



# SUN DANCER

*ALMOST READY TO FLY*



## SUN DANCER ARF ASSEMBLY MANUAL

### INTRODUCTION:

Congratulations on the purchase of the Sig Sun Dancer ARF kit! Properly assembled, powered, and flown the Sun Dancer will become one of your favorite models in no time. The construction of this ARF kit is extremely well engineered, providing an airframe structure that is very light and strong. This is one of the reasons that it flies as well as it does using the recommend engine sizes. The Sun Dancer ARF has superb take-off and landing characteristics combined with remarkable aerobatic capabilities. The airframe has been specifically designed to provide you with a model with that "zeroed out" feel. This is to say that the wings, stabilizers are set at 0° in relationship to the thrust line. In turn this provides you with a model that is completely "honest" in any attitude and goes just where you point it. We will cover more detailed set-up information later in the assembly instructions.

**Engine Note:** Do to the large number of useable engines for this model, we simply cannot cover every possible engine installation. However, the large volume of space provided inside the cowling should make it easy to mount virtually any engine within the suggested size range.

### ADDITIONAL ITEMS NEEDED TO COMPLETE THIS MODEL

#### RADIO EQUIPMENT:

We highly recommend the use of a modern computer radio. Such radio systems allow you to easily set and adjust every channel and additional pre-program various flight functions to suit your individual style of flying. Four channels are required to fly your Sun Dancer - rudder, elevator, ailerons, and throttle.

**Servos:** You will require a total of eight servos - ailerons(4), elevators(2), rudder(1), and throttle(1). Since the Sun Dancer is a large, highly aerobatic airplane and because the control surfaces are also large, we urge you to use appropriate servos on all control surfaces (ailerons, elevators, and rudder). This model should not be flown with "standard" 40- 50 inch/ounce output servos! The Sun Dancer is large enough to impart very large air loads and standard size servos will quickly fail, resulting in a loss of control and possibly crashing the model. You should use heavy-duty ball-bearing servos with at least 70 inch/ounce of torque or more to drive the ailerons, elevators, and rudder. If available, use a servo with metal gears instead of plastic gears. Specifically, in our prototype models we used Hitec™ HS-645MG (Part #32645S) servos for the ailerons, elevators, and rudder. This is a dual ball-

bearing servo, rated at 77 inch/ounces of torque. Another good choice would be the Airtronics™ #94731 servo, which has 80 inch/ounces of torque. These servos or their equivalent from other manufactures, can be relied upon to work well throughout the Sun Dancer's flight envelope. A "standard" servo is adequate for the throttle.

**Servo Arms:** We also suggest that you consider using after-market reinforced plastic servo arms such as the Du-Bro "Super Strength" products. These output arms are available to fit any brand of servo. They are very strong and work extremely well with this model. The Du-Bro output arms are molded from considerably stronger material and these have held up extremely well in our prototypes.

**Servo Extension Chords:** You will need the following chords...

- Four 24" and two 6" standard extension chords for the ailerons.
- Three standard Y-harness cords for the ailerons.
- One reversing type Y-harness cord for the two elevator servos.

The three Y-harness chords for the ailerons can be the standard type sold by all radio manufacturers for their radio systems. The Y-harness for the elevators should be the type that "reverses" the travel direction on one side of the Y-harness - see the following note about a great aftermarket product called the "Miracle Y".

**Miracle "Y":** Note in the photos that the elevator servos will be mounted on opposite sides of the fuselage (i.e. with the pushrods coming off the top of each servo in direct line with the control horns). This is done so the geometry of the servos, pushrods, and control horns is exactly symmetrical on both sides, providing the exact same response to control inputs for each elevator. This is very important in an all out aerobatic model like the Sun Dancer. Normally in order to have this setup work properly with a standard Y-harness, you would have to electronically reverse the wiring inside one of the elevator servos so that both elevators will go up (or down) at the same time. However, there is an after-market Y-harness available that electronically reverses one of the elevators for you. It also has a centering adjustment pot that lets you dial in the elevators exactly to a neutral relationship with each other. This product is called the "Miracle Y Servo Reversing Y adapter", sold by MAXX Products of Lake Zurich, IL. It can be ordered with any radio manufacturer's connectors you specify. We have thoroughly tested this product and found it to be reliable, easy to use and very reasonably priced. In addition, it is a total of 24" in length - 12" of elevator extension cables and a 12" cable for the receiver. Perfect for the Sun Dancer!



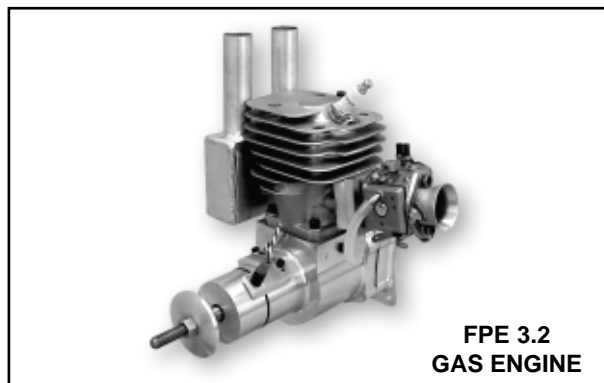
**RX Battery Pack:** Finally, since you will be using a total of 8 servos to fly this airplane, we strongly suggest you use a large capacity battery pack for his model. We used the 2400 mAh battery pack to power the flight system. This pack provides ample time to safely fly at least five or six flights during any given flying

session, a reasonable amount of time for most modelers. Naturally, a larger pack provides more flight time but remember that larger can also equate to heavier. We also suggest that you routinely use an Expanded Scale Voltmeter (ESV) at the field to check the charge condition of your batteries. This common piece of field equipment can save your model!

**ENGINES & PROPELLERS:**

The Sig Sun Dancer ARF has been flown with a wide verity of engines. As everyone knows, there is no substitute for power and the engines recommended for this model all provide good power margins. Naturally, the larger engines in this range make more power and will fly the Sun Dancer with more authority than the smaller engines. It is simply a matter of how you want to fly the airplane.

The Sun Dancer was designed from the start for gas engines providing ample room inside the cowling to comfortably fit most of the popular gas engines that are available. We recommend gas engines with a displacement ranging from 3.0 cu.in. to 4.3 cu.in. (30 cc - 70 cc). Some of the popular engines that fit into this range are listed below.



**SIG First Place Engines**

FPE3.2	3.2 cu.in. (52 cc)	Propeller: 22 x 10
FPE4.2	4.2 cu.in. (69 cc)	Propeller: 24 x 10
<b>Quadra</b>		
Q52	3.2 cu.in. (52 cc)	Propeller: 22 x 10
Q65	4.0 cu.in. (65 cc)	Propeller: 22 x 6-10
<b>Zenoah</b>		
G62	3.8 cu.in. (62 cc)	Propeller: 22 x 6-10

**KIT CONTENTS:**

The following is a complete list of every part included with your Sun Dance ARF kit. Use the check-off blocks to inventory your kit before beginning assembly.

**Note:** Do not remove the parts from the plastic bags until needed during assembly. All of the required parts, screws, and bolts will be included in the bag to assemble a particular component of the model.

**Fuselage:**

- 1 Fuselage

**Tail Surfaces:**

- 1 Fin
- 1 Rudder
- 1 Stabilizer
- 1 Right Elevator
- 1 Left Elevator

- Hinges for above, installed but not glued

**Hatch:**

- 1 Fuselage Hatch
- 4 T2.6 x 8mm PWA Screws

**Wings:**

- 1 Top Right Wing Panel
- 1 Top Right Aileron
- 1 Top Left Wing Panel
- 1 Top Left Aileron
- 1 Bottom Right Wing Panel
- 1 Bottom Right Aileron
- 1 Bottom Left Wing Panel
- 1 Bottom Left Aileron
- Hinges for above, installed but not glued

**Main Landing Gear:**

- 1 Aluminum Main Landing Gear
- 2 4" dia. Main Wheels
- 3 M4 x 20mm Socket-Head Bolts
- 3 M4 Flat Washers
- 2 M5 x 42mm Hardened Steel Axle
- 2 M8 Lock Nuts
- 4 M3 x 12mm Wheel Pant Mounting Bolts
- 4 M3 Split-Ring Lock Washer
- 4 Wheel Collars with Set Screws

**Wheel Pants:**

- 1 Right Wheel Pant
- 1 Left Wheel Pant

**Wing Joiners, etc.:**

- 4 Hardwood Wing Joiner
- 2 1/4-20 Nylon Wing Bolts
- 1 Throttle Servo Mounting Tray

**Cowling:**

- 1 Fiberglass Cowl
- 4 M2.6 x 8mm PWA Mounting Screws

**Tailwheel Assembly:**

- 1 Main Leaf-Spring with Steering Arm & Tailwheel
- 1 Secondary Tailwheel Spring.
- 1 Metal Rudder T-Horn
- 2 M2 x 10 mm PWA Mounting screws
- 3 M3 x 15mm PWA Mounting Screws
- 2 Coil Steering Springs

**Windshield:**

- 1 Molded Clear Plastic Windshield
- 5 M2 x 8mm PWA Mounting Screws

**Control Horns, etc.:**

- 2 .024" x 39.5" Steel Cable, for rudder pull-pull
- 4 Pull-Pull Rigging Couplers with Metal R/C Links and Knurled Stop Nuts
- 4 Copper Pull-Pull Swage Tubes
- 4 RIGHT Metal Control Horns
- 4 LEFT Metal Control Horns
- 24 M2.6 x 10mm Mounting Screws; for control horns
- 4 M2.5 x 14mm Mounting Bolts; for rudder control horns
- 4 M2.5 Hex Nuts; for rudder control horns

### Cabane Struts:

- 2 Aluminum Cabane Strut Assembly
- 2 Aluminum Strut Fittings
- 2 M3 x 15mm Socket-Head Bolts
- 4 M3 x 15mm Socket-Head Mounting Bolts
- 4 #3 Flat Washers

### Interplane Wing Struts:

- 2 Interplane Struts
- 8 Aluminum Strut Fittings
- 8 4-40 x 3/8" Socket-Head Bolts
- 8 4-40 Lock Nuts
- 8 #4 Flat Washers

### Tail Brace Wires:

- 2 Threaded Tail Brace Wires, 11-3/4" long
- 2 Threaded Tail Brace Wires, 10-1/8" long
- 4 Metal R/C Links
- 4 M2 Hex Nuts
- 3 M2 x 19mm Phillips-Head Mounting Bolts
- 1 M2 x 25mm Phillips-Head Mounting Bolts
- 4 M2 Hex Nuts

### Pushrods:

- 4 4-40 x 3" Threaded Pushrods; for ailerons
- 1 4-40 x 4" Threaded Pushrod; for right elevator
- 1 4-40 x 5-1/2" Threaded Pushrod; for left elevator
- 12 Metal R/C Links
- 12 4-40 Hex Nuts
- 12 Spring Keepers
- 1 4mm id x 460mm Outer Nylon Pushrod
- 1 3.2mm id x 460mm Inner Nylon Pushrod
- 2 M2.1 x 22mm Threaded Studs
- 2 Nylon Ball-Link Sockets
- 2 Metal Ball-Links
- 2 2-56 Hex nuts

### Fuel Tank:

- 1 650 c (22 oz.) Fuel Tank
- 1 Rubber Stopper
- 1 Tie-Wrap
- 1 Metal Clunk Pickup
- 2 Aluminum Tubes
- 1 Fuel Tubing for inside tank

### Miscellaneous:

- 4 1/2" x 13" Yellow Covering Strips
- 1 Sun Dancer Decal Set
- 1 Sun Dancer Assembly Manual

### A NOTE ABOUT COVERING MATERIAL:

Your Sun Dancer has been professionally covered with Oracover® #33 Cad Yellow, #32 Golden Yellow, and #23 Ferrari Red. (Note: In the United States, Oracover® is sold under the name of Hanger 9 Ultracoat®. The equivalent Ultracoat® colors are #872 Bright Yellow, #889 Dark Yellow, and #866 True Red).

Oracover® is well known for its ease of application, lightweight, and consistency of color. If you live in a dryer climate, you may notice that some wrinkles might develop after removing the covered parts from their plastic bags. If that is the case, there is no need to be alarmed. The covering is not defective. This is perfectly normal and nothing to do with the covering material or how it was applied.

It has to do with the moisture beneath the covering. Wood takes on or loses ambient humidity. Your Sun Dancer ARF was manufactured in a relatively humid region of the world. The wood was therefore holding humidity at the time the parts were covered and bagged. Once the parts are removed from their bags and subjected to drier conditions, the wood quickly loses moisture and the covering may appear loose. (This also explains why most iron-on covering stay tight in the summer only to loosen a little in drier winter conditions.)

Any wrinkles that appear in the covering are easy to remove by using a hobby-type of heat iron. We suggest covering the iron's shoe with a thin cotton cloth, such as an old T-shirt to prevent scratching the film. The iron should be set to about 280° - 300° F.

First use the heated iron to go over all the seams and color joints in the covering, making sure they are all sealed and well adhered. Then use the heated iron to lightly shrink material - do not press on it. Once the covering is tight, lightly iron the material back down to the wood. You can use a hobby type heat gun to re-shrink the covering, but must be extra careful around the seams. Re-heating the seams may cause them to "Creep", making them unsightly.

**Modelers Tip:** One of the most common problems associated with shrinking any covering film is controlling the heat around the seams. Heat applied close to or directly onto seams re-heats the covering adhesive and the seams will often "crawl". This is easy to control. Just tear a few paper towels into strips and soak them in cool tap water. Lay the wet strips over any covering seam and use a heat gun or iron as you normally would. The wet strips keep the seam cool while the covering immediately next to it shrinks. This tip works great with any iron-on covering.

