

The

# RAVEN

KIT # K-106

## *Assembly Instructions*



### **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-106-01           | .1/16" X 4" X 24" Laser Cut Balsa                             |
| 1    | LC-106-02           | .1/16" X 4" X 24" Laser Cut Balsa                             |
| 1    | LC-106-03           | .1/16" X 4" X 24" Laser Cut Balsa                             |
| 1    | LC-106-04           | .1/16" X 4" X 24" Laser Cut Balsa                             |
| 1    | LC-106-05           | .3/32" X 4" X 24" Laser Cut Balsa                             |
| 1    | LC-106-06           | .1/16" X 3" X 12" Laser Cut Balsa ( May be 1/32" x 3" x 12" ) |
| 1    | LC-106-07           | .3/32" X 4" X 12" Laser Cut Balsa                             |
| 1    | LC-106-08           | .3mm X 3" X 12" Laser Cut POPLAR PLY                          |
| 4    | Main Wing Spars     | .3/32" X 3/16" X 18" Balsa                                    |
| 4    | Wing Trailing Edges | .1/16" X 1/2" X 18" Balsa                                     |
| 2    | Wing Leading Edges  | .1/4" sq. X 18" Balsa   |
| 8    | Stringer Spars      | .3/32" X 3/32" X 18" Balsa                                    |
| 1    | Landing Gear Wire   | .1/16" X 12" MUSIC WIRE                                       |
| 2    | Ailerons            | .1/8" Laser Cut Balsa   |

### Hardware Bag

| Qty. | Name                            | Description                   |
|------|---------------------------------|-------------------------------|
| 4    | Blind Nuts                      | 4-40 Blind Nuts               |
| 1    | .1/16" Laser Cut Dihedral Brace | Wing Joiner                   |
| 3    | .1/8" x 3" Birch Dowel          | Wing Dowels & Elevator Joiner |
| 4    | Wing Center Section Sheet       | .1/32" X 1 1/2" X 3" Balsa    |
| 2    | .3/32" sq. x 2" Balsa           | Former Brace                  |
| 2    | .1/16" Wheel Retainer           | Wheel Retainers               |
| 4    | Control Horn                    | Control Horns                 |
| 3    | Sig EZ Hinge                    | Hinges                        |

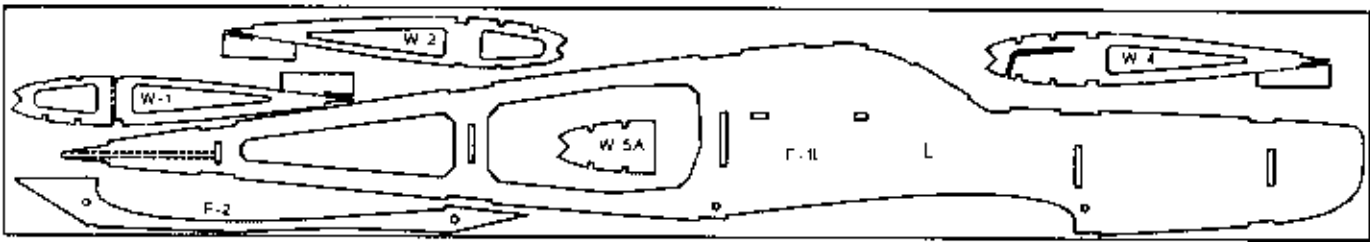
### Misc. Loose Parts

| Qty. | Name         | Description |
|------|--------------|-------------|
| 1    | K-106 PLAN A |             |
| 1    | K-106 PLAN B |             |

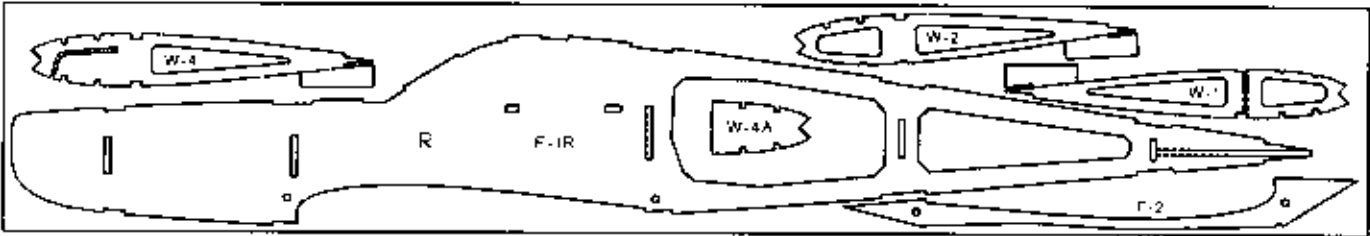
### Additional Items Required ( Not Included in Kit)

Note: These are parts that we have used and are familiar with. There are many other brands available and you may substitute other items that you are more comfortable with or have on hand.

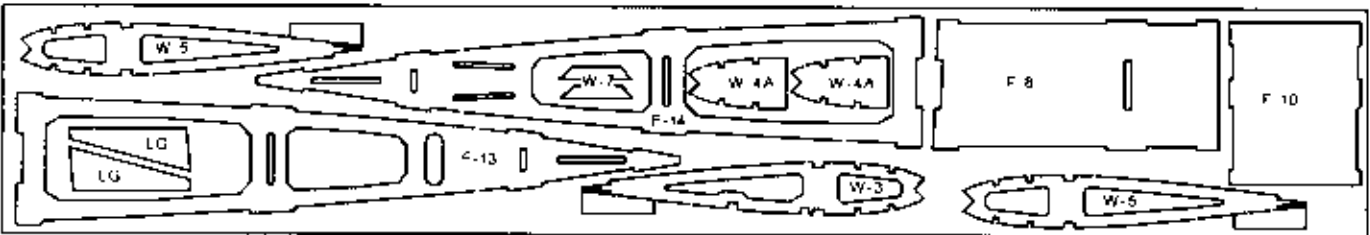
| Qty. | Name                 | Description   |
|------|----------------------|---|
| 1    | Motor                | ..Himax HC2808-1160 Brushless Motor ( Alien Aircraft P/N: AE-018)   |
| 1    | Speed Control        | ..Castle Creation Thunderbird-18 Electronic Speed Control ( Alien Aircraft P/N: AE-019)<br>with connectors matching motor & battery |
| 2    | Tail Pushrods        | ..Dubro Micro Pushrod Set ( Alien Aircraft P/N: AH-001)   |
| 2    | Aileron Pushrods     | ..Alien Aircraft "2" x 10" Pushrod Set ( Alien Aircraft P/N: AH-003)  |
| 1    | Propeller            | ..APC 7X4 SF Propeller ( Alien Aircraft P/N: AE-023)  |
| 2    | Wheels               | ..1.85" Aluminum Bushing Wheels ( Alien Aircraft P/N: AH-009)   |
| 1    | Velcro               | ..6" Velcro ( Alien Aircraft P/N: AE-012)   |
| 1    | Motor Mount Hardware | ..2808 Motor Mount Hardware ( Alien Aircraft P/N: AE-022)   |
| 1    | Battery              | ..3 Cell 1250Mah Lipo Battery   |
| 1    | Covering Material    | ..1 Roll Light Weight Covering Material Plus Trim Colors  |
| 1    | Radio                | ..4 Channel Radio with 4 micro servos & Receiver  |



