

# PINWHEEL 60

KIT # K-503

## *Assembly Instructions*



Revision:03  
09-10-13

### **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-503-01                | .3mm X 4" X 24" Laser Cut POPLAR PLY     |
| 1    | LC-503-02                | .3mm X 7-3/4" X 24" Laser Cut POPLAR PLY |
| 1    | LC-503-03                | .3mm X 4" X 24" Laser Cut POPLAR PLY     |
| 1    | LC-503-04                | .3mm X 7-3/4" X 24" Laser Cut POPLAR PLY |
| 1    | LC-503-05                | .3mm X 4" X 24" Laser Cut POPLAR PLY     |
| 1    | LC-503-06                | .3mm X 7-3/4" X 24" Laser Cut POPLAR PLY |
| 1    | LC-503-07                | .1/8" X 4" X 24" Laser Cut Balsa         |
| 1    | LC-503-08                | .1/8" X 4" X 24" Laser Cut Balsa         |
| 1    | LC-503-09                | .1/8" X 4" X 24" Laser Cut Balsa         |
| 1    | LC-503-10                | .1/8" X 4" X 24" Laser Cut Balsa         |
| 1    | LC-503-11                | .1/8" X 4" X 24" Laser Cut Balsa         |
| 1    | LC-503-12                | .1/8" X 4" X 24" Laser Cut Balsa         |
| 2    | LC-503-13                | .3/32" X 4" X 24" Laser Cut Balsa        |
| 2    | LC-503-14                | .3/32" X 4" X 24" Laser Cut Balsa        |
| 2    | LC-503-15                | .3/32" X 4" X 24" Laser Cut Balsa        |
| 2    | LC-503-16                | .3/32" X 4" X 24" Laser Cut Balsa        |
| 2    | LC-503-17                | .3/32" X 4" X 24" Laser Cut Balsa        |
| 1    | LC-503-18                | .1/16" X 4" X 24" Laser Cut Birch Ply    |
|      |                          |  |
| 6    | Tail Sheet               | .1/16" x 4" x 24" Balsa                  |
| 6    | Wing & Fuselage Sheet    | .3/32" X 4" X 24" Balsa                  |
| 5    | Wing Trailing Edge Sheet | .3/32" x 1 1/2" x 18" Balsa              |
| 5    | Braces & Hinge Fillers   | .1/4" sq. x 18" Balsa                    |
| 3    | Nose Sheet               | .1/4" x 2" x 6" Balsa                    |
| 10   | Fuselage Stringers       | .1/8" sq. x 18" Balsa                    |
| 1    | Motor Mount Braces       | .1/4" Triangle x 18" Balsa               |
| 1    | Wing Fairing Sheet       | .3/32" x 4" x 12" Balsa                  |

#### Plans Bag:

|   |                   |                          |
|---|-------------------|--------------------------|
| 1 | K-503 PLAN A      |                          |
| 1 | K-503 PLAN B      |                          |
| 6 | Main Wing Spars   | .1/8" x 3/8" x 30" Bass  |
| 2 | Wing Leading Edge | .3/8" x 3/8" x 30" Balsa |

## Hardware Bag

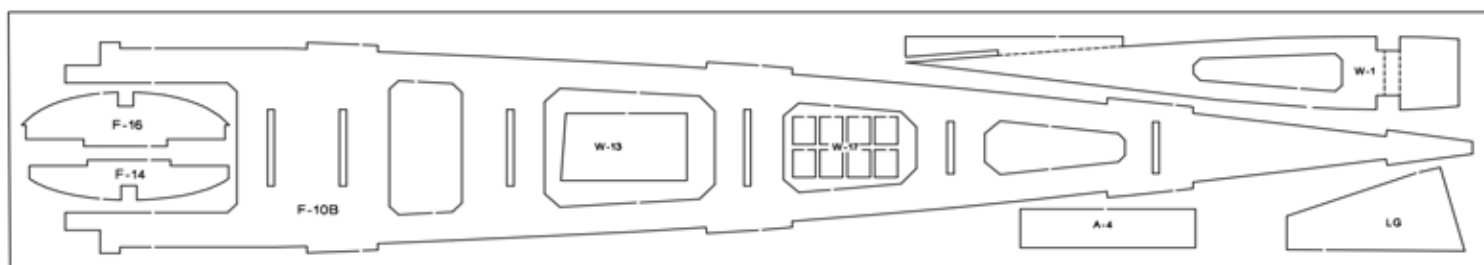
| Qty. | Name                      | Description                    |
|------|---------------------------|--------------------------------|
| 1    | Tailwheel Bracket         | Molded Nylon Bracket           |
| 4    | Landing Gear Straps       | Molded Nylon Straps            |
| 4    | Motor Mount 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        |
| 4    | Control Horn              | Aileron and Tail Control Horns |
| 22   | #2 Sheet Metal Screws     | # 2 X 1/2" Sheet Metal Screw   |
| 4    | Tail Control Horn Screws  | 2-56 x 1/2" Machine Screw      |
| 4    | Aileron 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    | Landing Gear Mount (LG-1) | 3/8" x 3/4" x 4" Grooved Block |
| 2    | Landing Gear Mount (LG-2) | 3/8" x 3/4" x 1" Grooved Block |
| 2    | Aileron Horn Wedge        | 3/16" x 1/2" x 1/2" Bass       |

## Misc. Loose Parts

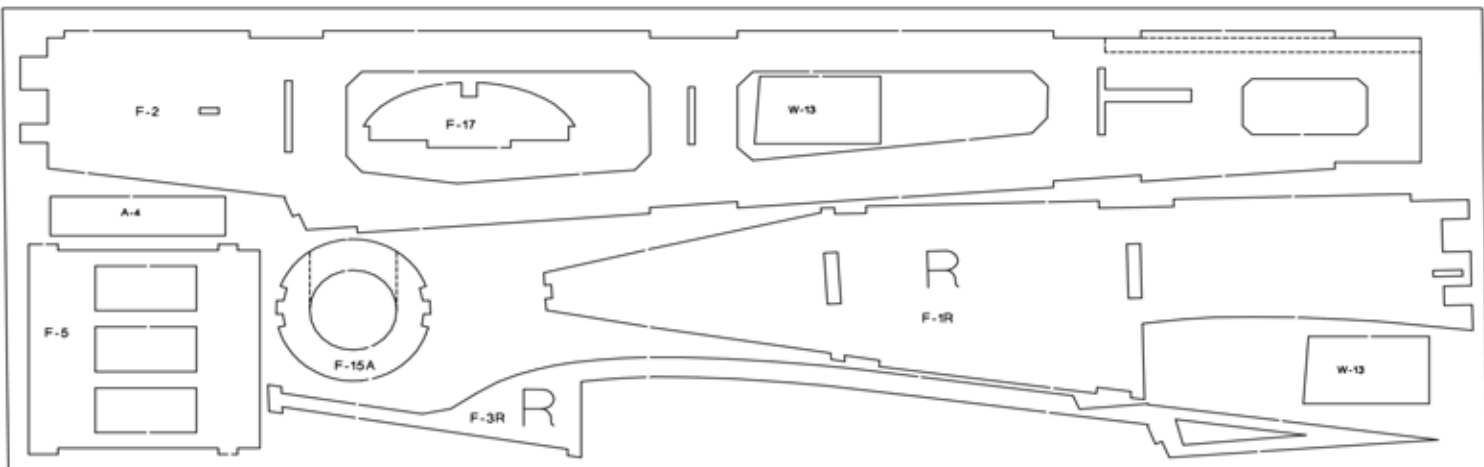
|   |                         |                                |
|---|-------------------------|--------------------------------|
| 2 | Main Landing            | 5/23" x 13.72" Music Wire      |
| 1 | Molded Canopy           | .020" x 6" x 12" Clear Plastic |
| 4 | Wing Leading Edge Sheet | 3/32" x 3" x 30" Balsa         |

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

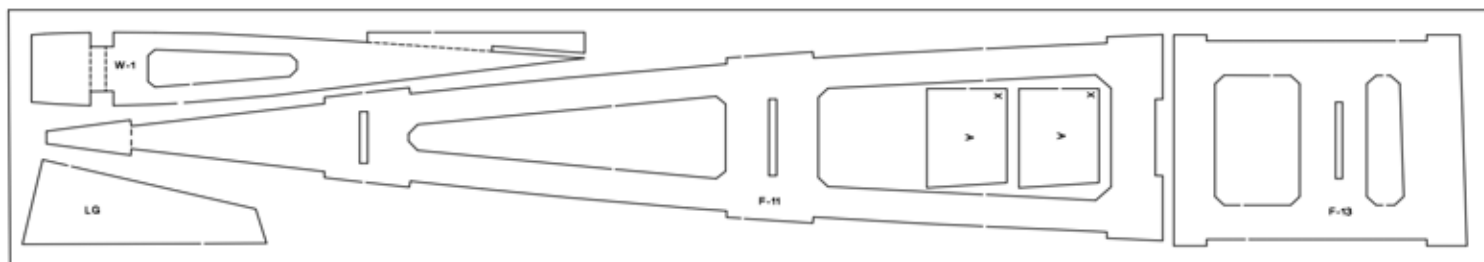
|    |                          |   |
|----|--------------------------|---|
| 1  | Covering Material        | 2 Rolls Covering Material Plus Trim Colors                      |
| 1  | Canopy Paint             | 1 Can of Fuel Proof Paint to Match Covering                     |
| 15 | Hinges                   | C/A or Pin Style Hinges   |
| 2  | Tail Pushrods            | DuBro 30" Laser Rods (1 pair) (Alien Aircraft P/N: AH-013)      |
| 2  | Aileron Pushrods         | 12" Aileron 2-56 Pushrods (1 pair) (Alien Aircraft P/N: AH-014) |
| 4  | Main L/G Collars         | 5/32" Wheel Collars (DuBro P/N: 140)                            |
| 1  | Tail L/G Collar          | 1/16" Wheel Collars (DuBro P/N: 137)                            |
| 2  | Main Wheels              | 3" Wheels (DuBro P/N: 300TL)                                    |
| 1  | Tail Wheel               | 1" Wheel (DuBro P/N: 100TW)                                     |
| 1  | Radio                    | 4 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  | 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                          |
| 1  | Motor                    | 2-Cycle .46-.61 4-Cycle .50-.61                                 |
| 1  | Motor Mount              | Dave Brown Motor Mount (to fit your motor)                      |
| 4  | Motor Mount Screws       | 6-32 x 3/4" Machine Screws (or size to fit your motor)          |
| 4  | Motor Screws             | 6-32 x 1" Machine Screws (or size to fit your motor)            |
| 1  | Propeller                | 11" x 7" Propeller (or size to fit your motor)                  |
| 1  | Fuel Tank                | DuBro 8 oz. Fuel Tank (DuBro # 408)                             |
| 1  | Throttle Pushrod         | Flexible Cable Pushrod (DuBro # 165)                            |
| 1  | Fuel Line                | Medium Fuel Line (DuBro #222)                                   |
| 1  | Foam Rubber              | 1/4" Foam Rubber (DuBro # 513)                                  |
| 1  | Optional Spinner         | DuBro 2 1/2" Spinner (Color to Match)                           |
| 1  | Throttle Servo           | HiTec HS-311 Standard Servo or Equivalent                       |
| 1  | Throttle cable to servo  | DuBro EZ Connector (DuBro #121)                                 |



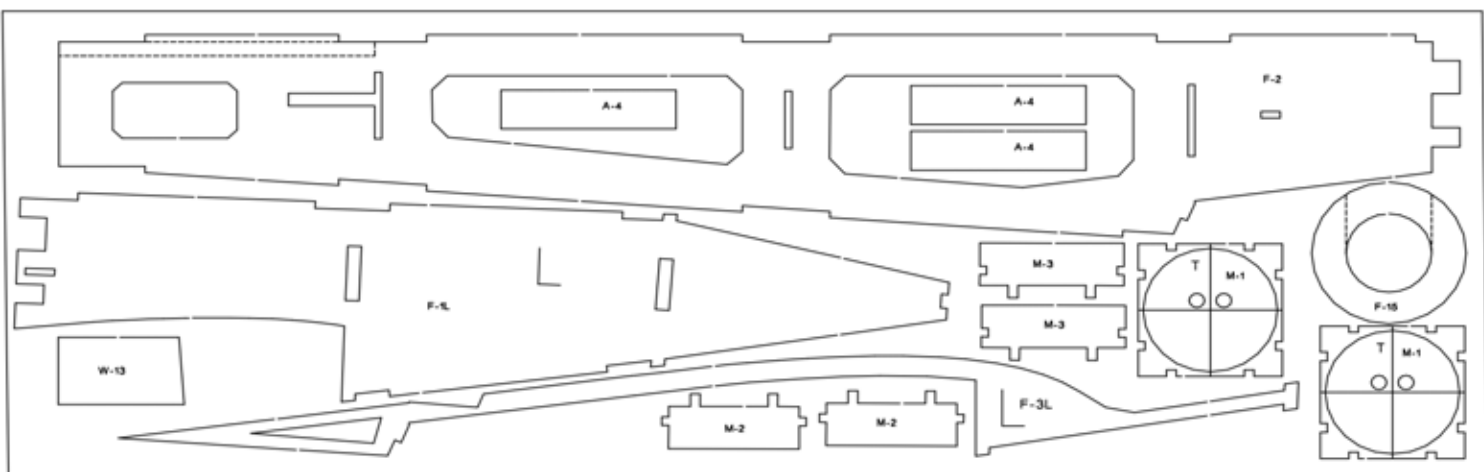
LC-503-01 3mm X 4" X 24" Poplar Ply 1 REQD.



