

# FunMaster 72

KIT # K-504

## *Assembly Instructions*



Version 2 11-15-13

### **WARRANTY**

Alien Aircraft Corp. guarantees this kit to be free from defects in both material and workmanship at the date of purchase. This warranty does not cover any component parts damaged by use or modification. In no case shall Alien Aircraft Corp.'s liability exceed the original cost of the purchased kit. Further, Alien Aircraft Corp. reserves the right to change or modify this warranty without notice. The quality and flyability of your finished model depends on how you build it; therefore, we cannot in any way guarantee the performance of your completed model, and no representations are expressed or implied as to the performance or safety of your completed model.

In that Alien Aircraft Corp. has no control over the final assembly or material used for final assembly, no liability shall be assumed nor accepted for any damage resulting from the use by the user of the final user-assembled product. By the act of using the user-assembled product, the user accepts all resulting liability. If the buyer is not prepared to accept the liability associated with the use of this product, the buyer is advised to return this kit immediately in new and unused condition to the place of purchase.

### **WARNING!!!**

Failure to follow these safety precautions may result in severe injury to yourself and others.

Use safety glasses when running the motor. Do not run the motor in an area of loose gravel or sand; the propeller may throw such material in your face or eyes. Keep your face and body as well as all spectators away from the plane of rotation of the propeller as you run the motor. Keep these items away from the prop: loose clothing, shirt sleeves, ties, scarfs, long hair or loose objects such as pencils or screwdrivers that may fall out of shirt or jacket pockets into the prop. Always remove the LiPo battery from the plane before charging. Always use a charger designed to charge LiPo batteries for charging the LiPo flight battery. Never leave the LiPo battery unattended while charging. If the battery becomes more than just warm, discontinue charging.



## Alien Aircraft Corp.

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# Notes about the laser cut parts

- 1...The first thing that you need to do is to identify and mark the part numbers on the laser cut parts using the drawings on the following pages as a guide.
- 2...It is possible that several of the laser cut parts may not be completely cut through. If this is the case you can free the part from the sheet quickly using an X-acto knife.
- 3...The slight discoloration on the edges of the laser cut parts may be removed by lightly sanding the edges with 400 grit sandpaper.

### Kit Contents:

**Your kit contains the following parts. Please check your kit for any missing or damaged parts before starting construction.**

### Wood Bag:

Qty.	Name	Description
1	LC-504-01	.3mm X 4" X 24" Laser Cut POPLAR PLY
1	LC-504-02	.3mm X 8" X 24" Laser Cut POPLAR PLY
1	LC-504-03	.3mm X 4" X 24" Laser Cut POPLAR PLY
1	LC-504-04	.3mm X 8" X 24" Laser Cut POPLAR PLY
1	LC-504-05	.3mm X 4" X 24" Laser Cut POPLAR PLY
1	LC-504-06	.3mm X 4" X 24" Laser Cut POPLAR PLY
1	LC-504-07	.3mm X 8" X 24" Laser Cut POPLAR PLY
1	LC-504-08	.3mm X 8" X 24" Laser Cut POPLAR PLY
1	LC-504-09	.3mm X 4" X 24" Laser Cut POPLAR PLY
1	LC-504-10	.3mm X 8" X 24" Laser Cut POPLAR PLY
1	LC-504-11	.1/8" X 4" X 24" Laser Cut BALSA
1	LC-504-12	.1/8" X 4" X 24" Laser Cut BALSA
1	LC-504-13	.1/8" X 4" X 24" Laser Cut BALSA
1	LC-504-14	.1/8" X 4" X 24" Laser Cut BALSA
1	LC-504-15	.1/8" X 4" X 24" Laser Cut BALSA
1	LC-504-16	.1/8" X 4" X 24" Laser Cut BALSA
1	LC-504-17	.1/8" X 4" X 24" Laser Cut BALSA
1	LC-504-18	.1/8" X 4" X 24" Laser Cut BALSA
2	LC-504-19	.3/32" X 4" X 24" Laser Cut BALSA
2	LC-504-20	.3/32" X 4" X 24" Laser Cut BALSA
2	LC-504-21	.3/32" X 4" X 24" Laser Cut BALSA
2	LC-504-22	.3/32" X 4" X 24" Laser Cut BALSA
1	LC-504-23	.3/32" X 4" X 24" Laser Cut BALSA
2	LC-504-24	.3/32" X 4" X 24" Laser Cut BALSA
1	LC-504-25	.3/32" X 4" X 24" Laser Cut BALSA
1	LC-504-26	.1/16" X 4" X 24" Laser Cut Birch Ply
7	Tail Sheet	.1/16" x 4" x 24" Balsa
3	Wing Sheet	.3/32" X 4" X 24" Balsa
2	Gap Filler & Braces	.1/4" Triangle x 18" Balsa
2	Main Landing	.3/16" x 13" Music Wire

### Plans Bag:

Qty.	Name	Description
1	K-504 PLAN A	
1	K-504 PLAN B	
1	K-504 PLAN C	
8	Main Wing Spars	.1/8" x 3/8" x 36" Bass
3	Wing Leading Edge & Jig	.3/8" x 3/8" x 36" Balsa
4	Wing Trailing Edge	.3/32" x 1" x 36" Balsa
2	Braces & Fillers	.1/4" sq. x 36" Balsa

### Misc. Loose Parts

4 .....Wing Leading Edge Sheet .....3/32" x 4" x 36" Balsa

### Hardware Bag

Qty.	Name	Description
1	Tailwheel Bracket	Molded Nylon Bracket
6	Landing Gear Straps	Molded Nylon Straps
4	Motor Mount Blind Nuts	.6-32 Blind Nuts
1	Elevator Joiner Dowel	.1/4" x 4 1/2" Birch Dowel
2	Wing Dowels	.1/4" x 1" Birch Dowel
2	Wing Bolts	.1/4-20 x 1" Nylon Screw
6	Control Horn	Aileron and Tail Control Horns
38	#2 Sheet Metal Screws	# 2 X 1/2" Sheet Metal Screw
8	Tail Horn Screws & landing gear fairing	.2-56 x 1/2" Machine Screw
4	Landing gear fairing	.2-56 Nuts
8	Aileron & Flap Servo Mounts	.3/8" x 3/8" x 1" Bass
24"	Wing Joint Tape	.2" x 24" Dacron Tape
1	Tail Wheel Wire	.1/16" x 6" Music Wire
2	Hatch Blocks	.3/8" x 3/8" x 3/8" Block

### Additional Items Required for Glow and Electric Power (Not Included in Kit)

1 ....Covering Material ....3 Rolls Covering Material Plus Trim Colors

15 ...Tail & Aileron Hinges ...C/A or Pin Style Hinges

8 ....Flap Hinges .....Robart 1/8" Steel Pin Hinge Points #307 (optional)

2 ....Tail Pushrods .....Dubro 30" Laser Rods (1 pair) ( Alien Aircraft P/N: AH-013)

2 ....Aileron Pushrods ....12" 2-56 Pushrods (1 pair) ( Alien Aircraft P/N: AH-014)

2 ....Flap Pushrods .....12" 2-56 Pushrods (1 pair) ( Alien Aircraft P/N: AH-014) (Optional)

4 ....Main L/G Collars ....3/16" Wheel Collars ( DuBro P/N: 141)

1 ....Tail L/G Collar .....1/16" Wheel Collars ( DuBro P/N: 137)

2 ....Main Wheels .....5" Wheels ( DuBro P/N: 500TL)

1 ....Tail Wheel .....Sullivan 1-1/2" Tail Wheel ( Sullivan P/N: S354)

1 ....Radio .....5 Channel Radio with Receiver

2 ....Tail Servos .....HiTec HS-311 Standard Servos or Equivalent

2 ....Aileron Servos .....HiTec HS-81 Micro Servos or Equivalent

2 ....Flap Servos .....HiTec HS-81 Micro Servos or Equivalent (Optional)

2 ....Aileron Servo Extensions 6" Servo Extensions to fit your radio

1 ....Aileron "Y" Connector .6" "Y" Connector to fit your radio

1 ....Aileron Servo Extension 6" Servo Extensions to fit your radio

2 ....Flap Servo Extensions .6" Servo Extensions to fit your radio (Optional)

1 ....Flap "Y" Connector .6" "Y" Connector to fit your radio (Optional)

1 ....Flap Servo Extension .6" Servo Extensions to fit your radio (Optional)

**Note:** Depending on the length of your motor, spacers may be required between the motor mount and the fire-wall to move the motor forward so that the propeller is in the proper location. These spacers should be made from Birch Plywood or hardwood.

## **Additional Items Required for Glow Power Only (Not Included in Kit)**

<b>Qty.</b>	<b>.Name</b>	<b>.Description</b>
1	.Motor	2-stroke .50-.65 4-stroke .50-.65
1	.Motor Mount	.Dave Brown Motor Mount (to fit your motor)
4	.Motor Mount Screws	.6-32 Machine Screws (size to fit your motor)
4	.Motor Screws	.6-32 x 1" Machine Screws (or size to fit your motor)
1	.Propeller	.12" x 6" Propeller (or size to fit your motor)
1	.Fuel Tank	.Dubro Square Fuel Tank 10 oz (Dubro # 410)
1	.Throttle Pushrod	.Dubro Throttle Cable Assembly (Dubro # 3105)
1	.Fuel Line	.Medium Fuel Line (DuBro #222)
1	.Foam Rubber	.1/4" Foam Rubber (DuBro # 513)
1	.Optional Spinner	.DuBro 2 1/2" - 2 3/4" Spinner
1	.Throttle Servo	.HiTec HS-311 Standard Servo or Equivalent
1	.Throttle cable to servo	.DuBro EZ Connector (DuBro #121)

## **Additional Items Required for Electric Power Only (Not Included in Kit)**

<b>Qty.</b>	<b>.Name</b>	<b>.Description</b>
1	.HC4220 Conversion Kit	.HC-4220-0770 Electric Conversion Parts ( Alien Aircraft P/N: AG-504)
1	.Motor	.Himax HC4220-0770 Brushless Motor ( Alien Aircraft P/N: AE-052)
1	.Speed Control	.Castle Phoenix Edge 50 Speed Control( Alien Aircraft P/N: AE-053)
1	.Battery Connector	.Male Deans Ultra Style connector ( Alien Aircraft P/N: AE-027)
1	.Arming Switch	.Arming Switch - 12 awg & Dean's Style ( Alien Aircraft P/N: AE-048)
1	.Battery	.4 Cell 5000Mah Lipo Battery 30C
1	.Heat Shrink Tube	.3/16" Heat Shrink Tube ( Alien Aircraft P/N: AE-029)
1	.Propeller	.APC 12-8E Propeller ( Alien Aircraft P/N: AE-054)
2	.Velcro	.6" Velcro ( Alien Aircraft P/N: AE-012)

**Note:** Depending on the length of your motor, spacers may be required between the motor mount and the fire-wall to move the motor forward so that the propeller is in the proper location. These spacers should be made from Birch Plywood or hardwood. See detail on plan.

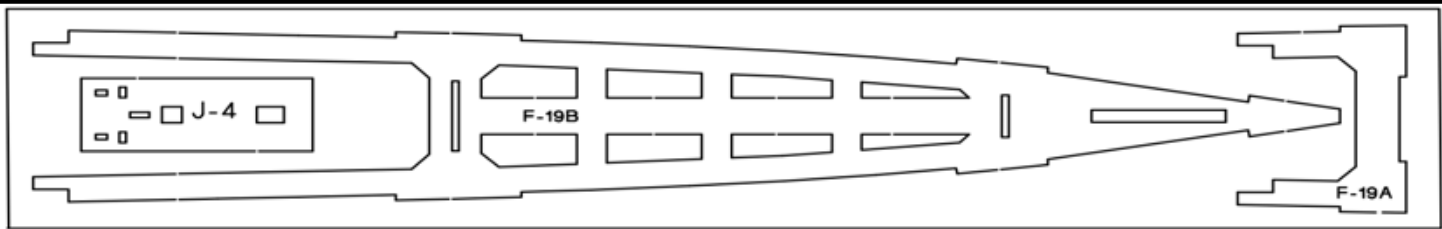
## **WARNING.....EXTREME DANGER:**

*Electric motors, propellers and batteries powerful enough to fly this model are extremely dangerous. These motors, propellers and batteries can cause serious property damage, serious bodily injury and death. Maximum safety precautions must be observed at all times when installing, maintaining and operating these items. Maximum safety precautions must be observed at all times when assembling, maintaining and operating this model. You must understand and follow all of the manufactures operating and safety instructions for every piece of equipment and component used with this model.*

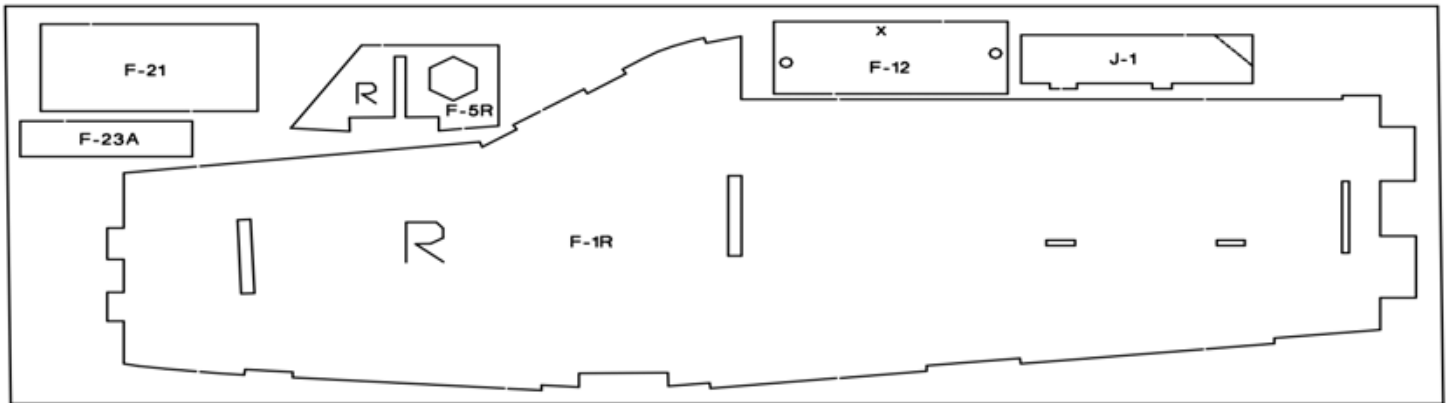
***YOU MUST USE AN ARMING SWITCH BETWEEN THE BATTERY AND SPEED CONTROLLER.***

*If you have any doubt about the proper safety precautions, you must contact the manufactures to obtain the operating and safety instructions for every piece of equipment and component used with this model.*

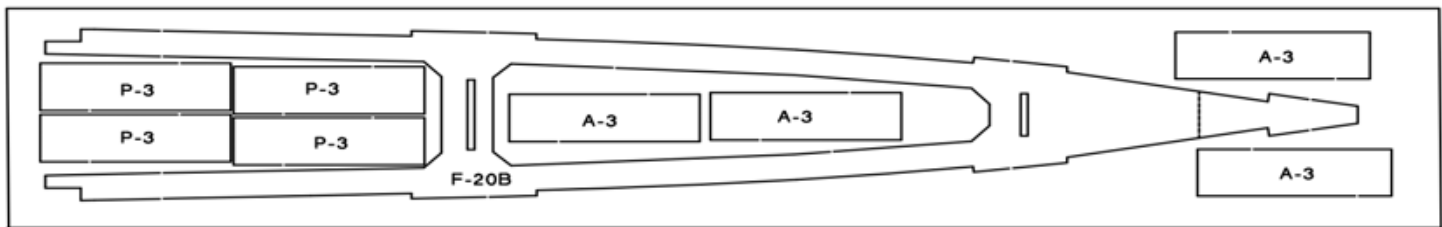
**You must read and follow the important notes on the cover and on page 53 and 54 of this manual.**



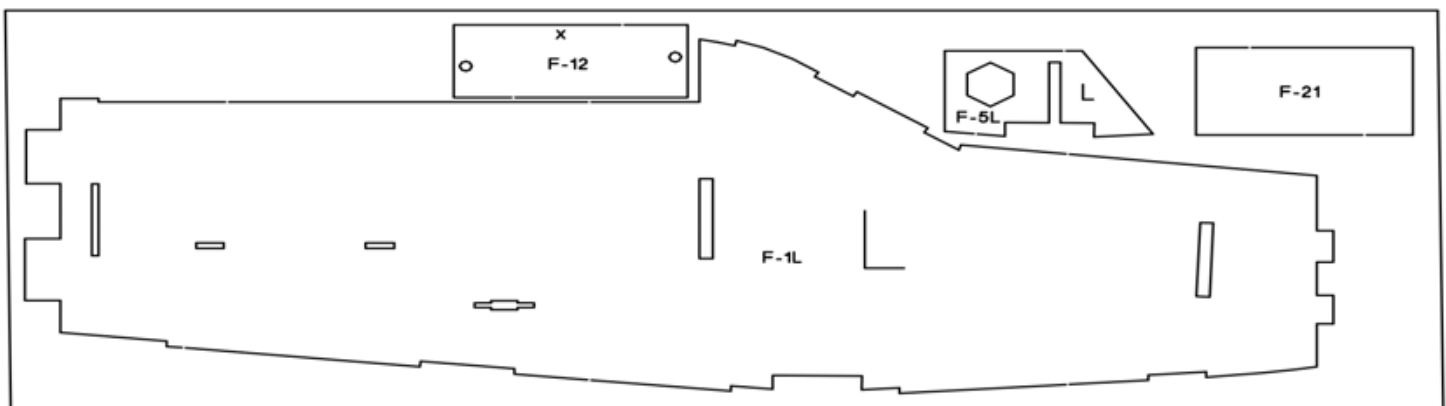
LC-504-01 3mm X 4" X 24" Poplar Ply 1 REQD.



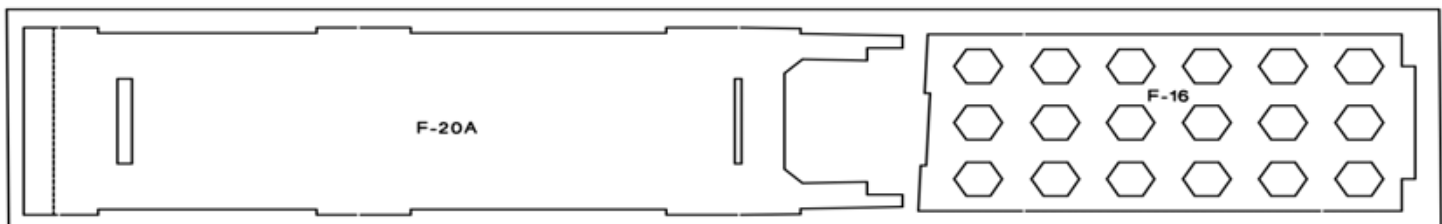
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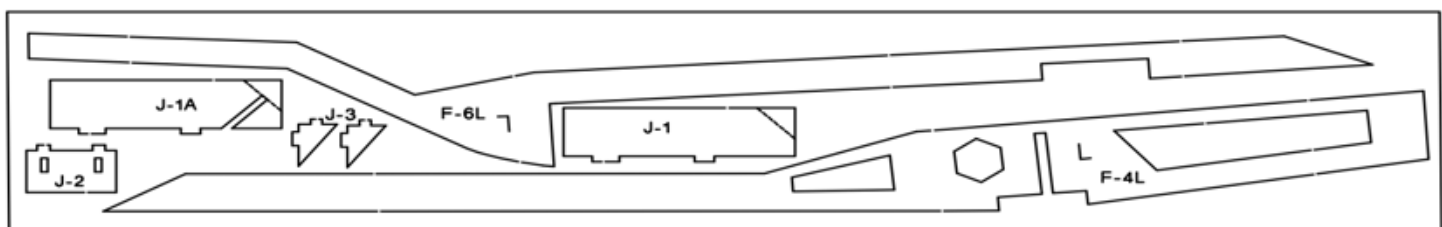
LC-504-03 3mm X 4" X 24" Poplar Ply 1 REQD.



