# Flyzone Spitfire

## FF to R/C Conversion Instructions

Hobbico® Flyzone EP FF airplanes have been around for years, with exciting new models being added constantly. The recent interest shown by R/C modelers in micro R/C airplanes inspired us to offer a kit that transforms these micro free flyers into high performance micro R/C airplanes. This R/C conversion package and the following instructions make the conversion as painless as possible and eliminates any guesswork. The R/C conversion power package can be used on any airplane weighing 5 to 9 oz [141 to 255g] with a wingspan between 20 and 30 inches [508 and 760mm]. A conversion radio package is also available and includes the radio gear you will need in conjunction with the conversion power package.

## PARTS NECESSARY

❏ RC Conversion power package (GPMG0780)
❏ Great Planes Electrifly™ Conversion Radio Pak (GPML0098) High or (GPML0099) Low
❏ Futaba® single conversion crystal (FUTL62**)
❏ 1/16" [1.6mm] scrap balsa sheet
❏ Carbon Fiber Strips (DAVR2030)
❏ 1/8" [3.2mm] x 3/4"[19mm] hardwood dowel
❏ Double-sided tape (GPMQ4442)

### CONVERSION POWER PACKAGE (GPMG0780)

This power system includes a 180-size motor, propeller, matched speed control, 8-cell, 300 mAh battery, pushrod, hinge material and control horns. Coupled with the suggested radio system it will fly airplanes with wingspans between 20 and 30 inches [508 and 760mm] and weighing 5 to 9 oz [141 to 255g].

❏ 8-cell 300 mAh, NiMH battery (GPMP0065)
❏ Great Planes® C-5 Speed Control (GPMM2000)
❏ 180 size motor (GPMG0290)
❏ Plastic propeller (HCAQ3260)
❏ (2) .039" x 14" [0.9mm x 356mm] steel pushrod
❏ (2) .020" ABS control horns
❏ 1" x 3/4" CA Hinge material

### CONVERSION RADIO PACKAGE (GPML0098 High)
### (GPML0099 Low)

The suggested radio system is a 2-servo setup for a total of three-channel control with the included speed control. The receiver suggested is a Great Planes Electrifly 4-channel receiver with 2 Hobbico CS-5 servos. The conversion radio package includes all of these items.

❏ Great Planes 4 channel Electrifly receiver (GPML0044) Low or (GPML0045) High
❏ (2) Hobbico CS-5 nano servos (HCAM0090)

## TOOLS REQUIRED

| | |
|---|---|
| ❏ Ruler | ❏ Pen |
| ❏ Hobby Knife | ❏ 400-grit sandpaper |
| ❏ 6-minute Epoxy | ❏ Mixing sticks |
| ❏ Foam-safe CA | ❏ Drill and 1/16" [1.6mm] drill bit |
| ❏ Scissors | ❏ Soldering iron |
| ❏ Solder | ❏ 3/32" [2.3mm] drill bit (or sharpened tube) |

## CONSTRUCTION

❏ 1. Remove the FF Spitfire EP from its packing box carefully.



❏ 2. Carefully remove the double-sided tape from the fuselage's wing saddle.
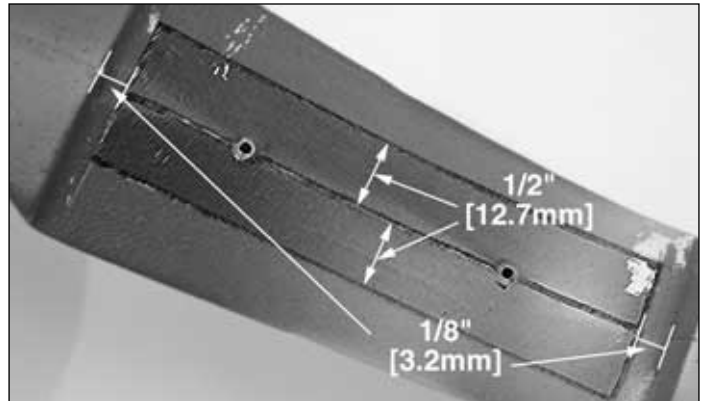


