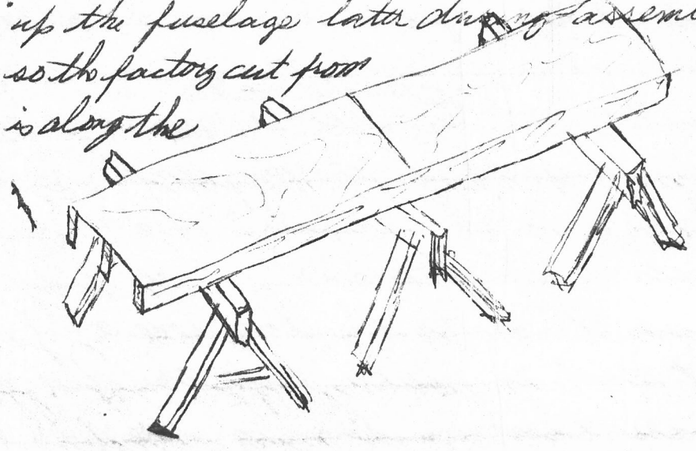
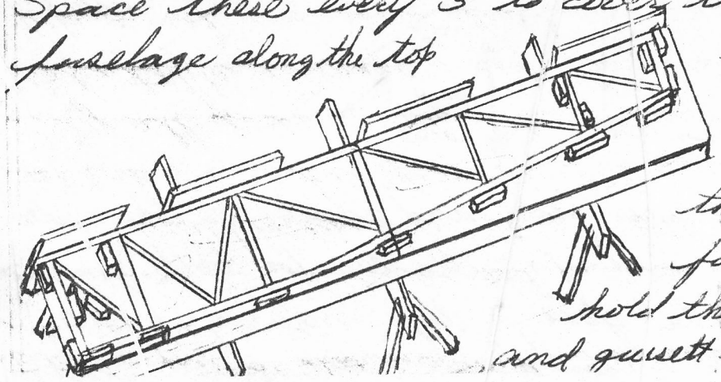
The fuselage of the Smith Termite builds up quite similar to a giant model airplane. The first step is to study the drawings. Next you will need a sheet of either 1/2 or 3/4" plywood; 3 - 2"x4"x16' pine 2x4's; 2 - 1"x2"x8' pine boards & 1-1"x6"x8' for making up the fuselage jig and 3 or 4 saw horses to support the jig. Cut the sheet of plywood down the middle so that you now have two pieces that measure 2'x8'. Remove 2' from one of the pieces, this can be used to square up the fuselage later during assembly. assemble so the factory cut from both pieces is along the same side



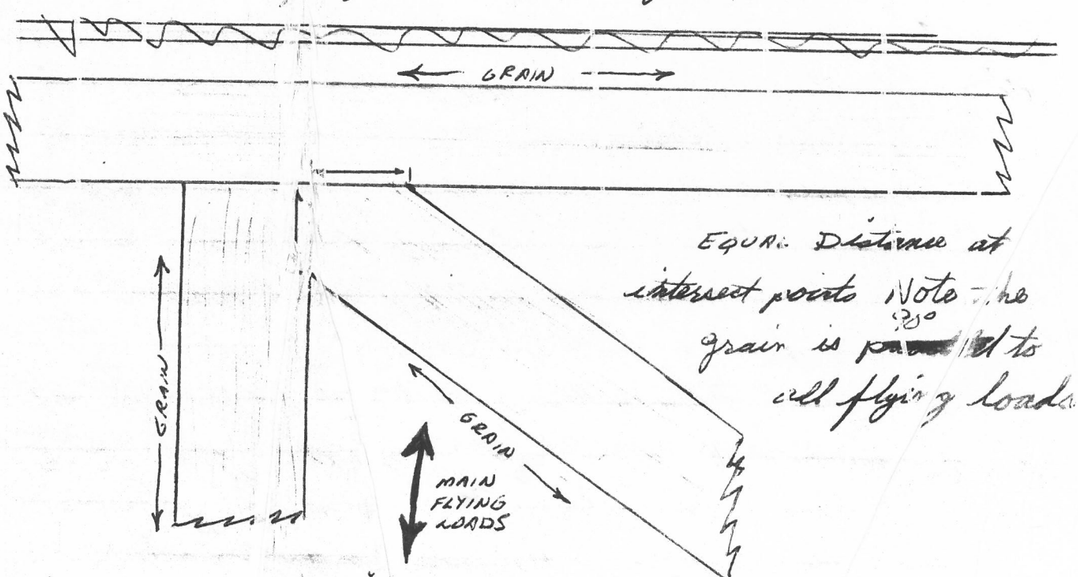
Now that you have your jig assembled dimension the fuselage side full size on the table starting with the top longeron being flush with the factory cut plywood jig top. After you have all of the dimensions marked draw in the fuselage side parts so you can see how they fit into place. Now take the 1"x6"x8' piece of pine and cut it into 4 - 2' pieces. and secure them on the face edge of the factory cut plywood into the 2x4 support. Space these every 3' to cover the length of the fuselage along the top longeron. Now cut some 3" 1"x1" blocks and secure them to your jig to fit the pieces, and to hold them until you glue and gusset the pieces.



P.1

Put material from page 3 that is enclosed in this area before continuing with fuselage construction

Now that you have your jig built, it's time to start building the fuselage. First if you didn't purchase a kit from us for goodness sakes buy all your wood from a well known reputable aircraft parts supplier. Use a very sharp fine tooth backsaw or good hollow-ground combination blade (if your lucky enough to own a table saw) to cut all your wood. And remember "DON'T FORCE CUT IT" You don't want any torn end fibers or jagged and angle cuts. Every part in an airplane must FIT WELL so "TAKE YOUR TIME" and do a good quality job. You will need to make a left and right fuselage side. First begin by carefully cutting your longerons, and place them in the jig. Next carefully and precisely cut your fuselage uprights and place them in the jig as well. After the longerons and uprights are cut and in place, cut the diagonals and place them in the jig keeping in mind that the center of the diagonal should intersect where the uprights and longerons meet.



Next cut your side and gussets for the side. You will save time if you do these for both. You could even cut all your fuselage longerons, uprights, and diagonals if you are sure they are of exacting size.