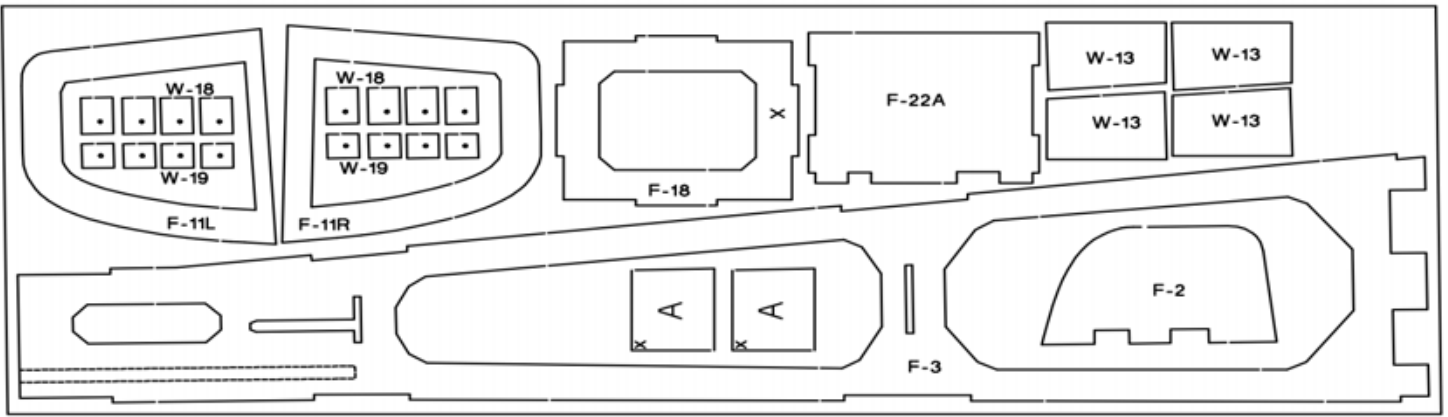
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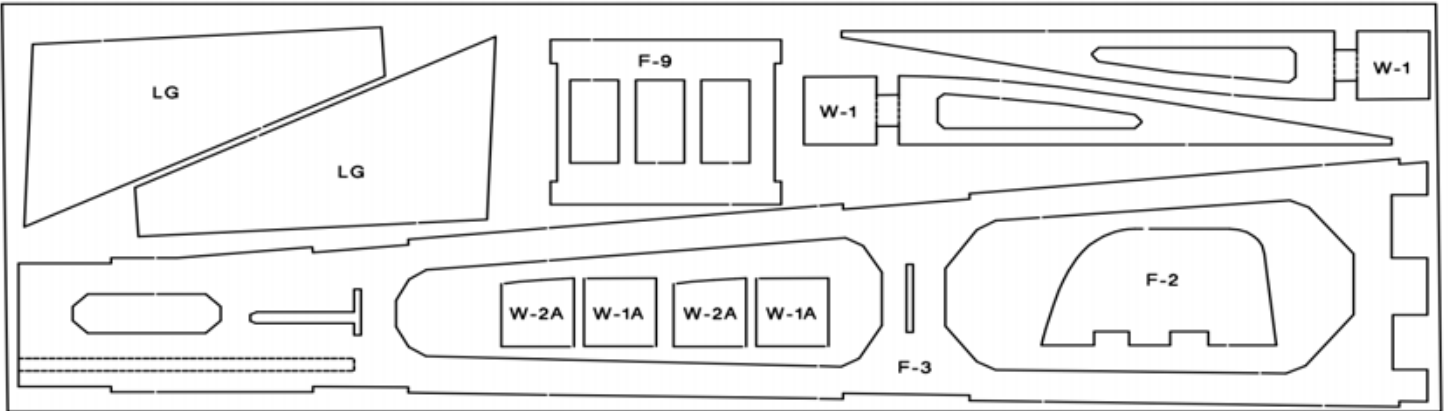
LC-504-05 3mm X 4" X 24" Poplar Ply 1 REQD.



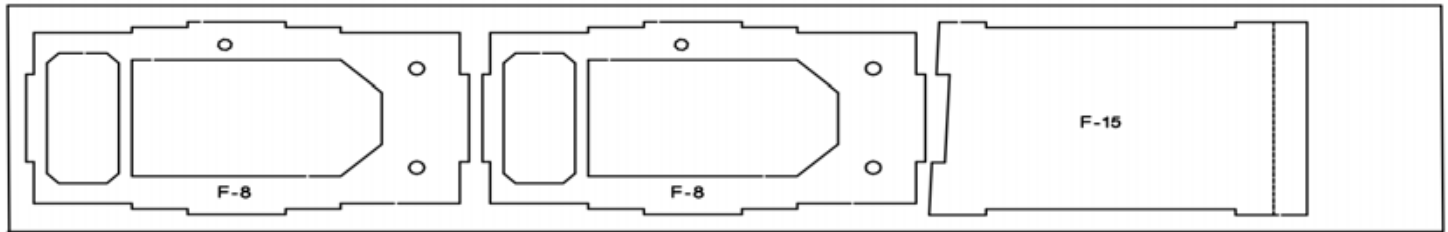
LC-504-06 3mm X 8" X 24" Poplar Ply 1 REQD.



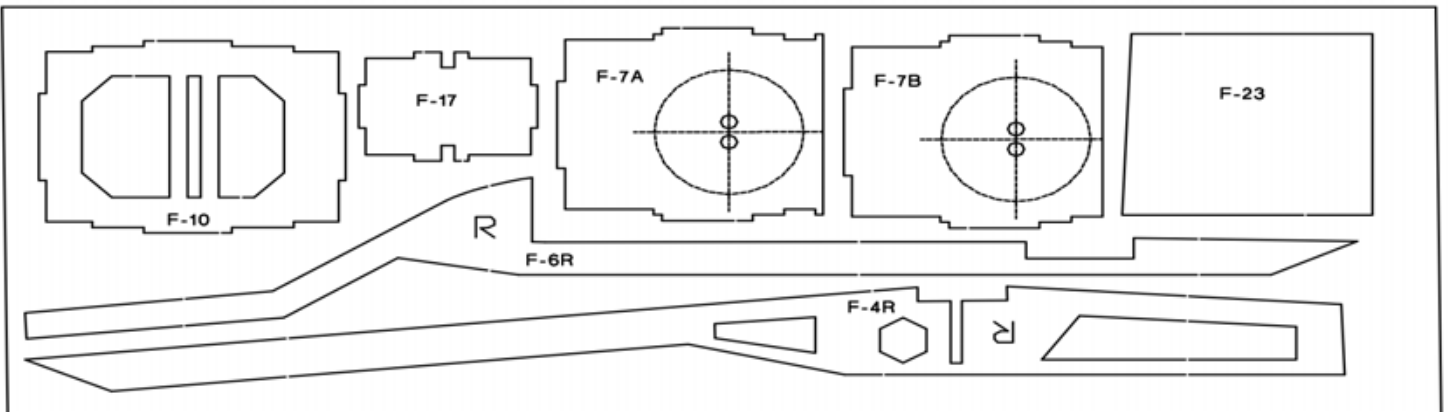
LC-504-07 3mm X 4" X 24" Poplar Ply 1 REQD.



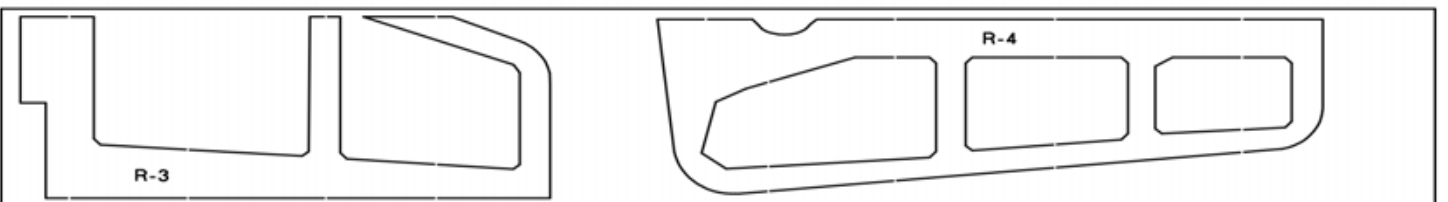
LC-504-08 3mm X 8" X 24" Poplar Ply 1 REQD.



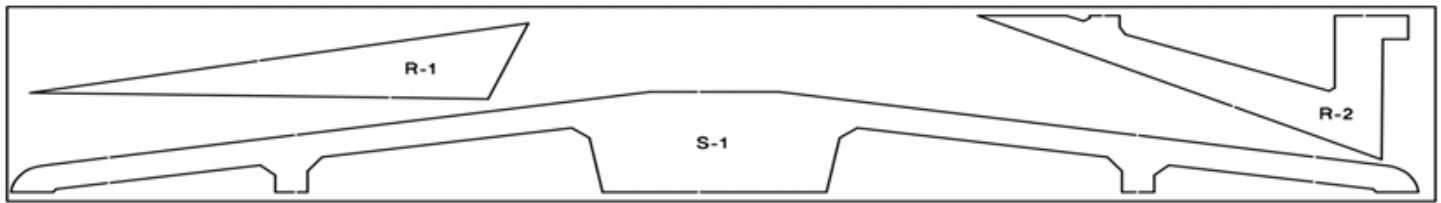
LC-504-09 3mm X 4" X 24" Poplar Ply 1 REQD.



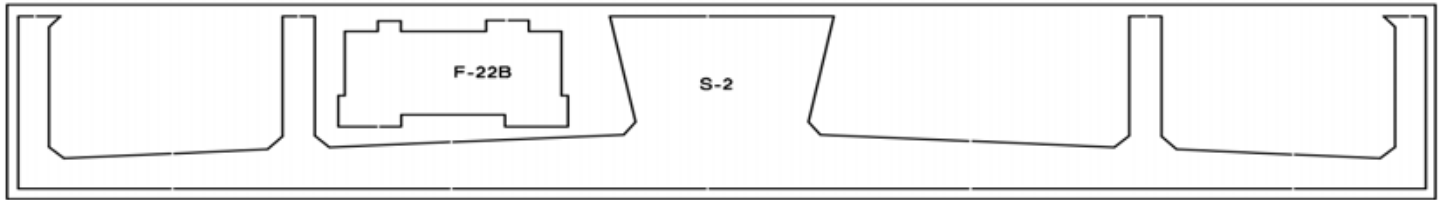
LC-504-10 3mm X 8" X 24" Poplar Ply 1 REQD.



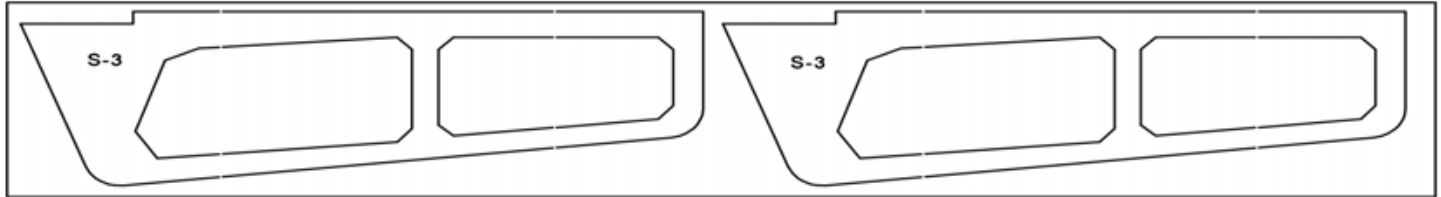
LC-503-11 1/8" X 4" X 24" Balsa 1 REQD.



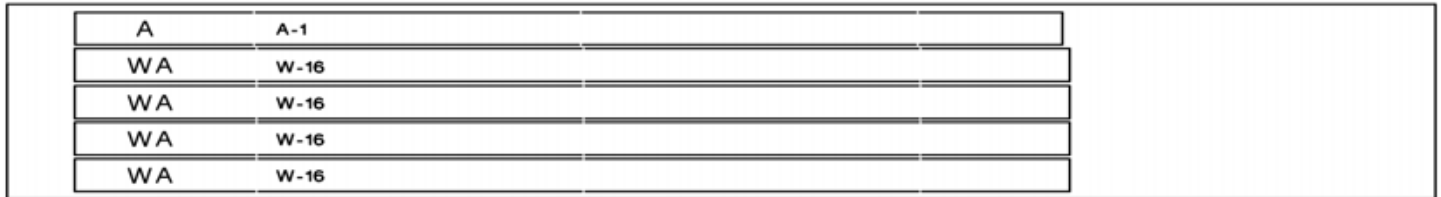
LC-504-12 1/8" X 4" X 24" BALSA 1 REQD.



LC-504-13 1/8" X 4" X 24" BALSA 1 REQD.



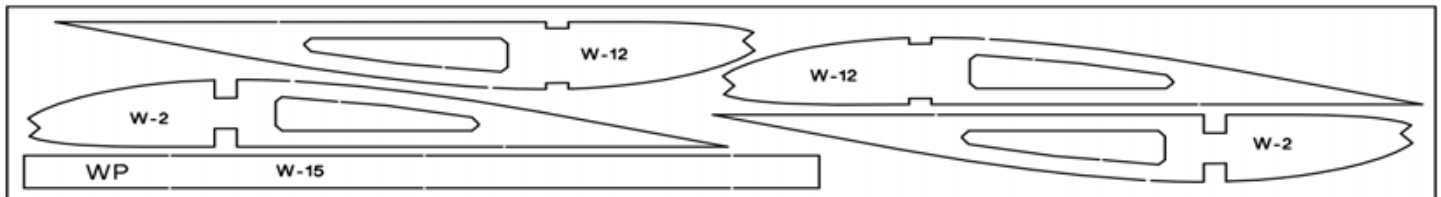
LC-504-14 1/8" X 4" X 24" BALSA 1 REQD.



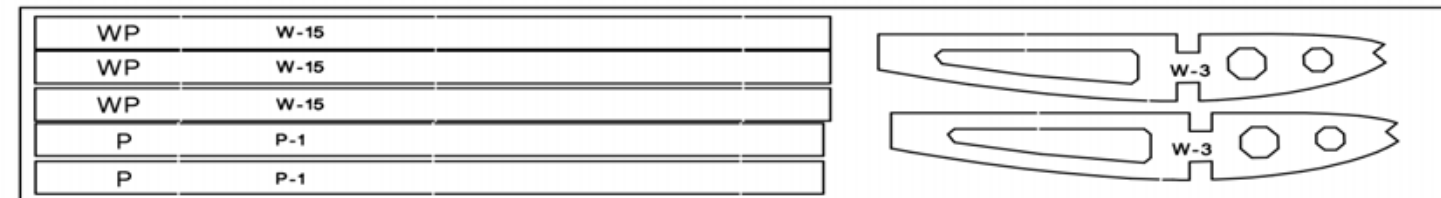
LC-504-15 1/8" X 4" X 24" BALSA 1 REQD.



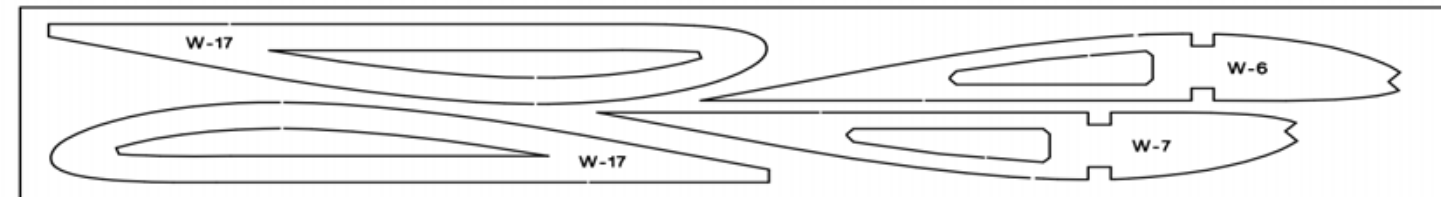
LC-504-16 1/8" X 4" X 24" BALSA 1 REQD.



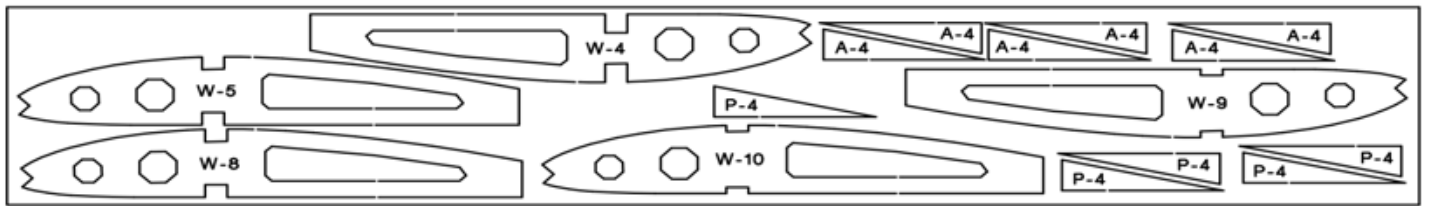
LC-504-17 1/8" X 4" X 24" BALSA 1 REQD.



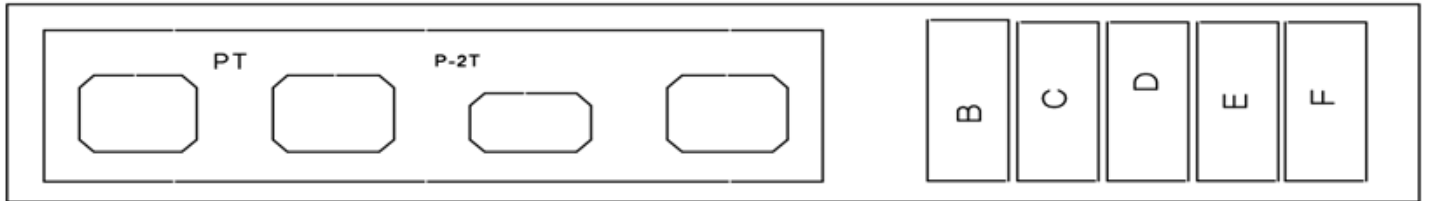
LC-504-18 1/8" X 4" X 24" BALSA 1 REQD.



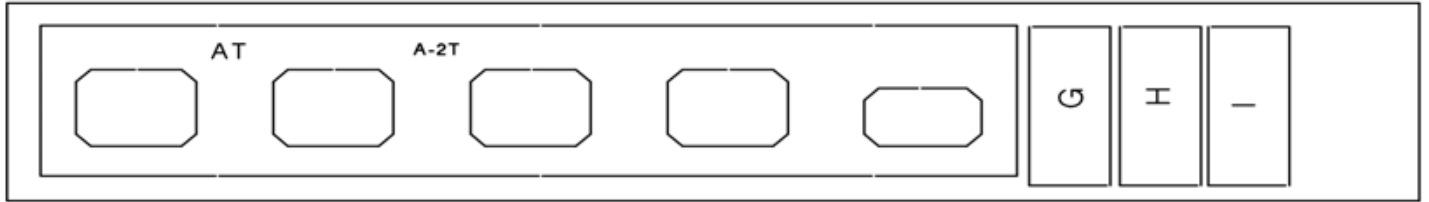
LC-504-19 3/32" X 4" X 24" BALSA 2 REQD.



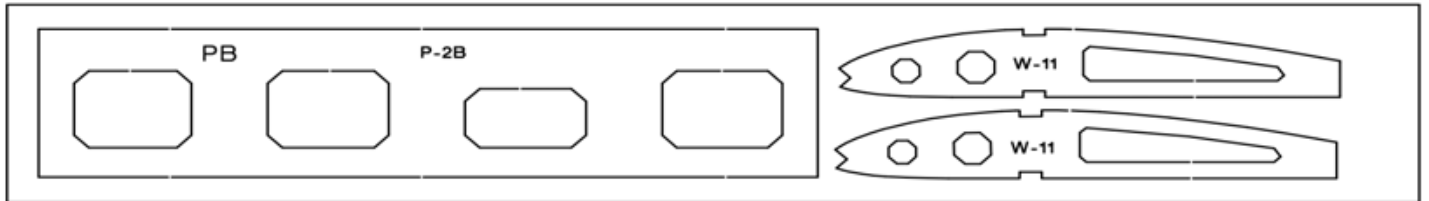
LC-504-20 3/32" X 4" X 24" BALSA 2 REQD.