❏ 3. Draw two lines 1/2" [12.7mm] away from the centerline of the fuselage. Draw another line 1/8" [3.2mm] away from the front edge and the aft edge of the wing saddle as shown above.
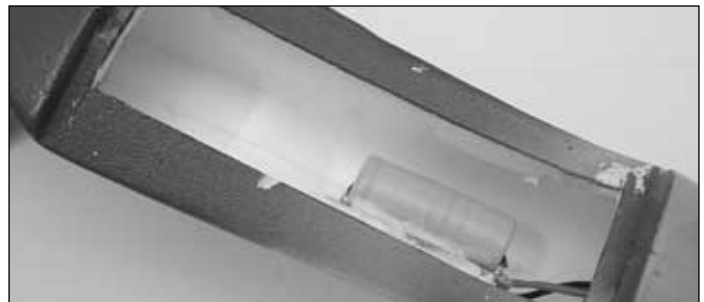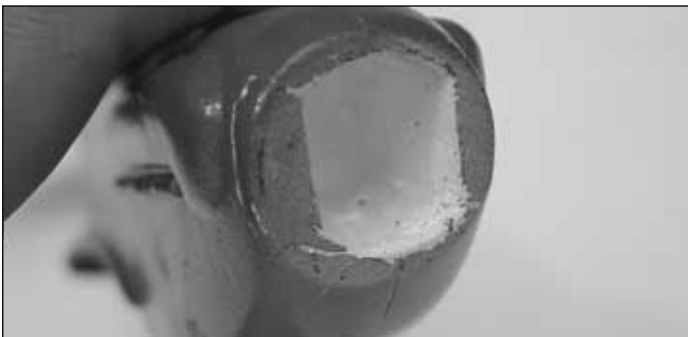


❏ 4. Use a hobby knife with a sharp #11 blade to cut the fuselage open at the lines.
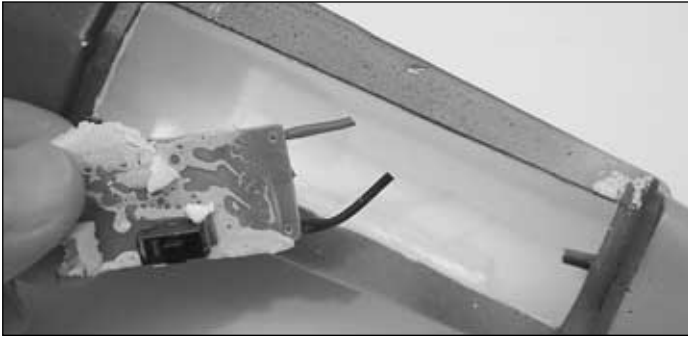
❏ 5. Cut the motor wires with scissors. Use a hobby knife to cut into the glue joint that holds the circuit board and battery in place. Remove the FF battery, motor wires and the circuit board from the fuselage. Note: Please dispose of your FF NiCd battery properly.





REMOVE PROTRUSIONS
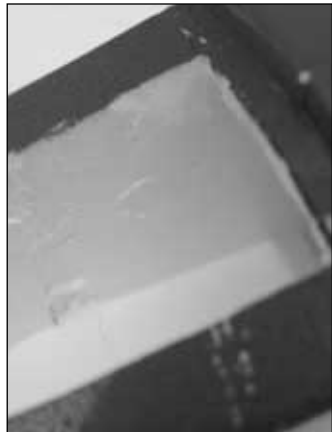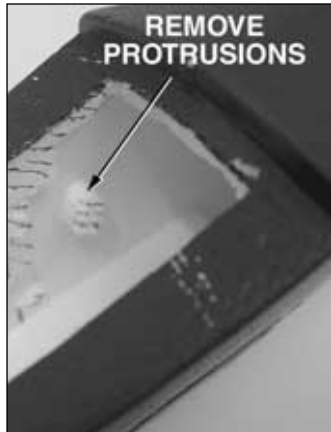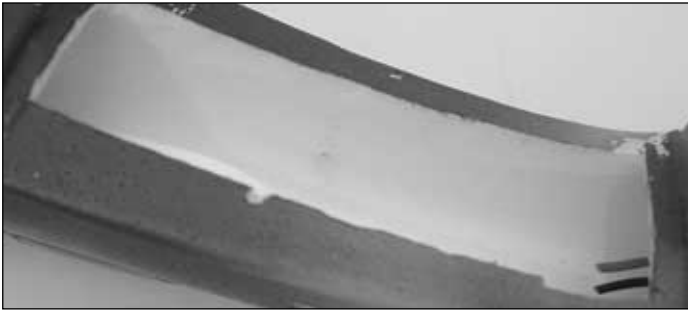


❏ 6. Cut the side edges flush with the fuselage walls.



