at the back of the boat on top of the deck, position the loop you have tied in the spectra so the knot creating the loop is right up, almost touching the brass U shaped turning tube in the transom. You absolutely do not want the knot creating the loop to be trying to pull into the end of the tube, because the servo will be straining to pull the line further and use up battery power rather too quickly. While making sure the positioning of the spectra does not change, and making sure the spectra is not going to be twisted around anything under the deck as the arm swings forwards and back, tie the end of the spectra line to the screw eye set at the back corner of the cockpit after the spectra line has come through the eye on the end of the sail control arm. Use multiple knots so the spectra will not slide. CAUTION: if the knot for the loop in the spectra at the back of the boat is not almost touching the top end of the brass U turning tube, the loop in the spectra will be able to travel so far forwards that it might come through the brass loop on top of the barney post and hang up at that end of its travel.

Take the piece of thinner 50 pound spectra and fold it at a point 24 inches from one end. Do not cut the spectra, just fold it back upon itself. Slide the folded over point through the brass eye on the top of the barney post. Run the folded over part back to the loop in the thicker 90 pound spectra and tie the folded over part through the loop in the heavier spectra.

Where the sheet lines come out of the eye in the top of the barney post, the shorter line is for the main sheet, and the longer line is for the jib sheet. Later on we will adjust the length of the sheets and attach the sheets to the booms after the booms are in place. For now, just leave the sheets long.

Sealing the Cockpit and Rudder Access Port.

1) Sealing the Rudder Access Port. Find the 8-1/2 x 11 inch sheet of clear mylar with the die cut shapes for the cockpit hatch and the rudder hatch. The cockpit hatch is a sliding hatch. The rudder hatch is attached to the deck with a removable double sided tape. Carefully press out the small rudder hatch measuring 1-7/8 x 2-3/4 inches from the mylar sheet. Use an exacto knife or scissors to free the piece if it does not press out easily. Apply the double sided tape with the brown backing paper to one side of the rudder hatch in four separate pieces around the edges. Stick the hatch down over the rudder opening in the back of the deck. This tape with the brown backing paper will release and reseal indefinitely should you ever need to access the linkage at the top of the rudder post. The double sided tape with the orange plastic backing is a permanent tape and will never release when applied to a clean smooth surface. Don't use the orange backed tape for the rudder access port!

2) The Sliding Cockpit Hatch. The remaining die cut pieces in the clear mylar sheet make up the sliding hatch for the cockpit opening. You will also need the small piece of clear lexan that measures 1/2 inch x 2-1/2 inches. This clear lexan piece is several times thicker (.030 inch) than the clear mylar sheet (.010 inch). The lexan piece is also much stiffer.

Start by freeing the hatch pieces from the mylar sheet. Use an exacto knife or sharp scissors to free the pieces if they do not press out easily. There are two rectangular horseshoe pieces measuring 4-1/8 x 6-3/8 inches. One piece has wider sides (1/2 inch wide) and the second piece has narrower sides (3/8 inch wide). The small rectangular piece for the rudder hatch was inside the horseshoe piece with wider sides. We will call the horseshoe piece with wider sides "piece A". On the second side of the mylar sheet, you will have a second horseshoe piece with a solid piece enclosed within it. The second horseshoe piece should be pressed out with the solid piece staying in place within it. The sides of this second horseshoe piece are narrower than the sides of the first horseshoe piece. We will call this second horseshoe piece "piece B". If you place piece A on top of piece B, the outside edges of piece A and piece B should line up exactly on all four sides. The solid piece of mylar in the center of piece B will eventually be cut free to make the sliding part of the hatch. Piece B with the narrower sides will be stuck down to the deck and piece A will be stuck down on top of piece B forming a groove between the deck surface and the underside of the wider piece A. The solid part of the sliding hatch slides forwards and backwards in this groove.

Before removing the solid part of the hatch from piece B it is best to attach piece B to the deck in its proper position with the permanent double sided tape, otherwise piece B is so flexible that it would be difficult to get the sides of the piece aligned correctly. Apply blue tape on the top surface of piece B to hold the center solid part of the hatch firmly in place in the outside horseshoe shaped piece. Cut with scissors the 1/8 inch tabs of mylar at the back edge of piece B. These are the tabs that hold the solid center part of the hatch to the horseshoe part of piece B. Now the solid center part of piece B is just held in place by the blue tape. The solid center part of piece B will become the sliding part of the hatch. The sliding part of the hatch and piece B which surrounds it should stay together until piece B is firmly adhered to the deck with the permanent double sided tape. Position piece B over the cockpit opening in the deck so that the piece is centered from side to side and the front outside edge of piece B is 5/8 of an inch in front of the front edge of the cockpit opening. The front edge of piece B is the side that is 3/8 inch wide by 4-1/8 inch long. You can use small pieces of blue tape stuck to the deck to mark the position for piece B.

Stick one side of the orange backed permanent double sided tape to the bottom side of piece B. Use three separate pieces of tape, one piece of tape along each side of piece B. Position this tape very carefully the first time since it won't release! Try not to have the tape hanging out over either the inside or the outside edge of piece B since tape exposed on the inside edge will stick to the sliding part of the hatch and make the hatch hard to open and tape exposed on the outside edge will collect

dirt and start to look messy. Once the narrow rectangular horseshoe shape of piece B is firmly adhered to your deck with the double sided tape, remove the center solid sliding part of the hatch from within piece B. Apply the orange backed permanent double sided tape to the bottom side of piece A. Line the edge of the tape up with the outside edge of piece A so the tape does not hang over into the groove between the bottom side of piece A and the surface of the deck, otherwise the sliding part of the hatch will not be able to slide. Line piece A up with piece B. The open side of piece A should be towards the back of the boat. Press piece A down on top of piece B. You should now have a groove for the sliding piece of the hatch between piece A and the surface of the deck. The horseshoe shape of piece B and of piece A are both open towards the back of the boat. The chance of water getting in under this back edge is minimal since it is hard to get a T37 to back up into large waves!

The last hatch detail uses the short piece of 1/2 inch wide clear lexan. You might want to round the corners a little bit. Attach orange backed permanent double sided tape to one side of the 2-1/2 inch piece of lexan. The lexan piece will be stuck on the bottom side of the sliding hatch piece at the back edge of the cockpit opening. The lexan will provide a lip underneath the sliding part of the hatch so the hatch cannot slide open without the back edge of the hatch being lifted slightly. When the back edge of the hatch is lifted slightly, the lexan piece will clear the deck at the back edge of the cockpit opening and allow the sliding hatch cover to slide open. The lexan piece will be running across the boat from side to side with the back edge of the lexan piece lined up with the back edge of the cockpit opening. Slide the hatch all of the way closed (forwards). On the top surface of the sliding hatch place a piece of blue masking tape lined up with the back edge of the cockpit opening. Remove the sliding hatch. On the bottom side of the sliding hatch stick the piece of lexan with the back edge lined up with the edge of the blue tape. The lexan will keep the sliding hatch from drifting open while sailing. Remove the piece of blue tape. To open the sliding hatch, the back edge of the sliding hatch has to be lifted slightly. To facilitate lifting the back edge of the hatch, add a little loop of nylon monofilament rigging line to the back of the sliding hatch. Use the #53 drill bit that is included with the kit to drill one small hole centered in the lexan piece. Cut a 6 inch piece of 90 pound spectra rigging line. Fold the line in half and tie several overhand knots or a figure eight knot with the two ends of the line. Crease the fold in the line tightly and slide the crease up through the hole you have drilled in the lexan so there will be a loop of line on the top side of the hatch. Tie an overhand knot on the top side of the hatch so the spectra loop will not slide back down through the hatch. Now you should have a loop of spectra on the top side of the hatch that is large enough to grab easily to lift the back edge of the hatch when you want to slide the hatch open. The sliding cockpit hatch is flexible enough that it easily bends up as you slide it back so the hatch can open all of the way by sliding the hatch up over the top of the barney post.

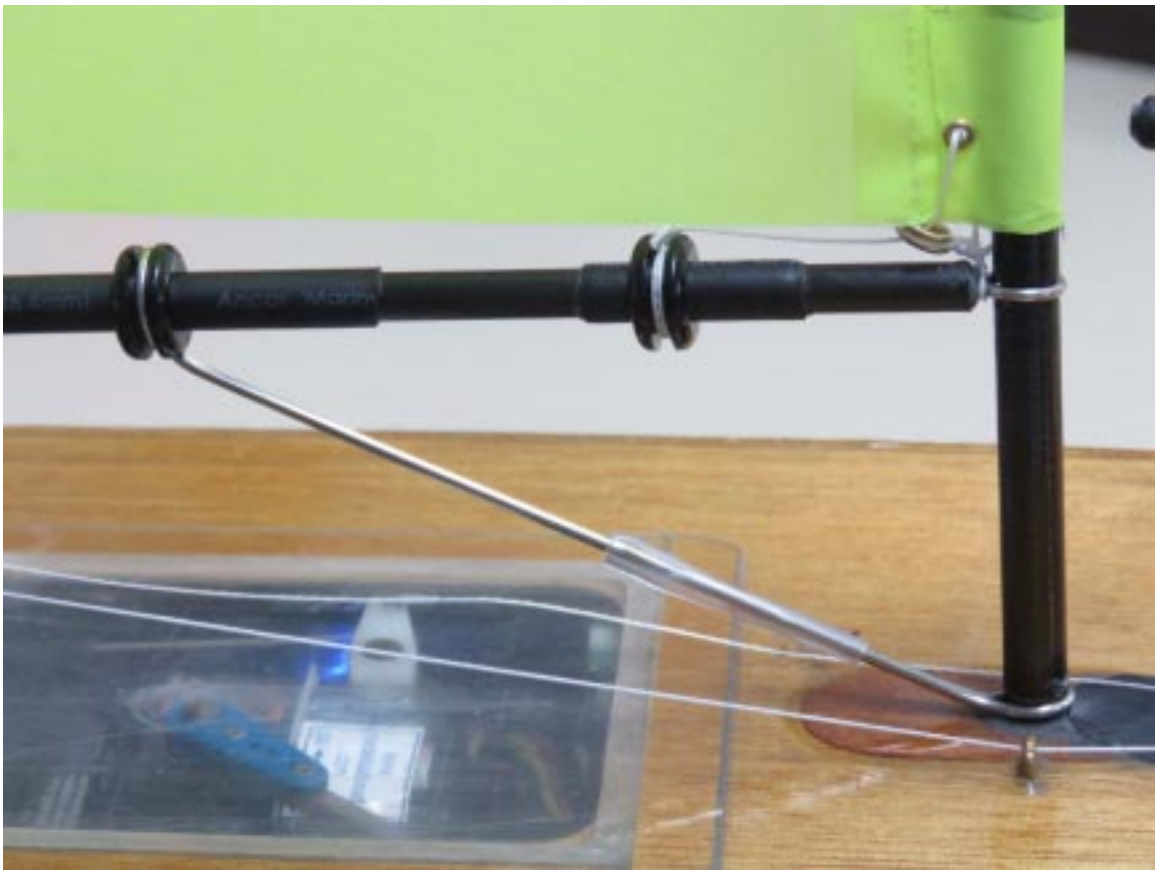
Preparing the Mast

1) The Mast System. The mast comes to you in two sections. The top section is 44-1/2 inches long. The bottom section is initially 4 inches long, but will end up being cut slightly shorter in the final stages when the mast is being fitted to the boat. The two sections of the mast are each .240 inch diameter carbon fiber tube. The two sections of the mast will be joined using a wrapped carbon fiber sleeve measuring 1-7/8 inches. There is an additional piece of wrapped carbon fiber sleeve measuring 1/2 inch that is positioned on the mast as a collar above the gooseneck fitting to keep the gooseneck fitting from sliding up the mast. The gooseneck fitting holds the boom to the mast so that the boom can pivot freely around the mast. The 1-7/8 inch wrapped carbon fiber tube that joins the two mast sections together also works to keep the gooseneck fitting from sliding down the mast and additionally works to keep the boom vang fitting at the base of the mast (just above the deck) from sliding up the mast.

The purpose of the boom vang on your T37 is the same as the purpose of a boom vang on a

large racing yacht. The boom vang primarily serves to keep the boom from lifting up and distorting the sail shape when the sail is sheeted farther out. The boom vang can also be used in some circumstances to support the weight of the boom when the wind is extremely light thus enabling more control of sail shape. However, the primary purpose of the boom vang is to hold the boom down so the boom does not lift up which can result in a billowing out sail shape with the effect of spilling wind out of the upper portion of the sail unless the lower part of the sail is sheeted in too tight.

The base of the mast slides into the mast step tube that is epoxied into the bottom of the boat and at the deck level. Starting at the deck level, first you will have the boom vang fitting which goes around the mast just above the deck, just above the boom vang fitting will be the mast sleeve that joins the top and bottom sections of the mast, and then comes the gooseneck fitting and then the collar around the mast that keeps the gooseneck fitting from sliding up the mast. The boom vang fitting that goes around the mast and the gooseneck fitting that goes around the mast are both made from the 1/16th inch stainless steel rod. The stainless steel rod of the boom vang fitting, after looping around the mast, runs up to the boom at an angle, running from the base of the mast at deck level to the boom at a point approximately 3-1/2 inches back along the boom.



2) Making the Gooseneck Fitting. The “gooseneck” is the fitting which holds the boom to the mast and allows the boom to pivot sideways on the mast. The gooseneck fitting consists of a stainless steel collar formed from 1/16th inch diameter stainless steel rod that holds the boom to the carbon fiber mast. The stainless steel collar is free to pivot on the carbon fiber mast.

The gooseneck fitting is relatively simple. It is made from the 1/16th inch stainless steel rod. A loop that will fit around the mast is formed in one end and then the other end of the short piece

of rod is slid into the forward end of the boom where you have glued in the smaller diameter carbon fiber inside sleeve. The easiest way to make a very clean loop in the end of the 1/16th inch stainless steel rod is to wrap the rod around a drill bit to form the loop as described below.

Start with the full length of 1/16th inch rod. Use a 7/32 inch drill bit to form the loop. (If you used a 1/4 inch drill bit, your loop would come out considerably too large in diameter due to the propensity for stainless steel to spring back after bending.) Place the rod against the drill bit at just a slight amount over one inch from the end of the rod so you have enough of the rod to hold onto as you form your loop around the drill bit. The drill bit needs to be held very firmly, preferably in a vice, although it could be possible for a second person to hold the bit in pliers braced against the edge of a table or to have the drill bit clamped firmly under a wood block against a table surface. Certainly in the vice, you want to clamp the smooth base of the drill bit, not the cutting end. You want to be wrapping the stainless steel rod around the smooth base of the drill bit as well, so you want as much of the bit sticking out clear of the vice as possible.