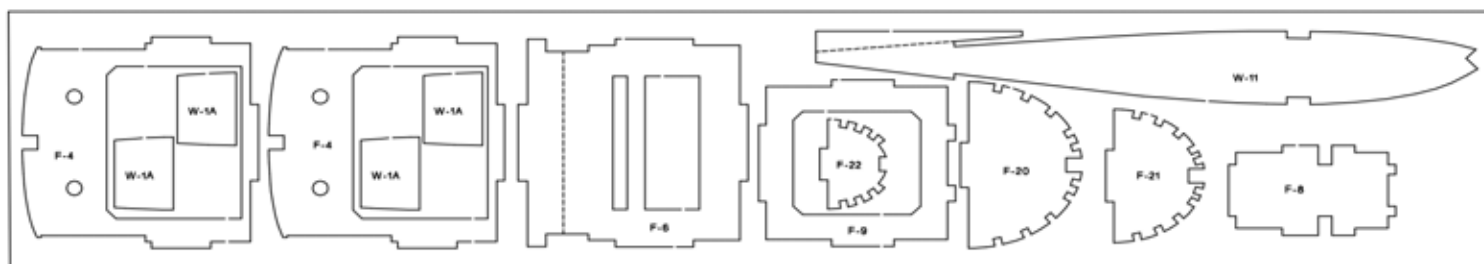
LC-503-02 3mm X 8" X 24" Poplar Ply 1 REQD.



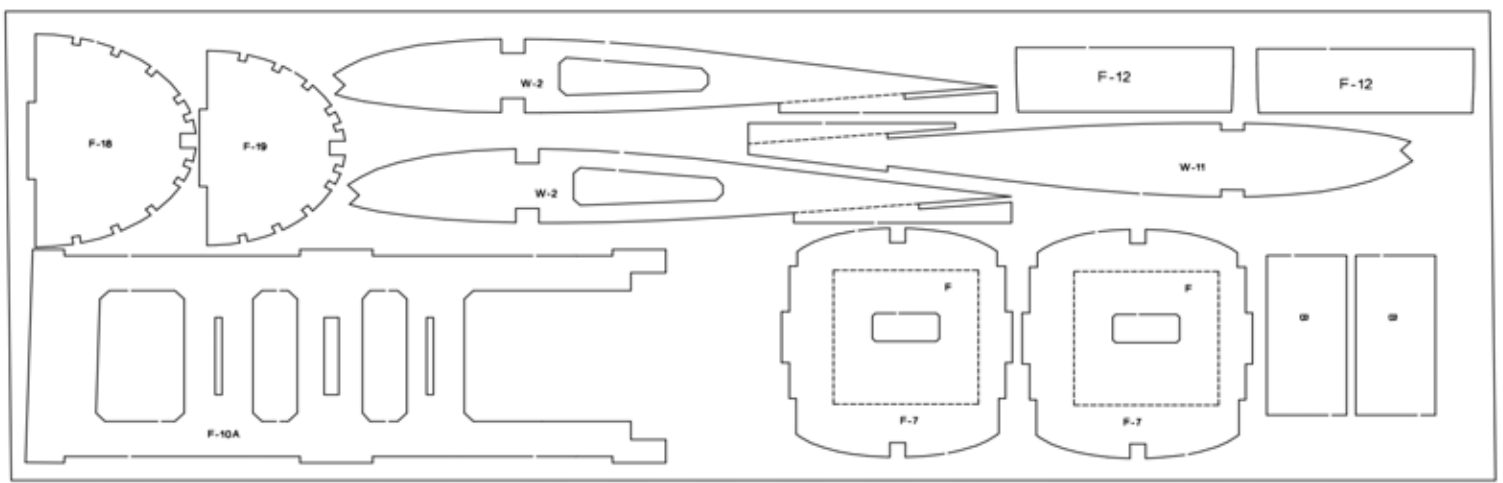
LC-503-03 3mm X 4" X 24" Poplar Ply 1 REQD.



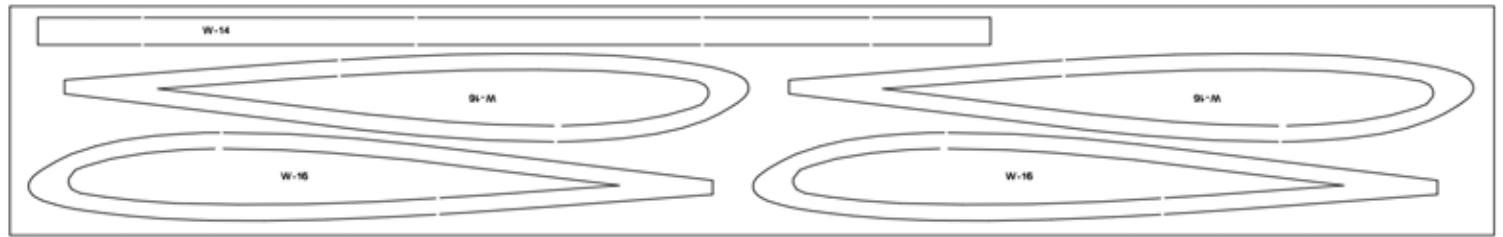
LC-503-04 3mm X 8" X 24" Poplar Ply 1 REQD.



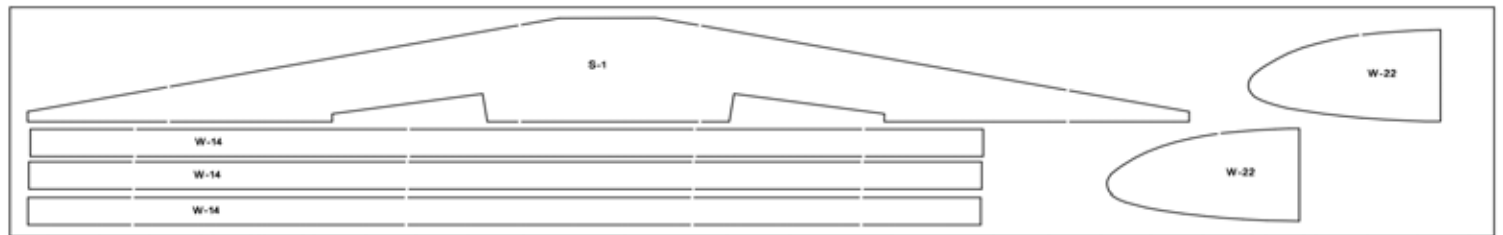
LC-503-05 3mm X 4" X 24" Poplar Ply 1 REQD.



LC-503-06 3mm X 8" X 24" Poplar Ply 1 REQD.



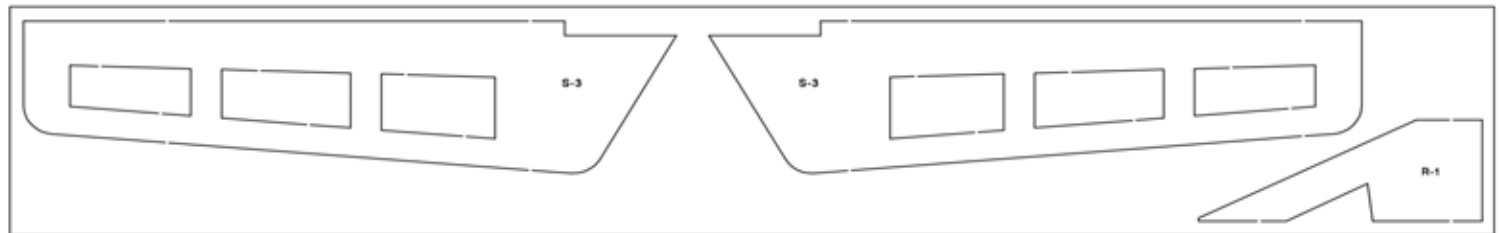
LC-503-07 1/18" X 4" X 24" BALSA 1 REQD.



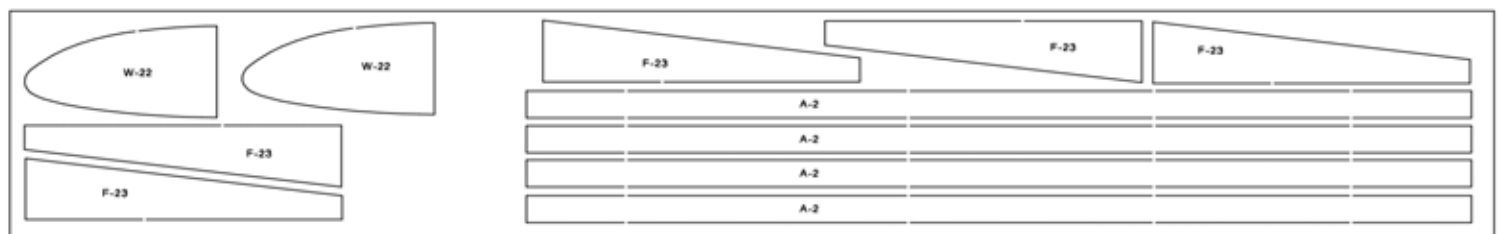
LC-503-08 1/8" X 4" X 24" BALSA 1 REQD.



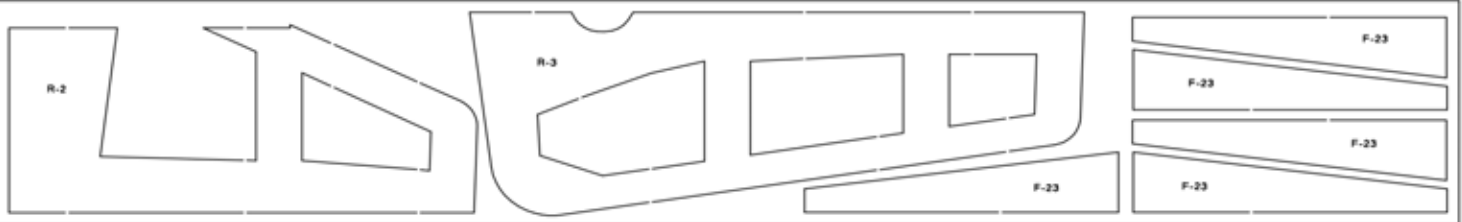
LC-503-09 1/8" X 4" X 24" BALSA 1 REQD.



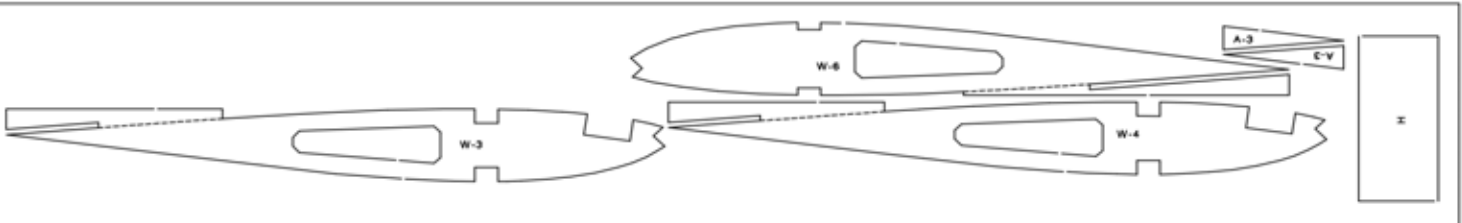
LC-503-10 1/8" X 4" X 24" BALSA 1 REQD.



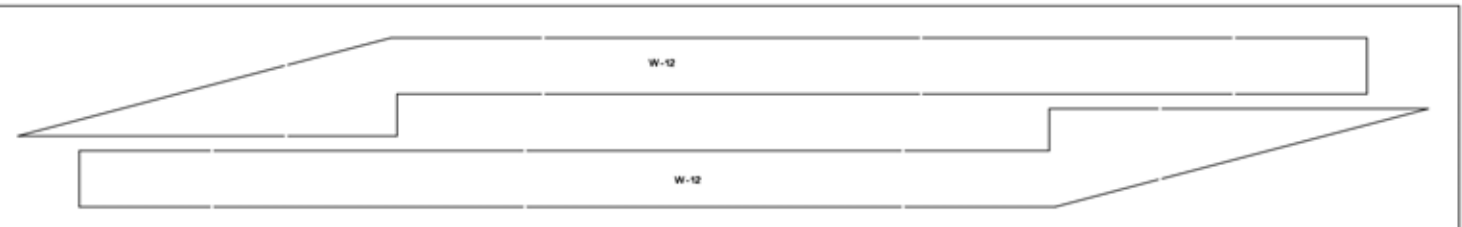
LC-503-11 1/8" X 4" X 24" BALSA 1 REQD.