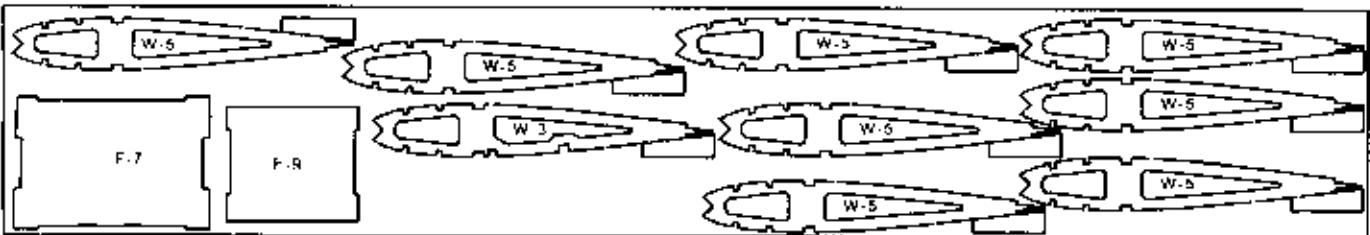
LC-106-01 1/16" X 4" X 24" Balsa 1 REOD.



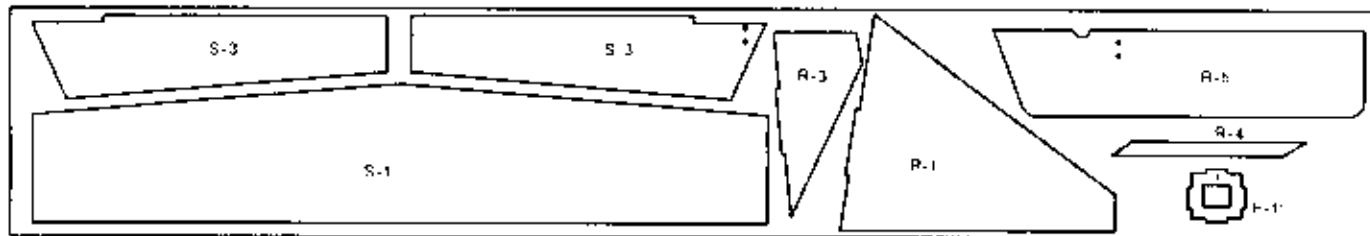
LC-106-02 1/16" X 4" X 24" Balsa 1 REOD.



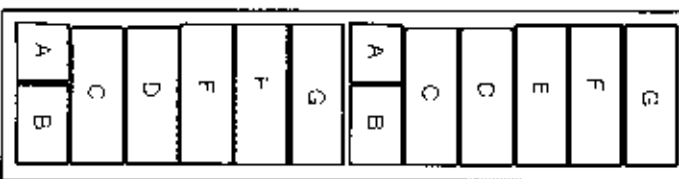
LC-106-03 1/16" X 4" X 24" Balsa 1 REOD.



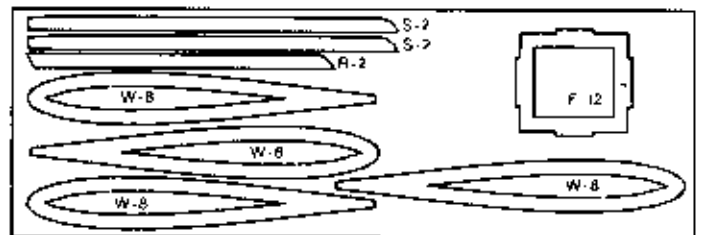
LC-106-04 1/16" X 4" X 24" Balsa 1 REOD.



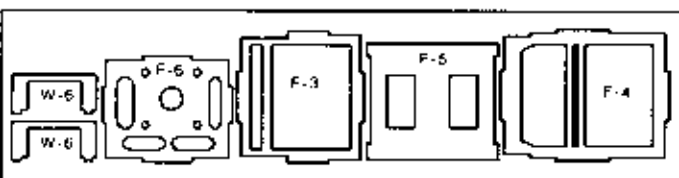
LC-106-05 3/32" X 4" X 24" Balsa 1 REOD.



LC-106-06 1/16" X 3" X 12" Balsa 1 REOD.  
May be 1/32" x 3" x 12"

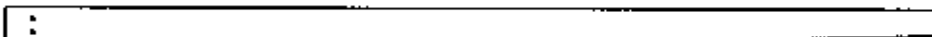


LC-106-07 3/32" X 4" X 12" Balsa 1 REOD.



LC-106-08 3mm X 3" X 12" Lite Ply 1 REOD.

1/16" PLYWOOD DIHEDRAL BRACE 1 REOD.



1/8" Balsa AILERON 2 REOD.