After bending, the loop should be a close fit on the mast tube, but should still be free to rotate easily. The loop must be small enough that the loop cannot slide over the wrapped carbon fiber sleeve which will be attached to the mast. Clip off the excess of the stainless steel rod where the loop overlaps itself so just the loop is left in the end of the longer rod. With needlenose pliers, grasp inside the loop and bend the rod back where it comes out of the loop so the rod now joins the loop at about a 90 degree angle so the loop on the end of the rod now looks like a giant version of the eye on the end of one of the smaller screw eyes (or a bit like the wand that comes for blowing bubbles where the handle of the wand meets the circle of the wand at a right angle). Clip off the straight part of the rod coming from the loop at a distance of 1-1/4 inch from the loop.

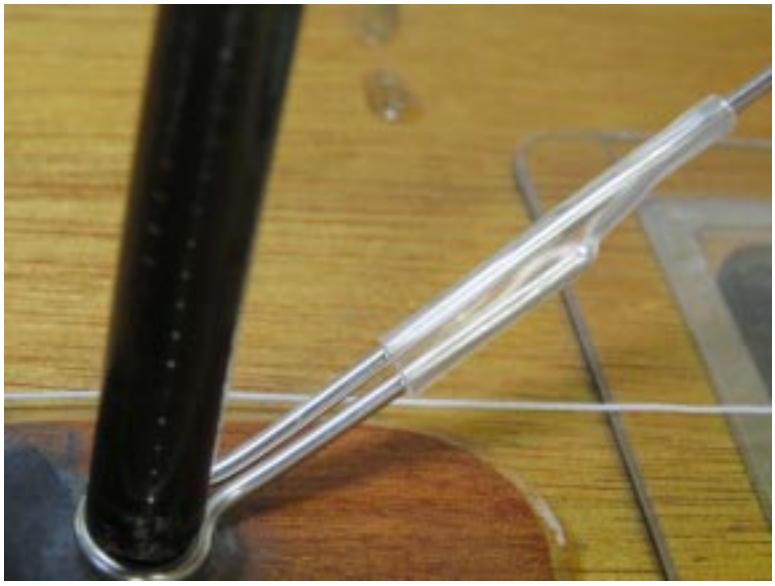
As the last step on the gooseneck fitting, crimp the straight part of the stainless steel rod in three separate places using the cutting edge of a pair of needlenose pliers so epoxy will be better able to get a mechanical bond to the stainless rod. You can practice by making a crimp mark right at the end of the extra stainless steel rod. With too much pressure, you will chop right through the rod, with too little pressure, you barely leave any mark on the rod.

3) Starting the Boom Vang Fitting. The boom vang fitting is somewhat similar to the gooseneck fitting, but it is somewhat more involved. Like the gooseneck fitting, the boom vang fitting also has a loop that goes around the mast. However if you just have a simple loop where the stainless rod comes around the loop and then ends, there is always the chance that the jib sheet will be blown back against the mast as you tack, and sure enough, the jib sheet will someday hit the loop just right so the jib sheet will slide inside the end of the loop and become captured. This is sure to ruin your race!

So we need to form a loop in the end of the stainless steel rod and then instead of clipping the rod off, we need to bend the rod back so the end of the rod runs up parallel to the part of the rod going up to the boom. Then we can slide the piece of clear heat shrink tubing down over the part of the rod coming up to the boom and over the free end of the rod that has come out of the loop and virtually seal the two together so there is no chance for the jib sheet to get inside the circumference of the loop.

It is a bit of a trick to keep the loop so it is a very fine fit around the mast tube. If the loop is sloppy around the mast tube, then the vang will work to hold the boom down (or to hold the boom up), but it won't be effective in precisely holding the boom down and up at the same time. A precise fit with no slop is most effective, although as we noted earlier, the primary purpose of the boom vang is to hold the boom down, and for this purpose, the fit does not need to be as precise. You might think that in light wind you want to hold the boom up very slightly and in heavy wind you want to hold the boom down, so you don't need to do both at the same time, however, we frequently sail in puffy winds where it is strong and then light back and forth, and in these conditions being able to set the boom so it can neither lift up nor weigh on the sail is possibly a slight advantage. There is extra ss rod included so you can have a second shot at making this loop cleanly

so it fits snugly around the mast. The real secret is to continue the loop around almost 1-1/4 turns so there is a significant overlap. Then hold inside the loop with needlenose pliers just where the overlap begins and bend the end of the rod up to lay parallel to the rod coming into the loop. The longer part of the rod coming out of the loop should be at least 6 inches long. Leave it as long as possible for now for when we are ready to complete the boom vang later on.



Slide the clear 1 inch piece of heat shrink tubing on so the heat shrink tubing overlaps the loose end of the rod and holds the loose end tight to the continuous part of the rod that will run up to the boom. The end of the rod coming out of the loop should be centered inside the length of heat shrink tubing. As you heat the shrink tubing, try to hold the two parts of the rod together (without burning your fingers!). Needlenose pliers can help here.. Once the heat shrink tubing cools, it will hold the two parts of the rod tightly together, but as it shrinks, the tubing will not be strong enough to pull the two parts of the rod together. The end of the stainless steel rod must be inside the heat shrink tubing so there is no exposed end of the rod for the jib sheet to get caught around.

4) Gluing the Collar on the Mast and Sleeving the Mast Together. The mast is in two sections. The top section is 44-1/2 inches long and the bottom section is 4 inches long. In order to be class legal, the final mast when sleeved together is not allowed to be longer than 48 inches. When fitting the mast to the boat, we will trim probably both the top and the bottom end of the mast to be precisely the correct length. Do not cut either end of the mast at this stage!

The mast sleeve which joins the top and bottom mast sections is 1-7/8 inches long of the wrapped carbon fiber tube which has a slightly ridged surface to it compared with the mast and boom tubing. The mast sleeve should be positioned so it is pretty exactly centered on the joint between the top and bottom mast sections. The sleeve will be cemented in place with epoxy and then it will also be pinned in place with 1/16th inch pins made from the 1/16th inch stainless steel rod. Before placing the mast joining sleeve, it is important to start with the collar sleeve that sits just above the stainless steel loop of gooseneck.

When the mast is all assembled correctly, starting at a point several inches above the bottom end of the mast and going down the mast, first there will be the 1/2 inch carbon fiber tube collar around the mast to keep the loop of the gooseneck fitting from sliding up the mast. Then there will be the loop of the stainless steel gooseneck fitting. Then there will be the 1-7/8 inch carbon fiber mast joining sleeve tube. And finally, coming out of the bottom of the mast joining sleeve tube will be the 4 inch short mast tube. This step can be broken into two steps if you are less confident

about your epoxy expertise. To do this step in two separate operations, epoxy the mast collar in place and let the epoxy set up hard. As a separate step add the gooseneck stainless steel loop and the mast joining sleeve and the 4 inch bottom mast tube.

The gooseneck fitting will want to slide up the mast if there is nothing keeping it from sliding up. The 1/2 inch collar of wrapped carbon fiber tube is glued and pinned to the mast just above the position for the gooseneck to keep the gooseneck fitting from sliding up the mast. Wrap a piece of blue tape around the longer mast section at a point 1-7/16th inches up from the end of the mast section (ie. just shy of 1-1/2 inches from the end). Use a piece of 100 grit sandpaper to slightly abrade the mast section just below the tape for 1/4 inch. Abrade the bottom 3/4 inch of the mast section as well. It is just as well not to abrade the mast surface where the gooseneck fitting will be riding.

Mix 1/2 large mark of prethickened resin with 1/2 small mark of hardener. Stir thoroughly. Apply the epoxy to the mast section below the blue tape for slightly less than 1/2 inch. DO NOT apply epoxy to the inside of the mast collar sleeve! Slide the 1/2 inch wrapped mast collar sleeve up the mast section, twisting slightly to allow the epoxy to get inside the collar tube. Slide the collar right up to the blue tape. While holding the collar in place, clean off any epoxy that has pushed out onto the blue tape during this process, otherwise the blue tape will become captured under the epoxy when the epoxy hardens. (It is worth checking this again in 5 minutes!) There should not be any epoxy on the bottom edge of the mast collar sleeve.

Now you must slide the stainless steel loop of the gooseneck fitting onto the bottom of the mast and up until it is right up against the bottom side of the mast collar sleeve.

Use the pipe cleaner and some of the remaining epoxy to thoroughly coat inside the mast joining sleeve (1-7/8 inch wrapped carbon fiber sleeve). Carefully clean off the top and bottom edges of the sleeve. DO NOT coat the mast tube with epoxy! Slide the mast joining sleeve onto the bottom of the mast tube and up against the loop of the stainless steel gooseneck. The gooseneck needs to be free to spin around the mast, but it should not have any room to move up or down the mast! If there is any epoxy getting on the stainless steel loop of the gooseneck, make sure to clean it off thoroughly, even if it means undoing the last step and doing it over! The gooseneck has to be free to spin around the mast tube. If you glue the gooseneck loop in place, it will not work! That is why on the mast collar, we did not coat inside the collar tube, we just coated the mast tube, while on the mast joining sleeve, we did not coat the mast tube, we just coated inside the mast joining sleeve! We did not want any epoxy being pushed out onto the gooseneck fitting as we slid the sleeves into place.

Now for the final piece of the mast assembly. It is important to remember to slide the bottom 4 inch section of mast tube into the mast joining sleeve at this point, because there is no way it will fit into the sleeve after the epoxy has set off. Your total mast length should now be 48-1/2 inches. The 1/2 inch collar sleeve should be right up against your blue tape place marker. The gooseneck fitting should be free to rotate around the mast (and free of any epoxy) and should be constrained by the collar and the mast joining sleeve so the loop of the gooseneck fitting cannot slide up and down the mast. The mast joining sleeve should be right up against the loop of the gooseneck fitting, but maybe not quite touching the loop. The 4 inch bottom section of the mast should be slid into the mast joining sleeve all of the way so it is up tight against the bottom end of the upper mast section. There should not be any trace of epoxy on the bottom edge of the mast joining sleeve because this surface has to be clean for the boom vang loop to be able to spin easily against.

It is important to lay the assembled mast on its side on plastic until the epoxy has set up so the epoxy won't run down the mast and get out from under the sleeves. Check the mast after 5, 10, 15 and 30 minutes to make sure there is no epoxy getting in the wrong places. If necessary, clean off any epoxy that is escaping from under the sleeves. You must have the gooseneck loop around the mast (not the boom vang loop!) between the mast collar and the mast joining sleeve! Let all of this epoxy set up thoroughly.

5) Pinning the Mast Collar and the Mast Joining Sleeve. To reinforce the epoxy bonding the

mast collar and the mast joining sleeve to the mast sections, it is important to add stainless steel pins. The pin through the mast collar sleeve should be centered halfway down the collar. The pins through the mast joining sleeve should be 5/16 inch down from the top edge of the sleeve and 5/16 inch up from the bottom edge of the sleeve. Wrap blue masking tape around the mast collar sleeve and around the two positions on the mast joining sleeve and mark the positions for drilling the holes. Drill a 1/16 inch hole through the side of the ½ inch wrapped carbon fiber sleeve and all of the way through the mast and out the second side of the ½ inch wrapped carbon fiber sleeve. This hole should be positioned in the middle of the ½ inch wrapped carbon fiber sleeve. Drill holes at your marked positions on the mast joining sleeve. Although it does not really matter, I like the visual aspect of having all of these holes lined up with each other.

Take the 1/16 inch diameter piece of stainless steel rod. Bevel or round one end slightly by rubbing on sandpaper or spinning lightly against a grinding wheel. From this same end of the 1/16 inch rod, cut off a 5/16 inch long piece with metal snips or with the cutting surface on good pliers. Press the rounded end of this piece of 1/16 inch rod into the 1/16 inch hole that you have drilled through the ½ inch wrapped carbon fiber sleeve and through the mast until it is flush on both sides of the ½ inch wrapped carbon fiber sleeve.

Put pins through the two holes in the mast joining sleeve in the same way. Remove all of the blue tape from the sleeves.

6) Fitting the Mast to Your Boat and Adjusting the Length of Your Mast. The total length of your mast cannot exceed 48 inches, and now it is slightly over 48-1/2 inches. Before, just lopping off part of your mast to get it down to size, you will need to slide the loop of the gooseneck fitting onto the bottom of the mast and put the mast in place in your boat. Due to the method of creating the mast step there will inevitably be minor variations in how far down the mast slides in the mast step tube set in the deck. The mast sleeve tube should ideally protrude above the deck surface by about 1/16th inch. The loop of the stainless steel boom vang piece needs to be free to pivot easily around the mast tube, but it should not have any additional room to move up and down on the mast tube, more than just enough so it is not being pressed on and held by the mast joining collar resting on it. The loop simply will not pivot if the weight of the mast is sitting on the loop.

The gap between the top edge of the mast sleeve tube in the deck and the bottom edge of the mast joining sleeve should be much larger at this point than you want it to be. Measure very precisely exactly how much you can reduce this gap without risking the boom vang loop being pressed upon. After getting this measurement, remove the mast and wrap blue tape around the mast at the base of the mast. Mark the blue tape so as to cut off just a bit less from the bottom of the mast than your measurement indicated (see cutting tips below). It is best to cut off less than you need to and then refit the mast to the boat and sand off just a bit more. This can be repeated several times until the fit is perfect. Always wear a good filter mask when sanding carbon fiber because the sanding produces a dust that can float in the air for a surprisingly long time. If possible sand outdoors.

When the bottom of the mast is just right so that, when the mast is in place in the boat, the stainless steel boom vang loop pivots easily around the mast, but does not have unnecessary room to move up and down, remove the mast. Wrap tape around the top of the mast, measure 48 inches from the bottom of the mast, make a mark on the tape and cut the top of the mast at this point.

7) Drilling the top two holes in the Mast. The first hole is just 3/8 in. down from the top of the mast. The second hole is 5 1/8 in. down from the top. These holes will be drilled with the #53 bit. It is important to slide the 6-1/2 piece of clear nylon tubing (.125 inch outside diameter) into the top of the mast before drilling these two holes. Screwing the screw eyes through the nylon tubing as well as the carbon fiber tube gives the screw eyes much greater holding power. Leave 1/2 inch of the nylon tubing sticking out of the top of the carbon fiber tube, and tape the nylon tube se-

curely to the top of the carbon fiber tube so that when you drill though the carbon fiber tube you will drill through the nylon tubing at the same time as drilling the carbon fiber tube. Leave this tape in place until after the final rigging of the mainsail when the screw eyes are screwed into these holes for the final time. If the nylon tubing is not drilled, the screw eyes won't screw into the tubing. For drilling the holes, take a small piece of masking tape and place it on the mast at the approximate location of the hole you are about to drill. Now measure carefully and make a mark on the masking tape at the exact position of the hole you are drilling. Drill the hole through the masking tape using the #53 bit that is included in the kit. Putting the masking tape down and drilling through the tape makes the bit less likely to want to slide sideways as you start drilling. Drill the hole through both sides of the mast, in other words, all of the way through the first side of the mast, through the nylon tubing and out through the second side of the mast. Both holes should be lined up with each other (parallel to each other).

