# 41% Pitts Model 12 Short Kit

By JTEC RADIOWAVE

Designed by Bob Trueworthy

Made in U.S.A.

# Builders Guide

# 41% Pitts Model 12 Specifications

Wing Span - 108 ¼” (Top Wing)

Length – 108”

Engine – 150cc & up

## 41% Pitts Model 12 Short Kit Includes the Following:

Full Plan & Reference Sheet Set

Laser Cut Parts

Fiberglass Cowl (2 Piece)

Fiberglass Scoop

Fiberglass Wheel Pants

Clear Canopy

Aluminum Landing Gear

Aluminum Cabanes

List of Wood & Parts Required to Finish Plane (listed on the Purchased items Page)

# ITEMS NEEDED TO COMPLETE KIT

## WING TUBES:

- 2 REQ'D. 1 1/4" DIA. X 48" LONG, FOR TOP & BOTTOM WINGS.
- 1 REQ'D. 1/2" DIA. X 15" LONG, FOR BOTTOM WING, ANTI ROTATION PIN.

## WING TUBE SOCKET:

- 1 REQ'D. 1 1/4" DIA. X 22 1/4" LONG, TOP WING, CENTER SECTION.
- 2 REQ'D. 1 1/4" DIA. X 13" LONG, TOP WINGS, OUTER WING PANEL.
- 1 REQ'D. 1 1/4" DIA. X 7 3/4" LONG, BOTTOM WINGS, FUSELAGE.
- 2 REQ'D. 1 1/4" DIA. X 20 1/2" LONG, BOTTOM WING PANELS.
- 2 REQ'D. 1/2" DIA. X 3 3/4" LONG, BOTTOM WING PANELS, ANTI ROTATION PINS.

-SOURCE: FOR WING TUBES & SOCKETS - **TNT LANDING GEAR PRODUCTS (419) 868-5408**

## WOOD:

- 10 REQ'D. BASSWOOD STRINGERS - 1/4" X 1/4" X 48" LONG, (2) FUSELAGE, & (8) WINGS.
- 16 RED'D. BASSWOOD STRINGERS -3/8" X 3/8" X 48" LONG, FUSELAGE.
- 31 REQ'D. BALSA STRINGERS - 1/4' X 1/4" X 48" LONG, (13) FUSELAGE, & (18) WINGS.
- 2 REQ'D. BALSA STRINGERS - 3/8" X 3/8" X 48" LONG, (2) FUSELAGE.
- 2 REQ'D. BALSA STRINGERS - 1/2 X 1/2" X 36" LONG, (2) FUSELAGE.
- 3 REQ'D. BALSA - 1/4" X 1/2" X 48" LONG, (2) HORIZONTAL STAB. & (1) VERTICAL STAB. & RUDDER.
- 9 REQ'D. BALSA - 1/4" X 3/8" X 48" LONG, (4) HORIZONTAL STAB. & (1) VERTICAL STAB. & RUDDER & (4) TRAILING EDGE, AILERONS.
- 4 REQ'D. BALSA - 1/2" X 3/4" X 48" LONG, (2) HORIZONTAL STAB. & ELEVATORS & (2) VERTICAL STAB & RUDDER.
- 8 REQ'D. BALSA - 1/2" X 1 1/2" X 48" LONG, (4) LEADING EDGE OF THE WINGS, & (4) LEADING EDGE OF AILERONS.
- 4 REQ'D. BALSA - 3/8" X 1 1/2" X 48" LONG, (4) TRAILING EDGE OF WINGS- (HINGE LINE).
- 35 REQ'D. BALSA SHEETS 3/32" THICK X 4" WIDE X 48" LONG, (14) FUSELAGE & (21) WINGS.

## MISC:

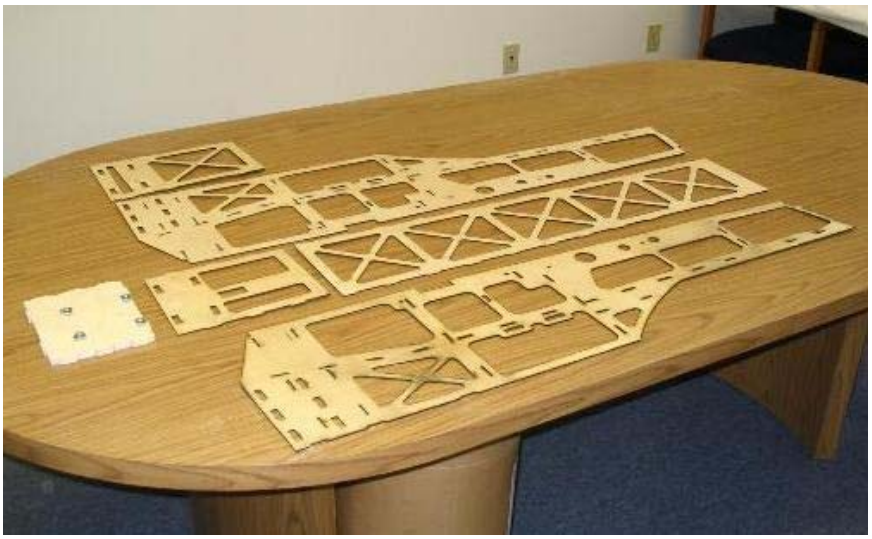
- AEROPOXY OR LOCTITE HYSOL, GUN, & MIXING TIPS
  - (HYSOL # 9462 CAT'L. # 6430A33 AVAILABLE FROM MC MASTER CARR)
  - (ADHESIVE GUN # 74695A71 AVAILABLE FROM MC MASTER CARR )
  - (MIXING TIPS # 74695A12 AVAILABLE FROM MC MASTER CARR)
- 2 REQ'D. ALUMINUM ANGLE 3/4" X 3/4" X 1/8" THICK WALL X 32" LONG,
  - CUT INTO (2) PIECES 9" LONG FOR LANDING GEAR SUPPORTS
  - CUT INTO (2) PIECES 6 1/2" LONG-FIREWALL TO MOTOR BOX SIDES
- 71 REQ'D. FLAT STYLE OR ROBART HINGES (LARGE)
- 1 REQ'D. 150 CC OR LARGER ENGINE.
  - RECOMMENDED ENGINES
    - DESERT AIRCRAFT DA-150 / DA-170 / OR DA-200
- 12 - 16 REQ'D. HIGH TORQUE DIGITAL CORELESS SERVOS – MINIMUM 300in/oz PER SERVO
  - EXAMPLES
    - FUTABA 9156, 9157, BLS 152
    - JR 8611A, 8711
    - AIRTRONICS 94780M MG

# MISC. CONTINUED:

- 2 REQ'D. DUBRO 5 1/2" WHEELS (DUBRO PART # 550TL)
- 2 REQ'D. DUBRO 1/4" DIA. AXLES (DUBRO PART #250)
- 4 REQ'D. 1/4" WHEEL COLARS (DUBRO PART #244 – 2 PACKS REQUIRED)
- 1 REQ'D. DUBRO 50 OZ. GAS TANK (DUBRO PART #692)
- BLIND NUTS:
    - 24 REQ'D. #6-32 (DUBRO PART #607)
    - 4 REQ'D. 1/4-20 (DUBRO PART #653)

# 41% Pitts Model 12

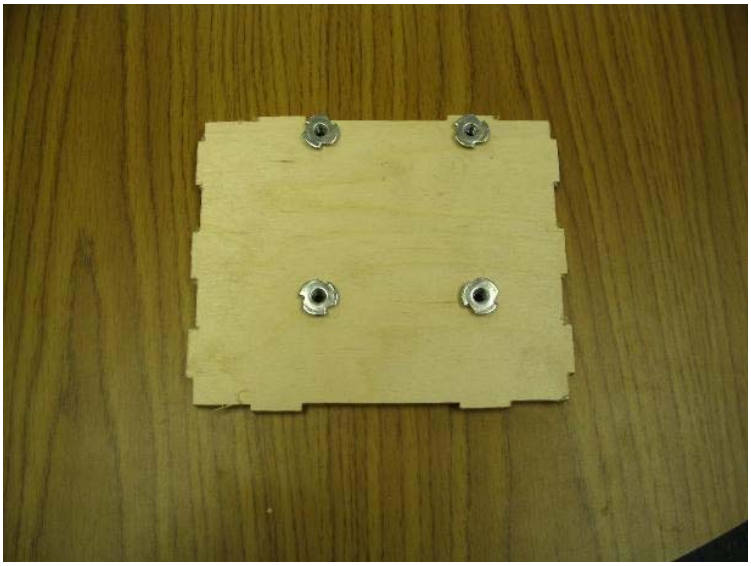
## Step # 1



This step builds the motor box.