## Building Instructions:

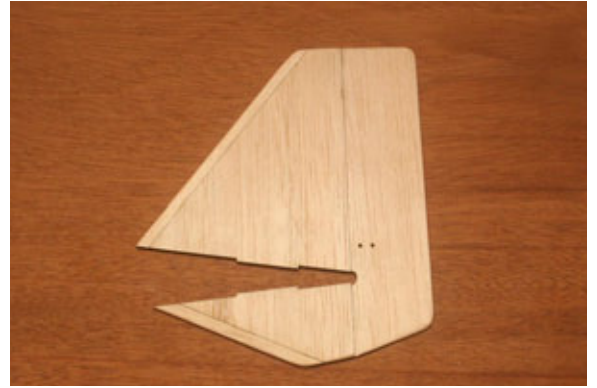
General Note: Cover the plans with wax paper before assembling your model to prevent the parts from sticking to the plan.

### **Building the Tail Surfaces:**

1...Glue R-1 and R-2 together. Glue R-3 and R-4 together. Sand the outside edges round. Leave the fuselage edges square.

Bevel the front edge of R-5 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.



2...Glue the S-2's to S-1. Sand one of the 1/8"x 3" dowels to 3/32" diameter. Join the elevators (S-3) using this dowel. Use the stabilizer as a guide. Trim the dowel if required to achieve the proper length.

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.

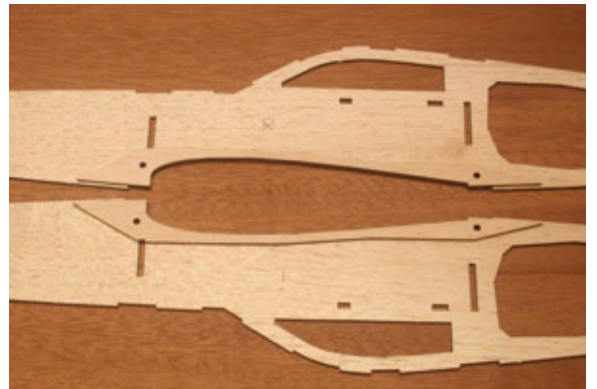
Mark the hinge locations and cut the hinge slots. Temporarily install the hinges without glue.



### **Building the Fuselage:**

3...Glue the F-2 doublers to the inside of the F-1R & F-1L fuselage sides. Be sure to make a right hand and a left hand side.

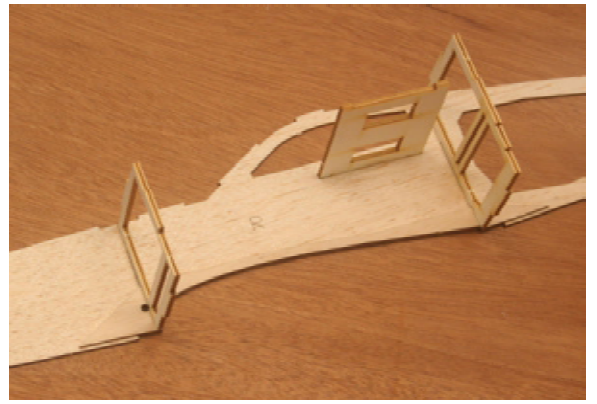
Note: The photos show a lightning hole in the fuselage sides (looks like windows in the cockpit area). This has been eliminated from the production kits. Please disregard it in the assembly photos that follow.



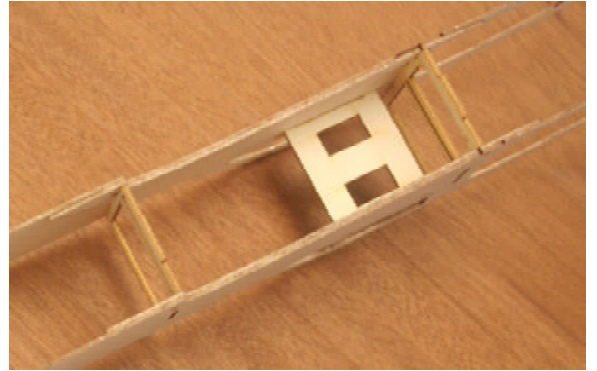
4...Press the four 4-40 blind nuts into the back of the firewall (F-6). Use a small drop of thin C/A to secure them in place.



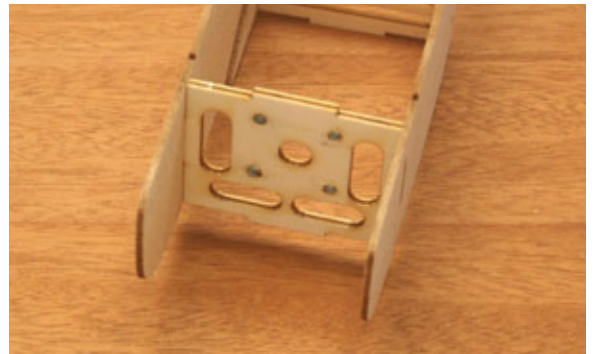
5...Lightly tack glue formers F-3 , F-4 and servo tray F-5 into position on the right fuselage side. Use a small square to position these parts 90 degrees to the fuselage side.



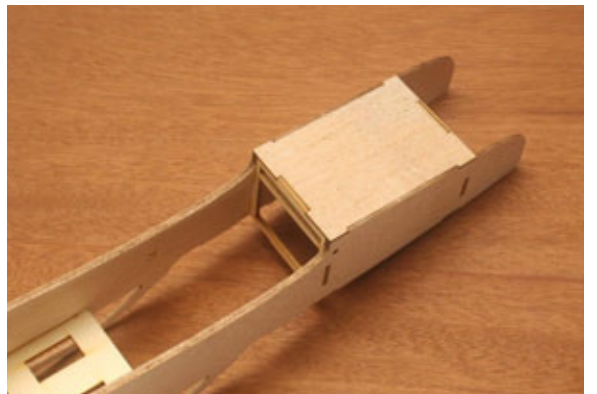
6...Place the left fuselage side into position and square up the fuselage. Glue the left fuselage to the formers. Make sure that the fuselage is square and completely glue the formers to the fuselage sides.



7...Glue the firewall (F-6) into position making sure the front of the fuselage is not twisted.



