SPITFIRE
INSTRUCTION MANUAL

GOLD GIANT SCALE EDITION™

TOP FLITE®

Top Flite Models Champaign, IL
Ph: (217) 398-8970, Ext. 5
Fax: (217) 398-7721
airsupport@top-flite.com

WARRANTY

Top Flite® Model Manufacturing Co. guarantees this kit to be free from defects in both material and workmanship at the date of purchase. This warranty does not cover any component parts damaged by use or modification. **In no case shall Top Flite's liability exceed the original cost of the purchased kit.** Further, Top Flite reserves the right to change or modify this warranty without notice.

In that Top Flite has no control over the final assembly or material used for final assembly, no liability shall be assumed nor accepted for any damage resulting from the use by the user of the final user-assembled product. By the act of using the user-assembled product, the user accepts all resulting liability.

If the buyer is not prepared to accept the liability associated with the use of this product, the buyer is advised to return this kit immediately in new and unused condition to the place of purchase.

To make a warranty claim send the defective part or item to Hobby Services at this address:

Hobby Services
3002 N. Apollo Dr. Suite 1
Champaign IL 61822 USA

Include a letter stating your name, return shipping address, as much contact information as possible (daytime telephone number, fax number, e-mail address), a detailed description of the problem and a photocopy of the purchase receipt. Upon receipt of the package the problem will be evaluated as quickly as possible.

SPECIFICATIONS

Wingspan:	86-1/2 in [2195mm]
Wing Area:	1325 in^2 [85.5 dm^2]
Weight:	22–24 lb [9.98–10.88 kg]
Wing Loading:	38–42 oz/ft^2 [116–128 g/dm^2]
Length:	72 in [1830 mm]
Radio:	6–7 channel
Engine:	3.0–4.0 cu in [50–65cc] spark ignition gas

READ THROUGH THIS MANUAL BEFORE STARTING CONSTRUCTION. IT CONTAINS IMPORTANT INSTRUCTIONS AND WARNINGS CONCERNING THE ASSEMBLY AND USE OF THIS MODEL.

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INTRODUCTION

In 1941 the Spitfire Mk IX was developed to counter the German Fw 190. The Spitfire Mk IX was developed from the Mk V by installing the Merlin 61 engine. The Top Flite Giant Spitfire Mk IX ARF is modeled after the earlier versions of the Mk IXs. This is notable by the rounded fin and rudder tip. Top Flite developed the Giant Spitfire Mk IX ARF to get you in the air quickly with a great looking model, without the sanding and covering required to build a kit.

For the latest technical updates or manual corrections to the Giant Spitfire Mk IX ARF visit the Top Flite web site at www.top-flite.com. Open the "Airplanes" link, then select the Giant Spitfire Mk IX ARF. If there is new technical information or changes to this model a "tech notice" box will appear in the upper left corner of the page.

ACADEMY OF MODEL AERONAUTICS

If you are not already a member of the AMA, please join! The AMA is the governing body of model aviation and membership provides liability insurance coverage, protects modelers' rights and interests and is required to fly at most R/C sites.

Academy of Model Aeronautics
5151 East Memorial Drive
Muncie, IN 47302-9252

Ph. (800) 435-9262
Fax (765) 741-0057

Or via the Internet at:
http://www.modelaircraft.org

IMPORTANT!!! Two of the most important things you can do to preserve the radio controlled aircraft hobby are to avoid flying near full-scale aircraft and avoid flying near or over groups of people.

IMAA

The Top Flite Giant Spitfire Mk IX ARF is an excellent sport-scale model and is eligible to fly in IMAA events. The IMAA (International Miniature Aircraft Association) is an organization that promotes non-competitive flying of giant-scale models. If you plan to attend an IMAA event, obtain a copy of the **IMAA Safety Code** by contacting the IMAA at the address or telephone number below, or by logging on to their web site at: **www.fly-imaa.org/imaa/sanction.html.**

IMAA
205 S. Hilldale Road
Salina, KS 67401

(913) 823-5569

SCALE COMPETITION

Though the Top Flite Giant Spitfire Mk IX is an ARF and may not have the same level of detail as an "all-out" scratch-built competition model, it is a scale model nonetheless and is therefore eligible to compete in the *Fun Scale* class in AMA competition (we receive many favorable reports of Top Flite ARFs in scale competition!). In Fun Scale, the "builder of the model" rule does not apply. To receive the five points for scale documentation, the only proof required that a full size aircraft of this type in this paint/markings scheme did exist is a single sheet

such as a kit box cover from a plastic model, a photo, or a profile painting, etc. If the photo is in black and white, other written documentation of color must be provided. Contact the AMA for a rule book with full details.