### REQUIRED TOOLS:

For proper assembly, we suggest you have the following tools and materials available:



- A selection of glues - SIG Thin, Medium, and Thick CA; SIG Kwik-Set 5-Minute Epoxy, and Sig Epoxy (slow cure)
- Threadlock compound, such as Loctite® Non-Permanent Blue
- Screwdriver Assortment
- Pliers - Needle Nose & Flat Nose
- Diagonal Wire Cutters
- Small Allen Wrench Assortment
- Drill and assorted Drill Bits
- Pen Vise for Small Dia. Drill bits
- Hobby Knife With Sharp #11 Blades
- Scissors
- Covering Iron and Trim Seal Tool
- Masking Tape

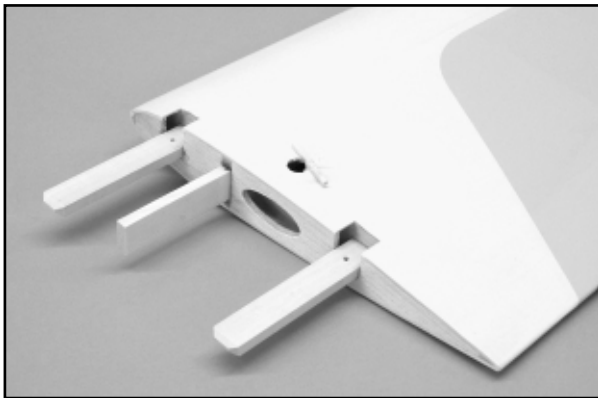
Paper Towels  
Dremel® Tool With Selection of Sanding and Grinding Bits  
Large Fuel Tubing

### TOP WING ASSEMBLY:

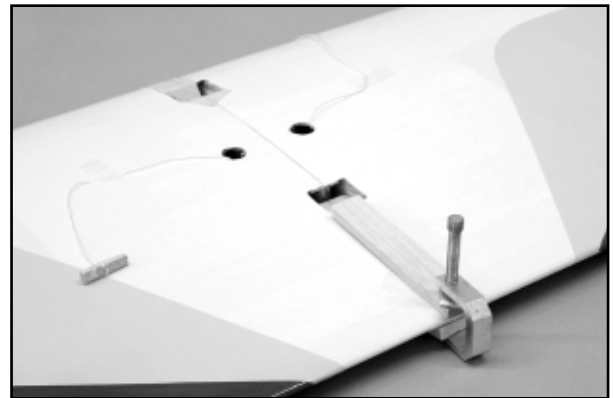
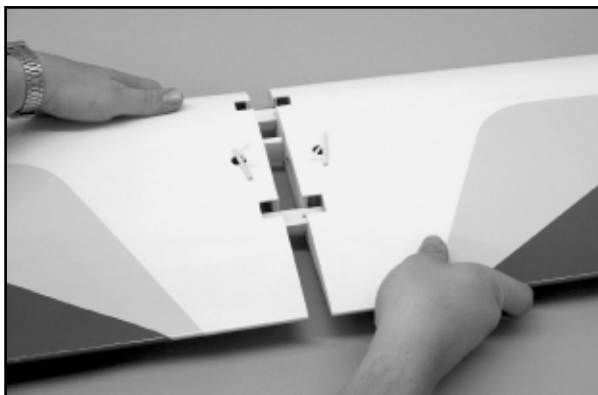
Note that a piece of string has been factory-installed in each wing panel to make it easier to pull the servo wires and the attached extension cords through the openings in each wing panel. Use small pieces of tape to hold the strings out of the way during while assembling the wing panels.

□ 1) a. Begin assembly of the upper wing by locating the two cabane attachment mounts and the wing joiner from the parts bag. Assemble the parts together as a "dry assembly" first to make sure you fully understand the assembly.

b. Using slow drying 30-minute epoxy glue, apply a liberal amount of glue to the two cabane attachment mounts and install them into one of the wing panels. Again, apply a liberal amount of glue to the inside of the wing joiner socket and to the sides, top, and bottom on one half of the wing joiner. Install the wing joiner in the wing socket and wipe off any excess epoxy that has oozed out with a rag soaked in alcohol. Allow the glue to cure.



□ 2) Apply epoxy glue to the inside of the wing joiner socket of the opposite wing panel and to the sides, top, and bottom of the wing joiner and to the cabane attachments including the inside face of the two exposed ribs on the end of each wing panel. Slide the two wing panels together and firmly press the two panels together. Again, wipe off excess epoxy that has oozed out. Use strips of masking tape at the leading and trailing edge joints to firmly hold the wing panels together. Check the alignment of the two wing panels by sighting down the length of the leading and trailing edges. Place a clean rag on the floor next to the wall. Stand the wing upright with one wing tip on the cloth, as vertical as possible, leaning against the wall. Place a weight on the upper wing tip and allow the assembly to fully cure.



**MODELER'S TIP:** Use a small "C" clamp and two scrap pieces of plywood and lightly clamp the trailing edge of the two wing panels together as shown in the photo. Allow the glue to cure while checking it periodically to make sure that it is properly aligned while the glue is curing.

□ 3) After the glue has cured, use one of the provided 1/2" x 14" Yellow Covering Strips to cover the bottom wing joint, centering the covering over the joint. Apply another strip to the top wing again, centering the covering over the joint. Work slowly and overlap the ends of the two strips by 3/8" at the leading and trailing edges. Try to arrange the overlaps so the seam is facing downwind.

□ 4) Next you will need to permanently glue the hinges in place. Notice that four hinges have been factory-installed in each aileron, but they are not glued.

a. First remove all the hinges from the ailerons and wing.

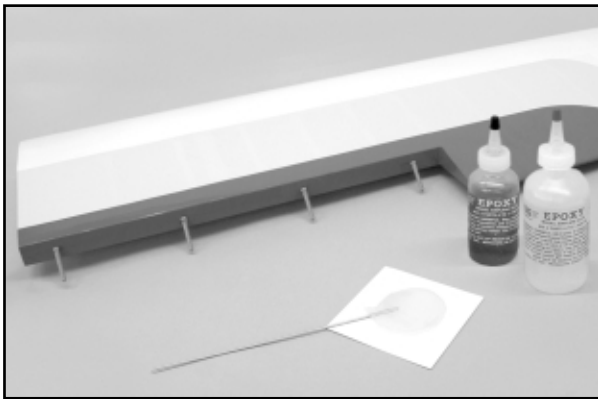
b. Notice that the holes the hinges came out of are the correct diameter for the round shank of the hinge, but not large enough to accept the square "knuckle" part of the hinge. You need to countersink the holes to accept the knuckle parts of the hinge, so that the hinge can be pushed in far enough for the pivot point to line up with the front of "V" point of the aileron leading edge. We recommend enlarging the opening of the hinge holes slightly with a held 1/4" dia. drill bit. You only need to twist the drill in about a 1/4" or so. Countersink all the hinge holes in the leading edge in this manner. This will allow a gapless hinge line with proper hinge movement.

c. Trial fit the ailerons onto all the hinges and the wing one more time to make sure everything lines up properly. You want the beveled leading edge of the aileron to be as close a to the mating wing as possible while still allowing full movement. When satisfied that everything is good, take it back apart for the gluing process.



d. We recommend using slow drying epoxy glue for gluing the hinges so that you will have ample time for clean up and

alignment. The best procedure with this type of hinge is to inject glue into the hole and then insert the hinge. Use a clean cloth soaked with methanol or rubbing alcohol to wipe off any excess glue that has oozes out into the control surfaces. Then move to the next hinge. Epoxy the hinges into the wing first and let dry. Then slide the aileron in place over the hinges. Again, wipe off any excess glue.

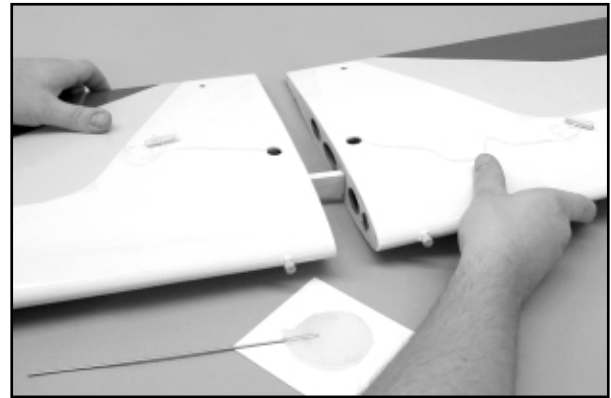
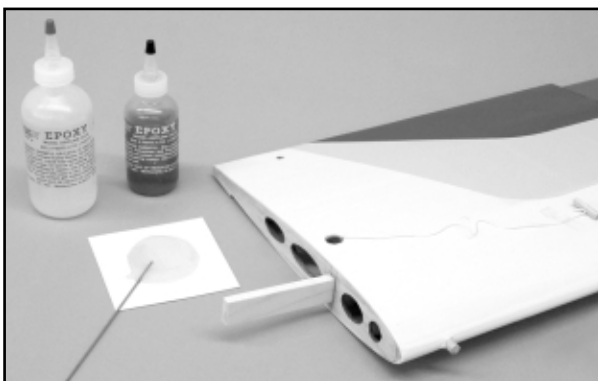


**IMPORTANT NOTE:** Be sure to correctly identify which aileron is for the right wing and which is for the left wing by looking for the aileron horn plywood mounting pad that is set into the BOTTOM side of each aileron, underneath the covering.

**MODELER'S TIP:** Apply a thin coat of petroleum jelly, such as Vaseline®, to the hinge knuckle. The petroleum jelly will keep the epoxy from sticking to the knuckle and causing a bind. Do not get the petroleum jelly on the round shank of the hinge, where you want the glue to stick.

**BOTTOM WING ASSEMBLY:**

□ 5) Begin assembling the bottom wing halves by mixing an ample amount of slow curing epoxy glue. Use a wire, stick, or small throwaway brush to liberally coat the dihedral brace pockets in the ends of the wing panels with glue. Then apply a liberal amount of glue to exposed centers of each wing panel. Next, apply glue to front and rear face of the dihedral brace and slide the dihedral brace into one wing panel. Next, slide the other wing panel in place over the exposed end of the dihedral brace joining the two panels at the center. Firmly press the wing panels together and wipe off any excess glue with a paper towel and alcohol. Make sure the wing panels are accurately aligned with each other by checking the alignment of the leading and trailing edges. Again, use masking tape at the leading & trailing edges of the joint to hold the panels in the correct position. Place a clean rag on the floor next to the wall. Stand the wing upright with one wing tip on the cloth, as vertical as possible, leaning against the wall. Place a weight on the upper wing tip and allow the assembly to fully cure.



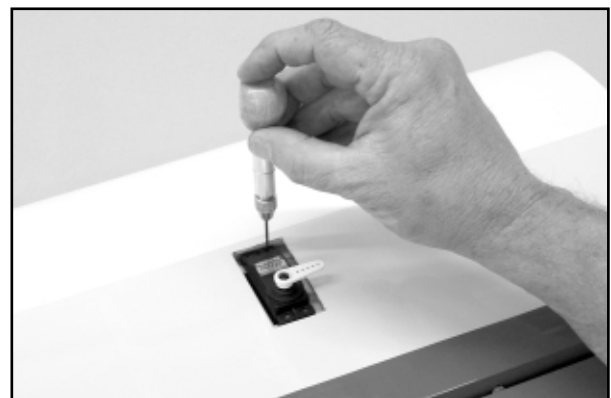
□ 6) Hinge the ailerons to the wing in the same manner as described in Step #4 of this assembly manual.

□ 7) Cover the top & bottom wing joint with the provided strips, as show in Step #3 of this assembly manual.

□ 8) Note that a piece of string has been factory-installed in each wing panel to make it easier to pull the servo wires and the attached extension cords through the openings in each wing panel. Begin by attaching a 24" servo extension to each of the four the servos. To prevent the connecting plugs from pulling apart during assembly or from flight vibrations, secure the connecting plugs together with a piece of tape or heat shrink tubing. Securely attach the end of the string (servo bay end) to the connecting plug of the 24" extension. By gently pulling on the opposite end of the string gently pull while feeding the servo extension into the servo opening in the wing. Take you time and do not pull too hard on the string. It is sometimes helpful to stand the wing vertical when trying to feed the extension through the openings in each of the wing ribs. When the extension is through the opening at the center of the wing, tape it in place to keep it from inadvertently slipping back through.

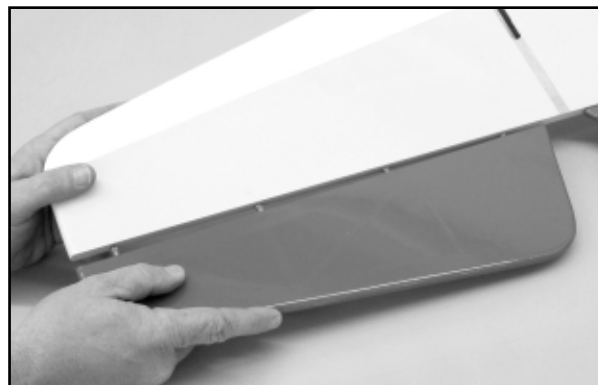
**Note:** Before installing the servos into the wing panels, use your radio system to center all four servos and to check servo travel making sure the servo output arms are 90° to the servo.

□ 9) Use a pin vise and a small drill bit to drill small pilot holes in the hardwood mounts for the servo mounting screws. Use the screws supplied with your radio system to mount the servo securely in place. Repeat this step for the remaining three aileron servos.



