SUKHOI SU-31

ALMOST READY TO FLY

SUKHOI SU-31 ARF ASSEMBLY MANUAL

INTRODUCTION:

Congratulations on your purchase of the SIG SUKHOI SU-31 ARF kit! We're confident that this SUKHOI will quickly become one of your favorite models, provided it is properly assembled and adequately powered.

This SUHKOI kit features some of the lightest, best engineered construction of any ARF on the market. It is remarkably light and strong! This is one of the reasons it flies as well as it does, using the recommended engine sizes. The SUKHOI has superb take-off and landing characteristics combined with unlimited aerobatic capabilities. The airframe has been specifically designed to provide you with a "zeroed out" model. This is to say that the wings and horizontal stabilizer sit at 0° in relationship to the thrust line. In turn, this provides you with a model that is completely "honest" in any attitude. We will cover more detailed set-up information later in the assembly instructions.

3D CAPABLE! For those of you who are interested in 3-D aerobatics, we have provided the SUKHOI with double beveled aileron, elevator and rudder hinge lines. This means that the control surfaces can be driven to throws in excess of 45° for extreme 3-D maneuvers!

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

EASY TO ASSEMBLE! We urge you to follow these assembly instructions closely to produce the model as it is intended to be. We understand that many modelers love to "kit bash" and incorporate their own modifications. Simply be aware that certain assembly procedures for this airplane must be followed in the correct sequence. Deviation from these instructions could lead to problems beyond our control. Plan carefully!

ADDITIONAL ITEMS NEEDED TO COMPLETE THIS MODEL

RADIO EQUIPMENT

We highly recommend the use of a modern programmable computer radio. Such radio systems allow you to easily set and adjust every channel and additionally pre-program various flight functions to suit your individual style of flying. Four channels are required to fly your SUKHOI SU-31 - rudder, elevator, ailerons, and throttle. However, you will require a total of six servos - ailerons (2), elevators (2), rudder (1), and throttle (1).

SERVOS: Since your SUKHOI SU31 is a large, highly aerobatic airplane and because the control surfaces are also large, we urge you to use appropriate servos on all the flight surfaces (ailerons, elevator and rudder). This model should not be flown with "standard" 40 - 50 inch/ounce output servos! The SUKHOI is big enough to impart very large air loads and standard servos will quickly fail, resulting in loss of control. You should use heavy-duty ball-bearing servos with at least 70 inch/ounces 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 Airtronics™ #94731 servos for the ailerons, elevators, and rudder. This is a dual ball-bearing servo, rated at 77 inch/ounces of torque. Another good choice is the Hitec™ #605MG servo, which has 76 inch/ounces of torque and metal gears. These servos or their equivalent from other manufacturers, can be relied upon to work well throughout the SUKHOI'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 output 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 well with this model. We highly recommend their use with the pull-pull rudder system used in this SUKHOI. Using typical plastic servo output arms with the braided steel cables for rudder control, may cause problems due to the potential of wearing of the plastic by the cables over extended use. The Du-Bro output arms are molded from considerably tougher material and these have held up extremely well in our prototypes.

SERVO EXTENSION CHORDS: You will need two 12" extension chords and one standard Y-harness chord for the aileron servos; one 24" extension chord for the rudder servo; and one Y-harness chord for the elevator servos. Y-harness chords are used to connect two servos to a single plug-in in the receiver. In the case of the two aileron servos, a standard Y-harness chord, available from your radio manufacturer, will work fine. In the case of the two elevator servos, see the following note about a special kind of Y-harness called the "Miracle Y".

MIRACLE "Y": Note in the photos that the elevator servos will be mounted on opposite sides of the fuselage in exact "mirror image" to each other (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 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 machine like the SUKHOI. Normally in order to have this

type of 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 elevator servos for you. It also has a centering adjustment pot that lets you dial in the elevators exactly to a neutral relationship with each other. The 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 lead to the receiver. Perfect for the SUKHOI SU-31.

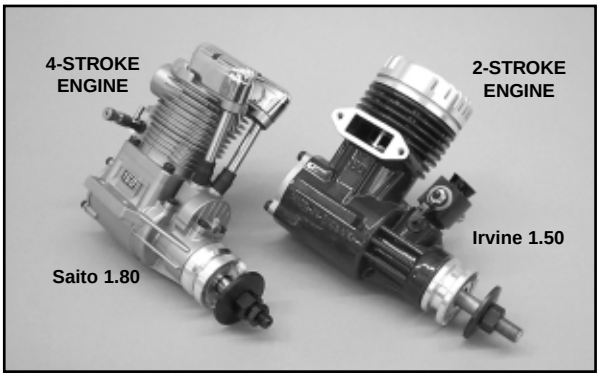
RX BATTERY PACK: Finally, since you will be using a total of six servos to fly this airplane, we strongly suggest you use a large capacity battery pack for use in this model. We have used both 1000 mAH and 1200 mAH packs with very good results. Using the light 1000 mAH pack, we have been able to safely fly five or six flights during any given flying session, a reasonable amount of flying 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!

ENGINE & SPINNER

The SIG SUKHOI SU-31 has been flown with a wide variety 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 SUKHOI with more authority than the smaller engines. It is simply a matter of how you want to fly the airplane.

RECOMMENDED ENGINES

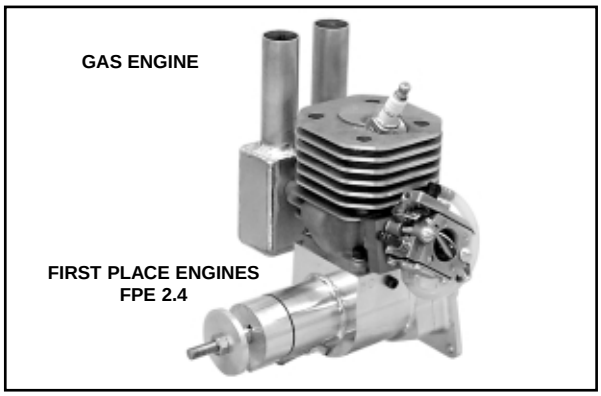
2-STROKE GLOW ENGINES: 1.50 - 2.10 cu.in.
4-STROKE GLOW ENGINES: 1.80 - 2.70 cu.in.
GAS ENGINES: 2.4 cu.in.



GLOW ENGINES:

GAS ENGINES: Our preferred engine for the SUKHOI is a 2.4 cu. in. gas engine. Our hands down favorite is the FIRST PLACE ENGINES FPE 2.4 cu. in. gas engine, available from SIG. Weighing only 52 ounces, this compact powerhouse delivers approximately 18 pounds of thrust with a 20x10 prop. You can imagine how that makes a 14 pound SUKHOI perform!

If you use a gas engine in your SUKHOI, be aware that the fuel tank stopper and the fuel tubing that are supplied in this kit ARE NOT gasoline compatible. Be sure to replace them with suitable after market components. The kit supplied fuel tank body itself is gasoline compatible.



SPINNER: Regardless of which engine you use in your SUKHOI, we recommend that you obtain a high quality 3-1/4" dia. aluminum spinner. Do not use a plastic spinner for engines this large.

KIT CONTENTS

The following is a complete list of every part included with your SUKHOI SU-31 ARF kit. Use the check-off blocks to inventory your kit before beginning assembly.

BAG 1: RIGHT WING
- ❑ 1 Right Wing Panel
- ❑ 1 Right Aileron
- ❑ 4 Hinge Points, installed but not glued

BAG 2: LEFT WING
- ❑ 1 Left Wing Panel
- ❑ 1 Left Aileron
- ❑ 4 Hinge Points, installed but not glued

BAG 3: FIN & RUDDER:
- ❑ 1 Fin
- ❑ 1 Rudder
- ❑ 3 Hinge Points, installed but not glued

BAG 4: STABILIZER & ELEVATORS
- ❑ 1 Stabilizer
- ❑ 1 Right Elevator
- ❑ 1 Left Elevator
- ❑ 6 Hinge Points, installed but not glued

BAG 5: FUSELAGE
- ❑ 1 Fuselage
- ❑ 1 Landing Gear Fairing
- ❑ 2 M2.6 x 12mm PWA* Screws, for l.g. fairing
- ❑ 1 Molded Plastic Canopy Base
- ❑ 1 Molded Clear Plastic Canopy
- ❑ 6 M2.6 x 10mm PWA* Screws, for canopy

BAG 6: COWLING
- ❑ 1 Fiberglass Cowling
- ❑ 4 M2.6 x 10mm PWA* Screws

BAG 7: WING FAIRING
- ❑ 1 Molded Plastic Wing Fairing

BAG 8: TAIL FAIRING
- ❑ 1 Molded Plastic Tail Fairing

BAG 9: MAIN LANDING GEAR
- ❑ 1 Aluminum Landing Gear
- ❑ 4 M4 x 15mm PWA* Bolts

❑ 4 M4 Lock Nuts
❑ 2 Hardened Steel Axles
❑ 2 Lock Nuts, for axles
❑ 4 Wheel Collars with Set Screws
❑ 2 3-1/2" dia. Main Wheels

BAG 10: TAILWHEEL ASSEMBLY
❑ 1 Main Leaf-Spring with Steering Arm, Wheel Yoke, and Tailwheel installed
❑ 1 Short Leaf-Spring
❑ 2 Coil Steering Springs
❑ 1 Metal Rudder T-Horn
❑ 2 M2 x 9mm PWA* Screws
❑ 3 M3 x 14mm PWA* Screws

BAG 11: FUEL TANK
❑ 1 450cc (15.2 oz.) Plastic Tank
❑ 1 Rubber Stopper
❑ 1 Metal Front Clamp
❑ 1 Metal Rear Clamp
❑ 1 M3 x 18mm Clamp Bolt
❑ 1 Metal Clunk Pickup
❑ 1 Fuel Tubing for inside tank
❑ 3 Aluminum Tubes
❑ 2 Fuel Tubing

BAG 12: SMALL PARTS
❑ 16 M2.6 x 10mm PWA* Screws, for fuselage hatch(4), aileron servo hatches(8), aileron servo mount blocks(4)
❑ 1 Plywood Right Aileron Servo Hatch
❑ 1 Plywood Left Aileron Servo Hatch
❑ 1 Hardwood Front Wing Joiner
❑ 1 Aluminum Tube Rear Wing Joiner
❑ 1 Plywood Front Wing Former WF-1
❑ 1 Plywood Rear Wing Former WF-2
❑ 1 1/8" x 3-1/2" x 7-1/2" Plywood Front Fuselage Hatch
❑ 4 3/8" x 3/4" x 3/4" Hardwood Aileron Servo Mounts
❑ 2 1/8" x 3/4" x 3/4" Plywood Wing Bolt Plates
❑ 1 1/8" Plywood Throttle Servo Tray
❑ 1 1/8" Plywood Throttle Pushrod Support
❑ 2 3/8" dia. x 1-5/8" long Hardwood Dowels

MISCELLANEOUS PARTS
❑ 2 1/4-20 x 2" Nylon Wing Bolts
❑ 2 RIGHT Metal Control Horns; for ail.(1), ele.(1)
❑ 3 LEFT Metal Control Horns; for ail.(1), ele.(1), rud.(1)
❑ 24 M2.6 x 10mm Metal Screws; for control horns
❑ 2 4-40 X 2-3/4" Threaded Pushrods; for elevator
❑ 2 4-40 X 4" Threaded Pushrods; for ailerons
❑ 1 4-40 X 4-5/8" Threaded Pushrod; for rudder
❑ 5 4-40 Threaded R/C Links; ail.(2), ele.(2), rud.(1)
❑ 5 4-40 Hex Nuts; jam nuts R/C Links
❑ 5 4-40 size Solder Links; ail.(2), ele.(2), rud.(1)
❑ 1 1/16"od x 18" Stranded Steel Cable; for thr. pushrod
❑ 1 1/8"od x 18" Nylon Pushrod Tubing, for thr. pushrod
❑ 1 2-56 size Solder Link; for engine end of thr. pushrod
❑ 1 Brass Pushrod Connector; for servo end of thr. pushrod
❑ 1 Molded Nylon Retainer; for pushrod connector
❑ 1 4-40 x 1/8" Socket-Hd Cap Screw; for pushrod connector
❑ 1 2-56 x 10" Threaded Rod; for thr. pushrod (for gas)
❑ 1 Instrument Panel Print
❑ 1 Decal Sheet

** PWA = phillips washer-style head*

NOTES ABOUT THE COVERING MATERIAL
Your SUKHOI SU-31 ARF has been professionally covered with **Oracover® #12 Cream, #40 Green, and #71 Black**. *(Note: In the United States, Oracover® is sold under the name of Hangar 9 Ultracoat®. The equivalent Ultracoat® colors are called #878 Cream, #880 Green, #874 Black).*

Oracover® is well known for its ease of application, light weight, and consistency of color. If you live in a drier 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 has nothing to do with the covering material or how it was applied. It has to do with the wood beneath the covering. Wood takes on or loses ambient humidity. Your SUKHOI 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 coverings 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 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 they are all sealed and well adhered. Then use the heated iron to lightly shrink the material - do not press on it. Once the covering is tight, lightly iron the material back down to the wood. You can also use a hobby-type heat gun to re-shrink the covering, but you must be extra careful around the seams. Re-heating seams may cause them to "creep", making them unsightly.

MODELER'S TIP: One of the most common problems associated with shrinking any covering film is controlling the heat around seams. Heat applied close to or directly onto seams re-heats the covering adhesive and the seam 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 your 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.