❏ 7. Measure the current motor right thrust and down thrust, then use a hobby knife to cut the motor out of the fuselage. Discard the motor.



❏ 8. Cut the rudder off of the fin at the hinge line using a hobby knife with a sharp #11 knife. Lightly sand the cut edges with 400-grit sandpaper. Cut the elevators off of the stabilizer at the hinge lines and sand the edges.
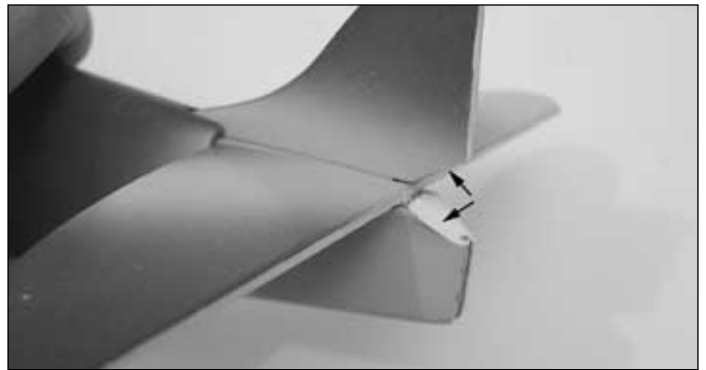


❏ 9. Cut a bevel as shown in the fuselage and fin for the elevator joiner.
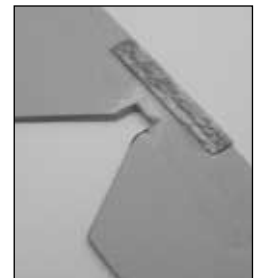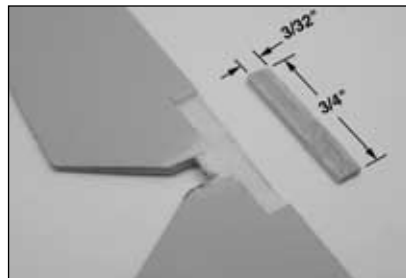


❏ 10. Cut a piece of scrap 1/16" [1.6mm] balsa 3/4"[19mm] long by 3/32"[3.2mm] wide. Cut a recess in the elevator center area, on the bottom side, as shown above and glue the small stick in place with epoxy to reinforce the area.
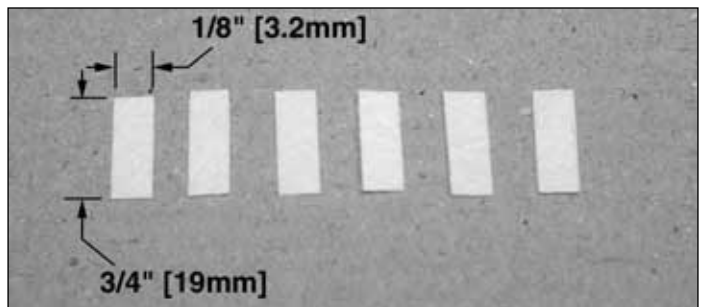


❏ 11. Cut six hinges out of the CA Hinge material 1/8"[3.2mm] wide by 3/4"[19mm] long.

❏ 12. Fit the rudder to the fin and mark the location of the two hinges on the fin, rudder and fuselage. Do the same for the four elevator hinges. Using a hobby knife, cut a slot 1/8" [3.2mm] wide, 3/8"[9.6mm] deep at the marks. Use the image below for reference. Be very careful as the foam is easy to cut.
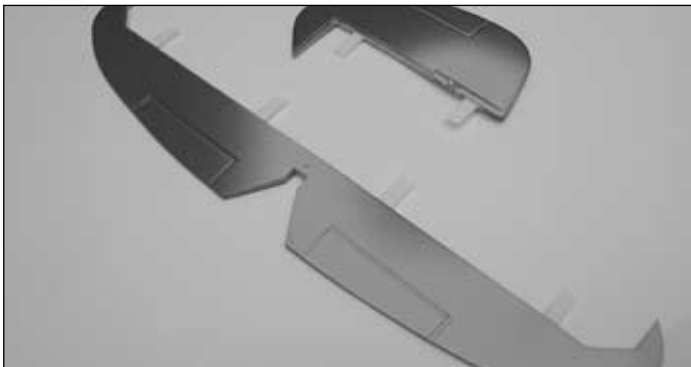