For more information and scale details of the full-size Spitfire Mk IX, photo packs are available from:

Bob's Aircraft Documentation
3114 Yukon Ave Ph: (714) 979-8058
Costa Mesa, CA 92626 Fax: (714) 979-7279

e-mail: www.bobsairdoc.com

IMPORTANT SAFETY PRECAUTIONS

PROTECT YOUR MODEL, YOURSELF & OTHERS... FOLLOW THESE IMPORTANT SAFETY PRECAUTIONS

1. Your Giant Spitfire Mk IX ARF should not be considered a toy, but rather a sophisticated, working model that functions very much like a full-size airplane. Because of its performance capabilities, the Giant Spitfire Mk IX ARF, if not assembled and operated correctly, could possibly cause injury to yourself or spectators and damage to property.

2. You must assemble the model **according to the instructions**. Do not alter or modify the model, as doing so may result in an unsafe or unflyable model. In a few cases the instructions may differ slightly from the photos. In those instances the written instructions should be considered as correct.

3. You must take time to **build straight, true** and **strong**.

4. You must use an R/C radio system that is in good condition, a correctly sized engine, and other components as specified in this instruction manual. All components must be correctly installed so that the model operates correctly on the ground and in the air. You must check the operation of the model and all components before **every** flight.

5. If you are not an experienced pilot or have not flown this type of model before, we recommend that you get the assistance of an experienced pilot in your R/C club for your first flights. If you're not a member of a club, your local hobby shop has information about clubs in your area whose membership includes experienced pilots.

6. While this kit has been flight tested to exceed normal use, if the plane will be used for extremely high stress flying, such as racing, or if an engine larger than one in the recommended range is used, the modeler is responsible for taking steps to reinforce the high stress points and/or substituting hardware more suitable for the increased stress.

7. **WARNING:** The cowl and landing gear covers included in this kit are made of fiberglass, the fibers of which may cause eye, skin and respiratory tract irritation. Never blow into a part to remove fiberglass dust, as the dust will blow back into your eyes. Always wear safety goggles, a particle mask and rubber gloves when grinding, drilling and sanding fiberglass parts. Vacuum the parts and the work area thoroughly after working with fiberglass parts.

We, as the kit manufacturer, provide you with a top quality, thoroughly tested kit and instructions, but ultimately the quality and flyability of your finished model depends on how you build it; therefore, we cannot in any way guarantee the performance of your completed model, and no representations are expressed or implied as to the performance or safety of your completed model.

REMEMBER: Take your time and follow the instructions to end up with a well-built model that is straight and true.

DECISIONS YOU MUST MAKE

This is a partial list of items required to finish the Giant Spitfire Mk IX ARF that may require planning or decision making before starting to build. Order numbers are provided in parentheses.

ENGINE RECOMMENDATIONS

When considering engines for this model, refer to the engine size recommendations on the cover of the manual. Spark-ignition "gas" engines are most popular with large-scale warbirds such as this. One advantage of a gas engine is economy – gas engines tend to consume less fuel than a glow engine as well. Additionally, gas engines deposit little exhaust residue on the model. Among other engines, this model was test flown with a **DLE-55 Side Exhaust, DLE-55 Rear Exhaust, and O.S. GT55** engine. All the engines provide more than adequate power and fly the Giant Spitfire Mk IX ARF in a scale-like manner.

Note: Instructions for mounting every possible engine cannot be incorporated into this manual. Modelers using another engine may refer to the instructions as a guide for mounting their engine in a similar way. If using the DLE-55 Rear Exhaust, the stock muffler will work well and is recommended.

The DLE-55 Side Exhaust and O.S. GT55 require the optional JTEC muffler.

- ❍ JTC-DA50WPTF Wrap Around Muffler (JTCG1035)

The O.S. GT55 requires a 1" [25.4mm] aluminum standoff.