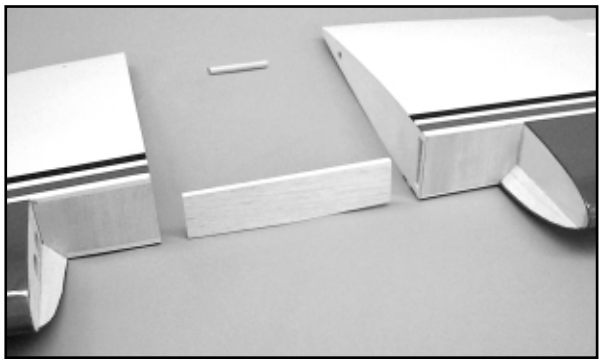
REQUIRED TOOLS
For proper assembly, we suggest you have the following tools and materials available:

A selection of glues - SIG Thin, Medium and Thick CA,
and SIG Kwik-Set 5-Minute Epoxy
Threadlock Compound, such as Loctite® Non-Permanent Blue
Silicone Sealer - clear or white
Screwdriver Assortment
Pliers - Needle Nose & Flat Nose
Diagonal Wire Cutters
Small Allen Wrench Assortment
Drill with Assorted Drill Bits
Pin Vise for Small Dia. Drill Bits
Hobby Knife With Sharp #11 Blades
Scissors
Covering Iron and Trim Seal Tool

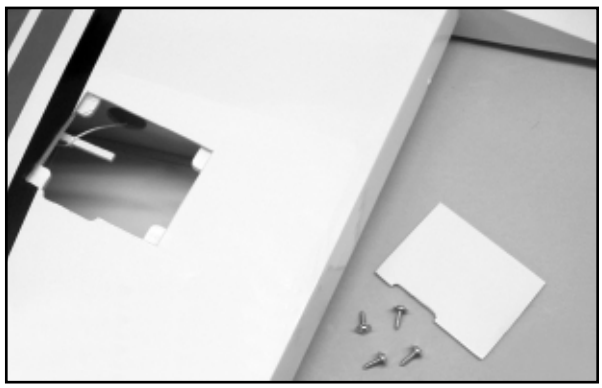
Masking Tape
Paper Towels
Power Drill With Selection of Bits
Dremel® Tool with Selection of Sanding and Grinding Bits
Soldering Iron and Solder
Large Fuel Tubing

WING ASSEMBLY

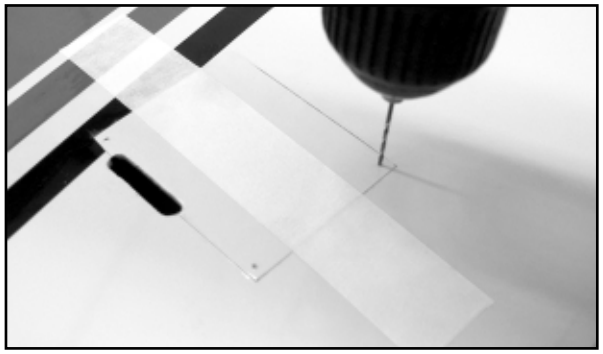
Before starting actual construction, trial fit both wing panels onto the Hardwood Wing Joiner and the Aluminum Tube Rear Wing Joiner. Check to see that the wing panels fit together in proper alignment, and that both root ribs come into firm, straight contact with each other. If the Hardwood Wing Joiner requires a little trimming to achieve this fit, do so now. *NOTE: Be sure you've got the Hardwood Wing Joiner right side up - the greater angles are on the bottom.* **Do not glue the wing panels together yet!**

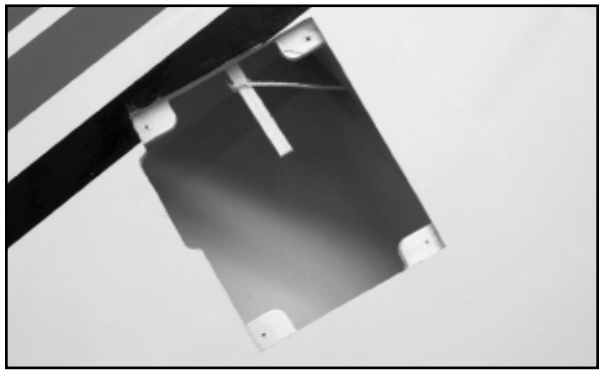


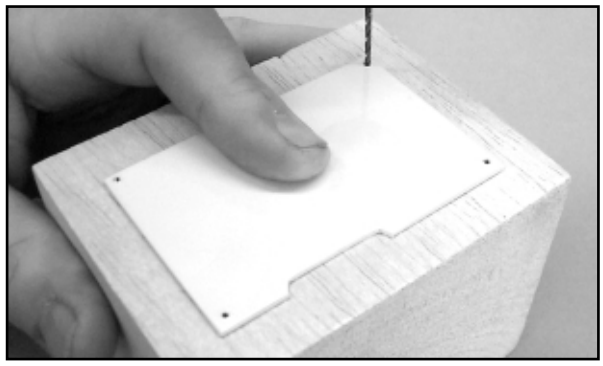
❑ 1) Locate the two pre-covered aileron servo hatches and eight M2.6 x 10mm PWA Screws. Trial fit the hatches into the aileron servo openings to determine which hatch goes in the right wing and which goes in the left wing. Tape the hatches in place, aligning their servo arm cutouts with the ones in the wing openings.



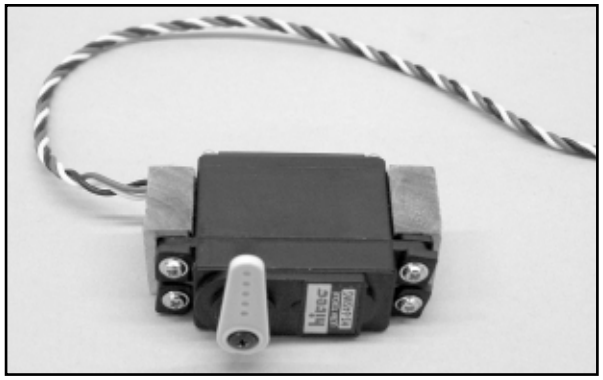
❑ 2) Drill a 3/64" (or #56) dia. hole near each corner of the hatch. Drill completely thru the hatch and into the hardwood mounting tabs that are in the wing. Remove the hatch. Redrill the holes in the hatch with a 7/64" dia. bit to allow clearance for the screws.



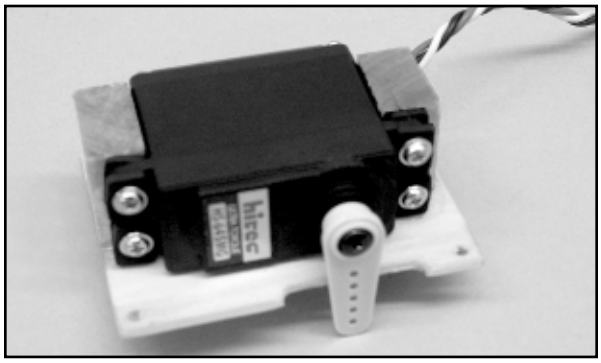




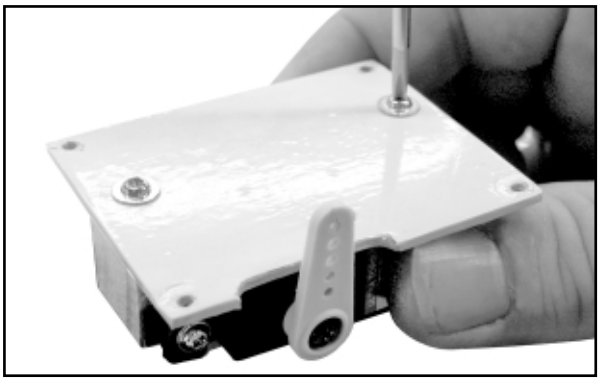
❑ 3) The aileron servos are mounted to the back, uncovered sides of the servo hatches. From the kit contents, locate the four 3/8" x 3/4" x 3/4" hardwood aileron servo mounts. You will also need the servos and the servo mounting grommets and screws supplied by your radio manufacturer during this step. Remove the servo output arm and lay the servo flat on its side. Position two of the mounting blocks beneath the servo's mounting arms, also flat on the same surface as the servo. Drill appropriate servo mounting holes into the wood mounting blocks. Use the screws that came with your radio system to now mount the servos to the two mounting blocks.



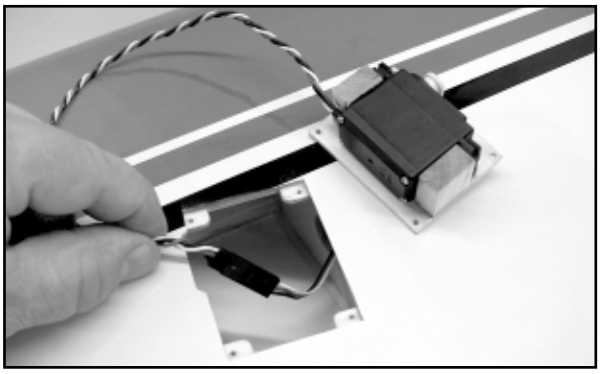
❑ 4) Install the output arm back onto the aileron servo, in neutral position. Place the servo/mounting block assembly onto the backside of the servo hatch, centering the output arm with the half slot opening. The servo output arm must be able to move freely back and forth without touching the slot's edge - about 1/32" clearance is adequate. With the servo now in this position, use a sharp pencil to mark the locations of the servo mounting blocks onto the hatch. Remove the servo from the hatch and apply thick CA glue or 5-minute epoxy to the bottoms of the servo blocks and glue them in place to the hatch, again checking for output arm clearance. Hold or clamp the block in exact position until dry. Repeat this step to mount the other aileron servo to its hatch.



❑ 5) Locate four M2.6 x 10mm PWA Screws. These screws will be used to mechanically secure each servo mounting block to the servo hatches. Use a ruler to find the approximate center of each block and mark the location onto the covered side of the servo hatch. With a 3/64" (or #56) dia. bit, drill a pilot hole - about 1/4" deep - through the servo hatch and into the mounting block, at the marks just made. Install and tighten the screws in place.



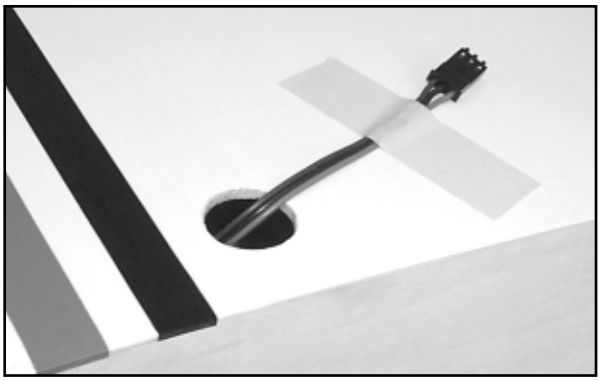
❑ 6) Before installing the aileron servos/hatches into the wing panels, use your radio system to center both servos and to check servo travel. Make sure both servo output arms are 90° to the servos and that they are long enough to clear the wing's bottom surface during extremes of travel.



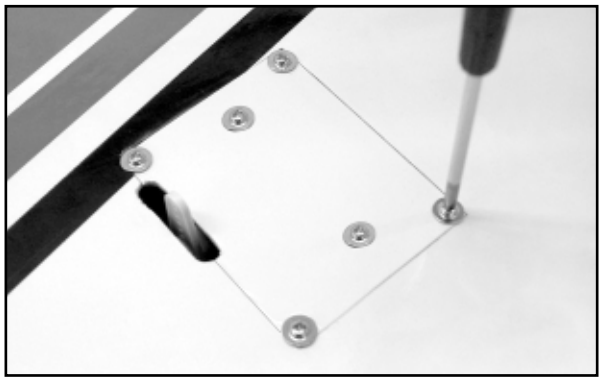
a. Now attach 12" long servo extension chords to both aileron servos. *(Note: Be sure to put a piece of tape around the connecting plugs so they can't come apart while hidden in the wing.)*

b. Feed the servo extension chords into the wings through the servo hatch opening, then through the holes in the ribs and finally out through the round holes provided at the center of each wing panel. *(Note that a piece of string has been factory-installed in the wing panels to make it easy to pull the extension chords through the wing.)*

c. After you get the end of the extension chord all the way through the wing, tape the loose end of the chord to the wing's top surface, so that it won't fall back inside the wing.



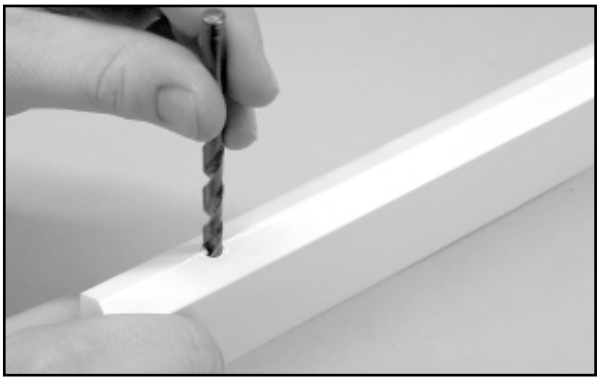
d. Finally, secure the aileron servo/hatch in place in the wing with M2.6 x 10mm PWA Screws. *(NOTE: Did you remember to install the servo output arm screws in each servo?)*



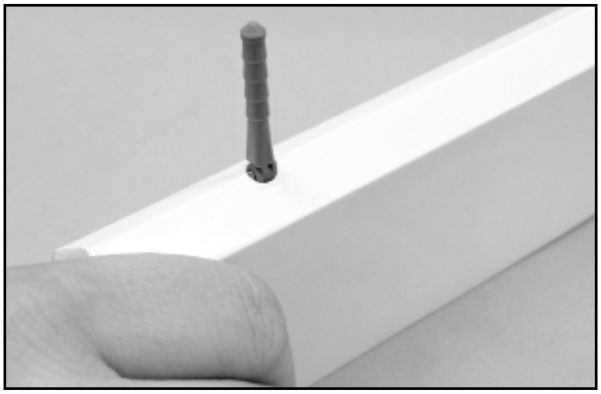
❑ 7) Next you need to permanently glue the aileron hinges in place. Notice that 4 hinges have been factory-installed in the each aileron, but they are not glued.

a. First remove the 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 part of the hinge, so



that the hinge can be pushed in far enough for the pivot point to line up with the front "V" point of the aileron leading edge. We recommend enlarging the opening of the hinge holes slightly with a hand-held 1/4" dia. drill bit. You only need to twist the drill bit in about an 1/4" or so. Countersink all of the hinge holes in the leading edge of the ailerons in this manner. This will allow a gapless hinge line with proper hinge movement.



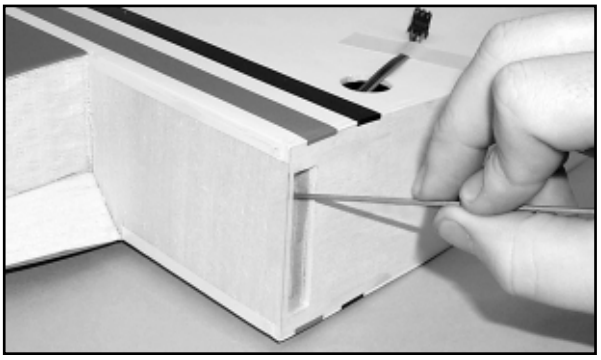
c. Trial fit the ailerons back onto all the hinges and the wing one more time to make sure everything lines up properly. You want the beveled leading edge of the aileron to be as close to the mating wing as possible while still allowing full movement. When satisfied that everything is good, take it back 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 cleanup and alignment. Epoxy the hinges into the ailerons first and let dry. Then hinge each aileron to its appropriate wing panel. The best procedure with this type of hinge is to inject the 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 onto the control surface. Then move on to the next hinge.

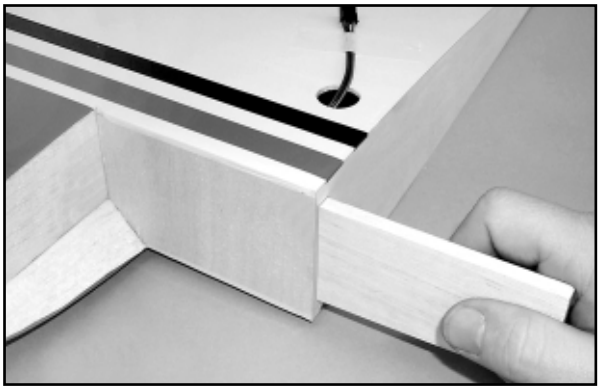
IMPORTANT NOTE: Be sure to correctly identify which aileron is for the right wing and which is for the left wing by looking for the aileron horn plywood mounting pad that is inset into the BOTTOM side of each aileron, underneath the covering.