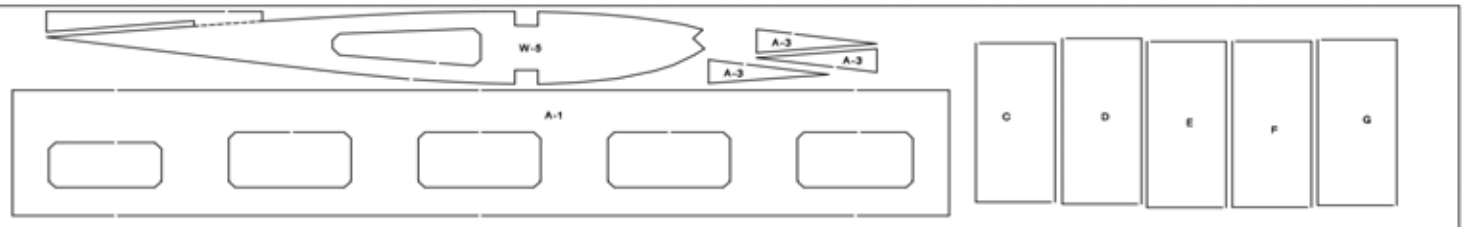
LC-503-12 1/8" X 4" X 24" BALSA 1 REQD.



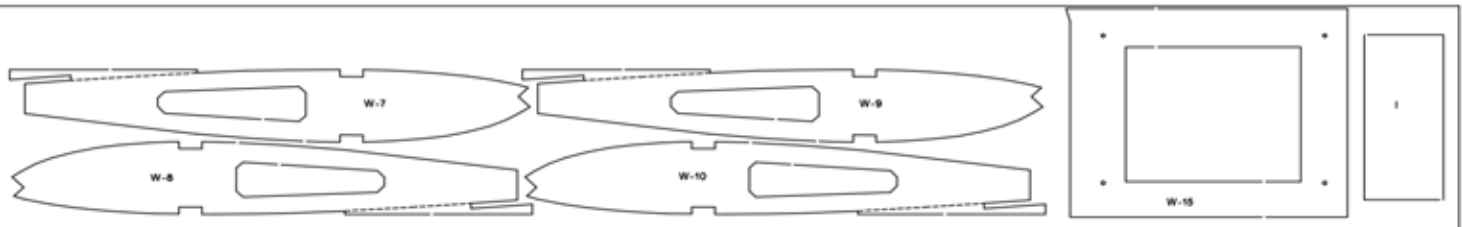
LC-503-13 3/32" X 4" X 24" BALSA 2 REQD.



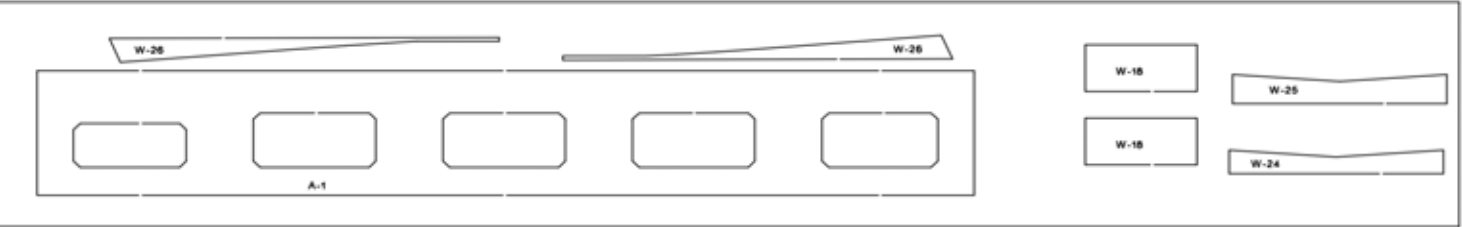
LC-503-14 3/32" X 4" X 24" BALSA 2 REQD.



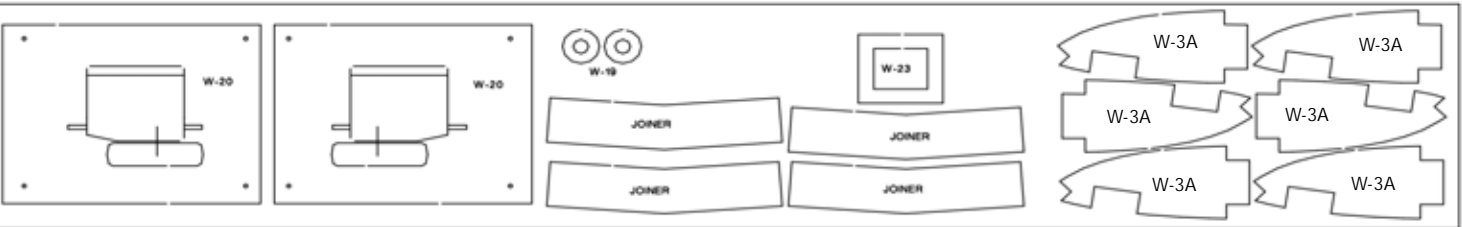
LC-503-15 3/32" X 4" X 24" BALSA 2 REQD.



LC-503-16 3/32" X 4" X 24" BALSA 2 REQD.



LC-503-17 3/32" X 4" X 24" BALSA 2 REQD.



LC-503-18 1/16" X 4" X 24" BIRCH PLY 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 S-1 and S-2 together as shown.



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



3...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.



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

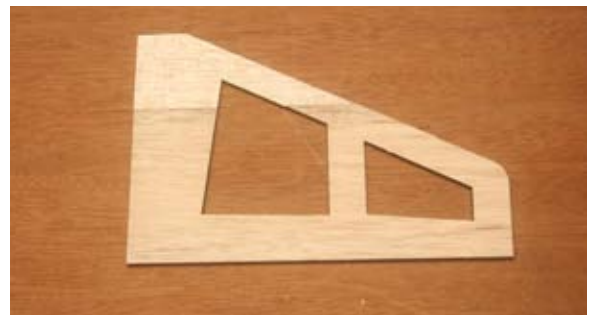
5...Bevel the front edge of the S-3's as shown on the plan, and sand the other edges round. Sand the front and ends of the stabilizer round. Leave the back edge square.

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





6...Glue R-1 and R-2 together.



7...Use 1/16" x 4" x 24" balsa to sheet both sides of R-1/R-2, and R-3.

8...Bevel the front edge of R-3 as shown on the plan, and sand the other edges round.

Mark the hinge locations and cut the hinge slots. Temporarily install the hinges without glue. Sand the outside edges round. Leave the other edges square.



### **Building the Wing:**

### **Building the Right Wing:**

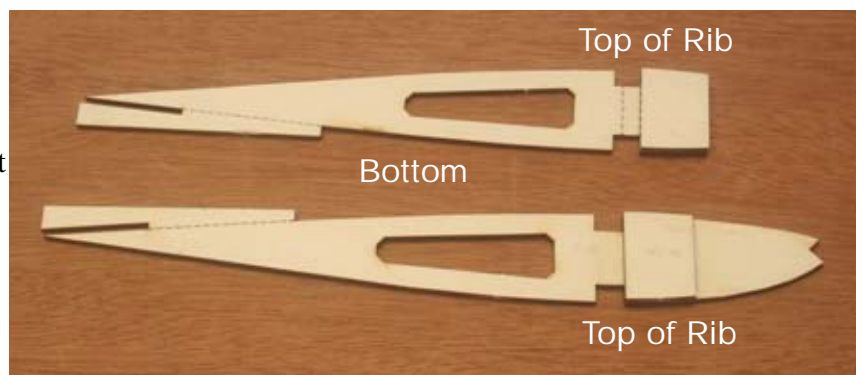
9...Cover the right wing plan with wax paper to prevent the parts from sticking to the plan.



10...Cut two 12" pieces from one of the 1/8" x 3/8" x 36" bass strips.

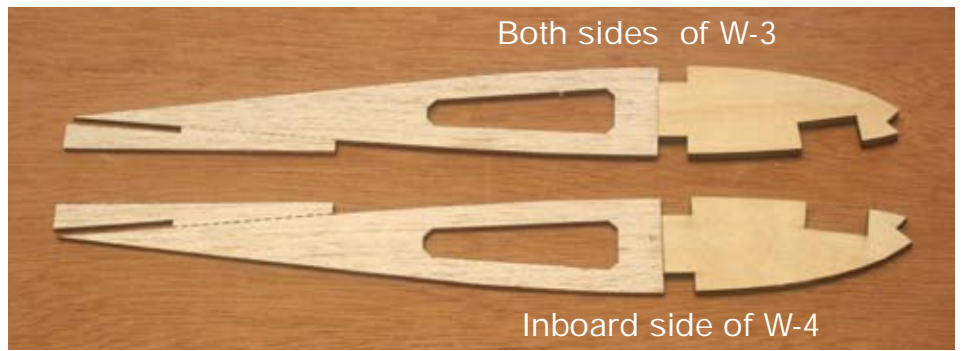
11...Glue these two 12" pieces to two 1/8" x 3/8" x 36" bass strips as shown to make the main spars.

12...Glue a W-1A to a W-1 and a W-2. Position the ribs as shown while gluing the W-1A's so that when upright, the W-1A's face each other.





13...Glue a W-3A to both sides of rib W-3. Glue a W-3A to the inboard side of rib W-4.



14...Glue two W-13's together, Glue two W-14's together, and Glue two W-16's together,



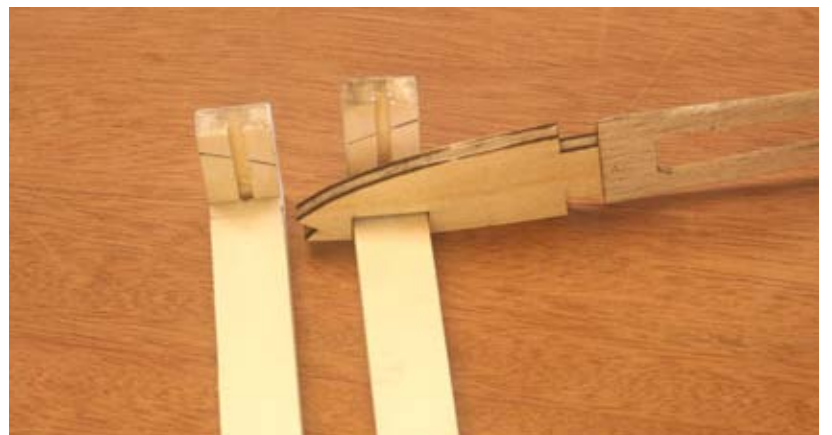
15...Make two trailing edges by placing W-12's against the 3/32" x 1-1/2" x 18" balsa sheets. The end of W-2 should be flush with the end of the 1-1/2" balsa. When properly positioned, glue the two pieces together.



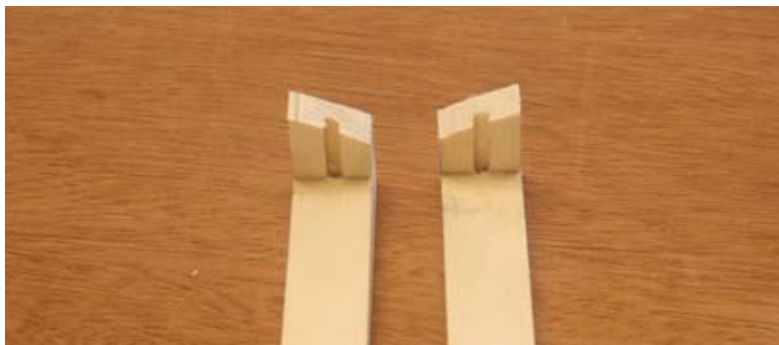
16...Glue the LG-2 grooved blocks onto the top of the LG-1 grooved blocks as shown.



17...Insert the landing gear block into the notch in W-3. Mark the upright (LG-2) at the top of W-3. **BE SURE TO MAKE A LEFT AND RIGHT HAND ASSEMBLY.**



18...Trim the top of LG-2 on the marked line to match the top of W-3.

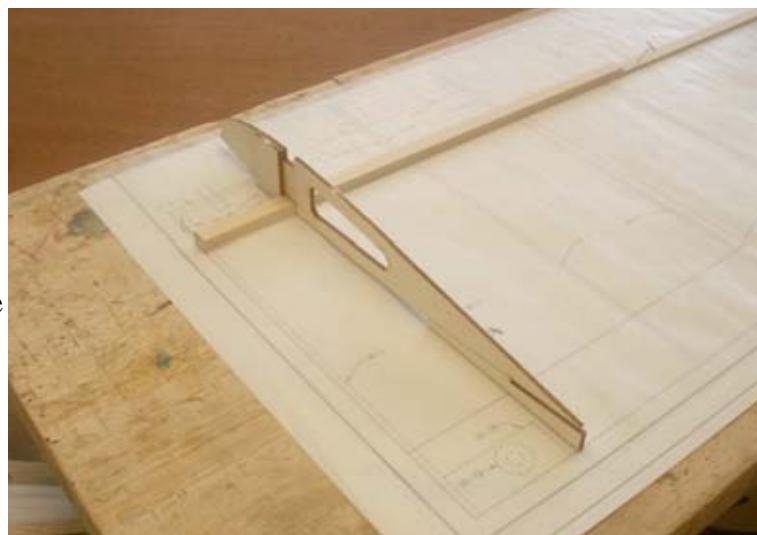


19...Drill a hole through LG-1 with a 5/32" drill bit. Place the drill in the groove in LG-2 and drill down through LG-2 as shown.