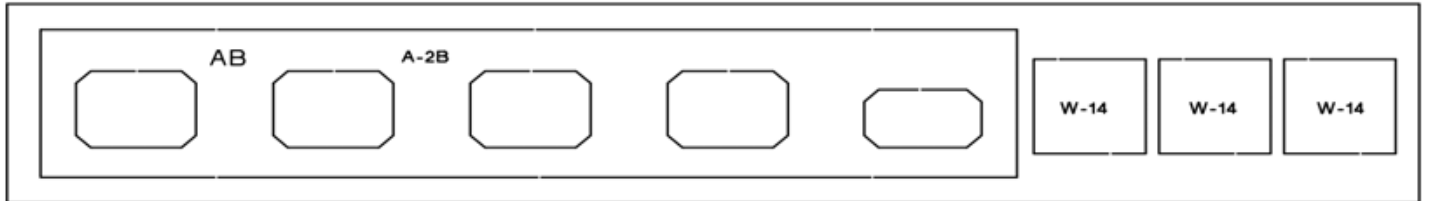
LC-504-21 3/32" X 4" X 24" BALSA 2 REQD.



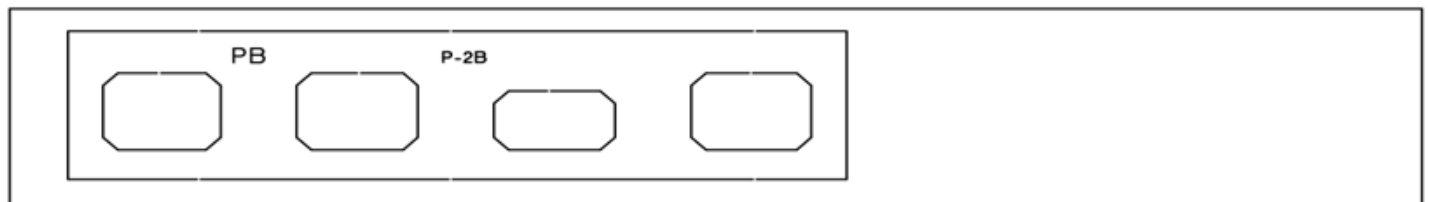
LC-504-22 3/32" X 4" X 24" BALSA 2 REQD.



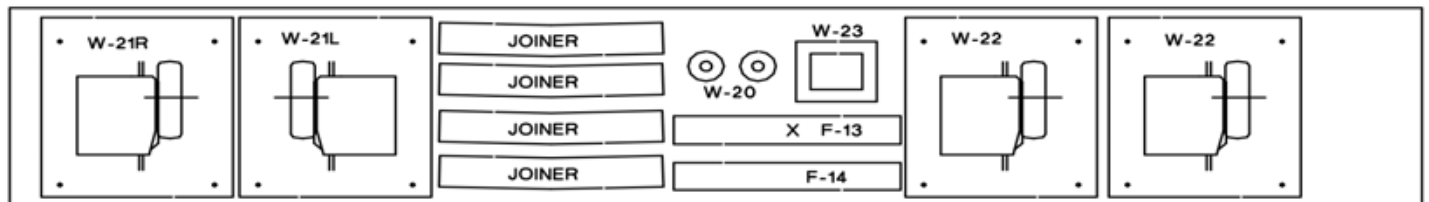
LC-504-23 3/32" X 4" X 24" BALSA 1 REQD.



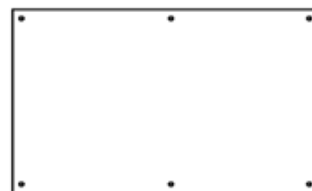
LC-503-24 3/32" X 4" X 24" BIRCH PLY 2 REQD.



LC-504-25 3/32" X 4" X 24" BALSA 1 REQD.



LC-504-26 1/16" X 4" X 24" BIRCH PLY 1 REQD.



LC-504-27 UNIVERSAL BASE PLATE 1 REQD.

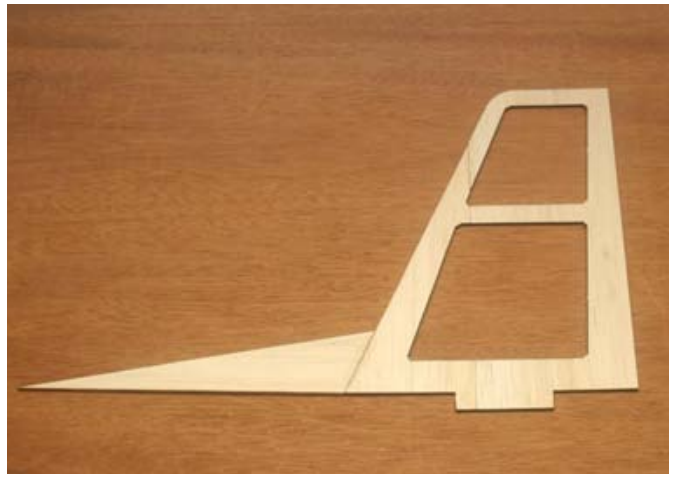


## Building Instructions:

General Note: Cover the plans with wax paper before assembling your model to prevent the parts from sticking to the plan.

### Building the Tail Surfaces:

1... Glue R-1, R-2, and R-3 together as shown.



2...Glue S-1 and S-2 together.



3...Glue together two pieces of 1/16" x 4" x 24" balsa sheet as shown to make the stabilizer skin. Glue two more together for the fin.



4...Glue this sheet to one side of the stabilizer. Trim the sheet flush with S-1 / S-2. Now sheet and trim the opposite side as you did the first.

Sheet one side of the fin. Trim the sheet and then sheet the other side and trim.

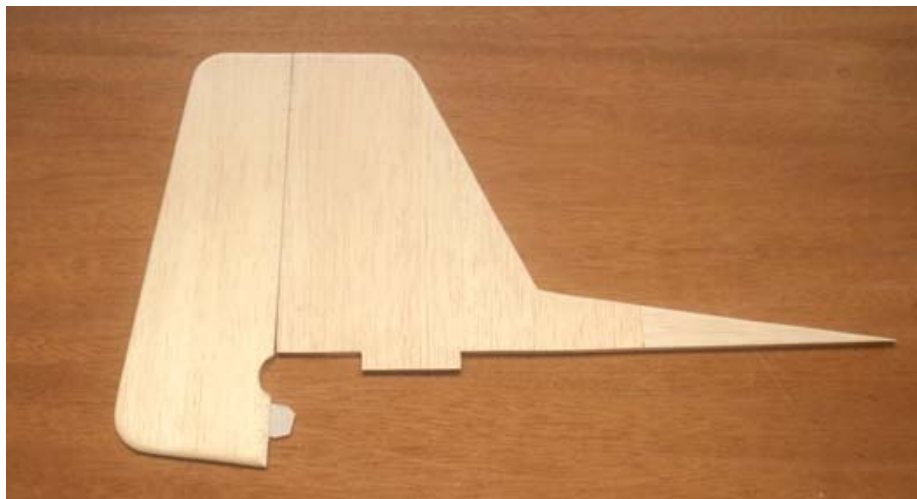


5...Use 1/16" balsa to sheet both sides of the elevators (S-3). Use 1/16" balsa to sheet both sides of the rudder (R-4).



6...Bevel the front edge of R-4 as shown on the plan, and sand the other edges of the fin and rudder round. Leave the bottom edges of the fin that will contact the fuselage square.

Mark the hinge locations and cut the hinge slots. Temporarily install the hinges without glue.



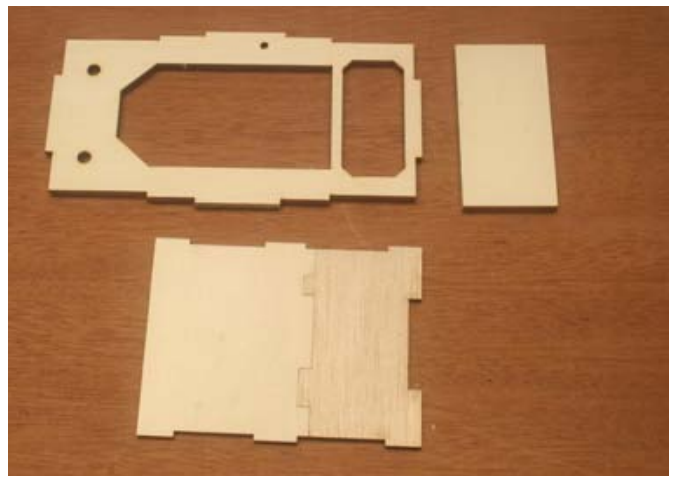
7...Join the elevators (S-3) using the 1/4" x 4-1/2" dowel. Use the stabilizer as a guide to establish the proper spacing. Trim the dowel to achieve the proper length if required.

8...Bevel the front edge of the S-3's as shown on the plan, and sand the other edges round. Sand the front and ends of the stabilizer round. Leave the back edge square.

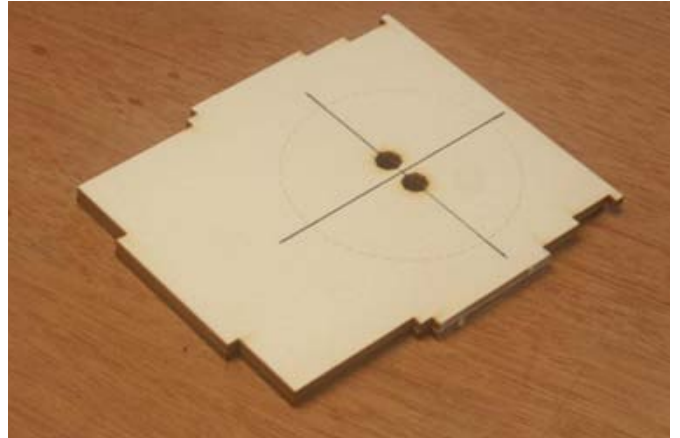
Mark the hinge locations and cut the hinge slots. Temporarily install the hinges without glue.

## Building the Fuselage:

9...Glue the two F-8's together. Glue the two F-21's together. Glue F-22A to F-22B as shown.

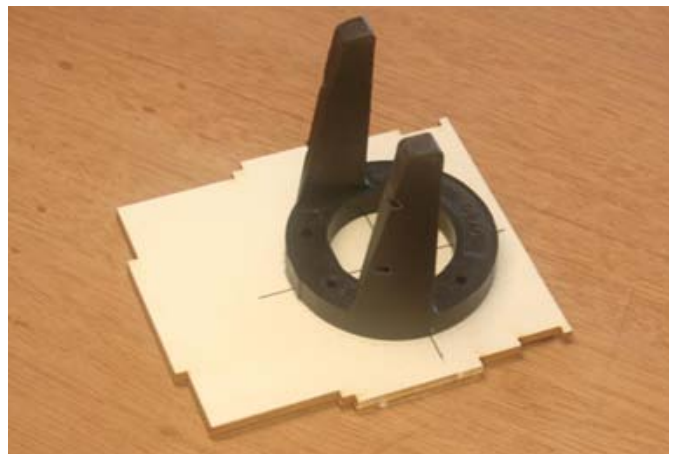


10...Glue F-7A to the front of F-7B. The laser marked centerlines on both parts should face forward.

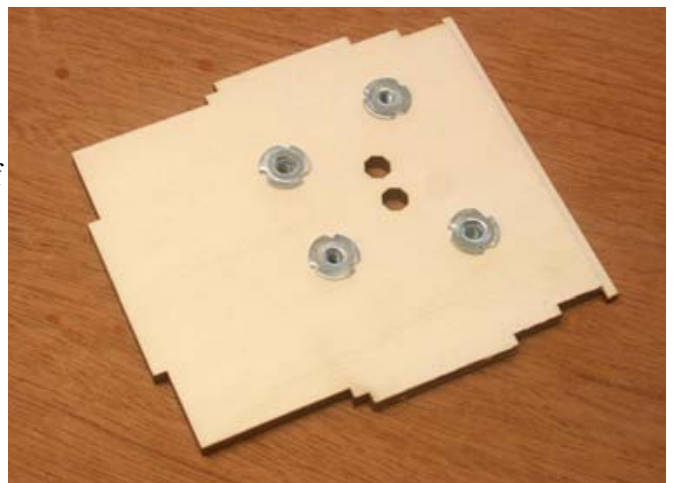


**MOTOR LENGTH NOTE:** Measure your motor + propeller + mount against the plan. Longer motors should be bolted directly to the front of F-7. Shorter motors will require spacers behind the mount to achieve the proper propeller location. Use birch plywood to make these spacers (not included)

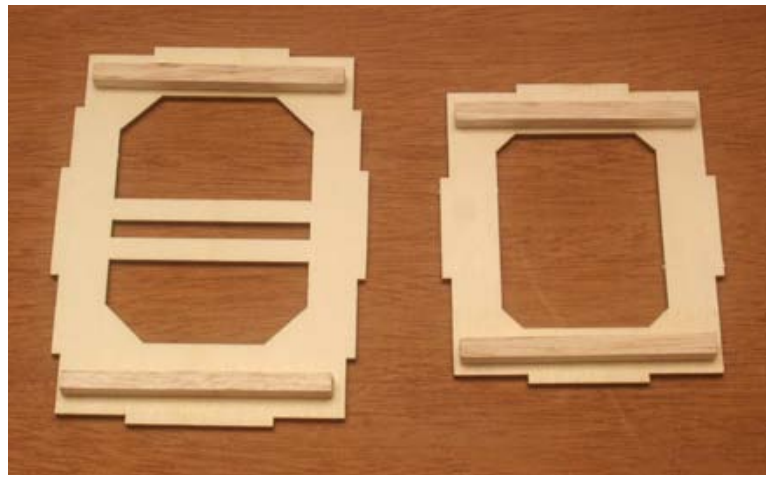
11...Place your motor mount in the front of F-7(or spacers) and align with the marked centerlines. Using the motor mount as a guide, drill the mount holes in F-7 as shown. Use a drill that fits the holes in the motor mount. Remove the motor mount and open up the holes in F-7 to 3/16" Dia.



12...Press the 6-32 blind nuts into the mount holes in the **back** of F-7B. Secure them in place with thin C/A Glue.



13... Glue two 1/4" sq. balsa braces formers F-10 and F-18 as shown.

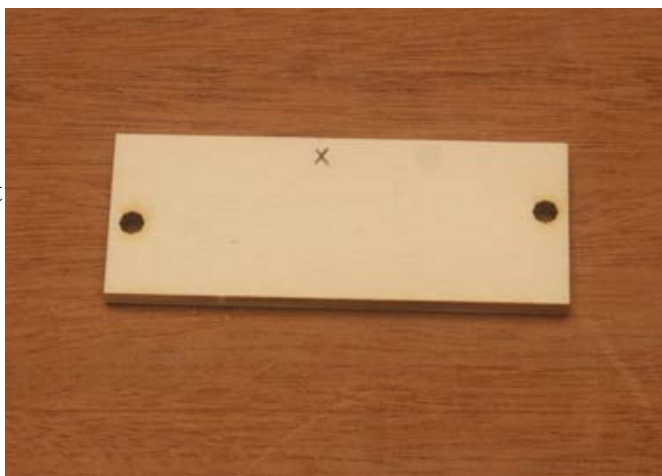


14...Glue an F-2 to the front of both F-1L and F-1R as shown.



15...Glue a F-3 to the back of both F-1L and F-1R.

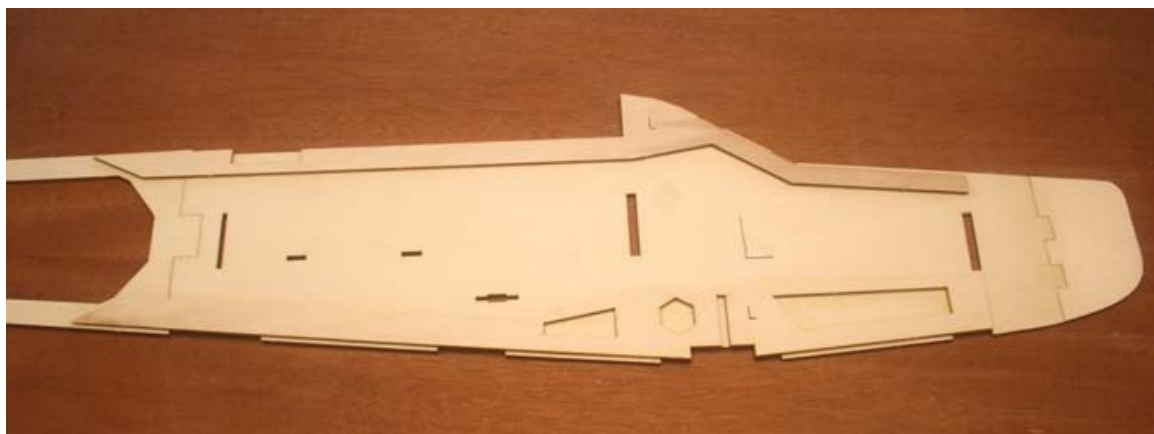
16...Glue the two F-12's together as shown. The "X" should be at the front and the holes should be oriented as shown.



17...Glue F-13 on top of the F-12's. It should be located flush with the front and sides. ("X" over "X")

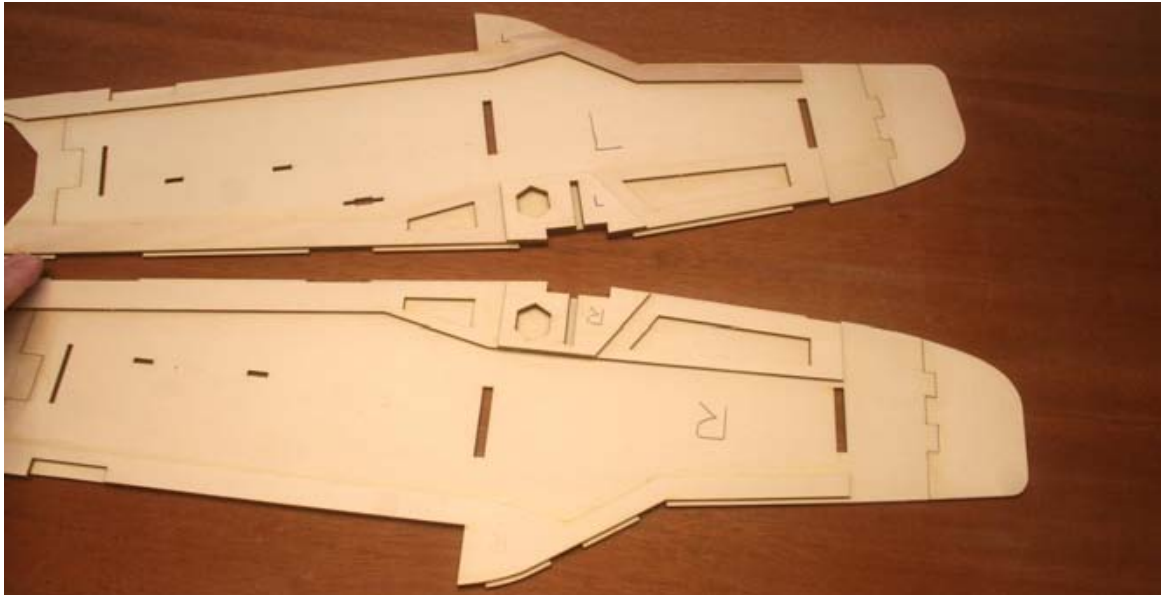
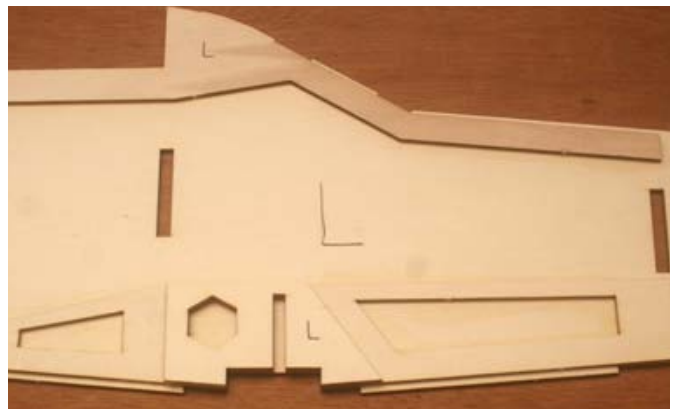


Glue F-14 on top of the F-12's. It should be located flush with the rear and sides.