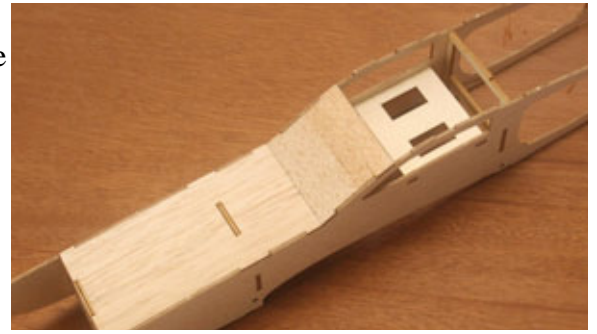
8...Glue F-7 into position on the bottom front of the fuselage.



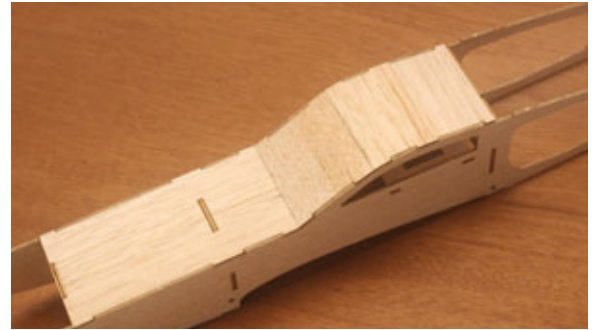
9...Glue F-8 into position on the top of the fuselage.



10...Glue F-9 to the top of the fuselage. Slightly wet the outside of the part to allow it to curve / bend easier.



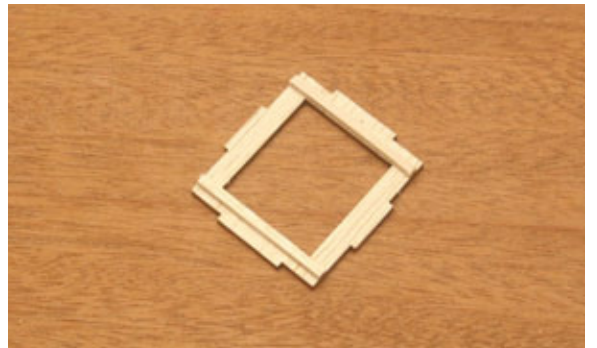
11...Glue F-10 to the top of the fuselage. Slightly wet the outside of the part to allow it to curve / bend easier.



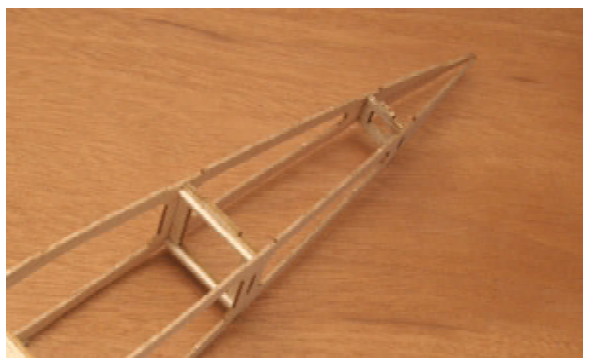
12...Pull and glue the rear of the fuselage sides together. Slide former F-11 into position. Adjust the back end until the fuselage is straight and square. Glue the former in place.



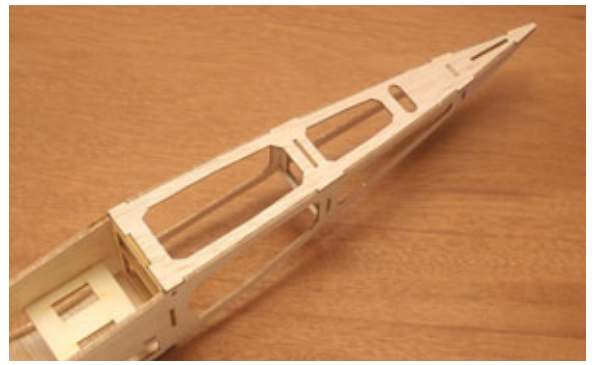
13...Glue the 3/32" sq. reinforcements to the top and bottom of F-12 as shown on the plan.



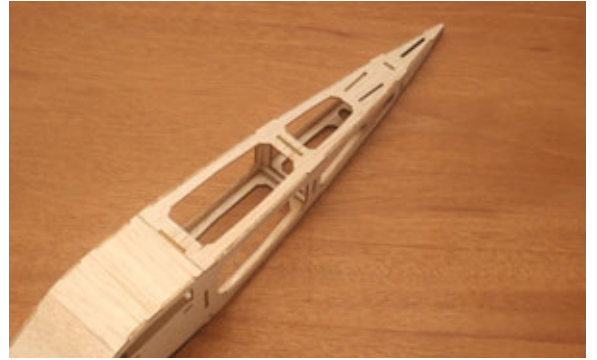
14...Place former F-12 into position and glue in place.



15...Glue F-13 into position on the bottom rear of the fuselage.



16...Glue F-14 into position on the top of the fuselage.



17...Follow the dashed lines to cut and remove the fuselage sides to make the slot for the stabilizer.

Use a sanding block to sand all of the fuselage surfaces smooth and flat. Now lightly sand the edges of the fuselage round. Sand the back edges of parts LG round. Leave the top, bottom and front square.



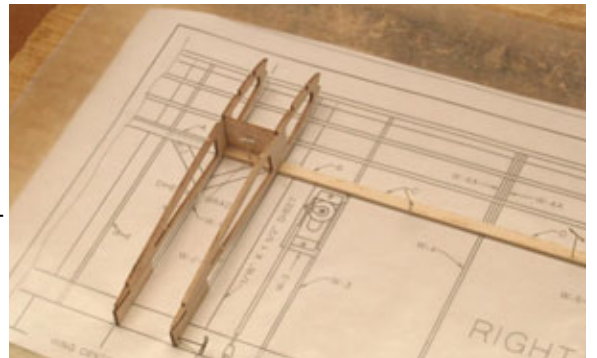
### **Building the Wing:**

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

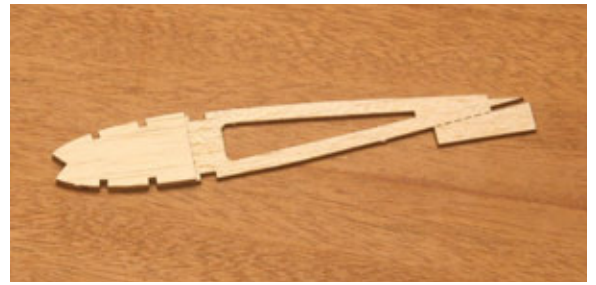
19...Pin the lower  $\frac{3}{32}$ " x  $\frac{3}{16}$ " lower main spar. Align the inboard ends with the wing center line. The outboard ends will extend past the last W-5 rib. Glue rib W-2 into position 90 degrees to the building board. Glue shear web "A" into position against the lower spar and rib W-2 as shown on the plan.