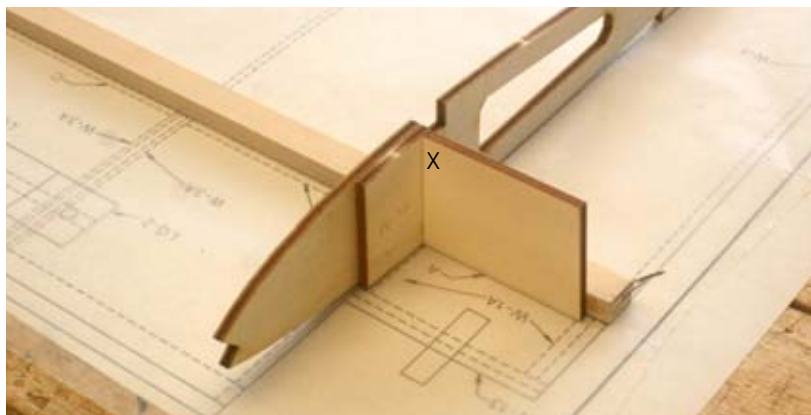


20... Pin the lower main spar to the plan. The inboard end (with the doubler) should be flush with the wing centerline on the plan. Let the outboard end extend past the W-11 rib at the wing tip.

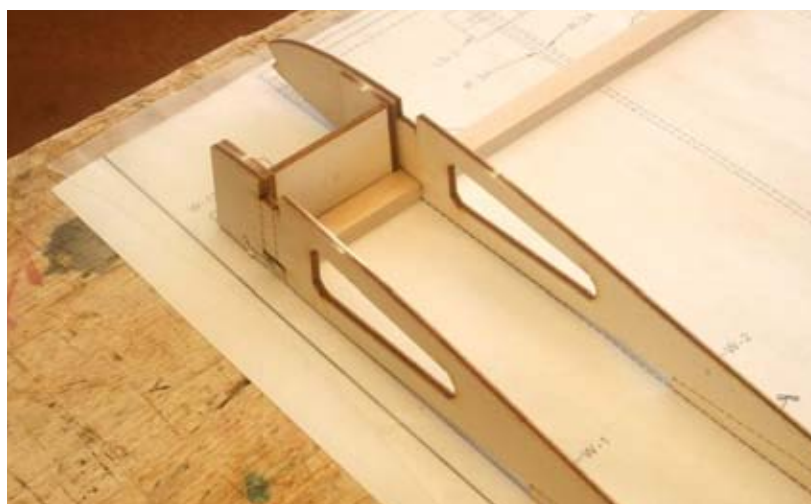
21...Pin and glue rib W-2 into position on the bottom spar. It should be 90 degrees to the building board. The W-1A should face toward the inboard end of the wing.



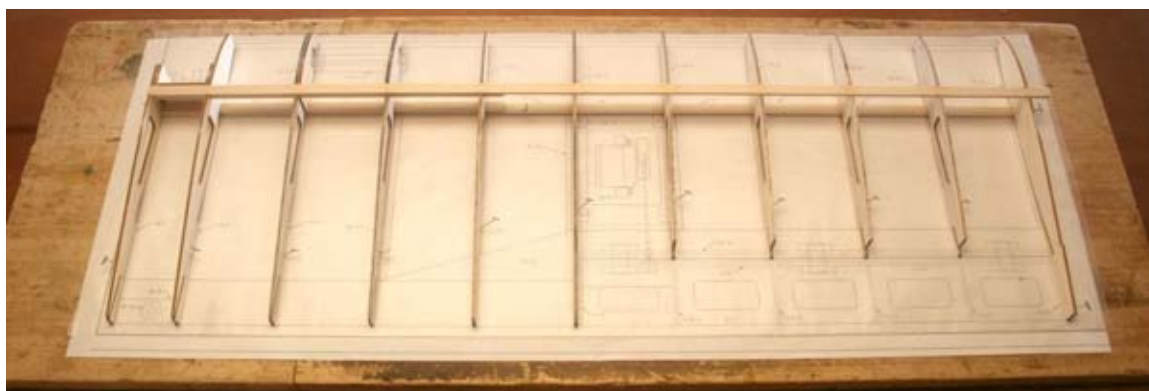
22...Glue shear web "A" into position against the front face of the lower spar and against rib W-2 as shown on the plan.  
The small "X" on the shear web marks the top out-board corners of the shear web.



23...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.

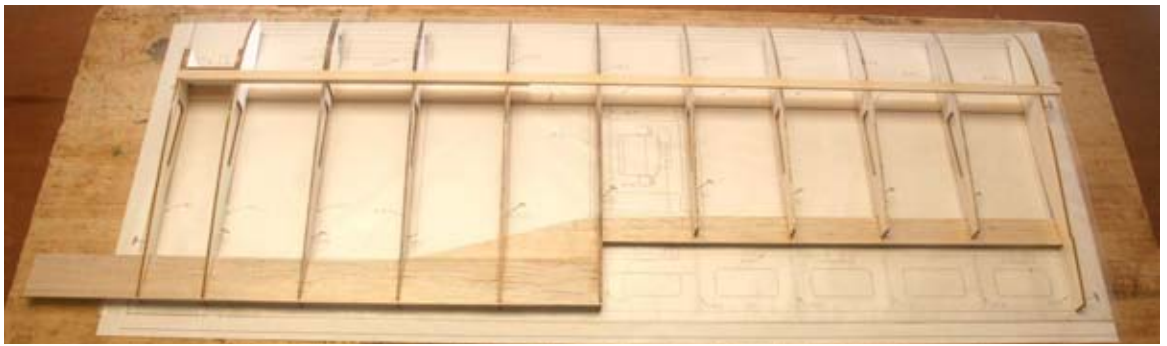


24...Pin and glue ribs W-3 through W-11 into position on the spar. They should be 90 degrees to the building board.



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





26...Working from the tip to the center, slide the trailing edge under W-11 and then into the slots in the remaining ribs. Line up the aileron cutout with the outboard edge of W-6. Make sure that the trailing edge is fully forward in the slots and glue in place.

27.. Put one W-14 assembly into position and glue to the ribs and bottom trailing edge sheet between ribs W-6 and W-11. Cut and glue three 1/4" sq. balsa fillers to the back of W-14 in the locations of the aileron hinges.



28...Place the top trailing edge sheet into position and glue into place.



29...Glue two W-18's together. Sand a taper on these parts so that they fit between the trailing edges. Glue in place between the W-1 and W-2 ribs.



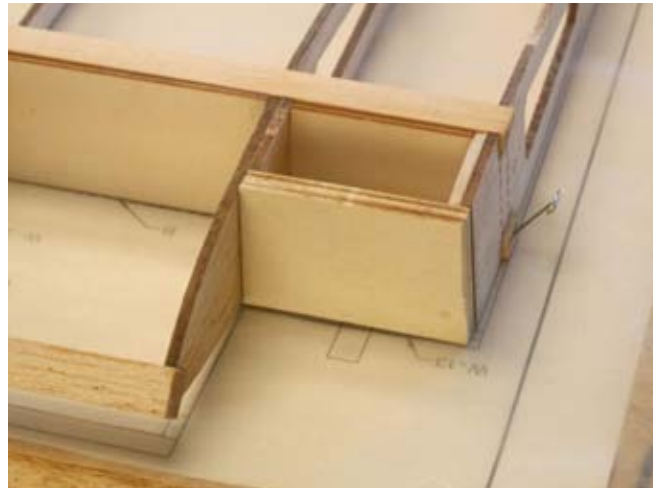
30...Glue the remaining shear webs B, C, D, E, F, G, H and I into position. Trim the ends to get the proper fit if needed.





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

32...Securely glue a W-13 assembly into position on the front of the W-1 and W-2 ribs. The angled edge should be aligned with the W-1 rib.



33...Position the 3/32" x 3" x 30" leading edge sheet against the leading edge as shown. When positioned properly, glue the sheet to the leading edge only.



34...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.

35...Cut two pieces 8-1/2" long from one of the 3/32" x 4" x 24" balsa sheet. Save the left over piece for use in the next step. Use the 8-1/2" pieces to sheet the inboard end of the wing from W-1 to just slightly past W-4, and between the leading edge sheet and trailing edge sheet.



36...Cut 1/4" strips from the left over sheet from the previous step.



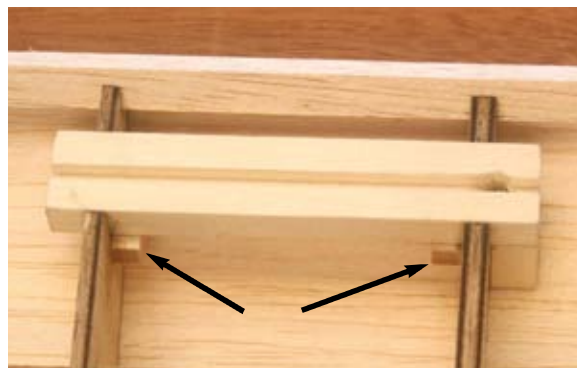
37...Use these 1/4" wide strips as cap strips and glue into position on top of the W-5 thru W-11 ribs. The cap strips should be centered on the ribs except for W-11. The W-11 cap strip should be flush with the outboard face of the rib and extend inboard.

38...Remove the wing from the plan. Trim the supports from the bottom trailing edge of the wing ribs.





39...Glue (with epoxy) the landing gear block into position in the notches in the W-3 and W-4 ribs. LG-2 should be glued to the plywood W-3A rib. Glue 1/4" sq. balsa braces into position as shown.



40...Using 3/32" x 3" x 30" 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. The sheet should be glued to the landing gear blocks but be careful to not get glue into the landing gear slot.

41...Sheet the inboard end of the wing as you did the top.



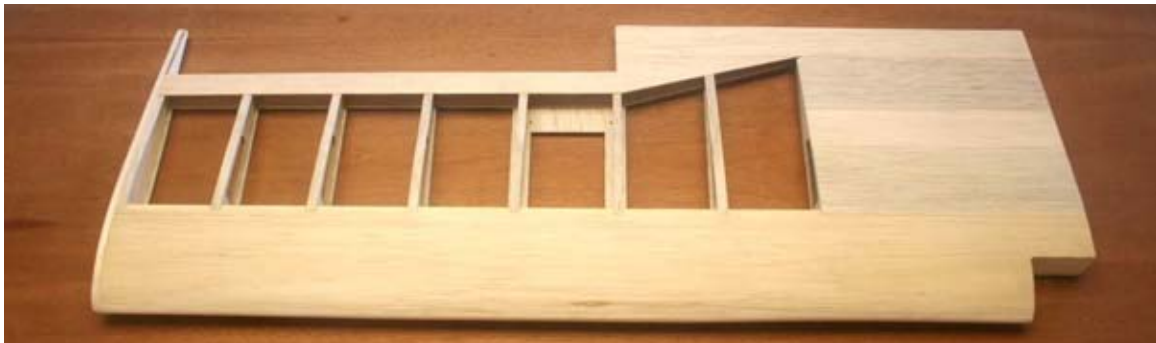
42...Test fit W-15 on ribs W-6 and W-7 as shown. Trim if required to fit tight against the leading edge sheet and the trailing edge. When the proper fit has been achieved, glue W-15 into place.







43...Cut, fit and glue 1/4" wide cap strips to the remaining ribs as you did the opposite side.



44...Trim the excess spars and sheet flush with the ribs on both ends of the wing. Glue a W-16 assembly to W-11. Sand the leading edge of the wing round to match the profile shown on the plan. Sand the trailing edge and the edges of the wing tip round. Leave the edges of the aileron cutout square. Now sand the wing smooth all over.

45...Glue the four W-17's into position on top of W-15 on the inside of the wing. The W-17's should be centered on the holes in W-15. Flip the wing over and using the holes in W-15 as a guide, drill pilot holes in the four W-17's.



46...Poke around with a straight pin to locate the slot in the landing gear block under the lower leading edge sheet. Slowly and carefully cut away the leading edge sheet from the landing gear slot.



47...Insert a landing gear leg into the slot in the wing. Trim the slot and radius the inboard end near the hole to allow the landing gear to be completely seated in the slot.

Place two nylon landing gear retainers into position as shown. Angle them so the screw holes are closer to the wire. Draw around the retainers to mark their locations.



48...Remove the landing gear wire and cut the balsa away from the retainer locations.



49...Replace the landing gear wire. Hold the retainers in position and drill small pilot holes into the landing gear block. Screw the retainers in place with #2 x 1/2" sheet metal screws. When happy with the fit, remove the landing gear and set it aside until the final assembly.



Repeat steps 9 thru 49 to build the left wing.

### **Building the ailerons:**

Build the right aileron.

50...Glue two A-2's together.



51...Trim an slight angle on the bottom edge of the A-2's



52...Glue the A-2 onto and flush with the front of A-1. Place it with the angle down so it leans slightly back toward the trailing edge.



53...Glue the first A-3 rib into position. It should be flush with the end and 90 degrees to A-1.



54...Position two A-4's into position against A-2 and A-3 and glue into place.





55...Glue the remaining A-3's into place.

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

These fillers are shown on the plan but not in the photo.



56...Trim an angle on the top of the A-1's to match the angle on the top of the A-3's.