❏ 13. Apply some foam-safe CA to half of each hinge. Slide two CA hinges in place in the rudder and four in the elevators. Let the glue cure.
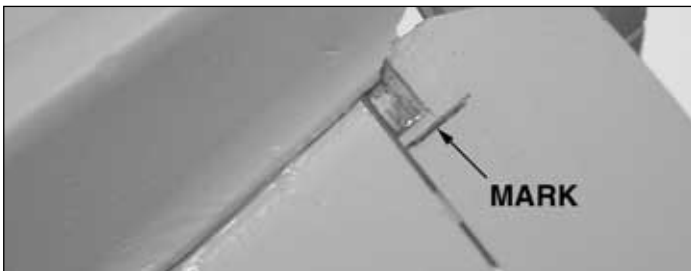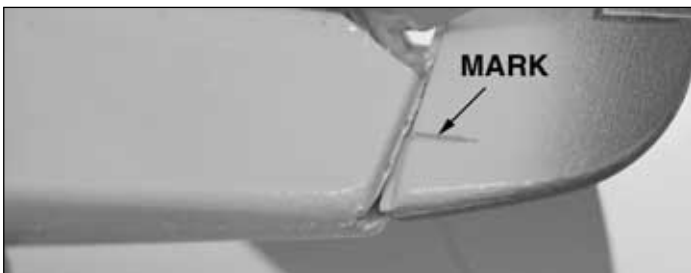


❏ 14. Fit the elevator to the stab and the rudder to the fin. Mark the location of the rudder and elevator control horns as shown above.
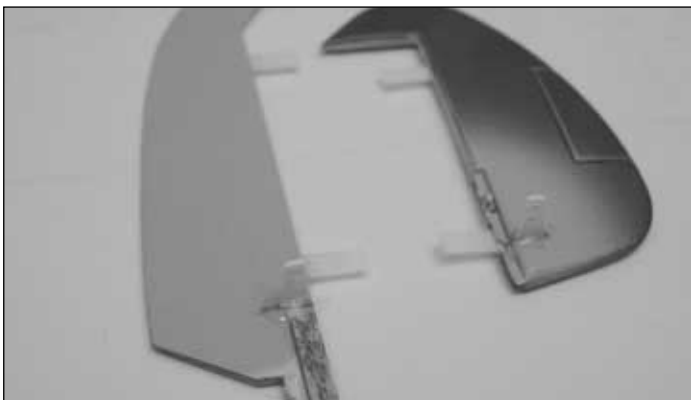


❏ 15. Remove the rudder from the fin and the elevator from the stab. Cut slots at the marks and glue the ABS control horns in place with epoxy as shown above.
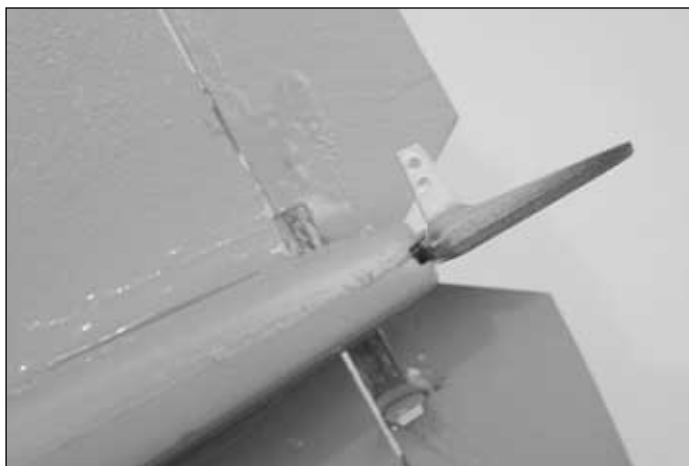


❏ 16. Apply some foam-safe CA to the CA hinges and permanently install the elevator and the rudder in place.



❏ 17. Use a small drill or a sharpened brass tube to make a hole approximately 3/32"[2.3mm] into the fuselage sides for the elevator and rudder pushrods.