MODELER'S TIP: Apply a 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 petroleum jelly on the round shank of the hinge, where you want the glue to stick.

❑ 8) Now it's time to glue the wing panels together permanently! Start by mixing up an ample amount of slow-drying epoxy glue. Use a wire, stick or small throw-away brush to liberally coat the inside of the wing joiner pockets in the end of the wing panels with glue. Then apply a liberal coat of epoxy to the exposed center ribs of each wing panel.



Next apply glue to the hardwood front wing joiner and to the aluminum tube rear wing joiner. Next slide the wing joiners into one wing panel, and then slide the other wing panel in place over the exposed end of the joiners, 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. Use tape at the leading and trailing edge joints to hold them in the correct position. Place a clean rag on the floor next to a 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 this assembly to fully cure. Continue watching for excess epoxy oozing out of the joint as it cures and wipe it off.



NOTE: It's very important to use plenty of epoxy when gluing the wing panels together. The strength of your wing joint depends on it! Don't worry if the excess glue oozes out and gets on the covering material. With slow-drying epoxy, you will have plenty of time to clean up all the glue smears with a paper towel soaked in rubbing alcohol. Also, if possible get someone to help you with this procedure. An extra set of hands makes the job much easier! While one person holds the two wing panels firmly together in correct alignment, the other person can clean off the excess glue and tape the wing panels together.

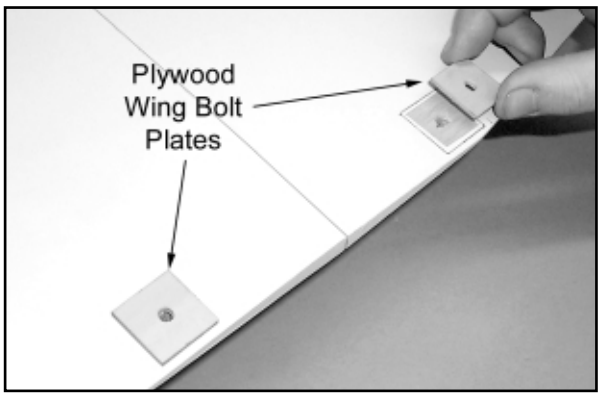
❑ 9) Locate the 1/8" thick plywood part WF-1 and trial fit it in place on the front of the wing. The top edge of WF-1 must fit flush with the top surface of the wing. Also make sure WF-1 seats tightly against the front surface of the wing. There should be no gaps! If there is a gap, find out what's causing it and fix it. Once you are satisfied that the plywood former fits properly, glue it securely in place. Let dry.

❑ 10) Using a 3/8" dia. bit, drill two holes in the front of the wing for the 3/8" dia. x 1-5/8" long leading edge dowels. The holes in WF-1 show the exact locations. Drill completely through the foremost wing structure, including the hardwood wing joiner.

❑ 11) Use slow-drying epoxy to install the two hardwood dowels into the front of the wing. First trial fit the dowels into the holes without glue, to make sure they can be pushed in far enough. You want to end up with about 1/2" of dowel remaining exposed in front of the plywood former. Take the dowels back out and apply plenty of epoxy glue inside the two holes. Smear some glue on the end of the dowels and then re-insert them into the holes. Wipe off any excess glue. Visually check to be sure the dowels are straight in the wings and not at angles. Allow to dry.

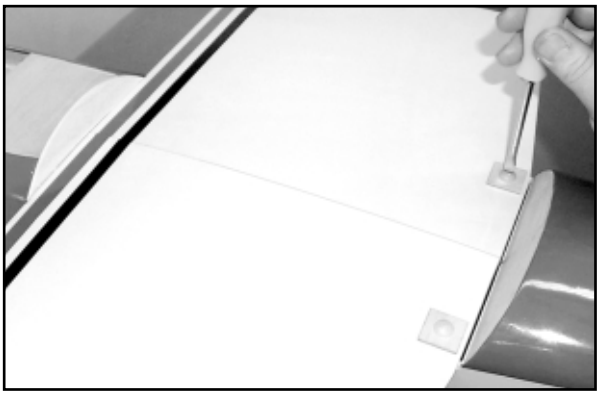
❑12) The wing can now fitted to the fuselage. First engage the two dowels at the front of the wing into the two holes in the fuselage former. If you cannot get both dowels into their respective holes at the same time, it may be that one of the holes is just slightly off (left to right) due to a misalignment in the manufacturing process. If this is the case, it shouldn't be off very much, and you should be able to correct it easily. Use a sharp #11 blade in your hobby knife to adjust ONE of the holes slightly to the left or right to achieve a good fit. Once the wing dowels properly engage, press the rear of the wing in place into the wing saddle and check the overall fit before proceeding.

❑13) Locate the two 1/8" x 3/4" x 3/4" plywood wing bolt plates. The wing bolt plates are already pre-drilled in the center to pass the nylon wing bolts. Notice that there are also holes for the wing bolts pre-drilled in the rear center section of each wing panel. Hold one of the wing bolt plates in position on the BOTTOM of the wing, aligning the hole in the plate with the bolt hole in the wing. Use a pencil (or fine tip marker) to draw the outline of the plate onto the wing. Do the same for the other wing bolt plate, marking its location on the bottom of the other wing. Use a hobby knife to



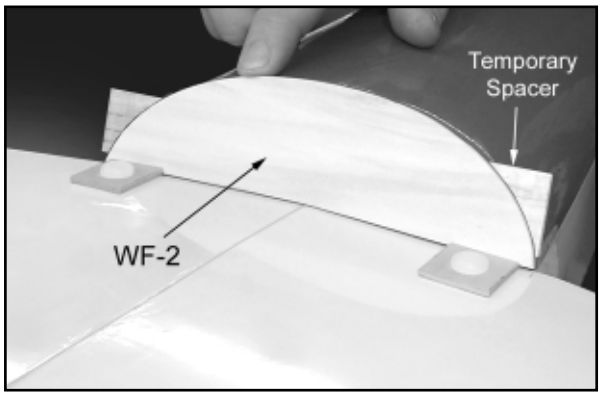
remove the covering material on the wing, about 1/16" inside the wing bolt plate outlines. *CAUTION: Be careful not to cut through the balsa wing sheeting!* Then glue the wing bolt plates to the wing with CA glue, carefully aligning the bolt holes. Make sure there is no excess glue inside the holes and let dry.

❑ 14) Locate the two nylon wing bolts. Mount the wing in place on the fuselage, using the nylon wing bolts. The nylon wing bolts should pass freely through the holes in the wing and thread into the blind nuts that are pre-installed in the fuselage. If the wing does not assemble cleanly and freely to the fuselage at this point, you need to find the cause of any binding and fix it now, before proceeding.



❑ 15) With the wing mounted to the fuselage, check the fit of the 1/8" thick plywood part WF-2. This part is to be glued to the trailing edge of the wing. Before gluing, carefully remove the covering material in the area where WF-2 contacts the wing, so that you will have a good wood-to-wood joint. Then glue WF-2 securely in place on the wing.

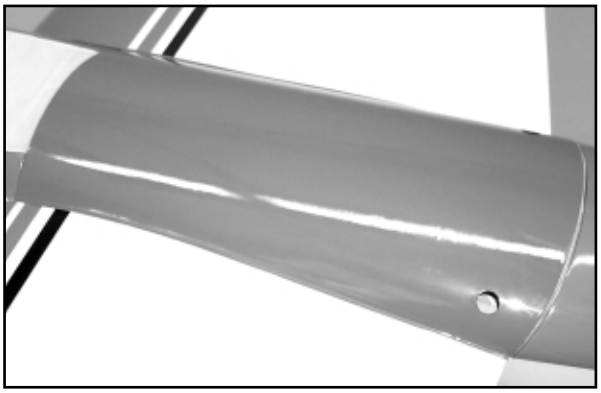
NOTE: *In order to allow the wing to slide on and off easily, it's best to have a slight gap (1/16" maximum) between WF-2 and the adjacent fuselage former. Tape or tack glue a piece of scrap 1/16" thick wood or cardboard to the backside of WF-2 to serve as a temporary spacer while you are gluing WF-2 to the wing.*



❑ 16) Set the molded plastic wing fairing in place on the bottom of the wing to check the fit. The plastic fairing should contact the wing surface and plywood formers WF-1 and WF-2. If WF-1 and WF-2 are keeping the sides of the fairing from contacting the wing surface, you may need to sand them down a little bit. When satisfied that the fit is good, put a bead of silicone adhesive on the side flanges of the fairing that will contact the wing and on the edges of plywood formers WF-1 and WF-2. Carefully set the plastic fairing back in place. Tape it to the wing in a few places to keep it from moving. Clean off any excess silicone that oozes out by first scraping it off with a clean flat stick, and then wiping the smears with a rag soaked in methanol or CA debonder. Let dry thoroughly.

OPTIONAL: If you'd rather use glue instead of silicone adhesive to hold the fairing to the wing, be sure to strip the covering material off the bottom of the wing where the side flanges make

contact so that you have a plastic fairing-to-wood joint. Be very careful not to cut into the balsa wood wing sheeting while you are cutting away the covering material! When ready, permanently glue the plastic wing fairing onto the bottom of the wing with thick CA glue or epoxy.



❑ 17) Plug a standard Y-harness chord into the "aileron" slot in your receiver. Plug the ends of your aileron servo extensions coming out of the wing into the dual ends of the Y-harness chord. Connect the airborne battery pack and switch harness to your receiver and then turn on your transmitter. You should now be able to operate your aileron servos. Perform the following setups:

a) Center the aileron servos using the transmitter trims and/or the radio's computer options.
b) Position the servo output arms on the output shaft to exactly 90° upright when the servos are neutral.
c) Test the action of the servos, making sure the output arms move freely and that they move in the correct directions for left and right aileron action.
d) Turn off the radio system and disconnect the aileron servos from the Y-harness.

❑ 18) Locate one left and one right metal control horn and eight M2.6 x 10mm Metal Screws.

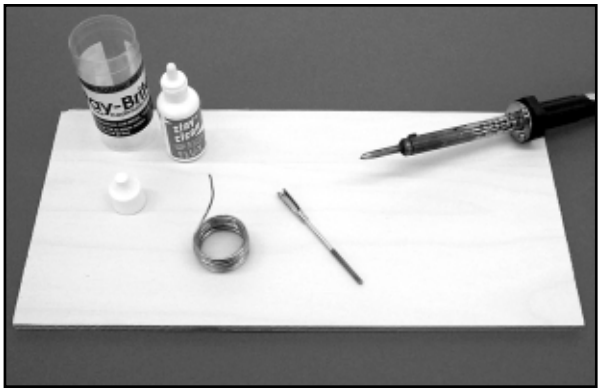
a. Tape the ailerons in neutral position and lay the wing upside down on your bench.

b. Position one of the control horns in place on the bottom leading edge of the appropriate 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.

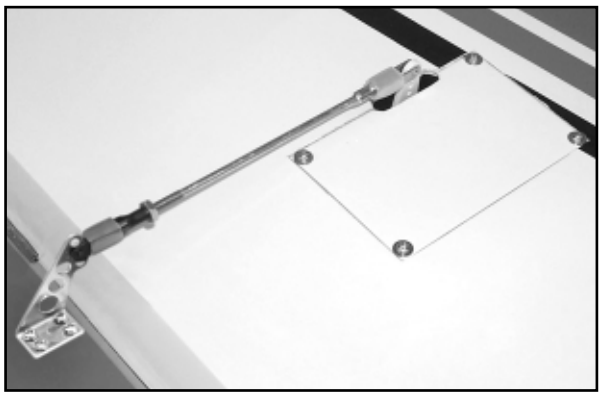
c. Drill a 3/64" dia. (or #56 drill) pilot hole into the aileron at each mark. Mount the control horn in place, using the M2.6 x 10mm Metal Screws. Repeat this process to attach a control horn to the other aileron.

IMPORTANT: After you finish mounting the control horns on the ailerons for the first time, take them back off and set them aside temporarily. Then put a few drops of Thin CA into each of the screw holes in the aileron. The Thin CA will soak into the threads in the wood, and when it dries the holding power of the threads will be much stronger. Use Thin CA only, not medium or thick CA. Let the Thin CA dry completely before remounting the control horns onto the ailerons.

❑ 19) Locate two 4-40 x 4" threaded pushrods for the ailerons, two 4-40 solder links, two 4-40 hex nuts, and two 4-40 threaded R/C links. Use a soldering iron (or torch) and resin core solder to attach a solder link onto the unthreaded end of one of the threaded pushrods. Thread a 4-40 hex nut onto the threaded end of the pushrod, followed by a 4-40 threaded R/C link. Connect the solder link end of the pushrod to the aileron servo output arm Holding the other end of the pushrod up next to the aileron horn, adjust the threaded R/C link as needed to match its connecting pin to the middle hole in the horn. Snap the threaded R/C link in place to the horn. Repeat this process to make a pushrod for the other aileron. Remove the tape holding the ailerons in neutral position.



❑ 20) Reconnect your radio system and check the aileron servo action. Make sure the ailerons are operating freely and smoothly. Final adjustments of all the control surfaces will be done after assembly is complete. This completes the wing assembly.

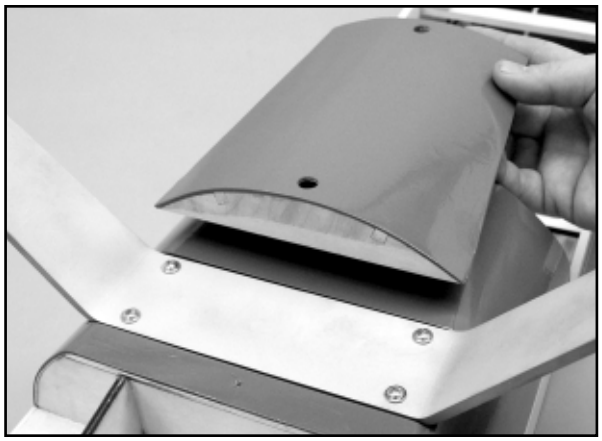


LANDING GEAR

❑ 1) Remove the landing gear fairing from the bottom of the fuselage by unscrewing the two metal screws that are holding it in place. The screws accessible through the two access holes in the fairing. Set the fairing aside.

❑ 2) Mount the formed aluminum main landing gear in place on the fuselage using the four M4 x 15mm PWA bolts and M4 lock nuts provided.

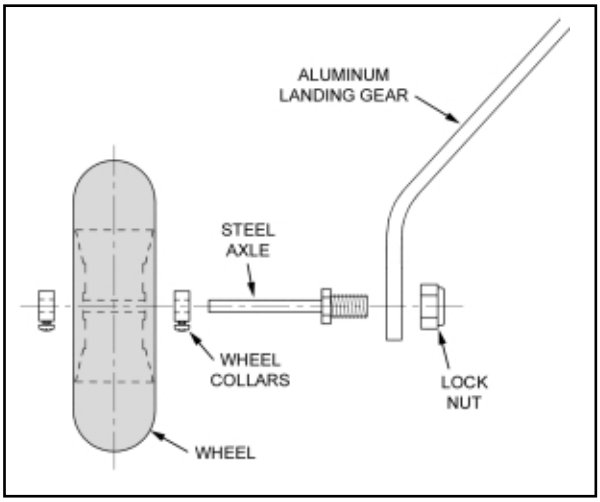
When finished, screw the landing gear fairing back in place.