□ 10) Locate four metal control horns (2 left & 2 right), along with sixteen 2.6 x 10 mm phillips-head screws for mounting the control horns. Tape the aileron in the neutral position and lay it upside down on you bench. Position one of the horns on the bottom

leading edge of the aileron. Be sure to line up the arm of the control horn with the servo output arm. Also make sure that the holes in the control horn are directly over the hinge line. Then mark the control horn's 4 mounting hole locations onto the aileron with a fine point marker pen. Drill 3/64" (or #56 drill) pilot holes into the aileron at each mark. Mount the control horn in place, using the M2.6 X 10mm phillips-head screws. Repeat this procedure for the remaining three control horns.

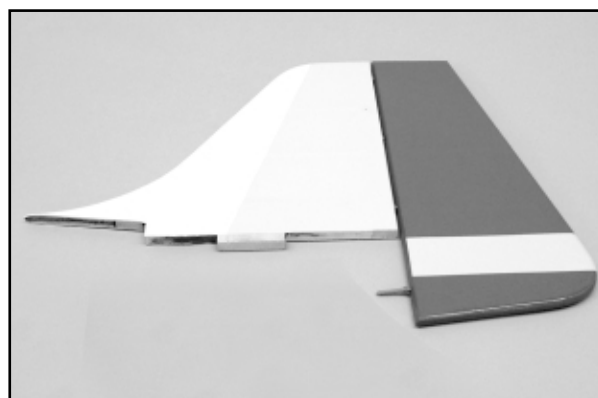
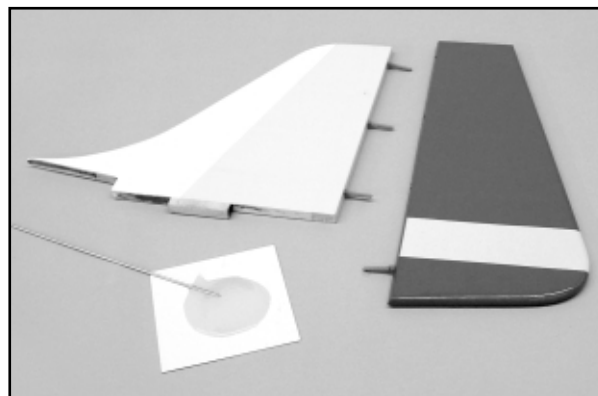
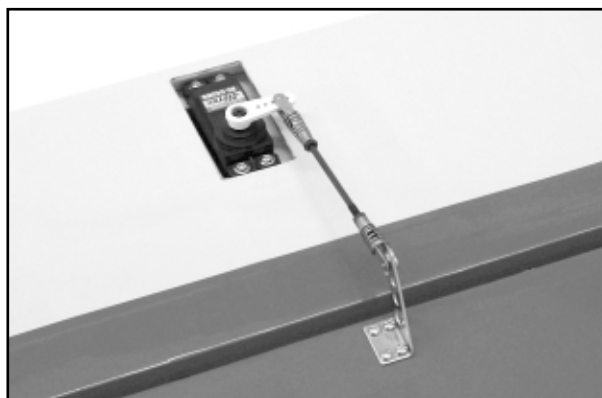


for the ailerons and require the use of a 3/16" drill bit to enlarge the mounting holes in both the stabilizer and elevators.

**FIN & RUDDER ASSEMBLY:**

□ 13) Again, install the hinges in the same manner as the ailerons with the exception of the bottom hinge. Glue this into the fin at this time only. The bottom hinge will be permanently glue in place when the fin and rudder are assembled to the fuselage.

□ 11) Four 4-40 x 3" pushrods have been provided for the ailerons. Each pushrod is pre-assembled at the factory with two 4-40 R/C Links, two 4-40 Jam Nuts, and two Spring Keepers. Connect one end of the aileron pushrod to the servo output arm and adjust the length of the pushrod by turning the R/C links in or out until the connecting pin matches the middle hole of the control horn. Snap the R/C Link in place onto the horn. Tighten the jam nut against the R/C link and push the spring keeper in place over the R/C Link. **Note:** Just tighten the jam nuts snugly at this time, further adjustments may be necessary during Final set-up.



**STABILIZER & ELEVATOR ASSEMBLY:**

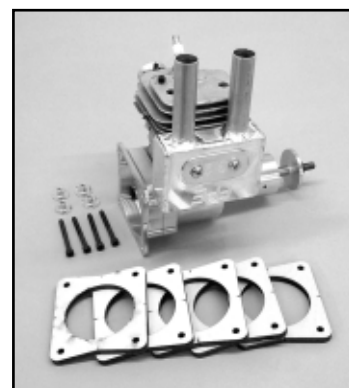
□ 12) Hinge the elevators to the stabilizer in the same manner as in Step #4. The hinges are slightly smaller than the hinges used



**ENGINE MOUNTING:**

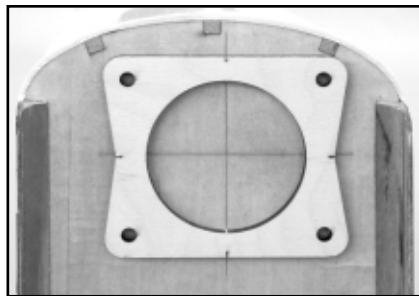
□ 14) Gasoline engines, like the FPE 3.2 pictured here, fit best in the Sun Dancer when mounted inverted. You will need to purchase mounting bolts and blind nuts to fit your particular engine installation.

a. The FPE 3.2 gas engine measures 6" from the prop drive washer to the back of the engine mount, while the Sun Dancer is designed with a firewall to prop washer distance

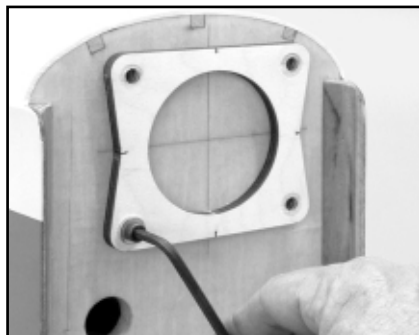


of 7-1/8". Consequently you will have to put a 1-3/16" thick spacer (not supplied) between the firewall and the backplate of the FPE engine to achieve the proper 7-1/8" distance. Sig has a set of laser cut plywood spacers specifically for the FPE 3.2 gas engine. They are part # SIGSH803 (2 spacers per package, so you will need three packages with a total of five spacers needed to achieve the 1-3/6" total spacers). You will also need 10-32 x 2" socket-head bolts and 10-32 blind nuts (not supplied).

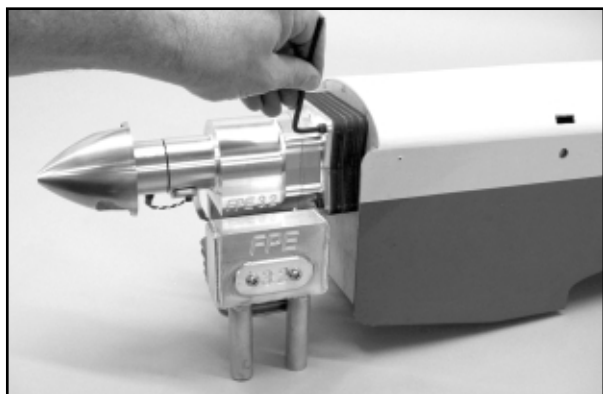
b. Position one of the spacers on the front of the firewall, carefully aligning it with the horizontal and vertical thrust lines as shown in the photo and tack glue in place with thin CA. Mark the mounting bolt hole locations on the firewall with a pencil and then drill holes completely through the firewall.



c. Install the 10-32 blind nuts by using a 10-32 bolt, flat washers, and Allen Wrench. Pull the blind nuts into the rear of the firewall by tightening the 10-32 bolt with the Allen Wrench until the blind nuts are properly seated and epoxy glue the blind nuts in place.



d. Mount the engine and additional spacers in onto the front of the firewall with the 10-32 bolts.

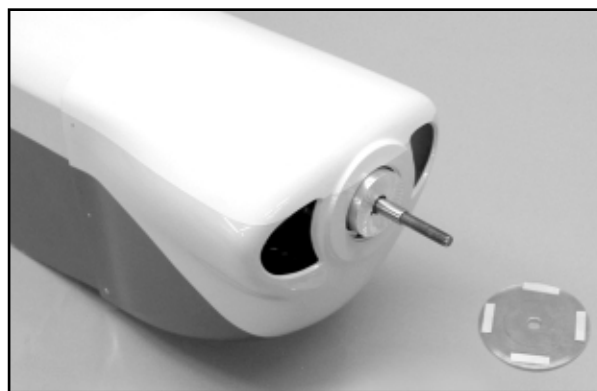


#### MOUNTING THE COWL:

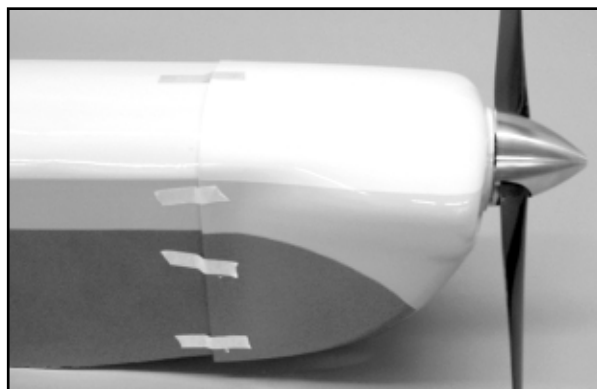
□ 15) Before mounting the cowling, carefully inspect its inside rear edges. Use sandpaper to smooth the inside rear surface of the cowl, making it free of any bumps or ragged edges that may scratch or dent the fuselage when pressed in place. Also, make sure the six mounting holes in the sides of the cowl are open and free of any debris. In addition, remove the muffler, carburetor, and the spark plug from the engine.

a. Slide the cowl over the engine and the fuselage until it is roughly in place, making sure that the drive washer on the engine extends through the opening in the cowl. A minimum of 1/16" clearance is required between the spinner backplate and the nose ring on the cowl. Tack-glue four small pieces of 1/16" x 1/4" balsa to the back of the spinner backplate to act like spacers. Install the

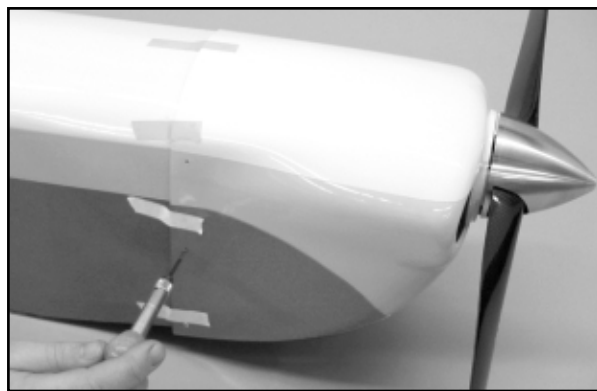
spinner backplate, propeller, and spinner on the engine and securely tighten in place.



b. Carefully position the cowl on the fuselage making sure that the spinner is centered on the nose ring of the cowl and touching the balsa scraps on the spinner backplate. Also use the paint stripes on the fuselage and the cowling to help achieve proper alignment. When satisfied, hold the cowl in place with strips of masking tape.



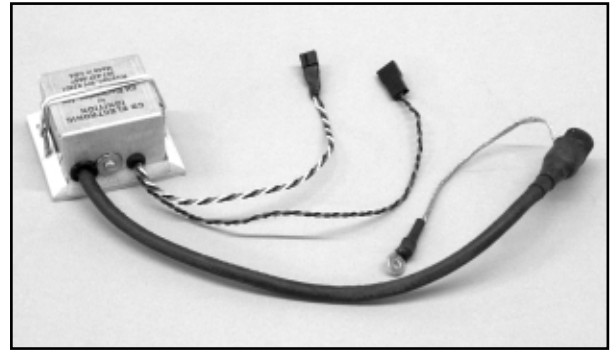
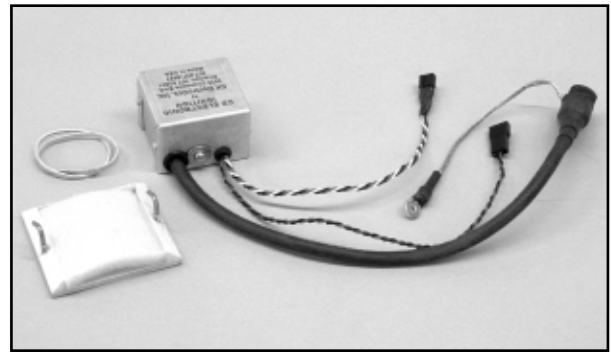
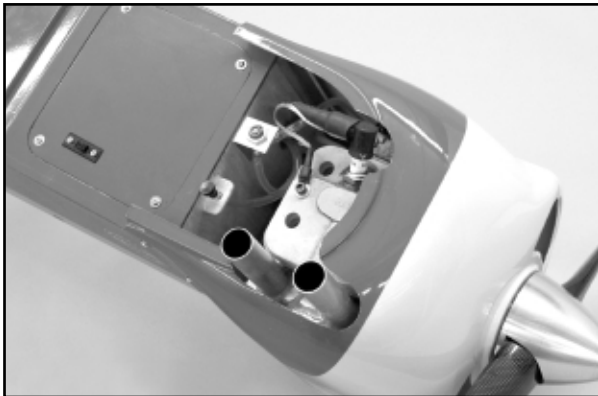
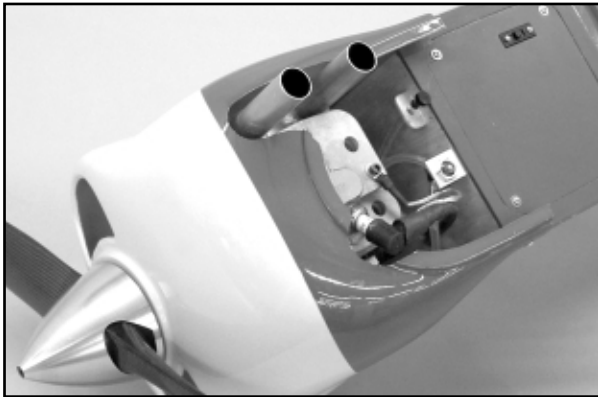
c. Using a 3/64" (or #56) dia. drill bit, drill pilot holes in the fuselage, centered in each of the six pre-drilled holes in the cowl. Securely mount the cowl in place with the 6 PWA 2.6 x 8mm (.375) screws that have been provided. Double check your work one more time to make sure that the cowl is bolted on in the correct location and is properly aligned. Then remove the cowling from the fuselage.