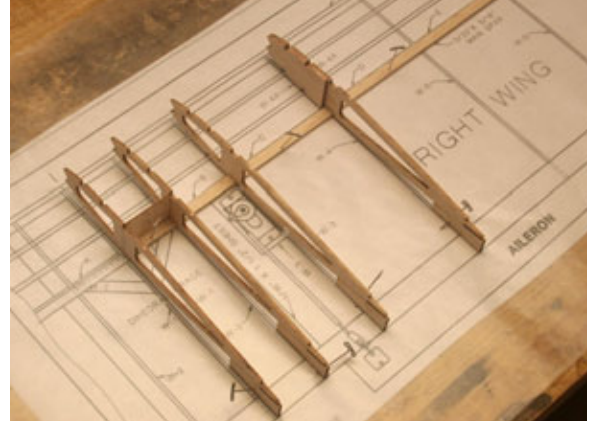
20...Glue rib W-1 into position. The top of the rib should angle slightly toward the wing tip.



21...Glue one F-4A rib to one side of the W-4 ribs.



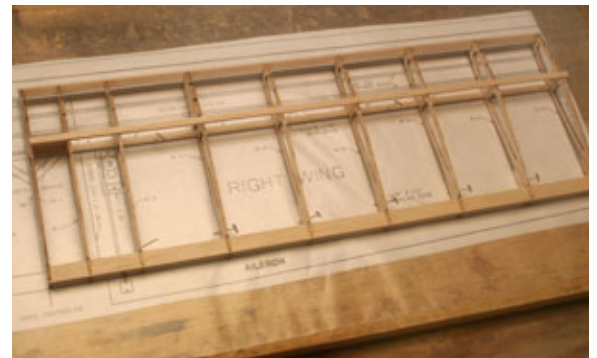
22...Glue the W-3 and W-4 rib into position. They should be 90 degrees to the building board.



23...Glue all of the W-5 ribs into position. They should be 90 degrees to the building board.



24...Glue the 3/32" x 3/16" top spar and the 1/4" sq. leading edge into position. Slide the lower 1/16" x 1/2" trailing edge into position in the slots between the ribs and their support tabs. After making sure that it is positioned properly, glue to the ribs.

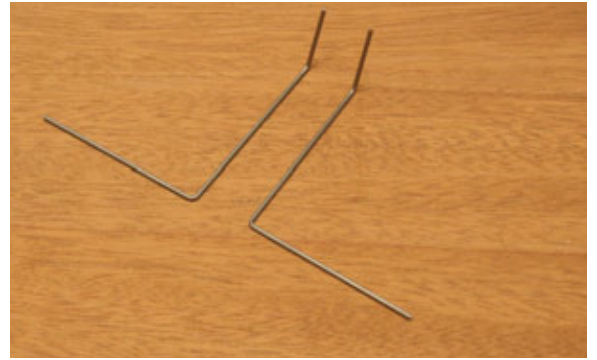


25...Glue the remaining shear webs (B thru G) into position on the front face of the spars. Glue the top 1/16" x 1/2" trailing edge into position.

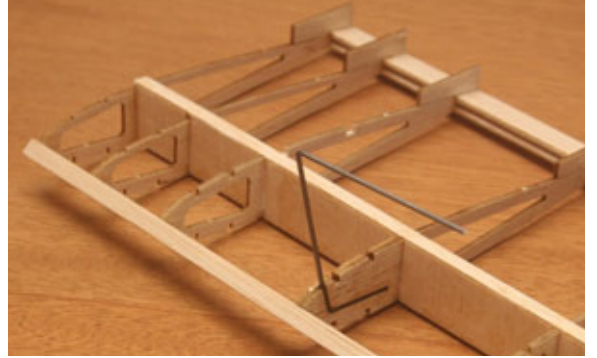




26...Bend the landing gear wires to shape using the pattern on the plan. Leave the axles long until you mount the wheels.



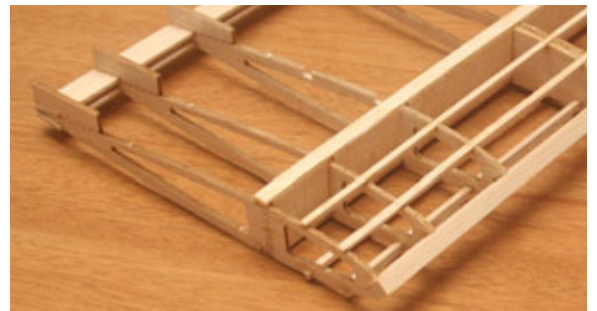
27...Remove the wing from the plan. Glue the right landing gear wire into the slot in rib W-4.



28...Glue a W-4A rib to the side of the W-4 rib, capturing the landing gear wire.



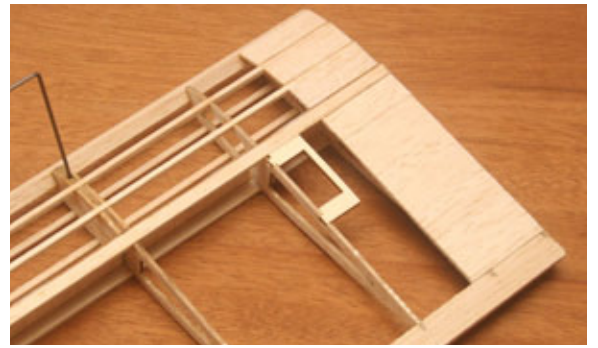
29...Glue the four 3/32" sq. x 18" stringer spars into position on the ribs.