The Carbon Fiber Booms

1) Preparing the Booms. The inside diameter of the booms is too large for 1/16th inch stainless steel rod to slide into without being very sloppy and loose. The first step in preparing the booms is to glue a smaller diameter carbon fiber tube into the forward end of each boom to receive the 1/16th inch stainless steel rod that will be slid into the front end of each boom (the main boom and the jib boom).

At the front end of the main boom there will be a smaller diameter carbon fiber tube glued into the front end of the boom so that the end of the inside smaller diameter cf tube and the end of the outside larger diameter cf boom tube are flush with each other. The smaller diameter carbon fiber tube at the front end of the main boom will act as a sleeve reducing the inside diameter of the main boom to the correct diameter for the 1/16th inch stainless steel rod that will be made into a gooseneck to join the boom to the mast.. The inside diameter of the smaller carbon fiber tube is just slightly over 1/16".

The jib boom will get a slightly longer piece of 1/8 inch outside diameter carbon fiber tube glued into its forward end so that the smaller diameter carbon fiber tube sticks out from the front end of the boom approximately 5/8 of an inch. Later on we will slide into this projecting 1/8 inch diameter cf tube a piece of 1/16 inch stainless steel rod that holds the jib boom counterweight. The stainless steel rod is just a pressure fit inside the small diameter carbon fiber tube, adequate pressure being created by putting a very slight curve in the ss rod, so the jib boom counterweight can be easily removed for heavier wind conditions when it is not necessary. The purpose of the counterweight at the front end of the jib boom is to encourage the jib boom to swing out to the side even when the wind is virtually imperceptible. With the counterweight and the elastic thread system, the jib will go full out almost instantly when you let the sheets out as you round the upwind mark . This is a big advantage over boats where it might take a few yards in ultra light winds for the jib to finally go out to its full extent for the downwind leg. The mainsail, due to its larger surface area and its position in the boat, will fill and go out by itself in almost every condition.
You will want to cut one piece 1-1/2 inches long for the front end of the main boom and a second piece 2-1/2 inches long for the front end of the jib boom.

2) Gluing in the CF Inserts. Let's start with the jib boom. The jib boom is the shorter of the two larger diameter carbon fiber tubes. Mix ten drops of clear resin with 2 drops of hardener. Place some epoxy on one end of the jib boom. Cover with epoxy the outside of the 2-5/8 inch small diameter tube to within 5/8 inch of what will be the front end of the smaller diameter tube and slide the tube into one end of the jib boom with the epoxy. Leave the front end of the smaller

diameter cf tube projecting from the front end of the jib boom by 5/8 of an inch.

Use the rest of the epoxy you have already mixed up or mix ten more drops to glue the 2 inch piece of smaller diameter carbon fiber tubing into the front end of the main boom so the forward end of this insert is flush with the forward end of the boom. Clean out any epoxy that has gotten into the outer end of either small diameter cf insert before the epoxy sets up, otherwise you will want to drill this epoxy out after it has set up using a 1/16th inch bit.

3) Systems for Adjusting Sail Trim Settings on the Booms. The lines we definitely want to be able to adjust on the jib are the position of the clew outhaul and the length of the jib sheet. The clew outhaul is where the back corner (clew) of the sail attaches to the back end of the boom. Sliding this attachment point forwards creates a fuller sail with more camber for lighter winds. Sliding this attachment point back towards the back end of the boom creates a flatter sail for heavier winds.

You will also want to be able to set the jib slightly farther out for light winds or for more power in choppy conditions by adjusting the length of the jib sheet. In flat water and stronger winds, you will want the jib flat and tight so you can point really close to the wind which means shortening the jib sheet and sliding the clew attachment point back on the boom.

A final adjustment for the jib is being able to control the length of the line attaching the jib boom down to the deck. The jib boom is held down at a point about 2-1/4 inches back along its length, instead of being attached to the deck at the very front end of the jib boom. The forestay holding the jib sail comes down to the front end of the jib boom, and attaches to the front end of the jib boom, but the forestay does not attach to the deck. The jib boom pivots around the point 2-1/4 inches farther back where the boom is attached to the deck.

The effect of attaching the jib boom to the deck farther back along the boom is to give control of the back end of the jib boom to keep the back end of the boom from lifting up when the jib is sheeted out. More tension on the backstay means the forestay is tighter and pulling up harder on the front end of the jib boom, which acts as a lever pulling down on the back end of the jib boom. If you want to hold the jib boom down, but do not want to bend the mast, then the line attaching the jib boom to the deck should be short. Even with relatively a lot of backstay tension the mast will still stay straight. In strong winds, if you want to bend the mast to flatten the mainsail, then letting the line be longer that holds the jib boom down to the deck will allow the mast to bend more and by bending the mast to match the curve sewn into the front edge of the mainsail, you will achieve a very flat mainsail and be better able to handle the strong blasts. Enough bend will start to spill wind out of the top of the mainsail to reduce heeling. Fine tuning the boat for every wind becomes an art!

Just a note about positioning the jib: the jib should never be sheeted in so the clew is any closer than 2 inches from the mast. There must always remain an adequate slot between the back edge of the jib and the front edge of the mainsail for the air coming off the jib to flow through. If you close off this slot, the air flow is totally disrupted and the boat will struggle to sail upwind or to even tack.

On the mainsail we will find that the primary adjustments that significantly affect performance in different conditions are the clew adjustment and the length of the main sheet which determines how far in the boom comes when the sheets are sheeted all of the way in, also the boom vang which holds the boom down.

For the adjustments on the jib boom and on the main boom, we use vinyl (as opposed to rubber) marine quality grommets that slide on a marine grade shrink tubing with an internal heat activated adhesive which is shrunk onto the booms at the points where the vinyl grommets are gripping the booms. The result is that the grommets can still be slid manually for adjustment, but the grommets will not slide due to the force of the wind on the sails.

In addition to the sliding grommets, there is another innovation on the main sheet system

which works quite nicely. The system is most effective with the digital servos with their extended degrees of swing, but it is still somewhat effective with the 90 degree analog servos as well. The concept is to have the mainsheet lead to a sliding tube on the main boom instead of to a fixed point on the main boom. When the main sheet is brought in tight, the sliding attachment point for the mainsheet slides back so it is centered above the barney post from which the mainsheet leads. When the sail is sheeted all of the way out, the sliding attachment point for the mainsheet slides forwards along the boom towards the mast so that the distance from the barney post to the attachment point on the boom is reduced. This allows the boom to swing farther out to the side so that the boom is virtually at right angles to the centerline of the boat for the most effective sail angle for running directly downwind.

A vinyl grommet on the sliding brass tube allows for adjusting the length of the mainsheet. Due to the slightly larger outer diameter of the brass tube that slides on the boom, the vinyl grommet grips the brass tube very securely (without the heat shrink tubing). The grommet can be slid manually to adjust the length of the mainsheet. A vinyl grommet sliding on heat shrink tubing on the main boom will be used to adjust the position of the clew of the mainsail (back corner at the end of the boom) and to adjust the upper end of the boom vang for holding the boom down.

4) Creating Sail Trim Systems on the Main Boom. Cut the length of black heat shrink tubing into 6 pieces: 2 lengths measuring 1-1/2 inches each, two lengths measuring 2 inches each, and two pieces measuring 1 inch each. It is best to start with the main boom. There will be three pieces of heat shrink tubing on the main boom for the adjustable vinyl grommets. The sliding brass tube for the mainsheet must be put onto the boom before the heat shrink tube at the back end of the boom is applied, otherwise the sliding brass tube will not fit on. The front end of the main boom is the end of the boom with the smaller diameter carbon fiber tube that you have epoxied into the end. Measure back from the front end of the main boom a distance of 2-3/4 inches. Slide one 2 inch piece of heat shrink tubing onto the boom and position the heat shrink tubing so that it begins at the 2-3/4 inch mark and runs from that point towards what will be the back end of the boom. Heat this tubing gently until the tubing shrinks tightly and evenly to fit snugly around the boom. You should see a fine line of shiny, melted adhesive along the edges of the heat shrink tubing when the tubing is evenly shrunk onto the surface of the boom. Heat the heat shrink tubing over a wood match, a stove burner, a lighter (or a stick lighter), or best of all (and safest), use a heat gun. Play the heat source over the tubing evenly from different sides. Avoid having flame touch the tubing directly. You are not trying to melt or incinerate the heat shrink tubing!! Make certain that you have not set the tubing on fire so as not to risk setting other things on fire if you set the piece down! Do not add a vinyl grommet at this point.

Add a piece of one inch long heat shrink tubing to the boom 3/4 inch back from the front end of the boom for the second vinyl grommet. This vinyl grommet will be used for adjusting the cunningham (the line which pulls down on the front edge of the mainsail for either more or less tension along the luff of the sail.) Do not add a vinyl grommet at this point.

Find the 3 inch long piece of brass tubing. With 220 grit sand paper remove any slight burrs from the end of the brass tubing and slightly bevel the end to make it easier to slide a vinyl grommet onto the brass tubing. Getting the tubing started into the vinyl grommet initially is a tight fit, but the grommets are somewhat elastic and the tubing will slide in, as long as the edge of the tubing is smooth and does not start to dig into the vinyl grommet. Once the vinyl grommet has been slid onto the brass tubing, slide the brass tubing onto the boom from the back end of the boom.

After the brass tubing has been slid onto the boom, apply a 1-1/2 inch long piece of heat shrink tubing to the back end of the boom. The heat shrink tubing should run all of the way to very back of the boom. In fact, it looks very clean and sharp to have the heat shrink tubing slightly longer than the carbon fiber boom so the heat shrink tubing extends past the end of the carbon

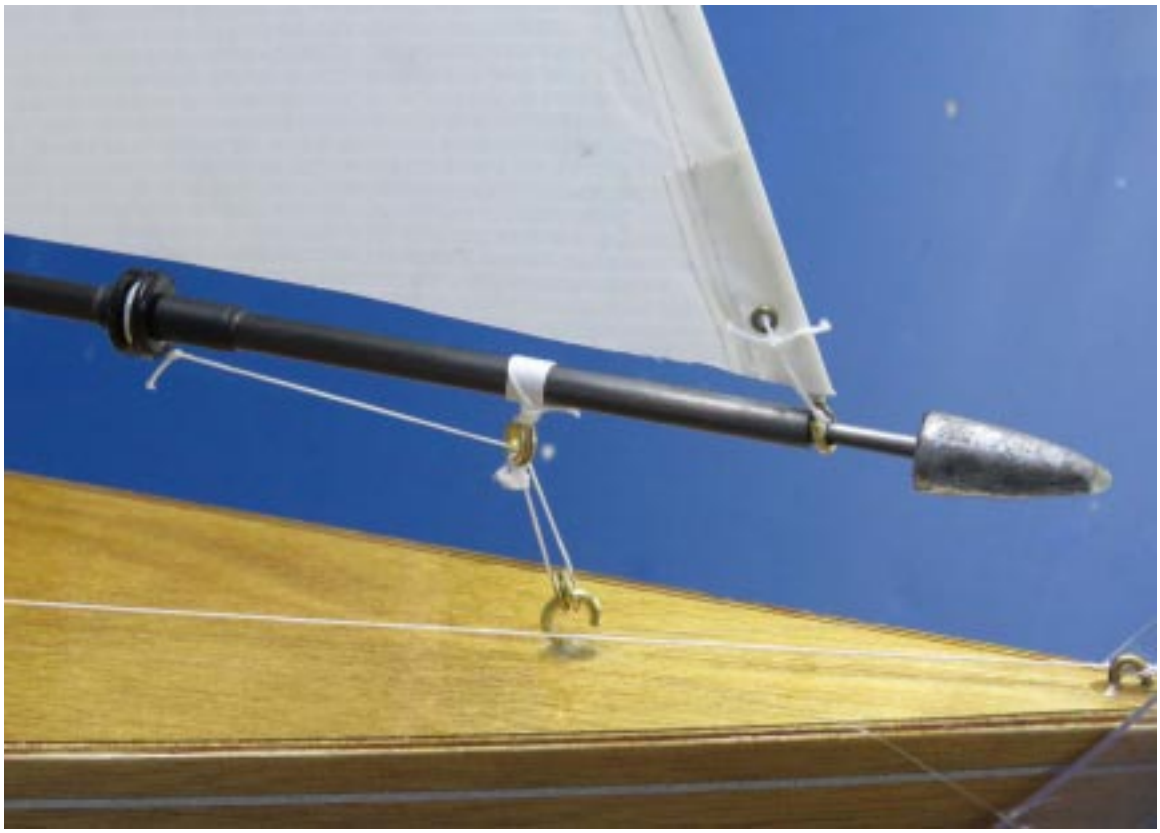
fiber boom by 3/32 inch or so. When shrunk, the tubing will come together to almost close up the back end of the boom. Is the brass tube in place between the two pieces of heat shrink tubing? If yes, then go ahead and heat this second piece of heat shrink tubing tightly onto the boom. After the heat shrink tubing has cooled, slide a vinyl grommet onto the back end of the main boom.

5) Final Steps on the Jib Boom. There is no sliding brass tube on the jib boom. The jib boom is never sheeted in as far as the main boom because you always need to keep the slot between the jib and the mainsail somewhat open, so the jib boom does not require as many degrees of swing to get out all of the way as the main boom requires. The front end of the jib boom is the end that has the smaller diameter carbon fiber tube sticking out from the end. The back end did not get any carbon fiber tube glued into it. Measure from the back end of the jib boom a distance of 4-1/2 inches and slide the second 2 inch piece of heat shrink tubing onto the boom so that the tubing starts at the point 4-1/2 inches from the back end of the boom and runs forwards from this point towards the front end of the boom. Heat this piece of tubing to shrink and adhere it to the boom in this position.

From the front end of the jib boom (not counting the small diameter carbon fiber tube extending from the boom), measure back 3-1/2 inches and slide the 1 inch piece of heat shrink tubing onto the boom so that the tubing starts at the point 3-1/2 inches from the front end of the boom and runs back from this point towards the back end of the boom.

The final piece of 1-1/2 inch long heat shrink tubing slides onto the back end of the jib boom, and like on the main boom, you can let the heat shrink tubing extend just very slightly beyond the end of the boom. Heat this piece of tubing to shrink and adhere it to the boom. Slide one vinyl grommet onto the back end of the jib boom and continue to slide it forward until it is on

the piece of shrink tubing that is positioned further forward on the boom. Slide a second vinyl grommet onto the heat shrink tubing at the back end of the boom. Slide a third vinyl grommet onto the heat shrink tubing near the front end of the boom. The remaining vinyl grommet will be incorporated into the boom vang before being slid into place on the main boom.