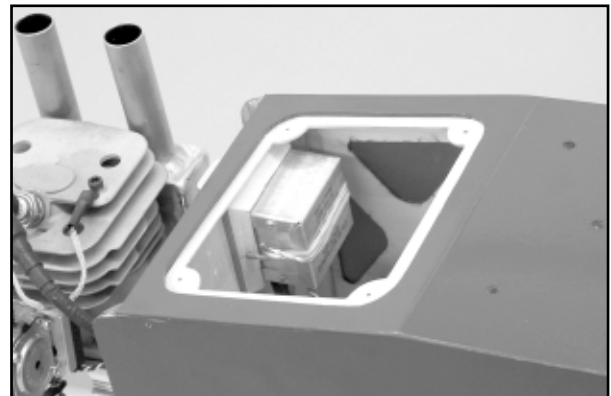
d. For most engine installations, there is more than an adequate amount of openings provided in the cowling for cooling air to enter and exit. A rule of thumb is that the exit area must be equal to or larger than cooling air inlet. There must be at least 1/8" of clearance between the cowling and any accessory such as muffler and/or carburetor. In these pictures showing the FPE 3.2



engine, all that is required is to remove part of the cowling from around the spark plug and around the muffler tubes. **Note:** If you are using an engine other than the FPE, you will have to adjust the size and shape of the cowling openings to suit your engine.



b. This bracket was then epoxied to the rear of the firewall in the lower left corner. Isolate the ignition module with foam rubber and secured to the bracket with rubber bands. The leads from the module are then routed through the hole in the firewall.



#### TIPS ON CUTTING HOLES IN FIBERGLASS

First of all, be sure to wear safety glasses and a mask of some kind to avoid inhaling any fiberglass dust. Use a fine point marker to draw an exact outline of the area you want to cut out. Then use a Dremel® Tool with a sanding drum to remove the material just inside the lines you have drawn. Work slowly and carefully while removing the material from the cowl. Check your progress often and make sure you are not removing too much material. Finally, use 220 sandpaper by hand to clean up any rough or jagged edges. Make sure all edges are free of any loose glass fibers. Be careful not to sand the paint on the outside of the cowl. Remove all fiberglass dust from the cowl with a tack rag or with alcohol on a clean cloth.

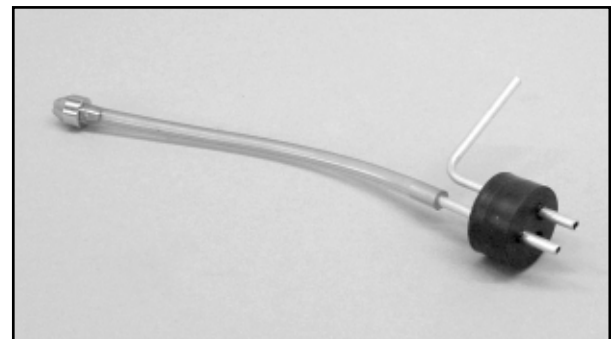
#### GAS ENGINE IGNITION MODULE:

□ 16) Our FPE engine operates on electronic ignition. This feature eliminates a great deal of bulk (weight) and makes for easier starting and a smoother running engine. The ignition module is a small and separate unit that must be installed in the nose of the fuselage, behind the firewall. It must be close enough to the engine to allow the wiring to reach. The module wiring consists of the spark plug lead, the ground wire, the electronic module connection to the prop hub sensor, and the battery pack lead. The battery pack lead stays in the fuselage and will be connected to a separate battery pack & switch used to power the system. The most convenient location for this module in our Sun Dancer installation was at the lower left corner of the firewall.

a. Of course the module could be wedged in place with foam but a cleaner and more sanitary installation was achieved by making a mounting bracket out of 1/8" plywood, 1/4" triangle balsa, and "J" bolts.

#### FUEL TANK ASSEMBLY:

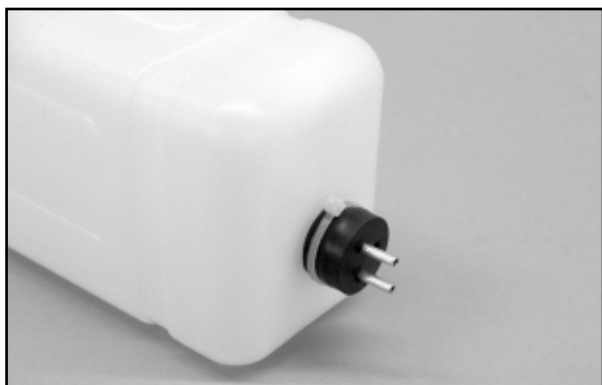
□ 17) a. Two pieces 1/8" aluminum tubing has been provided in the parts bag for venting the fuel tank. The first piece is 2" in length and the second is 3-1/4". Insert the 2" piece of aluminum tubing into the rubber stopper for the fuel pick up tube leaving 1/2" of the tube protruding out the front of the stopper. Next, place a 90° bend into the middle of the 3-1/4" aluminum tubing (making two equal sides) to make up the overflow vent. Insert this into the rubber





stopper in the same orientation as shown in the photo again, leaving a 1/2" of the tubing protruding from the stopper. **Note:** The neck of the fuel tank is NOT located in the center of the tank body and is offset to one side. The offset side is the BOTTOM of the fuel tank.

b. Add the length of fuel tubing and the clunk to the pick-up vent and install the stopper assembly into the tank. Make sure that the clunk is free to move up and down and side to side in the back of the fuel tank. When satisfied, secure the stopper with the small tie-wrap that has been provided. Cut two 8" or so lengths of fuel tubing (gasoline compatible such as Du-Bro Tygon) and place onto each of the two fuel tank lines. Label each of the vents to insure proper identification during assembly.



c. Working through the wing opening in the bottom of the fuselage, slide the fuel tank into position while routing the fuel lines through the firewall. Secure the fuel tank in place with two #67 rubber bands (or four #64 hooked together) by attaching each end of the rubber band to the laser-cut hooks in the tank floor. **Note:** It is a good idea to isolate the fuel tank from vibration by sandwiching a piece of 3/8" foam between the tank floor and the fuel tank.

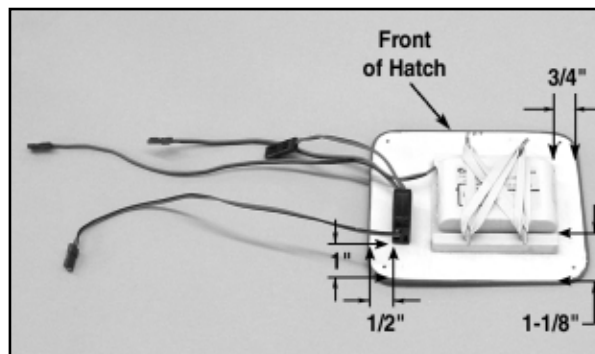


#### HATCH:

□18) Gas engines with electronic ignition require a separate battery pack to power the ignition module. In the case of our FPE 3.2, we used a 4-cell 1200 mAh battery pack for this purpose. This battery pack provides about 2 hours of running time before needing recharging. **Note:** Please keep in mind it is a good idea to have as much separation between the components of the engine ignition system and radio flight system as possible to prevent possible interference with the flight radio.

a. We mounted our ignition battery to the inside of the hatch by gluing two pieces of 3/8" x 3" square basswood to the hatch using the dimensions shown in the photo. Next, drill four 3/32" holes in the basswood and thread in four "J" bolts. Wrap the battery pack in foam and secure it to the hatch with two #64 rubber-bands.

b. The ignition system must be able to be turned on and off as needed and this means that there must be a separate switch for this purpose. We used a standard radio system switch assembly, with a charging receptacle, for this purpose. The charging receptacle can be easily accessed from the wing opening in the fuselage without removing the hatch. Mount the switch to the hatch using the dimensions shown in the photo. Install the hatch with four 2.6 x 8mm screws provided.



□19) The throttle servo can be mounted on either the left or right side of the fuselage depending on the engine used. For the FPE engine, mount the servo on the right side (on the left when viewed from the bottom) with the hardware and screws provided with the servos. Install the metal Ball-link stud into the outer most hole in the servo output arm and secure in place with a 2-56 hex nut. **Note:** A laser cut plywood throttle servo mount has been provided to mount the throttle servo in an alternate location if other than the FPE engine is used.



With gas engines, it is especially important to avoid any metal-to-metal connections in your throttle linkage. This is because such connections may cause unwanted RF (radio frequency) "noise". Such RF noise can interfere with the radio system. Therefore, it is important to use the provided nylon pushrod and nylon ball-link fitting at the engine's throttle arm. Most gas engines used for R/C



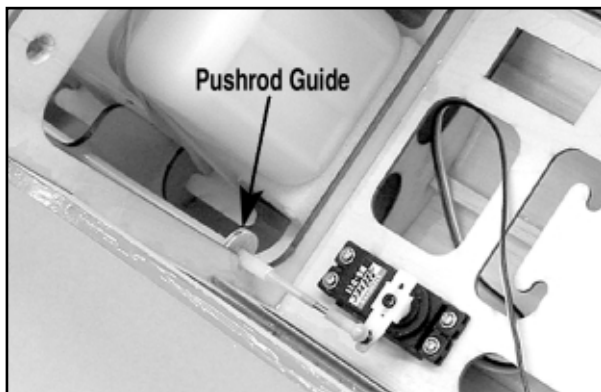
model aircraft are equipped with Walbro carburetors and most of these engines have the carburetor mounted to the side of the cylinder head, at non-linear angles. The ball-link throttle arm connection solves this problem. **Note:** If the throttle arm on your engine is spring loaded, either remove the spring or cut it from the throttle arm with wire cutters.

□20) Choose a location on the throttle arm that will best provide fore and aft linear movement from the servo. This is the location to mount the ball link fitting. Drill the throttle arm to accept the ball link and mount it in place. In the case of the FPE 3.2 engine, the hole in the throttle arm is already present, just mount the provided ball link stud to the throttle arm with the 2-56 threaded nut. Note that some throttle arm locations and shapes may require an extension that must first be attached to the primary carburetor throttle arm. If this is the case with your engine, make and attach the extension with the ball link fitting in place.

**Note:** With the variety of gasoline engines that are available today, it was not practical to pre-cut the holes in the fuselage formers for the nylon pushrod housing. Each manufacturer of R/C gasoline engines has the carburetor mounted in a different position and/or orientation. The following instructions show how we installed the FPE 3.2 engine in the Sun Dancer, but these instructions should be similar for other engines as well.

Use a pencil to mark the firewall at the point where the throttle pushrod will be placed. Remove the engine from the firewall and use a 13/64" dia. drill bit to make a hole through the firewall at that mark. Once the nylon pushrod housing is permanently installed, it will have a slight arc or bend in it from the firewall to the servo output arm.

Next, drill a hole in the right side of the next fuselage former (F-2) that is on the same vertical plane, but 3/4" higher, than the hole in the firewall. Perform this operation from inside the fuselage by reaching through the wing opening in the bottom of the fuselage. Insert the nylon pushrod housing through the hole in the firewall, former F-2, and into the fuselage interior. Using your fingers, hold the nylon pushrod housing until it is the same height as the output arm as the servo. Mark the location where the housing passes next to the third fuselage former (F-3) with a pencil. Cut a 1/4" x 1/4" notch in the fuselage former at the marked location.

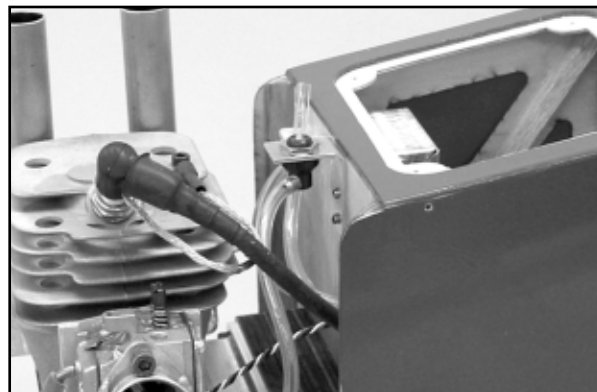


Make a pushrod guide from a 1/8" piece of scrap plywood and drill a 13/64" hole through it. Slide the guide over the pushrod and epoxy it to the backside of fuselage former (F-3) as shown in the previous photo. Adjust the position of the pushrod housing so that the end of the housing is 1/2" past the fuselage former. Glue the pushrod housing in place. Trim off the excess pushrod housing leaving 1" of the pushrod housing protruding from the firewall.

After the outer pushrod housing tube is in place, remount the engine permanently in place to the firewall. Be sure to use thread lock compound on the bolt threads. Attach the wiring leads to the engine.