1/2" [13mm]

3/4" [19mm]

3/8" [9.5mm]

❏ 18. Bend one end of both .039"[0.9mm] pushrod wires as shown above. Cut the other end of one of the pushrods wires 8-3/4" [222m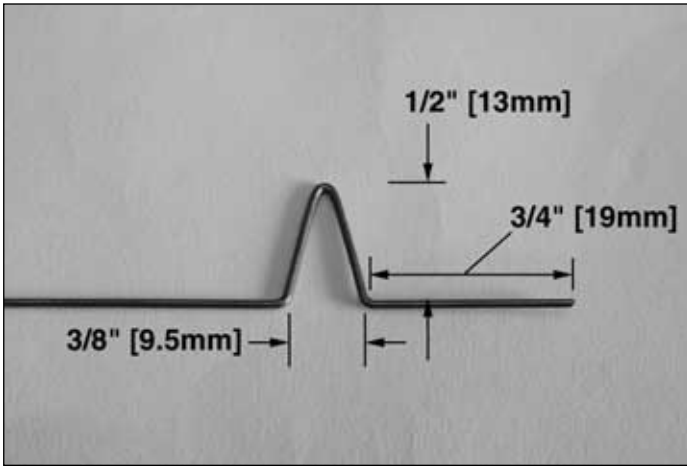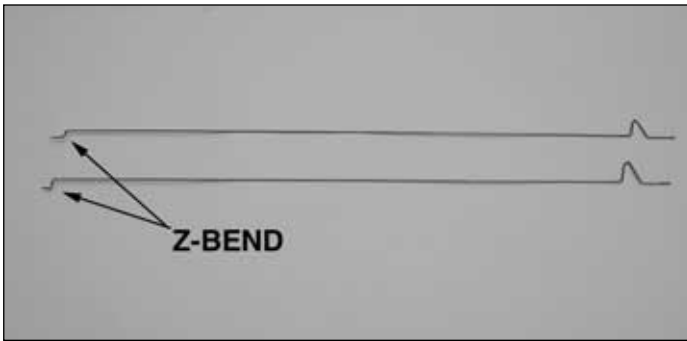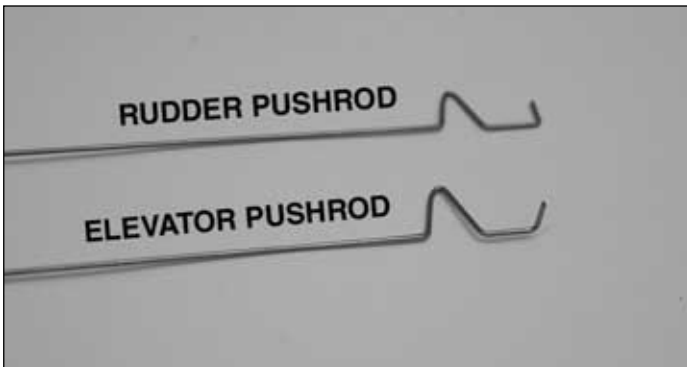m] long to make the rudder pushrod. Cut the other end of the leftover pushrod wire 8-3/8" [213mm] long to make the elevator pushrod.
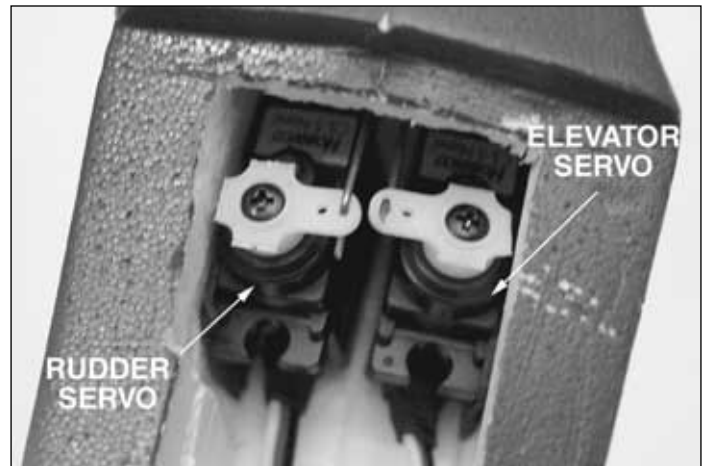


Z-BEND

❏ 19. Make a "Z" bend at the long end of each pushrod. Use the sketch above for reference.



RUDDER PUSHROD

ELEVATOR PUSHROD

❏ 20. Bend the short end of the rudder and elevator pushrod as shown in the above image. Note that the bends are different for each pushrod.
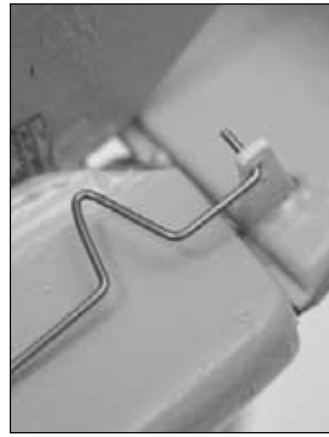


❏ 21. Slide the rudder pushrod inside the fuselage. Insert the pushrod wire into the control horn hole farther from the surface. Do the same for the elevator pushrod.