R.2

and dont forget to label the pieces. USE WEILDWOOD OR T88

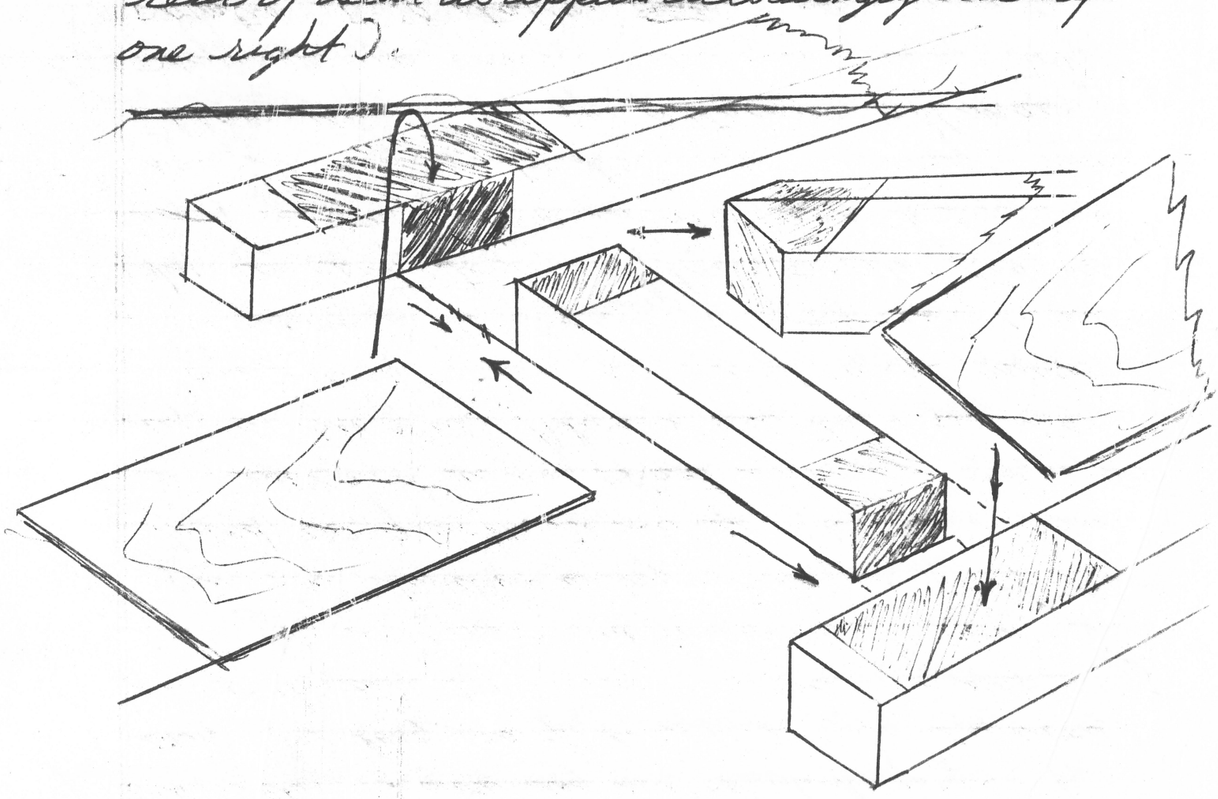
Now your ready to start assembly. Don't mix up too much glue at once. Pot life isn't all that long on most glues and even though you have all the pieces cut it still takes a while for proper assembly.* You will also have to decide ~~before mixing your glue~~ whether you will be using aircraft nails or staples to fabricate your parts as there are advantages and disadvantages to each. If you use aircraft nails make sure they are long enough to hold fast in the wood. It will take longer to fabricate the airplane but you will not need to remove the ~~staples~~ nails after the structure is dry. Staples on the other hand are quicker to use so construction time is less and is important when considering pot-life of the glue. Always use tack pointed staples they go in easier and cause much less damage to the wood. ~~Hammer~~ Assow has a complete line of tack pointed staples ~~and extras~~ There smaller gun which uses T-21 staples is excellent for building ribs but you will need their heavy duty gun for attaching all main plywood and gussets. This gun uses tack pointed T-50 staples. ~~Have~~ Before you go off and buy your new staple guns remember that plain steel staple attract moisture so they will need to be removed before sealing and varnishing the wood. You wont need to remove brass coated aircraft nails. Either way a good glue job is what is really holding the parts together and with weldwood resin glue or T-88 the parts if protected can last a good many years (400 or so). Now you can decide to buy those staple guns or that tack hammer.

CONT. ON P 4

* Put just after it's assembly

Put this

After thoroughly mixing the glue according to instructions, apply a uniform coat to all mating surfaces. First the main structural members and then the plywood parts. Fasten the parts in place ~~and~~ using either nails or staples. After all pieces and parts are in place remove the side from the jig and apply gussets to the other side in the same manner as before. Remember you need a left and right side so make sure the plywood that goes from firewall to rear of seat is applied accordingly (one left one right).

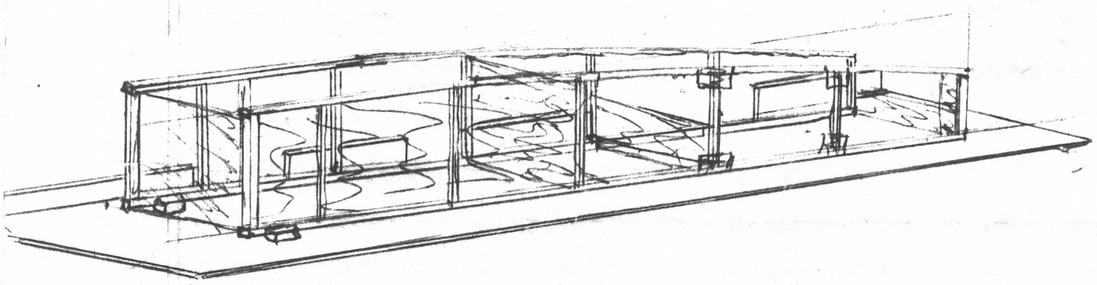


TYPICAL GLUE APPLICATION WHEN JOINING PARTS NOTE GLUE APPLIED TO SHADED AREAS

Now that you have both side constructed it is time to assemble them into a complete fuselage. Remove all jig assembly blocks except the ones on the top longeron, but do not throw these away. Next cut the piece of plywood for your firewall being careful to keep everything square. Next the left over plywood can be cut to make a 2"x 15" and a 2"x 9" piece also keep

them perfectly square. Now cut the seat back support perfectly square and set them aside. Now take each fuselage side and place it with the top longeron against the jig table, and secure them with blocks. Now take the firewall seat back support and the other two pieces of plywood and place them in the fuselage. Secure these with clamps or temporarily with aircraft nails. Now that you have the fuselage trued up, begin at the front and start cutting your crosspieces for both the top & bottom. Only cut these the same back to station #3. ~~After that~~ Now glue in the pieces and apply the gussets but again on back to station #3. Now that you have that done allow at least 12 hours of elapsed time before going farther (YOU ARE DONE FOR TODAY). After the glue has been allowed to cure completely ~~have~~ remove the rear plywood ~~jig~~ alignment jigs and bring the rear of the two fuselage sides together making sure that the rear of the fuselage is in ℄ with the center of the fuselage. You can take measurements on the width by refrence off the ℄.

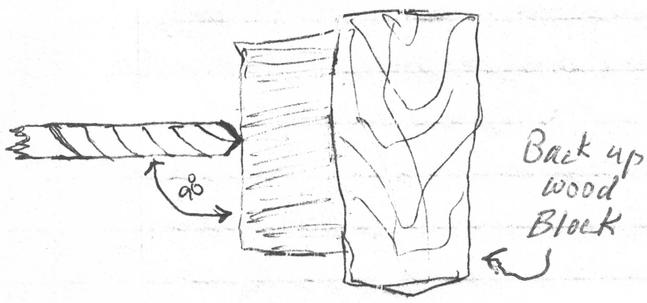
You will have to notch the seat back and other two pairs of plywood to get them to fit in the fuselage. DONT NOTCH the firewall. the covers the entire front of the fuselage.



