

# F5F Construction

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## BEFORE YOU START

Watch the weight! Much of the structure of this model is behind the design center of gravity, so every extra ounce in the tail will need many ounces in the nacelles to achieve the design center of gravity. Be diligent with the sandpaper, and don't use too much glue and paint.

## WING

### Wing Center Section

1. Laminate the two W9 spars.
2. Laminate the two 1/8 balsa center W1 ribs.
3. Glue the laminated W1 ribs to a ply W1 rib.
4. Remove the balsa between the two etched lines to create a hole for the wing mounting bolt.
5. Glue the remaining ply w1 rib to the W1 assembly.
6. Glue the three wing bottom skin pieces together.
7. Using your own 1/16 balsa sheets, make a wing top skin to duplicate the wing bottom skin. Make the top skin about 1/4 inch wider in chord.
8. Sand the outer surfaces of the wing top and bottom skins smooth.
9. Pin the wing bottom skin to the building board, smooth outer surface down.
10. Cut a length of 3/8 x 3/4 balsa stick to be the wing leading edge. Glue and pin the leading edge stick to the forward edge of the wing bottom skin.
11. W8 false leading edge provides additional gluing surface for extra strength. Glue the W8 false leading edge to the bottom skin and the leading edge stick.
12. Glue the nacelle mount doublers in place on the inside surface of the wing bottom skin, using short lengths of 1/8 dowel to align the doubler.
13. Place the W9 spar on the bottom skin, and add the W1 ribs. Line up everything with the etched lines. Glue W9 and the W1 ribs to the bottom skin and to the W8 false leading edge.
14. Run pull strings through the rear holes in the W1 ribs. These pull strings will help you install the servo leads later.

15. Remove the assembly from the building board. Use a long sanding block to bevel the wing trailing edge to a thickness of about 1/32". This will provide a better surface for gluing down the wing top skin. Also smooth off the tops of the ribs and spar. Also drill through the wing bottom skin through the bolt hole in the center rib assembly.
16. Place the assembly back on the building board. Pin the leading edge and the outer W1 ribs to the board.
17. Apply glue to the tops of the ribs, false leading edge and spar. Apply glue to the trailing edge bevel. Apply a light bead of glue to the forward edge of the wing top skin. Set the wing top skin in place, smooth outer surface up, and pin it down securely.
18. After the glue has set, remove the wing center section from the building board. On the leading edge, mark the location of the nacelle. Sand the leading edge to shape, but leave the nacelle areas flat-nosed.

## **Wing Outer Panels**

1. Build the wing outer panels following the same general steps as for the wing center section. The main differences are as follows.
2. Cut holes in the bottom skins for the servo arms. Wrap servos with masking tape, then glue the servo to the bottom skin with CA. To help with the covering steps later on, manually position the servo arm so that it does not protrude below the wing skin. Make sure to pull the servo leads out the rear holes in the ribs.
3. Make the aileron spar and aileron leading edge from 1/8 balsa. Glue in place with a 1/32" gap between them.
4. Laminate the wing tip blocks together. Glue the wing tip assembly to the wing panel.
5. Remove the ailerons from the wing panels. Use a long sanding block to clean up the edges of the aileron and the aileron cut-out. Sand a bevel into the aileron leading edge.
6. Glue the wing outer panels to the wing center section. Don't forget the dihedral!
7. If you got good glue joints between the outer panels and the center section, no further reinforcement is needed. If desired, reinforce the joint with light fiberglass cloth and resin.

## **Nacelle**

1. Laminate a 1/16 ply N1 to a 1/16 balsa N1. Laminate a 1/16 ply N2 to a 1/16 balsa N2.
2. Glue the two N7 parts together. Glue the two N8 parts together.
3. To assemble the battery box, glue two B1 parts to N7. Glue B2 to the two B1 parts.
4. Glue the N2 lamination to N7 and the battery box assembly, with the plywood side to the rear. Glue the N1 lamination to N7 and the battery box assembly, with the plywood side to the front.

5. Laminate two ply RM parts. Then install but do not glue the RM lamination to N1, N2. Install the two RMB parts to the rear face of N2 and RM. Line everything up and epoxy the parts together.
6. Glue a 1/8 x 1/8 balsa stringer between N1 and N2.
7. Glue the nacelle assembly to the wing, using four short lengths of 1/8 dowel to align the nacelle.
8. Glue N2T to N7 and the wing leading edge. Then glue N1 and N9 in place.
9. Glue lengths of 1/8 square balsa between N1 and N2, on top of N7.
10. Use thin cardboard to develop the upper nacelle skin shape. The skins should wrap around N1 and N2 to the top of N7. (But do not cover N7.) Cut the upper nacelle skins from 1/16 balsa and glue in place.
11. Trim the vacuum-formed plastic lower nacelle skin to fit, all the way to the front of N1. The plastic skin extends over the sides of N7 and rests on the wing lower surface.
12. Glue a super magnet in the aft end of N7. Glue a matching super magnet in the aft end of N8.
13. Glue two short 1/2" lengths of 1/8 x 1/8 balsa along each side of the battery box (B1). These two sticks create a slot to hold down the forward end of N8.
14. Cover N7 and the surrounding area of the wing with cling film. Slide N8 into place.
15. Make any final adjustments to the fit of the vacuum-formed plastic lower nacelle skin. Use fine sandpaper to roughen the inner surface of the plastic skin, about 1/4" above the lower wing surface. Then glue the plastic skin to the edges of N8. Canopy glue is best for this. If necessary, use short "rivets" made from common dress pins to provide additional strength to this join.
16. Slide N8 and the plastic skin off N7. Be careful not to crack N8.
17. Bolt the retract gear in place. Then cut an opening for the retract mechanism and wheel in the plastic skin. DO NOT cut the opening all the way to the front of the plastic skin!
18. Trim the vacuum-formed plastic cowls to an overall length of 2.5".
19. Install super magnets in two opposing holes in each NC1 cowl ring. Install matching magnets in the appropriate holes in N1. Install short lengths of 1/8" dowel in the smaller holes in NC1.
20. Fit an NC1 cowl ring into the base of each plastic cowl. You may need to sand NC1 to fit. When satisfied with the fit, glue the NC1 cowl ring to the plastic cowl.