- Locate the components shown.
- Before gluing check the fit for all components. All tabs should fit matching slots.

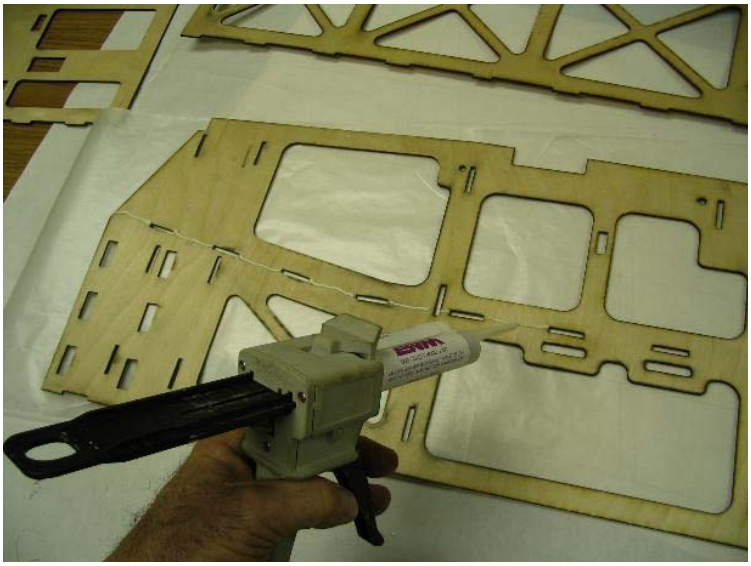
## Step # 2



Firewall

- Using the print, check firewall and mark front, top, left, right, & bottom.
- Using same print mark the location of the screw holes. (This location is for a DA-150/170/200.
- Make sure to check your engine for the mounting hole locations.
- Drill for 1/4-20 blind nuts & Install the blind nuts on back side.

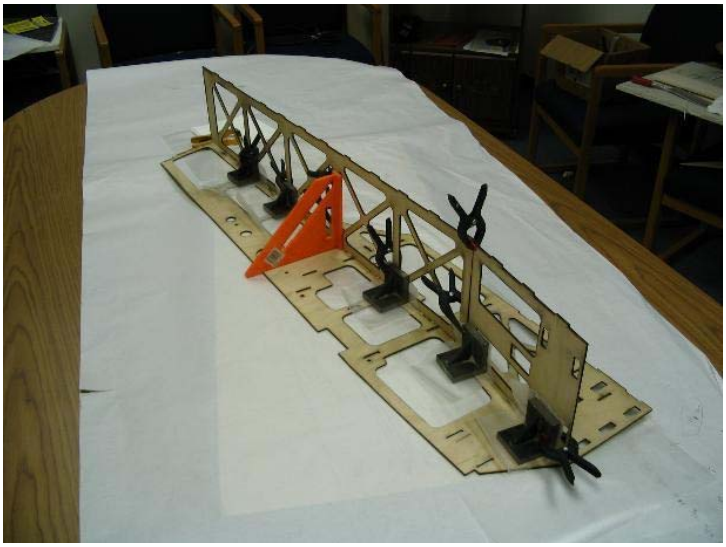
# Step # 3



<u>This step builds the motor box</u>

- **NOTE**: Make sure to identify the left motor box side, the right motor box side, the front and back of the motor box floor, the left and right side of the front motor box floor and the top and bottom of the firewall.
- Before gluing check the fit for all components. All tabs should fit matching slots.
- This step will glue in place the motor box floor, the front motor box floor and the firewall to the motor box side. (Make sure that you know which side is the left and which side is the right.)
- Lay (1) motor box side on your building surface.
- Run a bead of Aeropoxy along the slots. Place the motor box floor, the front motor box floor and the firewall in place.
- Use squares to square up the motor box floor and the front motor box floor.
- (**NOTE**: The firewall is not square).

# Step # 4



This step builds the Motor Box

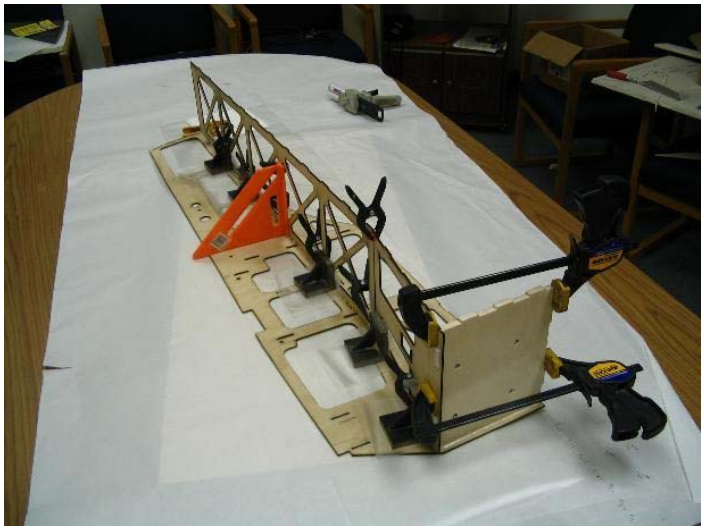
- Use squares to square up the motor box floor and the front motor box floor.
- NOTE: Very important to these 3 pieces as square as possible.
- The curing time for the Aeropoxy is about 8 hours, so you have a lot of working time.
- **NOTE**: The firewall is not square to the motor box side or the motor box floor

# Step # 5

This step builds the motor box.

- As you build run a bead of Aeropoxy (as shown) along all joints run your finger along bead to produce a fillet radius.
- We recommend the firewall be at least 3/8" thick ply for a 150cc engine.
- **NOTE**: The second set of 3/8" x 1" slots are for a 4 cylinder engine.
- Also former F1 also moves to the rear.
- Next epoxy in the firewall, if you know which engine is going to be used, it will be easier to drill motor mounting holes before installing the firewall.
- **NOTE**: Don't forget to offset engine to the left side and to the bottom because of the right thrust and up thrust.
- This right trust and up thrust is built into the firewall.