Refer to the top drawings on the plans for placement of crosspieces and gear supports. DO NOT Remove from the jig until glue is thoroughly cured.

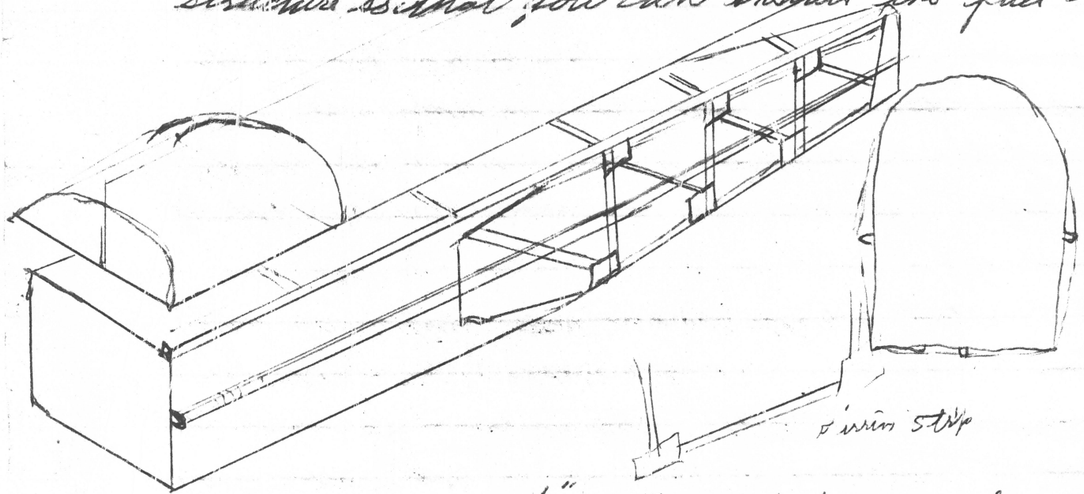
Now that you have the fuselage built remove it from the jig. Refer to the drawings and drill all of the fitting holes in the fuselage. Be very carefull to measure cosectly and drill precisely. Make sure you back up your wood with a

wood block to keep the drill bit from tearing up the wood on the way out.



Now turn the completed main fuselage over and support it on horses. Cut the super-structure parts out and glue them to the fuselage as indicated in the drawings.

* Remember not to install forward plywood on super structure so that you can install the fuel tank.



Now glue a 3/4" x 1/2" firewall strip on each side and underneath the aircraft so that when you apply the fabric these firewall strips will keep the fabric away from the structure. You will also need to apply 1/8" x 1/4" plywood strips between your gussets on the top and bottom longerons on each side of the airframe. Now you can either fabricate the fuel tank and install it and finish the fuselage or wait to complete it and fabricate your gear pieces and tank assembly. We feel that it is generally better to fabricate and fit the fittings and tank now since there placement is fresh in your

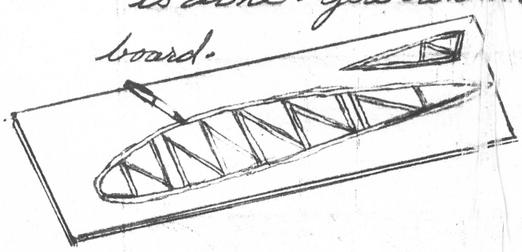
mind, However it is up to the individual builder to decide which he would rather do. If you decide to fabricate all of the fuselage fittings turn to the chapter on FITTING FABRICATION.

WINGS:

Before starting any construction on the wings study the main wing drawings and related fittings drawings to become familiar with the layout of the wing and its related metal fittings and hardware. Unless you have purchased a kit of ours for you wings the first thing you will need to do is acquire the proper amount and size of materials you will need for your ribs, spars, and fittings. You will undoubtedly spend the most time constructing your ribs. You will consume between 1 and 1 1/2 hours building each rib. You can use one corner of your fuselage jig to lay out a rib pattern. If you haven't built the fuselage jig yet and don't really care to a good jig can be fabricated from a 3/4" x 10" x 5 piece of good on one side plywood. Since your ribs are made from 1/4" sq. cap strip stock we suggest using either an extra piece of cap strip or a piece of 1/4" lathe or trim. You will need either a ARROW ST-21 staple gun or a tack hammer. If you use a staple gun all you will need is 1/4" staples since your gussets are only 1/16" thick. If you decide to use nails they will also only need be 1/4" long (make sure they are brass aircraft nails). You wont have to remove the staples if you use nails, but assembly time is

much quicker with staples. Just make sure you remove them after your glue has dried because they are uncoated steel and they will corrode and draw moisture ~~into the~~ ultimately destroying the integrity of the wood. The best way to protect your wings is by applying a good heavy coat of wood preservative and a good crosscoat (one coat with the grain the other across it) of polyurethane varnish. With a little care ~~and~~ you will end up with an airframe that could well last a lifetime.

Now it's start the wing construction. First build the rib jig using the 3/4" x 10" x 5' piece of plywood or a 1" x 10" x 6'. Now take the full size rib drawing and carefully outline the rib pattern on the board, making sure you carefully mark spar spacings and upright and diaganals ~~spacing~~ locations. Now using either the 1/4" lath or a piece of 1" board cut some blocks to help ~~flame~~ your ribs. You will need to place these at every location where the rib bends and will need to be kept in line; at wood intersection points; and also to help hold diaganals and uprights in position until all gluing is done. You can also construct the aileron jig on the same board.

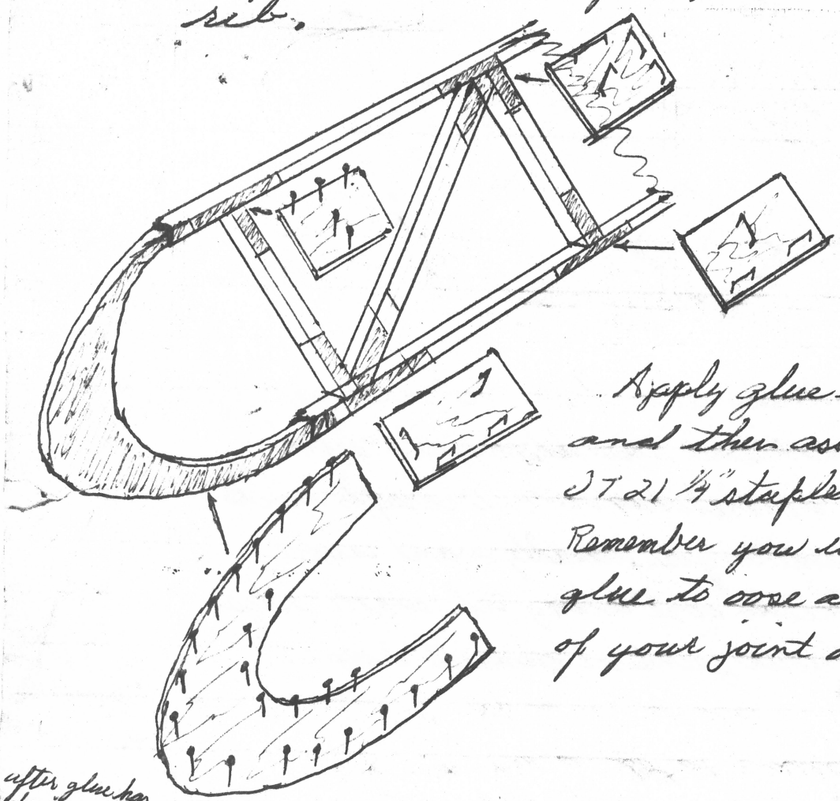


TRACE OUTLINE OF RIB ON RIB JIG BOARD ALL PIECES MUST BE OUTLINED



Place Blocks at shaded in locations either with staple and glue or finishing nails & glue Make shure spar cut out have a piece of stock for blocks that is the same dimensions as the front & rear spars