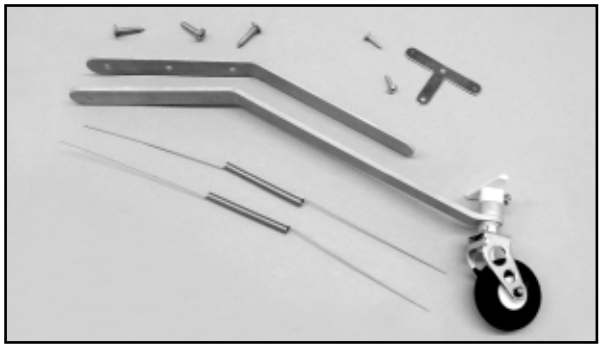
NOTE: *We recommend that you use Loctite® threadlocking compound on all bolts used in the assembly of the landing gear.*

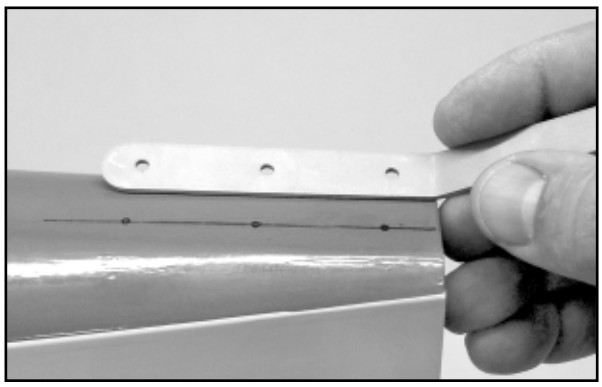
❑ 3) Locate the two main wheels, the two steel wheel axles, two axle lock nuts, and four wheel collars with set screws. Install the axles into the holes at the bottom of each leg of the aluminum main landing gear. Thread the lock nuts onto the threaded ends of the axles and tighten these securely.

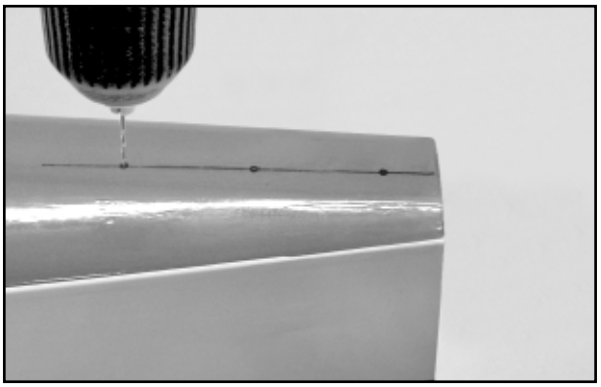
❑ 4) Slide a wheel collar onto the axle shaft, all the way up against the hex shoulder of the axle. Tighten in position. Next slide on the wheel and then another wheel collar. Tighten the outer wheel collar against the wheel, leaving just enough gap to allow the wheel to spin freely. Note: If the wheel itself seems too tight on the axle, drill out the wheel hub with a #20 drill bit.



❑ 5) 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 onto the fuselage. Drill pilot holes through the bottom of the fuselage with a 1/16" dia. drill bit.

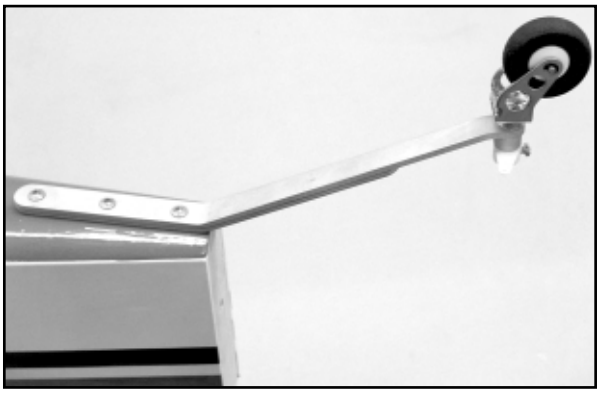






❑ 6) Fasten both leaf springs of the tailwheel assembly to the bottom of the fuselage with the M3 x 14mm PWA Screws.

Tip: After a preliminary mounting, take the tailwheel assembly back off and flow some thin CA adhesive into the holes in the fuselage to toughen them up. Then screw the leaf springs back on.



❑ 7) The tailwheel's coiled steering springs will be installed later, after the fin and rudder are attached to the fuselage.

ENGINE MOUNTING AND THROTTLE HOOKUP

With the wide variety of 2-stroke, 4-stroke, and gas engines that can be used in the SUKHOI, it is impossible for us to provide detailed step-by-step instructions on how to install every engine. Instead, we will provide general guidelines about the installation of two basic types: SINGLE-CYLINDER GLOW ENGINES and 2-CYCLE GASOLINE ENGINES.

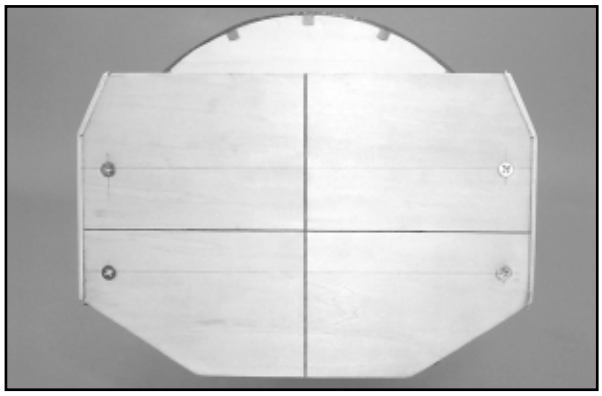
GENERAL GUIDELINES ON THE INSTALLATION OF

SINGLE-CYLINDER GLOW ENGINES

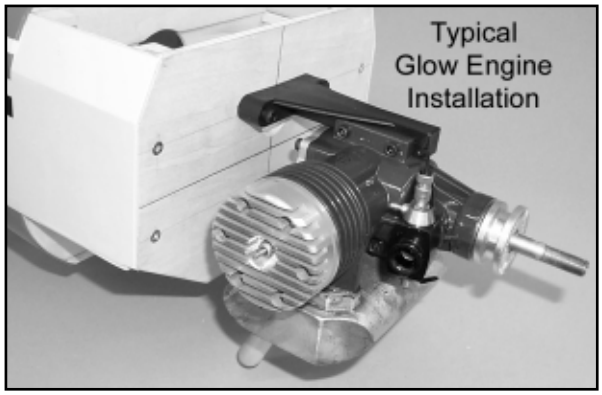
Whether they are 2-stroke or 4-stroke, single-cylinder glow engines work best in the SUKHOI when side mounted. Realistically, with the SUKHOI's huge round cowling the engine could be mounted in any position, including upright or inverted. However we find that a side mounted engine makes it easier to route the exhaust out the bottom of the cowling. Shown here is a single-cylinder 2-stroke Irvine 1.50 glow engine mounted on its side, with the head of the engine in the right side of the cowling. Other single-cylinder engine installations will be similar.

❑ 1) You need to purchase a suitable engine mount (*not supplied*) to fit your particular engine and the appropriate mounting bolts & blind nuts (*not supplied*) to attach the mount to the firewall. A wide variety of after-market engine mounts are available. Many of them are one-piece and sized to fit a particular engine. We recommend that you choose aluminum mounts for engines of this size.

❑ 2) Horizontal and vertical engine thrust line marks are scribed onto the front of the firewall. Use a straightedge and pencil to extend the lines all the way to the edges of the firewall. Position your engine mount on the front of the firewall, carefully aligning it with the horizontal and vertical thrust lines. Mark the mount's bolt hole locations on the firewall with a pencil. Drill holes completely through the firewall at those locations for the mounting bolts. Finally, bolt the engine mounts in place, being sure to glue the blind nuts into the back of the firewall.



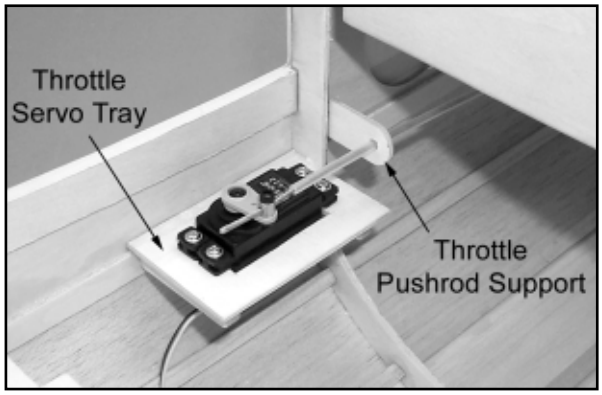
❑ 3) With the engine mount bolted on the firewall, place your engine on the mount. Move the engine forward or backward on the mount until you measure exactly 6" from the front face of the prop drive washer to the front of the firewall. This is the distance your engine needs to be from the firewall for proper cowl mounting and prop clearance purposes. Mark your engine's mounting bolt hole locations onto the engine mounts and remove the engine. Drill the required holes in the engine mounts, and then bolt the engine in place with suitable mounting bolts (*not supplied*).



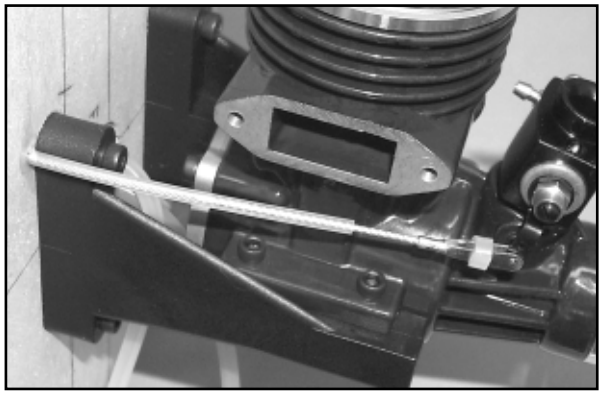
❑ 4) A pre-cut plywood servo tray is provided for mounting the throttle servo. Decide on the best location for the tray based on the location of your engine's throttle arm. In most cases, with a single-cylinder engine, the best location will be on the right side of the fuselage, just behind the front fuse former - see photo. Glue the servo tray securely in place, and then mount the throttle servo in the tray using the grommets and mounting screws supplied with your radio system. It's best to mark the servo mounting hole locations on the plywood first, then drill 1/16" dia. pilot holes, before screwing the servo in place.

❑ 5) Next we're going to assemble the throttle pushrod. Locate the 1/8" od x 18" nylon pushrod tubing, the 1/16" x 18" stranded steel cable, the pre-cut 1/8" plywood throttle tube support (has one rounded end with a hole for the tube), the pushrod connector assembly (hex brass body, nylon retainer and 4-40 x 1/8" socket-head cap screw), and the 2-56 solder link.

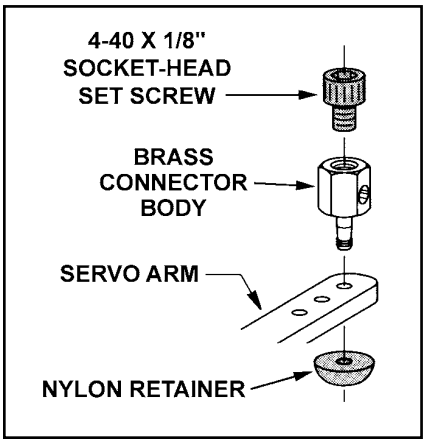
Drill a 9/64" dia. hole through the firewall, aligned with your engine's carburetor throttle arm. From the front, insert the 1/8" nylon pushrod tube through the firewall and into the fuselage, leaving about 3" of tube exposed in front of the firewall (typical when using a 1.20 or 1.50 2-stroke engine). With the tube in place, turn the fuselage over and note the location of the tube in relationship to the throttle servo. You want to position the tube directly in front of the servo's output arm. Slip the plywood throttle pushrod support over the end of the tube. Glue the support to the former in the location that will aim the nylon tube directly at the throttle servo output arm. Then use a sharp razor blade to cut the nylon tube to length 1" beyond the plywood tube support. Remove the tube and sand its surface with 220 sandpaper to rough it a little. Reinstall the tube and glue it in place to the firewall and the plywood tube support with thick CA glue.



❑ 6) Solder the 2-56 solder link to one end of the steel cable - this is the carburetor end of the throttle pushrod. In addition to attaching the solder link to the end of the cable, you should flow some solder into the last 1" to 2" of cable (depending on your specific installation) to stiffen it. Also flow solder into the last 1" of the other end of the cable to stiffen it and keep it from unraveling.



❑ 7) Install the brass pushrod connector assembly to the output arm on the throttle servo, as shown in the drawing.



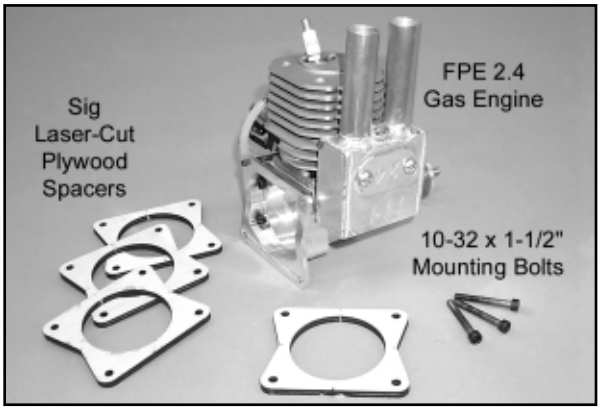
❑ 8) From the firewall, insert the bare end of the steel cable through the nylon tube. When you get it all the way in, insert the end of the cable into the pushrod connector on the servo. At the other end, connect the solder link to your engine's throttle arm. Finally cut the cable to length inside the fuselage, leaving about 1" of extra length behind the brass pushrod connector. The extra length will be useful when setting up the throttle travel limits later on.

GENERAL GUIDELINES ON THE INSTALLATION OF

2-CYCLE GASOLINE ENGINES

Gasoline engines like the FPE 2.4 pictured here fit best in the SUKHOI when mounted inverted. You will need to purchase mounting bolts and blind nuts to fit your particular engine installation.

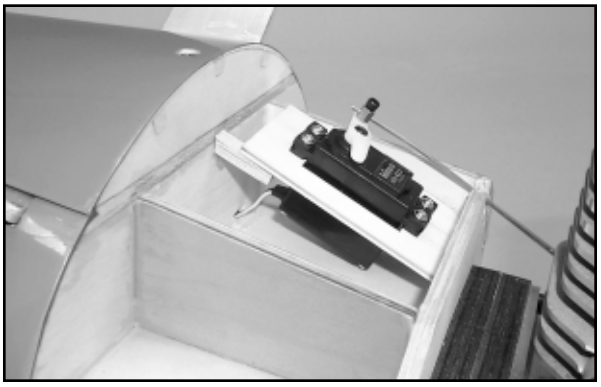
❑ 1) The FPE 2.4 gas engine measures 5" from the prop drive washer to the back of the engine mount, while the SUKHOI is designed with a firewall to prop washer distance of 6". Consequently you will have to put a 1" thick spacer (*not supplied*) between the firewall and the back of the FPE engine to achieve the proper 6" total distance. SIG has a set of laser-cut 1/4" thick plywood spacers specifically for the FPE 2.4. They are part #SIGSH802 (2 spacers per package, so you will need 2 packages to achieve 1" total spacers). You will also need 10-32 x 1-1/2" mounting bolts & blind nuts (*not supplied*).