57...Glue A-1 onto the top of the aileron. Sand the ends, front, top and rear of the aileron flush.



58...Draw a line centered on the front of the aileron. Draw a line 1/8" back from the leading edge on the top and bottom of the aileron.



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



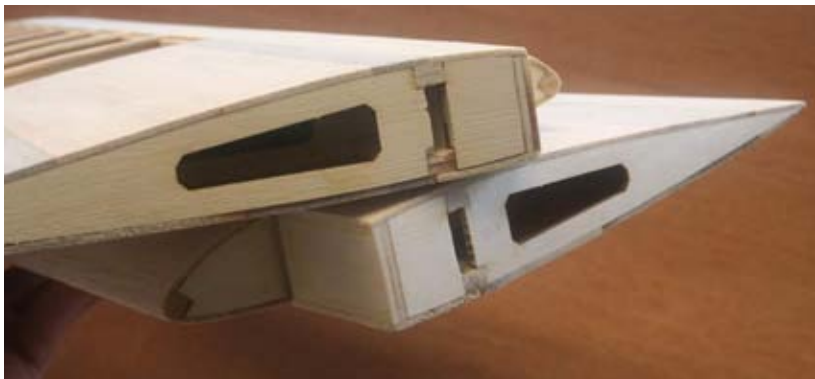
60...Mark a line centered on the back of the aileron spar (W-14). Mark the hinge locations and cut slots for the hinges. Temporarily install the hinges and check the aileron for proper fit on the wing. Do not glue the hinges at this time.

61...Repeat steps 50 thru 60 to build the left aileron.



### **Joining The Wing:**

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



63...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.

64...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.

65...Glue the 2" dacron tape into position on the top of the wing. Start at front end. Tack the front end down, centered on the joint.

Now pull the tape tight and tack at the rear. Pull the tape around the trailing edge and tight onto the joint on the bottom of the wing. Tack glue the tape at the leading edge. 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.

Now sand the wing smooth all over.



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

**Building the Fuselage:**

67...Assemble the **RIGHT** fuselage side using parts F-1R and F-2 . Assemble the **LEFT** fuselage side using parts F-1L and F-2. **Be sure to make a right hand and a left hand side.**

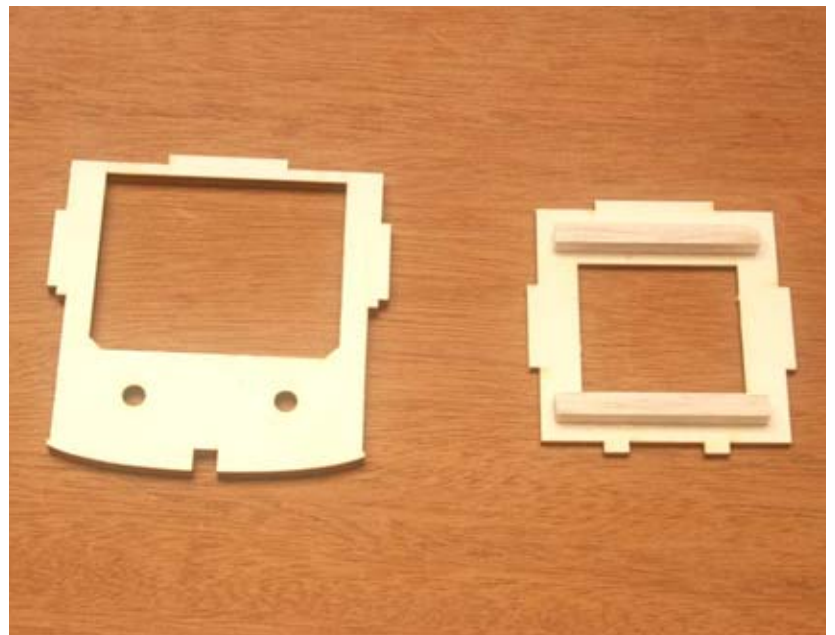




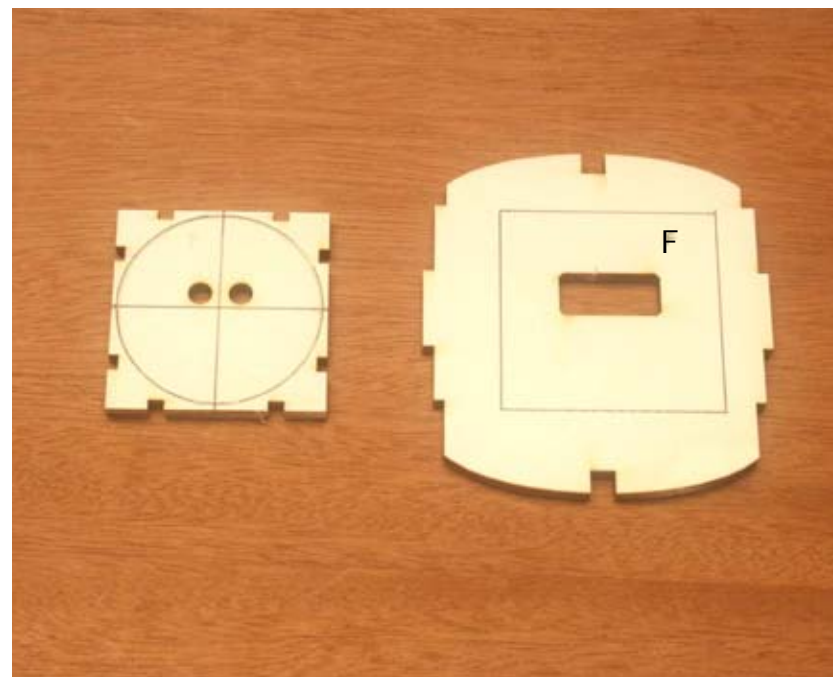


68...Glue the F-3R doubler to the **inside** of the **RIGHT** fuselage side. Glue the F-3L doubler to the **inside** of the **LEFT** fuselage side. **Be sure to make a right hand and a left hand side.** Use the drawing on the plan to properly locate the doublers on the fuselage sides.

69...Glue the two F-4's together. Glue two 1/4" sq. balsa braces to the front of F-9 as shown.

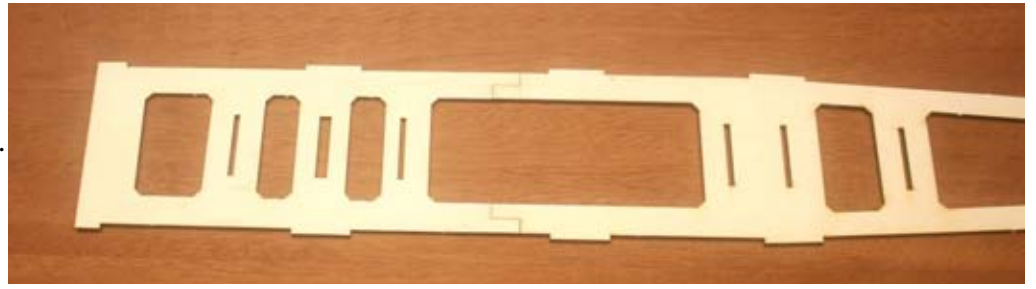


70...Glue the two F-7's together. Glue the two M-1's together.



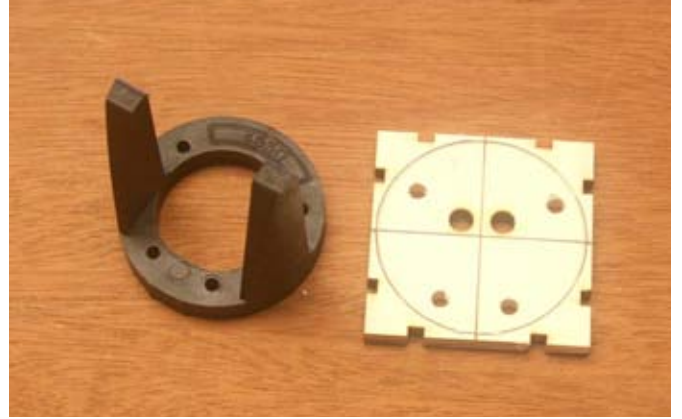


71...Glue F-10a to the front of F-10B.



**MOTOR LENGTH NOTE:** Measure your motor + spinner + mount against the plan to determine the length of the motor mount box. Trim the M-2's and M-3's to the length needed for your motor. Some longer motors may not need the mounting box at all and the motor mount should be bolted directly to the front of F-7.

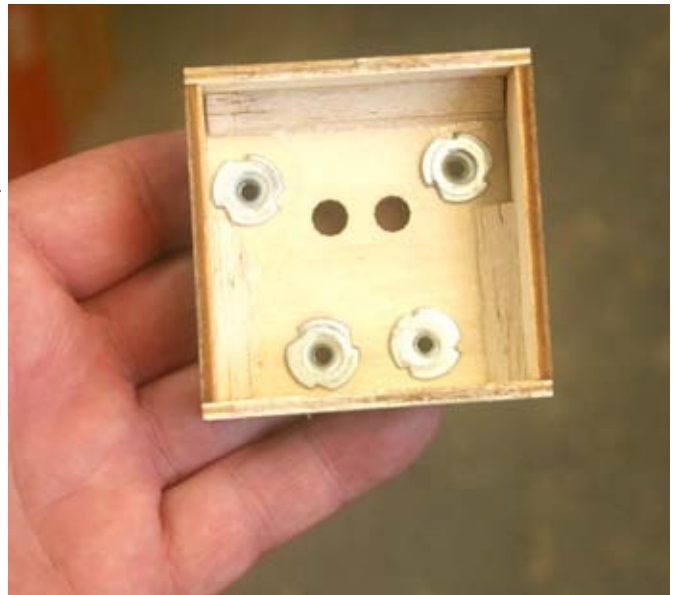
72...Using the motor mount as a guide, drill the mount holes in M-1 as shown.



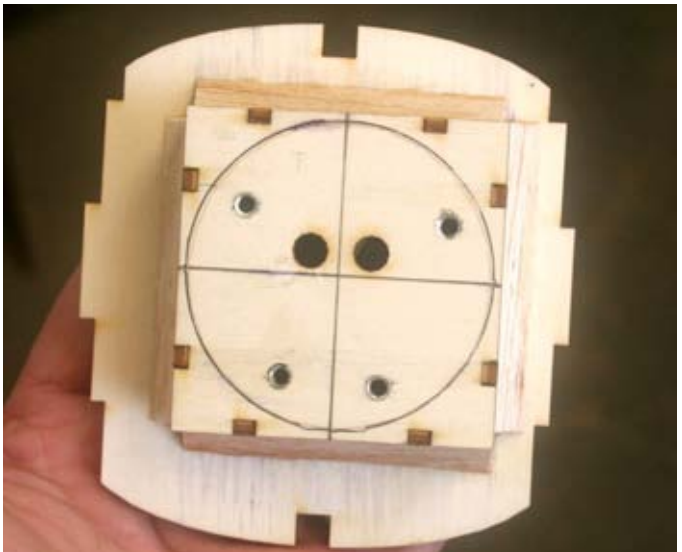
73...Press the 6-32 blind nuts into the mount holes in the back of M-1.

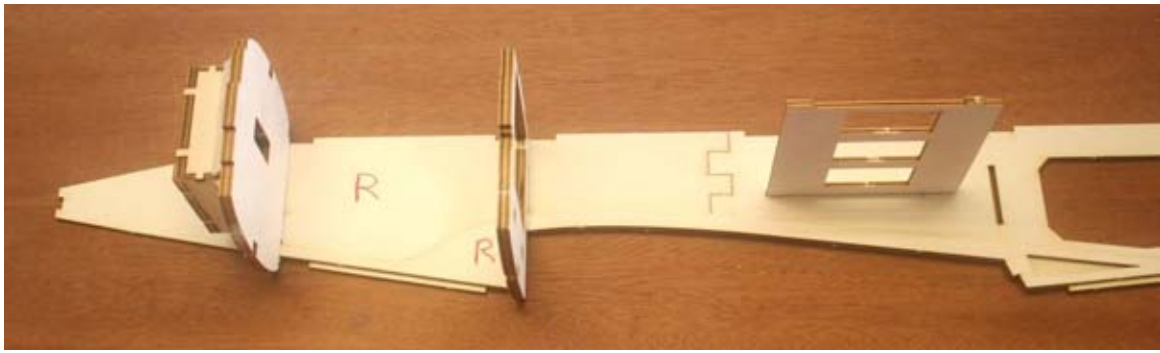
Assemble the motor mount box onto M-1. The M-2's go on the top and bottom. The M-3's go on the sides.

After the box is assembled, glue three pieces of 1/4" balsa triangle into the places shown.



74...Securely glue the motor mount box to the front of F-7. Use epoxy. Glue 1/4" balsa triangles on all four sides as shown.