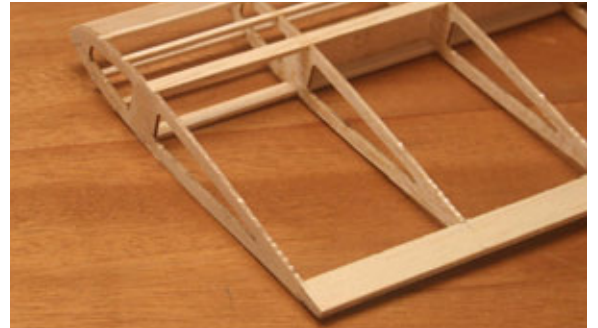
30...Glue the aileron servo tray (W-6) into position on rib W-3. Glue to the rib as well as the main spar.



31...Use two of the 1/32" x 1 1/2" sheets to sheet the bottom center of the wing. The sheet should be cut to fit between the spars as shown on the plan.



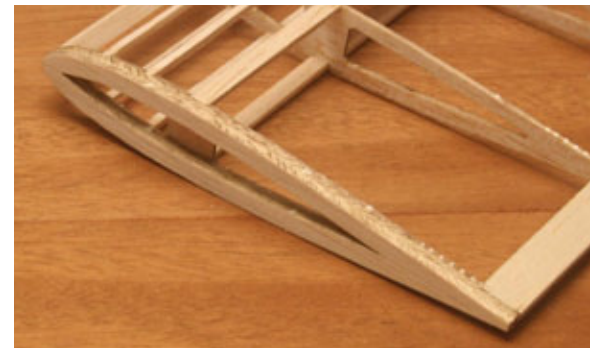
36...Cut off the rib support tabs from the ribs. Trim the spars, leading edge and trailing edge flush with each end of the wing.



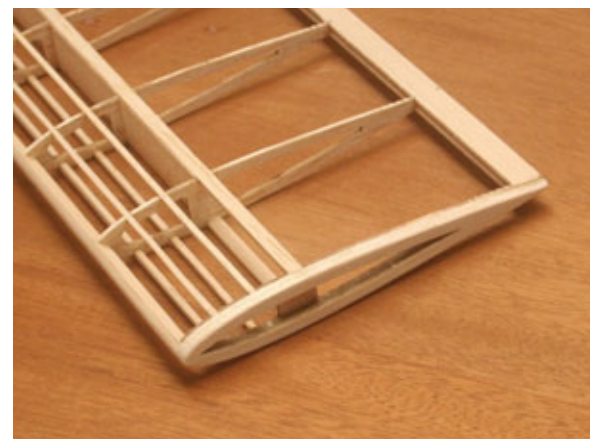
37...Glue part W-7 into position on the top of the wing.



38...Glue two W-8 wing tips to the end of the wing.

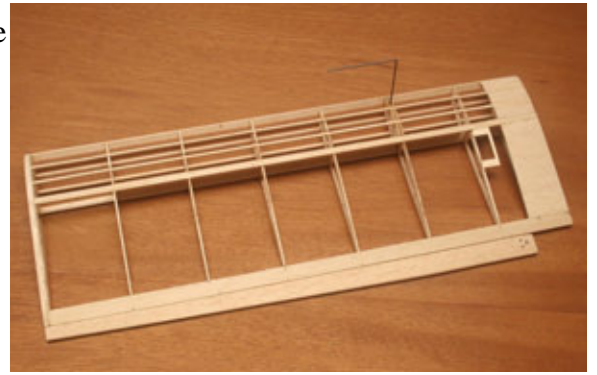


39...Sand the leading edge of the wing round to match the profile shown on the plan. You can test fit the wing on the fuselage to check your progress. Now sand the wing smooth all over.



40...Sand the back edges and the ends of the ailerons round. Taper the front edge of the ailerons to the shape shown on the plan.

Mark and cut the hinge slots in the ailerons and the wing. Install the hinges without glue and test fit the ailerons to the wing.



41...Now repeat steps 18 thru 40 to build the left wing.

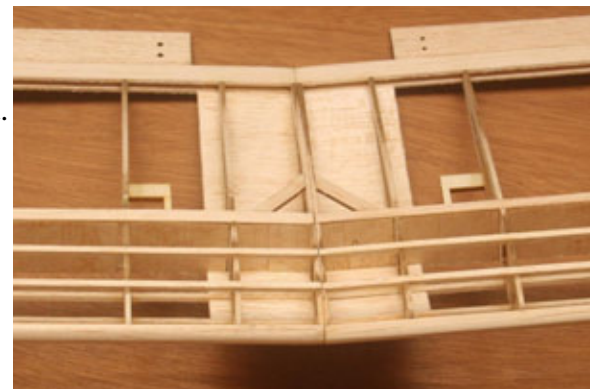
42...Cut slots in both W-1 ribs to accept the dihedral brace as shown on the plan.



43...Slide the dihedral brace into position in the right wing. Position it tightly between the spars and forward against the shear web and glue into position.



44...Glue the right wing onto the left. Now test fit the wing onto the fuselage and sand the wing as required to produce a good fit if needed.



### **Covering:**

45...Sand all parts smooth with 400 grit sandpaper. Cover the model with a light weight iron on covering material.

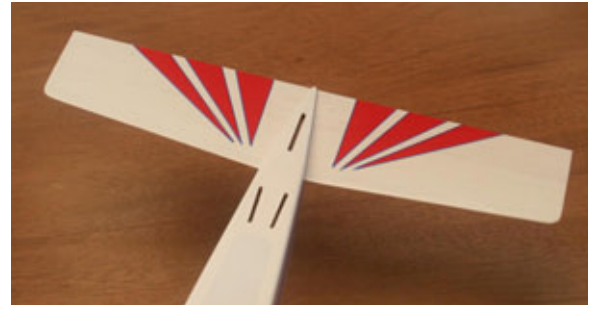
**Note:** After the model is covered you must check the tail surfaces and wings for warps or twists. If there are any they can be removed by twisting the parts straight and heating the covering.

### **Final Assembly:**

46...Cut the covering away from the stabilizer in the area that makes contact with the fuselage. Cut the covering away from the stabilizer slot in the fuselage.