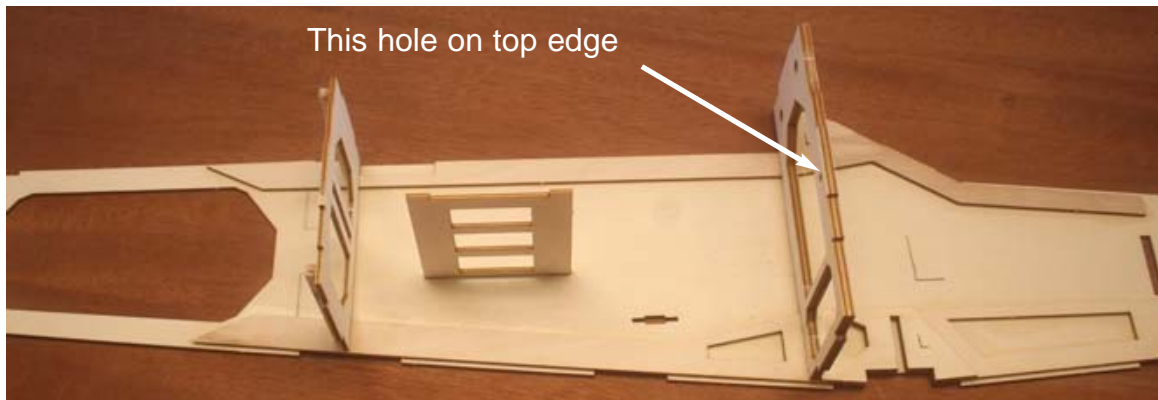
18...Glue the F-4L doubeler to the **INSIDE** of the **LEFT** fuselage side as shown. Glue the F-6L doubeler to the **INSIDE** of the **LEFT** fuselage side as shown. Use the drawing on the plan to properly locate the doublers on the fuselage sides. The front of F-6L should be 1/8" down from the top edge of the fuselage side. Use a scrap piece of plywood to check this distance.

19...Glue F-5L on top of F-4L on the inside of the left fuselage side as shown.

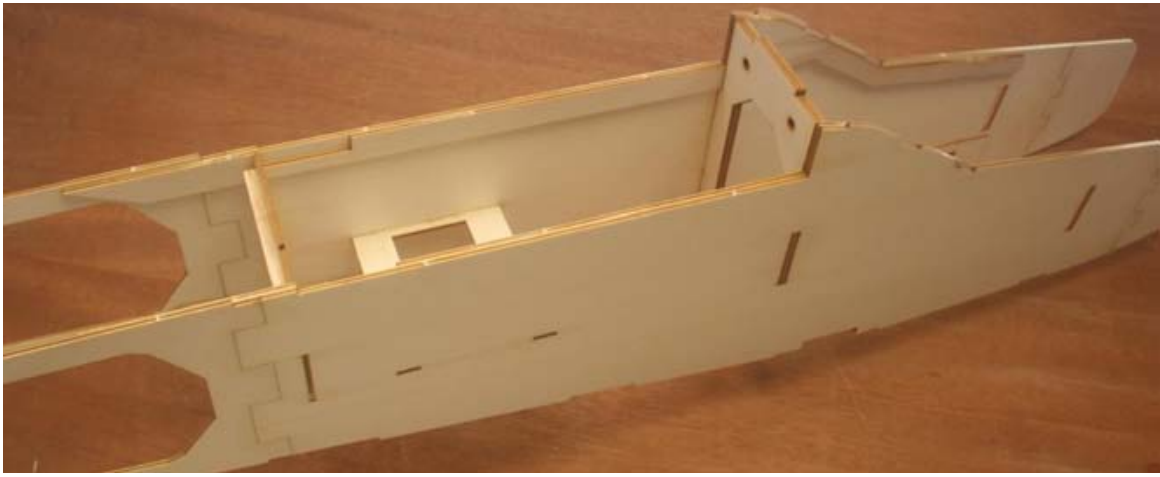


20...Glue the F-4R doubler to the **INSIDE** of the **RIGHT** fuselage side as shown. Glue the F-6R doubler to the **INSIDE** of the **RIGHT** fuselage side as shown. Use the drawing on the plan to properly locate the doublers on the fuselage sides. The front of F-6L should be 1/8" down from the top edge of the fuselage side. Use a scrap piece of plywood to check this distance.

Glue F-5R on top of F-4R on the inside of the left fuselage side as shown.



21...Place formers F-8, F-9(servo tray) and F-10 into position on the Left fuselage side. They should be completely seated against and be 90 degrees to the fuselage side. When properly positioned, glue securely to the fuselage side. NOTE: The hole in the side of F-8 should be on the top edge that will be glued to the left fuselage side. The wide side of F-9 is at the top edge. The 1/4" sq. braces on F-10 should face the rear.



22...Position the Right fuselage side into position on the formers. They should be completely seated against the side. The formers should be 90 degrees to the fuselage side. When properly positioned, glue formers securely to the fuselage side.

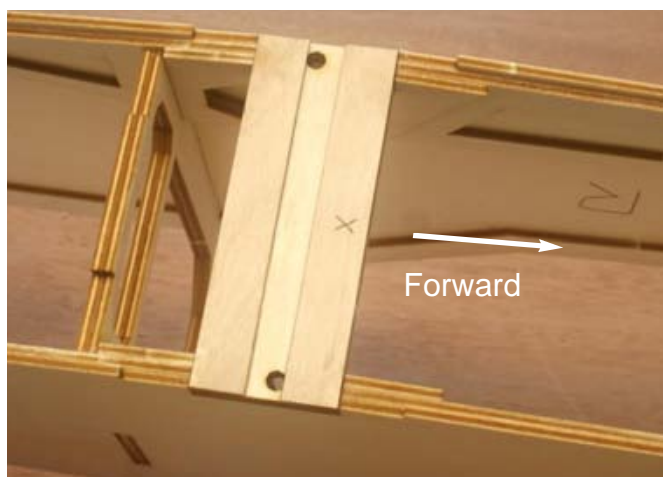
23...Fit former F-7 into position. When viewed from the top, former F-7 should be angled slightly to the right. Wiggle the former and front of the fuselage to get the former completely seated in both sides. Glue former F-7 to the sides.



24...Position parts F-11L and F-11R on the inside of the fuselage sides at the nose and glue in place.



25...Position F-12 into the slots in the bottom of the fuselage. The holes should line up with the slots in F-4/F-5. The "X" should be at the front. Securely glue in place with epoxy.



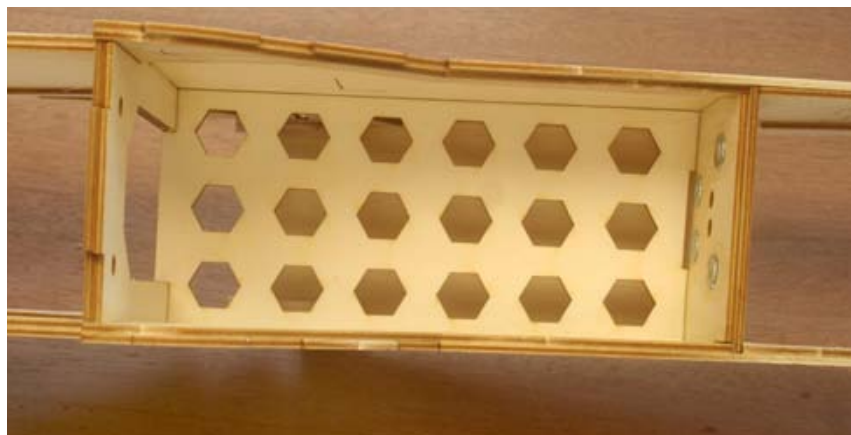
26...Cut two pieces of 1/4" sq. balsa 2" long. Epoxy these pieces on top of F-12 and against the F-5's.



27...Test fit and glue F-15 onto the bottom of the fuselage. Gently crack it on the dashed line so the back end fits flat on F-12. The angle on the front end should match the angle of F-7.

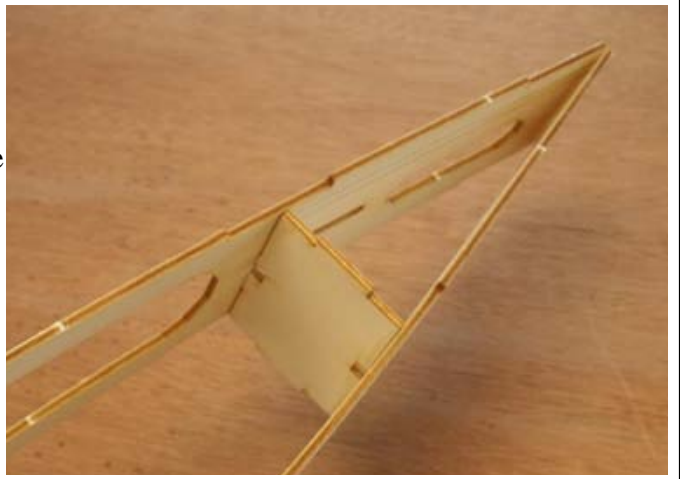


28...Place F-16 into position in the front of the fuselage. The back end should be seated in F-8 and the sides should be seated against the F-4's. When properly positioned, glue F-16 in place.

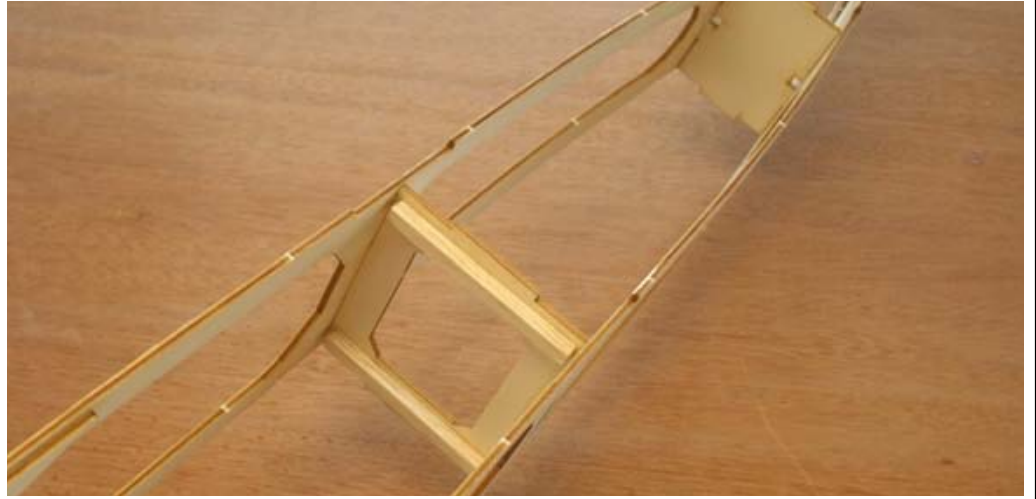




29...Place former F-17 into position and pull the rear of the fuselage sides together. Adjust the back end until the fuselage is straight and square. Glue the fuselage sides together and glue the former in place.



30...Glue former F-18 into position and glue in place. The 1/4" balsa braces should be on the front side.



31...Glue F-19A and F-19B together.



32...Glue F-20A and F-20B together.

33...Glue F-19 into position on the top of the fuselage. Spread and squeeze the sides as required to get F-19 to fit in the proper position.

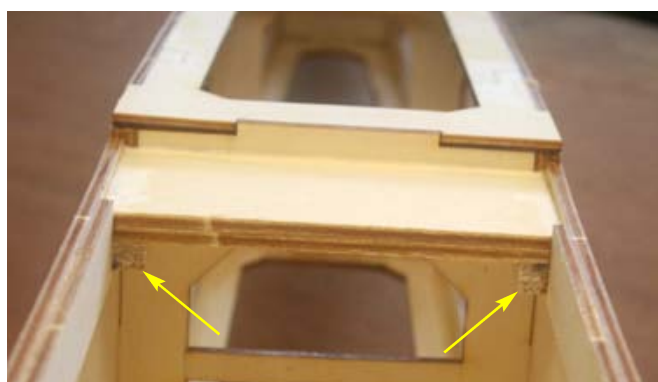


34...Glue F-20 into position on the bottom of the fuselage. Spread and squeeze the sides as required to get F-20 to fit in the proper position. Gently crack it on the dashed line so the front end fits flat on F-12.

35...Securely glue the F-21 assembly into place in the notches in the back of the F-6 doubelers. Glue to the fuselage sides and F-8.



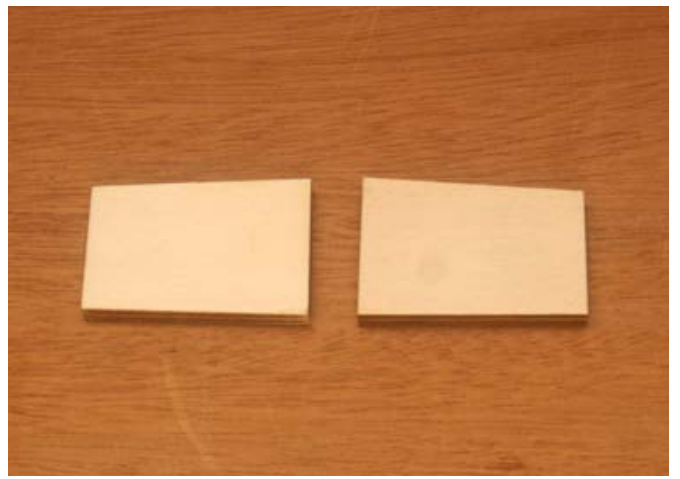
36...Cut and glue a 1/4"x 2" brace under F-21 in the corner between F-21 and F-6 on each side of the fuselage.



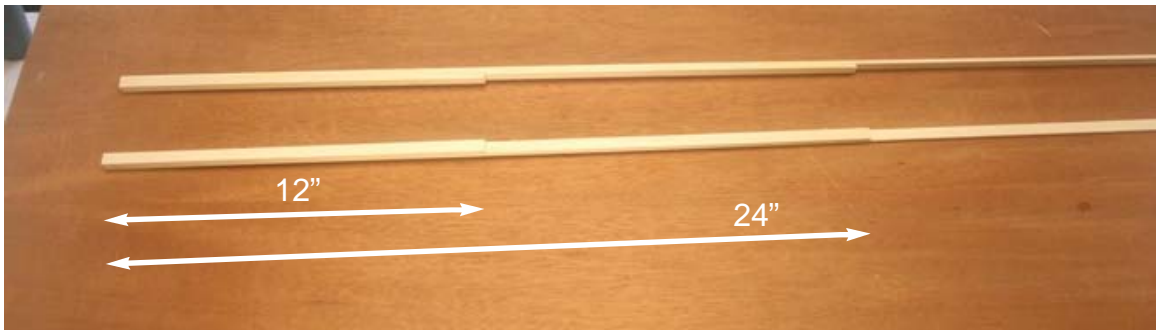
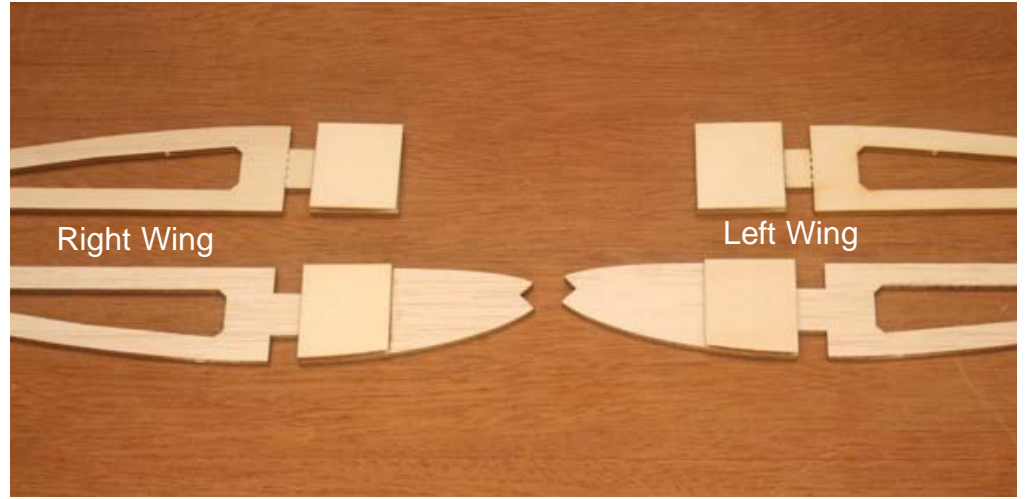
## Building the Wing:

Cover the right wing plan with wax paper to prevent the parts from sticking to the plan.

37...Glue (2) W-13 together. Repeat to make a 2nd unit.



38...Glue the W-1A's to the W-1 ribs. Be sure to make a left and right hand assembly as shown. Glue the W-2A's to the W-2 ribs. Be sure to make a left and right hand assembly as shown.



39...Cut one of the 1/8" x 3/8" x 36" bass strips into a 12" piece and a 24" Piece. Glue the 24" piece on to one of the 1/8" x 3/8" x 36" bass strips as shown on the plan. Glue the 12" piece on top of the 24" bass strip as shown on the plan. to make the main spars. Repeat to make the remaining three main spars for both wings. Total 4 assemblies, 2 for each wing.

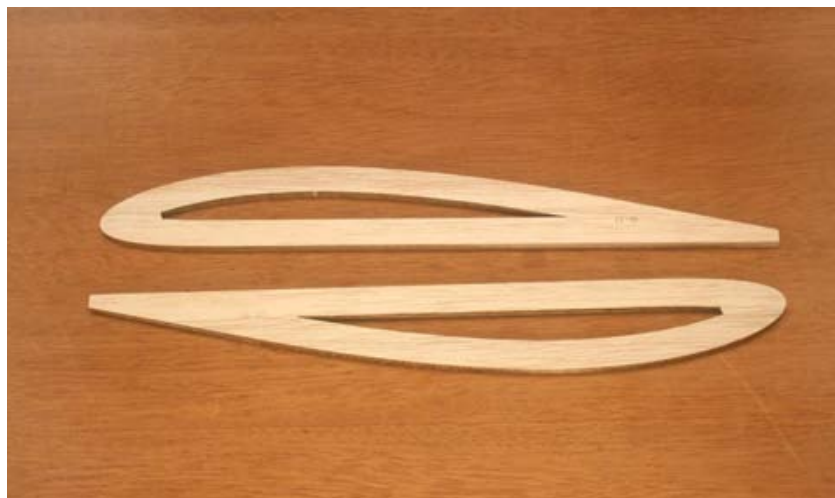
40...Glue (3) W-14 together to make 1 assembly. Repeat to make a 2nd assembly.



41...Glue two pairs of W-15's together. Glue two pairs of W-16's together.