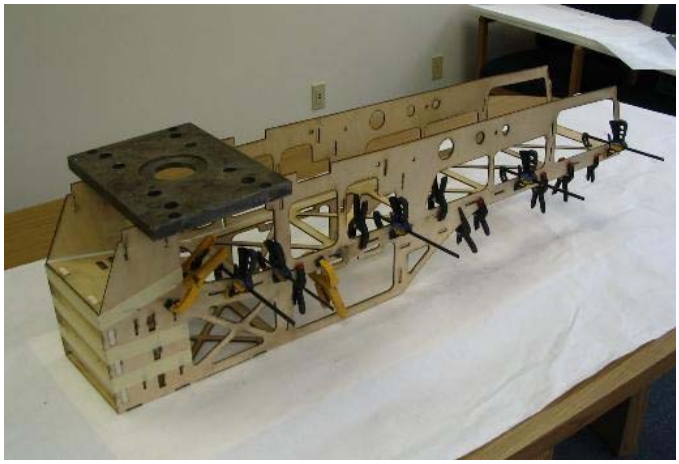
# Step # 6



This step builds the motor box.

- Install the firewall. You do not have to wait until the motor box side and the motor box floor have cured.
- Use Aeropoxy to glue in the firewall and run a large bead of Aeropoxy around the firewall.
- Clamp as shown.
- Let this assembly cure overnight.
- NOTE: Build this as square as possible

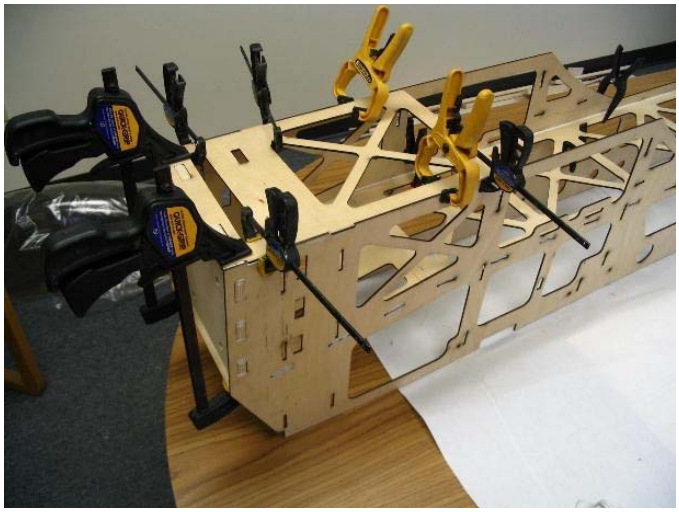
# Step # 7



This step builds the motor box.

- After the Aeropoxy has cured, test fit the other motor box side to assembly you have built.
- Glue this side together as you have done in the previous operation.
- Clamp together until cured.
- Weigh down to assure that the assembly is square.

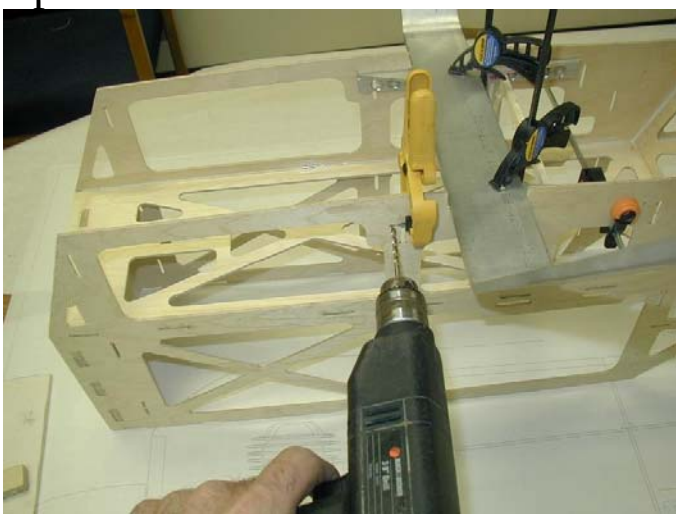
# Step # 8



This step adds motor box top.

- Glue the motor box top in place.

# Step # 9



A picture of the Aluminum landing gear Brackets

This step mounts the landing gear.

- Drill 4 (2 per side) 9/64" dia. holes located on the motor box side through the alum. bracket.
- Open up the 9/64" dia. holes in the motor box sides to fit #6-32 blind nuts. Install the 4 blind nuts on the outside of the motor box sides.
- NOTE: You may need to add a piece of 1/8" x 3/4" x 3/4" lite ply as a spacer under the blind nuts and glued to the motor box sides.
- The landing gear brackets will be held on with #6-32 x 1/2" soc. head cap screws, through the brackets into the blind nuts.
- The landing gear brackets are made from 1/8" thick x 3/4" x 3/4" aluminum angle (see print).

# Step # 10

This step mounts the landing gear.

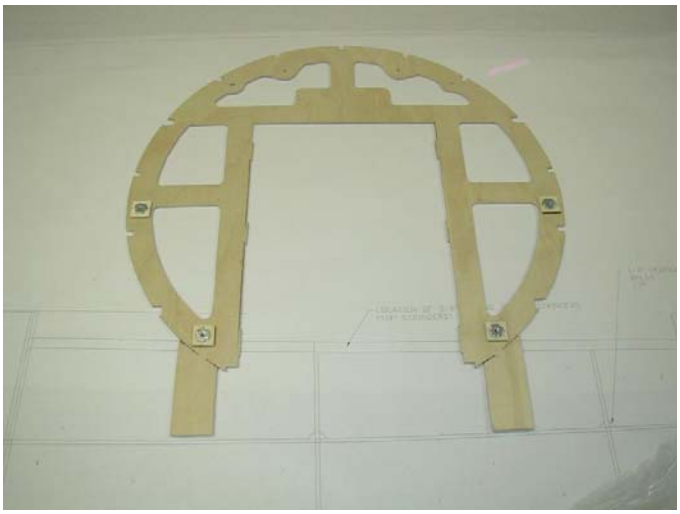
- Open up the 9/64" dia. holes in the motor box sides to fit #6-32 blind nuts.
- Install the 4 blind nuts on the outside of the motor box sides.
- NOTE: You may need to add a piece of 1/8" x 3/4" x 3/4" lite ply as a spacer under the blind nuts.
- Glue this assembly to the motor box sides. Use the bracket to locate the blind nuts.
- The landing gear brackets will be held on with #6-32 x 3/8" long soc. head cap screws, through the brackets into the blind nuts.
- NOTE: Make sure that the 3/4" x 3/4" lite ply piece does not cover the locating slots.

# Step # 11

This step mounts the landing gear.

- NOTE: The landing gear is now (1) piece, no plate in the center.
- Locate the landing gear on the alum. brackets.
- Draw a center line on the landing gear. Take measurements from each side of the motor box to the center line.
- Move landing gear side to side until you have it perfectly located.
- Clamp in place and transfer the holes from the landing gear through the brackets, using a #19 drill (.166 dia.).
- Use 4 #8-32 x 1/2" long soc. head cap screws, with lock nuts to hold the landing gear in place.

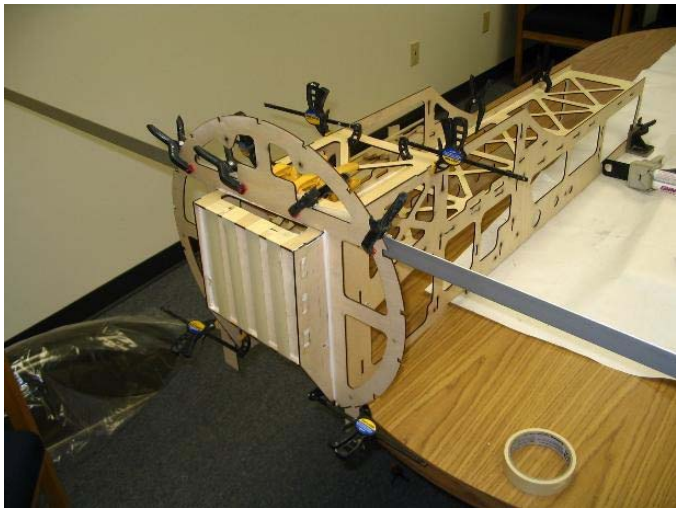
# Step # 12



F1 Former

- Open up 4 lower holes in former F1 to fit #6-32 blind nuts.
- Install 4, #6-32 blind nuts on the back side of former F1, as shown in this picture.
- Make 4, 3/4" x 3/4" x 1/8" thick spacers for under the blind nuts.
- Glue in place.