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



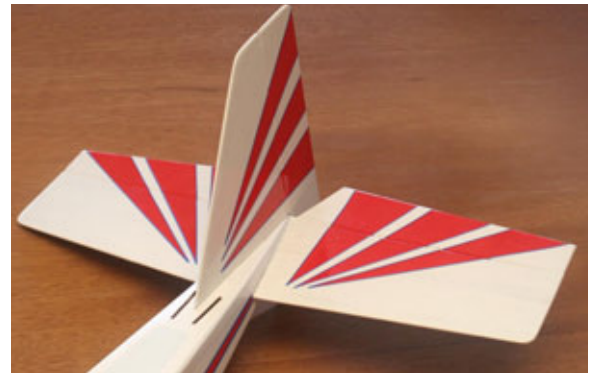
48...Carefully cut the covering away from areas on the fuselage that will make contact with the fins. Place the fins into position and make sure that they are straight and square. Glue the fins into position.



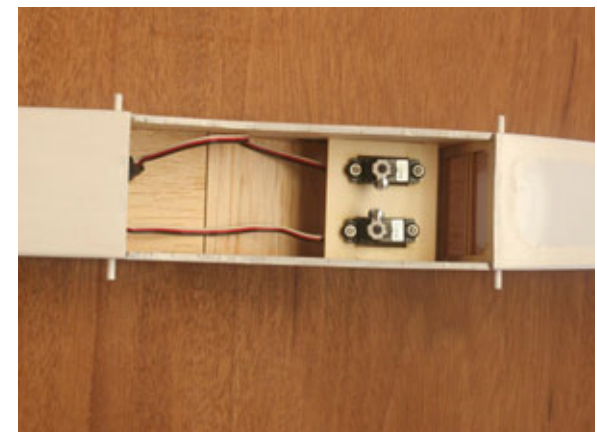
49...Attach the elevators with the hinges and glue in place.



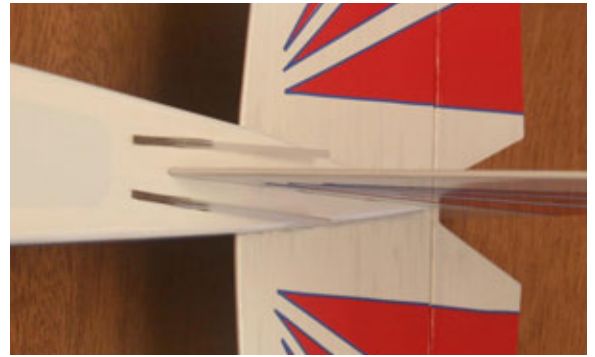
50...Attach the rudder with the hinges and glue in place.



51...Screw the servos to the servo tray. Glue the wing dowels into position.



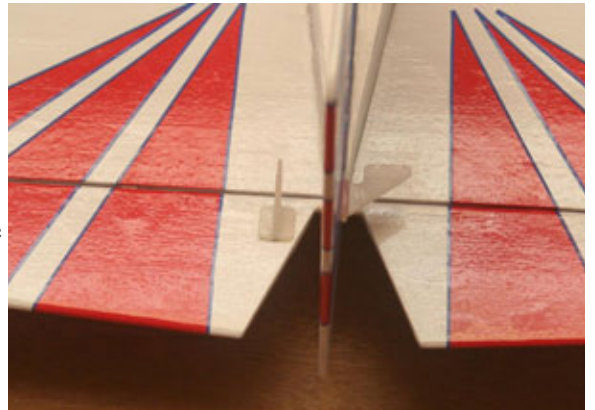
52...Insert the pushrod housings into the exit slots in the back of the fuselage. They should extend out about 2 1/2" from the fuselage top.



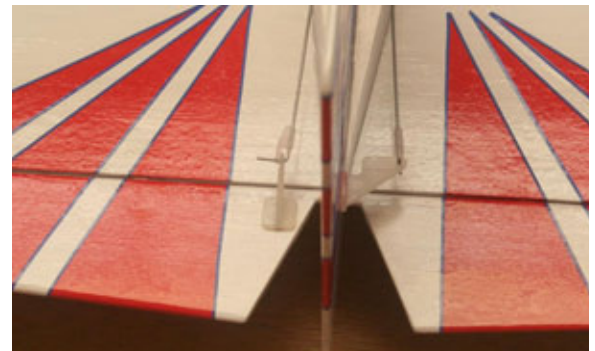
The front ends should pass thru the slot in former F-4. Glue the housings to the rear exits. Do not glue the front ends to the former at this time.



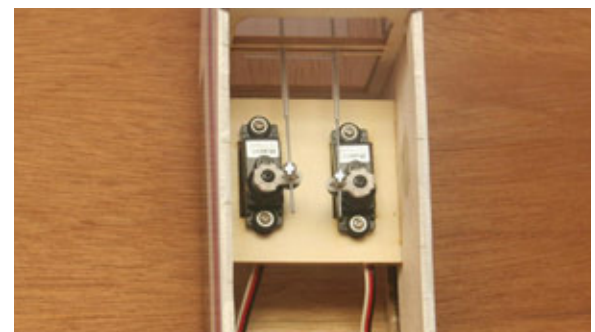
53...Glue the rudder and elevator control horns into position. Drill 1/16" holes for the pins to pass thru. When the glue is dry, cut off the excess pins flush.



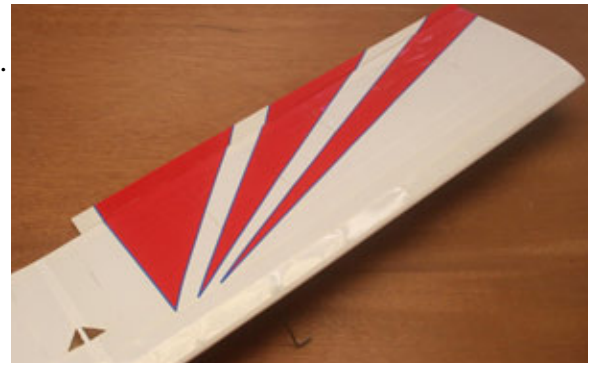
54...Install the pushrods into the housings. Secure the rear of the pushrods with Mini E/Z Links.



The front ends are attached to the servos with Mini E/Z Connectors. Glue the pushrod housings to the former.



55...Attach the ailerons to the wings with the hinges and glue in place.