Additionally you will want two brass eyelets lashed tightly to the jib boom as follows. These will be the larger diameter brass grommets measuring slightly over 1/4 inch in outside diameter. The first eyelet will be lashed at a point 2-1/4 inches back from the front end of the larger diameter jib boom material (NOT measuring from the smaller diameter forward extending piece of carbon fiber). The second will be lashed at a point 1-1/2 inches forwards from the back end of the boom. Lash these eyelets in the following manner.

Take a fourteen inch piece of the heavier spectra and tie the middle of the spectra line around the groove in the outside perimeter of one of the round brass eyelets. The two ends should both be equal lengths. Tie several tight knots. The ends of the spectra now tie around the jib boom. At a point 2-1/4 inches back from the front end of the carbon fiber jib boom, wrap one end of the spectra around the boom in one direction and the other end of the spectra around the boom in the other direction. Wrap about 4 wraps with each end for a total of 8 wraps. Bring the ends together and tie firmly with one square knot. Grab the ends coming out of the knot with pliers and pull the ends apart from each other until the knot slides up tight and keep pulling until all of the wrappings on the boom slide tight. The spectra is so slippery that the line will slide right through the square knot tightening up the lashings beneath the knot - very convenient! Now tie two more square knots on top of the first knot, pulling each knot tight, otherwise the knots will slide out.

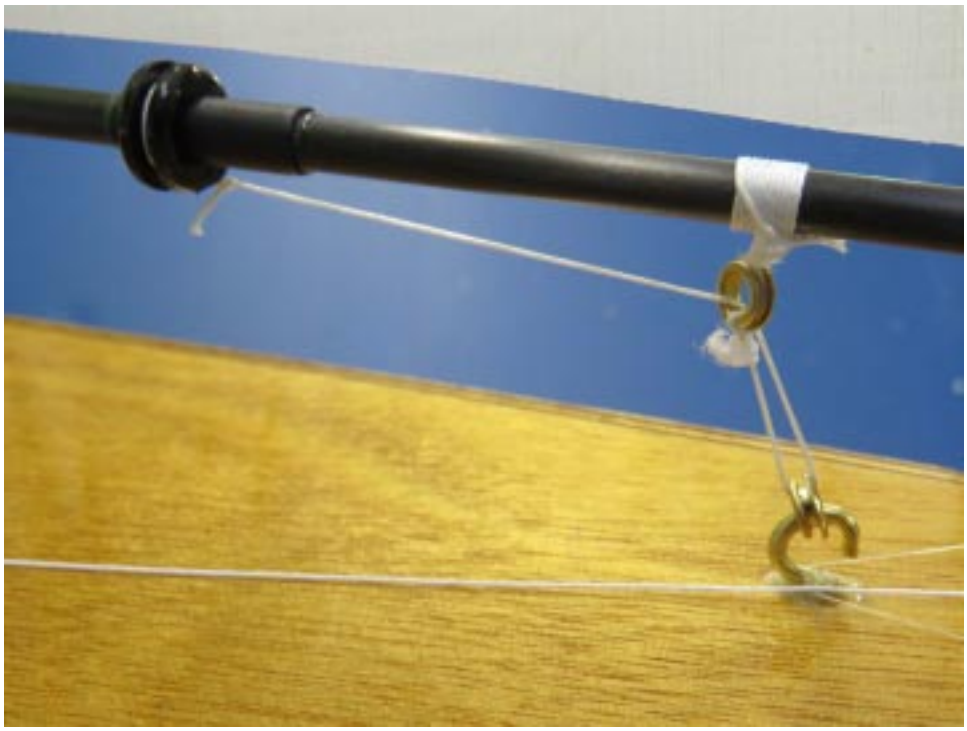
Lash the second round brass rigging eye to the bottom side of the jib boom at a point 1-1/2 inches forwards from the back end of the jib boom, right up against the edge of the heat shrink

tubing at the back end of the boom.. This eye will be used for the jib sheet to run through. A dot of ca (cyanoacrylate - or “superglue”) works well to keep these spectra lashings from sliding along the boom.

Completing the system for attaching the jib sheet to the boom, take one of the two stainless steel and brass fishing style clips and a twelve inch length of the heavier spectra. Loop the spectra several times around the groove in the middle vinyl grommet on the jib boom and tie it firmly with several knots. With the excess of this line, tie the smaller end of the fishing style clip closely to the vinyl grommet, but not so tightly that the clip is forced up into the groove in the vinyl grommet since you will want the clip to be able to point backwards parallel to the boom.

For the last step on the jib boom, this is a good time to rig the line that will attach the jib boom to the deck and hold the jib boom down. By moving the attachment point where the jib boom is attached to the deck back from the front of the jib boom and the front corner of the jib, to a point 2-1/4 inches back along the jib boom, we can use this as a fulcrum point to turn the jib boom into a lever arm so that when the front end of the jib boom is pulled up, the back end of the jib boom is pulled down. This in effect works the same as the boom vang on the main boom and keeps the back end of the jib boom from lifting up and spilling wind out of the jib when the jib is sheeted out for running off the wind. We will want this downhaul line holding the jib boom down to the deck to be adjustable so we have better control over sail shape in different wind conditions. Yes, it is the amount of tension on the backstay that will determine the tightness of the back edge (leach) of the jib, but it is the length of this downhaul line on the jib boom that will together with the tension on the backstay affect the amount of bend in the mast which dramatically affects the shape of the mainsail. This starts to give you some idea of how advanced your tuning techniques can get when racing your T37!

Take a 14 inch piece of the heavier spectra line and tie it tightly to the eye of the furthest forward brass eye lashed to the bottom side of the jib boom. Slide a single one of the larger brass eyelets onto the line with the line running through the center of this new eyelet. Run the end of the line up through the eyelet lashed to the boom and then wrap the line around the groove in the closest vinyl eyelet that is just slightly farther back along the boom and tie the line to the eyelet with several half hitches such that the line will be very taught when the vinyl grommet is positioned all of the way towards the back edge of the heat shrink tubing on the boom and will be very slack when the vinyl grommet is slid forwards along the boom to the forward edge of the heat shrink tubing. The loose eyelet hanging on the loop of line will be hooked onto an open screw eye in the bow deck when your boat is rigged.



6) Completing the Boom Vang. This may be the most difficult step in the rigging process, but not to worry, it will turn out fine. The forward end of the stainless steel rod being used for the boom vang should already have your loop to fit tightly around the base of the mast just above the deck along with the clear heat shrink tubing to capture the short end of the rod coming up from the loop.

Grab the loop with needlenose pliers, and bend the rod up right behind the loop to an angle of 25 degrees, or in other words to an angle so the upper end of the rod is pointing right to the middle of the forward piece of heat shrink tubing on the main boom. Slide the front end of the main boom onto the end of the stainless steel gooseneck rod that sticks out from the mast to determine this bend in the boom vang rod.

The upper end of the boom vang rod now needs to be bent to loop around the groove in the final vinyl grommet so that the vinyl grommet will be centered in the heat shrink tubing on the boom when the boom is horizontal. Measure up the stainless steel rod 4 inches from the loop in the bottom end of the boom vang rod. Make a mark at the 4 inch point with a Sharpie permanent marker. Begin the loop just above this mark using needlenose pliers and bending the stainless steel rod bit by bit around into a circle. Keep the circle open enough that the loop will fit around the vinyl grommet. This upper loop in the rod also needs to be bent so that the loop is vertical, or perpendicular to the horizontal boom. This loop does not need to be a closed loop, but only needs to be about 3/4 of a circle or about 270 degrees such that the loop can grip onto the vinyl grommet and remain firmly in the groove in the vinyl grommet. Clip off the excess stainless steel rod using the cutting edge of the needlenose pliers. Position the loop around the groove in the vinyl grommet and squeeze the loop closed enough around the groove in the vinyl grommet so that the vinyl grommet is captured in the loop. Do not squeeze the loop so tightly that the vinyl grommet will be unable to slide onto the boom.

After making this loop around the vinyl grommet, slide this vinyl grommet at the upper end of the boom vang rod onto the main boom from the front end of the boom. Slide one additional vinyl grommet onto the front end of the main boom as well and onto the furthest forward bit of heat shrink tubing.

Mix 10 drops of clear epoxy with 2 drops of hardener. Coat the forward end of the main boom with epoxy, coat the stainless steel rod of the gooseneck fitting with epoxy, being careful not to get any epoxy in the loop that pivots around the mast. Slide the front end of the boom back onto the stainless steel gooseneck rod. Slide the boom vang vinyl grommet back along the boom until it is more or less centered on the patch of heat shrink tubing that starts 2-3/4 inches back along the boom. Clean off any excess epoxy on the front end of the boom and clean off especially where any epoxy might get between the gooseneck loop and the mast.

The boom vang is adjusted by sliding the vinyl grommet forwards or backwards along the boom to lift the boom slightly or to hold the boom down more tightly. The additional vinyl grommet forwards of the boom vang slides onto the one inch piece of heat shrink tubing near the front end of the boom and will be used for adjusting the cunningham to tension the front edge of the mainsail. Leave the boom in place for rigging the mainsail.

7) Final Steps on the Main Boom. One of the larger brass eyelets gets lashed onto the sliding brass tube on the main boom. Position this brass eyelet 1/4 inch back from the front end of the sliding brass tube. Lash this eyelet onto the brass tube in the same manner that you lashed the brass eyelets onto the jib boom. A dot of ca (cyanoacrylate - or “superglue”) works well to keep the spectra lashings from sliding.

For completing the system for attaching the main sheet to the main boom, take one of the two stainless steel and brass fishing style clips and a ten inch length of the heavier spectra. Loop the spectra several times around the groove in the vinyl grommet on the sliding brass tube and tie the spectra firmly with several knots. With the excess of this line, tie the smaller end of the second fishing style clip closely to the vinyl grommet, but not so tightly that the clip is forced up into the groove in the vinyl grommet since you will want the clip to be able to point forwards parallel to the boom.

Rigging the Mainsail and the Backstay

1) Rigging the Mainsail. On the mast locate the hole 5-1/8 in. down from the top of the mast. This

hole should be pointing forward. Slide the sleeve of the mainsail over the mast. Position the mainsail so that the bottom edge (the foot) is about 1/4 inch above the top of the boom (i.e. the bottom edge of the mainsail should be just above the middle of the wrapped carbon fiber sleeve you have pinned to the mast.) Screw a regular screw-eye through the front edge of the mainsail into the hole in the front of the mast (5-1/8 inches down from the top). This screw eye should be screwing into the carbon fiber mast , but it should also be screwing into the nylon tube that you have slid into the mast from the top. Once the screw eye is screwed into the nylon tube, the screw eye will never pull out. Turn this screw-eye until it is lined up parallel with the mast.
Screw a second closed screw eye into the hole at the top of the mast with this screw eye screwed into the back side of the mast. Your mainsail has a grommet at the top of the sail (head). Use a 6 inch piece of heavier 90 pound spectra to tie the top of the sail through this grommet up to the screw eye that holds the backstay at the top of the mast. Once again tie several knots here so the knots will stay put in the slippery spectra.

2) Rigging the Clew Outhaul. The clew (back corner) of the mainsail will be attached by spectra to the groove around the vinyl grommet at the back end of the boom. By sliding the grommet forward along the boom, the draft of the sail can be increased and by sliding the grommet back towards the back end of the boom, the sail can be flattened. This clew adjustment, along with also being able to control how much the boom vang is pulling down on the boom, gives a tremendous amount of control over the sail shape.

Cut a piece of the heavier spectra 10 inches long for the clew outhaul line. Tie a loop of this spectra through the eyelet in the clew of the mainsail. Use a knot that won't slide up tight when tieing a loop of the heavy weight spectra through the eyelet in the clew of the mainsail. The loop through the eyelet must be as small a loop as possible without crimping the bottom of the sail, otherwise the sail will not be able to be pulled tight enough by adjusting the vinyl grommet on the boom. A bowline works fine here creating a loop in one end of the spectra, but always lock the bowline off with two half hitches tied up against the bowline since the spectra is so slippery. If you use a bowline, tie the spectra coming from the bowline around the groove in the vinyl grommet using two half hitches so that the bowline is right up as tight as possible to the vinyl grommet. It also works fine to create a loop through the clew eyelet by running the spectra through the eyelet so the spectra length is centered in the eyelet. Double the spectra over and tie a figure eight in the doubled over strands of spectra coming from the eyelet. Finish off by tieing the spectra tightly around the groove in the vinyl grommet at the back end of the boom. Several square knots on top of each other work fine in this case.

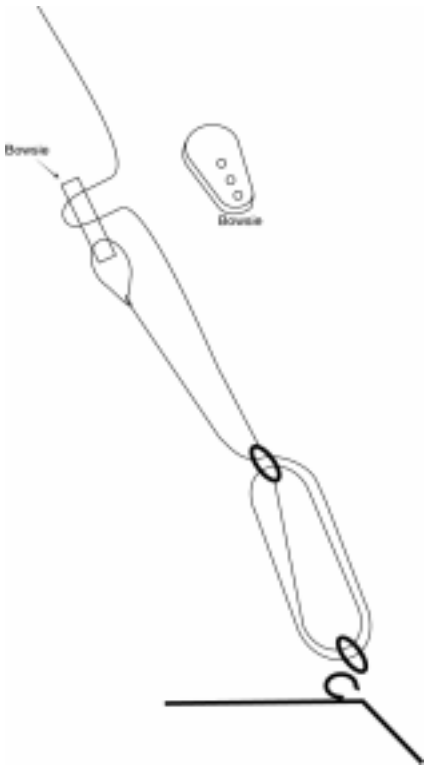
3) Rigging the Cunningham. The cunningham is the line that pulls down on the tack of the mainsail (front lower corner) to adjust the luff tension along the front edge of the mainsail. Your mainsail has a grommet at the tack for rigging the cunningham. The furthest forward vinyl grommet on the main boom is used for adjusting the cunningham.
Take a 14 inch piece of the heavier 90 lb spectra. Tie one end of this spectra around the groove in the perimeter of one of the round brass rigging eyes. Use several knots so the spectra won't slide out of the knot (half hitches work well here). Right up next to the rigging eye as close as possible, tie the spectra where it comes off of the rigging eye around the stainless steel rod of the gooseneck fitting just at the point where this rod comes out of the front end of the main boom. Don't cut the excess spectra off!! Now you have the rigging eye tied up close to the stainless steel rod as the rod comes out of the boom and a long piece of spectra coming off from the knots on the stainless steel rod. Run the long piece of line up through the eyelet in the tack of the mainsail, back down through the brass rigging eye at the gooseneck and then back to the first of the vinyl grommets on the boom. Tie the line around the groove in the vinyl grommet so that when the grommet is at the midpoint on the heat shrink tubing, the tension is equivalent to medium downward pressure on the front edge of the

mainsail (luff).