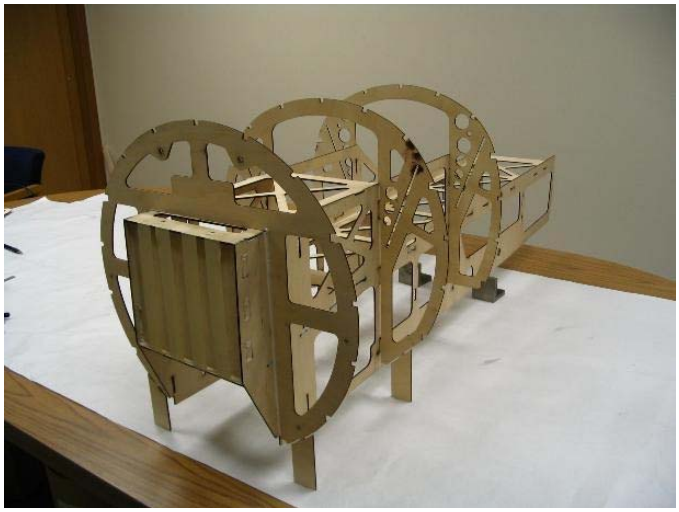
# Step # 13



This step adds former # F1 to motor box.

- Start with former F1, slide down over the motor box, you will have to twist and spread the former slightly to fit over the motor box. The tab will drop into the slots on the motor box sides. If fit looks good, slide former out of the slots enough to glue with Aeropoxy.
- Slide the former back into the slots, wipe off excess Aeropoxy.
- Using the Aeropoxy, run a fillet on both sides of the F1 former.
- NOTE: Use a straight edge against the back side of the former to keep it straight.
- The cowl ring screws against F1 former, so you want it as square as possible.

# Step # 14



This step adds formers # F2 and F3 to motor box.

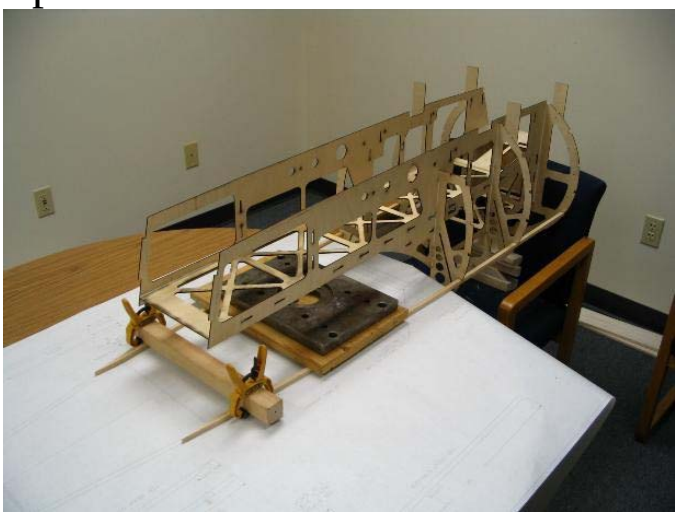
- Install formers F2 and F3 using the same method as former F1.

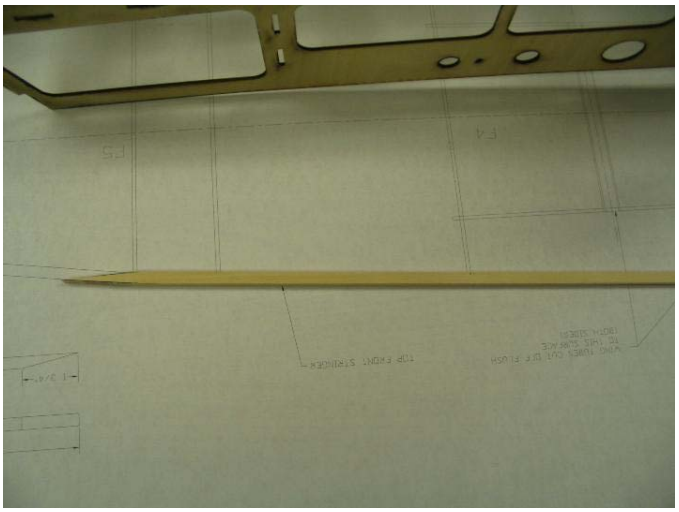
# Step # 15

This step adds the top 2, 3/8" bass stringers.

- Needed for this step are (2) 3/8" square x 48" long basswood stringers, which were cut to size, as shown on print # 3
- Make sure the angle has been cut and the locations of formers # 1, # 2, # 3, and # 4 have been marked on the stringers.
- Line up formers with marks on 3/8" stringers, glue in place.
- NOTE: I like to use straight edges against the formers to hold them straight while gluing the 3/8" stringers in place

# Step # 16

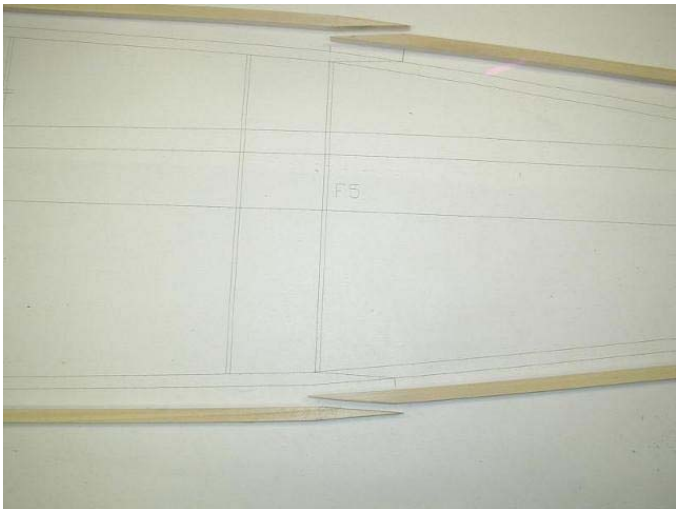




Stringers

- Draw a line on print #2 from the 3/8" stringer on (1) side across the paper to the 3/8" stringer on the other side.
- Draw this line 6" behind former # 3.
- Next mark a line 6", to the rear of former #3, on both 3/8" wood stringers.
- NOTE: These lines are to locate the fuselage on top of the print #2, which is hard to do with the fuselage
- hanging off the end of the table.
- With the top (2) 3/8" stringers in place, move the print so the first 3 formers are off the end of your table.
- Turn the plane upside down and locate from the marks that you added.
- Pull the stringers in and locate them over the print. Use weights or pins to hold in place.
- Glue a few 1/4" x 1/4" balsa stringers as cross braces. (Will hold the (2) 3/8" x 3/8" basswood longerons in place).