❑ 2) Position one of the plywood spacers on the front of the firewall, carefully aligning it with the horizontal and vertical thrust lines. Mark the mounting bolt hole locations on the firewall with a pencil and then drill the holes completely through the firewall. Bolt the engine and spacers onto the firewall and glue the blind nuts in place.

❑ 3) A pre-cut plywood servo tray is provided for mounting the throttle servo. Decide on the best location for the tray based on the location of your engine's throttle arm. Note that the location and direction of movement of the throttle arm on a gas engine varies tremendously from engine to engine. So it is not possible for us to show you a "best" method for all gas engines. We can only show you what worked well with the FPE gas engine we used.

With the FPE 2.4 gas engine, we found it easiest to mount the throttle servo right behind the bottom of the firewall - see photos. It's actually a very simple trouble-free arrangement. Glue the plywood servo tray in place at an angle that will provide a straight shot from the servo arm to the carb's throttle arm. Mount the throttle servo in the tray using the grommets and mounting screws supplied with your radio system.



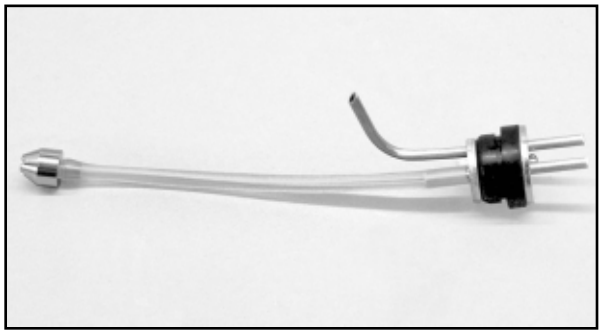
❑ 4) The throttle pushrod is a standard 2-56 size steel R/C rod (not supplied). On the threaded end of the pushrod we used a Du-Bro #367 Swivel Ball Link (not supplied) to connect to the carb's throttle arm. At the servo end of the pushrod we used the brass pushrod connector assembly that is provided in this kit. Assemble it to the servo arm as shown in the drawing. Plug the throttle servo into your radio system and test the action of the throttle setup, checking for proper movement. Make sure there is no binding.

NOTE: *The carburetors on gas engines are notorious for having a short amount of "travel", requiring limited servo movement. You will probably find it best to mount the brass pushrod connector in the innermost hole of the throttle servo arm.*

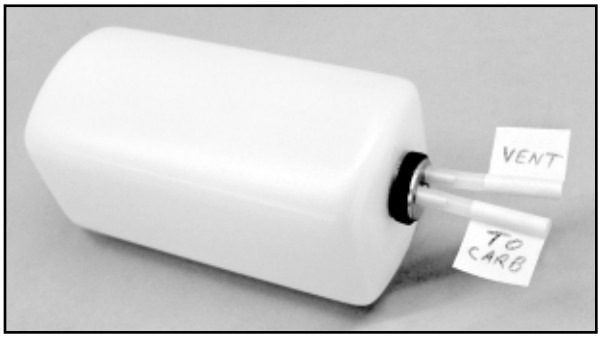
❑ 5) Drill a small hole in the fuselage former right in back of the throttle servo to pass the servo chord into the radio compartment.

FUEL TANK AND HATCH

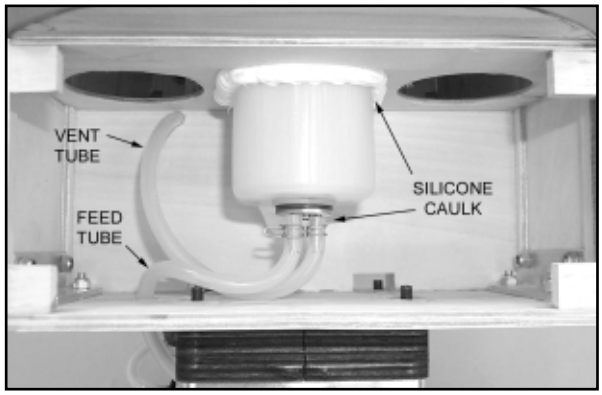
VERY IMPORTANT! The fuel tank parts provided in this kit are intended for use with glow engine installations. If you are using a gas engine, you will need to substitute a gasoline compatible fuel tank stopper (such as Du-Bro #400 Gas Stopper) and gasoline compatible fuel tubing (such as Du-Bro #800 Tygon Fuel Tubing) for those items supplied in this kit. The fuel tank bottle itself is gasoline compatible.



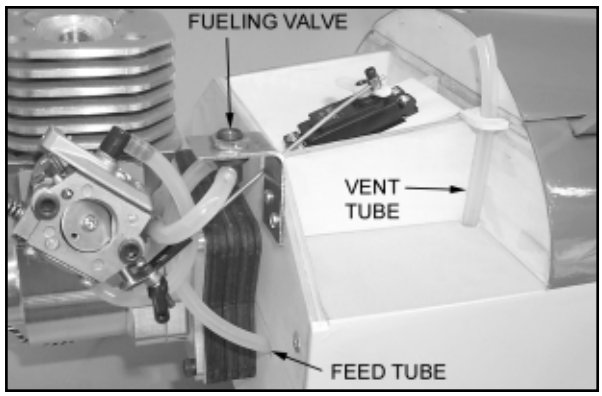
❑ 1) Assemble the fuel tank as shown. Be sure to label the "vent" and "carb" lines for later identification.



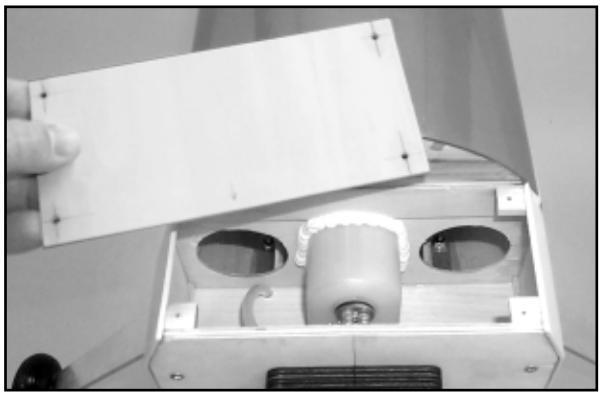
❑ 2) Working through the wing opening in the fuselage, slide the tank into the contoured hole in the front fuselage former. Slide it forward until the front of the tank is approx. 1" back from the firewall. This will allow room for your fuel line tubing to be curved behind the firewall over to the carb side of the engine. Drill a 5/16" dia. hole in the firewall for the fuel feed tubing to pass through. Drill a 5/16" dia. hole in the tank compartment floor that will let the fuel tank vent tubing exit the bottom of the airplane. Be sure that you don't have any kinks in the fuel line tubes that could restrict the fuel flow. To keep the tank from moving in flight, run a bead of silicone seal around the tank body where it contacts the fuselage former. Another glob of silicone seal at the front of the tank secures it to the plywood tank floor. If the tank ever has to be removed for service, you can cut the silicone loose and get the tank out.



NOTE: *Now is the time to think about how you are going to fuel and de-fuel your airplane. With the fuel tank assembled as shown in the earlier steps, with one carb tube and one vent tube, you will need to pump fuel into the carb line until it runs out the vent line. When fuel runs out the vent line, the tank is full. With the cowling on, it's going to be nearly impossible to reach the lines for fueling. In this situation, we like to use a remote "fueling valve" (not supplied). The fueling valve goes in the carb line, between the tank and the carburetor. It allows you to pump in fuel without having to remove the carb line from the engine. We use and recommend the Du-Bro #334 GLOW Kwik-Fill Fueling Valve, and the Du-Bro #335 GAS Kwik-Fill Fueling Valve. Locate the fueling valve in a position where it is easily accesible from outside the cowling.*



❑ 3) Fit the 1/8" x 3-1/2" x 7-1/2" plywood front fuselage hatch onto the nose of the airplane. Simply set the hatch in place and drill a 3/64" (or #56) dia. hole through each corner of the hatch and on through the plywood corner tabs mounted in the fuselage. Take the hatch off and open up the holes in the hatch to 7/64" diameter. Screw the hatch in place with the M2.6 X 10mm PWA screws provided. Trim or sand any overhanging edges of the hatch flush with the fuselage.



ADDITIONAL FUEL PROOFING: It's a good idea to paint the hatch, firewall, and bare wood areas of the nose with a fuel-proof paint such as clear dope, epoxy, enamel, or similar. A light coat of fuel-proofer has been applied at the factory, but another coat will increase the life of the model and treat the newly exposed areas that you have drilled and/or cut out.

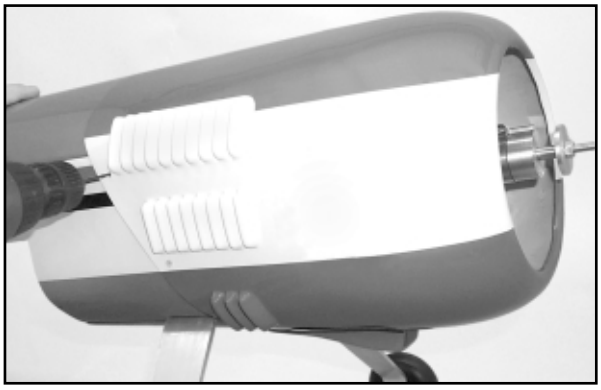
MOUNTING THE COWLING

❑ 1) 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 four mounting holes in the sides of the cowl are open and free of any debris.

❑ 2) Slide the fiberglass cowling over the engine and back onto the fuselage. Watch carefully to see if the cowling is going to clear your engine installation. Continue sliding the cowling back onto the fuselage until the engine's prop drive washer clears the front of the cowling by at least 1/16" (1/16" to 1/8" is OK). When you've got the position of the cowl right, use masking tape to secure the back edge of the cowling firmly to the fuselage. Leave the four pre-drilled mounting holes along the back edge of the cowling uncovered for the next step.

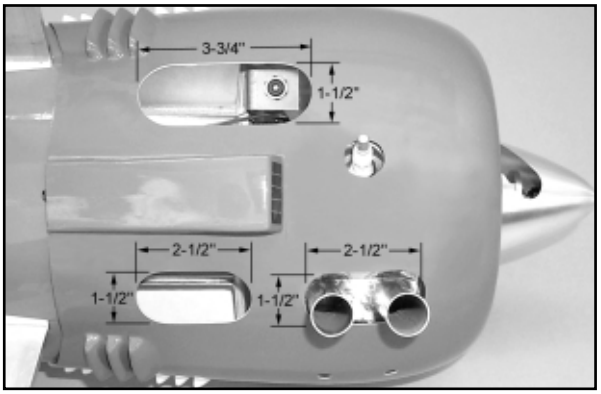
NOTE: *The SUKHOI has lots of room inside the cowling, and the engines that we have used fit completely inside - except for the muffler pipes and the spark plug of the FPE 2.4 gas engine.*

❑ 3) With the cowl securely taped in place, use a 3/64" (or #56) dia. bit to drill pilot holes in the fuselage, centered in each of the four pre-drilled holes in the cowl. Mount the cowling to the fuselage with four M2.6 x 10mm PWA screws. Double check your work one more time to make sure that the cowl is bolted on in the correct location and alignment. Then remove the cowling from the fuselage.



❑ 4) You need to cut adaquete size openings in the bottom of the SUKHOI cowling to allow engine cooling air to properly flow through and exit the cowl. Cooling a fully cowled engine is not difficult, although many modelers have trouble doing it. It's relatively simple if you follow one basic rule. Simply stated, the total square inches of area you have for air exit must be equal to, or slightly more than, the square inches of area you have in the front of the cowl (with the spinner in place) for air to come in. In other words, ALL the air that comes in the front of the cowl, must have room to get out! Some air will escape around the sides and bottom of the cowl, but that is not enough. Additional openings in the bottom of the cowling are absolutely necessary for proper cooling! Without these additional openings, your engine may overheat and quit. The exact dimensions and locations of the openings may certainly be "customized" for your particular engine/muffler set-up, as long as there is sufficient total square inches of air exit area.

NOTE: *In this picture of our FPE 2.4 gas engine installation, notice the 1-1/2" wide x 3-3/4" long cooling opening, a 1-1/2" wide x 2-1/2" long cooling opening, another 1-1/2" wide x 2-1/2" long opening for the muffler pipes to stick through, and a 7/8" dia. round hole for the spark plug to stick out. All of these holes contribute to the total square inches of cooling air exit area.*



TIPS ON CUTTING HOLES IN A FIBERGLASS COWLING: *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 pen to draw an exact outline of the area you want to cut out. Then use a Dremel® Tool and a large cut-off wheel to remove the bulk of the area inside the lines. If you are careful, you will find that you can get fairly close to the lines with the cut-off wheel. The goal is to remove most of the material within the lines. Once the majority of the area is cut and removed, exchange the cut-off wheel for a sanding drum bit in your Dremel® Tool. Use the drum sander to finish the edge right up to the line. Finally, use 220 sandpaper by hand to clean up any jagged edges. Make sure all edges are uniform and free of any loose glass. Be careful not to sand the paint on the outside of the cowl. Remove all fiberglass dust from the cowl with tac rag or with alcohol on a clean cloth.*

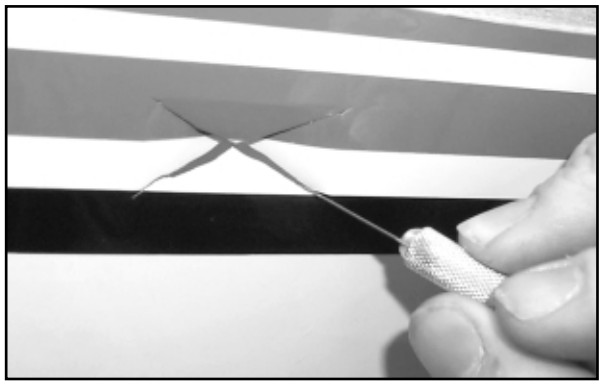
❑ 5) We recommend a 3-1/4" dia. aluminum spinner (*not supplied*) for the SUKHOI.