ELEVATOR SERVO

RUDDER SERVO

❏ 22. Apply double-sided tape to one side of the rudder servo. Rotate the servo arm until it is 90 degrees with the servo. Slide the rudder "Z" bend into one hole of the servo arm. Move the servo back and forth until the fin is straight with the rudder. Attach the rudder servo to the side of the fuselage with the double-sided tape. Install the elevator servo the same way. Note: because of the narrow width of the fuselage, you may have to install one servo slightly higher than the other one to avoid interference.
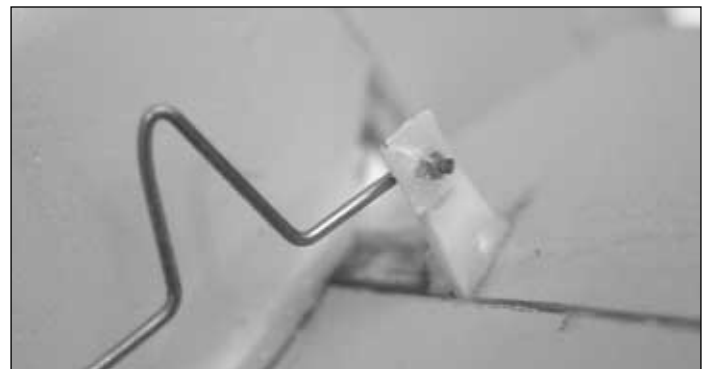


❏ 23. Cut a small portion of the leftover CA Hinge material and make a small hole in it with a pin. Place it against the control horn as shown above. Use a drop of medium CA on the CA Hinge material to glue it to the pushrod. Make sure you do not glue the CA hinge material to the control horn.

❏ 24. Locate the motor and two capacitors. Solder one leg of each one of the capacitors to a motor power tab and the other to the motor case.
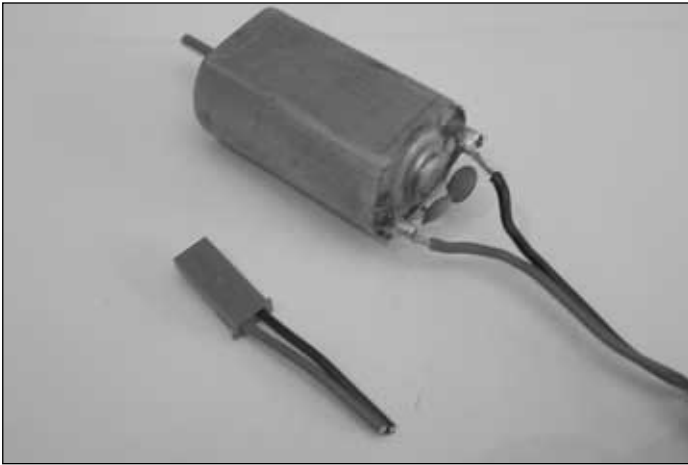
❏ 25.Locate the speed control. Cut the connector on the motor end of the speed control and solder the wires to the motor. The red wire goes to the motor tab with the red dot.

❏ 26. Slide the speed control and the motor into the fuselage through the hole in the front where the other motor was. The motor should fit snug. You may have to trim the opening slightly for the motor to fit well. Apply a dab of epoxy to glue the motor in place. Make sure you glue it in with the original downthrust and right thrust noted in step 7 on page 2.

❏ 27. Install the frequency crystal to the receiver. Connect the speed control and the servos to the receiver. Route the receiver antenna to the back of the fuselage and out of the fuselage. Install the receiver into the forward area of the fuselage. **Warning**: Let any excess antenna wire hang at the back of the fuselage. Do not coil it up inside the fuselage and do not cut it to length.