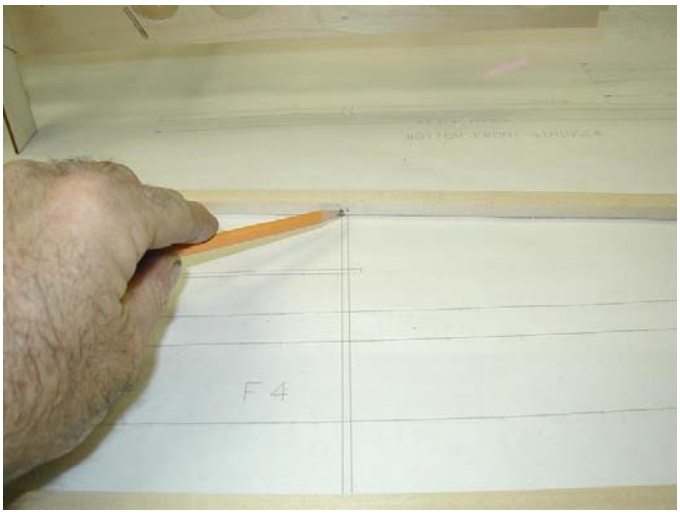
# Step # 17



Stringers

- Glue the rear 3/8" stringer to the front 3/8" stringer.
- Cut angles as shown on print # 2 and this picture.
- Glue together. Clamp flat on your building board and let the joint setup.

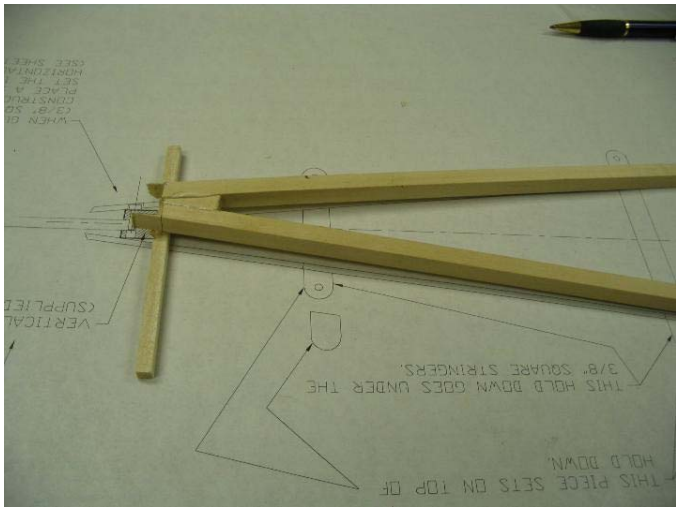
# Step # 18




Stringers

- After epoxying together the joint shown in the previous step, with the 3/8" square
- Stringer sitting on top of the print # 2, draw lines at formers F4, F5, F6, & F7.

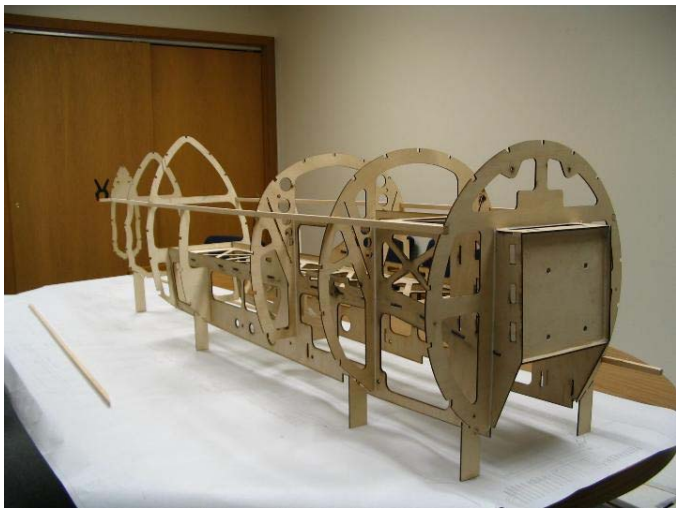
# Step # 19




Finishing the rear of the top longerons.

- NOTE: The (2) 3/8" stringers at the rear of the plane, from former #F7 to the vertical stab. post is a separate piece glued to the 3/8" stringer, which comes from the front former #F1 to former #F7.
- While still upside down, over print #3, make sure that the rear of the 3/8" stringer has the angle shown on print #3. Also cut an angle on this piece of stringer, which gets glued to the rear of the stringer talked about above.
- Place a 5/16" thick piece of balsa, as a shim, under the rear of the stringers.
- Cut a notch for the receiver post in the end of the stringers.
- Cut a wedge, that goes between the (2) stringers, make sure you have the 5/16" shim under the stringers, check alignment with the print, and glue the whole assembly together.

# Step # 20



Adding formers F4 through F7.

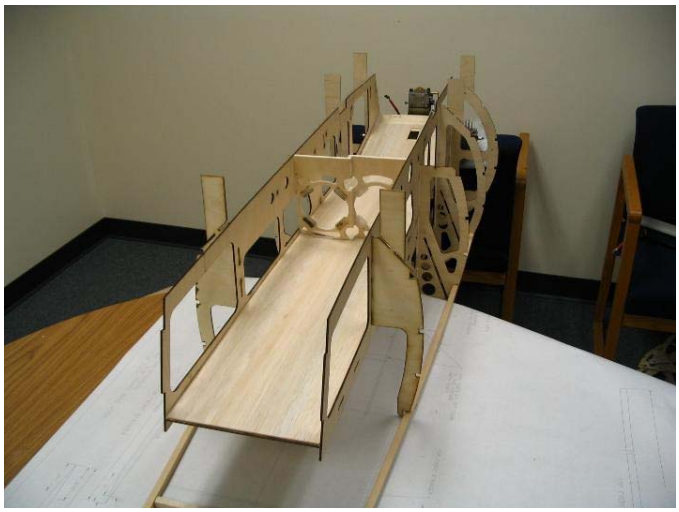
- Turn plane right side up. Align over sheet #3 and glue the legs down to the print.
- Add formers #F4, F5, F6, and F7. Align each former over the print. Use a square to square up the former.
- Recheck everything and glue to the stringers and glue the legs to the print.

# Step # 21

Adding exhaust support.

- If you are going to use canister mufflers or tuned pipes (such as K&S 1090 pipes) then now is a good time to add your muffler mount.
- Bolt on your engine, the headers, and the mufflers.
- NOTE: My 41% Pitts 12 is using a DA-170. If you are using the same, stock flex headers will work fine. Specify flex headers with a 100mm (4") drop. Tuned Pipes & Headers Available from Desert Aircraft.
- Next locate the muffler bracket supplied in kit, locate over the mufflers,
- Alter if necessary, and glue in place.

# Step # 22



Sheeting Pipe Tunnel

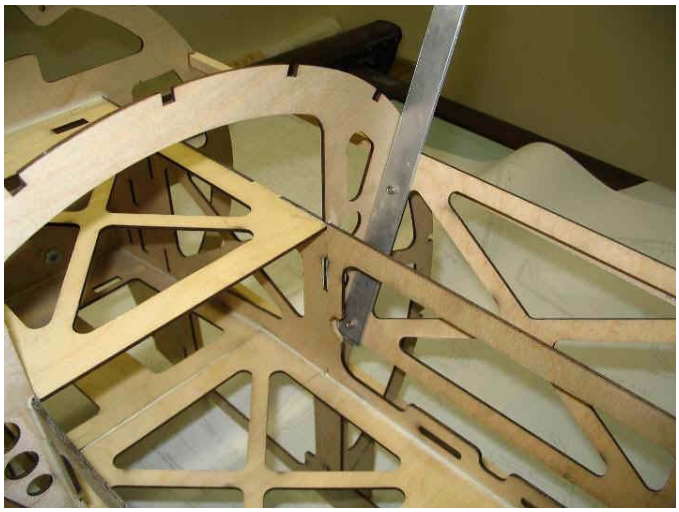
- Add 3/32" balsa sheeting to bottom of the tunnel.