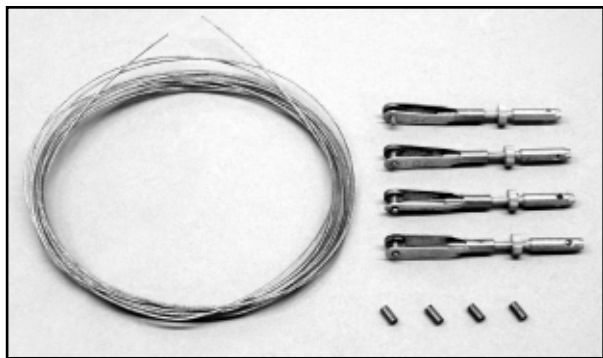
□21) The inner nylon throttle pushrod is now prepared. Thread one of the provided 2-56 threaded studs halfway onto one end of the inner nylon pushrod. Next, thread onto the stud one of the nylon ball-link connectors. Working from the servo end, insert the inner nylon pushrod into the outer nylon housing and snap the nylon ball-link onto the metal ball that was previously installed on the output arm. Place the throttle servo in the neutral position so that the output arm is 90° to the servo. Position the throttle lever of the carburetor so it is in the middle of its range of travel. Thread the remaining 2-56 threaded stud into the nylon ball-link fitting and press ball link fitting onto the metal ball link on the carburetor throttle arm. Place a mark on the nylon pushrod that is 1/4" from the end of the nylon ball-link fitting and cut off the excess nylon pushrod tubing. Remove the nylon ball-link and treaded stud from the carburetor and thread into the end of the nylon pushrod until you have about 1/4" gap between the end of the nylon pushrod and the end of the nylon ball-link. This should allow for more than enough adjustment to set up the throttle properly.

□22) The Sun Dancer is a large model so make it easy on yourself by installing a fueling valve in his airplane. For gasoline engines, Du-Bro makes a very good fueling valve, Du-Bro #335. This valve is easy to use and we have provided an aluminum bracket in your kit that will allow you to mount the valve directly to the firewall. We mounted this valve behind the engine on the left side of the firewall as shown in the photo. In addition, make a bracket to hold the overflow fuel line from a piece of scrap 1/8" plywood. Drill a 1/4" hole in the plywood bracket and epoxy it to the firewall. Pass the fuel vent line through the plywood bracket and trim off the excess tubing leaving 3/4" protruding through the plywood bracket. Connect the fuel pick-up line from the fuel tank to the angled nipple fitting of the filling valve. Attach a piece of tubing to the straight nipple on the fueling valve and to the fuel inlet on the carburetor.



**MODELER'S TIP:** Once you have flown the Sun Dancer, it is a good idea to plug the fuel vent line after every flying session. Harmful and dangerous gasoline vapors can vent from the tank while traveling to and from the flying field. Du-Bro sells an assortment of fuel line plugs that work quite well. Simply select the proper size plug and insert it into the end of the fuel vent line.

□23) The rudder pull-pull system can now be installed. From the kit contents, locate the 2 Steel Cables, 4 Swage Tubes, 4 Threaded Rigging Couplers, and 4 Metal R/C links.



a. Mount the rudder servo in place using the screws and hardware provided by the servo manufacturer. As previously mentioned, we highly recommend using the Du-Bro's super strength servo output arms for the pull-pull rudder system. Install the heavy-duty servo output arm on the servo. Turn on your radio system and center the servo also making sure that the transmitter trim is in the neutral position. Turn off the radio system.

b. The pull-pull cables have been provided in two equal lengths, insert one of the cables into each of the pull-pull exits located in the rear of the fuselage. Pass the cables completely through the rear of the fuselage and up to the rudder servo location. Keep pulling the cables forward until you have about eight inches of cable remaining at the rear of the fuselage. Tape the cables in place at the rear of the fuselage with small pieces of masking tape to prevent the cable from slipping out of the pull-pull exit tubes.

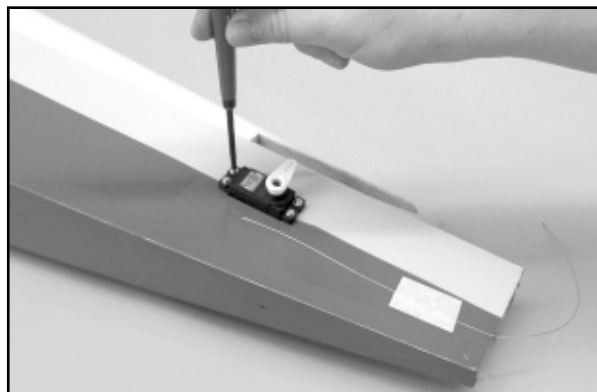
c. On the servo end of the cable, slide one of the copper swage tubes onto the end of one of the pieces of cable. Then insert the end of the cable through the small hole in the end threaded rigging couplers, giving yourself about 2"-3" of cable to work with. Loop the short end of the cable back and run it back through the copper swage tube. Pull the swage tube up to the rigging coupler about 1/2" away it. Use pliers or a crimping tool to squeeze the copper tube tightly over the cable, locking it in place. Cut off the excess short end of the cable. Repeat this process to make the same type of end on the other piece of cable.

d. Attach the rigging couplers to the servo out-put arm as shown in the photo. Make double sure that the cables do not cross over each other in the rear of the fuselage. Each cable should be straight from the servo out-put arm to the exit tube in the rear of the fuselage.

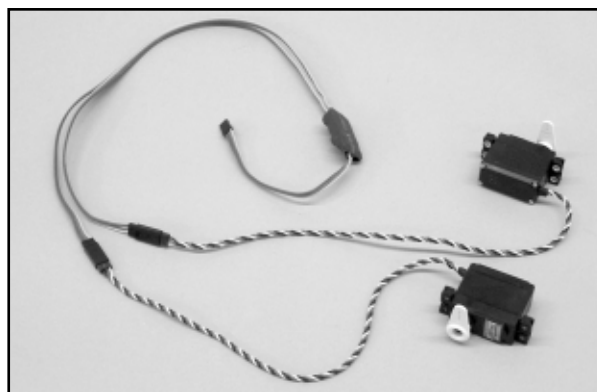
**Note:** The rudder ends of the cables will be assembled after the fin & rudder are glued in place on the fuselage.



□24) Mount the two elevators servos in the fuselage at this time using the hardware and screws provided by the servo manufacturer. When done, temporarily unscrew the elevator servos so you can install the "Y" harness cord in the next step.



□25) As mentioned earlier, to make the elevators function properly you will need to either electronically reverse one of the servos internally and use a standard "Y" harness, or use the MIRACLE "Y" servo reversing adapter" to obtain a mirror image elevator action.



Install the your Y-harness through the wing opening in the bottom of the fuselage through the upper cutouts in each of the fuselage formers, back to the two elevator cutouts. The reason the cord is routed through the top openings in the formers is to keep the cord from cluttering up the rear of the fuselage and to keep from interfering with the pull-pull cables. Plug the servos into the "Y" harness ends at the servo cutouts, and secure the connectors with tape or heat shrink tubing. Then reinstall both the elevator servos, pulling the excess chord lengths towards the front. Wrap the MIRACLE "Y" control pot in foam and secure in place with "cable ties" as shown in the photo.

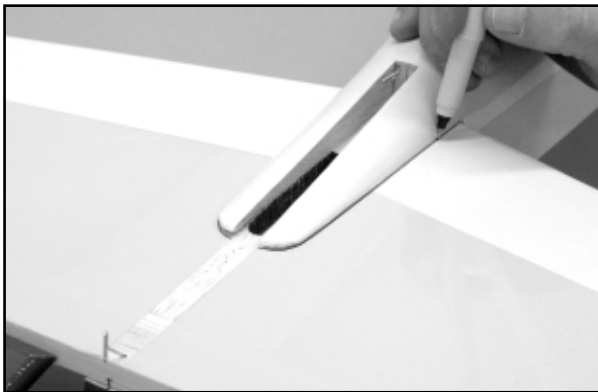


□26) Place the stabilizer & elevator assembly onto the rear of the fuselage and carefully align the stabilizer to the fuselage by

measuring from the center of the firewall to the tip of the stabilizer at the hinge line. Make sure that both of these measurements are equal and secure in place with straight pins.



a. Using a felt tip pen, carefully mark the outline of the rudder fairings onto the top of the stabilizer and where the stabilizer rests on the fuselage stabilizer mount on the fuselage.

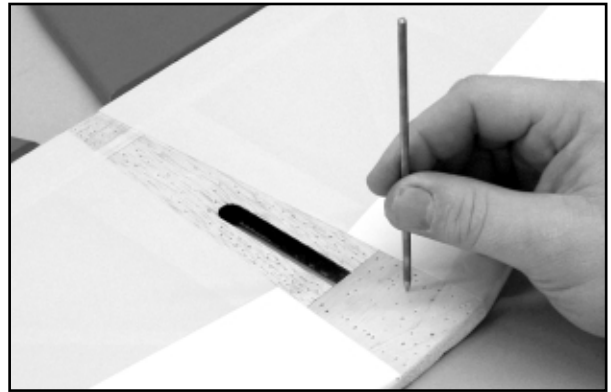


b. Remove the stabilizer assembly from the fuselage and carefully remove the covering material from the previously marked areas with a sharp new # 11 X-Acto® blade and a modeling knife. Cut just inside the line of the marked areas and try not to cut into the balsa wood. You must have a good wood-to-wood contact for the glue joint.

c. Using slow curing epoxy, apply glue to the bottom of the stab, stab saddle, top of stab, and to the bottom of the rudder fairings. Slide the stabilizer assembly into the fuselage and wipe off any excess glue that may have oozed out with a cloth soaked in alcohol. The slow curing epoxy allows plenty of time to properly align the stabilizer assembly to the fuselage. View the airplane from the top, front, and rear making sure the stab is square, without leaning one way or the other. Again, measure from the center of the firewall to the tip of the stabilizer. When satisfied, pin the stab in place and allow the glue to cure.



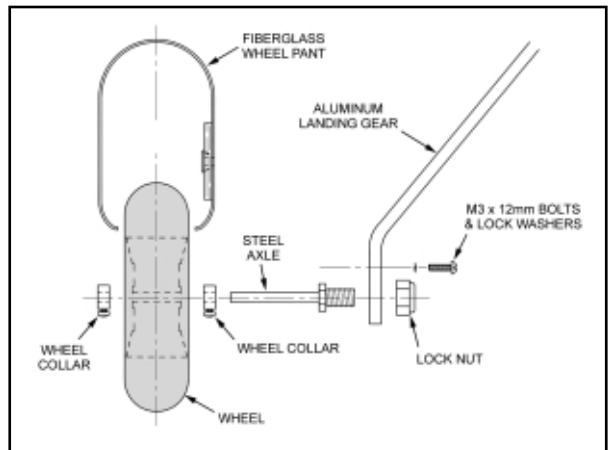
**BUILDER'S TIP:** Use a sharpened piece of music wire or an awl to perforate the mating surfaces of the stabilizer and the fuselage. These small holes or dimples allow epoxy glue to migrate into them and act like small nails when the epoxy has cured giving you a superior glue joint.



### LANDING GEAR AND WHEEL PANTS:

Now that most of the major components for the fuselage have been installed the landing gear can be assembled and attached to make it easier to handle and move around. **Note:** We suggest you use Loctite threadlocking compound on all bolts used in the assembly of the landing gear.

□27) Locate the two fiberglass Wheel Pants, two Main Wheels, the two Steel Wheel Axle, two axle lock nuts, four Wheel Collars with Set Screws, and four M3 x 15mm PWA bolts. Install the axles into the large holes at the bottom of each leg of the aluminum main landing gear. Thread the large lock nuts onto the threaded ends of the axles and tighten these securely.



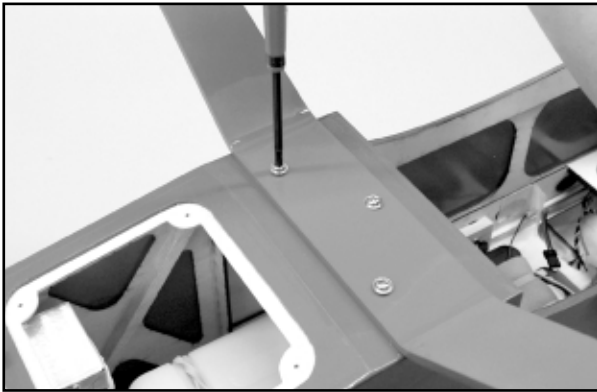
**Note:** On the axle side of the gear leg, the two flat sides of the flange must end up parallel to the front of the landing gear, so that the notch in the wheel pant will fit over the flange properly.



Slide a wheel collar onto the axle followed by a main wheel, and then another wheel collar. Locate the outer wheel collar near the end of the axle and snug its set screw tight against the axle. Now slide the wheel and the inner wheel collar out against the outer wheel collar, and lightly tighten the inner collar set screw. Trial fit the fiberglass wheel pant in place over the wheel. If necessary, reposition the wheel collars to center the wheel in the pant opening. Then tighten the set-screws for good.

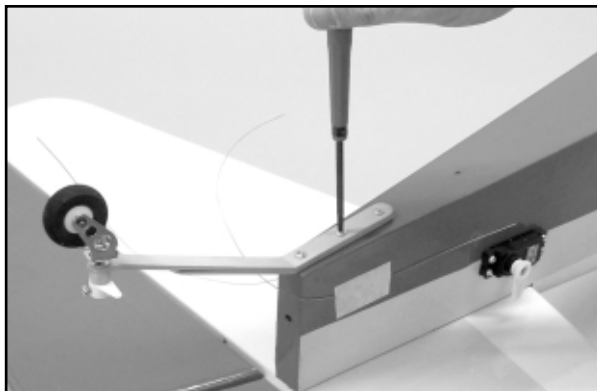
**Helpful Hint:** Tighten all wheel collar set screws with their heads pointing straight down. That way you will have easy access to the collars if adjustments are needed.