4) Displaying the Masthead Streamer. Find the brightly-colored nylon masthead streamer. Attach the masthead streamer to the end of the nylon tube coming out of the top of the mast. At the wider end of the streamer is a waterproof double sided tape. Remove the backing on the tape. Attach the streamer by winding it tightly around the tube at the top of the mast. Begin winding with the widest end of the streamer attached to the tube and continue to wind until the double sided tape is entirely wound around the tube.

5) Rigging the Backstay. The backstay can be made easily adjustable as well by using a three to one ratio ending in a sliding bowsie. Cut a piece of the heavier 90 lb spectra 55 inches long. Screw a regular screw eye (no brass sleeve liner) into the hole 3/8 inch down from the top of the mast on the back side of the mast. This screw eye should be threading itself into the carbon fiber of the mast and into the nylon tube inside the mast. The screw eyes absolutely cannot pull out of the nylon tubing inside the carbon fiber mast, whereas a screw eye might eventually loosen and pull out of the carbon fiber mast if there were no nylon tubing inside the mast. Tie the top end of the spectra to the screw eye with a whole series of half hitches, enough to make sure the line won't slip out of your knots!

This is where you have to add the sliding bowsie on the backstay. You must add the bowsie before completing the backstay with the rigging eye at the bottom end of the backstay otherwise it is not possible to get the bowsie onto the backstay! Find the bowsie, the small white plastic piece with three holes. Sand the edges of the bowsie to a smooth rounded shape so the bowsie will look nice when rigged. Run the end of the spectra backstay line through the first hole at the wider end of the bowsie. Turn the line and come back through the middle hole of the bowsie. Slide the bowsie up along the line about 8 inches.



Measure to a point 46-1/2 inches from the screw eye in the top of the mast and tie on a

round brass rigging eye by running the spectra around the groove in the outer perimeter of the rigging eye. Again use a series of half hitches here. This rigging eye at the bottom end of the back-stay is some distance above the deck at the back of the boat. The final part of the backstay will be rigged with a three to one purchase ending with the line running back up to the third hole in the sliding bowsie. Cut a piece of spectra line 20 inches long. Tie one end of this spectra tail through the rigging eye on the bottom end of the back stay.

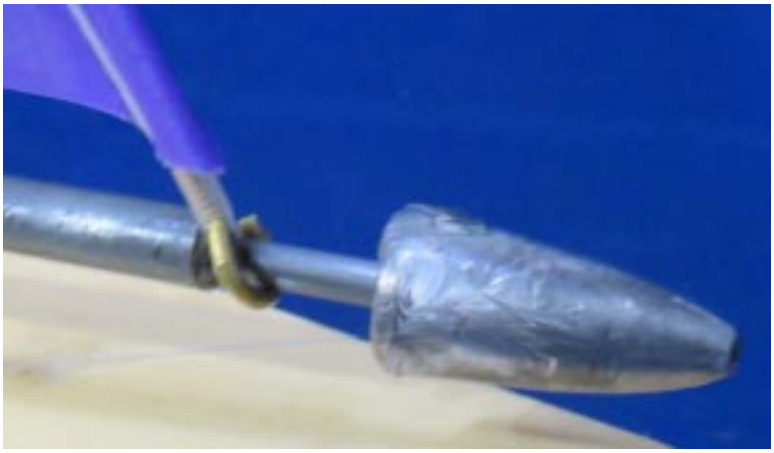
Using the #53 drill bit, drill out the hole in the back of the deck just in front of the transom since epoxy has probably gotten into the hole. Open a screw eye enough that a rigging eye can slide onto the screw eye. Screw this screw eye into the hole centered at the very back of the deck. Have the open part of the screw eye pointing towards the back of the boat. Leave this screw eye open so you can remove your rig.

Slide the mast into place in the hull, attach the jib boom downhaul eye to the open screw eye in the front deck. Take a round brass rigging eye and slide this rigging eye onto the open screw eye at the back of the deck. Bring the spectra tail from the backstay down through this rig-ging eye at the deck, back up through the brass rigging eye on the end of the backstay and down through the rigging eye at the deck a second time and then up through the eye on the end of the backstay and then on up to the third hole in the sliding bowsie. Tie the spectra tail securely with a series of half hitches through the third hole in the bowsie. Very precise adjustments can now be made to your backstay tension! Without rigging the bowsie with the three to one purchase, the bowsie would be much more difficult to adjust precisely.

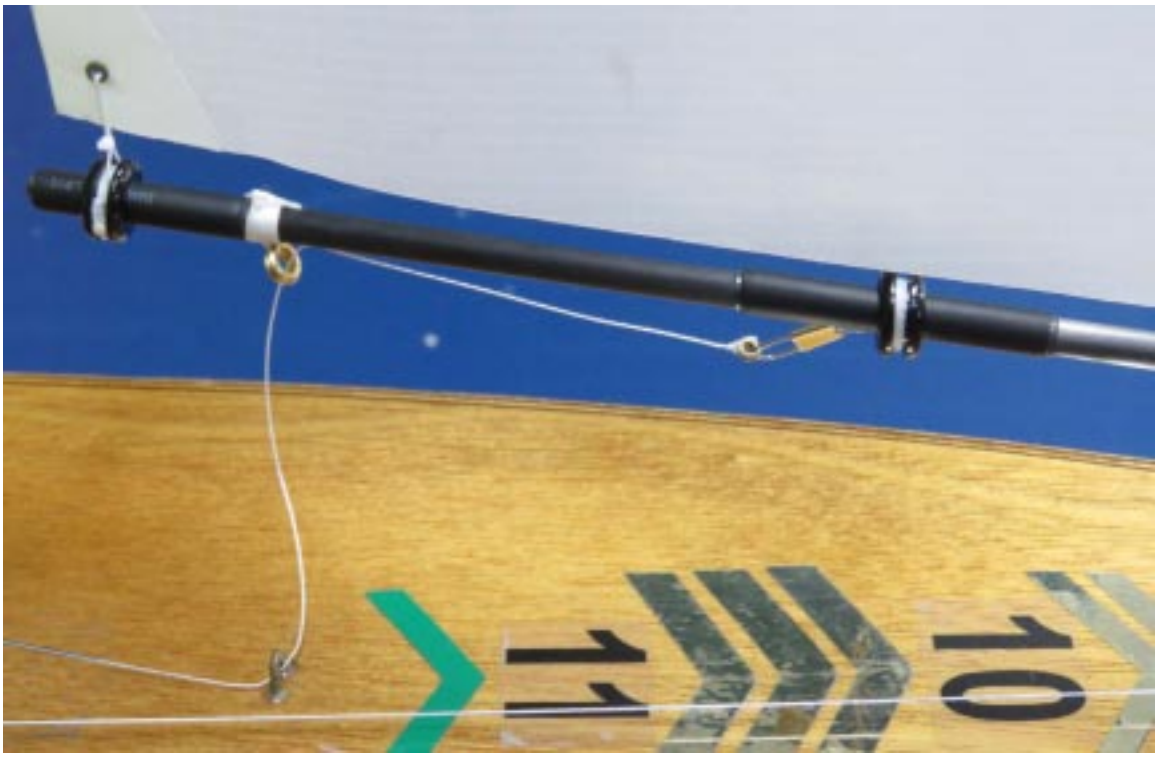
The racing upgrade T37 does not require shrouds because the carbon fiber mast is so stiff that even in the strongest winds the mast will not bend significantly.

Rigging the Jib

1) Rigging the Jib. Slide the long nylon forestay tube into place in the front sleeve of the jib sail. Open a screw eye so the eye is open very slightly. Screw this open screw eye into the bottom of the nylon tube where it comes out of the bottom of the jib. Slide this open screw eye over the 1/8 inch diameter carbon fiber tube sticking out from the front end of the jib boom. Take 8 inches of the heavier spectra line and tie the middle of the line firmly around the 1/8 inch diameter carbon fiber rod which comes out from the front end of the jib boom . Take the two ends of this line and tie them in a loose loop through the grommet in the tack (bottom front corner) of the jib so that the jib is held with the bottom edge just 1/4 inch above the top of the jib boom. (Tie at least two square knots.)



At the back corner of the jib, rig a clew outhaul line for the jib clew in exactly the same way as the clew outhaul line is rigged on the mainsail (from the eyelet in the clew of the jib to the vinyl grommet at the back end of the jib boom).



2) Attaching the Forestay to the Mast. The round brass rigging eye that is hanging from the jib boom at the point 2-1/4 inches back from the front end of the boom is now ready to be hooked onto the open screw eye in the deck, about 4-1/2 inches back from the front of the boat. Set the sliding vinyl grommet that controls the length of this downhaul line to the middle position on its length of heat shrink tubing. The nylon forestay tube runs from the front end of the jib boom up to the screw eye in the front of the mast.

Adjusting the length of the forestay tube takes some precision. It is best to cut the tube slightly too long initially and then to trim it bit by bit until it is just the right length. With the mast straight up and not being pulled backwards by the backstay or forwards by the forestay tube, the forestay tube should be just the right length so that the back edge of the sail (the leach) is straight and firm, but not overly tight. Hold the forestay tube with the jib up to the screw eye which you have screwed into the front of the mast. Position the mast so it is either perpendicular to the deck or slanting almost imperceptibly backwards. Clip off the nylon tube so that when you screw an open screw eye into the end of the tube and hook this screw eye to the screw eye in the front of the mast, the forestay tube will be held straight. If you clip the tube too short the mast will be held so it is forced to lean forwards. If you clip the tube slightly too long and you find that the mast is leaning back too much, you can easily unscrew the open screw eye and clip the nylon tube slightly shorter. When you have the forestay tube the correct length, screw an open screw eye into the top of the forestay tube. Hook the open screw eye in the top of the nylon forestay tube to the closed screw eye in the front of the mast. Squeeze the screw eye in the top of the nylon forestay tube closed. Leave the screw-eye in the foredeck open so that you can unhook the jib boom when you want to unstep the mast. Take an 8 inch piece of the heavier spectra line and tie the top (head) of the jib up to the screw eye in the front of the mast by running the line through the brass eyelet in the top of the jib. Tie this line so that the jib material is actually taking slightly more of the load

than the forestay. You don't want the leading edge of your jib to be sloppy. By tightening and loosening the backstay, you can add tension or loosen the leading edge of the jib.

Attaching the Sheets

1) Attaching the Mainsheet. Now we are ready to adjust the length of the sheets and attach the sheets to the booms. Turn on the transmitter and the receiver and use the control stick on the transmitter to move the sail control arm on the sail servo all of the way forward. Slide the trim tab beside the control stick all of the way in the same direction as the control stick to maximize the distance of travel of the sail control arm. Run both the main sheet and the jib sheet through the eye on the top of the barney post (starting from the back side and running forwards).

When we have determined the correct length for the main sheet, the end of the main sheet will be tied around the perimeter groove in one of the very small diameter round brass rigging eyes (just over 1/8 inch diameter). The main sheet, after running through the larger diameter brass rigging eye lashed to the sliding brass tube on the main boom, will attach with the very small diameter round brass rigging eyes to the fishing style sheet clip hanging from the vinyl grommet on the sliding brass tube. Move the sliding vinyl grommet to a position in the middle of its range on the brass tube.

Clip one of the very small diameter brass rigging eyes onto the fishing style sheet clip hanging from the vinyl grommet on the sliding brass tube. Run the shorter piece of spectra sheet line that comes up from the barney post up through the large diameter rigging eye lashed to the brass tube then around the slot in the periphery of the small diameter rigging eye. Check that your transmitter is still on and set with the sheets pulled in the maximum amount using both the control stick and the sliding trim tab beside the control stick. Check inside the cockpit opening beneath the deck to make certain that the main sheet line is running straight and are not looped around anything. Rig the main sheet so that the sheet is quite tight and holding the main boom right to the center of the boat. Tie the spectra sheet line tightly around the very small diameter brass eyelet so that the main sheet holds the boom in this position. Tie the mainsheet spectra line tightly to the brass rigging eye using at least four knots. Half hitches are suitable here. By sliding the vinyl grommet on the brass tube, the main sheet can be made looser or tighter.

2) Rigging the Jib Sheet. The jib sheet leads from where it comes through the eye in the top of the barney post forwards to where it goes through the U sheet lead on the port side of the deck just beside the mast and then to the center of the boat where it goes through the U sheet lead in front of the mast. The sheet leads keep the jib sheet clear of the mast and the boom vang.
From the U sheet lead in front of the mast, the jib sheet runs up through the large brass rigging eye lashed towards the back end of the jib boom and then forwards to the fishing style clip attached to the vinyl grommet. Clip the second very small brass grommet to the fishing style clip hanging from the vinyl grommet. Slide the vinyl grommet to the middle of the 2 inch heat shrink tubing on the boom.

To get the jib sheet to be the correct length, you want the main sheet to be very tight, holding the main boom right to the center of the boat. Now you want to rig the jib sheet to the jib boom surprisingly loosely so the end of the jib boom is pointing to a point just 2-3/8 inch out from the side of the mast, measured perpendicular to the centerline, when the jib boom is held out to the side. It is important not to have the slot between the back edge of the jib and the mainsail be too narrow by having the jib boom sheeted in too tight. If the slot is too narrow the boat will not want to sail upwind easily and may even have trouble tacking.

Run the jib sheet around the slot in the periphery of the very small rigging eye hanging from fishing style clip attached to the vinyl grommet. Check to make sure the jib sheet is leading straight

and not hooked on anything. Check that the jib sheet goes through the top of the barney post and then through two sheet leads set in the deck. Hold the jib boom in the correct position so the end of the boom is pointing to the point measured out sideways from the mast 2-3/8 inches and tie the jib sheet securely to the small diameter brass rigging eye hanging from the fishing style clip.

While sailing in different conditions, you can experiment with opening up the slot further by moving the vinyl grommet adjuster on the jib boom. Closing off the slot between the back edge of the jib (the leach) and the mainsail is a common mistake that skippers make. The slot between the jib and the front edge of the mainsail is important in powering the mainsail. A fast moving stream of air coming off the jib and flowing along the back side of the mainsail gives the mainsail more lift and contributes to the Bernoulli effect of the air foil of the mainsail. (Faster moving air has lower pressure, creating low pressure on the back side of the mainsail, pulling the boat forwards.) Remember to keep the slot open, probably farther open than you might expect especially in light to medium air!

Finishing Up!