# Step # 23

Sheeting Pipe Tunnel

- Add 3/32" balsa sheeting to the sides of the tunnel.
- This picture shows the shorter tunnel, but this step is the same.

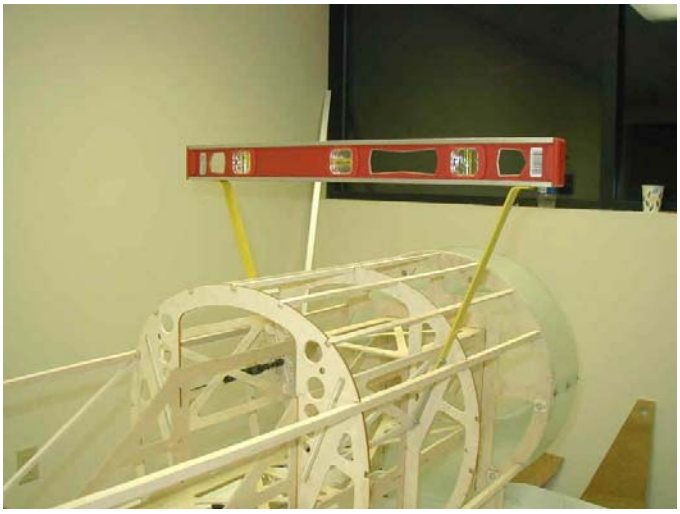
# Step # 24



This step installs cabanes.

- Slide into place the (2) cabane supports. If fit looks good, slide back out, add glue or epoxy and slide back into location.
- Clamp the front right cabane up against the rear of former F1, and to the inside of the cabane support.
- With the bottom of the cabane 3/32" below the bottom of the cabane support, drill 9/64" dia. thru. the cabane in (2)
- Locations.
- Remove the cabane and open up the hole in the cabane support for a #6-32 blind nut. Install blind nuts on the outside of the cabane support.
- NOTE: if the blind nut is thicker than 1/8", you must add a plywood shim, 1/8" thick, so the blind nut does not hit the alum. cabane.

# Step # 25



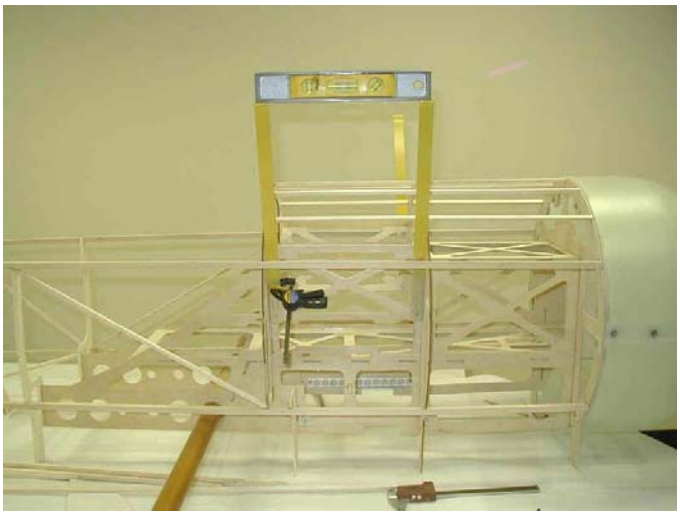
Mounting Cabanes.

- NOTE: Again, the motor box is a different version and the cabanes will be on the inside (as shown in step #28), not outside as shown, of the cabane support.
- The step is the same.
- Clamp the front left cabane to the cabane support.

# Step #25 Continued

- Move the cabane up or down until the left cabane is level with the right cabane.
- Drill a 9/64" dia. hole through the cabane support, using the holes in the cabane as the location.
- Remove the cabane and open up the holes to fit a #6-32 blind nut on the
- inside of the cabane support.
- Install the blind nuts.
- Reinstall the cabane using #6-32 x 3/8" long soc. head cap screws.

# Step # 26



Mounting Cabanes

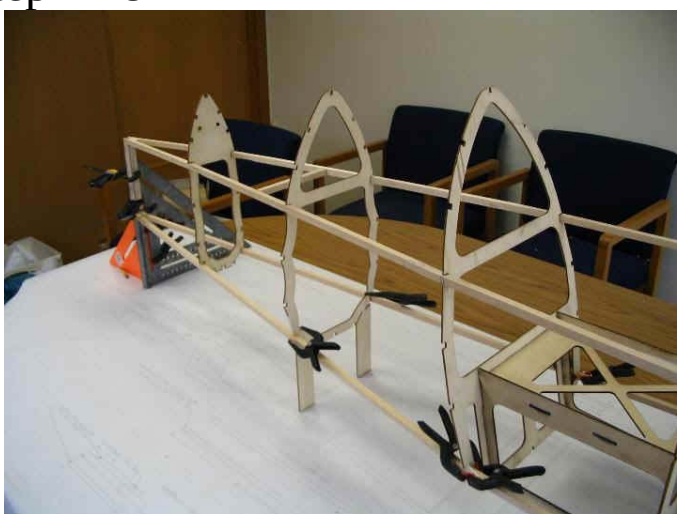
- Clamp the right rear cabane in place. Move the cabane up or down until the cabane is level with the right front cabane.
- Drill 2, 9/64" dia. holes through the cabane support, using the holes in the cabane as the location.
- Remove the cabane and open up the holes to fit a #6-32 blind nut on the inside of the cabane support.
- Install the blind nuts.
- Reinstall the cabane using #6-32 x 3/8" long soc. head cap screws.
- Clamp the left rear cabane in place. Level it with the right rear cabane,
- Drill and install blind nuts.
- Do the same step for the left rear cabane.

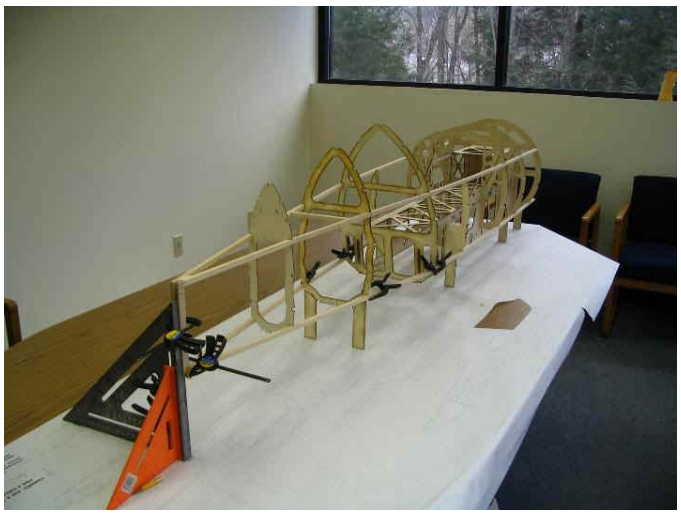
# Step # 27

Building the vertical stab. & the receiver.

- Build the vertical stab. receiver. Check print # for directions.
- Build the vertical stab. at this time. Notice how the vertical stab. post sets into the receiver.
- Glue the receiver into the fuse (next step).
- Don't transfer the holes in the vertical stab. yet. This will be done later.

# Step # 28





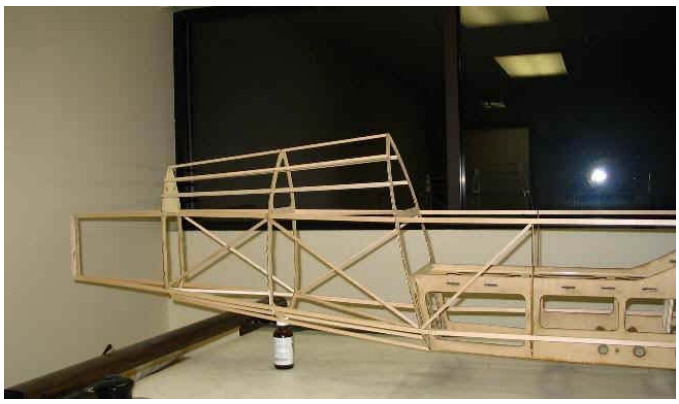
Adding the bottom 3/8" stringers (longerons) and vertical stab. receiver.