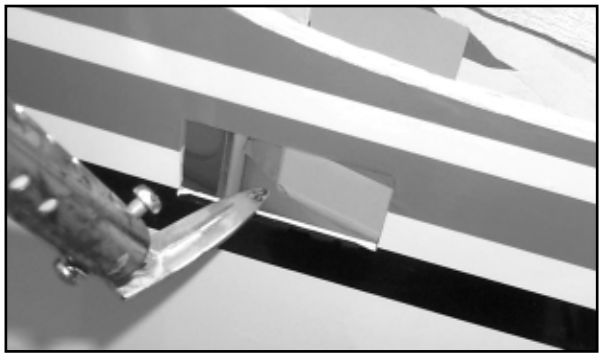
TAIL SURFACES

The following instructions depict the installation of dual elevator servos and a single rudder servo, all mounted at the rear of the fuselage. This provides the simplest, most direct linkage from the servos to the control surfaces. There are cutouts provided in the rear of the fuselage sides for the servos. If you look closely you can see the cutouts underneath the covering material. The two elevator servos go in the two uppermost cutouts, right underneath the stabilizer. The single rudder servo goes in the lower cutout on the right side of the airplane.

NOTE: *Some fliers prefer to use a pull-pull cable system for the rudder, with the rudder servo mounted in the front of the airplane. For those that prefer that method we have provided a single servo tray in the front of the fuselage for the rudder servo. No other materials are provided for making a pull-pull cable rudder hookup.*

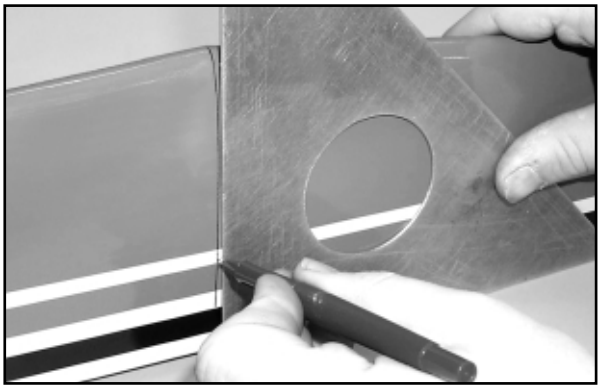
❑ 1) Use a sharp #11 blade to open up the two elevator servo cutouts and the rudder servo cutout at the rear of the fuselage. Use a trim seal iron to tack the loose covering around into the cutouts. Trim and remove the excess covering material.



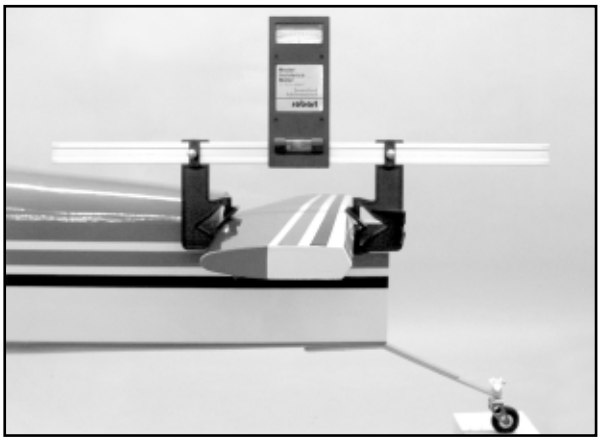


NOTE: *Accurate alignment is ultra critical to the performance of an aerobatic airplane like the SUKHOI. For that reason, we recommend that you buy or borrow an accurate "incidence meter" (like a Robart® Incidence Meter) to help with the final alignment of the tail surfaces during the next steps.*

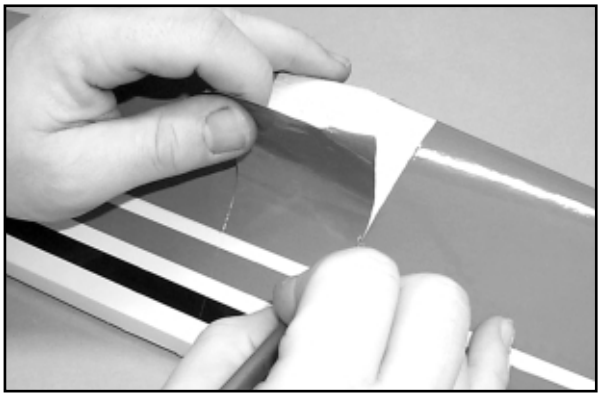
❑ 2) Use a ruler to find the exact center of the stabilizer at the trailing edge, marking the location with a felt-tip pen. Then use a 90° triangle to draw a centerline on the stab at this location.



❑ 3) Next bolt the wing in place on the fuselage. Attach an incidence meter to the leading and trailing edges of the wing, near the fuselage. Then prop up the rear of the fuselage until it is level according to the meter. In this position, the wing incidence should read 0°. Place the stabilizer into its saddle in the fuselage and use weights and/or pins to hold it in place. With the stab in this position, carefully remove the incidence meter from the wing and attach it to the leading and trailing edge of the stabilizer, without jarring the position of the airplane. Ideally the meter will again read 0°. If it does not, then the stab saddle in the fuselage must be adjusted slightly to seat the stab at 0°. Use a sanding block to adjust the stab saddle as needed. DO NOT GLUE THE STABILIZER TO THE FUSELAGE AT THIS TIME!

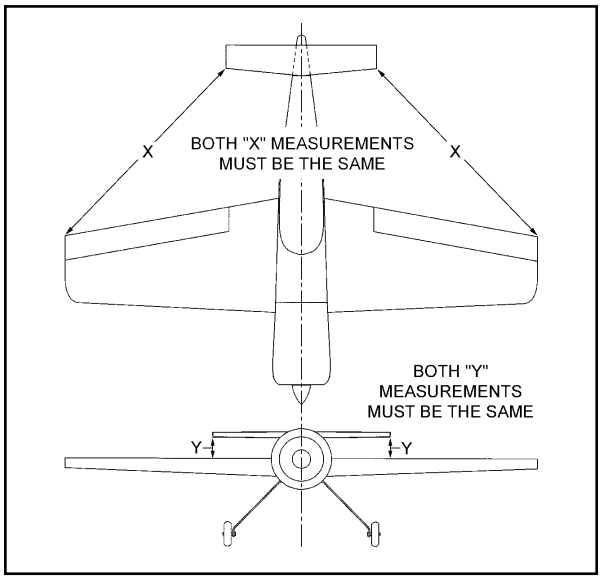


❑ 4) With the stabilizer in correct alignment on the fuselage, use a felt-tip pen to mark the location of the fuselage sides on the bottom of the stab. Then remove the stabilizer and use a sharp blade to carefully remove the covering material just inside of these two lines, including where it contacts the fuselage at its leading and trailing edges. **BE VERY CAREFUL NOT TO CUT INTO THE BALSA WOOD!**

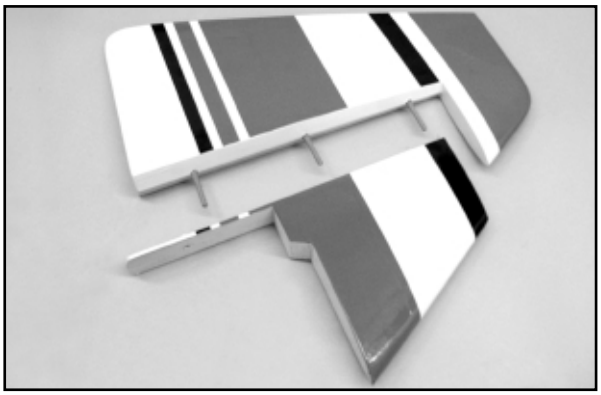


❑ 5) There's one more thing to do before gluing the stabilizer onto the fuselage! That is preparing the stab and elevators for hinging. It's a lot easier to do it now while you can still hold the individual parts in your hands. Refer back to step 7 of the WING ASSEMBLY (on page 5) for basic guidance on installing hinges. Note that there are 3 hinges per elevator. Go ahead and permanently glue the hinges into the elevators at this point, but not into the stabilizer. Let dry.

❑ 6) The stabilizer can now be glued permanently in place on the fuselage. Use slow-drying epoxy glue for this step. First apply glue to the stab saddle area of the fuselage and then place the stab squarely in position - use a weight to hold it in position. View the airplane from the top, front and rear, making sure the stab is square, without leaning one way or the other. Use a ruler to measure from the outer trailing edge wingtip back to the stab's leading edge tip and note the measurement and repeat this process on the opposite side. The two measurements should be the same. Make adjustments as needed. Tape and/or weight the stab firmly in place to the fuselage, wipe off any excess glue with alcohol and allow the glue to set. Remove the wing from the fuselage.



❑ 7) Prepare the fin and rudder for hinging. Note that there are 3 hinges in the fin/rudder. Go ahead and glue the hinges in the rudder at this point, but not into the fin. Let dry.

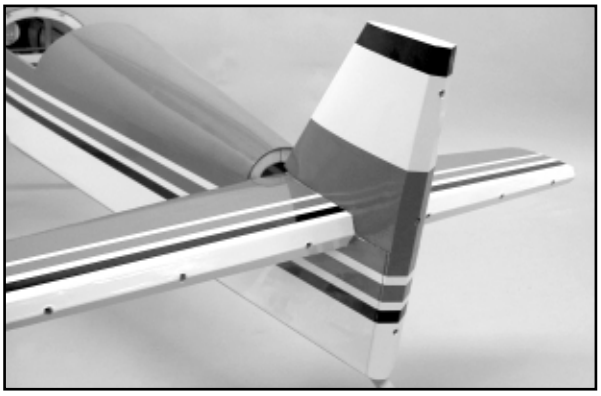


❑ 8) Trial fit the fin in place on the fuselage. The bottom of the fin should rest on the high point of the stabilizer.

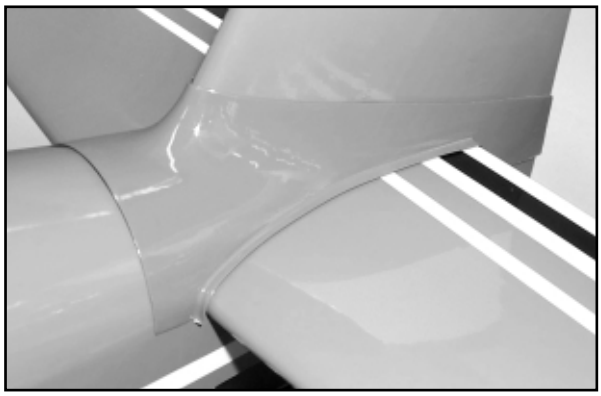
a. View and measure the alignment of the stabilizer to the entire airplane from several different angles. Make sure that the fin is absolutely 90° upright on the fuselage, and that it is aligned straight with the centerline of the fuselage, not turned left or right.

b. When satisfied with the alignment, use a felt-tip pen to mark the fin location on top of the stab. Take the fin off and carefully remove the covering material from the stab just inside of the lines.

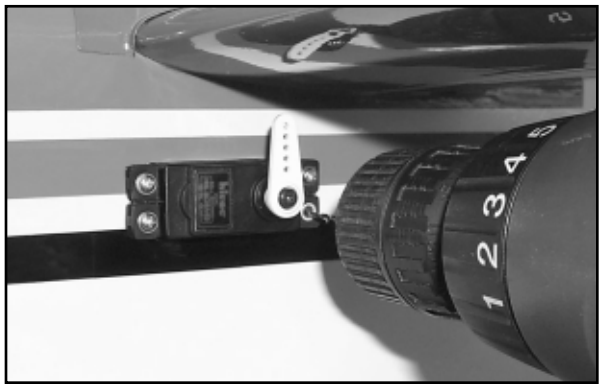
c. Apply slow-drying epoxy glue to all the mating surfaces and then put the fin back in place on the fuselage. Wipe off any excess glue with alcohol. Recheck the alignment, adjust as needed, and then let dry.



❑ 9) Locate the molded plastic tail fairing. Trial fit the fairing in place onto the fuselage. Trim as needed to seat the fairing in contact with the fuse, the top of the stab and around the fin. Once satisfied with the fit, mark the location of the fairing onto the fuse, stab and fin with a felt-tip pen. Remove the fairing. Use a sharp #11 blade to cut away the covering just inside of the lines, exposing the wood. Apply a coat of glue to the inside of the fairing where it will contact these areas. Install the fairing, pressing it firmly in place to make sure it contacts all gluing areas. Clean up any excess glue with alcohol and use tape to secure the fairing in place. Allow to dry.



❑10) Mount the two elevator servos in the fuselage now, using the rubber grommets and screws that were supplied with your radio system. It's best to mark the servo mounting hole locations on the plywood first, then drill 1/16" dia. pilot holes, before screwing the servos in place. When done, temporarily unscrew the elevator servos so you can install the radio "Y-harness" chord in the next step.



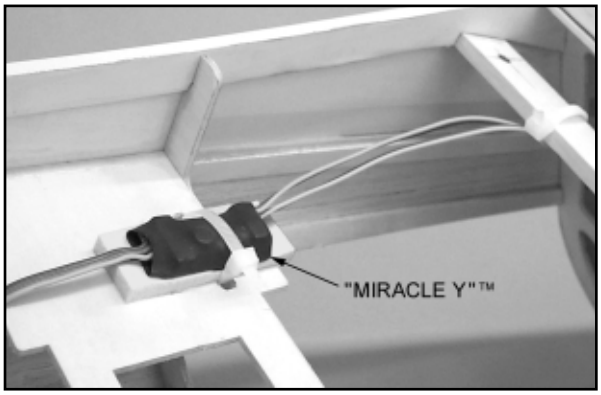
IMPORTANT: *While you have the elevators servos out, flow some thin CA into the screw holes in the plywood to toughen up the threads. Let dry.*

❑11) As mentioned earlier, to make the elevator servos function properly you will need to either:

(a) electronically reverse one of the elevator servos internally and use a standard Y-harness (and possibly another short extension chord)

(b) use the " MIRACLE Y™ Servo Reversing Y Adapter" to obtain mirror image elevator action

Install your Y-harness chord through the canopy opening, back to the two elevator servo cutouts. To avoid a clutter of chords and to keep them away from the pull-pull cables, route the y-harness chord through the upper part of the rear fuselage. Plug the elevator servos into the Y-harness ends at the servo cutouts, securing all connector plugs with tape. Then reinstall both elevator servos, pulling the excess chord lengths towards the front. Use plastic "cable ties" or small spots of silicone adhesive to lightly fasten the extension chords (or the " MIRACLE Y™" control pot) in place to the model structure, to keep them from flopping around during flight and possibly coming unplugged. Finally, plug the chord into your radio system to check the action of the elevator servos. Make any corrections that may be required.



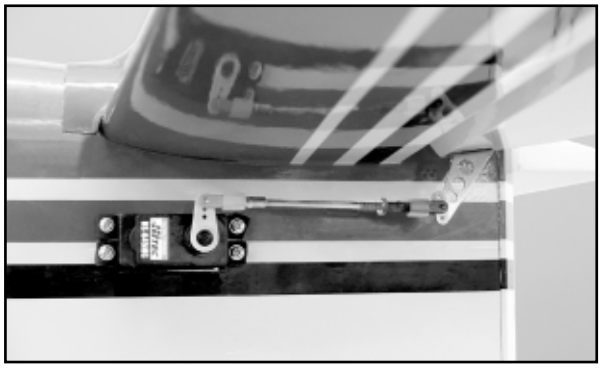
❑12) Hinge the elevators to the stabilizer at this time. Be careful to correctly identify which elevator goes on the right side of the airplane and which goes on the left. Look for the plywood control horn mounting pads, that are inset into the BOTTOM side of each elevator, underneath the covering. After installing the hinges, wipe off all excess glue from the hinge line with alcohol, and then tape the elevators to the stabilizer in neutral position and allow to dry.