1) Jib Counterbalance Weight. In light air, there is a significant advantage to having a counterbalance weight sticking out slightly in front of the jib boom. Due to the forestay being slanted back at an angle instead of being vertical, the front end of the jib boom actually goes down when the boom swings out to either side (and the back end of the boom goes up higher in the air). Taking advantage of this, by adding a weight out in front of the jib boom, the weight encourages the jib boom to want to swing out to the side when the wind is not adequate to carry the boom out by pushing on the sail. In racing there is a decided advantage if the jib on your boat goes out instantly as you round the upwind mark and sheet out for a downwind course. If your jib takes 5 feet before it fills and goes out, several boats may have passed you in the meantime!

In strong winds, there is no reason to have the weight on the jib boom, and in fact it can be a bit of a liability. If you don't leave adequate room to clear a mark or another boat, the weight sticking out slightly to the side can catch on whatever comes too close. Also in strong winds, you don't want any more weight forwards than necessary because the forward drive of the sails is already driving the bow down. It makes sense to have the counterbalance weight easily removable.

CAUTION: LEAD IS KNOWN TO THE STATE OF CALIFORNIA AND TO ALL GOVERNMENT AGENCIES TO BE SERIOUSLY DAMAGING TO THE HEALTH OF ANY INDIVIDUALS IF ANY TRACES ARE INGESTED THROUGH HANDLING. IT IS ILLEGAL TO HAVE ANY PERSONS 12 OR UNDER USING ANY DEVICE THAT INCORPORATES LEAD INTO ITS STRUCTURE. IF ANY PERSONS AGE TWELVE OR UNDER MIGHT HAVE ACCESS TO THIS SAILING VESSEL, DISPOSE OF THE LEAD WEIGHT AND SUBSTITUTE SOME OTHER FORM OF WEIGHT OR USE THE BOAT WITHOUT ANY WEIGHT. THE WEIGHT IS NOT CRUCIAL TO THE SAILING OF THIS BOAT. ALWAYS HANDLE LEAD CAREFULLY. EITHER DISPOSABLE GLOVES OR CAREFUL WASHING OF HANDS AFTER HANDLING LEAD IS ESSENTIAL. THE LEAD WEIGHT MUST BE COATED IN EPOXY BEFORE BEING USED ON YOUR BOAT. THIS BOAT IS INTENDED FOR ADULT USE ONLY. Find the lead cone shaped weight. Cut a 4 inch piece off the remainder of the 1/16th inch stainless steel rod. Slide the 4 inch rod into the small diameter hole in the cone from the wide end of the cone and out the front pointy end of the cone. Bend the front 1/8 inch of the rod at about a 15 degree angle in front of the pointy end of the cone. Slide the rod back into the cone so that the small bend comes up against the front pointy end of the cone. Use pliers on the back side of the cone, not to grip the rod, but to whack against the cone hard enough to drive the cone forwards until the slight bend at the front end of the rod is pulled into the cone and jammed so the rod now is permanently stuck fast inside the lead cone. NOW IS THE TIME TO COAT THE LEAD WEIGHT THOROUGHLY WITH EPOXY. Use a clear epoxy, mix in a small amount of phenolic powder so you get a thicker coating encasing the lead and coat every surface of the lead weight so that in handling

the lead weight there will be no contact with the surface of the lead. It works well to suspend the lead weight on the stainless steel rod with the pointy end of the weight down so the epoxy can form a smooth surface and can drip off of the pointy end. It is a nice detail to paint on top of the epoxy after the epoxy has set up. Wipe the epoxy down with warm water before painting to remove any traces of amine blush.

When the epoxy has set up or after painting, put a slight, gentle bend into the stainless rod about one inch in from the back end of the rod. Now when the stainless rod is slid into the small diameter carbon fiber tube, it should fit tightly enough because of the bend to stay in place.

2) Final Step - Elastic Thread. The elastic thread, although not necessary for the boat to sail well, is a very nice refinement. The only reason we don't like elastic is that eventually it stretches out and needs to be retied slightly tighter, and then finally it loses its stretchiness entirely and needs to be replaced. However, since the elastic thread is not really necessary and is only a performance enhancer, we are content to use it in this capacity.

Tie one end of the elastic thread through the loop in the end of the heavy 90 pound spectra that comes forwards from the brass U tube at the back of the boat (the same spectra loop that the sheet lines tie to). Run the elastic thread forwards through the eye on top of the barney post and then continuing forwards through the brass sheet lead on the port side behind the mast and then all of the way forwards to the farthest forward screw eye in the deck. Turn on the transmitter and the receiver and let the sails all of the way out as far as they can go using the control stick and the trim tab. Tie the elastic thread to the bow screw eye so that there is just barely the very slightest tension on the elastic thread (it is really almost slack with the sheet lines run forwards like this). Cut the elastic thread off after tieing it securely. Save the excess to run new elastic thread when necessary. The elastic thread is available directly from Joanne's Fabric physical stores or ordered on-line or can be ordered from Tippecanoe Boats. Nice to have the last step be so easy!!!

Addendum for those who don't want to stop!

One final refinement is adding a control for the luff tension on the jib. Some skippers do not feel this is a necessary refinement, and in fact having too many different controls can sometimes make tuning your boat successfully even more difficult since the number of variables, each of which seems to affect all of the others, can begin to seem overwhelming. Even when everything is set terribly wrong, your boat will still sail beautifully (as long as the slot between the jib and the main is not closed off too tightly), but when another boat which is tuned perfectly for the wind conditions is able to pass you on the upwind leg, you start thinking more seriously about sail trim and tuning! It is simply splendid when you feel your boat is sailing at its absolute best and is tuned perfectly! What is the perfect way to set everything? Well interestingly enough, each T37 seems to tune slightly differently, so sometimes copying the settings from another boat that seems exceptionally fast on a certain day, will provide you with the key, and other times it seems you have to figure it out for yourself and for your boat! A Strad may tune differently from a more recent instrument!

This addition is quite simple and does not require undoing or changing anything you have already done. It requires making a quick fitting for the top of the mast which will slide into the top end of the nylon tubing that should still be sticking up from the top of the mast with the streamer wrapped around it. The fitting can be bent from the left over 1/16th inch stainless steel rod quite easily with needlenose pliers and takes only a couple of minutes. The fitting should look like this:

Slide the straight end of the fitting into the top of the nylon tube. The fitting should slide all of the way down so the bend at the top of the fitting rests on the top of the nylon tube. If the straight part of the fitting inside the nylon tube is too long then the end of the ss rod will be hitting the brass screw eye for the backstay and holding the fitting up too high. If this is the case, clip the straight part of the fitting off slightly shorter. Take a 16 inch piece of the heavy spectra and tie it to the loop in the stainless steel rod with a series of half hitches pulled very tight. Find the small white plastic piece with the three holes (this is called a bowsie). Run the spectra through two holes in the bowsie (up through the hole in the wider end of the bowsie and down through the middle hole). Slide the bowsie to a point two inches below the masthead. Run the spectra from left to right through the eye of the screw eye set in the front of the mast and then through the small eyelet in the head (top) of the jib and then back up through the screw eye from right to left and then back up to the small hole in the narrow end of the bowsie. Pull the spectra tight and tie the spectra to the bowsie with several half hitches. Sliding the bowsie down or up loosens or tightens the tension on the luff of the jib.

Bravo! Well Done! Time to Launch! Enjoy! Enjoy! Enjoy!

Happy Sailing! Remember that enjoying the beauty of the outdoors is an integral part of the satisfaction of life. Whenever possible help to contribute to keeping our waters clean and our outdoor areas beautiful and natural.

Each T37 is Very Special. We love to get pictures back of the boats sailing or being held by the skipper or to hear reports of your sailing adventures. We will put your pictures and stories on our web site. If you have any questions or need replacement parts or if you want to add to your fleet, please call us at 1-800-206-0006, ask for Will. Or contact us at Tippecanoe Boats Ltd., 4305 Nordum Rd., Everson, WA 98247. International phone/fax 1-360-966-7245. Visit us at www.modelsailboat.com or send e-mail to fun@modelsailboat.com.

Will Lesh, the creator of the T37 Racing Yacht, is a world sailor. In 1980 he built a 24' laminated Western Red Cedar sloop and cruised in it from the Chesapeake Bay across the Atlantic to the Azores and then on to Gibraltar and eventually to Greece and Turkey. He holds a Master's License for sailing vessels up to 100 tons. For years he has taught sailing, skippered charter yachts from Maine to Florida, and instructed courses in Celestial Navigation. You can enjoy Will's video on Celestial Navigation on YouTube by searching for "Celestial Navigation Made Easy" in the YouTube search box. His knowledge and love of the sea and sailing are expressed in the lines and the sailing ability of the T37. Tippecanoe Boats has produced over 75,000 fine sailing models which are sailing in more than 65 countries around the world.

T37RC Assembly Diagrams

Diagram A
Marks on the syringes

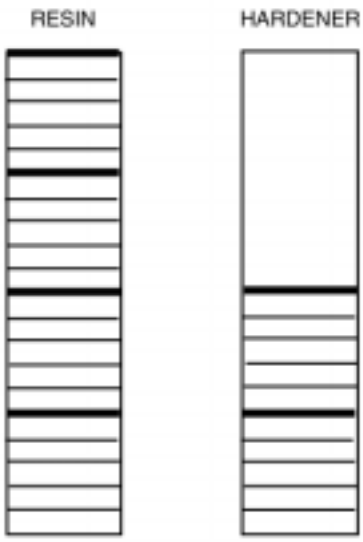


Diagram B

Diagram C

Diagram D

TRANSOM PIECE IS SHOWN AS GRAY

Diagram E

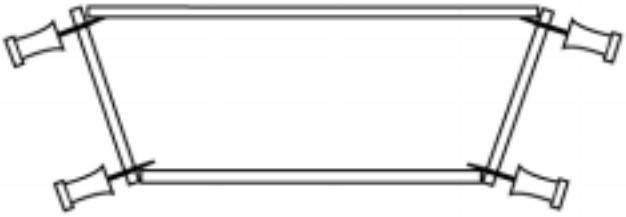


Diagram F

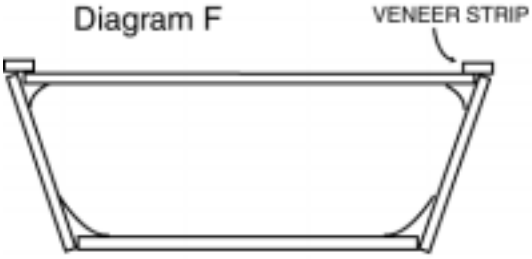


Diagram G

Diagram H

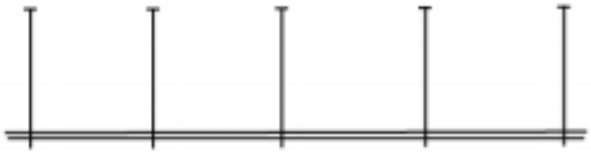


Diagram I

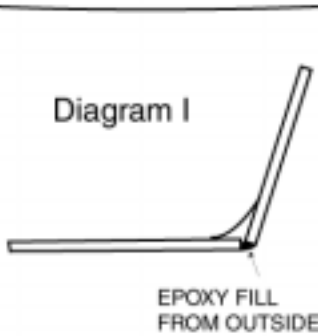
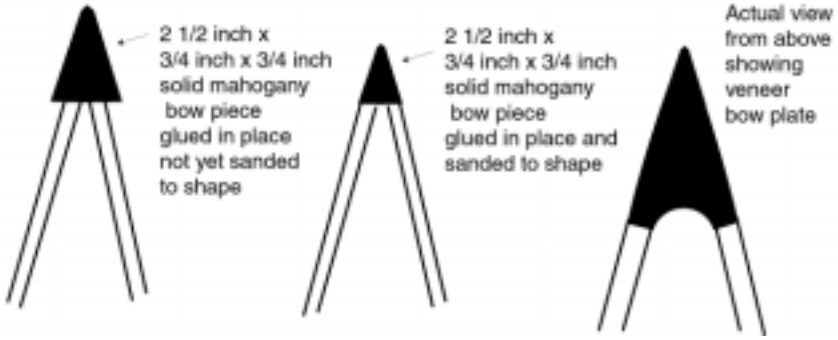


Diagram J

Cut-away view from above showing the front of the boat with the two sides meeting and the solid mahogany bow piece glued in place. This view shows what is happening underneath the veneer bow plate. The veneer bow plate covers all of this so it is not visible from above.



T37RC Assembly Diagrams (continued)

Diagram K part a

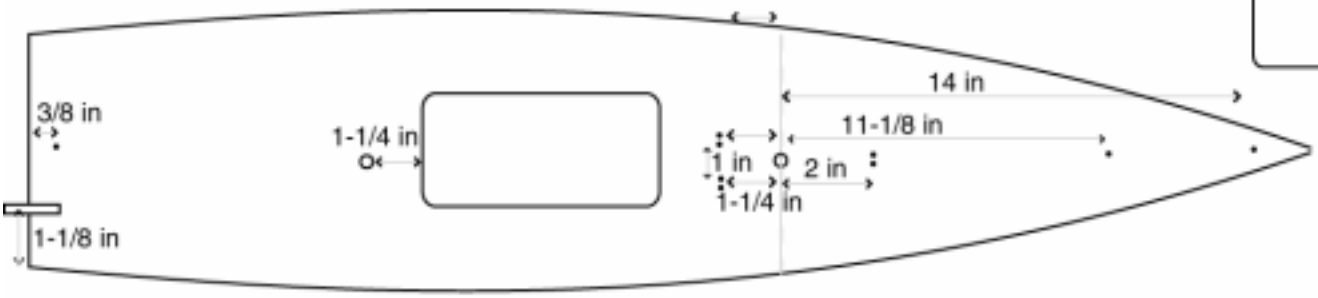


Diagram K part b

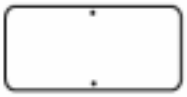


Diagram L

Rudder Cross-section

Diagram M

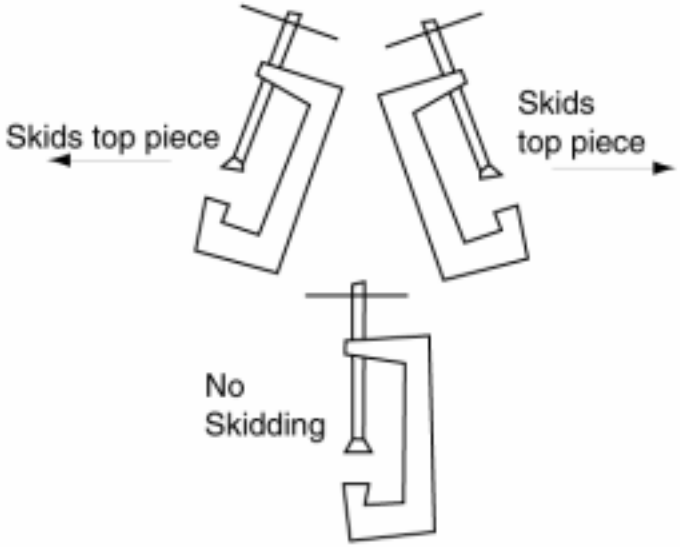


Diagram N

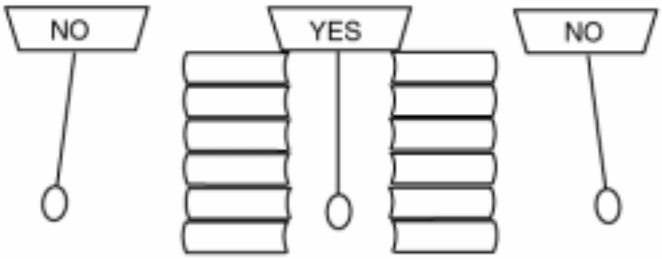
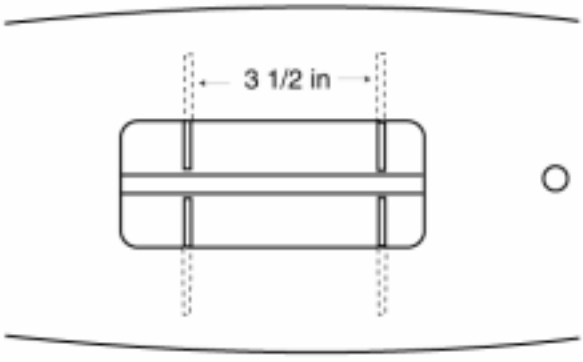
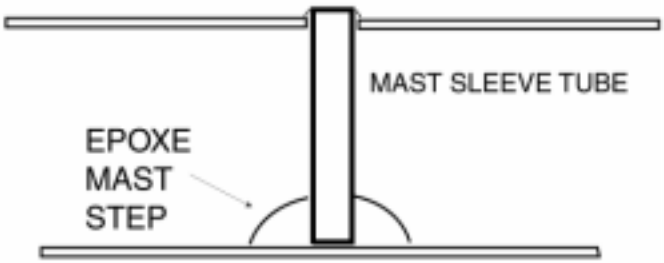