- Check print #3 for the angles on the ends of the 3/8" stringers. Cut these angles.
- Do some checking and fitting before cutting.
- The joint will be at former F5.
- NOTE: If the angles are correct you won't have to force them together at the rear of the fuselage.
- Cut a notch at the rear of the stringers to accept the vertical stab receiver post.
- NOTE IMPORTANT: Use a square to square up that post. Make sure the rear of the plane is square, (on the side and on the back) and still over the plans. I have had to cut apart the upper longerons, on (1) side to realign this post.
- Get it right.

# Step #28 Continued

- Not shown, but next add the 1/4" balsa stringers. For the (3) stringers on the bottom of the plane I use basswood. You may use balsa to save weight but I find that you pick up the plane with one hand under the fuselage bottom and it's easy to break balsa stringers, as I found out.

# Step # 29



Stringers

- Cut and glue the diagonal 1/4" square balsa stringers in place.
- See print # 5.
- These stringers are on the sides, top and bottom.
- Use hard and stiff balsa for this.
- I have also used carbon fiber tubes (5/32" outside dia. x 1/8" inside dia.) instead of balsa. More expensive, but stiffer.

# Step # 30

Building the horizontal hole downs.

- Locate the (2) stab. hold down plates (front and rear).
- They are glued under the top longerons, (Locate from print and the left and right side plates, which will get glued on next).
- Glue the 3/8" thick spacers on top of the (2) hold down plates, left side and right side. This will bring the top level with the longerons.
- The horizontal stab. will get screwed to these plates, so make sure they are in the right place.
- You are also seeing the vertical stab. receiver glued in place.

# Step # 31

Locating the horizontal stab.

- Build both the horizontal stab. and the vertical stab. Finish both to the point that you could cover them, including cutting the hinge slots and the beveling the trailing edges.
- Place former F7A against the back of former F7. Glue in (2) dowels in former F7A for location.
- Clamp in place.
- Locate the horizontal stab. in place on top of the top longerons.

# Step #31 Continued

- Note: It is very important to get the horizontal stab. on square. Once located in the right place, transfer (4) screw hole down through the (2) hold down plates.
- Open up those holes and install (4) #6-32 blind nuts.
- The horizontal stab. is next glued to the rear of former F7A.
- Next place the vertical stab. on top of the horizontal stab. The vertical stab. post should sit into the receiver tray.
- Again square up the vertical stab. (important). I know that you are getting sick of hearing this. When happy, glue it down to the top of the horizontal stab.

# Step # 32

Attaching Rear F8 Former

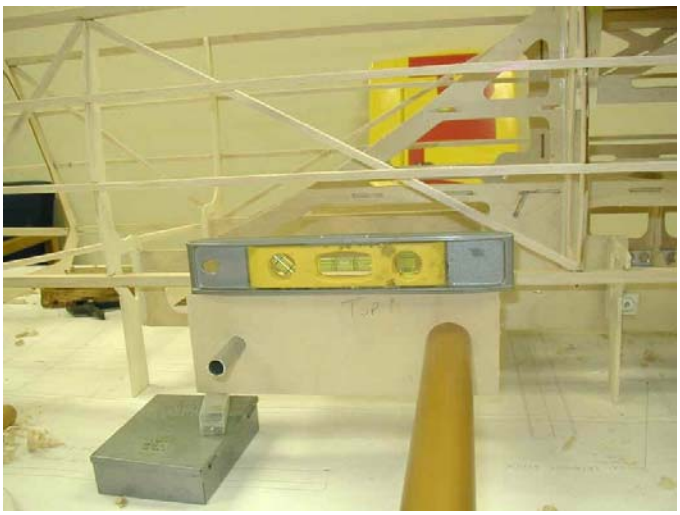
- Another view of step #35.
- Add former F8, this supports the stringers.

# Step # 33

Stringers

- Add the 1/4" balsa stringers from F7A to the vertical stab. post.
- Don't forget that the tail feathers come off,
- DO NOT glue former F7A to F7.

# Step # 34



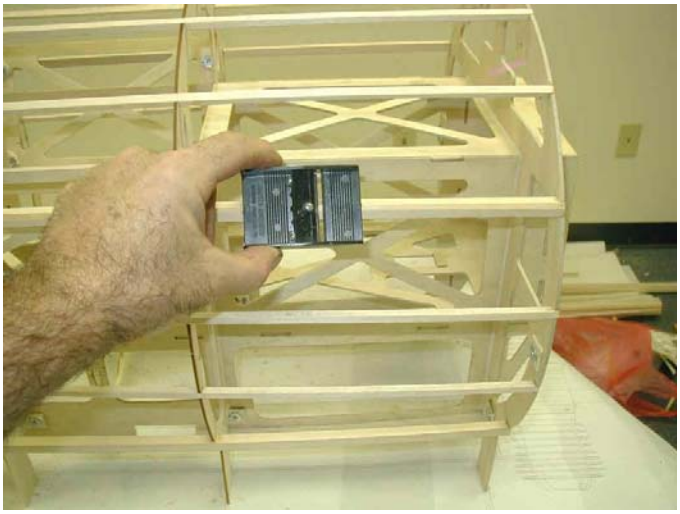
Wing tubes.

- NOTE: Again different motor box.
- Align the wing anti rotational 1/2" wing tube and the 1 1/4" dia. socket with the wing tube.
- Find (2) 1/8" lite ply donuts to fit the socket.
- Cut the socket to length. (Flush with the outside of the motor box. The wing will butt against the motor box).
- The donuts go against the inside wall of the motor box.
- I make up 2 templates, 1 for each side (shown on the prints) cut out of scrap plywood.
- The upper surface of the template is level to the center line of the holes.
- With the fuselage level, put the level on the top of the template as shown. Shim up or down the make the rear anti rotational pin level to the wing tube.
- Do both sides. Moving 1 side will effect the opposite side so check both sides until they are level.

# Step #34 Continued:

- NOTE: This is important, it sets the bottom wing incidence.
- Using Aeropoxy glue the donuts and socket in place.

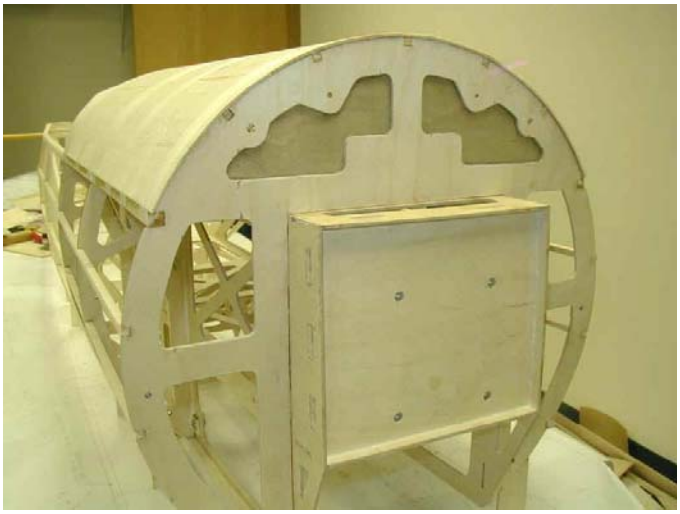
# Step # 35



Shape the top & bottom 3/8" stringers.