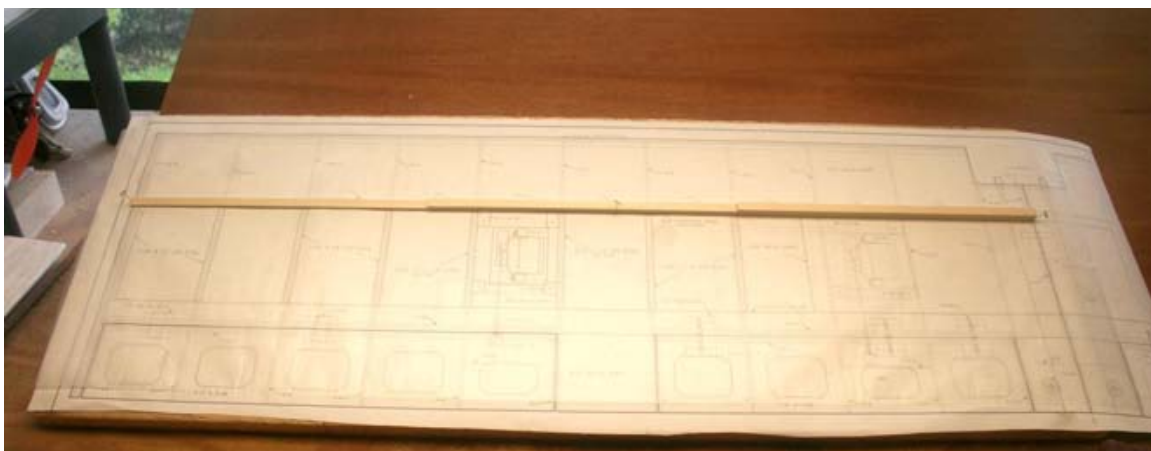
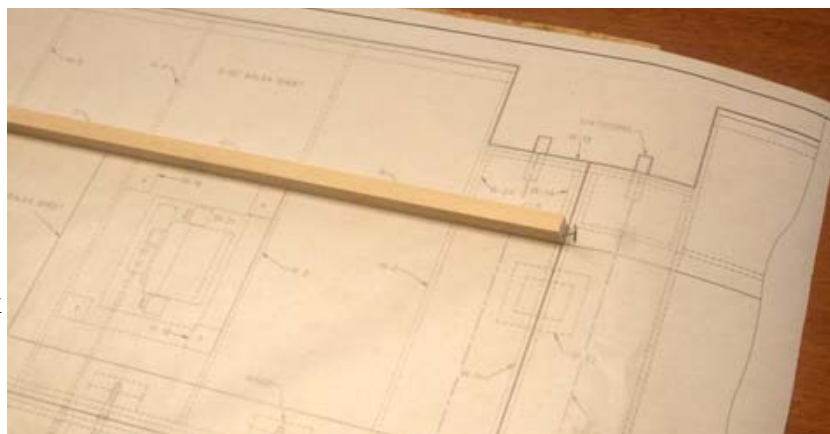


42...Glue two pairs of W-17's together.

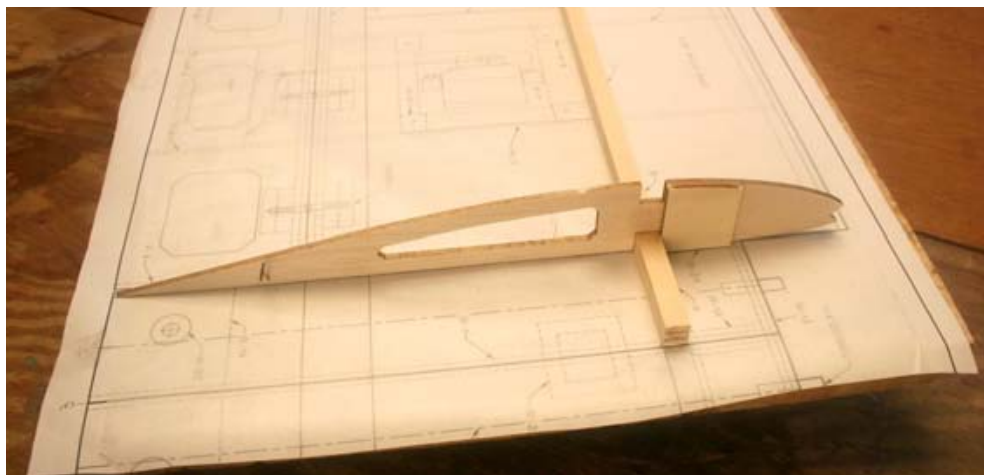


### **Building the Left Wing:**

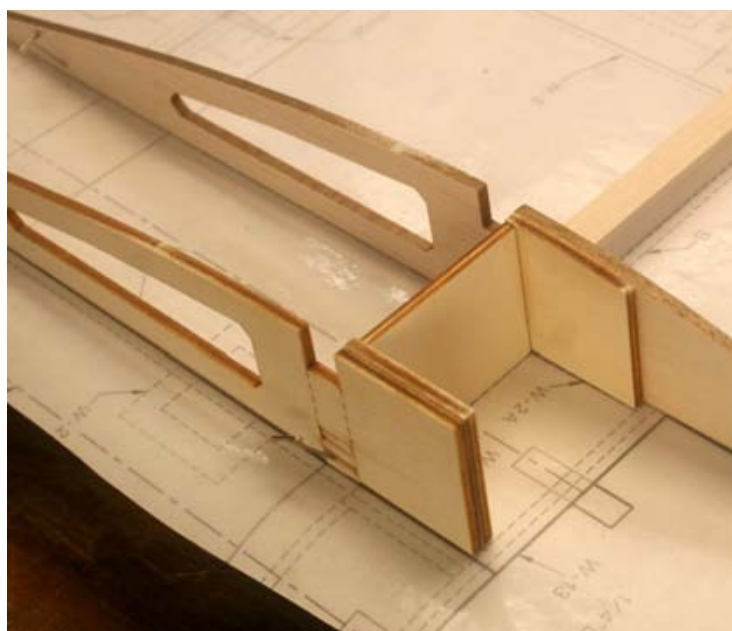
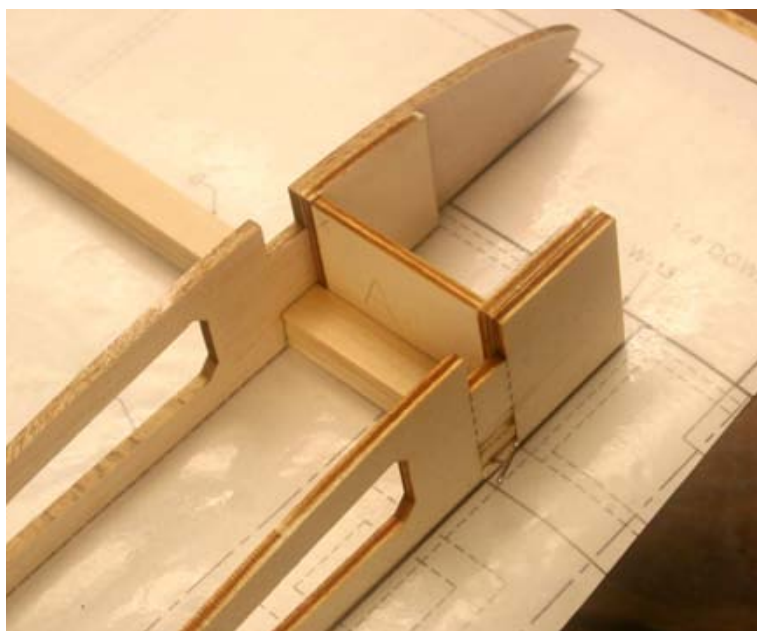
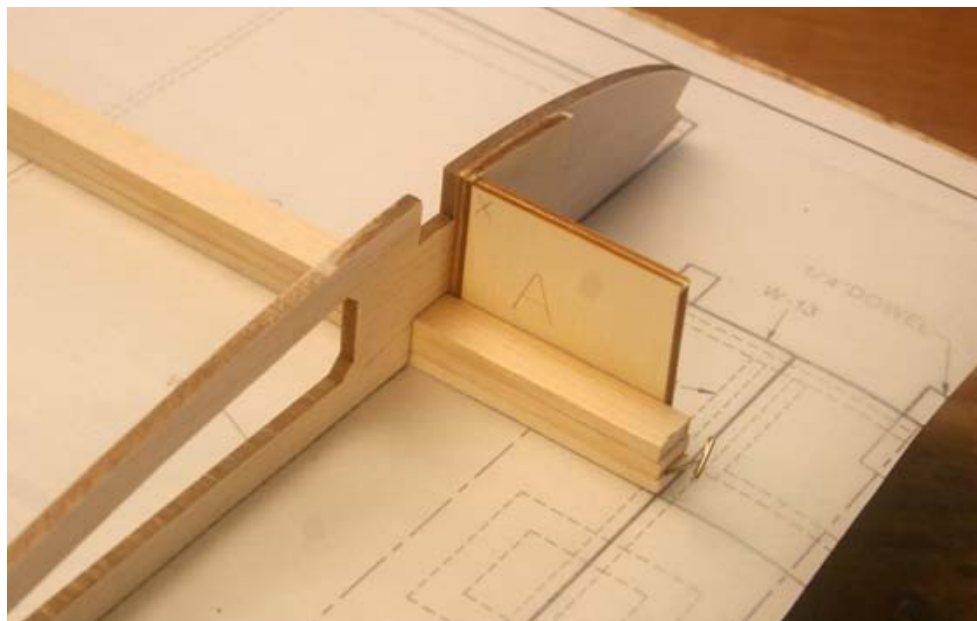
43...Pin one of the main spars to the plan. The thick end should be flush with the centerline of the wing. The other end will be slightly long and extend past the last rib at the wing tip.



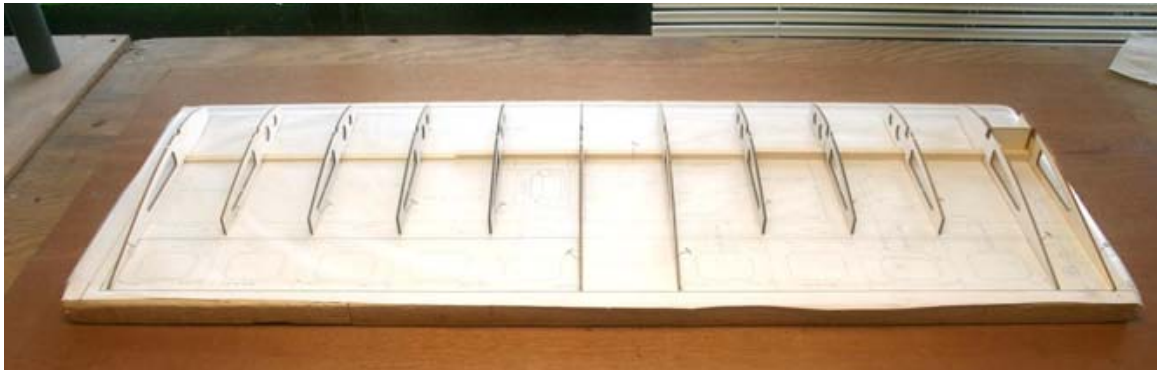
44...Pin and glue rib W-2 into position on the bottom spar. It should be 90 degrees to the building board. The W-2A should face toward the inboard end of the wing.



45...Glue shear web "A" into position against the front face of the lower spar and against rib W-2 as shown on the plan. The small "X" on the shear web marks the top outboard corners of the shear web.

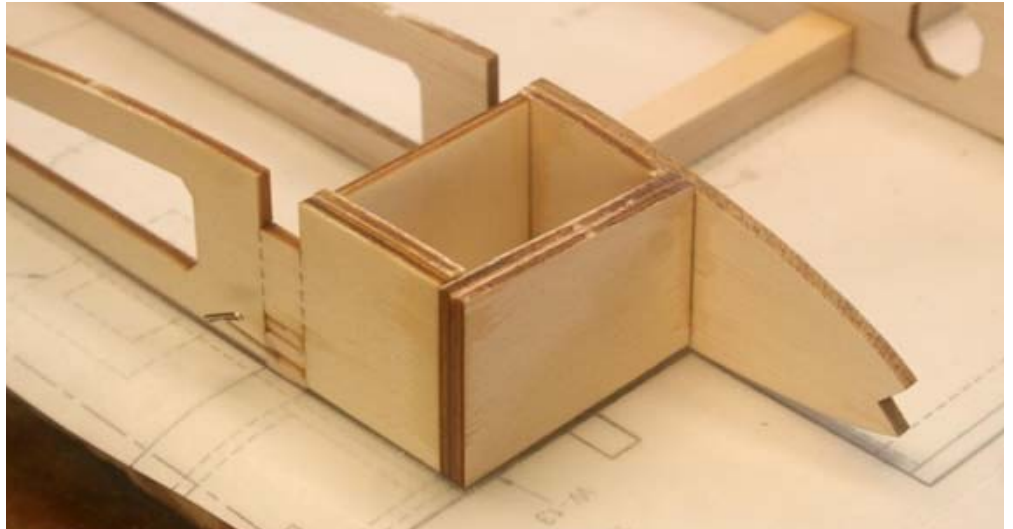


46...Pin and glue rib W-1 into position. The top of the rib should angle slightly toward the wing tip and be in full contact with the shear web.



47...Pin and glue ribs W-3 through W-12 into position on the spar. They should be 90 degrees to the building board.

48...Glue the W-13 assembly to the front of ribs W-1 and W-2A. The angled edge is at the top and the tall end is against the W-1 rib.



49...Trim and sand a taper on W-14 as shown on the plan.



50...Glue W-14 between ribs W-1 and W-2 at the trailing edge of the wing.





51...Glue the top main spar into position.

52...Position and glue one W-15 assembly into place between ribs W-2 and W-6 at the back of the wing. It should be tight against the back of ribs W-3, W-4 and W-5.



53...Position and glue one W-16 assembly into place between ribs W-7 and W-12 at the back of the wing. It should be tight against the back of ribs W-8, W-9, W-10 and W-11.



54...Place the top 3/32" x 1" trailing edge sheet into position and glue into place. The back edge should be flush with the back faces of W-15 and W-16. The ends will be a little long and will be trimmed flush with the end ribs later.

55...Glue the remaining shear webs B, C, D, E, F, G, H and I into position. Trim the ends to get the proper fit if needed.



56...Glue the 3/8" sq. x 36" balsa leading edge into position. You can let the extra extend past the end ribs.



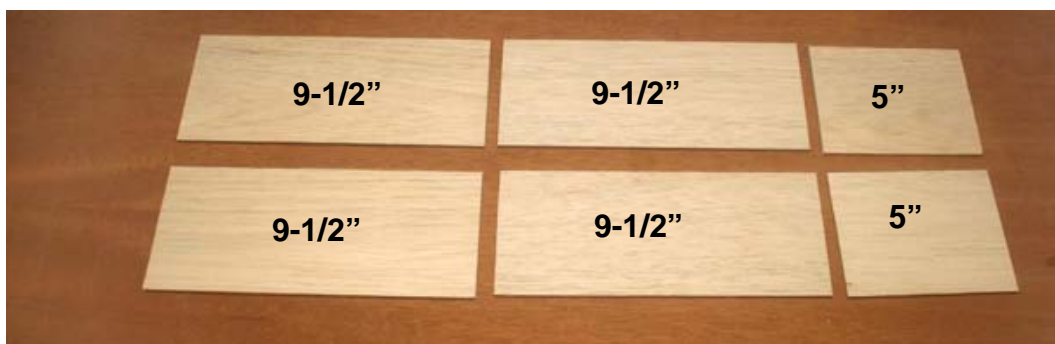
57...Position the 3/32" x 4" x 36" leading edge sheet against the leading edge as shown. The outboard end should be flush with the W-12 rib. The inboard end will extend slightly past the W-1 rib. When positioned properly, glue the sheet to the leading edge only.



58...Moisten the outside of the leading edge sheet with an ammonia based glass cleaner such as Windex. Allow it to soak in for several minutes. Roll the sheet back and glue thoroughly to the ribs and main spar.



59...Cut two pieces 9-1/2" long from two of the 3/32" x 4" x 24" balsa sheet. The remaining piece will be 5" long.



60...Cut 1/4" strips from the 5" sheet from the previous step. There should be at least 14 pieces. They will be longer than needed and will be trimmed to fit on assembly.



61...Use these 1/4" wide strips as cap strips and glue into position on top of the W-5 thru W-12 ribs. The cap strips should be centered on the ribs except for W-12. The W-12 cap strip should be flush with the outboard face of the rib and extend inboard. **No cap strips on ribs W-1, W-2, W-3 and W-4.**

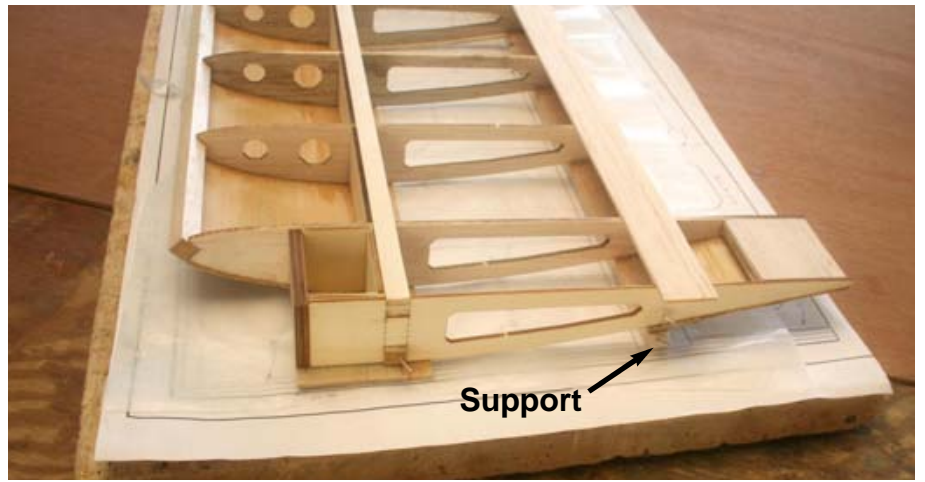


62...Cut pieces from one of the 3/32" x 4" x 24" sheets to sheet the top of the trailing edge of the wing between ribs W-1 and W-2, and W-6 and W-7.

63...Remove the wing from the plan.

64...Pin the 3/8" sq x 36" balsa support to the plan in the position shown on the plan. Pin the wing back into position on the plan and support with the lower side up.

65...Glue the lower 3/32" x 1" x 36" trailing edge to the bottom of the wing.



66...Using the 3/32" balsa sheet left over from step 62, Cut pieces to sheet the bottom of the trailing edge of the wing between ribs W-1 and W-2, and W-6 and W-7.

67...Using a 3/32" x 4" x 36" balsa, sheet the lower leading edge as you did the top. Be sure that the wing is held straight so you do not induce a twist while installing this sheet.

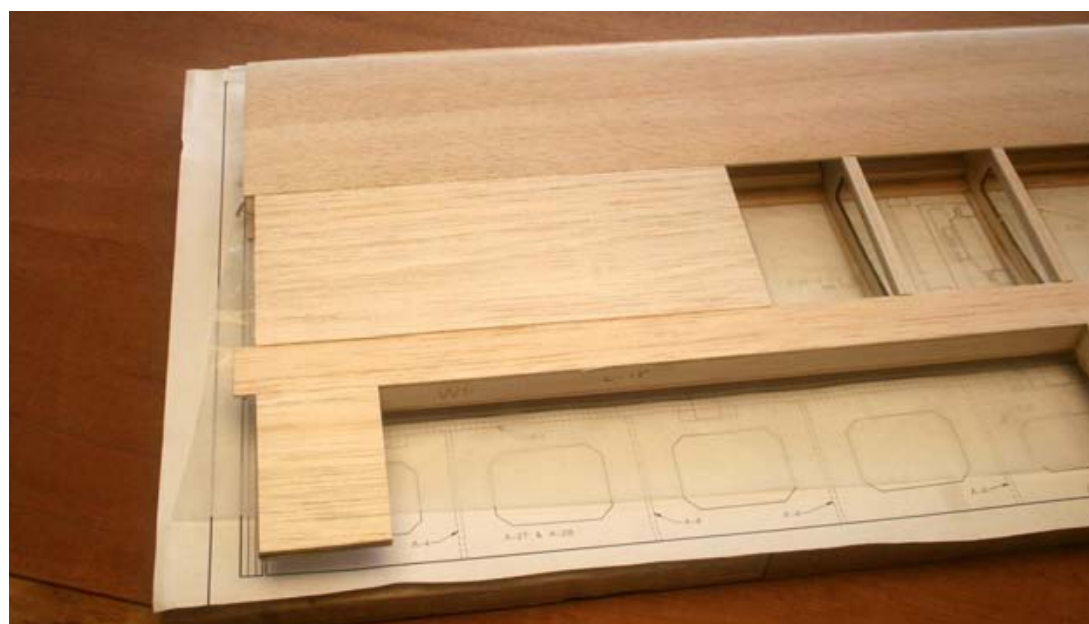


68...Using pieces from step 60, cut, fit and glue 1/4" wide cap strips to the bottom of ribs W-5, W-6, W-9, W-10 W-11 and W-12.