□28) Mount the formed aluminum main landing gear in place on the fuselage using the three M4 x 15mm socket head bolts and flat washers provided. Note that the blind nuts have been pre-installed inside the fuselage for these bolts.



□29) Locate the bag containing the tailwheel assembly. Hold the short leaf spring in place on the fuselage. Make sure it is lined up with the fuselage centerline, and that it is as far back as shown in the pictures. Use a fine tip marker pen to mark the locations of the 3 mounting holes in the fuselage. Drill the holes through the bottom of the fuselage with a 1/16" dia. drill bit.

□30) Fasten the both leaf springs of the tailwheel assembly to the bottom of the fuselage with three M3 x 15mm PWA screws. **Note:** The tailwheel coiled springs will be installed later, after the fin and rudder are attached to the fuselage.



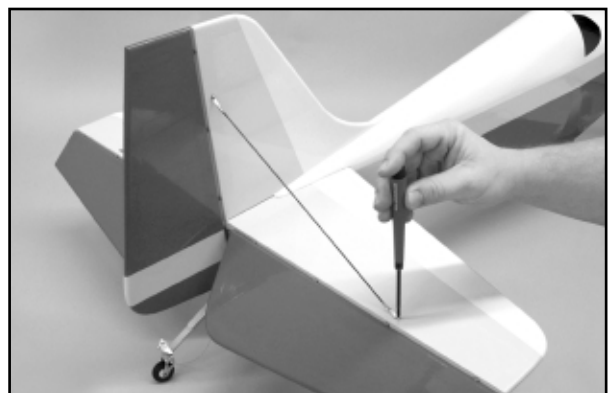
□31) Trial fit the fin & rudder onto the fuselage and make sure you install the bottom hinge into the fuselage. Using a felt tip pen, draw the outline of the rudder fairings onto each side of the fin and around the fillet located on the front of the fin. Using a sharp #11 X-Acto® blade, cut just inside the previously made lines and remove the covering material from both sides of the fin and the small fillet section on the top of the fuselage. Again, you need a good wood to wood contact for the best glue joint.

□32) Using slow curing epoxy, apply a liberal amount to the bottom of the fin, insides of the rudder fairings, the fillet area on top of the fuselage, and into the bottom hinge hole in the fuselage. Slip the fin & rudder in place until it is fully seated in place and secure with straight pins (you did install the lower hinge, didn't you?). Wipe off any glue that has oozed out with a cloth soaked in alcohol. Using a triangle, align the fin & rudder so it is 90° to the horizontal stabilizer. Use long strips of masking tape to hold the fin & rudder assembly in alignment until the glue cures. It is a good idea to view the fin & rudder from the front and rear to make sure it is aligned properly during the curing process.

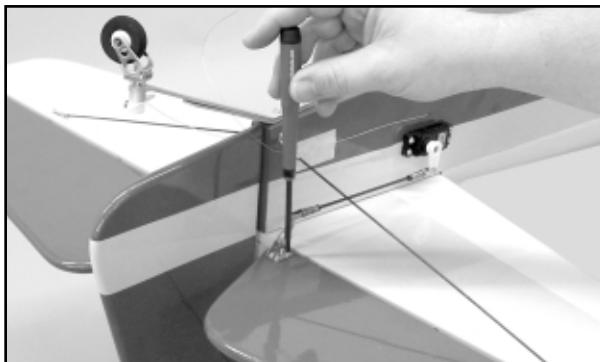


**Note:** The tail brace wires are functional and must not be omitted. Flying the model with out the brace wires could lead to structural failure and loose control of the model aircraft.

□33) Locate the bag that contains the tail brace wires. There are a total of four tail brace wires - the upper tail brace wires measure 11-3/4" and the lower tail brace wires measure 10-1/4". They come assembled with a half solder link on one end, and half a threaded link on the other. Also included is a "jam" nut on the threaded end of each of the brace wires. Pre-drilled hardwood mounting points have been installed at the factory in each side of the horizontal stabilizer, fin, and fuselage. Begin by removing the covering from the holes in the hard points if needed. Adjust the length of each brace wire so the tail surfaces are NOT pulled out of alignment. Attach the tail brace wires as shown in the photo with the threaded ends of the upper brace wires next to the fin, and the threaded ends of the lower brace wires next to the fuselage. Use the three M2 x 15mm bolts and M2 hex nuts that have been provided to attach the wires to the fin and stabilizer. Use the M2 x 25mm bolt and M2 hex nut to attach the lower brace wires to the fuselage. When satisfied with the installation of the tail brace wires, loosen each of the hex nuts and apply a small drop of thread locking compound to the threads of the bolts and securely tighten the hex nuts.



□34) You will need two metal control horns for the elevators, one left and one right, and eight M2.8 x 10mm metal screws. Hold the control horn in place on the elevator, lined up with the elevator servo output arm. Make sure the pivot holes in the control horn line up with the hinge line. Mark the control horn mounting holes on the elevator with a felt pen. Drill a 3/64" dia. (or #56 drill) pilot hole for each screw, then screw the horn in place. Repeat this procedure on the opposite elevator.



**IMPORTANT:** After mounting the elevator control horns for the first time, take them back off and set aside temporarily. Put a few drops of Thin CA into each of the screw holes in the elevators. The Thin CA will soak into the threads in the wood, increasing their holding power. Be sure to use Thin CA, not medium or thick CA. Let the thin dry completely before remounting the control horns.

□35) Because the elevator servos are staggered in the fuselage two assembled elevator pushrods have been provided for the elevators. The 4-40 pushrod for the left elevator measures 5-1/2", and the pushrod for the right elevator measures 4". Use your radio to center the elevator servos and then mount the output arms in place at 90° upright. Tape the elevators to the stabilizer in the neutral position. Attach the pushrod to the servo output arm in the second hole from the end of the arm. Adjust the threaded R/C links to fit into the middle hole of each elevator horn. Remove the tape holding the elevators in the neutral and test the movement of the elevators with you radio system. Adjust as required to get both elevators exactly at neutral (if you are using the Miracle "Y" chord, you can turn the pot adjustment screw to achieve exact neutral very easily). The final elevator throw adjustments and locking the R/C links in place with the hex nuts will be made later.

□36) Tape the rudder in the neutral position. Remove the tape holding the pull-pull cable to the fuselage and pull it straight back against the rudder - note the cable exits the fuselage and runs parallel to the bottom of the stabilizer. Hold the cable in this position and mark its location onto the side of the rudder with a non-permanent marker pen. This line represents the mounting location for the Metal control horns (one on each side of the rudder). Re-tape the pull-pull cable back onto the fuselage side for now.

□37) Place the 90° angle of the control horn onto the line just made. In top view, line up its three linkage holes with the hinge line of the rudder. Hold the control horn in position and use a marking pen to mark the four base mounting hole locations onto the rudder. Four 5/64" dia. holes are now drilled through the rudder at the four marks just made. Make sure you hold the drill perpendicular to the rudder when drilling these four holes. Then bolt the two control horns in place using four M2.5 x 14mm (1/2") and four M2.5 Hex nuts. Temporarily remove the horns and harden the holes with thin CA. Allow the glue to cure and re-drill the holes with the 5/64" dia. drill bit and reinstall the control horns.



**BUILDER'S TIP (or straighten up and drill right):**

*Make a drill guide from a piece of scrap hardwood such as maple and drill a hole through the scrap with the desired size of drill bit in a drill press. Mark the location of the hole to be drilled with an awl and slip the guide (scrap hardwood) over the drill bit. Place the drill bit in the marked hole and hold the drill guide flush with the surface. Drill through the surface making sure that your fingers are out of the way when you drill through the surface.*

□38) Center the R/C Link in the middle of the threads of the rigging coupler and run the knurled stop nut up snugly against the R/C Link. Attach the rigging couplers and the R/C Links in the outer holes of the rudder control horns. Turn on your radio system and make sure the servo is centered and the trim on the transmitter is also set in the middle of its range. Slip one of the copper swage tubes onto the end of the cable. Then thread the end of the cable through the small hole in the end of the rigging coupler and take up any slack in the cable. Loop the end of the cable back and run it through the copper swaging tube and pull up the swaging tube up to the rigging coupler about 1/2" away from it. Do not crimp the swaging tube at this time. Repeat this procedure for the remaining pull-pull cable.

Next, with the rudder still taped in the neutral position, remove any excess slack from each of the pull-pull cable by pulling on the short end of the cable and sliding the swaging to towards the rigging coupler. Using pliers or a crimping tool, squeeze the copper tube tightly over the cable locking it in place. Cut off the excess short end of the cable. Adjust the threaded R/C Links until you get both pull-pull cables to approximately the same mild tension - Its not necessary to pull the cables extremely tight.

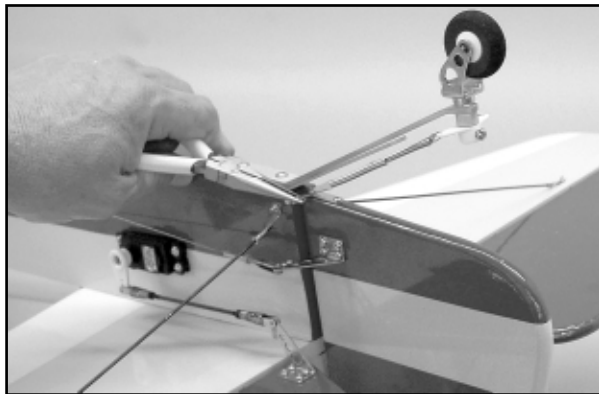
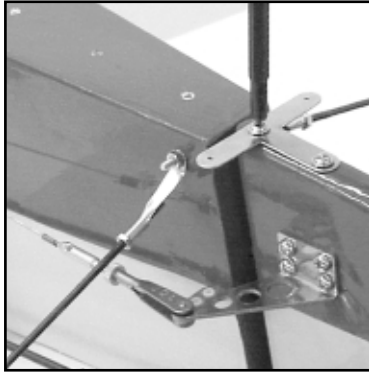


Remove the tape holding the rudder in place, turn on the radio system, and test the movement and centering of the rudder. Make adjustments if needed. When satisfied with the operation of the pull-pull system, tighten the knurled stop nut on each rigging



coupler up against the end of the R/C Links to lock the links in place.

□39) For better access to the bottom of the rudder, temporarily remove the tailwheel assembly from the fuselage. Mount the metal rudder T-Horn onto the bottom of the rudder with the two M2 x 9mm PWA screws that have been provided. Remove the two screws and harden the threads with thin CA. Reinstall the screws after the CA is fully cured. Reinstall the tailwheel assembly.



□40) The two Coiled Steering Springs can now be installed on the tailwheel, connecting the tailwheel's steering arm to the T-shaped metal horn mounted on the bottom of the rudder.

a. Use needle nose pliers to bend loops in end of each spring to hook into the holes of the T-shaped rudder horn.

b. With the rudder and the tailwheel both in the neutral position, apply a small amount of tension to the spring using the pliers, make a 90° bend in the wire at the tailwheel steering arm hole. Insert the wire into the steering arm and make another 90° bend back toward the center of the spring, forming a loop. Do the same for the other spring. Do not over stretch the springs when doing this. A little bit of tension is all you need.

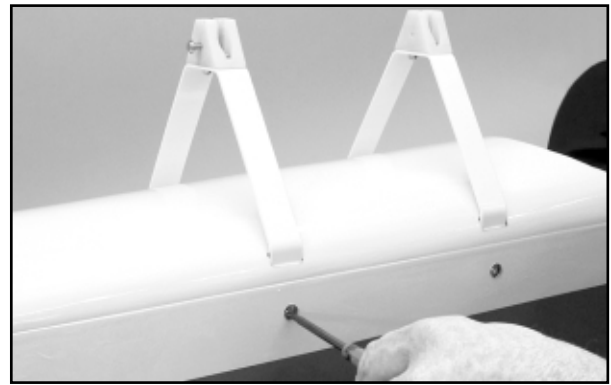
c. Turn on your radio system to check the movement of the rudder and tailwheel. If there is any binding, correct it. The springs should center the tailwheel to the rudder when it is at neutral.

□41) Two aluminum cabane struts are provided for connecting the top wing to the fuselage. You will notice that at the top of each cabane strut is a nylon connector that is bolted to the aluminum strut. These two cabane struts are identical so there is no front or back or left or right.

a. Mount one of the provided cabane struts into the rear position on the fuselage with two M3 x 15mm socket-head bolts and flat washers.

b. Next, insert a 6" aileron extension cord into each of the front openings passing the extension between the fuselage sheeting and into the interior of the fuselage. Make sure that the extension cord does not interfere with the hardwood mounting blocks for the aluminum cabane strut.

c. Install the remaining cabane strut in the front position of the fuselage and secure in place with the M3 x 15mm socket-head bolts and flat washers.



d. Tape the female connector plugs to the insides of the cabane with clear plastic tape.



**Note:** With the female connector plugs taped to the cabane strut, connecting and disconnecting the aileron servos becomes quick and easy. In addition, this secures the connection and prevents the plugs from being subjected to the forces of the slipstream and from accidentally becoming unplugged.

#### WINDSHIELD ATTACHMENT:

□42) The windshield is molded with a frame around the outside edge of the windshield. This frame can be painted a contrasting color (we used black) to give your model that "finished look" that will be admired by other modelers at the flying field. Prepare the windshield by washing it in warm soapy water. Rinse thoroughly. Tape off the clear section of the canopy inside the windshield framing with masking tape. Also, mask off the entire inside of the windshield, leaving only the outside windshield framing exposed. Lightly sand the windshield frame with 600 wet-or-dry sandpaper. Paint the framing with a high quality enamel paint (not supplied), such as the paints sold in the hobby shop for plastic models.