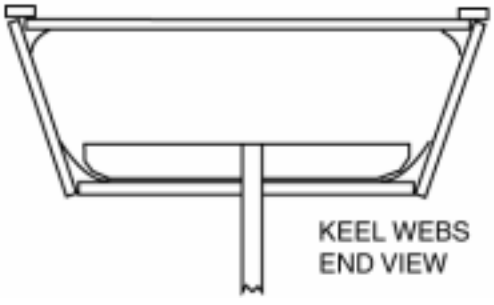
Diagram O



KEEL WEBS FROM ABOVE

Diagram P





KEEL WEBS
END VIEW

T37RC Assembly Diagrams (continued)

Diagram R

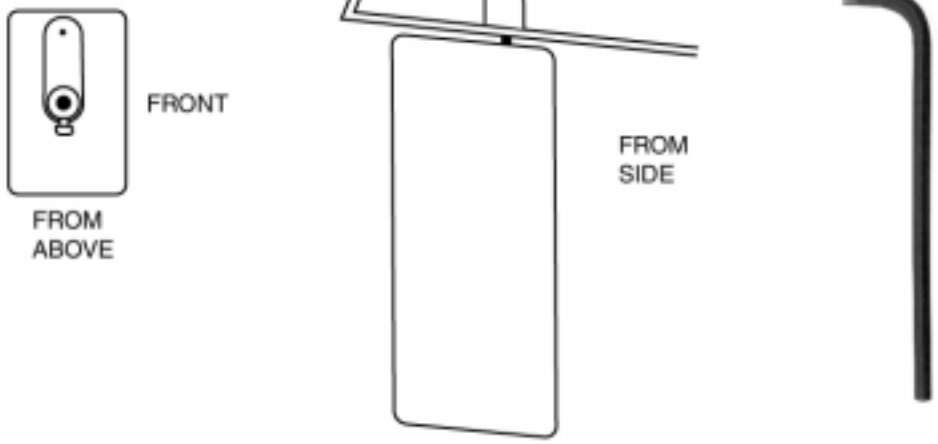


Diagram S

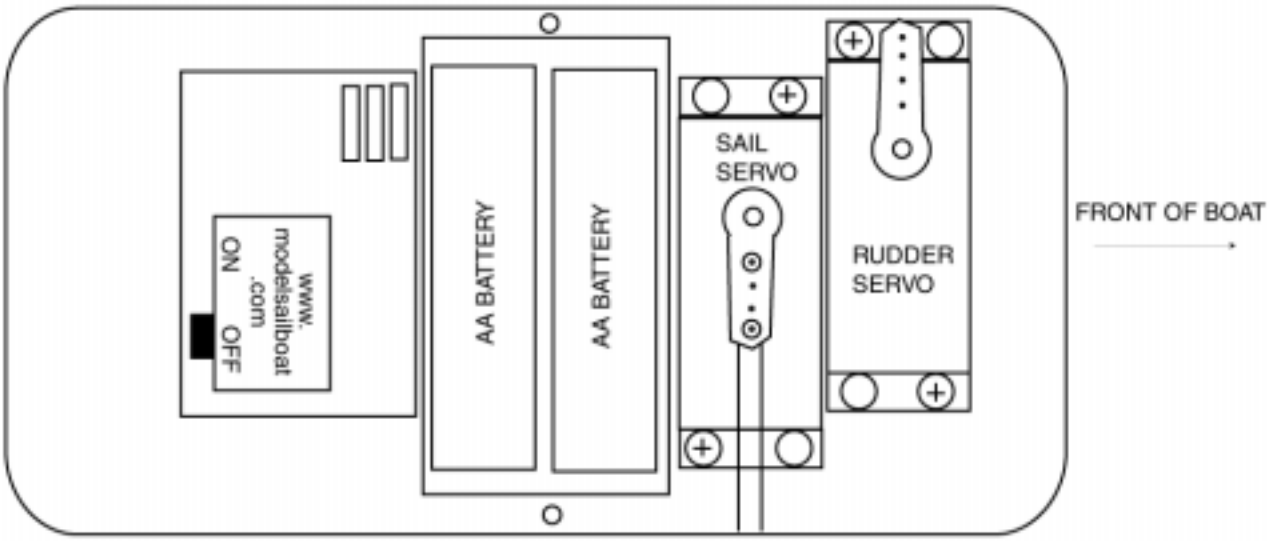
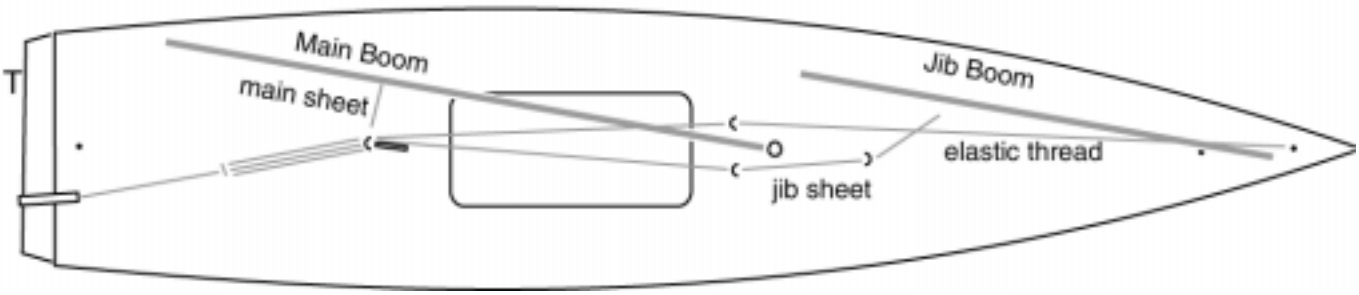


Diagram T



SAILING TIPS T-37 RC

Range of the RC Gear. For most sailing situations the antenna on the receiver works well when it is run forwards beneath the deck. The range can be extended further by taping a plastic drinking straw up underneath the bow deck and sliding the antenna wire into the straw or by using velcro to hold the end of the antenna wire up under the deck. Range is also affected by the height of the transmitter above the surface of the water. Sitting in a low chair on the beach will not give you nearly as much range as standing up on the beach. Standing on a slightly elevated bank will increase the range significantly. If you sense your boat is reaching the edge of its range because it is not responding quickly, you can raise the transmitter above your head, thereby extending the range, to bring the boat back into range. One common mistake is pointing the tip of the antenna at the boat. Almost no signal goes off the tip of the transmitter antenna. The signal goes out from the side of the antenna like the ripples in a pool caused by throwing a pebble into the pool. This is different from the remote controls for TVs and DVD players where you need to point the remote at the machine to get it to work. The radio control gear supplied with the T37 Racing Sloop is full powered RC gear so the range is quite impressive.

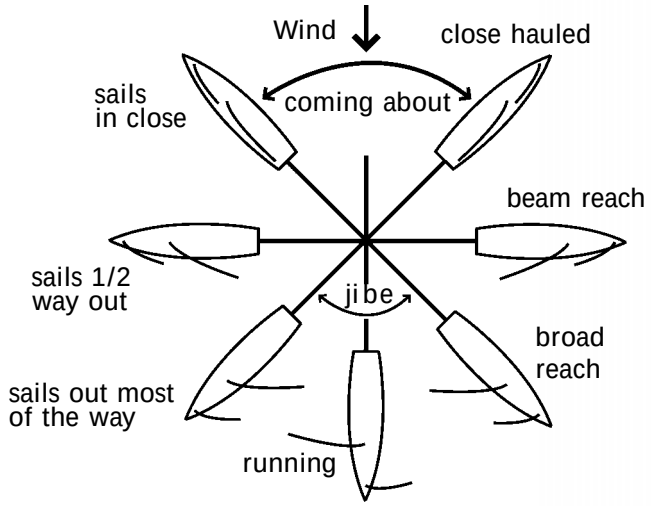
Operating Under Radio Control. Turn the power switch on the transmitter on. Both the switch on the Transmitter and the switch in the cockpit for the receiver must be turned on before the RC gear will work. Before launching, test out the rudder and sail functions of the RC gear. As you sail you can adjust your sails for the course you want to sail relative to the wind direction. To sail close to the wind, set the sails in fairly close. To sail downwind, set the sails farther out. Practice coming about and jibing. In normal conditions turning the rudder will result in an immediate alteration of course. In large, irregular waves, it sometimes requires more skill to bring your boat around into the wind and onto the other tack. Just as on a full size yacht the appropriate maneuver is to head off the wind slightly to gain additional speed and then to put the rudder hard over quickly, bringing the bow up into the wind and about. Sometimes you can play the wind waiting for a momentary lull or slight shift in direction to initiate this tacking maneuver. Holding the rudder hard over when the boat is not responding just stalls the boat's forward speed and ensures that it won't be able to respond to the rudder. Straighten the rudder, get up speed and then try your maneuver again.

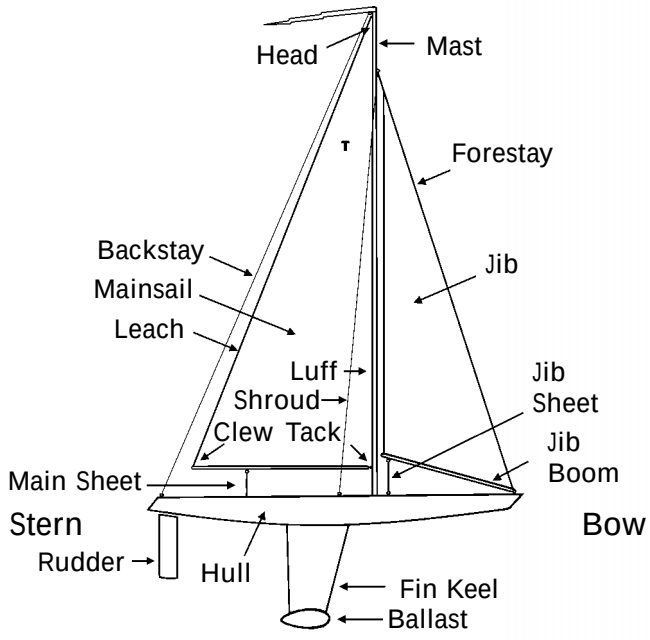
Racing! Race your boat around buoys. Races can be held with two boats or with many boats. The typical sailing course has two markers to form the starting line. After the start, the first leg is an upwind leg where the boats have to tack upwind to get to the first rounding mark. The second leg is off the wind on a broad reach down to a jibing mark. The boats jibe around this mark onto the opposite tack and then continue downwind on a broad reach to the downwind mark. The downwind mark is usually the same mark as the mark at the left hand end of the starting line. The next leg is upwind, the same as the first leg, and the final leg is straight downwind with the finish line at the same place as the starting line. All rounding marks are passed on the port side of the boat. For a full set of racing rules see www.modelsailboat.com/rc-rules.html or contact us. We will be glad to help you with ideas for putting together a racing club in your area. The T37 is the perfect boat for starting a club. Not only does the T37 sail incredibly, it is also very affordable for anyone interested in getting started in the fun sport of racing pond yachts. The T37 can be raced as a one design class against other T37s or raced against other boats. For T37 Class regulations on what modifications are allowable for racing under the T37 One Design Class Rules, see www.modelsailboat.com/class.html or contact us. The T37 is a Sanctioned Racing Class with the AMYA (American Model Yachting Association - theamya.org). Our Tippecanoe web site has terrific resources telling all about setting up race courses and discussing all aspects of racing the T37s - everything we have learned from years of running regattas with the T37s. This information can be found at www.modelsailboat.com/race-rc.html

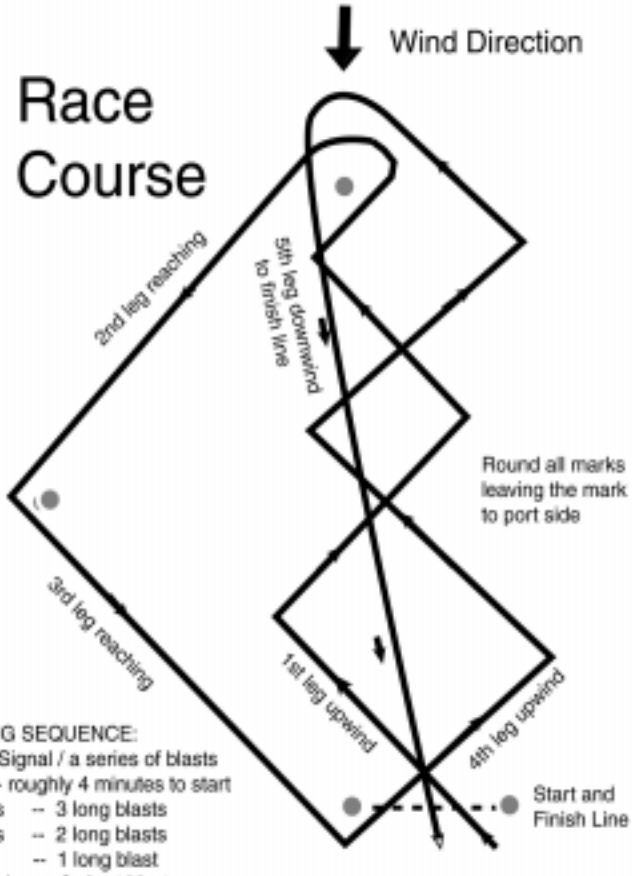
SAILING TIPS

Sailing Terms

AHOY: The usual way to greet another boat is to shout out “Ahoy” followed by the name of the other boat.
BOW: The forward end of the boat.
COMING ABOUT: Turning your boat into the wind and through the wind until you are sailing again. Commands: “Ready About!....Hard-a-Lee!”
JIBE: A downwind turn which causes the wind to cross the stern making your sails whip across to the other side. Jibes can be dangerous! Commands: “Prepare to Jibe!... Jibe-ho!”
JIB: The sail in front of the mast.
HEEL: When your boat tips from the pressure of the wind.
LUFF: a) When your sail flaps because it is not full of wind. Solution: Sheet in the sail or change course off the wind until the sail is full. b) The forward edge of the sail.
SLOOP: A yacht rigged with one mainsail and one jib; the most efficient rig, especially for sailing upwind.
SHROUDS: The rigging on either side of the boat that holds up the mast.
BACKSTAY: The rigging from the mast to the stern of the boat.
FORESTAY: The rigging from the mast to the bow of the boat.
MARCONI RIG: A rig having a triangular mainsail with a tall mast supported by shrouds and stays.
Named after the inventor of the wireless radio because of the resemblance to early radio transmitting towers.
MAINSAIL: The largest sail on a boat.
LEEWARD: The downwind side as in the leeward side of your boat, lee shore or “Hard-a Lee!”
WINDWARD: The upwind side of your boat.
STARBOARD: The right side of your boat when facing forward.
PORT: The left side of your boat when facing forward.