**No cap strips on ribs W-1, W-2, W-3, W-4, W-7 and W-8.**



69...Use the 9-1/2" piece from step 59 to sheet the inboard end of the bottom of the wing from W-1 to just slightly past W-4, and between the leading edge sheet and trailing edge.



70...Using one of the 3/32" x 4" x 24" balsa sheets, cut, fit and glue a piece of sheet on ribs W-7 and W-8. The sheet should extend past the ribs slightly and be tight against the leading edge and trailing edge sheet.



71...Cut the Left Aileron Mount Template from the plan. Cut out the center hole in the template.



72...Turn the wing over. From the top, place the template on the sheet between ribs W-7 and W-8. The front of the template should be forward against the lower main spar. The sides should touch or be centered between the ribs.



73...Trace the center opening and mark the hole locations on the lower sheet.



74...Cut out the center hole from the balsa sheet. Drill the hole locations with a 1/16" drill bit.

75...Glue the W-18's and W-19's into position on the inside of the bottom sheet in the locations shown on the plan. Align the holes in these parts with the holes that you drilled in the sheet.

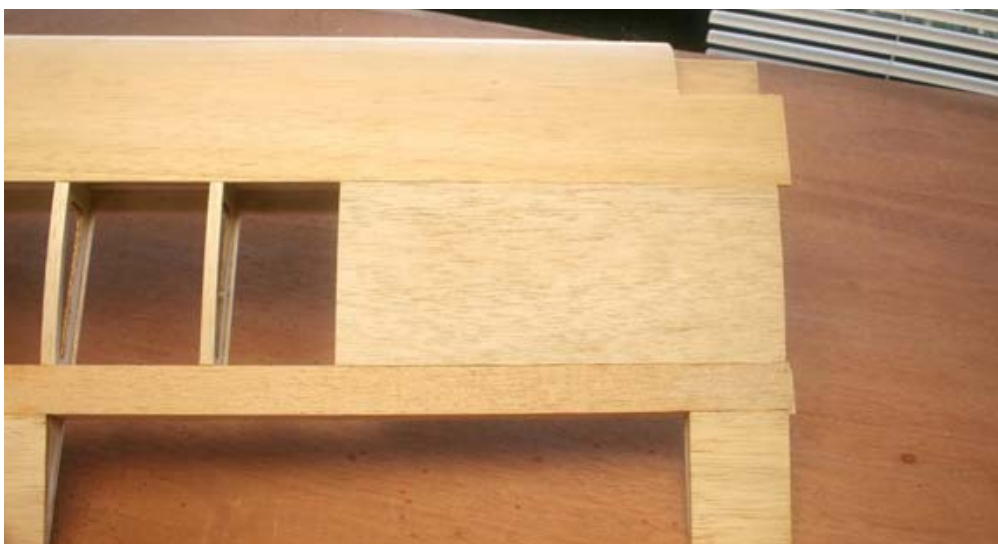
76...Repeat the previous steps to make the cut out for the flap servo. Use the Left Flap Mount Template and position it on the bottom sheet between ribs W-3 and W-4.

Note: The flaps are optional. If you do not want to use flaps on your model, you do not have to make this cutout.



77...Cut the eight 1/4" sq. balsa flap hinge supports to the length shown on the plan. Glue them into position on the bottom trailing edge sheet, and tight against W-15.

78...Use the 9-1/2" piece from step 59 to sheet the inboard end of the top of the wing from W-1 to just slightly past W-4, and between the leading edge sheet and trailing edge sheet.

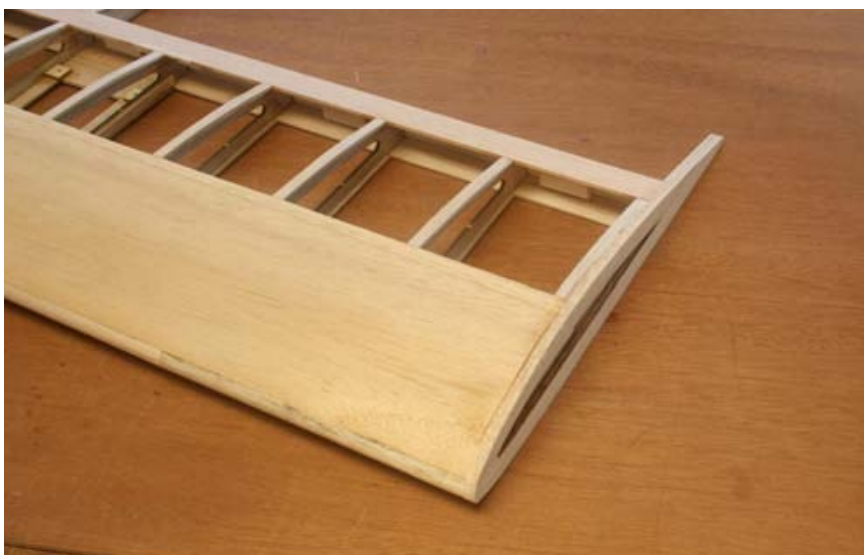


79...Trim the sheet, spars & leading edge flush with the ribs on both ends of the wing. Sand the leading edge of the wing round to match the profile shown on the plan.



80...Glue the W-17 assembly to the outboard end of the wing. Sand it flush with the contour of the wing. Sand the trailing edge and the edges of the wing tip round. **Leave the edges of the aileron and flap cutouts square.** Now sand the wing smooth all over.

Repeat steps 43 thru 80 to build the Right wing.



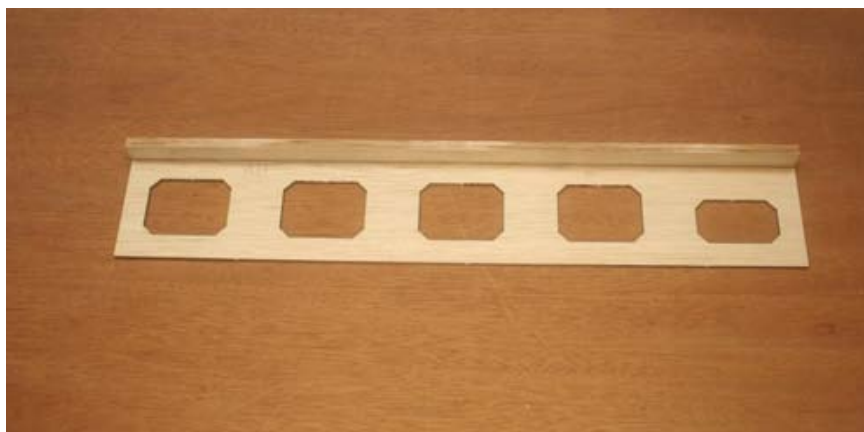
### **Building the ailerons:**

Build the left aileron.

81...Glue two A-1's together.



82...Glue the A-1 onto and flush with the front of A-2B. The A-1 should be 90 degrees to A-2B.



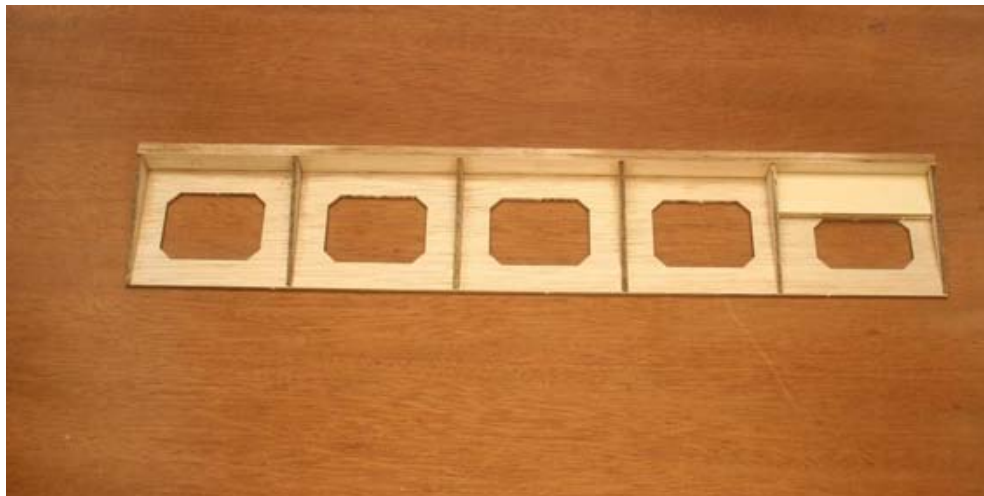
83...Glue the first A-4 rib into position. It should be flush with the end and 90 degrees to A-2.



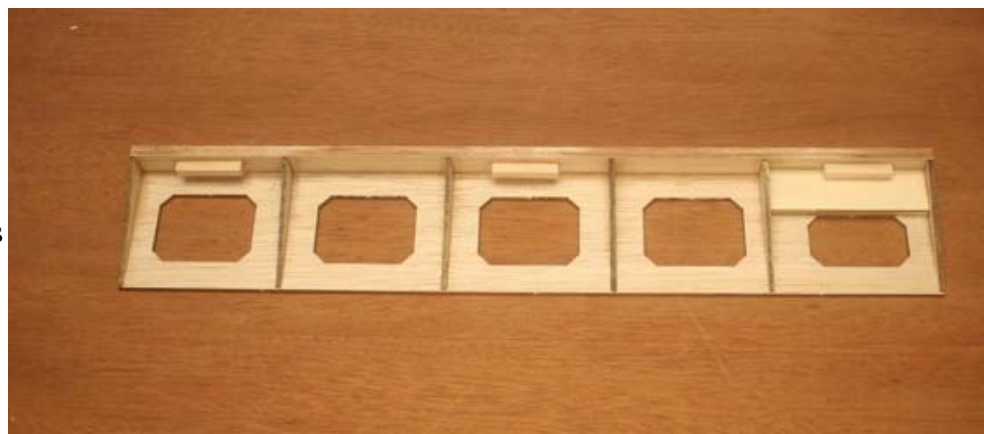
84...Position two A-3's into position against A-1 and A-4 and glue into place.



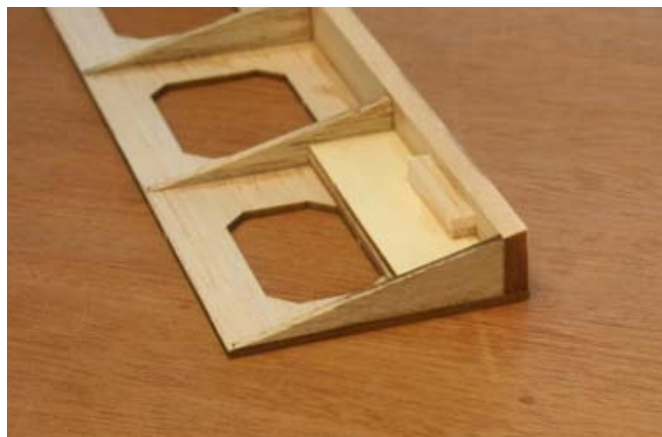
85...Glue the remaining A-4's into place.



86...Cut and glue three 1/4" sq. balsa fillers to the back of A-2 in the locations of the aileron hinges.



87...Trim an angle on the top of the A-1's to match the angle on the top of the A-4's.



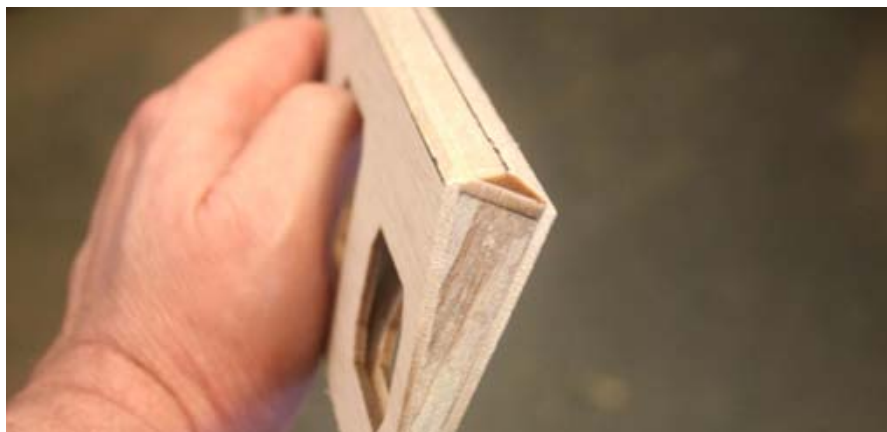
88...Glue A-2T onto the top of the aileron. Sand the ends, front, top and rear of the aileron flush.



89...Draw a line centered on the front of the aileron. Draw a line 3/16" back from the leading edge on the top and bottom of the aileron.



90...Use these lines as a guide to trim or sand the proper angles on the front of the aileron as shown on the plan.



91...Cut and glue three 1/4" sq. balsa fillers to the back of W-15 in the locations of the aileron hinges. They should be centered top to bottom.



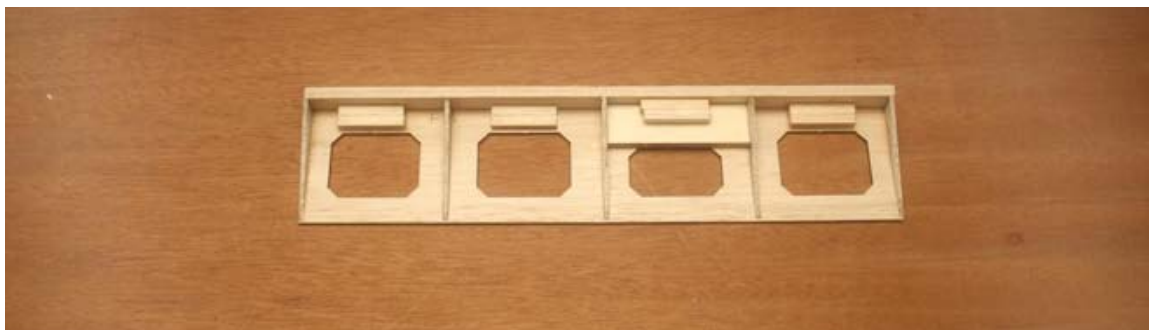


92...Mark a line centered on the back of the aileron spar (W-15). Mark the hinge locations and cut slots for the hinges. Temporarily install the hinges and check the aileron for proper fit on the wing. Do not glue the hinges at this time.

93...Repeat steps 81 thru 92 to build the left aileron.



### **Building the Flaps:**



94...Follow steps **81 to 88** to build the flaps as you did the ailerons with following differences:

\*The P-3's are positioned between the second and third P-4 ribs.

\*Two hinge supports are used at each hinge positions and should be positioned on the sheet at the bottom of P-2B as shown on the plan. At the P-3's, the supports are on top of P-3.

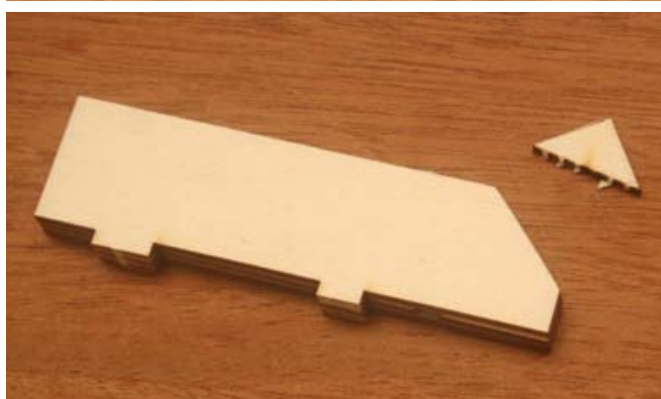
\***Do Not Taper the Front of the Flaps as you did the ailerons.**

### **Building the Flap Hinge Drill Jig:**

NOTE: If you are not using the flaps, you do not need to build the drill guide.

95...Glue J-1A between the two J-1's.

96...When the glue is dry, break the corner tab from J-1A.



97...Glue the two J-3's to J-2.



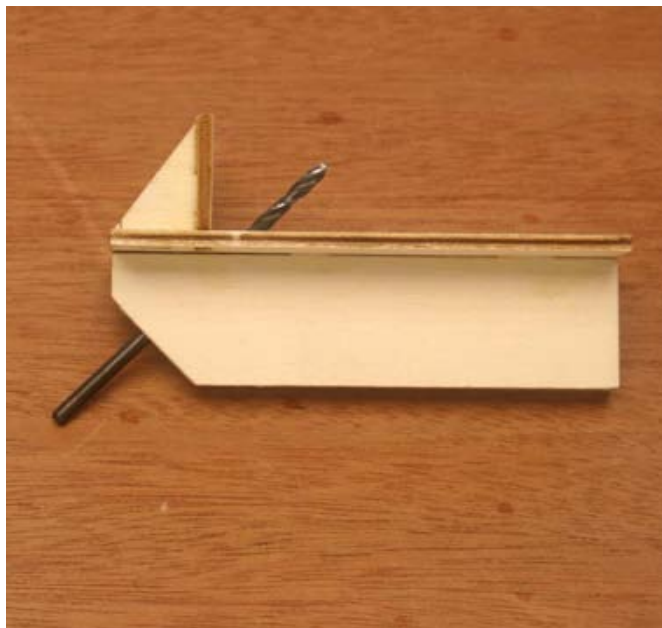
98...Glue the J-1 assembly to J-4 as shown.



99...Glue the J-2/J-3 assembly to the other side of J-2 as shown.

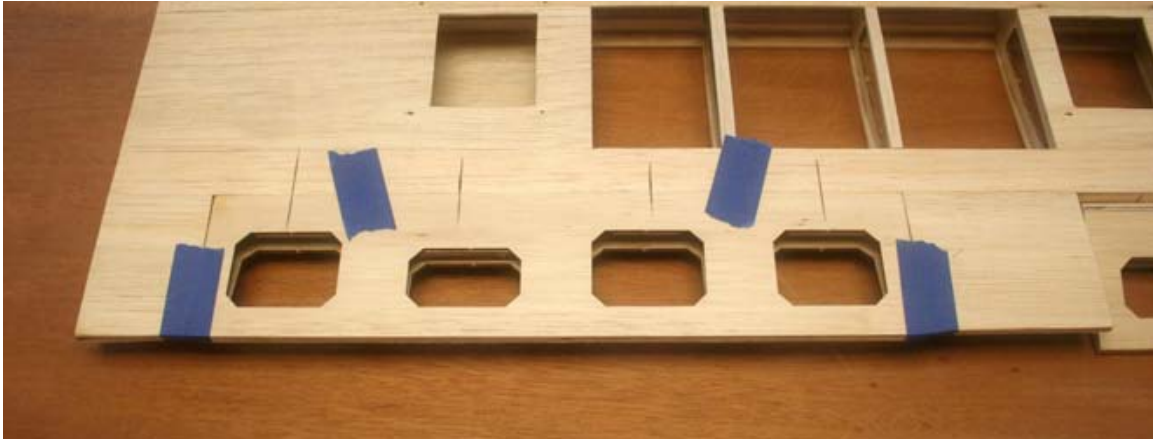


100...Run a 1/8" drill bit down through the slot in J-1A to clean out any excess glue.