Remove the pieces one at a time and apply glue to all areas that will be in contact with the other piece of wood and place them back in their proper location. ~~After gluing~~ and Now glue the gussetts in their proper location and quickly remove the rib from the jig, turn it over and glue the ~~remaining~~ gussetts ~~parts~~ on the other side. Clean your jig out with either water (if you use weldwood) or lacquer thinner (if you use "T 88") ~~before~~ before proceeding to the next rib.



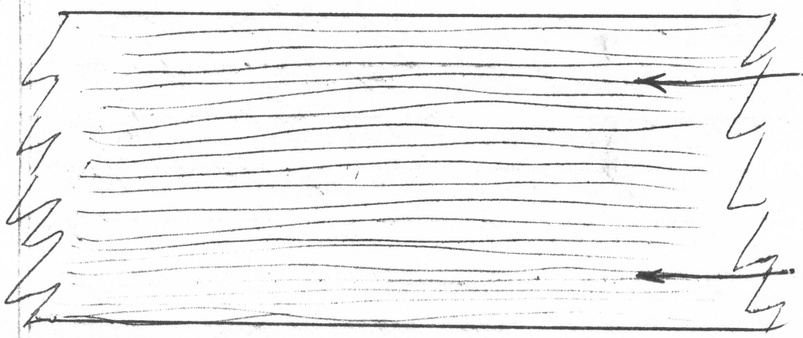
Apply glue to shaded areas and then assemble with either T 21 1/4" staples or 1/4" aircraft nails Remember you ideally want some glue to ooze along the whole edge of your joint or gussett areas.

after glue has dried clear out all spar openings

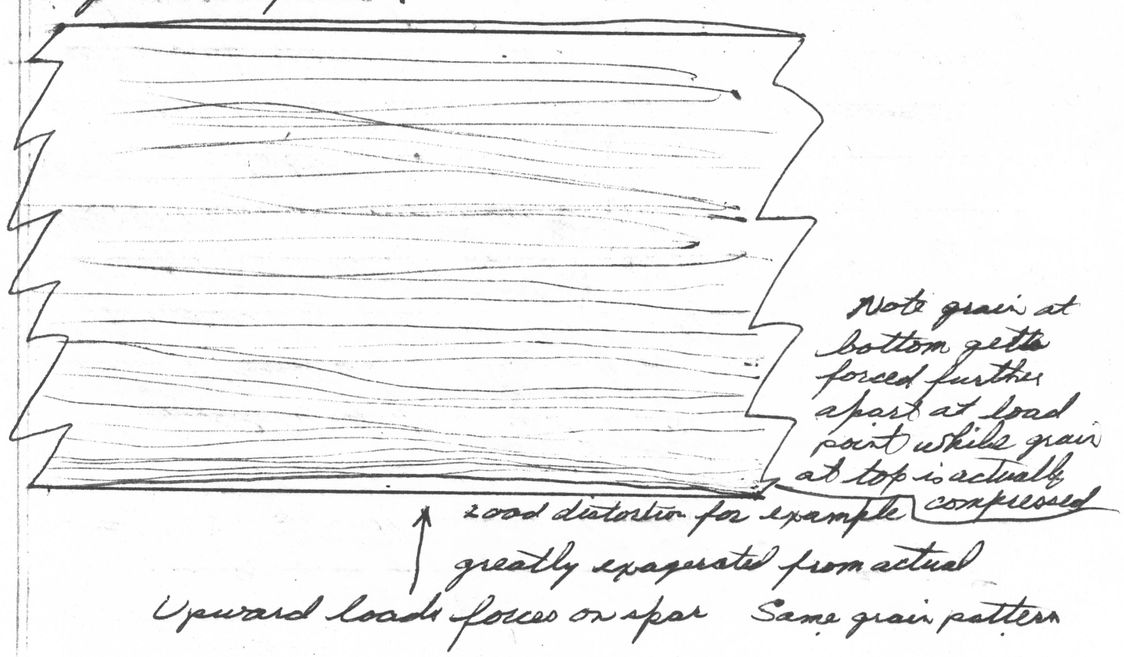
Now complete all ribs including aileron ribs. Remember that your butt rib will have a wider spar openings because T pads & fittings as built the rib accordingly put in drawer

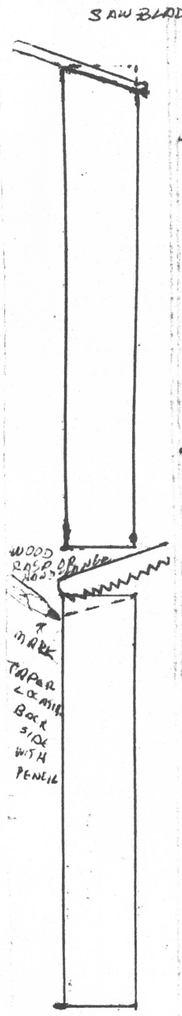
Now is the time to turn your attention to your spars. If you have a total of 8 spars to make for your wing 1 front left : 1 right front 1 rear left : 1 rear right : 1 front left aileron spar : 1 front right aileron spar : 1 rear left aileron spar and finally 1 rear right aileron spar. All of these will have at least a 3° taper on the tops of the spars. So when ordering your wood make sure you use the

deepest part of the spar dimension on the drawings for your wood. If you have a table saw just adjust your blade and cut your taper. Before going any farther there is an explanation on determining the top and bottom of your spar stock. As a tree grows to maturity the annular rings become farther apart. So as the closest grain will be in the heart of the tree this area of your board you need to use for the bottom of the spars (the closer grain needs to go on the bottom). See illustration below for reference.



This way the bottom of the spars are in tension and the top of the spars are in compression. The loads on the wing are trying to pull at the bottom of the spar and push at the top of the spar Thus bottom in tension top in compression.