56...Screw the servos into position on the bottom of the wing.



Feed the servo wires through the holes in rib W-2 and out through the top of the wing.

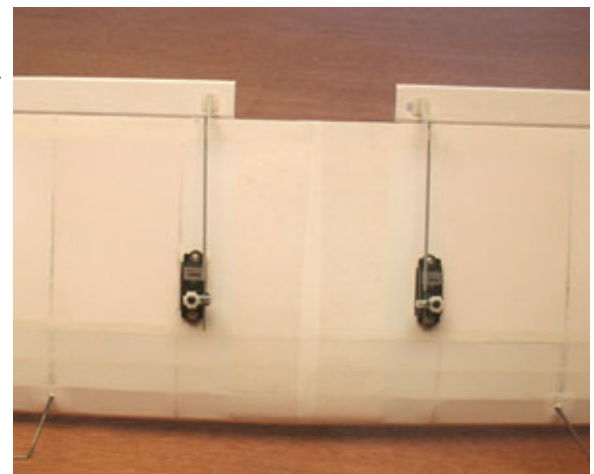


57...Glue the aileron control horns into position on the bottom of the ailerons. Drill 1/16" holes for the pins to pass thru. When the glue is dry, cut off the excess pins flush.

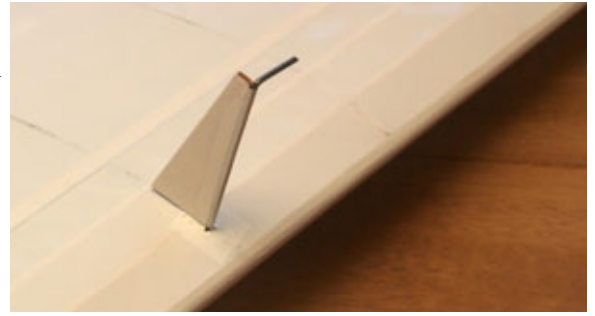


58...Install the pushrods. Slide the 1/32" id. aluminum tube stiffeners onto the pushrod. Attach the rear of the pushrods to the horns with Mini E/Z Links.

59...The front ends are attached to the servos with Mini E/Z Connectors. When the servos are in neutral the servo arm should be 90 degrees to the pushrod. Now center the aluminum tubes on the pushrods. Place a drop of thin C/A glue to each end of the tubes to secure it onto the pushrods.



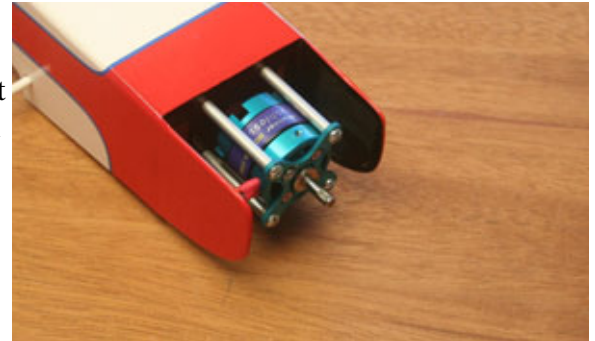
60...Attach parts LG to the back of the landing gear wires with a small amount of C/A. Wrap a 1/2" wide strip of covering material around the front of the landing gear wire and iron into position to secure parts LG to the landing gear wire.



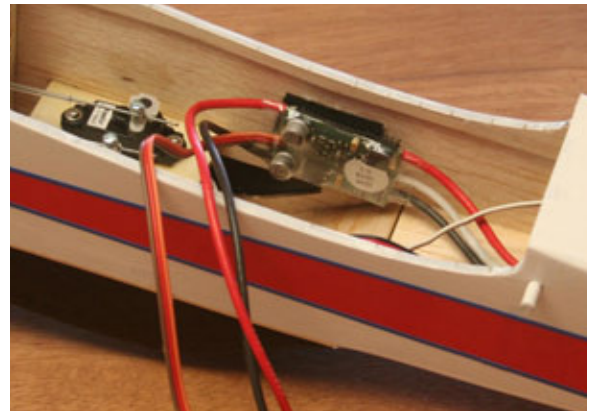
61...Put the wheels on the model and press the wheel retainers into position. With the retainers in place, cut off the excess wire axle flush with the retainer.



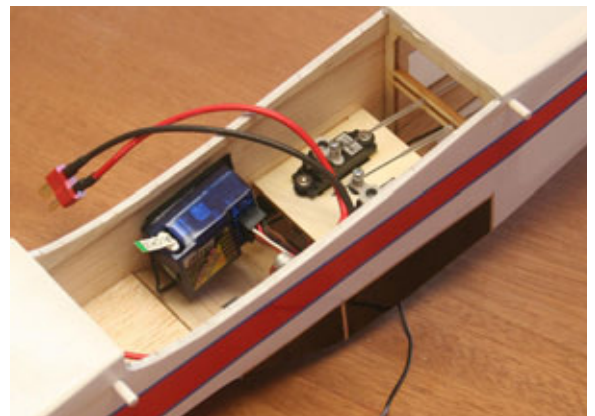
62...Secure the motor mount to the front of the motor with the four flat head screws. Now bolt the motor to the firewall with 4-40 screws and aluminum tube spacers. Note: Because the wires on the motor are short, pass the wires from the speed controller thru the firewall and attach to the motor before mounting the motor to the firewall.



63...Secure the speed controller to the fuselage with velcro.



64...Plug the speed control and servos into the receiver and attach the receiver to the fuselage side with velcro. Pass the receiver antenna back and out through the rear of the fuselage.



65...WITH THE PROPELLER REMOVED...Turn the transmitter on. Place the throttle stick in the low position. Plug the battery into the speed controller. Check the motor for proper operation and direction of rotation. Follow the instructions with the speed controller to make any adjustments.

66...Check the servos for proper operation and direction. Adjust the control throws to the values shown on the plan. Now disconnect the battery and then turn off the transmitter.

67...Place the battery in the nose of the model. Attach the propeller. Attach the wing onto the fuselage.

68...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. Use velcro to secure the battery in the model in this position. Note: If moving the battery will not achieve the proper balance, you will have to add weight to the nose or tail. Glue any weight securely to the model.

69...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. 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.