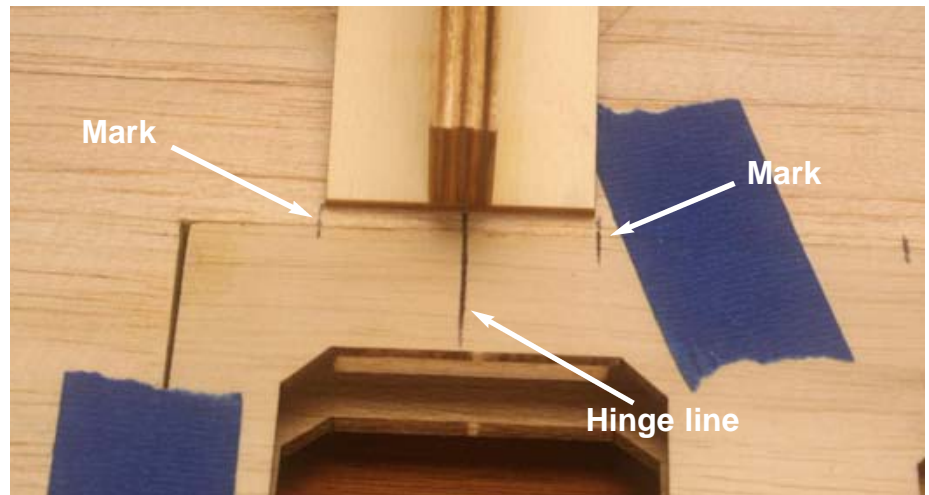
## Hinging the Flaps:

101...If you are **NOT** using the flaps, Glue the flaps securely to the wing. Use some scrap balsa to fill the gaps at each end of the flap. Glue these fillers to the wing and the flaps. When the glue is dry, sand the flaps flush and smooth with the wing. Now skip ahead to step 114.

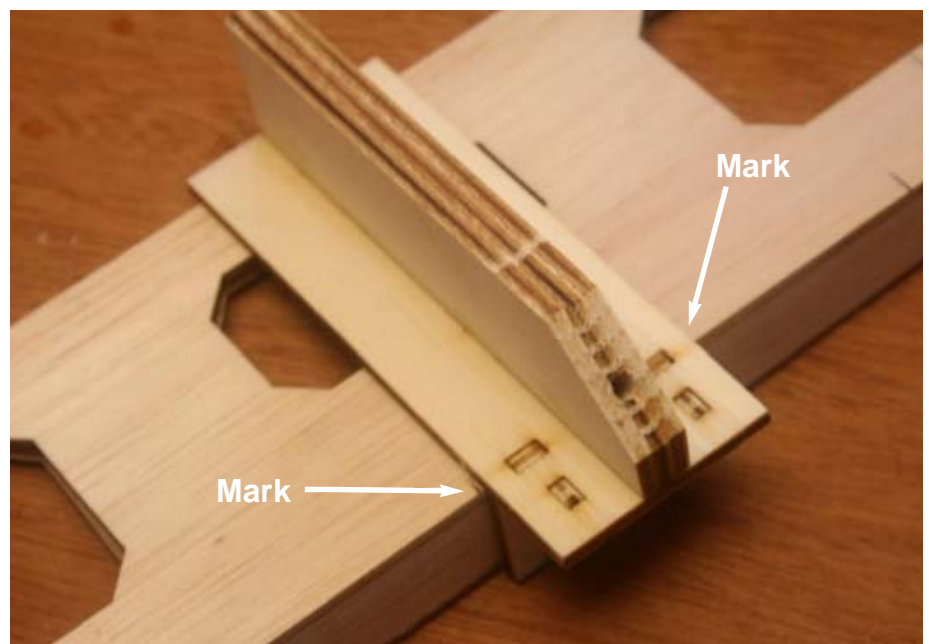


102...If you **are** using the flaps, tape the flaps to the wing. It should be flush with the bottom of the wing and centered left and right. Using the plan as a guide, draw lines on the bottom of the wing at each of the hinge positions.

103...Center the end of the hinge drill jig on each hinge line. Mark the wing and flap at the left and right edges of the drill jig.



104...Remove the flap from the wing. Position the drill jig flat on the bottom of the flap with J-2 tight against the leading edge of the flap. The edges of the drill jig should be on the marks made in the previous step.



105...While holding the drill jig tightly against the flap, drill a 1/8" hole in the flap through the bottom sheet and the hinge braces. Do this at all four hinge locations.



106...Position the drill jig flat on the bottom of the wing with J-2 tight against the trailing edge of the wing. The edges of the drill jig should be on the marks as you did with the flap.



While holding the drill jig tightly against the wing, drill a 1/8" hole in the wing through the bottom sheet and the hinge braces. Do this at all four hinge locations.

107...Temporarily install the hinges and check the flap for proper fit on the wing. Place all four hinges in the wing, then carefully slide the flap into position. The hinge pins should be centered over the joint between the wing and flap as shown on the detail on the plan. You will have to wiggle everything around a little to get the hinges and flap in the proper position. Do not glue the hinges at this time.



108...Remove the flap from the wing. On the **Bottom of the flap**, draw a line  $\frac{1}{4}$ " back from the leading edge. On the **Front of the flap**, draw a line  $\frac{1}{4}$ " up from the bottom of the flap.



109...On the **Top of the flap**, draw a line  $\frac{5}{16}$ " back from the leading edge. On the **front of the flap**, draw a line  $\frac{3}{8}$ " down from the top of the flap.



110...Using the lines as a guide, carefully trim and sand the top and bottom corners of the front of the flap round to match the profile shown on the plan.



111...Cut, fit and glue a piece of 1/4" triangle to the top of the flap cutout on the wing as shown in the detail drawing on the plan.



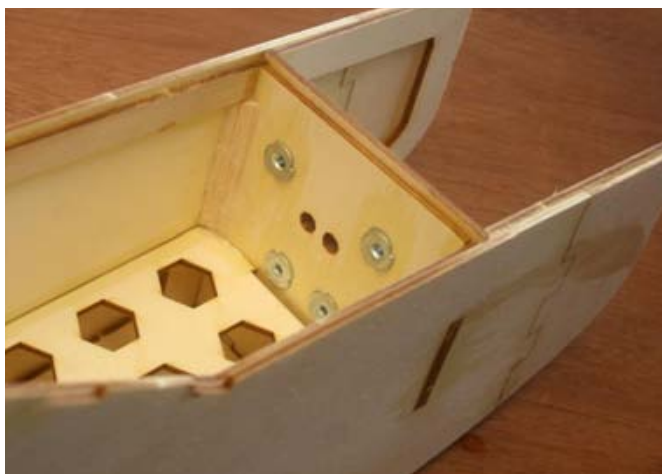
112...Sand the top of the 1/4" triangle flush with the top of the wing.



113...Install the flap back on the wing. Do Not glue the hinges. Adjust the hinges until the flap is in the proper position. If the flap doesn't come up all of the way so that it is flush with the wing, carefully sand a little off of the top radius on the flap so it doesn't touch the 1/4" triangle. Check for proper movement.

## Joining The Wing and Fitting the Wing to the Fuselage:

114...Cut two pieces of 1/4" triangle and glue them into the corners between the back of the firewall(F-7A) and the fuselage side.



115..Cut open the 3/8" wide slots in the W-1 ribs between the dashed lines for the wing joiners.



116...Glue the four 1/16" plywood wing joiner pieces to make one joiner.



Test fit the joiner into the slots in the W-1 ribs. Slide and test fit the other wing into position. Sand or trim as required to achieve a good fit.

117...Securely glue the joiner in place and join the wings. Glue the joiner to the shear web and the top and bottom spars. Glue the W-1 ribs together. Use epoxy for this step.



When the glue is dry, sand the joint between the wings smooth and flush.

118...Cut the 2" dacron tape into two 12" pieces. Glue one piece of the 2" dacron tape into position on the bottom of the wing. Start at back end. Tack the back end down, centered on the joint. Now pull the tape tight and tack at the front. Now use thin C/A glue to attach the tape to the wing.

**Use adequate ventilation.**

When the glue is dry, Trim the tape flush with the front of the W-13's and the trailing edge.



119...Place the wing onto the fuselage. Sand the back end of the wing if required to achieve a good fit with the front of the wing tight against F-8 with the wing completely seated in the wing saddle.



120...Center the wing left and right on the fuselage. **Hold the wing tightly against the fuselage.** Use a 1/4" drill bit to drill holes through F-8 into the front of the wing.



121...Insert the 1/4" dowels into the holes in W-12. They should stick out 3/8". Securely glue the dowels into position.

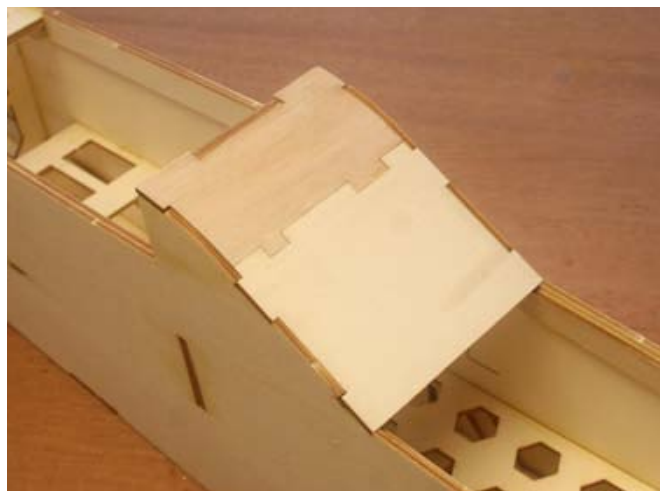




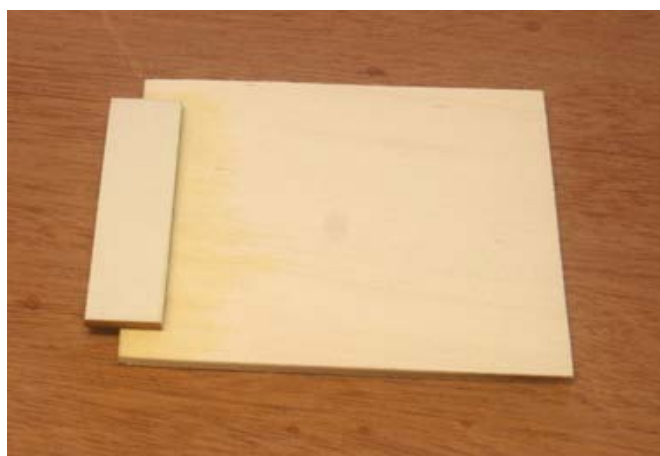
122...Sand a bevel on the outside edges of W-23. Glue W-23 to the bottom of the center section in the position shown on the plan. Cut out the opening in the bottom sheet and ribs for the aileron and flap servo wires as shown.



123...Fit and glue F-22 to the front of the fuselage. Moisten the top end with Windex to allow it to bend easier.



124...Test fit the hatch(F-23) into place on the front of the fuselage. The front edge is angled to match the angle of the firewall. Mark the top of the hatch.



Remove the hatch and flip it upside down. Glue F-23A to the bottom rear of the hatch as shown. Center it left and right and front and back.

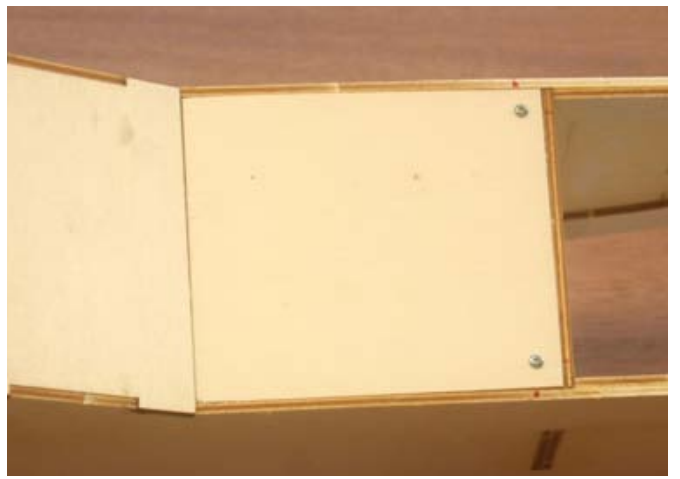
125...Glue the 3/8" hardwood blocks into the corners between the fuselage side and the firewall. The top edge of the block should be flush with the top edges of F-6 and F-7B.



126...Install the hatch on the model. F-23A slides under the front edge of F-22

Drill pilot holes in the hatch and hardwood blocks and install #2 sheet metal screws to retain the hatch.

NOTE: Depending on your personal preference, you can use other methods to retain the hatch such as magnets or a latch.



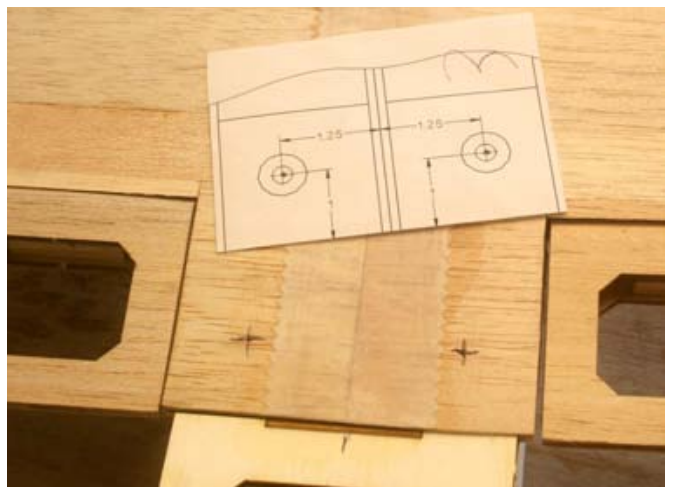
127...Place the wing back on the fuselage. Hold firmly in place and sand the front of the wing and the top of F-22 smooth and flush.



128...Glue the remaining 12" piece of dacron tape to the top seam on the wing as you did the bottom seam.



129...Center the back edge of the wing on the fuselage. Mark the bolt holes on the back of the wing using the template on the plan as a guide.



130...Center parts W-20 over marks for the wing bolts and glue into position.



131...Center the wing left and right on the fuselage. Hold it tightly in position, and using a 3/16" drill bit, drill the bolt holes in the wing and parts F-21 in the fuselage. The drill bit must be 90 degrees to the top surface of the wing so the bolt heads will sit flat.



Remove the wing from the fuselage. Using a 1/4" drill bit, drill out the wing bolt holes in the **wing only**.

Place the wing back on the fuselage. Use a 1/4-20 tap to cut threads in the holes drilled in F-21. Apply some thin C/A to harden these threads and when the glue is dry, re-tap to clean up the threads.



Use the two 1" nylon bolts to attach the wing to the fuselage.

132...Test fit the main landing gear on the fuselage. Trim a radius on the holes in F-12 as shown on the plan to allow the wire to sit tightly against F-12. Trim the slot to widen it if required to allow the wires to be completely seated against F-12.

Place the plastic retainers into position, drill holes and install #2 sheet metal screws to hold the gear in place.



133...Install the motor on the model. Trim away the balsa on the sides of the motor to provide clearance for the muffler and needle valve. Mount the propeller and check for proper clearance.



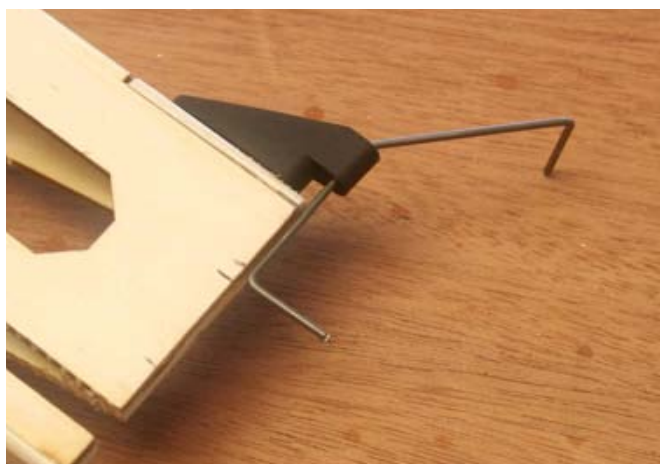
134...Cut on the dashed lines to remove the wood from the stabilizer slots on the fuselage sides. Temporarily mount the tailwheel bracket to the bottom of the fuselage. It should be positioned so that the 1/16" axle is just at the back of the fuselage as shown on the plan.



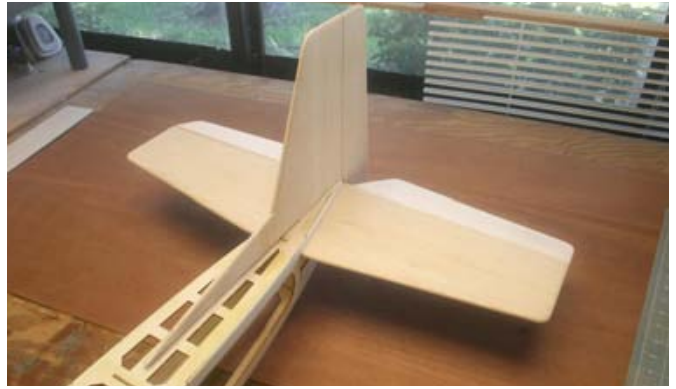
135...Bend the tailwheel wire to the shape shown on the plan.



136...Install the tail wheel wire into the tail wheel bracket and make the top bend as shown here and on the plan.



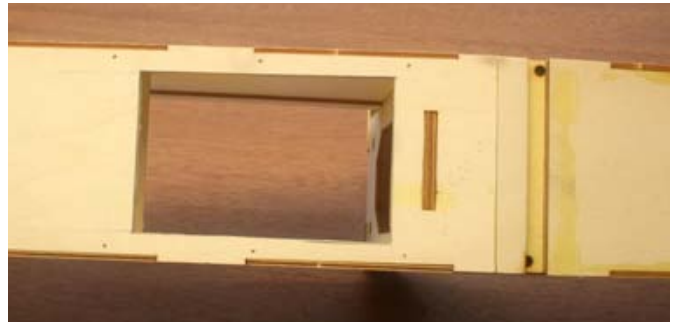
137...Test fit the tail surfaces on the fuselage. Sand or trim if required to obtain the proper fit. The back edge of the stabilizer should be flush with the back end of the fuselage.



138...Drill a 1/16" hole in the leading edge of the rudder for the tail wheel wire. Cut the hinge slot in the fuselage.



Sand the fuselage smooth all over. Round off all edges except for the wing saddle.



Note: If you plan on using the internal bombay or other accessories with the universal mounting plate, Cut out the hole in the bottom of the fuselage as shown.

### **Covering:**

139...Sand all parts smooth with 400 grit sandpaper. Feed strings from the aileron servo and flap mounts to the center section. You will use these strings to pull the servo wires thru the wing after the model is covered. Cover the model with a plastic iron on covering material. Overlap all seams approximately 1/8".

**Note:** After the model is covered you must check the tail surfaces and wings for warps or twists. If there are any they can be removed by twisting the parts straight and heating the covering.

### **Final Assembly**

140...Cut the covering away from the stabilizer, fin and pushrod slots in the fuselage. Cut the covering away from the stabilizer in the area that makes contact with the fuselage.

Place the stabilizer into position on the fuselage. Make sure that it is straight and square and then glue it into position.



141...Attach the elevators with the hinges and glue in place.



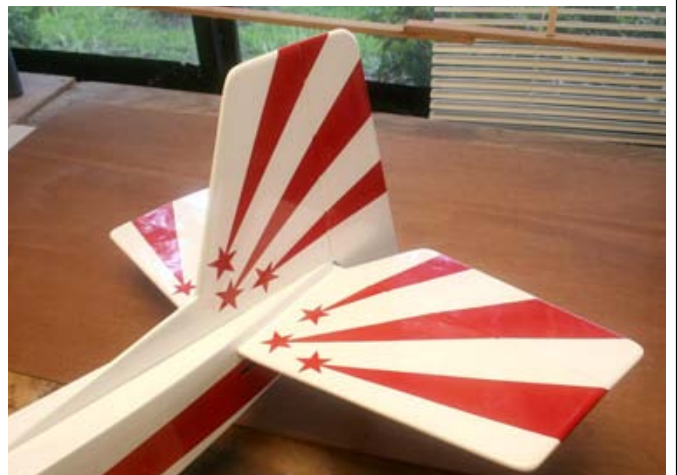
142...Carefully cut the covering away from areas on the fin that will make contact with the fuselage. Carefully cut the covering away from areas on the fuselage that will make contact with the fin. Place the fin into position and make sure that it is straight and square. Glue the fin into position.