❑13) Locate one left and one right Metal Control Horn and eight M2.6 x 10mm Metal Screws. Hold one of the control horns in position on the bottom leading edge of the appropriate elevator. The horn should be as far forward as possible so that the holes in the horn line up directly over the stab/elevator hinge line. Also be sure the control horn lines up with the elevator servo output arm. Mark the horn's hole locations on the elevator with a fine-point marker 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 you finish mounting the control horns for the first time, take them back off. Then put a few drops of Thin CA into each screw hole in the elevator. The Thin CA will soak into the threads in the wood, and when it dries the holding power of the*

threads will be much stronger. Use Thin CA only, not medium or thick CA. Let the Thin CA dry completely before remounting the control horns onto the elevators.

❑14) Locate the two 4-40 x 2-3/4" threaded pushrods for the elevator, plus two 4-40 solder links, two 4-40 threaded R/C links and two 4-40 hex nuts. Make two elevator pushrod assemblies by soldering a solder link onto the unthreaded ends of the pushrods. Thread a hex nut onto the threaded ends, followed by an R/C link. Use your radio to center the elevator servos and then mount the servo output arms in place at 90° to the servo body. Tape the elevators to the stabilizer in neutral position. Attach the solder link ends of the elevator pushrods to the servo output arms. Adjust the threaded R/C links to fit into the middle hole of each elevator horn. Remove the tape holding the elevators in neutral and test the movement of the elevators with your radio. Adjust as required to get both elevators exactly at neutral (if you are using the "Miracle Y™" splitter chord, you can turn the pot adjustment screw to achieve exact neutral very easily). Final elevator throw adjustments and locking the R/C links in place with the hex nuts will be made later.



IMPORTANT SAFETY ISSUE: You may have noticed in the last picture that we installed a short length of fuel line tubing over each R/C link, as insurance against the link popping open and coming off in flight. It's a good idea to do this to all the R/C links you use in all of your models.

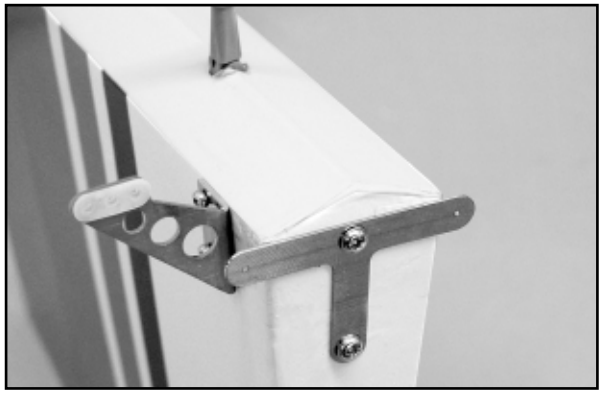
❑15) Mount the rudder servo in the fuselage now, using the rubber grommets and screws that were supplied with your radio system. It's best to mark the servo mounting hole locations on the plywood first, then drill 1/16" dia. pilot holes, before screwing the servo in place.

IMPORTANT: *After the initial mounting, remove the rudder servo and flow some thin CA into the screw holes in the plywood to toughen up the holes. When dry, screw the servo back in place.*

❑16) Locate one left Metal Control Horn and four M2.6 x 10mm Metal Screws. Mount the control horn on the right side of the rudder, about 3/8" up from the bottom, as shown in the photos. Notice that the control horn should be as far forward as possible, up against the front edge of the rudder, so that the pivot holes in the control horn line up with the hinge line. Mark the mounting hole locations on the rudder with a fine-point pen. Drill a 3/64" dia. (or #56 drill) pilot hole for each screw. Then screw the horn in place.

IMPORTANT*: After mounting the control horn for the first time, take it back off and flow some thin CA into the screw holes in the rudder. The Thin CA will soak into the wood and toughen up the threads. Let the Thin CA dry completely before remounting the control horn onto the rudder.*

❑17) Mount the T-shaped Metal Rudder Horn onto the bottom of the rudder with two M2 x 9mm PWA Screws, as shown here.

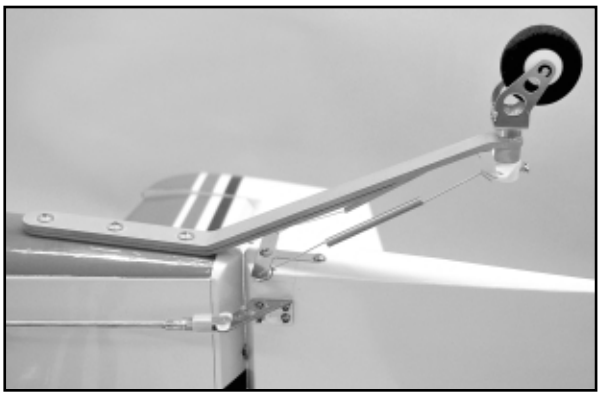


❑18) Hinge the rudder to the fin with epoxy glue. Clean off any excess glue and allow to dry.

❑19) Locate a 4-40 x 4-5/8" threaded pushrod for the rudder, plus a 4-40 solder link, a 4-40 threaded R/C link and a 4-40 hex nut. Solder the solder link onto the unthreaded end of the pushrod. Thread the hex nut onto the threaded end, followed by the R/C link. Use your radio to center the rudder servo and then mount the servo output arm in place at 90° to the servo body. Tape the rudder to the fin in neutral position. Attach the solder link end of the rudder pushrod to the servo output arm. Adjust the threaded R/C link to fit into the middle hole of the rudder horn. Remove the tape holding the rudder in neutral and test the movement of the rudder with your radio. Final rudder throw adjustment and locking the R/C links in place with the hex nuts will be made later.

❑20) 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 one end of each spring to hook into the holes of the T-shaped rudder horn.

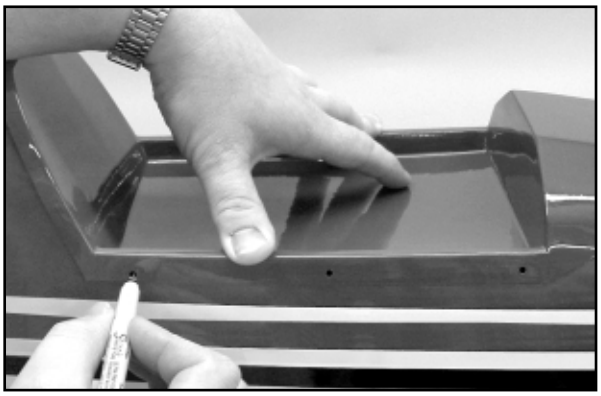


b. With the rudder and tailwheel both in neutral position, apply a small amount of tension to the spring and use the pliers to make a 90° bend at the tailwheel steering arm hole. Insert the wire into the steering arm and make another 90° bend back toward the center of the spring, forming a loop. Do the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

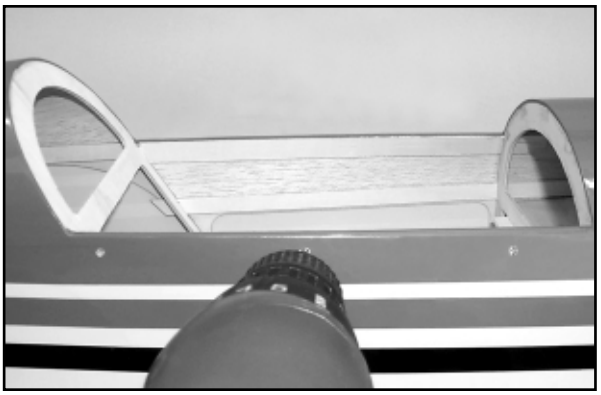
c. Turn on your radio system to check the movement of the rudder and tailwheel. If there is binding, correct it. The springs should center the tailwheel to the rudder when it is at neutral.

CANOPY ATTACHMENT

❑ 1) Notice that the molded plastic canopy base has 3 factory drilled holes along each side for the mounting screws. Set the canopy base in position on the fuselage. Use a felt-tip pen to mark the position of each mounting hole on both sides of the fuselage. Remove the canopy base.



❑ 2) Carefully drill a 3/64" (or #56) dia. pilot hole at each marked location. Drill completely through the balsa and plywood cockpit sides.

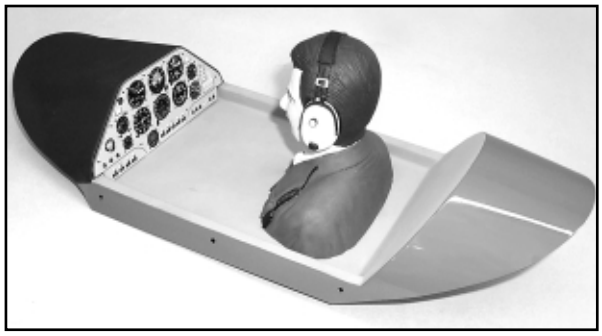


❑ 3) Mount the canopy base back on the fuselage, using the M2.6 x 10mm PWA Screws provided to fasten it in place. If there are any problems with the fit of the canopy base to the fuselage, fix it at this point before proceeding.

❑ 4) A full-color printed paper SUKHOI instrument panel is included in this kit. Simply cut it out with a sharp scissors and use spray cement to glue it in place on the canopy base.

❑ 5) **OPTIONAL STEP:** 1/4 -scale civilian pilot figure looks best in the SUKHOI. There are many brands of pilot figures available. No matter which brand you use, be sure to mount it securely to the canopy base (you don't want the pilot "bailing out" in flight). We recommend reinforcing the bottom of the canopy base by epoxying a piece of scrap 1/32" or thicker plywood underneath the area where the pilot will be mounted. This stiffens the canopy base and allows you to fasten the pilot to the base with screws.

On our prototype models we made the bottom and back areas of the canopy base light gray. The instrument panel front deck is "anti-glare" flat black. Acrylic latex "craft paints" or hardware store variety spray enamel work well for painting these areas. Before painting, sand all the surfaces you plan to paint with 220 grit or finer sandpaper to insure good paint adhesion.



❑ 6) a. Screw the canopy base back in place on the fuselage.

b. Use several pieces of masking tape to secure the canopy base to the fuselage, and then remove the screws.

c. Set the clear plastic canopy in position on top of the canopy base. Check all around the edges to see how the clear canopy matches up to the base. If the clear canopy hangs over the edge of the base in some spots, trim off the excess clear canopy plastic with a sharp scissors or modeling knife as needed to achieve a good match.

d. Once you are satisfied, hold the clear canopy in exact position and use a felt-tip pen to mark the locations of the six mounting holes onto the canopy.

e. Remove the canopy and drill clearance holes at the marks with a 3mm (.018") or #31 (.020") drill bit.

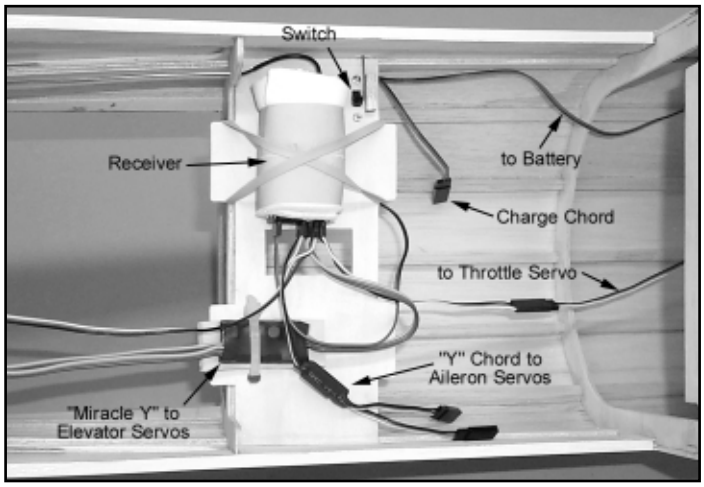
f. Mount the canopy base and the clear canopy TOGETHER onto the fuselage with the six screws. Check the fit and make any final alterations.

❑ 7) Unbolt the clear canopy and clean it with window cleaner. Dry it completely with a soft cloth and avoid handling the inside surface. Set it aside for a moment. Now use 220 grit sandpaper to lightly scuff the perimeter areas of the canopy base that actually contact the clear canopy. Wipe off excess dust with alcohol. Mix a small amount of epoxy glue and smear a thin layer of glue on the sanded area. Carefully place the clear canopy back on the canopy base and put the bolts back in. Use alcohol and a paper towel to wipe off any excess glue. If necessary, use some pieces of masking tape hold the clear canopy tight against the base and fuselage while the glue dries.

RADIO INSTALLATION
With all the servos now installed, all that remains is the installation of the receiver, battery pack and switch.

RX 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. Be sure to wrap the battery pack in foam rubber and use rubber bands or tie-wraps to secure it to the model structure so that it can't move around in flight.

RECEIVER: Wrap the receiver in foam and use rubber bands or tie-wraps to secure it in the fuselage. Note that the EXTRA has an internal receiver antenna exit tube already installed inside the fuselage. It's the clear plastic tube running along the right side of the fuselage, extending from the radio tray all the way back through the fuselage, exiting just ahead of the tailwheel assembly on the bottom. Slide your antenna into this tube when installing your receiver.



SWITCH: The switch can be mounted onto the fuselage side or internally. We prefer an internally mounted switch. We mounted ours onto the radio tray, using a length of music wire to activate the switch from the outside. This is 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. Apply silicone adhesive (or double-sided foam servo mount tape) to one side of the switch and insert the wire through the hole in the fuselage, pressing the switch firmly to the radio tray. 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 provides protection to the switch from dirt, debris and exhaust.

RADIO CHECK: All servo, switch, and battery connections to the receiver are now made. We find it easiest to leave the aileron Y-harness plugged into the receiver aileron channel receptacle all the time, with the two connecting ends hanging loose. Plug your two aileron servo extension chords into the two loose ends of the Y-harness and mount the wing to the fuselage. Turn the radio system on and check the functions of all the controls. Make sure they are moving in the right direction! Thousands of R/C airplanes have crashed over the years because the servos were moving the wrong way! Also make sure all the servos are centered and working perfectly, without any binding. Correct any such problems now. With everything checked and working, now is the time to set the initial control movements.

CONTROL MOVEMENTS
This is an important section of this manual. After flying your SUKHOI for awhile, getting used to its characteristics, you will likely change the control throws to suit your style of flying. But you have to start somewhere and this is where you begin. These movements provide the SUKHOI 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 type flying.

SURFACE	**SUGGESTED THROWS**
AILERONS:	LOWRATE: 7/8" UP - 7/8" DOWN
	HIGH RATE: 1-1/8" UP - 1-1/8" DOWN
ELEVATORS:	LOW RATE: 1" UP - 1" DOWN
	HIGH RATE: 1-1/2" UP - 1-1/2" DOWN
RUDDER:	2-1/4" RIGHT - 2-1/4" LEFT

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

SAFETY ISSUE: After centering all the servos and setting the control surface throws, make sure each R/C link has a short length of fuel tubing in place to prevent it from coming disconnected from either the control horns or the servo output arms. Also be sure you have tightened each of the 4-40 hex nuts tightly against all threaded R/C links, locking them in place.