❏ 28. Install the motor battery in the fuselage between the forward section of the fuselage and the servos. The fit should be snug.
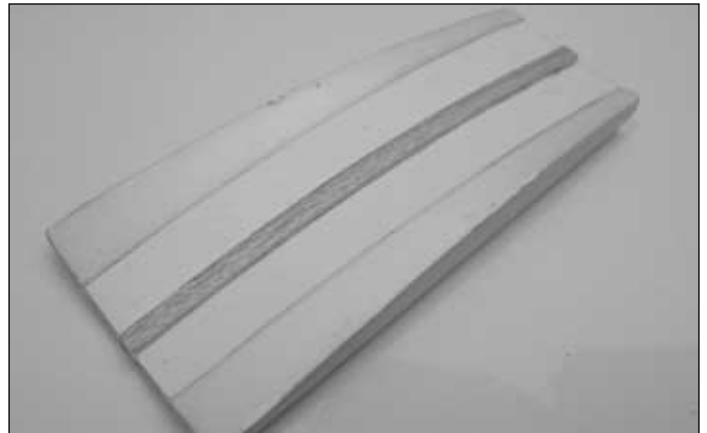
❏ 29. Locate the belly pan. Lightly sand the plastic where the wing is to be glued on. Cut a 1/8" [3.2mm] strip of 1/16"[1.6mm] balsa and glue it on to the centerline as shown above. This is done to modify the wing dihedral. Sand the balsa wood and fit the two wings onto the belly pan until the dihedral is 3-9/16" [90 mm] measured with one wing flat on the work surface with the belly pan installed.
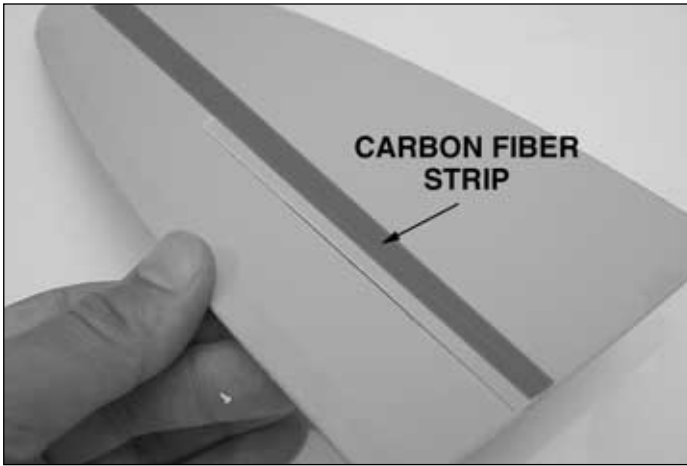
CARBON FIBER STRIP

❏ 30. Using epoxy, glue a strip of carbon fiber to the bottom of each wing to reinforce it.



AFT

FRONT

❏ 31. Glue both wings to the belly pan with epoxy. Note that the wide end of the belly pan is the aft end.



❏ 32. Fit the wing to the fuselage. Because you changed the wing dihedral, you may need to trim the fuselage for a good fit. Be sure **not** to change the wing incidence when trimming the fuselage.



❏ 33. Cut a 1/8"[3.2mm] hardwood dowel to 3/4" [19mm]. Sharpen one end of the dowel with a hobby knife and push it into the forward belly pan as shown above until only about 1/4" [6.4mm] protrudes. Mix a small amount of epoxy and glue it in place. Let the glue cure.



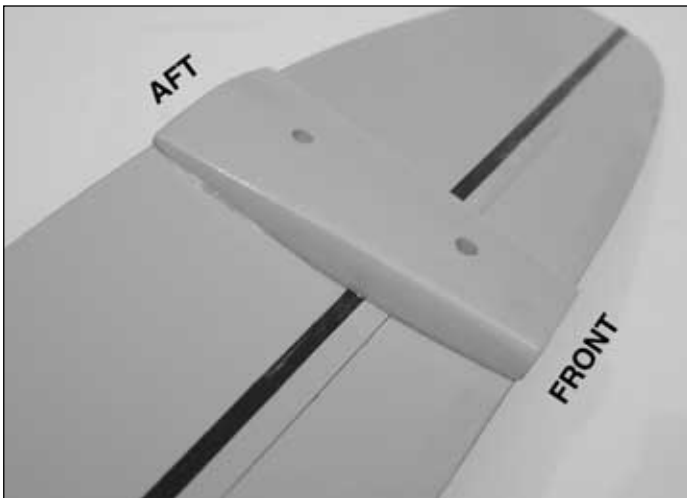❏ 34. Slide the wing in place on the wing saddle. Carefully push the dowel into the foam former in the fuselage's front of the wing saddle until it marks the position of the dowel. Use a 1/8" [3.2mm] drill and hand-drill the hole.



APPLY EPOXY

❏ 35. Test fit the wing in place. Trim the hole as necessary until the wing fits well. Remove the wing. Mix a small amount of epoxy and apply it to the hole area to reinforce it. Do not reinstall the wing until after the epoxy has fully cured.