## **FUSELAGE**

1. Glue F9 wing seat doubler to the inside of each fuselage side.
2. Glue a 1/4 x 1/4 strip to the inside of each fuselage side, aligned with the bottom edge of the fuselage, between the front of F3 and the front of F7. Use a razor saw to cut a series of kerfs in the 1/4 x 1/4 strip aft of F4. The kerfs should be about two-thirds the depth of the strip, and spaced at 1/4" intervals.
3. Glue formers F1, F2, F3 and F4 to one fuselage side.
4. Glue the opposite fuselage side to F1, F2, F3 and F4.
5. Stand the assembly on your building board with the tops of the fuselage sides to the building board. (The fuselage should be upside down.)
6. Laminate former F6A to F6. F6A provides extra gluing surface for mounting the horizontal stab.
7. Moisten the 1/4 x 1/4 strips along the bottom of the fuselage.
8. Squeeze the fuselage sides together and glue formers F5, F6 and F7 in place.
9. Sand the bottom of the fuselage so as to flatten the 1/4 x 1/4 strips.
10. Plank the bottom of the fuselage with 1/16 balsa, from the front edge of former F4 to the rear edge of F7. The grain of this planking should be across the fuselage.
11. Glue F11 into the notches in the wing saddle doublers.
12. Remove the fuselage from the building board.
13. Glue the cockpit floor CF in place.
14. Glue the tail wheel mount in place.
15. Glue the tops of formers F1 thru F6 in place.
16. Glue the servo/wing mounts F12 in place on the front of former F1. Laminate and glue the two F10 mounting bolt plates in place. Glue 1/8 x 1/4 hardwood servo rails in F12. Mount the rudder and elevator servos on these rails.
17. Put the fuselage aside until after the empennage is complete.

## **Empennage**

1. Build the vertical stabs and rudders flat on your building board. Fill in with 1/16 x 3/16 balsa ribs as shown on the plan.
2. Cover the vertical stabs and rudders with film or silkspan.

3. Hinge the rudders to the vertical stabs.
4. Glue the rudder control horns in place.
5. Build the horizontal stab panels and elevators.
6. Sand the root of the horizontal stab panels to the correct dihedral angle. Pin one panel flat on your building board. Pin the other panel to the supplied "HDJ" dihedral jig to set the correct dihedral angle.
7. Glue the horizontal stab panels together.
8. Run an 8-32 bolt through the hole in the centerline of the horizontal stab assembly. Using washers and nuts, install the bellcrank on the 8-32 bolt. Make sure that the bellcrank moves freely, but without too much slop.
9. Fill the space between the outer rib and H3 with 1/16 balsa, to provide support for the rudder control cable sheath.
10. Use a needle file to route a channel for the rudder control cable sheath through the horizontal stabs. The sheath should be flush with the underside of the horizontal stabs. Glue the Sullivan cable sheath in place.
12. Cover the horizontal stab and elevators.
13. Hinge the elevators to the horizontal stab.
14. Glue the elevator control horns in place.
15. Glue the vertical stabs to the horizontal stab, using the supplied "TAIL JIG" to set the correct angle.
16. Trial-fit the assembled empennage to the fuselage. Adjust the fuselage as necessary to that the empennage sits square.
17. Make the rudder and elevator pushrods. Make holes in the formers as appropriate to route the pushrods to the servos.
18. Install the Sullivan cable between the rudder control horns and the rudder bellcrank. Test for proper operation.
19. Attach the pushrods to the rudder bellcrank and to the elevator control horns.
20. Glue the empennage to the fuselage, installing the pushrods as you go.

### **Final Fuselage Assembly**

1. Trial-fit the wing to the fuselage. Drill holes through the wing and the two ply wing mounting plates F10 and F11.

2. Tap the holes in F10 and F11 for the wing mounting bolts.
3. Cut a fuselage bottom fairing from 1/8 sheet, using the pattern on the plans. Glue the fairing to the bottom of the wing. Then drill through the fairing to allow installation of the wing mounting bolts.
4. Glue F3A in place.
5. Glue a 1/8 x 1/4 stringer in place in the notches in F1 thru F6.
6. Cover the top of the fuselage with 1/16 balsa.
7. Cut the cockpit opening between F2 and F3A.
8. Sand and cover the fuselage.
9. Bolt the wing to the fuselage. Then trim the vacuum-formed plastic nose to fit. Use small hardwood blocks and servo screws to mount the nose to the fuselage. Don't attach it to the wing.
10. Build up the sides of the cockpit with 5/8 X 1/4" balsa, and sand to match the fuselage.
11. Paint the cockpit area and install an instrument panel if desired. Trim the vacuum-formed canopy to fit.
12. Paint and decorate the model as desired, and glue the canopy in place.
13. Install the electronics, motors and batteries. Test for proper operation.
14. Make sure that the model balances 2.4" aft of the wing leading edge. Install weights on N1 as needed, dividing the added weight equally between the two nacelles.

## **FINISHING THE MODEL**

Cover the model using your preferred methods. Light fiberglass cloth and finishing resin provides the greatest strength, but is heaviest. Next choice would be medium weight silkspan and dope or Delta Ceramcoat. Last choice would be an iron-on film. **WATCH THE WEIGHT!**