DECAL APPLICATION
The decals provided with this kit are typical of the markings that might be seen on full-scale SUKHOI. They are not intended to be a complete set of markings to duplicate one particular SUKHOI SU-31. 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.

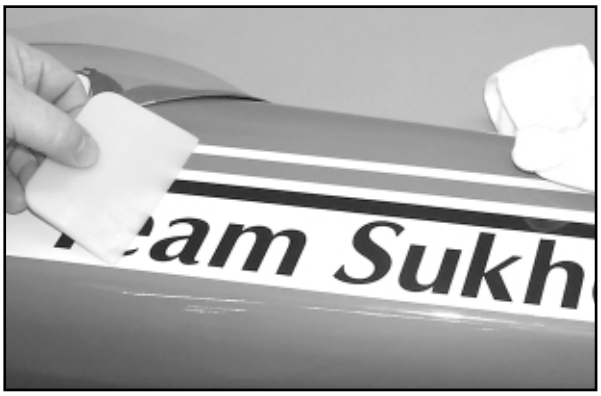
The decals are made of adhesive-backed mylar, they are NOT water activated transfers. These decals are not die-cut and need to be cut from their sheets with a sharp #11 blade or good pair of scissors. Trim as close to the image as possible.

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 easy and fun.

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 sharp #11 blades. We also suggest that you have some trim tape handy for making temporary guidelines (1/8" width or so 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 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 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 of the water out from under the decal as possible. After setting overnight, the decal will be solidly adhered to the surface.

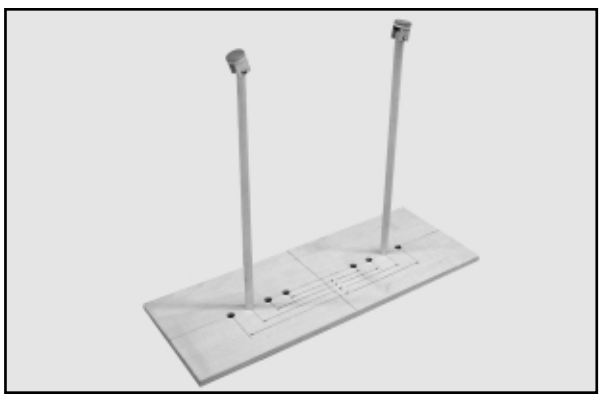


BALANCE YOUR SUKHOI

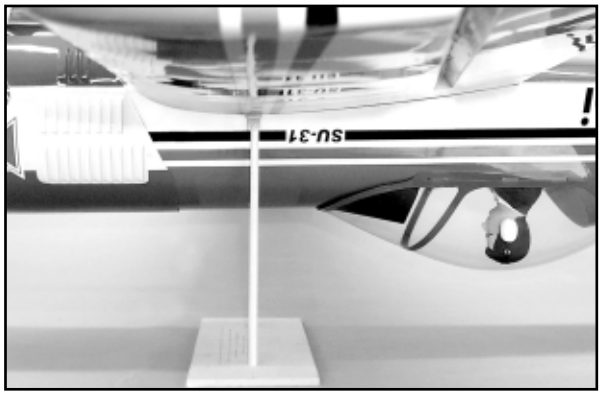
In terms of the flight characteristics you will realize, this is probably the single most important step in preparing your SUKHOI for flight. The final placement of the longitudinal Center of Gravity, or Balance Point, is extremely important and should be approached with patience and care.

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. Some people prefer to balance their airplanes by lifting the model up by one finger at each wingtip to find the spot where the model will sit perfectly level. This has been done for years and is an acceptable way to balance a model (we have included balance measurements for this method below). However with an airplane as large as the SUKHOI, it is virtually impossible to balance it by the wingtips by yourself. We prefer to use a "balancing fixture" which checks the model's balance point right along each side of the fuselage (balance measurements are given below). It can be done alone and is actually a little more precise than a fingertip balance.

You can make your own simple "balancing fixture" with a couple of 1/4" dia. dowels glued into a wood base at perpendicular 90° angles. The dowels need to be the same length and tall enough to accommodate the height of the assembled airplane, as well as the width of the fuselage, plus about 1/2" additional width. The tops of the dowels need to be padded to avoid damage to the wing. We used 1/8" thick rubber sheet, cut to 1/4" diameter, glued in place, for the padding. There are commercial units available for balancing but be sure they are large enough to support the weight and size of the SUKHOI.



Set the model UPSIDE DOWN on the balancing fixture and shift it back or forward until you find the exact spot where the model will set perfectly level. Carefully measure the distance of that spot from the leading edge of the wing.



IMPORTANT NOTE: *Balanced means the airplane sets level when supported at the desired balance point. Believe it or not, we've had questions like; "When my model is balanced it should sit slightly nose down, right?". NO, balanced means level - not nose down or nose up - flat level!*

BALANCE REFERENCE POINTS FOR THE SUKHOI SU-31

* Percentage of Mean Aerodynamic Chord

** Distance aft of wing leading edge measured right along side of fuselage

*** Distance aft of wing leading edge measured at the wing tips

% MAC*	@ fuse side**	@ wing tip***
25%	4.468"	2.874"
26%	4.619"	3.025"
27%	**4.769"**	**3.175"**
28%	4.920"	3.326"
29%	5.070"	3.477"
30%	5.221"	3.627"
31%	5.372"	3.778"
32%	5.522"	3.929"
33%	5.673"	4.079"

For initial test-flying and familiarization purposes, we suggest a starting balance point of 27%, which is approximately 4-3/4", behind the leading edge of the wing at the side of the fuselage (this translates to about 3-3/16" aft of the leading edge at the wing tip, for those of you who prefer to balance your airplanes that way).

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 SUKHOI 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 SUKHOI SU-31 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 adaquetly 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 SUKHOI 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.

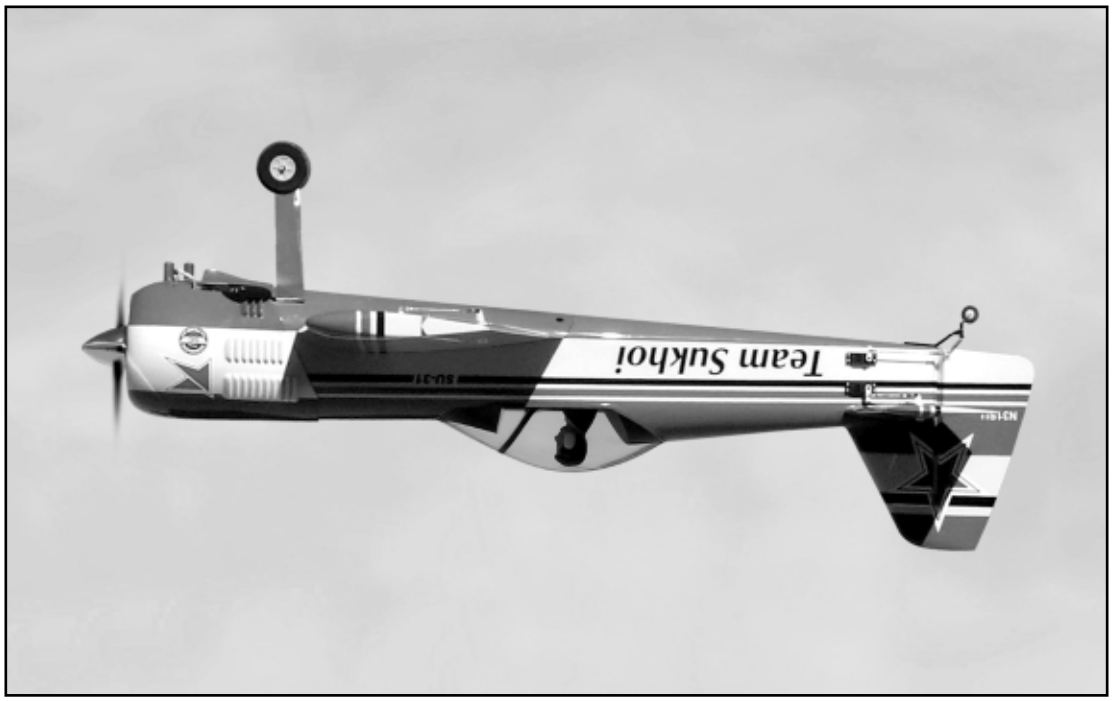
FLYING YOUR SUKHOI

If you have carefully followed this assembly manual, you should have no real problems in test flying your SUKHOI. 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 overlean 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 SUKHOI 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 SUKHOI will roll smoothly and very axially in either direction. Now try a loop. The SUKHOI should pull cleanly through loops, without wandering to either side. Once you're comfortable, try knife-edge flight. You will quickly find that the SUKHOI 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 SUKHOI has outstanding inverted flight characteristics. Our prototypes require 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 SUKHOI should demonstrate fairly sedate, no fuss stall characteristics. Once flying speed and up elevator input is bled off, the SUKHOI 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 SUKHOI 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 SUKHOI, you are going to discover its ability to perform aerobatics. The SUKHOI is an elegant aerobatic machine with seemingly endless capabilities. For those of you interested in using your SUKHOI for 3-D 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 SUKHOI SU-31 for a long time to come. Please fly the model safely with constant regard to other fliers, spectators, and property.

GOOD LUCK AND GOOD FLYING!

SUKHOI SU-31 LOG BOOK

Engine:

Prop:

Flying Weight:

Wing Loading:

Balance Point:

Aileron Travel:

Elevator Travel:

Rudder Travel:

Date of first flight:


SU-31
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WANT A GREAT GAS ENGINE FOR YOUR SUKHOI SU-31? CHECK THIS OUT!

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

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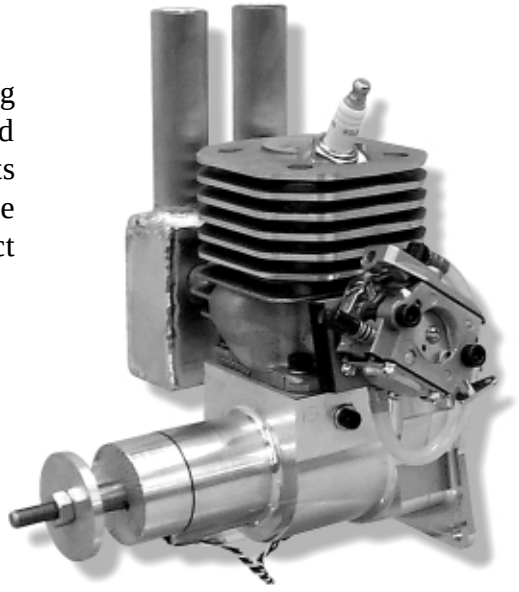

Item #FPE24

Specifications:

Size:	2.4 cubic inches (40 cc)
Weight:	52 ounces with muffler
Prop:	20x10
RPM:	7,400 rpm (APC 20x10)
Thrust:	20 pounds
Horsepower:	1.7

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: www.modelaircraft.org

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SIG MANUFACTURING COMPANY, INC.
401-7 South Front Street
Montezuma, IA 50171-0520

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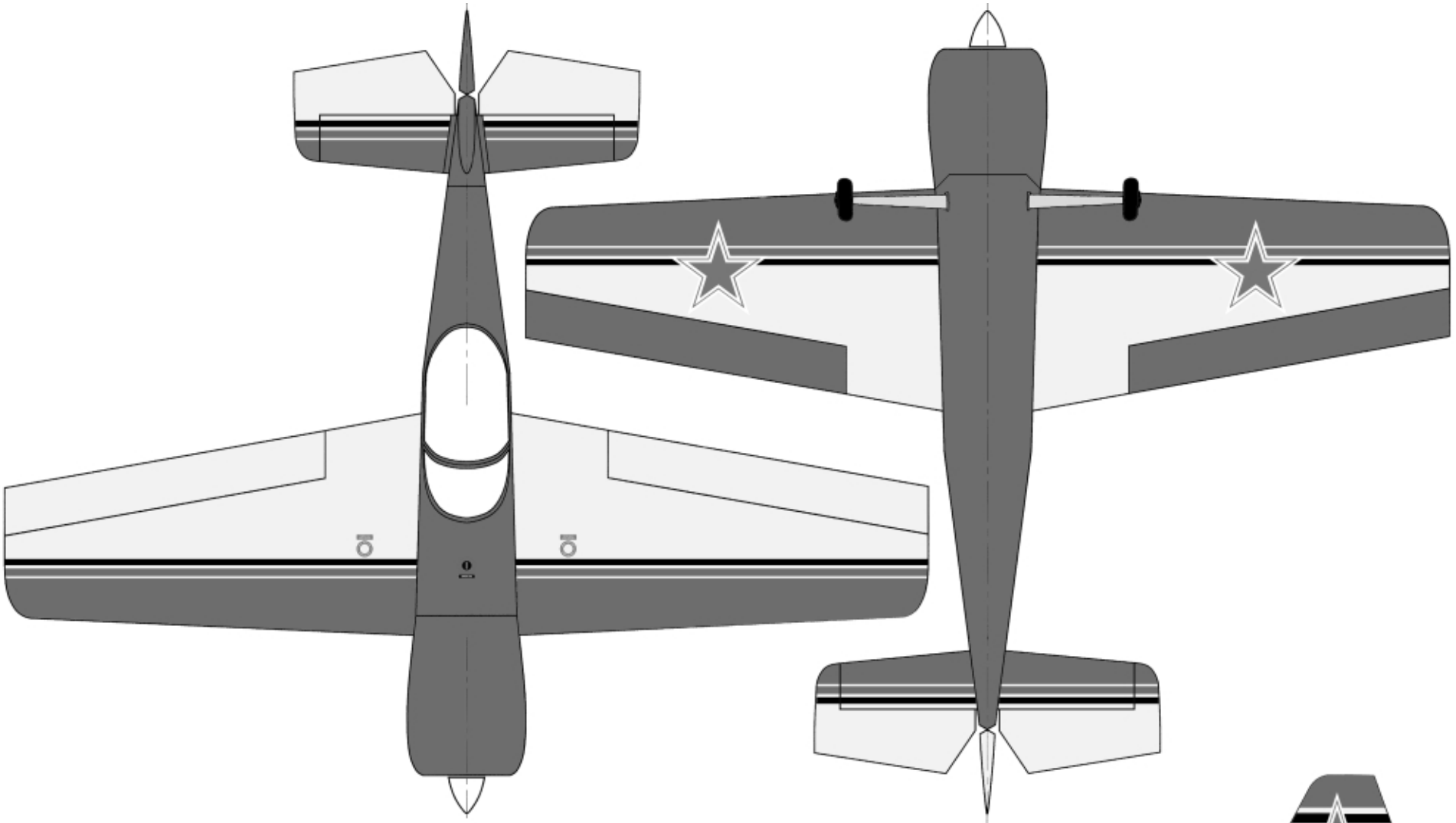

SIG

Sukhoi SU-31

The color and markings of this ARF kit do not duplicate one particular full-scale Sukhoi SU-31. Rather, they are a realistic selection of markings typically seen on many full-scale aerobatic airplanes.