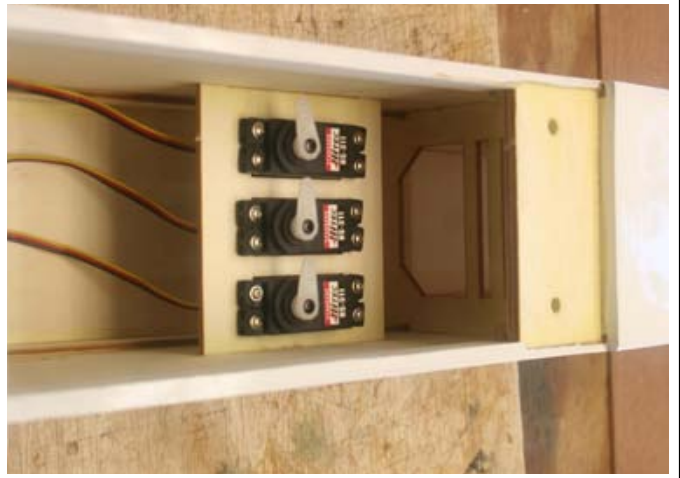
143...Attach the tail wheel bracket to the bottom of the fuselage. Glue the screws in place.



144...Attach the rudder with the hinges and glue in place. Use epoxy on the tail wheel wire.



145...Screw the servos to the servo tray.



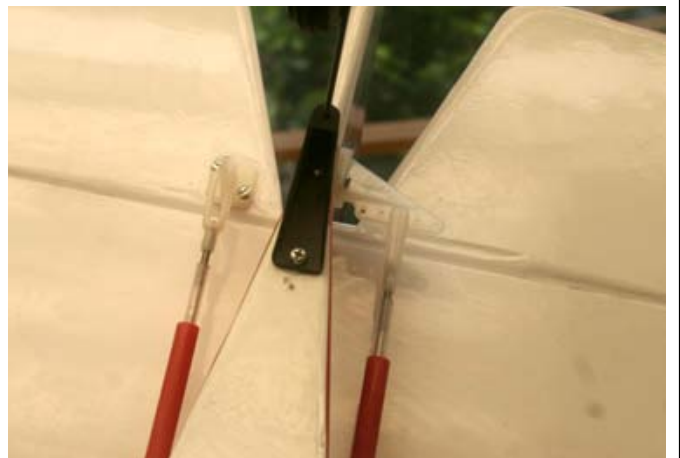
146...Insert the pushrod housings into the exit slots in the back of the fuselage. The front ends of the pushrod housings should pass thru the slot in former F-10. The back ends should stop 1-1/2" forward of the hinge lines. Glue the housings to the rear exits. Do not glue the front ends to former F-10 at this time.



147...Attach the control horns to the elevator and rudder with **2-56 machine screws** and back plates.



148...Assemble the back end of the pushrods. Slide the pushrods into the housings and connect the clevises to the horns.



149...Assemble the front ends of the pushrods and connect them to the servo arms. The control surfaces should be in neutral when the servos are centered.

Glue the pushrod housings to former F-10.



150...Seal the firewall with dope or epoxy. Drill the firewall for the throttle cable.

Glue the throttle cable housing into the firewall.



151...Assemble the fuel tank. Wrap with 1/4" foam rubber and slide onto the tank mount tray while pulling the fuel and vent line through the firewall.



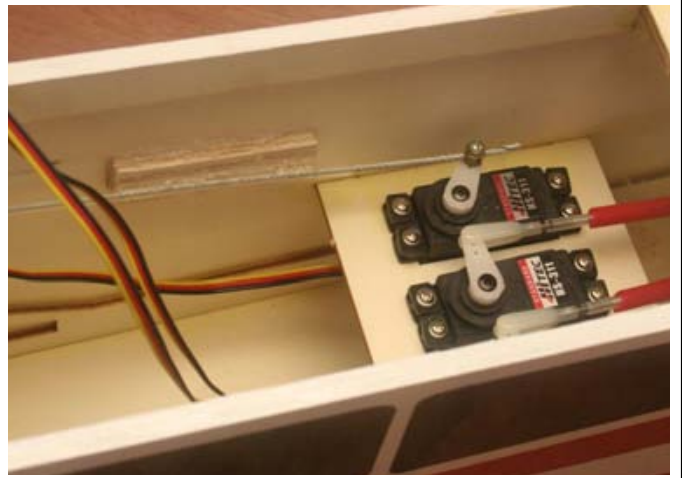
152...Attach the motor mount to the firewall. Mount the motor to the model. Make up the front end of the throttle cable and use a nylon clevis. Pass the throttle cable through the housing and attach the clevis to the throttle arm.





153...Attach the throttle cable to the servo with an EZ Connector.

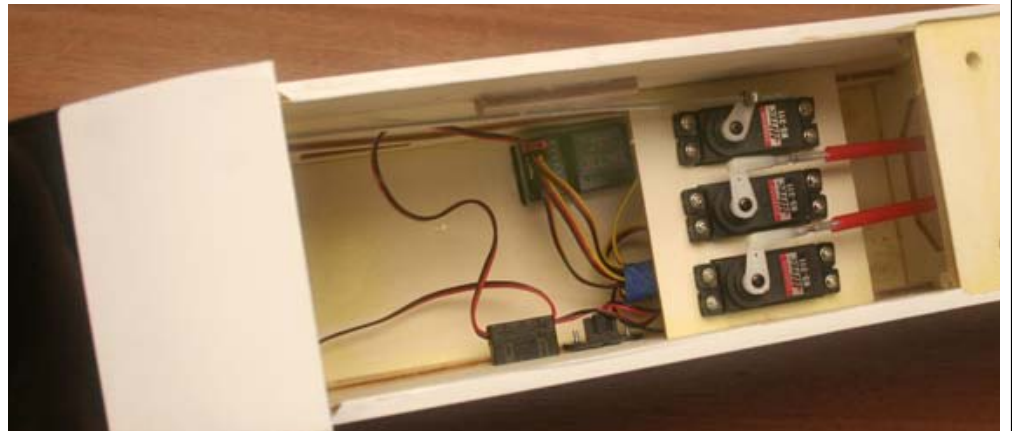
Secure the back end of the housing to the fuselage side using a scrap piece of wood as needed for alignment.



154...Mount the muffler to the motor. Attach the fuel line to the motor. Attach the vent line to the muffler. Attach the hatch with #2 sheet metal screws.



155...Secure the receiver and run the antenna in accordance with the radio's instructions. Wrap the battery pack in foam rubber and slide it in position under the fuel tank.



156...Attach the main landing gear wire to the fuselage with the nylon straps and #2 sheet metal screws. Apply epoxy on the vertical legs and into the holes in the fuselage during assembly.



157...Use a pair of pliers to bend the landing fairing straps to the shape shown. The rear strap has a single bend in the middle. The front strap has two bends to make a "Z" shape.



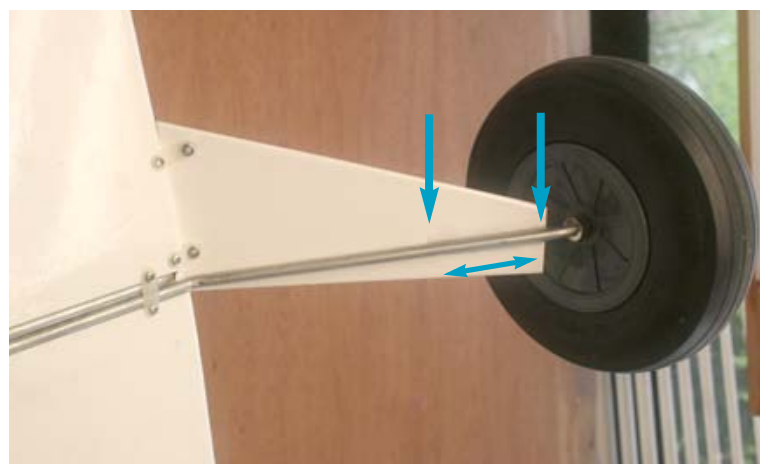
158...Put the landing gear fairings into position. The top edge should be parallel to the bottom of the wing. This edge will be at an angle to the fuselage bottom. The landing gear wire will be about in the middle of the fairing at the bottom. Tape the fairing securely into position.



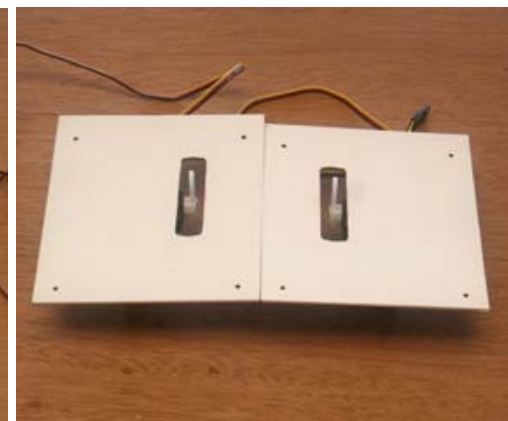
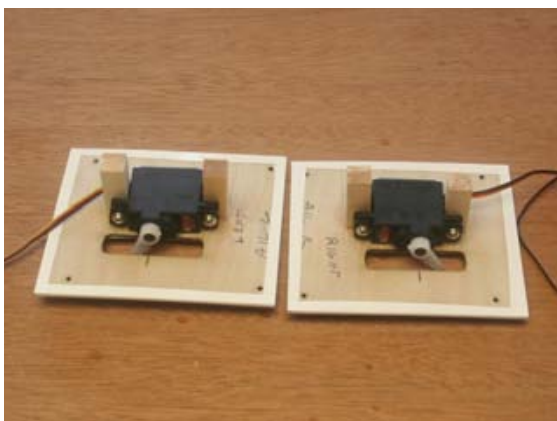
159...Place the nylon straps into position as shown. Attach to the fuselage with #2 sheet metal screws. The other end of the straps should be attached to the fairings with 2-56 machine screws and nuts. Use a thread locker on the nuts. Trim the excess length from the screws on the fairings.



160...Use clear silicone rubber to attach the bottom 2" of the landing wire to the fairing. The silicone should be under the wire as well as a fillet on each side.



161...Glue the 3/8" sq. x 1" bass servo mounts to the W-21 mount plates. Mount the aileron servos into position on the mounts. The servo arms should be angled 30 degrees forward to the plate when the servo is in neutral and be centered left and right in the slot. **Be sure to make a left and a right hand assembly.**



162...Attach the ailerons to the wing with the hinges and glue in place.

Cut the covering away from the aileron servo openings.

Screw the servo mount plates to the wing. The servo arms should be forward and outboard as shown. Use the strings in the wing to feed the servo wires through the wing and out the center section.

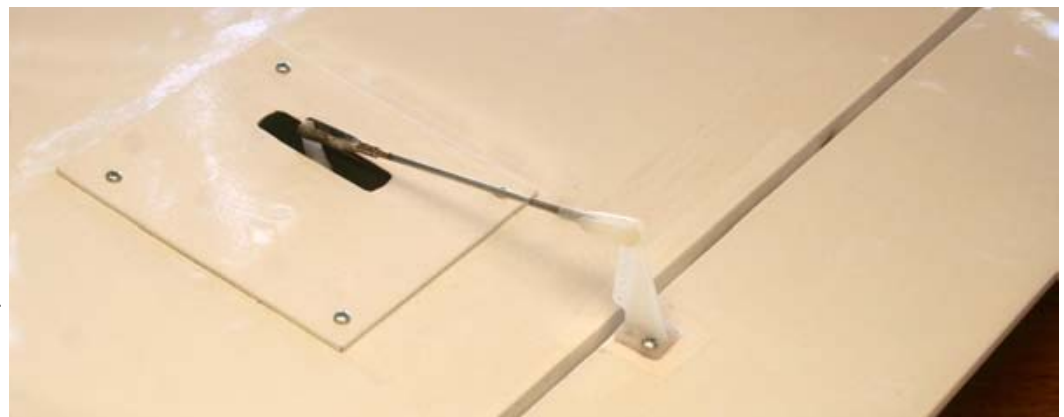


163...Screw the aileron control horns to the bottom of the ailerons in the position shown on the plan. **Use #2 sheet metal screws. Use epoxy on the screws to secure them in place.**



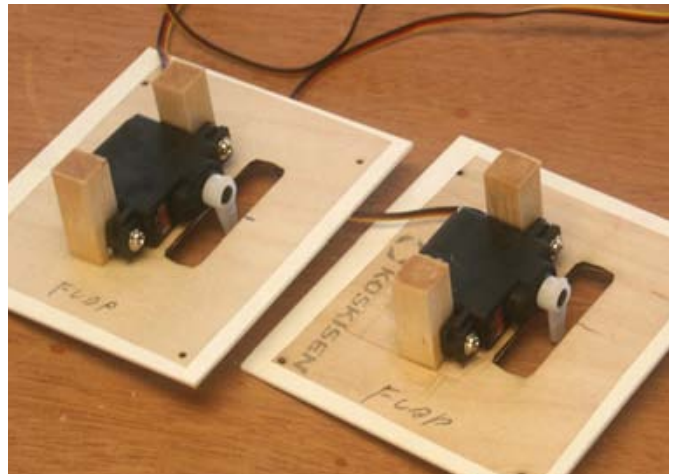
164...Assemble the aileron pushrods as shown on the plan. Install the pushrods making sure the ailerons are in neutral when the servos are in neutral.

NOTE: Be sure that the nylon clevis is completely threaded on the pushrod before assembly.



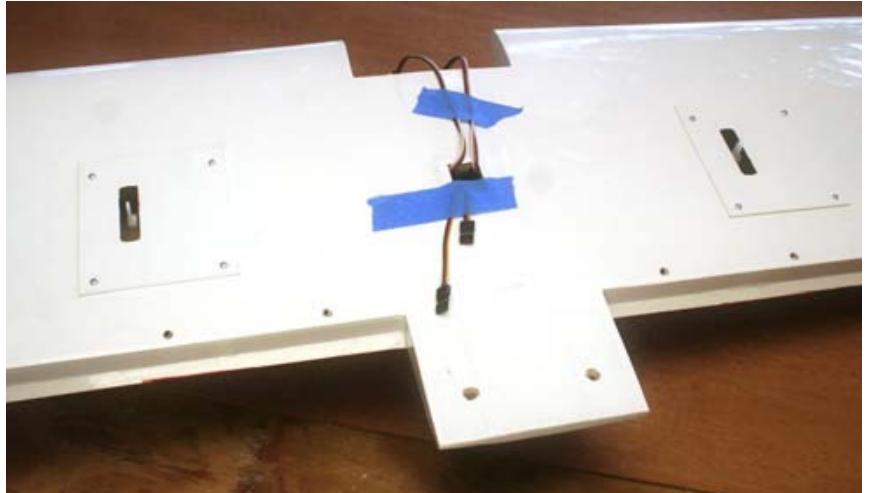
Skip steps 165 - 168 if you are not using the flaps.

165...Glue the 3/8" sq. x 1" bass servo mounts to the W-22 mount plates. Mount the flap servos into position on the mounts. The servo arms should be angled 90 degrees to the plate when the servo is in neutral and be centered left and right in the slot. Unlike the aileron servos, there is no left and right hand assembly. The flap servos face the same direction.



166... Cut the covering away from the flap servo openings.

Screw the servo mount plates to the wing. The servo arms should be forward and both should face the right wing tip.. Use the strings in the wing to feed the servo wires through the wing and out the center section.



167...Tape the flap into position on the wing. The front edge should be tight against the wing and the top and bottom surfaces should be flush with the wing. Center it left and right in the opening.

Attach the flaps to the wing with the hinges and glue in place.

Screw the flap control horns to the bottom of the flaps in the position shown on the plan. Use #2 sheet metal screws. Use epoxy on the screws to secure them in place.



168...Use the radio to place the flap servos in the up position. Assemble the flap pushrods as shown on the plan. Install the pushrods making sure the flaps are in up when the servos are in the up position.

NOTE: Be sure that the nylon clevis is completely threaded on the pushrod before assembly.



169..Check the servos for proper operation and direction. Adjust the control throws to the values shown on the plan. Attach the propeller. Attach the wing onto the fuselage.

170...Check the balance of the model. It should balance at the position shown on the plan. Move the battery forward or aft to achieve the proper balance. Note: If moving the battery will not achieve the proper balance, you will have to add weight to the nose or tail. Glue or bolt any weight securely to the model.

171...Your model is now ready to fly. Fully charge the transmitter and airborne battery before attempting to fly the model. Always range check and do a thorough pre-flight of the model before every flight. Always follow established safety guidelines while operating the motor, radio and flying your model.

## LIPO BATTERY SAFETY ALERT

### Lithium Battery Fires

Lithium batteries are becoming very popular for powering the control and power systems in our models. This is true because of their very high energy density (amp-hrs/wt. ratio) compared to NiCd's or other batteries. With high energy comes increased risk in their use. The principal risk is FIRE which can result from improper charging, crash damage, or shorting the batteries. All vendors of these batteries warn their customers of this danger and recommend extreme caution in their use. In spite of this, many fires have occurred as a result of the use of Lithium Polymer batteries resulting in loss of models, automobiles, and other property. Homes and garages and workshops have also burned. A lithium battery fire is very hot (several thousand degrees) and is an excellent initiator for ancillary (resulting) fires. Fire occurs due to contact between Lithium and oxygen in the air. It does not need any other source of ignition, or fuel to start, and burns almost explosively. These batteries must be used in a manner that precludes ancillary fire. The following is recommended:

1. Store, and charge, in a fireproof container; never in your model.
2. Charge in a protected area devoid of combustibles. Always stand watch over the charging process. Never leave the charging process unattended
3. In the event of damage from crashes, etc, carefully remove to a safe place for at least a half hour to observe. Physically damaged cells could erupt into flame and after sufficient time to ensure safety, should be discarded in accordance with the instructions which came with the batteries. Never attempt to charge a cell with physical damage, regardless of how slight.
4. Always use chargers designed for the specific purpose, preferably having a fixed setting for your particular pack. Many fires occur in using selectable/adjustable chargers improperly set. Never attempt to charge Lithium cells with a charger which is not specifically designed for charging Lithium cells. Never use chargers designed for Nickel Cadmium batteries.
5. Only use charging systems that monitor and control the charge state of each cell in the pack. Unbalanced cells can lead to disaster if it permits overcharge of a single cell in the pack. If the batteries show any sign of swelling, discontinue charging and remove them to a safe place outside as they could erupt into flames.
6. Most important: NEVER PLUG IN A BATTERY AND LEAVE IT TO CHARGE UNATTENDED OVERNIGHT. Serious fires have resulted from this practice.
7. Do not attempt to make your own battery packs from individual cells.

These batteries CANNOT be handled and charged casually such as has been the practice for years with other types of batteries. The consequence of this practice can be very serious resulting in major property damage and/or personal harm.

## **NOTES ABOUT THE ARMING SWITCH:**

- \*YOU MUST USE THE ARMING SWITCH IF FLYING THIS MODEL WITH ELECTRIC POWER. THIS IS AN IMPORTANT SAFETY ITEM.**
- \*THE PLUG SHOULD ONLY BE INSERTED IN THE ARMING SWITCH IMMEDIATELY PRIOR TO FLIGHT.**
- \*ALWAYS REMOVE THE PLUG FROM THE ARMING SWITCH IMMEDIATELY AFTER EVERY FLIGHT.**
- \*THE PLUG SHOULD NEVER BE INSERTED IN THE ARMING SWITCH WHILE CHANGING OR INSTALLING THE BATTERY IN THE MODEL.**
- \*BE ABSOLUTELY SURE THAT THERE ARE NO OBJECTS, CLOTHING, BODY PARTS, ETC. ANYWHERE NEAR THE PROPELLER AND THAT THE MODEL IS SECURELY RESTRAINED BEFORE INSTALLING THE PLUG IN THE ARMING SWITCH.**