□43) The molded clear plastic windshield has five factory-drilled holes in the base of the windshield. These holes are used for mounting the windshield to the fuselage with five M2 x 8mm PWA

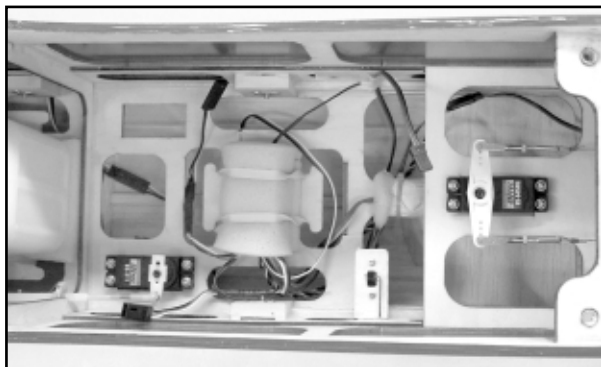




screws that have been provided. Place a mark on each side of the fuselage with a felt tip pen that measures 3-1/4" forward from the headrest on the fuselage. Place the windshield on the fuselage and line up the rear edge of the windshield at the previously make marks. Use small pieces of masking tape to hold the windshield in place. Carefully view the windshield from the front, top, and rear to make sure properly aligned. When satisfied, mark the five mounting screw locations with a felt tip pen. Drill pilot holes at the five locations with a 3/64" dia. drill bit and secure the canopy in place with the provided screws. **Note:** As noted in previous steps, remove the windshield and harden the holes with thin CA and reinstall the windshield.

#### RADIO INSTALLATION:

With all the servos now installed, all that remains is to install the receiver, battery pack, and switch.



**Battery Pack:** The single heaviest unit of the radio system is the battery pack. This means that you can, if needed, locate the batteries wherever they are required in the airplane to help achieve the correct balance point. **Note:** Our Sun Dancer prototype required that the battery pack (2400 mAh) be placed inside the fuselage just behind the fuselage former at the trailing edge of the bottom wing. We made a 1/8" plywood mount and glued it in place inside the fuselage. Wrapped the battery pack in foam rubber and secured in place with rubber bands and "J" hooks so it would not be able to move or shift around in flight.

**Aileron Y-Harnesses:** Three standard Y-harness chords are needed for the ailerons when using a 4-channel radio system. One to couple the two left aileron servos together, one to couple the two right aileron servos together, and then one to couple the left & right Y-harnesses together so you end up with a single plug that is inserted into the aileron channel of the receiver. All three aileron Y-harnesses will be located inside the fuselage.

Final hookup is as follows ... Plug one Y-harness into the receiver aileron slot. Connect another Y-harness onto each branch of the first Y-harness. Designate one of those Y-harnesses for the right aileron servos and the other for the left servos. Now connect one branch of the right aileron Y-harness to the bottom end of the 6" extension chord that you taped to the right cabane strut in step 41. Likewise, connect one branch of the left aileron Y-harness to the bottom end of the 6" chord taped to the left cabane strut. That completes the aileron hookups that remain inside the fuselage.

Later, when bolting the bottom wing in place, connect the unused end of the right aileron Y-harness to the end of the 24" extension chord that you installed in the bottom right wing in step 8. Likewise connect the unused end of the left aileron Y-harness to the 24" chord in the bottom left wing. Finally, when bolting on the top wing, connect the servos chords in those wings to the top ends of the 6" chords that are taped to the right and left cabane struts.

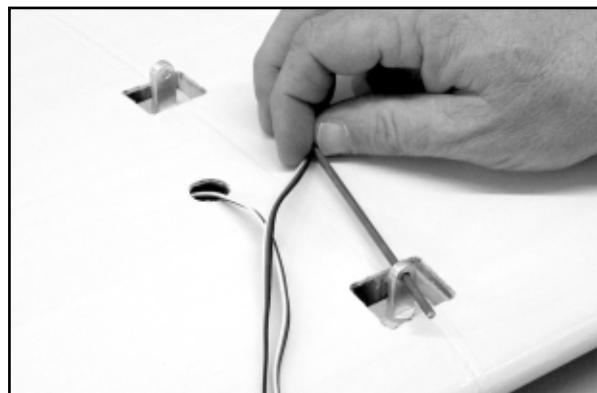
**Receiver:** Wrap the receiver in foam and use rubber bands or tie-wraps to secure it inside the fuselage. Note that the Sun Dancer has an internal receiver antenna exit tube already installed inside the fuselage. It is a clear plastic tube running along the left side of the fuselage, exiting just ahead of the tailwheel assembly on the bottom. Slide your antenna into the tube when installing your receiver.

**Switch:** The switch can be mounted onto the fuselage side or internally. We prefer an internally mounted switch for cosmetic reasons only. We mounted ours onto a bracket made from scrap 1/8" plywood and using a length of music wire to activate the switch from the outside. This is really simple to do. Just drill a small diameter hole in the switch lever to fit a piece of .045 music wire. Drill an exit hole in the side of the fuselage, lined up with the switch/wire location. Make a 90° bend in one end of the wire and insert the short end into the hole in the switch. Insert the wire through the hole in the fuselage and make another 90° bend in the wire outside of the fuselage, giving you a small "handle" to pull and push when activating the on/off switch. Besides looking neat, this method protects the switch from dirt, debris, and exhaust residue.

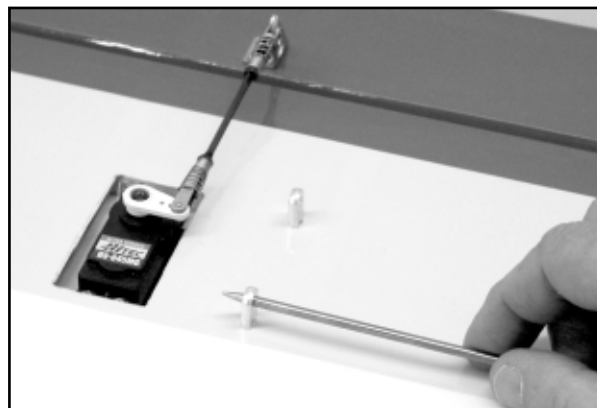
#### FINAL ASSEMBLY:

**Strut Fittings:** Eight aluminum strut fittings have been provided for the interplane struts and two aluminum fittings for the cabane struts. **Note:** The cabane strut fittings are slightly larger than the interplane fittings.

□44) Begin by installing the two cabane strut fittings in bottom of the top wing. Screw each fitting in until the bottom of the fitting touches the hardwood mount. Then as a starting point, screw the fittings out one full turn until mounting holes on each fitting is facing for and aft.



□45) Install the interplane strut fittings in the same manner in the bottom of the top wing, and in the top of the bottom wing. Align the holes in the strut fittings so they run 90° to the wing span.



**Wing Attachment:** Install the bottom wing and bolt securely in place with the 1/4-20 x 1-1/2" nylon bolts. Take care when hooking up the wires for the aileron servos so they are not caught between the wing and the wing saddle.

□46) Attach the top wing to the fuselage by inserting the strut fittings in the bottom of the wing into the slots in the nylon cabane blocks. Line up the holes in the strut fittings with the holes in the cabane blocks and secure the wing in place with the provided M4 x 25mm (1") socket-head bolts. Plug the aileron extensions into the connector that are taped to the inside of the cabane strut.



**Note:** Do not install the interplane struts at this time.

**Wing Incidence:** Because the Sun Dancer is a biplane configuration, the incidence of the wings is twice as critical and therefore must be properly set up to achieve the "awesome" flight performance that this model is capable of providing. The following steps require the use of an "incidence meter" to properly align the wings to the stabilizer. Do not attempt to set up this model without the use of a good incidence meter.

□47) Place an incidence meter on the stabilizer, and then place block or scraps of balsa wood under the tailwheel until the meter reads 0° of incidence.



Carefully remove the incidence meter, without disturbing the blocked up airplane, and attach the meter to the bottom wing next to the fuselage as shown in the photo. This should also read 0° of incidence. If not, then look for the lead wires from the servos being caught between the wing and wing saddle, or the wing improperly installed.



Now move the incidence meter to the center of the top wing. View the top wing from the front and make sure the wing is close to horizontal (level). If needed, remove the top wing and turn the cabane fittings in or out until the incidence meter reads 0° of incidence.



#### Interplane Struts:

□48) Before we can attach the interplane struts we must first align the holes in the fittings with the holes in the struts. Adjust the fittings until each of the interplane struts can be bolted in place without applying any pressure to the wing or strut to align the holes of the struts and fittings. In addition, make sure that the wings are the same distance apart at the wing tips by measuring from the bottom of the top wing to the top of the bottom wing with a ruler. Bolt the interplane struts in place with the (8) 4-40 x 3/8" socket-head bolts, flat washers, and 4-40 lock nuts that have been provided.



Using the incidence meter, measure the incidence of the four wing panels at the inboard end of each aileron. Again, the incidence should read 0° of incidence at each location. If the meter reads anything other than 0° then we have to find the problem before flying the model. The most likely place to start is by unbolting the interplane struts to see if a warp was induced when the interplane

struts were attached. If that is not the case then further inspection is required to check for improper assembly of the wing panels. Highly unlikely, but possible, is a warped wing from the factory. The wings are built and covered in jigs at the factory and checked for warps before they are packaged and shipped. The change in humidity and climate could allow one of the panels to warp slightly. These warps can be easily removed by twisting the wing panel in the opposite direction of the warp and re-shrinking the covering material on the appropriate side of the wing panel. Continue holding the opposite twist in the wing until the covering cools. You may have to repeat this step until the warp is completely removed.



**CONTROL MOVEMENTS:**

This is an important section of this manual. After flying your SUN DANCER for awhile, getting used to its characteristics, you will likely change the control throws to suit your flying style. But you have to start somewhere and this is where you begin. These movements provided the SUN DANCER with very smooth control inputs without the immediate need for exponential. We suggest starting out with these movements as your low and high rates. You can easily play with more control throw after you become comfortable with the airplane, especially for 3-D flying.

**Remember:** Control movements should always be measured at the widest point of the control surface.

<b>SURFACE</b>	<b>SUGGESTED THROWS</b>
Ailerons:	Low Rate: 7/8" up, 7/8" Down High Rate: 1-1/4" up, 1-1/4" down
Elevators:	Low Rate: 2" up, 2" down High Rate: 3" up, 3" down
Rudder:	2-1/2" Right, 2-1/2" Left

**DECAL APPLICATION:**

The decals provided with this kit are typical markings that might be seen on a full size aerobatic airplane. They are not intended to be a complete set of markings to duplicate any particular full size aircraft. However, I think you'll agree that when applied to the airplane as shown on the box label, they look very realistic and believable. Feel free to use all or only some of the decals in different locations as you see fit.

The decals are made of adhesive-backed mylar, they are NOT water activated transfers. These decals are not die-cut and need to be cut from their sheets with a sharp #11 blade or scissors. Trim as close to the image as possible.

Putting sticky-back decals on a model can be tricky! Especially medium to large size ones like those in this kit. If you don't do it right, you will end up with unsightly air bubbles trapped underneath the decal. Here's a method that eliminates that problem entirely and makes the job fun and easy.

You will need a "soapy water" mixture (water mixed with a very small amount of dish soap, or SIG Pure Magic Model Airplane Cleaner, or Fantastic®, Windex®, or 409® type cleaners all work good). You will also need a supple squeegee (the SIG 4" Epoxy Spreader #SIGSH678 is perfect for this job), a couple clean soft cloths (old tee shirts are great), a good straight edge, a ruler, and a hobby knife with a sharp #11 blade. We also suggest that you have some trim tape handy for making temporary guidelines (1/8" width is perfect), for help in aligning the decals.

First spray the surface of the model where the decal is to be placed with a soapy water mixture. Then peel the backing sheet completely off the decal, being careful not to let the sticky side double over and adhere to itself. Place the decal onto the wet surface of the model. Do not push the decal down! The soapy water solution will keep the decal from actually sticking to the model until you have had time to shift it around into the exact position. Once you have it in position, squeegee the excess soapy water out from under the decal. Mop up the water with a dry cloth. Squeegee repeatedly to get as much water out from under the decal as possible. After setting overnight, the decal will be solidly adhered to the surface.

**BALANCE YOUR SUN DANCER:**

In terms of the flight characteristics, you will realize, this is probably the single most important step in preparing your SUN DANCER for flight. The final placement of the longitudinal Center of Gravity or Balance Point, is extremely important and should be approached with patience and care. Completely assemble the model, including propeller, spinner, etc. Do not leave anything off the airplane that will be on it in flight. DO NOT FILL THE FUEL TANK for balancing purposes.

Due to the large size and weight of the Sun Dancer, we found that the simplest way to check the balance is the old "fingertips at the wingtips" method. First place a strip of masking tape on the bottom side of each wingtip of the top wing. Measure back from the leading edge and place marks on the masking tape at the distances shown in the table below. Then, with you at one wingtip and a helper at the other, place your fingers at the 27% mark and gently lift the model up off the workbench. If the model hangs in a tail low position, set the model back down and shift your finger positions rearward slightly before picking it back up again (if the model hangs nose low, shift your pickup position forward). Repeat until you find the exact spot where the model sits perfectly level. This is your current balance point. Adjust as necessary according to the chart below.

**BALANCE REFERENCE POINTS FOR THE SUN DANCER**

\* Percentage of Mean Aerodynamic Cord.