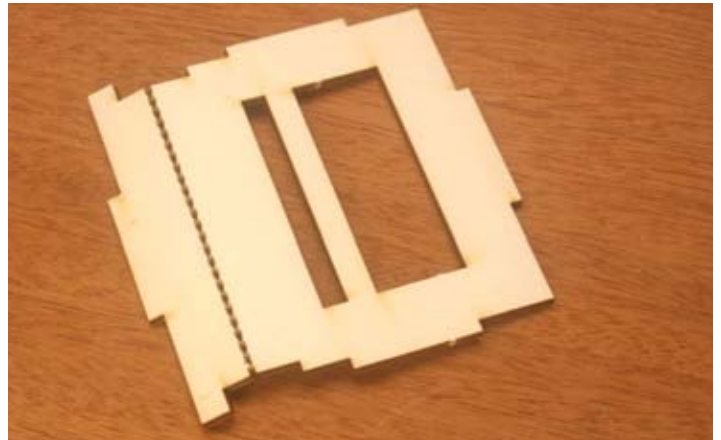




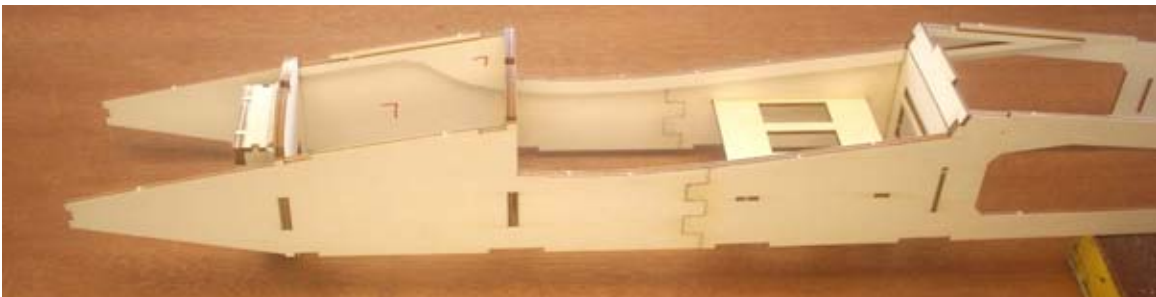
75...Place formers F-7, F-4 and F-5 into position on the right fuselage side. F4 and F-5 should be completely seated against the side and be 90 degrees to the fuselage side. When properly positioned, glue F-4 and F-5 securely to the fuselage side. F-7 should be completely seated but only tack glued with a small amount of glue.

76...Gently score F-6 on the dashed line with your hobby knife. Do not cut all of the way through.

Carefully crack along this line and bend the bottom section back slightly.

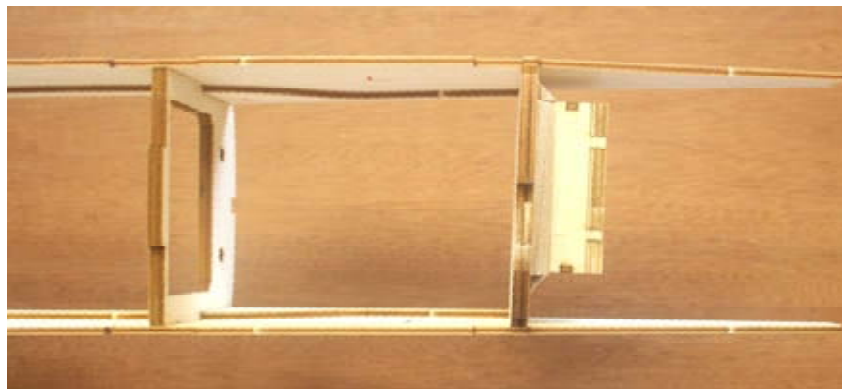


77...Place F-6 into position on the fuselage side. Bend the bottom back into full contact with the side. The top section should be 90 degrees to the fuselage side. When in the proper position, glue F-6 to the fuselage side.

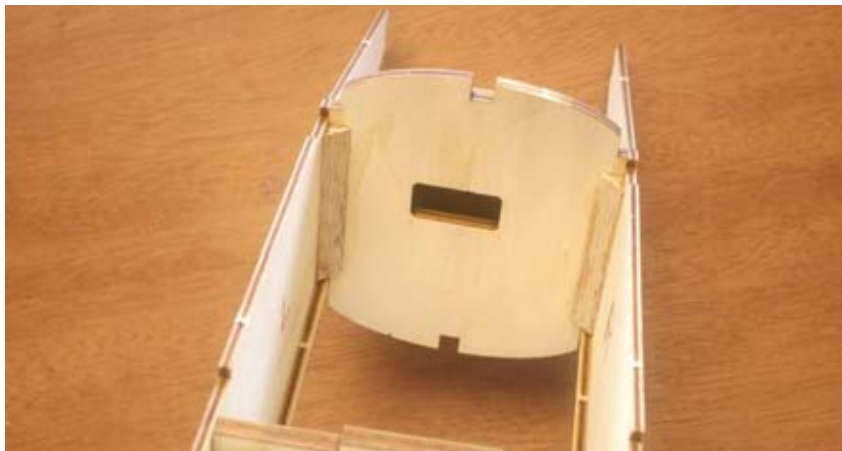


78...Position the left fuselage side into position on the formers. They should be completely seated against the side. F-4, F-5 and F-6 should be 90 degrees to the fuselage side. When properly positioned, glue formers F-4, F-5 and F-6 securely to the fuselage side.

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



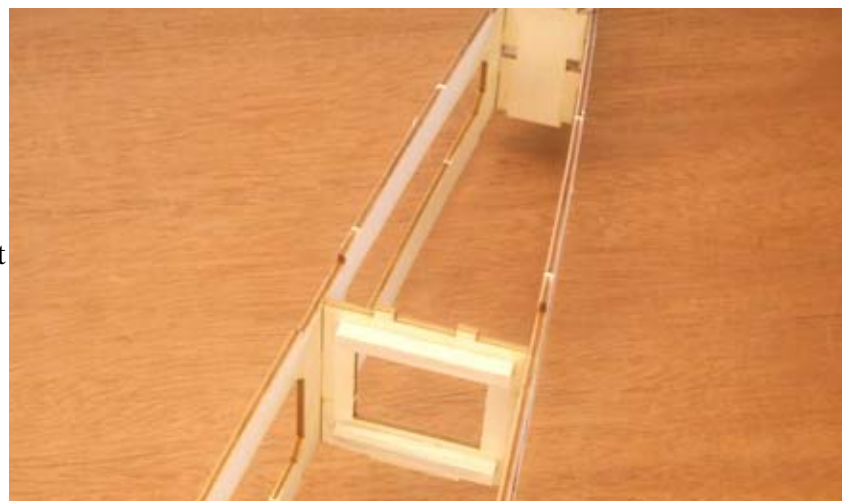
80...Glue pieces of 1/4" balsa triangle into place behind former F-7 as shown.



81...Place former F-8 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.



82...Glue former F-9 into position and glue in place. The 1/4" balsa braces should be on the front side.





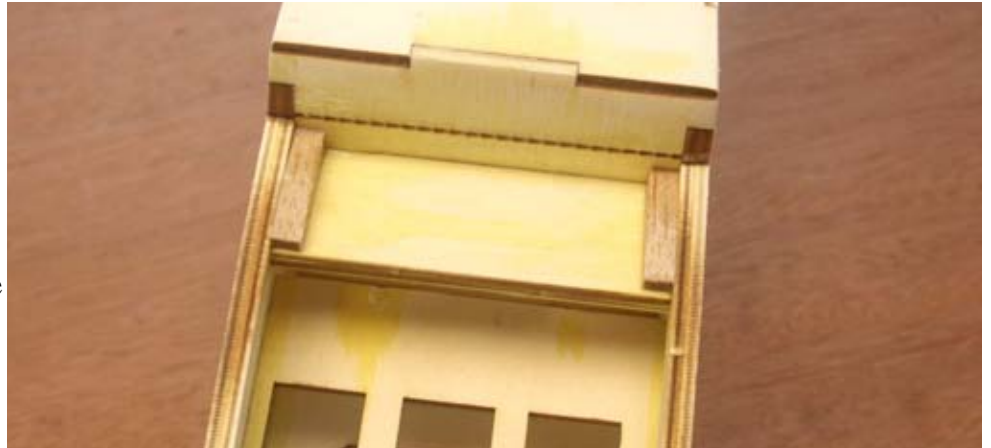


83...Glue F-10 into position on the top of the fuselage. Spread and squeeze the sides as required to get F-10 to fit in the proper position. The front of F-10 is angled and should match the angle to the right of Former F-7.

84...Glue F-11 into position on the bottom rear of the fuselage. Spread and squeeze the sides as required to get F-11 to fit in the proper position.



85...Glue two F-12's together. Securely glue the F-12 assembly into place in the notches in the back of the F-3 doublers. Glue to the fuselage sides and F-6. Glue a 1/4" triangle between F-3 and F-16. When the glue is dry, trim the tops of the triangles to match the contour of the wing saddle.



86...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-4 and the top of the wing completely seated in the wing saddle.



87...Mark the bolt holes on the back of the wing using the template on the plan as a guide.



88...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-12 in the fuselage. The drill bit must be 90 degrees to the bottom surface of the wing so the bolt heads will sit flat. Glue the W-19's on the bottom of the wing centered on the drilled holes.



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-12. Apply some thin C/A to harden these threads and when the glue is dry, re-tap to clean up the threads.

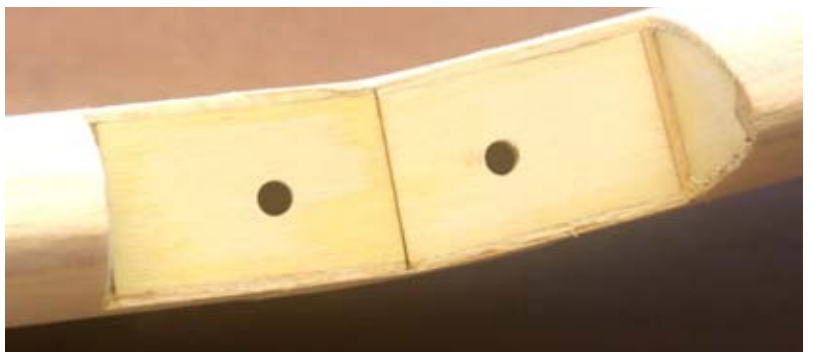
Use the two 1" nylon bolts to attach the wing to the fuselage.



89...With the bolts in place, **Hold the center section tightly against the fuselage**. Use a 1/4" drill bit to mark holes through F-4 into the front of the wing.



90... Remove the wing and drill the holes in the front of the wing for the dowels.



91...Insert the 1/4" dowels into the holes in W-13. They should stick out 3/8". Securely glue the dowels into position.



92...When the glue is dry, check the fit on the fuselage again.



93...Place F-13 into position on the lower front of the fuselage. The angle on the front should match the angle of F-7. When W-13 is in the proper position, securely glue it into place.



94...Glue F-14 in place on F-13. It should be positioned 90 degrees to F-13.



95...Glue a 1/4" sq. balsa strip into the notches in formers F-4, F-14 and F-7. When the glue is dry, trim flush at the front and back.



96...Cut a piece from one of the 3/32" x 4" x 24" sheets 6" long. Now split this in half to make two 2" wide pieces.



97...Glue two pieces of 1/4" sq. balsa on top and at the edges of F-13. They should be tight against the formers.

Position and fit one of the 3/32" x 2" x 6" sheets against the outer 1/4" strips, just touching the formers. Sand or trim to get a good fit against the 1/4" sq. pieces, and then glue the sheet to the 1/4" piece only.

See detail on the plan.





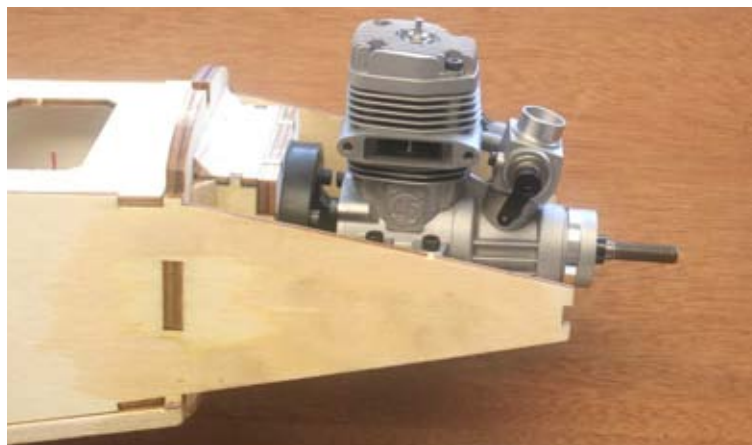
98...Moisten the outside of the sheet with an ammonia based window cleaner such as Windex. Roll the sheet around the formers. Trim it so that it ends at the center-line of the middle 1/4" sq. stringer. Glue the sheet into place. When the glue is dry, trim the front flush with the formers.



99...Fit and glue the other sheet on the opposite side as you did the first.



100...Install the motor and mount.