- A razor plane works great. Sand and plane this stringer down until it is flush with the formers.
- Do both sides.

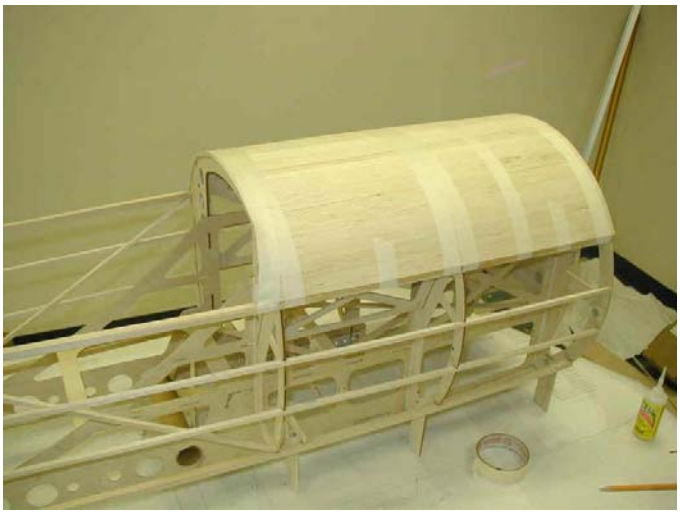
# Step # 36



Close off the lightning holes to prevent air from flowing into the fuselage.

- I show the sheeting in place, but it's much easier to do this step before you sheet the fuselage.
- Cut 6 pieces of 1/32" plywood or 3/32" balsa to close off the lighting holes in the back of former F1.
- Hold each piece on the back side of F1, trace the clearance hole with a pencil.
- Cut the shape out, leaving about 1/4" extra all around to glue to.
- Glue in place.

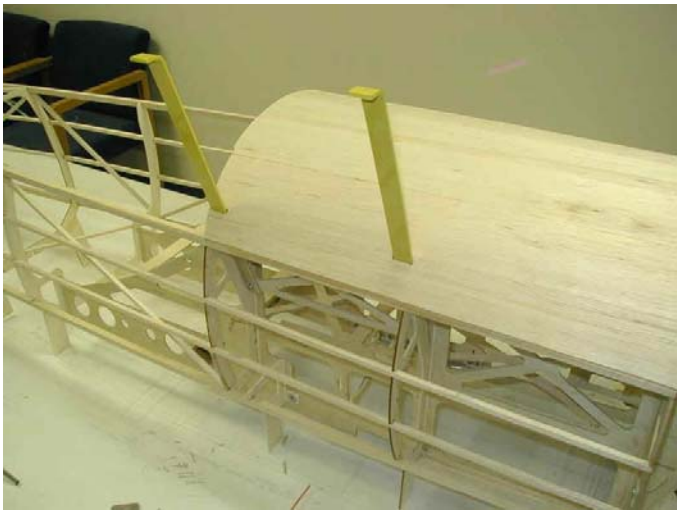
# Step # 37



Sheeting.

- NOTE: Again different motor box.
- Sheet the front of the fuselage with 3/32" balsa sheeting.
- Only sheet down to the center of the top 3/8" stringers.
- I test fit the piece, leave a little long. Wet with Windex, tape it down and let it dry.
- I use 30 minute epoxy to glue it down. Tape it, let it setup and sand the ends flush with the formers.
- Don't sand the sheeting until your ready to cover.

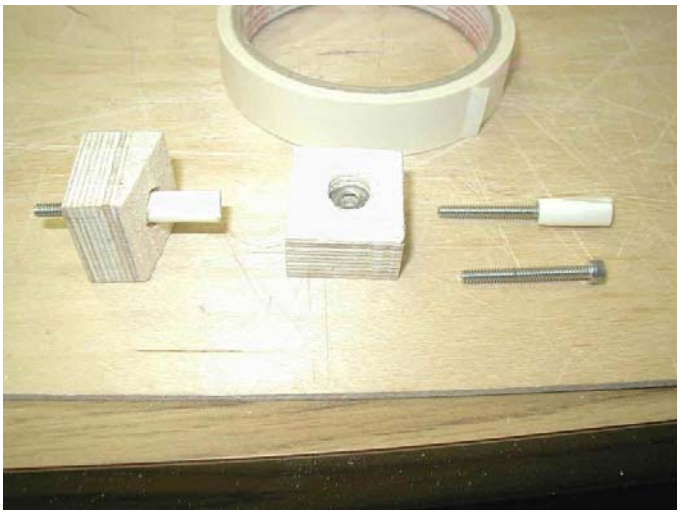
# Step # 38



Cut clearance holes for cabanes.

- On the 2 rear cabanes add clearance, to your hole, for your servo leads.
- Next step is to continue sheeting the fuselage. (I don't show a picture of this).
- Sheet down to the bottom longerons (3/8" stringer) and back to former F5.
- NOTE: Don't sheet below the bottom longerons at this time, you will do this after fitting the bottom wings.

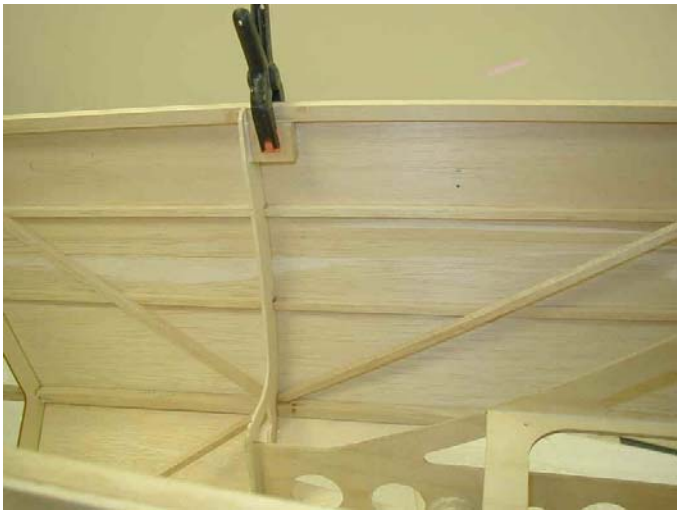
# Step # 39



Construct (4) blocks which mount under the top longerons. (see next step #40).

- These block are made with (1) piece of 3/8" thick aircraft ply, with a 9/64" dia. drilled hole through.
- Next block is balsa with a clearance hole for the head of a #6-32 socket head cap screw.
- I also glue in a #6 washer against the plywood block.
- Again, look at the next step to understand what this block does.

# Step # 40



Mount (4) blocks under the top longerons.

- These blocks hold down the canopy hatch.
- Check the prints for the location.
- These block were made in step #39
- Transfer the hole through the sheeting.

# Step # 41

Cowling

- Tape the 2 halves of the cowl together.
- With the cowl sitting on my building board, I epoxy the cowl ring to the inside of the cowl.
- Next I locate the screw holes and drill through both halves of the cowl with a # 34 drill (clearance for a #4-40 x 3/8" long soc. head cap screw).
- Next I cut 5/8" x 5/8" x 1/8" lite ply squares. I then drill a hole through them for a #4-40 blind nut. Glue in place the blind nuts (notice them in this picture).
- Next epoxy the blind nut assembly to the inside of the cowl. Use # 4-40 x 3/8" with washes to hold blind nuts in place while the epoxy sets up.

# Step # 42

Mounting Cowling

- Mount the cowl on the fuselage.
- Build a hatch on the bottom of the fuselage, see print for directions.

**For Wing Construction please follow instructions on Plans**