APPLY EPOXY HERE

❏ 36. With the wing in place, drill a 1/16"[1.6mm] hole between the trailing edge of the wing and the fuselage at the center section of the wing. Remove the wing. Mix a small amount of epoxy and apply it to the hole area. Also, apply some epoxy to the trailing edge of the wing.



❏ 37. Install the wing in place with one #2 x 1/2" [12mm] screw and a #4 washer.



❏ 38. Apply the decals to the finished airplane. Install the propeller. The ready-to-fly weight should be between 6.3oz and 6.7oz [180 - 190g].

## CONTROL THROWS

Turn your radio on. Center the servo arms. With the sticks in a neutral position, modify the bend in the pushrods for each control surface until the surface is aligned. Adjust the travel of your servos or the position of the pushrods in the servo arm or control horn to obtain the throws specified below.

|  | Up | Down |
|---|---|---|
| **Elevator** | 1/8" [3mm] | 1/8" [3mm] |
|  | **Left** | **Right** |
| **Rudder** | 5/32" [4mm] | 5/32" [4mm] |

It is important that you set up your airplane to match these throws, otherwise your airplane will become extremely difficult to control and possibly unflyable.

## CENTER OF GRAVITY LOCATION

The center of gravity range for this airplane is between 1-3/16" [30mm] and 1-9/32" [33 mm] from the leading edge of the wing at the fuselage. Move the battery and receiver inside the fuselage to attain a CG within that range. Do not attempt to fly your airplane if your CG is not within the range. Mark the C.G. range on the top of the wing panels, just outside the fuselage. Check the balance by lifting the airplane upside-down, with the eraser-end of two pencils.

## FLYING YOUR SPITFIRE

It is recommended that you do the first couple of flights in a place with tall grass. This way your airplane may not get damaged if you crash it.

With all controls centered, add full power to the motor and gently throw the airplane straight and level. Level the wings after the throw and then add some "up" elevator to begin climb. After you have gained some altitude, reduce the throttle to about 50% and fly your airplane around until you get used to the controls. When you decide to land, slowly reduce throttle, align your airplane with the runway and apply some "up" elevator to flare as you get close to the ground.

This RC converted airplane is not a slow flier. The motor and battery combination in this airplane offers really high performance. The climb rate approaches 40 degrees and there is enough power to perform some basic aerobatic figures easily. Flying times should be around 8 minutes. Only fly this airplane outdoors and preferably in calm conditions. If you want to fly this airplane slower, you may want to try a smaller battery to reduce the weight, such as a 6-cell, 300mAh NiMh battery.

The foam this airplane is made of is very fragile. For that reason, you should check every critical structural point on this airplane after every flight to ensure that the airplane is safe to fly. Critical points include the flying and control surfaces, the wing attachment points, the motor and servo attachments, etc.

# ADDITIONAL FINE PRODUCTS!

## Hobbico®
### 60 Watt Soldering Iron
### HCAR0776

*This iron's fast-warming, high-quality mica heating unit provides years of dependable, 110V use. The balanced, anti-roll handle is heat- and impact-resistant, with a ribbed design for fingertip control. Two flat chisel tips are included, along with a table stand.*

## Hobbico®
### Deluxe Modeling Knife
### HCAR0105

*Ideal for cutting, trimming, shaping, slicing and more, the durable aluminum Deluxe Hobby Modeling Knife features a 4-jaw chuck to hold the included #11 blade. The soft, red handle provides a comfortable and secure grip, and its "anti-roll" design lets the knife rest securely on your work surface when not in use. A clear plastic cap is also supplied to cover the blade for additional storage safety.*

## Great Planes®
### ElectriFly™ Peak Charger
### GPMM3000

*It's designed specifically for small, lightweight electrics and transmitter batteries, but can be used on any 6-8 cell NiCd or NiMH pack. Plugs into a power supply or cigarette lighter for fast recharges; pulsed current charging protects small packs from overheating. Charging rate adjusts to 200mA (for smaller packs) or 600mA for larger motor and Tx packs; 15mA trickle charge keeps packs topped off for immediate use anytime. Includes 2-pin connector for ElectriFly packs; adapters available separately.*

## Great Planes®
### Double-Sided Foam Servo Tape
### GPMQ4442

*Mount servos and receivers securely in your R/C car, plane or boat using this handy, 1" wide x 1/32" thick double-sided tape. Both sides are covered in a super-sticky adhesive for impressive holding power. One roll per package; each roll contains a 36" length of tape.*