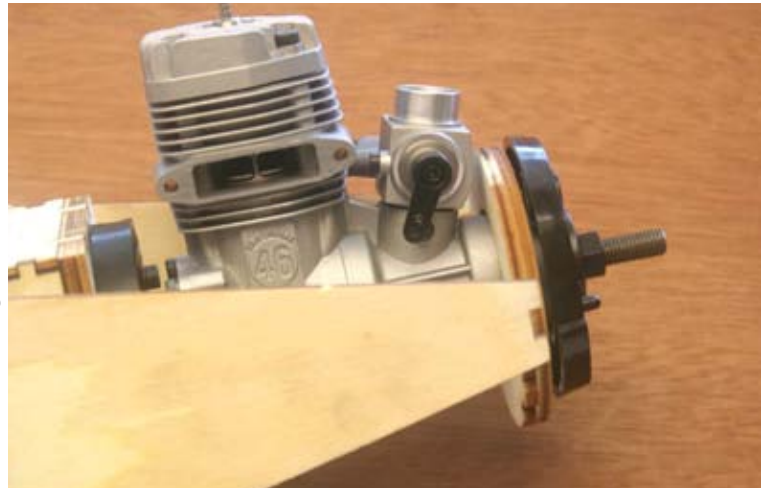
101...Glue F-15 and F-15A together.



102...Slide the F-15's over the crankshaft. Secure the spinner backplate on the motor.

Pull the fuselage sides into contact with F-15. Center F-15 with the spinner backplate. You might have to rotate F-15 180 degrees to get the proper fit.

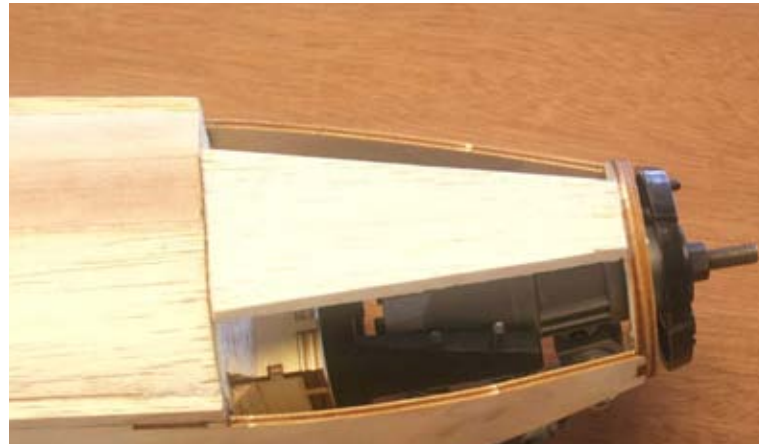
Glue F-15 to the fuselage sides. Hold as required to keep F-15 centered on the spinner backplate while the glue dries.



103...Cut, fit and glue a piece of 1/4" x 2" balsa sheet into position between F-7 and F-15 on the bottom of the fuselage. It should be flush with the bottom of the fuselage and the bottom of F-15.



104...Trim angles on the side of the 1/4" sheet as shown.



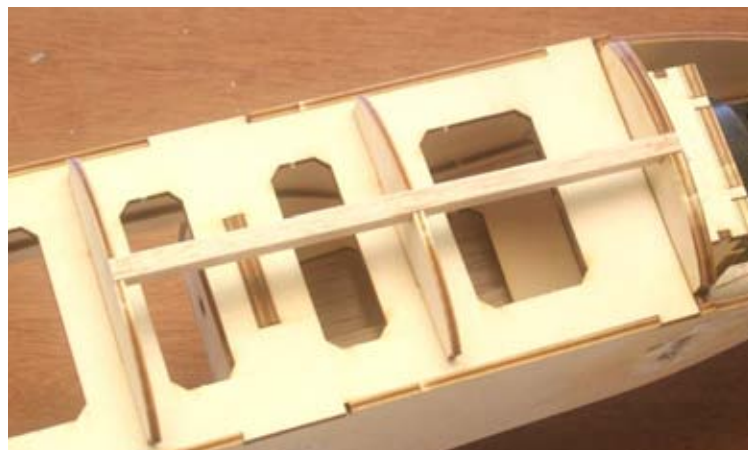
105...Cut additional pieces of 1/4" sheet to fill in the bottom of the nose on both sides. Taper small pieces to fill in any gaps to ensure a solid assembly.



106...Remove the motor from the model. Glue formers F-16 and F-17 into place on the top front of the fuselage. They should be positioned 90 degrees to F-10.

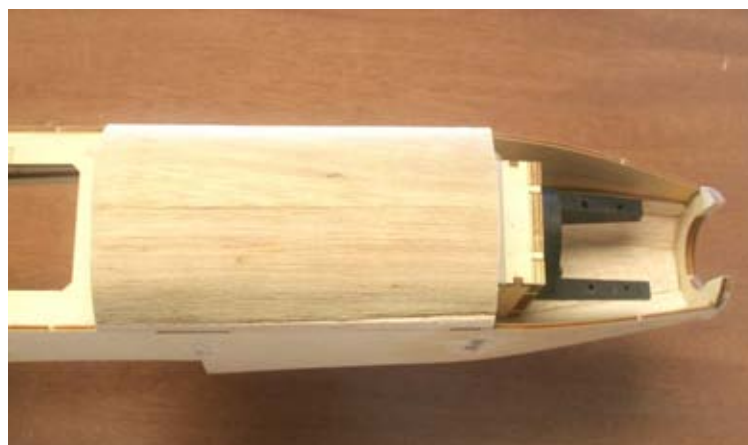


107...Glue a 1/4" sq. balsa strip into the notches in formers F-4, F-16 and F-17. When the glue is dry, trim flush at the front and back.



108...Glue the 1/4" sq. strips to the sides and sheet the top of the fuselage as you did the bottom.

Cut away the top of F-15 as shown for motor clearance.

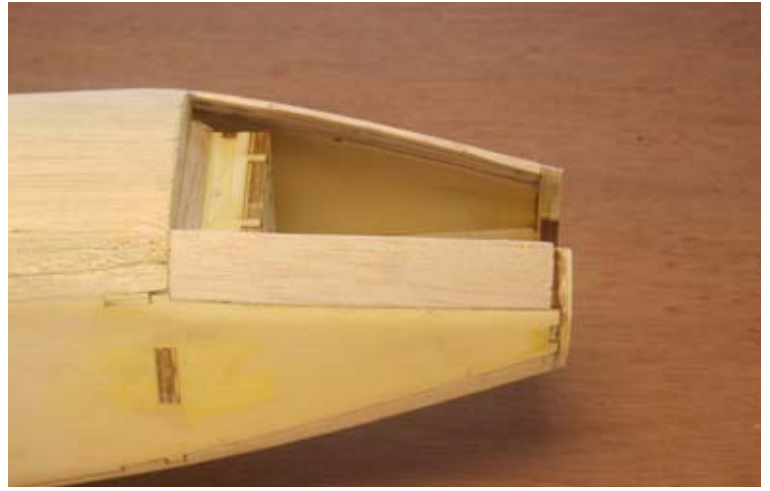


109...Cut two pieces of 1/4" balsa and glue them into position on each top side of the fuselage.

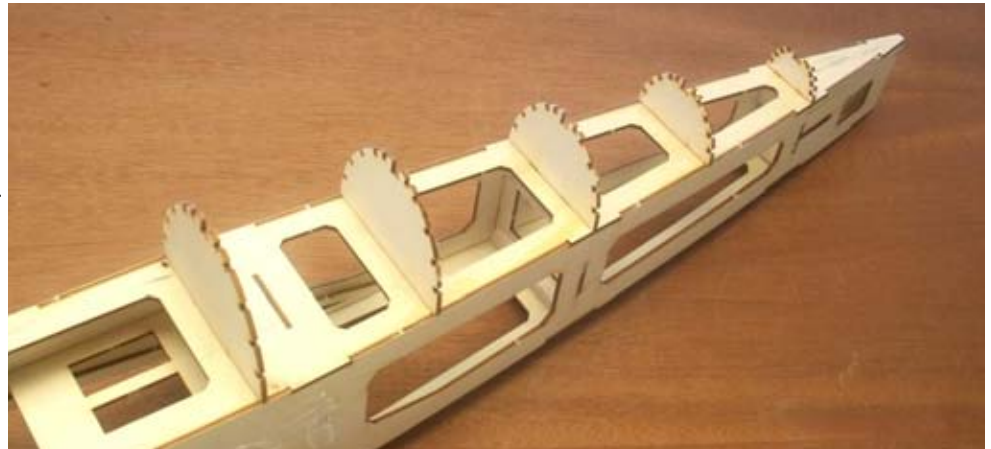




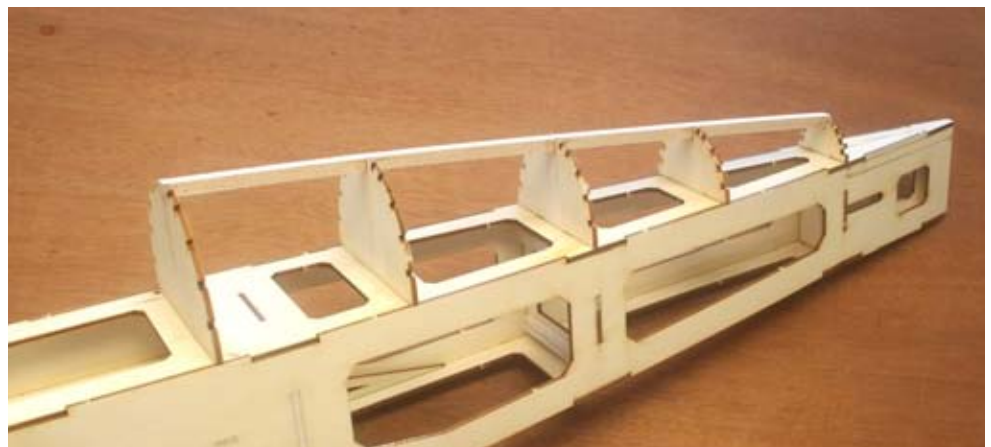
110...Shape and sand the front of the fuselage smooth.



111...Position and glue formers F-18 through F-22 on the top rear of the fuselage. They should be 90 degrees to the top of the fuselage.



112...Glue a 1/4" sq. balsa strip into the notches in the top of these formers. When the glue is dry, trim the ends flush.



113...Glue the 1/8" sq. stringers into place in the notches in the formers. When the glue is dry, trim the ends flush.



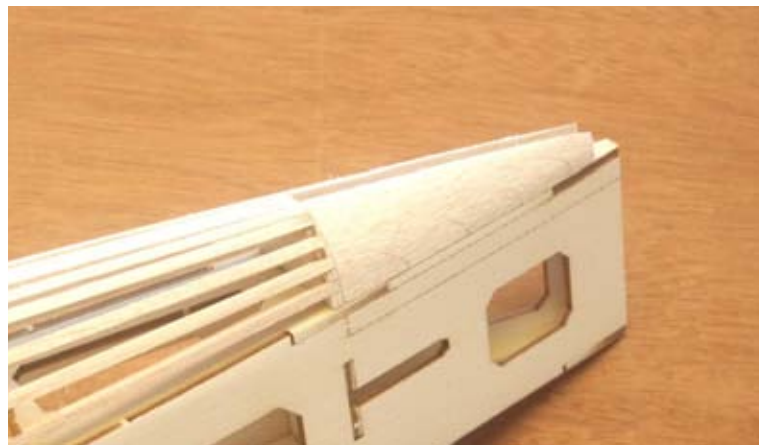
114...Glue two stacks of five F-23's together.



115...Glue the two F-23 assemblies into place at the back end of the fuselage. Use the fin to space and align them on the fuselage.



116...Trim and sand the F-23's to shape. Sand the fuselage smooth all over.



117...Drill a 1/4" drain hole in the bottom of the fuselage immediately in front of F-7.



118...Bolt the wing onto the fuselage. Draw two lines on the bottom of the wing to mark the fairing location.



119...Remove the wing from the fuselage. Place wax paper in position on the front and back as shown and bolt the wing back onto the fuselage.



120...Glue two W-26's together. Now glue the other two W-26's together. Glue the two W-24's together and glue the two W-25's together.

Position and glue the W-26's and the W-25 on the bottom of the wing as shown. They should be back, tight against former F-6. The W-25 will stick up above the W-26's.



121...Position and glue W-24 on the bottom of the wing as shown. It should be forward, tight against former F-4. It will stick up above F-4.





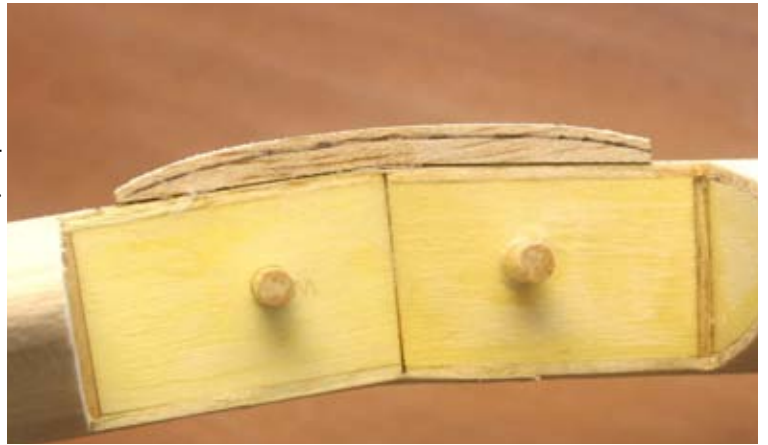
122...Remove the wing from the fuselage. Sand the top of W-25 flush with the top edges of the W-26's.



123...Bolt the wing back on the fuselage. Sand W-24 flush with the bottom of the fuselage.