STARTING SEQUENCE:
Warning Signal / a series of blasts
- roughly 4 minutes to start
3 minutes -- 3 long blasts
2 minutes -- 2 long blasts
1 minute -- 1 long blast
30 seconds -- 3 short blasts
20 seconds -- 2 short blasts
10 seconds -- 1 short blast
Voice Countdown - 9,8,7,6,5,4,3,2,1
Start -- 1 long blast

Voice - All Clear - if no boats are over early, otherwise call back individual boats. If too many boats are over early to identify and call back each boat individually, then sound a General Recall - 4 blasts.

SCORING:
Low Score wins.
Scoring for each race is
1st place finish = 1 point
2nd place finish = 2 points
3rd place finish = 3 points
4th place finish = 4 points
etc.

Adding Sail Numbers and the T37 Insignia to your Mainsail

We have used adhesive backed Insignia Cloth for numbers in the past but these numbers have some negative features. While they look good and work well in summer weather, they have a different thermal expansion than the sail cloth. In cold and wet weather the sail cloth tends to wrinkle and pucker around the numbers. This distortion of the sail is especially a problem in light wind conditions.

We have experimented with different techniques for adding numbers. We have found that the use of a standard Sharpie Permanent Marker does not affect the sail shape like the stick on numbers, but it is difficult to create a sharp outline of the numbers and insignia. The standard Sharpie Permanent Marker ink tends to bleed into the fabric leaving a fuzzy and irregular outline.

A Sharpie Paint Pen yields a dense number with sharp borders, but, like the insignia cloth numbers, the paint pen application may cause the sail cloth to pucker around the numbers in cold, wet weather. We now use a fine or an extra fine Sharpie Paint Pen to trace the outline of the numbers. Trace a narrow outline of the number, ~1/2 mm wide and then fill in with a standard Sharpie Permanent Marker. Let the ink from the standard Sharpie Permanent Marker dry and then recoat with more standard Sharpie. The paint pen gives a crisp sharp edge to the numbers preventing the fuzzy border which would result from just using a standard Sharpie Permanent Marker. We have tested this technique by immersing a numbered sail in ice water and see no difference in sail contour from warm and dry to cold and wet and we have tested the technique extensively at the pond and in lakes and salt water. Sharpie Paint Pens are available at Michael's Craft Stores, Joanne's Fabrics, various craft, hobby and sewing stores and on line in various point sizes. We suggest the Fine or Extra Fine point. Look in the small print on the side of the Sharpie Paint Pen to find a paint pen that says "oil based" rather than "acrylic based".

Adding the sail numbers and T37 logo can either be done by tracing freehand as described below, or an even more precise effect can be achieved with an adhesive backed vinyl stencil kit provided by Tippecanoe Boats for two sets of T37 Sail Logos and two sets of your unique sail number for $39.

Detailed Tracing Instructions:

Remove the small "T" on the mainsail. If you want to remove the residual adhesive, use "GoofOff" or Xylene. Alternatively you can leave the small T in place and place the T37 Insignia right on top of the small T. Use a computer to print out a page with your sail numbers in the right size (see next page) and use the T37 Insignia on the next page as a pattern. Your official sail numbers are the same as the hull number of your boat. Tape the pattern on the port side of the sail positioning the top of the T37 insignia about 11 inches below the head of the sail and 1½ inches from the mast. This should center insignia between the luff and the leech of the sail and the insignia should cover the area occupied by the small T.

With the sail laying flat on a table, with the starboard side of the sail facing up, use a fine or extra fine Sharpie Paint Pen to carefully trace the outline of the pattern showing through the sail. I like to keep just inside the edge of the numbers and the T with my line. If there is a slight wobble in the line, I can go back over the line in question and fill in right to the edge of the number with the Paint pen without the numbers starting to look too thick. Trace the outline of the entire T37 insignia. After the Paint Pen paint has dried which takes just a few minutes, fill in the numbers with several coats of standard Sharpie Permanent Marker ink. As you did with coloring books as a child it took lots of practice to stay within the lines with the crayon. Be very careful to color within the outline. And be careful not to get ink on your fingers which might result in smudge around the numbers. The ink cannot be easily removed from the sailcloth, although lacquer thinner will remove the ink as long as larger areas of permanent ink do not get smeared in the process.

Position the pattern on the starboard side of the sail so the T37 pattern is ½" directly below the starboard T37. Tape firmly to the sail and then trace the port insignia.

Trace the number pattern on the starboard side of the sail in the same way using the pattern affixed to the port side of the sail. Position the number perpendicular to the luff of the sail and center it between the luff and the leech of the sail. Make certain that the starboard side numbers are high enough to leave room for the port side numbers. There should be approximately 1 inch vertical separation between the port and starboard numbers. Starboard above port. Trace the outline first in Paint Pen and then fill in with Sharpie Permanent Marker

With white and light colored sails the black Sharpie works well. Sharpie Paint Pens and standard Sharpie Permanent Markers come in a variety of bright colors as well. White paint pens on dark sails may not work as well. On dark sails the most popular technique is to use a stencil for the numbers and the T37 Insignia and to very lightly dust the sail with a light coat of white primer from a spray can. Too heavy a coat of paint or primer will result in the sail being stiff in this area and will cause puckering around the numbers in wet weather. A light dusting of primer shows up well and does not affect the shape or flexibility of the sail. Tippecanoe Boats can provide a vinyl stencil kit with instructions with 2 sets of T37 Insignias and 2 sets of your unique sail numbers for $39.

T37 Insignia.
Place the top of the T on the starboard side of the sail 11 inches down from the top of the sail.
Starboard is placed higher than Port.
Vertical separation 1/2 inch.
1-1/2 inches from the mast

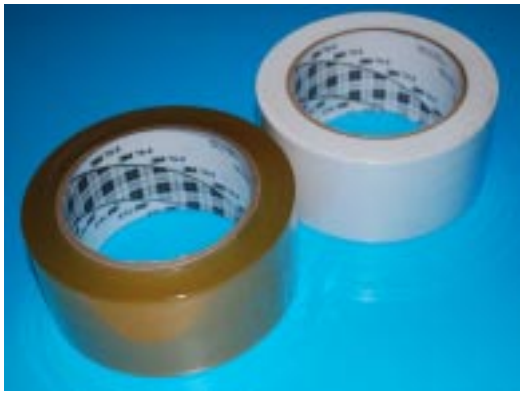
Use your computer to print out your unique sail numbers in IMPACT typeface, size 272 point which should be about 3 inches high. The Sail Number is the same as the Hull Number found on your Certificate of Authenticity. If Impact typeface is not available use a comparable sans serif font 3 inches high.

Place the sail numbers 2 inches back from the mast. The bottom edge of the starboard numbers should be about 13-1/2 inches above the bottom edge of the mainsail. Starboard higher than port. Vertical separation one inch between starboard and port numbers.

Racing Accessories

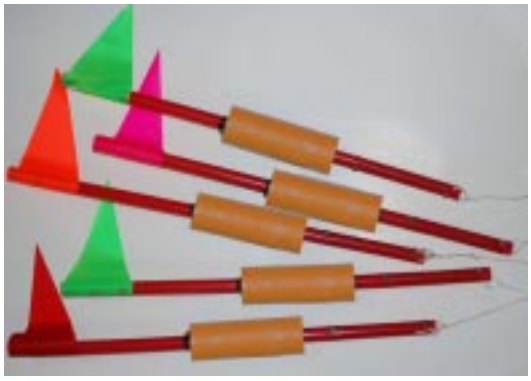
Also Available from Tippecanoe Boats

www.modelsailboat.com



Waterproof Cockpit Cover Tape. For sailing in Salt water and rough open seas, this resealable, waterproof non marking tape will keep you dry time after time. Reuse the same piece for weeks of sailing and then take off another piece from the roll. With 36 yards on each roll , you won't run out any time soon! Two pieces side by side seal the sliding hatch perfectly so it is entirely watertight no matter what! Leaves no sticky residue even after weeks in place. Amber see-through for varnished decks or white opaque. 36 yard roll, $10

Racing Timer. Once you have sailed a few races with this nifty timer, you won't believe you ever did without one. Press the red button and a starting sequence begins witha loud clear countdown. When the countdown gets to zero, the starting timer shuts itself off automatically. No more fumbling with buttons on a tape recorder while trying to sail your boat on the first leg of the race course. Set the length of the timing sequence to 2 minutes, one minute or 30 seconds. Set the volume as loud as you want it. A very clear voice calls out the time at 2 minutes, one minute 30 seconds, one minute, 45 seconds, thirty seconds, twenty seconds, ten seconds, then 5,4,3,2,1 start! Runs for many hours on 4 AA batteries. $95



Racing Mark Kit. This easy to assemble kit includes all of the pieces for 5 upright flag racing marks, including anchor weights, braided nylon anchor line, and spools for winding the line up. These are throwable marks and can be thrown out over thirty yards to set a course from shore. One end of the retrieval line stays on shore so the marks can be easily retrieved after a day of sailing. The same marks can be set from a dinghy or canoe and anchored out in water up to 110 feet deep. The shaft of the upright mark is weighted so the mark stands upright in the water with the brightly visible flag at the top of the pole. The flags are all different bright colors so it is easy to call out a course by the colors of the flags. Developed by the Pacific Northwest Model Yacht Club, these are the standard race markers in the Pacific Northwest Model Yacht Club fleet.

Racing Mark Kit for 5 Throwable Marks $89.

Classic Tug by Tippecanoe Boats. With the Mark Setting Barge the T24 Classic Tug can set out a racing mark far upwind or on the far side of the lake for a race course. The Classic Tug is ready to head out to retrieve any boat with its powerful engine and retrieval hook. The retrieval hook reaches out to the side of the tug until a boat is hooked by the forestay and then the arm swings back to tow the boat in to shore. Sometimes just a shove will free the sailboat and she will be ready to go again. The Classic Tug has a powerful electric engine with variable speed forwards and reverse. There is lots of speed at full throttle. Very maneuverable. 24 inch long Classic Tug Kit includes all of the running gear, motor, speed controller, rechargeable power pack for the motor, charger, transmitter and receiver and everything else to build and run your tug, except paint, varnish and AA batteries for the transmitter. Very clear and detailed instructions. Fun to build! Made in the USA.

24 inch Classic Tug Kit $425.

Also from Tippecanoe Boats!

You won't find a more beautiful boat than the T50 MOD. Her sleek, elegant lines capture the perfect grace of a great sailing boat. Add the beauty of the Western red cedar hull planking and you have a classic yacht that is equalled by none. With her 6 foot mast and 20 inch long keel fin, she is just under 8 feet tall overall. Her 50 inch length makes the T50 impressive to sail. Even a couple of hundred yards out on a lake, the T50 still looks big. The entire boat rigged and ready to sail weighs just 8.5 pounds which makes her very fast and maneuverable. The building techniques have been developed to make it simple to build this elegant round bottom hull even for a first time builder. Carbon fiber masts and carbon fiber reinforcing inside the hull make her very strong and very light. (Kit Price $625)

T52 Radio Control Model Sailboat: includes all of the RC Gear with powerful drum winch sail control. The extremely clear instruction manual is full of pictures and guides you through the building process step by step. This is a beautiful yacht that will be the most impressive rc model sailing yacht on almost any lake. The T52 is remarkably fast and powerful. It is very maneuverable and sails beautifully in winds from the very lightest breezes up to winds over 20 mph. This is one of the very finest RC model sailing Yachts available anywhere today! Tippecanoe Quality - built to last a lifetime! (Kit price $425, Finished price $1650) 52 inches long, 6.5 feet tall overall.

T65

RC Racing Yacht - the ultimate! Over 65 inches long and 9 feet tall. This boat will sail faster than any other model mono-hull sailboat on the lake. Only 12 pounds total sailing weight. It is easy to carry in one hand and easy to launch. You won't ever own a finer model boat! Cedar Hull gleaming in the sunlight, the T65 attracts attention wherever she goes. Easily built kit requires no previous experience. If you built the T37, you will have no difficulty building the T65 next!

The T47 Schooner is "our little ship". Sailing out of the golden days of sail, this two masted schooner recalls the days when almost every cargo on the East coast of North America was moved by the wind. The schooner carries a lot of sail down low making it very fast off the wind. She points nicely for upwind sailing and can never capsize due to her ballast casting at the bottom of the keel. In a strong blow she sails beautifully and stays perfectly balanced reefed down flying just the mainsail at the back and the forward jib. The classic mahogany plywood hull with cedar gunnel rails complements the traditional look of this beautiful sailing boat.

Tippecanoe Boats
4305 Nordum Rd.
Everson, WA 98247
1-800-206-0006

www.modelsailboat.com

Made in USA

International: ph/fax 1-360-966-7245 e-mail fun@tboats.com