Now if you have a table saw ~~just cut~~ ~~your blade~~ & make sure you use a very sharp carbide tip hollow ground blade. These types of blade will give a very fine and precise cut. Now angle your blade to match the taper in the rib; set up your fence and begin to cut your spar stock. REMEMBER LEFT WING & AILERON SPARS & RIGHT WING & AILERON SPARS. If you dont have a table saw. don't try to cut the taper with a circular saw unless you have an ~~awful~~ very good rip guide for it. Probably the quickest and safest way to taper the spar if you don't have power tools is to mark the depth of the taper on the spar and then take a hand wood plane or rasp and remove the excess. Then follow up by sanding smooth with either a power sander or hand sand. Next take and make sure your spars are 90° at the ends of the ~~boxes~~ spars. If there is any indication of tears in the end fibers either sand smooth and check to see if they have disappeared and if not slowly cut off ½"-1" of material and recheck the spar; if they are still present after sanding repeat the ~~previous~~ step. Now measure the length of the spars ~~mark~~ and mark the taper of your spar wing tips. Now take your time and carefully cut these with a hand saw.

Put in a picture or two of spar stress caps in construction

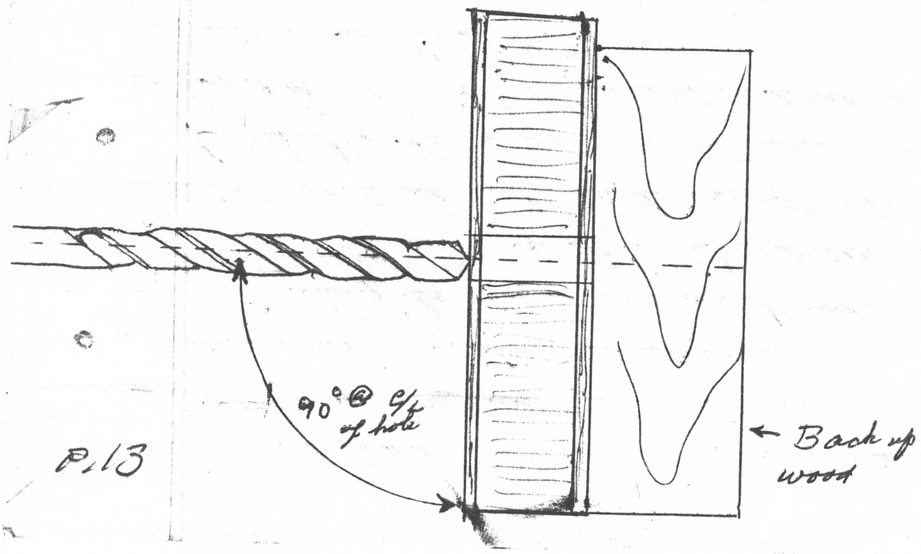
Now you have your spars ready for assembly but ~~if~~ before you proceed go over all surfaces of your spars with 80 grit sand paper and then 120 grit or 160 grit paper. Gently round the edges of your spars. This will keep them from splintering and maybe tearing if they get caught on clothes, tools, etc. and clean them off.

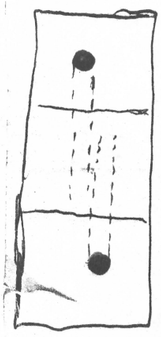
Next mark the locations of your plywood reinforcing pads and your rib and compression

strut location. Also mark the location of your drag & anti drag wire fittings. Now cut out all of your plywood pads for your spars (butt fittings, lift aileron hinges strut fittings, jury strut fittings if so used; etc).

~~Now tape and apply glue to each pad and put to~~
~~it's place on the spar where it goes and either~~
~~nail or staple it in place. You may clamp~~
~~the piece upon which the pad will sit and~~
~~tape or staple the pad to the piece right~~
~~you can remove the clamps.~~
~~Now you can begin to square your spars and begin~~
~~sliding each of the ribs in place~~

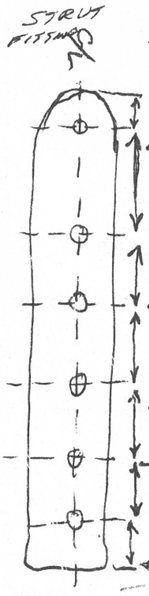
Place the pads in their proper locations and temporarily fasten to the spars with either aircraft nails or staples in each corner. Now very carefully measure the location of the fittings on your spars and mark their mounting hole locations. Do this on all spars keeping in mind you have a LEFT WING and a RIGHT WING. After double checking all of your measurements and locations Now place your spars flat and carefully drill the proper size holes in your spars for the fittings making sure the holes are at 90° with the surface of the spar and on center; also don't forget to back up your work with old plywood or wood to keep from tearing the spar & pad stock as the drill bit passes through it.





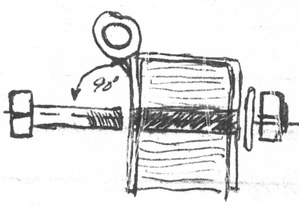
Now that you have yours spars drilled lets ~~start and fly~~ fabricate the drag wires and drag wire fittings and compression struts.

Study the drawings and we'll get the easy items out of the way first. You want a tight fit but not so tight as to distort the spar width dimens. Carefully measure and cut your compression struts from 1"x1" stock. Remember that the compression struts in the Butt area of the spars and lift strut fitting areas of the spar will have to be reduced by 1/4" because of the thickness of the two pads in these areas. When you have all of these made label their location with a pencil or pen & masking tape and set them aside. Now study the drawings for the drag wires and the related fittings. Fabricate the drag wire/spar backing ~~p~~ blocks being very carefull to cut and drill the phenolic according to drawings. Now cut and thread the drag wires and label their locations and remember you need a set for left and right wings. Finish up by fabricating your butt and lift strut fittings. Take your time marking and drilling these and make sure the hole patterns perfectly match those in the spars. It takes patience to perfectly drill these from 4130 steel but it is the only way to go!

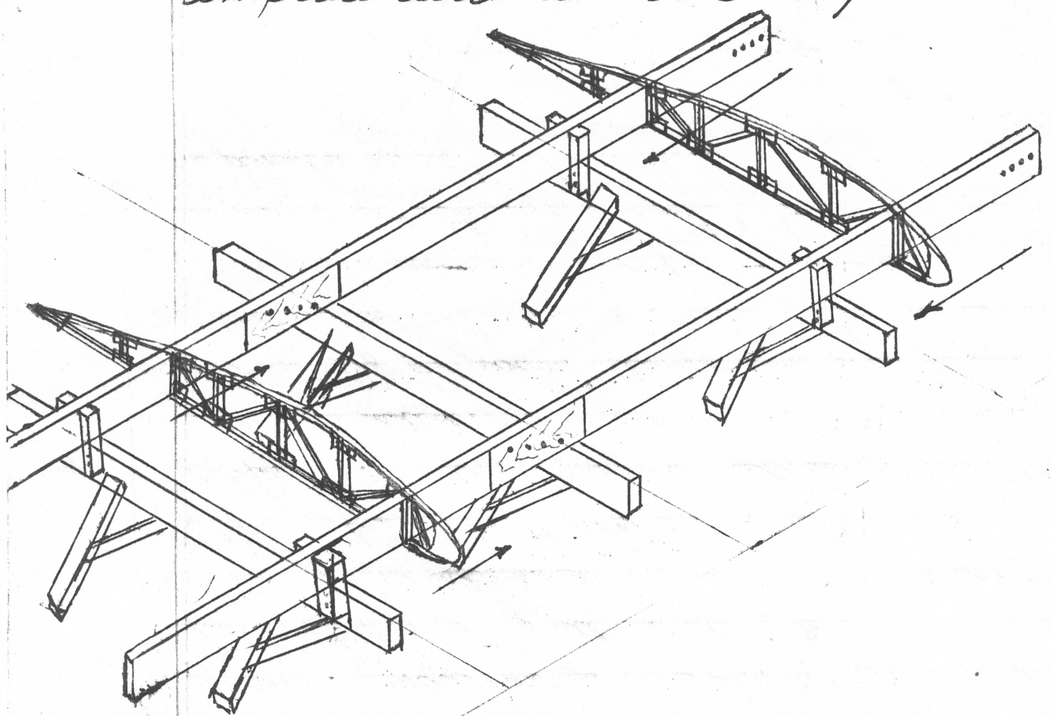


Now place these with your compression struts, and drag wires so they don't get misplaced.