124...Remove the wing and draw a line on the front of W-24, 3/32" down from the top. Trim this 3/32" from W-24.



125...Sheet the bottom of the fairing using the piece of 3/32" x 4" x 12" balsa.





126...Use scrap 3/32" sheet to blend in the front of the fairing with the bottom of the wing.



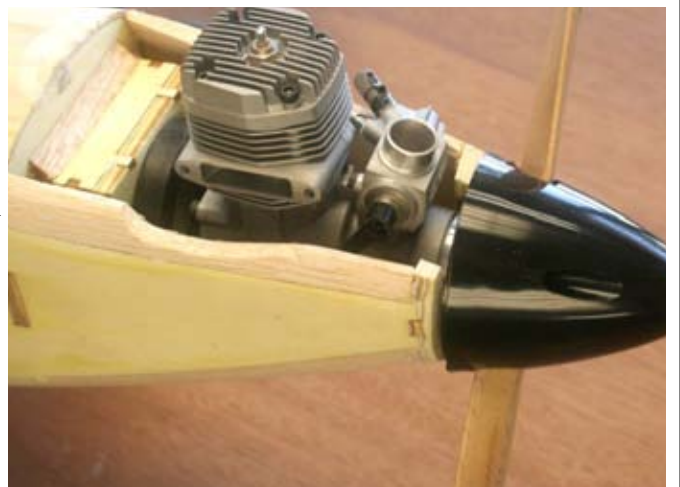
127...Cut two holes in the fairing for the wing bolts. Bolt the wing back onto the fuselage and sand the fairing flush with the fuselage.



128...Glue the W-22's to the wing to fill in the gap between the front of the wing and the fuselage.



129...Install the motor back on the model. Trim away the balsa on the sides of the motor to provide clearance for the muffler and needle valve. Trim F-15 flush with the top of the fairings as shown.

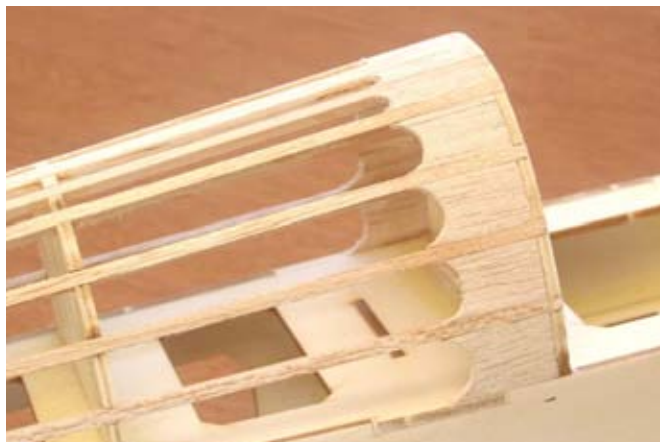


130...Cut on the dashed lines to remove the wood from the stabilizer slots on the fuselage sides. Temporarily mount the tailwheel bracket to the bottom of the fuselage. It should be positioned so that the 1/16" axle is just at the back of the fuselage as shown on the plan.

Test fit the tail surfaces on the fuselage. Sand or trim if required to obtain the proper fit.



131...For a smoother covering job, fill in between the 1/8" sq. stringers at F-18 with scrap 3/32" balsa. scallop the back edges as shown. You can also scallop formers F-19 through F-21 between the stringers. See the detail on the plan.



132...Trim the canopy oversize. Fit it on the model. Do a final trim so that the canopy overlaps the fuselage at the ends and bottom by 1/8"



### **Covering:**

133...Sand all parts smooth with 400 grit sandpaper. Feed strings from the aileron servo 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". Mask and paint the canopy with fuel proof paint. **WARNING: Test the paint on a scrap piece of the canopy plastic first to make sure will not damage the plastic.** Paint the inside of the cowl / motor area with fuel proof paint or epoxy to seal the wood.

**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

134...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 in the fuselage. Make sure that it is straight and square and then glue it into position.



135...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.



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

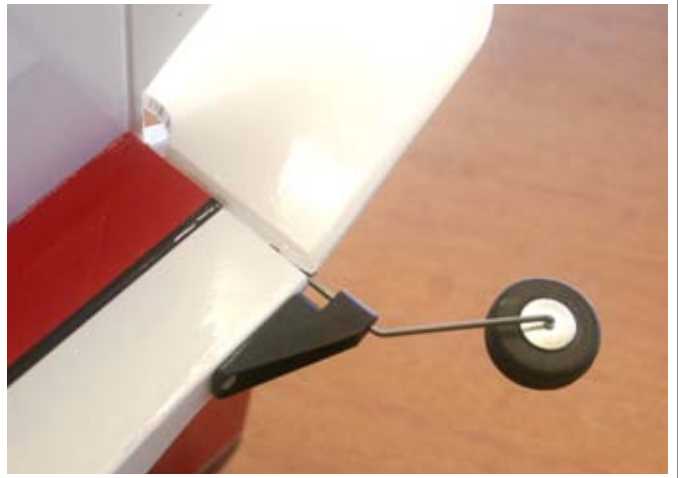


137...Attach the tail wheel bracket to the bottom of the fuselage. Glue the screws in place. Make the bottom two bends in the tail wheel wire as shown. Use the drawing on the plan as a guide. Install the wire into the bracket. Using the plans and the rudder as a guide, make the top bend in the music wire. Drill a 1/16" hole in the front of the rudder for the tail wheel wire. Attach the rudder with the hinges and glue in place. Use epoxy on the tail wheel wire.





138...Attach the tail wheel with a 1/16" wheel collar.



139...Insert the pushrod housings into the exit slots in the back of the fuselage. They should stop 1-3/4" forward of the hinge lines. Glue the housings to the rear exits.

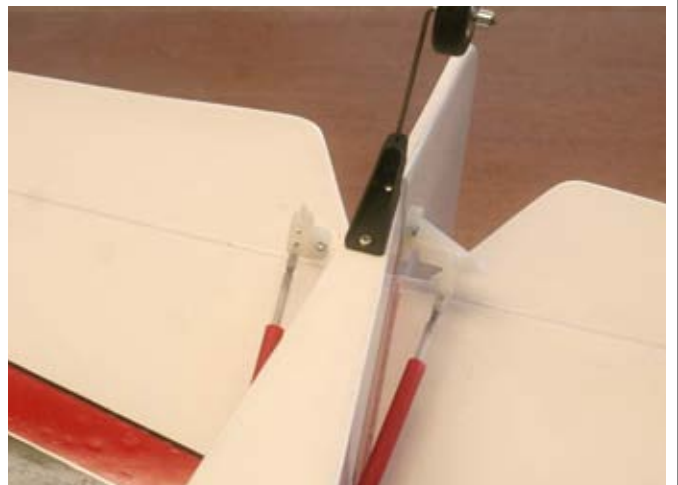


The front ends of the pushrod housings should pass thru the slot in former F-6. Do not glue the front ends to the former at this time.



140...Assemble the back end of the pushrods using short pieces of threaded rod and large clevises.

141...Attach the control horns to the elevator and rudder with **2-56 machine screws** and back plates. Slide the pushrods into the housings and connect the clevises to the horns.



142...Screw the servos to the servo tray.

143...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-6.



144...Seal the firewall with dope or epoxy. Attach the motor mount. Use a thread locker on the screws. Drill the firewall for the throttle cable.

Glue the throttle cable housing into the firewall.



145...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. 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.

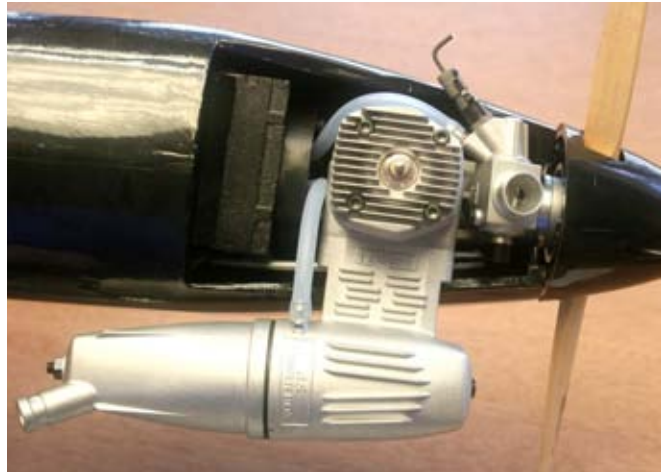


146...Assemble the fuel tank. Wrap with 1/4" foam rubber and slide into the tank mount tray while pulling the fuel and vent line through the firewall.

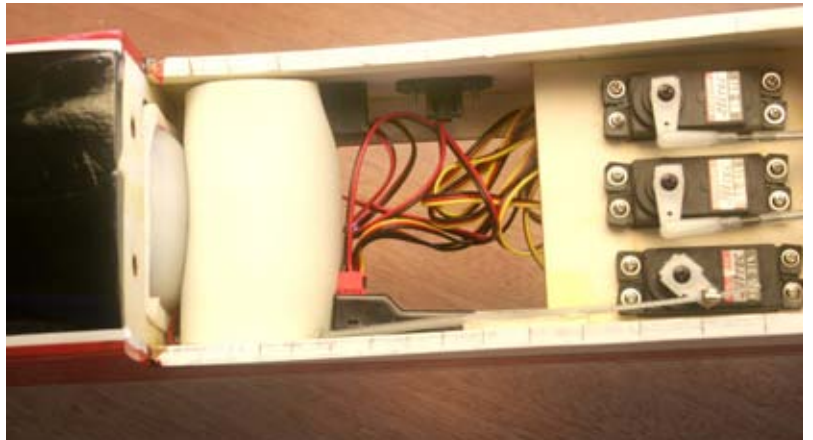
If you are using a flat battery pack, wrap it in foam and slide it in first, positioned under the fuel tank.



147...Mount the muffler to the motor. Attach the fuel line to the motor. Attach the vent line to the muffler.



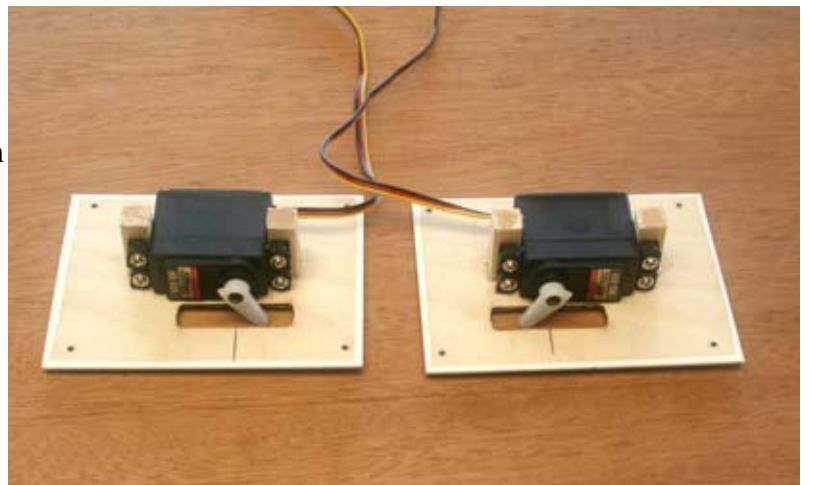
148...Wrap the receiver and battery pack with foam rubber. Secure the receiver and run the antenna in accordance with the radio's instructions.



149...Attach the ailerons to the wing with the hinges and glue in place. Cut the covering away from the aileron servo openings.



150...Glue the 3/8" sq. x 1" bass servo mounts to the W-20 mount plates. Mount the 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.





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



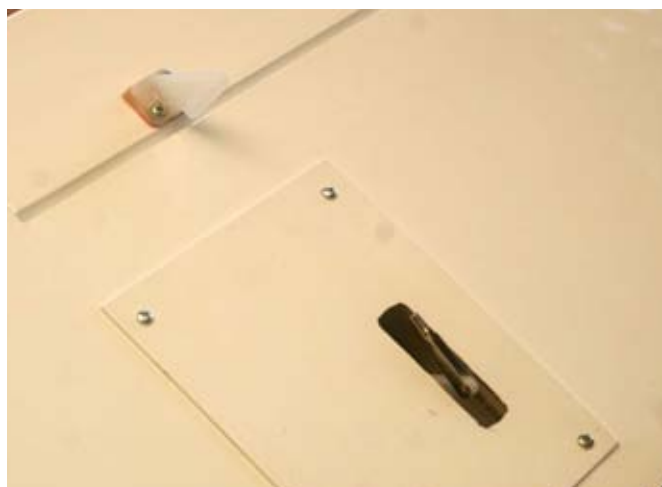
152...Trim and sand the two 3/16" x 1/2" x 1/2" bass blocks to the wedge shape shown.



153...Glue the aileron horn wedges to the aileron horns as shown. Note that the narrow edge faces front.



154...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.



155...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.



156...Attach parts LG to the back of the landing gear wires with a small amount of C/A. Wrap a 1/2" wide strip of covering material around the front of the landing gear wire and iron into position to secure parts LG to the landing gear wire.

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



157...Glue the canopy on the fuselage.



158..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.

159...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 (it probably won't) , you will have to add weight to the nose or tail. Glue or bolt any weight securely to the model.

160...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.