\*\* Distance aft of wing leading edge

% MAC*	@ wing tip of the top wing**
25%	4.625"
26%	4.745"
27%	4.865"
28%	4.985"
29%	5.105"
30%	5.220"

**For initial test flying and familiarization purposes, we suggest a starting balance point of 27%, which is approximately 4-7/8" behind the leading edge of the wing.**

As we all know, as the balance point is moved aft, an airplane will become more responsive in all axis, but it will be especially noticeable to a model pilot in "pitch" (up and down). We have flown the SUN DANCER at the 30% location and found it to be manageable, with excellent aerobatic capabilities. However, we did notice an increase in pitch sensitivity and had to decrease the elevator throw to compensate. "Softening" elevator response with a reasonable exponential percentage also works. In the end, the final balance point and control throws you use will depend somewhat on how you like to fly. Some pilots like their models extremely reactive, others strive for more smoothness. The SUN DANCER is a very capable aerobatic machine and can be tailored to fit your style. We therefore suggest that you begin with the 27% CG location and experiment from there.

If you need to move your balance point fore or aft slightly, the first method you should try is to relocate your receiver battery pack. Often times, moving your battery pack fore or aft is all you need to do to achieve the desired balance point. If you have a super heavy gas engine, it's not unheard of for the battery pack to end up behind the cockpit area. Wherever the battery pack ends up, be sure it is adequately secured to the model structure so it will not move around in flight. If relocating your battery pack is not enough to achieve the desired balance point, and more weight is needed, consider using a larger (and therefore heavier) battery pack. Try to avoid adding useless weight. If you need more weight in the nose, try a heavier spinner or replace the light wheels with heavier after-market wheels. If your model is nose heavy and battery shifting does not work, you can make significant changes in balance with stick-on lead weights. These can be used temporarily on the outside of the model until you've flown the airplane sufficiently to know exactly where you like the CG and how much weight it takes to get it there. Once that's done, the lead weights can be placed inside the fuselage by simply removing the elevator servos and securing the weights on the inside. With the elevator servos back in place, the weights are hidden.

Finally, the aerobatic performance of your SUN DANCER will benefit greatly if you balance the airplane laterally as well as fore and aft. In other words, eliminate the "heavy wingtip" syndrome. Lateral balancing requires that the model be suspended upside down by two lines (use substantial size chord or fishing line). Loop one line over the engine propeller shaft and the other line over the tailwheel bracket. Hang the model from the ceiling or a rafter, leveling it in side view. With the model secured in this way, observe the wings. Ideally, they should be level, without one wing lower than the other. If one wing panel is lower, it means that it is somewhat heavier than the other. When flying the model, this imbalance can cause the model to "pull" to the heavy side, especially in loops and up line maneuvers. To make the airplane track true, the light wing panel needs weight at the tip to balance it level with the other panel. Again, this can be done with stick-on weights, which could later be hidden inside the wingtip.

#### **FLYING YOUR SUN DANCER:**

If you have carefully followed this assembly manual, you should have no real problems in test flying your SUNDANCER. Try to choose a calm day for the first flight. Good conditions will help in correctly evaluating the flight performance of the model. Begin your test flight by making sure the engine is properly set with a reliable idle, a strong top end, and smooth transition performance. Set your engine's high speed needle valve a little on the rich side,

so that when the airplane noses up the engine will not be over lean and sag.

Holding up elevator, taxi the model to get a feel for how it handles on the ground. Make sure you have positive left and right turning ability. If not, make any adjustments needed to achieve positive ground control. Once you are satisfied with the taxi tests, line the model up with the centerline of the runway, nose into the wind. Hold a little up elevator and advance the throttle smoothly - do not throw the throttle open all at once! The airplane should roll forward smoothly, tailwheel on the ground. As speed builds, slowly back off the elevators and use just a little rudder, only as needed, to maintain a straight takeoff run. The tail will come up as flying speed is reached and a little up elevator will lift the SUN DANCER off the ground.

Maintain a straight outbound flight path, climbing at a shallow angle until a safe maneuvering altitude is reached. If the model requires trim, fly it to a reasonable altitude first before trimming. Initially, make your control inputs smooth and avoid jerking the sticks.

At altitude, make any trim changes needed to achieve hands off, straight and level flight. From our experience, this will take very little trim input, if the model was assembled and balanced properly. Once you're comfortable, make a few circuits around the field to get the feel of the controls. The airplane should demonstrate smooth flight characteristics without jumpiness or over-sensitivity. At altitude, try a roll. Then try another roll to the opposite side. Properly trimmed, the SUN DANCER will roll smoothly and very axially in either direction. Now try a loop. The SUN DANCER should pull cleanly through loops, without wandering to either side. Once you're comfortable, try knife-edge flight. You will quickly find that the SUN DANCER has little or no pitch/roll coupling and that it easily maintains altitude with just a little rudder input! You will also discover that your SUN DANCER has outstanding inverted flight characteristics. Our prototypes required only the smallest amount of down elevator to maintain level inverted flight!

Assuming you're comfortable and getting used to the airplane, take it to a safe altitude and throttle back to get a feel for the slow flight and stall characteristics. Properly balanced and trimmed, your SUN DANCER should demonstrate fairly sedate, no fuss stall characteristics. Once flying speed and up elevator input is bled off, the SUN DANCER should just drop its nose and resume flying as speed picks up. All of this is great information to have when you are setting up the first landing.

Landing the SUN DANCER is a pleasure. We like to keep a little power on the engine during final approach, down to a few feet off the ground. Back completely off the throttle once the airplane is low to the ground with a good rate of descent established. Flair the airplane as the ground approaches for a smooth 3-point landing and rollout. Hard landings are not necessary, sound piloting skills are.

The second flight should be even more fun because you have by now inputted any required trims learned from the first flight. Before flying again, check the airplane for anything that may have come loose, become disconnected, etc. This is good practice and tends to insure a long life for the model.

As you become more familiar with your SUN DANCER, you are going to discover its ability to perform aerobatics. The SUN DANCER is an elegant aerobatic machine with seemingly endless

capabilities. For those of you interested in using your SUN DANCER for 3D aerobatics, set up your radio to take advantage of the huge control movements available from this model. However, we would urge you to "sneak up" on such control throws, making very sure you have them available to you only on your high rate switches!

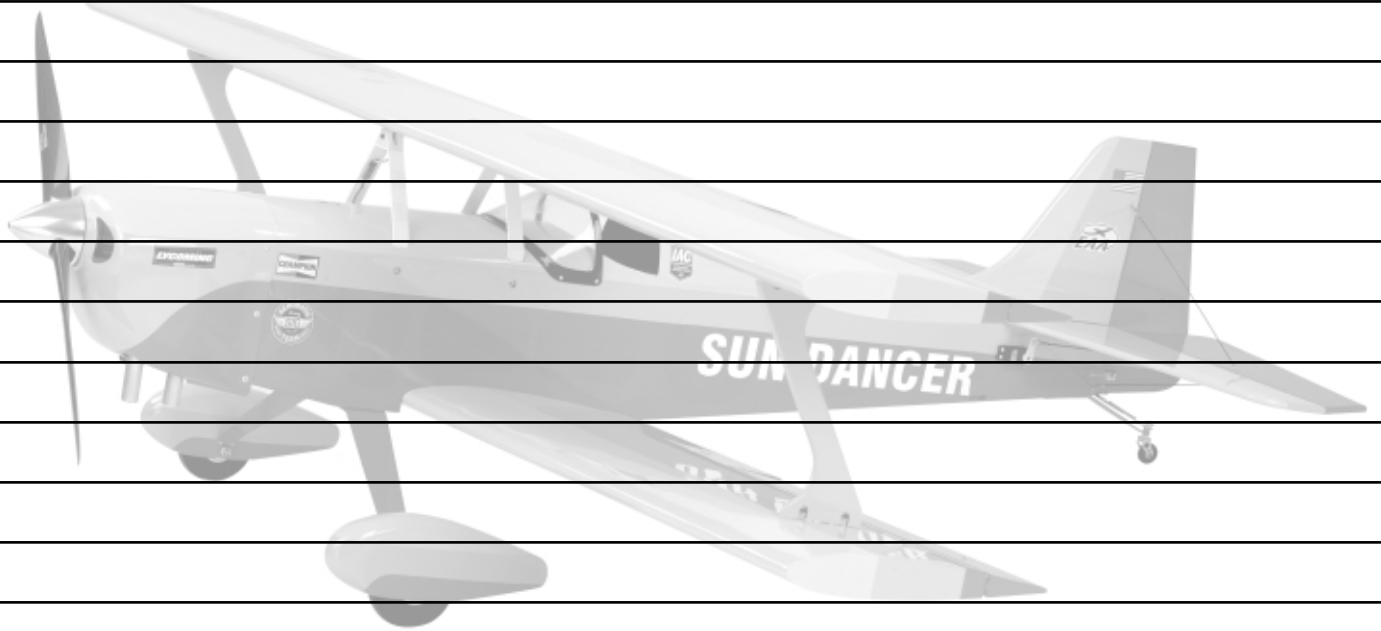
We hope you will enjoy your SUN DANCER for a long time to come. Please fly the model safely with constant regard to other fliers, spectators, and property.

**GOOD LUCK AND SAFE FLYING!**

# SUN DANCER ARF LOG BOOK

Date of first flight:

Comments:



## **WARNING! THIS IS NOT A TOY!**

Flying machines of any form, either model-size or full-size, are not toys! Because of the speeds that airplanes must achieve in order to fly, they are capable of causing serious bodily harm and property damage if they crash. **IT IS YOUR RESPONSIBILITY AND YOURS ALONE** to assemble this model airplane correctly according to the plans and instructions, to ground test the finished model before each flight to make sure it is completely airworthy, and to always fly your model in a safe location and in a safe manner. The first test flights should only be made by an experienced R/C flyer, familiar with high performance R/C aircraft.

The governing body for radio-control model airplanes in the United States is the **ACADEMY OF MODEL AERONAUTICS**, commonly called the **AMA**. The **AMA SAFETY CODE** provides guidelines for the safe operation of R/C model airplanes. While AMA membership is not necessarily mandatory, it is required by most R/C flying clubs in the U.S. and provides you with important liability insurance in case your R/C model should ever cause serious property damage or personal injury to someone else. For more information, contact:

**ACADEMY OF MODEL AERONAUTICS**  
5161 East Memorial Drive  
Muncie, IN 47302  
Telephone: (765) 287-1256

**AMA WEB SITE:** [modelaircraft.org](http://modelaircraft.org)

## **CUSTOMER SERVICE**

SIG MANUFACTURING COMPANY, INC. is committed to your success in both assembling and flying the SUN DANCER ARF kit. Should you encounter any problem building this kit, or discover any missing or damaged parts, please feel free to contact us by mail or telephone.

**SIG MANUFACTURING COMPANY, INC.**  
P.O. Box 520  
Montezuma, IA 50171-0520

**SIG MODELER'S ORDERLINE: 1-800-247-5008**  
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**SIG MODELER'S HOTLINE: 1-641-623-0215**  
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**SIG WEB SITE:** [www.sigmfg.com](http://www.sigmfg.com)

## **LIMIT OF LIABILITY**

The craftsmanship, attention to detail and actions of the builder/flyer of this model airplane kit will ultimately determine the airworthiness, flight performance, and safety of the finished model. SIG MFG. CO.'s obligation shall be to replace those parts of the kit proven to be defective or missing. The user shall determine the suitability of the product for his or her intended use and shall assume all risk and liability in connection therewith.

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# First Place ENGINES



**PROUDLY MADE IN THE U.S.A.**

Dedicated to providing the most power at a reasonable cost, First Place Engines are your best choice for large, gasoline powered model airplane power plants. All engines use piston and cylinder assemblies from world-renowned manufacturers such as Husqvarna and Sachs/Makita, insuring long life and easy operation. Using state-of-the-art CNC machines, First Place produces all other major components from high quality billet aluminum and/or bar steel stock. All engines are internally balanced using needle bearings at the top and bottom of the connecting rod, giving you smooth operation. Each First Place Engine comes complete with an electronic ignition system, smoke-ready TIG welded custom aluminum muffler, complete instructions, and a one-year limited warranty.

Sig Manufacturing is pleased to be the exclusive distributor of First Place Engines.

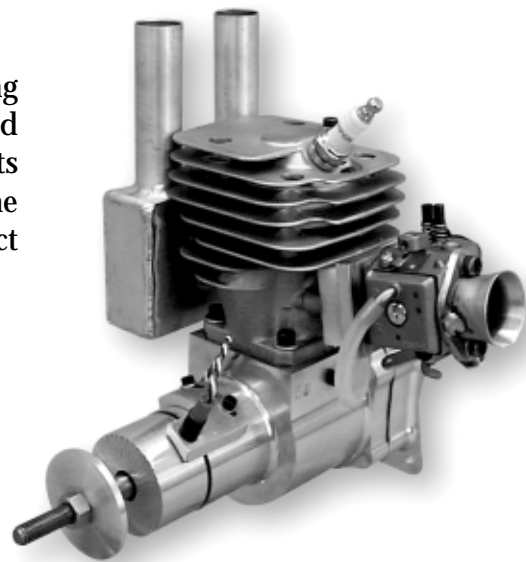
## For the SIG Sun Dancer, we recommend the **FPE 3.2 cu. in. Gas Engine**

This is no overweight, bone-jarring converted lawn care engine!

Chock full of power, the FPE 3.2 is the lightest, smoothest running engine in its class. Utilizing a premium Husqvarna piston and cylinder, *First Place Engines* machines all other major components from billet aluminum and bar steel stock. It's a gas engine designed and produced by modelers for modelers. The perfect power plant for the SIG Sun Dancer ARF!

### **Specifications:**

Size:	3.2 cubic inches (52 cc)
Weight:	68 ounces with muffler
Prop:	22x10
RPM:	7,300 rpm (APC 22x10)
Thrust:	23 pounds
Horsepower:	3.95 bhp@7,300 rpm



**Item #FPE32**