Now fabricate your aileron hinges & horns, and your pulley fittings. Make sure that all of your fitting holes line up perfectly with those that you already have drilled in your spars.



When you begin assembling the wings you will need at least 2 and preferably 3 saw horses to hold your wing. Make sure that all of your saw horses are the same height. Place your saw horses evenly apart as to distribute the weight of your spars and to keep them from saging during assembly. Place a straight spar on the sawhorses and if you have a sawhorse that is short shim it up so they are all equal. Now take your 2 front and 2 rear wing spars and glue the outer lift strut plywood pads on the spars. Now take and cut 8 or 12 2"x2"x12" spar supports. Take these and space them 3¼" apart on each sawhorse front and rear for each spar. Either fasten these in place with nails or C-clamps.

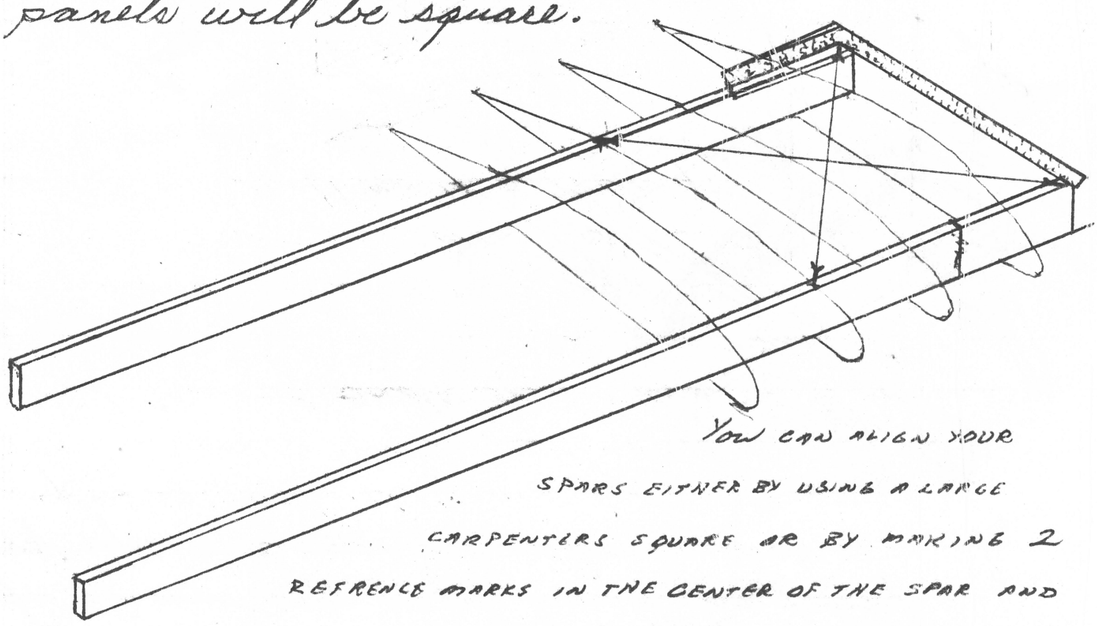


To have a strong wing structure your ribs have been designed with a snug fit so that when the uprights have been nailed and glued to the spar all of the flying loads are directly distributed to the spars!

P.15

Before you can actually ~~be~~ assembled the wings mix up some glue for your outside lift strut

plywood reinforcing plates. Support your spars where the pads will be located and either nail, staple, or nail & clamp these pads on all for spars "Only Glue These Pads On For Right Now! After you glue the pads on carefully place the spars between the 2"x2" uprights that you have fastened to the saw-horses. Now after cleaning all spar openings in your ribs of excess glue slide the ribs on from each end of the spars according to the drawings. (full ribs from butt section in and aileron ribs from tips in. Slide these in place where they are to be located but do not glue. Next glue ~~your~~ the remaining plywood reinforcing ~~pads~~ in place. Now that all of the pads are in place its time to ~~glue the ribs in place.~~ align the spars at the butt ends soo that the wing panels will be square.



YOU CAN ALIGN YOUR SPARS EITHER BY USING A LARGE CARPENTERS SQUARE OR BY MAKING 2 REFRENCE MARKS IN THE CENTER OF THE SPAR AND THEN BY USING A GOOD RULER OR TAPE CROSS REFRENCE YOUR MEASUREMENTS AS SHOWN ABOVE

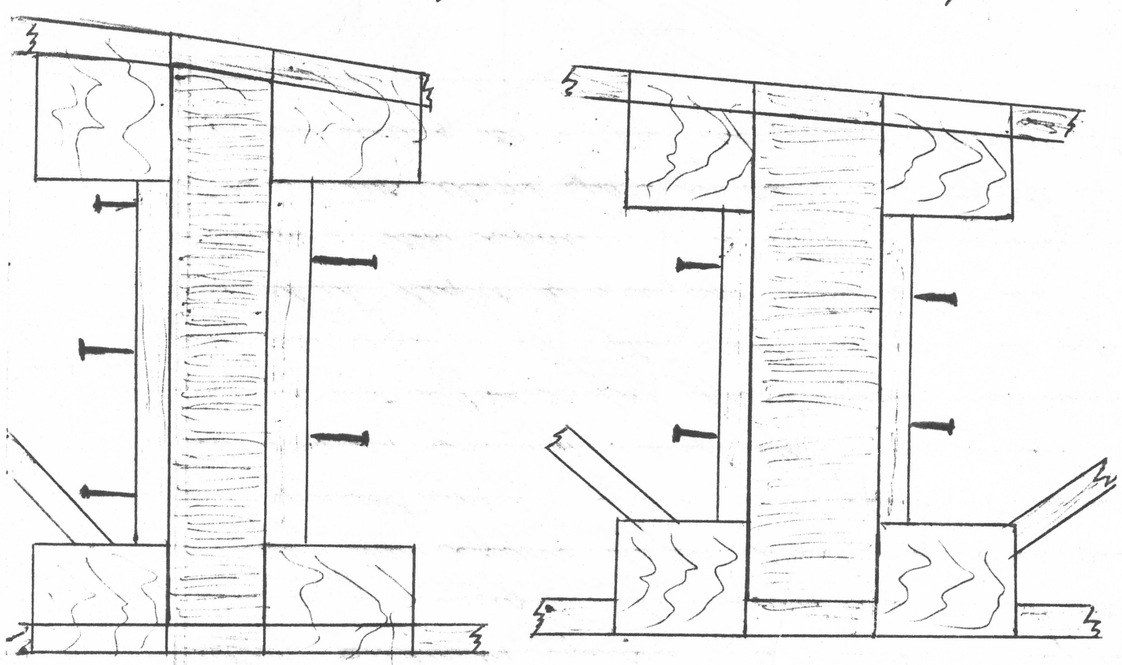
~~Now place the compression struts in place (you will not be able~~

Now ~~apply~~ ~~the~~ ~~temporarily~~ apply wood sealer and 2 coats of varnish to all areas that will have steel fitting attached to them, but keep the

seales and varnish away from any glue areas.
After these have thoroughly dried attach the zinc-chromated fittings to the spars. Slide drag wires or tubing in place being carefull not to disturb the location of the sibs. Also note that the wires or tubing do not come in contact with the sibs when they are in position and snug. *THIS IS VERY IMPORTANT*! If you use steel tubing for compression struts or drag struts place these in place on their proper fittings.

Remember, Do not over tighten but make sure they are snug and snug.

After all of these fittings are in place again check alignment of the spars. Now mix up some glue and glue and nail your sibs in place using 2 3/4" nails on the front of the front spar ~~and 2 on the rear of the rear spar and 3 on the back side of the front spar and again 2 on the front sibs of the rear spar~~. and 3 on the back sids of the front spar. Next tack 2 on the front of the rear spar and if possible 2 on the back of the rear spar.

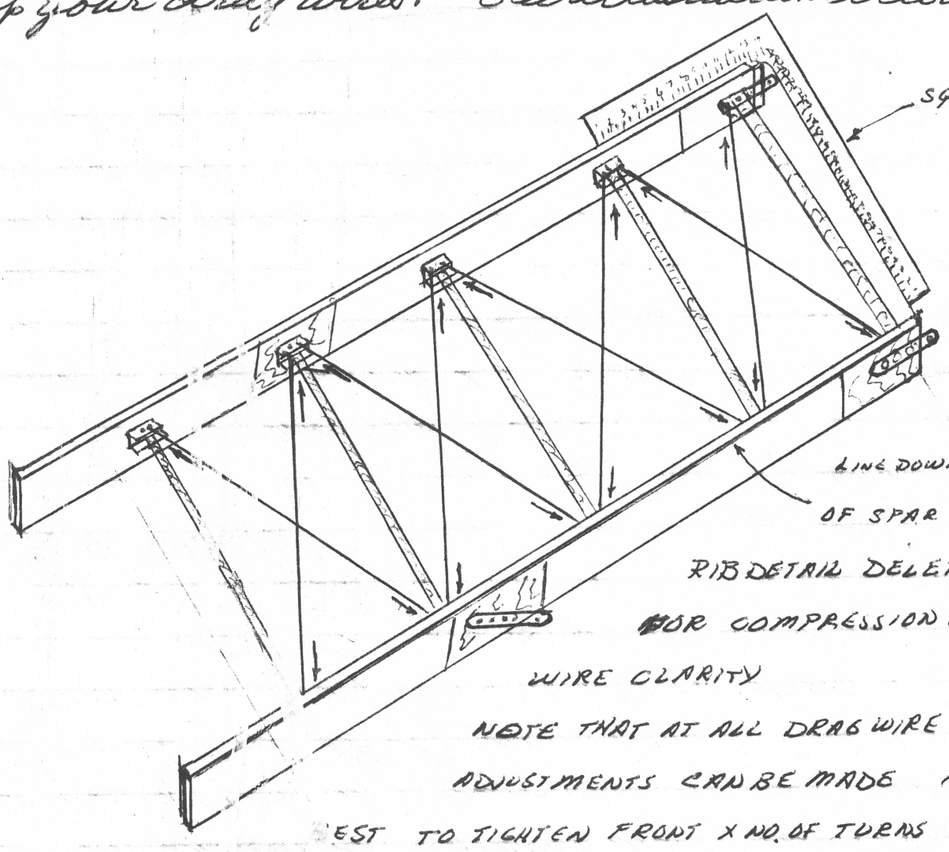


FRONT SPAR

REAR SPAR

P.17 After you have all of your ribs secured in place, go back and tighten up all of your drag

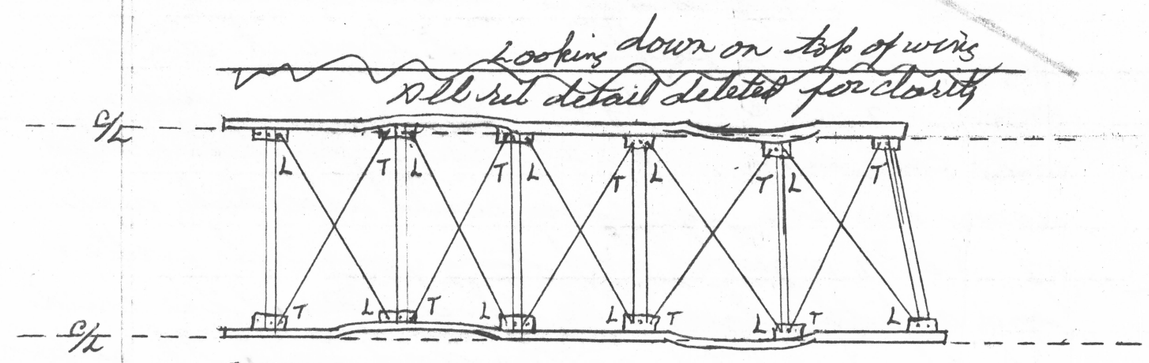
wires. Do this as evenly as possible and pull them all up the same from the front to the back and from butt end to tip. Make sure the wing stays perfectly square and that the spars remain perfectly straight. An easy way to do this is to tape your square to the butt rib and maintain alignment on the spar and to take a string (colored if possible) and fasten it with a staple at the front edge of the front spar and run it span wise down the front edge of the spar and pull it tight and again staple it to the front edge of the spar. Now by referencing off of these two items you should be able to keep your wing in total alignment while tightening up your drag wires. See illustration below.



RIB DETAIL DELETED FOR COMPRESSION & DRAG WIRE CLARITY

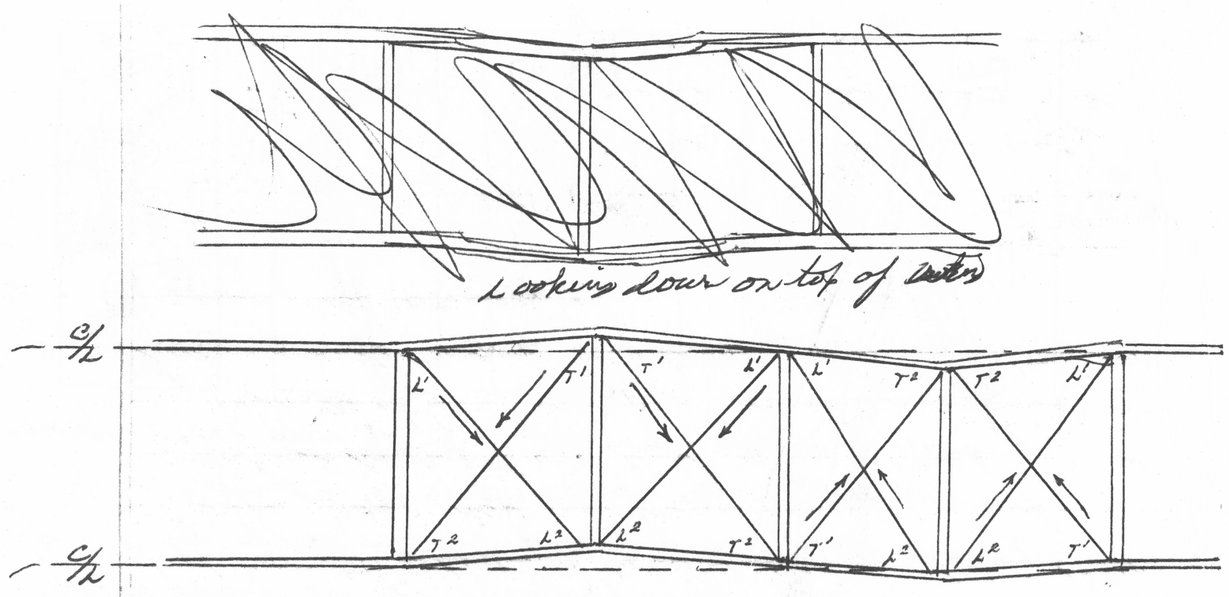
NOTE THAT AT ALL DRAG WIRE ENDS ADJUSTMENTS CAN BE MADE IT IS BEST TO TIGHTEN FRONT X NO. OF TURNS & TIGHTEN BACK ONES SAME NO. OF TURNS & WORK DOWN THE WING WHEN TIGHT THEY SHOULD BE AS TIGHT AS A STRUNG BOW (VERY LITTLE TWANG WHEN THUMPED) REFERENCE OFF OF STRING & SQUARE TO KEEP EVERYTHING SQUARE & STRAIGHT

If while you assemble the wing the wing comes out of square or the spars do not remain straight, the illustration below will help you to correct the problem.



EXCESSIVELY DISTORTED FOR CLARITY

1st To Align problem wing above ~~first~~ first loosen wires with "L" by it and tighten wires with "T" by it



EXCESSIVELY DISTORTED FOR CLARITY

After re squaring the wing as in diagram above now you can true up the spars and get them straight again. Its best to do adjoining bays together Loosen wires with "L" 1-2 and tighten wires with "T" 1-2 Arrows indicate which way spars will be pulled to align only loosen or tighten jam nuts on wires 1 or 2 turns at a time to refrain from overadjusting.

Now make a bow tip jig from the other side of your rib jig. ~~Take one piece of 1/8"x1"x6in 1 piece of spruce~~ ~~Glue blocks~~ Take and make a full size bow tip pattern and trace it out on your jig board. After tracing your pattern out cut some 1"x1"x2" blocks and fasten them down on the jig. You could also take a piece of 1/2 or 3/4" plywood and take your rib pattern and cut the plywood to the contour of the inside of the bow tip pattern and fasten the plywood cutout to the pattern. Next cut out some 1"x1"x2" blocks or plywood blocks and fasten the blocks to the jig leaving a little gap to allow for your bow tip pieces and wedges.

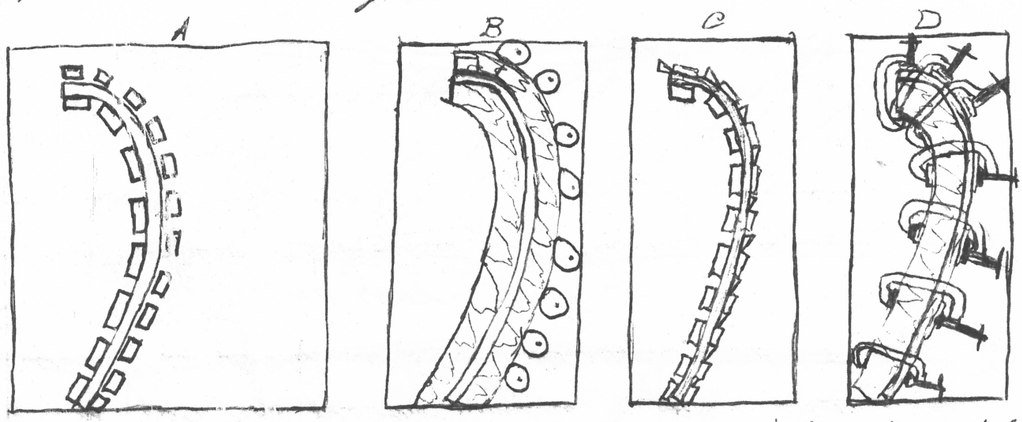
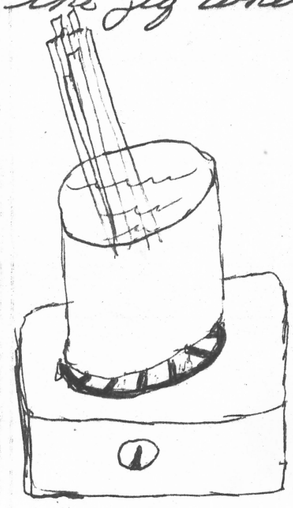


Figure "A" shows the bow tip jig with 1"x1"x2" blocks for supporting the spruce while it is drying in jig. Figure "B" shows plywood formers on the tip jig. the one on the left is fastened to the jig board while the one on the right side of the board fits up against the bow tip spruce and is forced tight in the jig using either some eccentric plywood discs as shown or nail it tight until the bow tip cures out. Figure "C" shows rib jig using 1"x1"x2" blocks on both sides of the bow tip pattern. Fasten these down with a small gap on the ones on the right hand side of the jig. Cut some 1"x2" wedges

~~and after gluing and clamping your spruce bow tip pieces in the jig together, glue and tack~~

to be used to force the laminates of the bow tip together while they cure out. Now take 8 pieces of bow tip stock and soak them in steaming hot water for 10-20 minutes. Next place these in your jig and clamp or wedge them in place until they dry out (the next day) Now they will be bent and will make it much easier to glue and place them in the jig when you are ready to assemble them.



Now place either wax paper or plastic wrap over your bow tip jig. Mix up either your weldwood or T-88 epoxy according to directions and apply an even coat to all mating surfaces. Now place the pieces in the jig and immediately clamp or apply pressure to remove "ALL" gaps in your bow tip. Clean all excess from the top of the bow tip and place somewhere safe until thoroughly dry. "See" it isn't so bad. Now all you have to do is make 13 more.

After you have glued all of the bow tips and they are thoroughly trial fit it on the spars. If you need to taper the tip of the spars a bit for a nice fit do so, However be careful and take your time doing so and use just a fine wood file or jewelers saw since it is very easy to tear the exposed end

grain on the spar tips. After you are satisfied (and be picky") that the fit is right!