- ❍ OSMG8958 74003540 1" standoff

Hardware required (not included) to mount the O.S. GT55 engine is included with the aluminum standoffs.

Hardware required (not included) to mount the DLE-55 engines.

- ❍ (4) 10-32 x 1-1/2" Socket head cap screws
- ❍ (4) #10 Lock washers
- ❍ (4) #10 Fender washers

Per the IMAA Safety Code, magneto spark-ignition engines must have a coil-grounding switch on the aircraft to stop the engine and prevent accidental starting, The switch must be operated manually (without the use of the transmitter) and accessible by the pilot and assistant.

RADIO EQUIPMENT

The radio equipment and number of channels required to fly the Top Flite Giant Spitfire Mk IX ARF depends on the capabilities of your transmitter and how the servos will be connected.

The Giant Spitfire Mk IX ARF requires a servo to operate the retract air control valve, a throttle servo, two flap servos, two aileron servos, two elevator servos, a rudder servo and a tail steering servo. Servos with a minimum of 50 oz-in [3.9kg-cm] of torque are required for operating the elevators, rudder, ailerons and flaps. We recommend that metal geared servos also be used. Standard servos may be used for the throttle and choke (the servo operated choke is optional). A micro servo is required to operate the retract air valve. An optional servo operated kill switch may also be used (this is in addition to the IMAA-required, manually operated engine kill switch. A servo operated kill switch is only really necessary for engines that do not reliably shut off by closing the carburetor, but could also serve as a backup.

Function	Servos Required
Elevators	2 (min. 50 oz-in torque) (Futaba S3305 **FUTM0045**)
Rudder	1 (min. 50 oz-in torque) (Futaba S3305 **FUTM0045**)
Ailerons	2 (min. 50 oz-in torque) (Futaba S3305 **FUTM0045**)
Flaps	2 (min. 50 oz-in torque) (Futaba S3305 **FUTM0045**)
Tail Steering	1 (min. 50 oz-in torque) (Futaba S3305 **FUTM0045**)
Throttle	1 (standard) (Futaba S9001 **FUTM0075**)
Retract	1 (micro) (Futaba S3102 **FUTM0034**)
Optional Choke	1 (standard) (Futaba S9001 **FUTM0075**)

Total: 10-11 servos

A receiver battery with a minimum of 2,400mAh is recommended for flying the Giant Spitfire Mk IX ARF. The battery voltage should be checked before every flight to be certain it has enough “charge”.

In addition to the servos, the following items (or similar items) are also required. The order numbers shown in parentheses are for Futaba servos.

- ❍ (4) 6" Y-harness for elevator, rudder/steering, ailerons and flaps (FUTM4130)
- ❍ (2) 12" [305mm] servo extension for flaps (HCAM2711)
- ❍ (2) 24" [610mm] servo extension for ailerons (HCAM27021)
- ❍ (2) Heavy Duty switch harness (FUTM4385)
- ❍ (2) Ernst Charge Receptacle 124 (ERNM3001)
- ❍ (1) HydriMax 3600mAh NiMH battery (HCAM6333) for receiver
- ❍ (1) HydriMax 1600mAh NiMH battery (HCAM6308) for engine ignition

Note: The length and quantity of servo extensions and Y-connectors may vary depending on the brand of radio you are using and the radio installation.

RETRACTABLE LANDING GEAR

The Top Flite Giant Spitfire Mk IX ARF has been designed for Robart pneumatic and electric main gear retracts. **Note:** The Spitfire Mk IX had a fixed tail gear.

Following is the complete list of items required to install the Robart retracts:

- ❍ (1) TFSPITFIRE-E Top Flite Giant Spitfire Mk IX electric retractable main landing gear (ROBQ1651)
- ❍ (1) TFSPITFIRE Top Flite Giant Spitfire Mk IX pneumatic main landing gear (ROBQ1650)
- ❍ (1) Robart #157VRX Large-Scale Deluxe Air Control Kit – includes pressure tank, air line tubing, variable-rate air valve, T-fittings (ROBQ2305)
- ❍ (1 pkg.) #190 Air Line Quick Disconnects (ROBQ2395)

Note: An air pump will also be required to pressurize the air tank. The Robart hand pump could be used, but is not practical because of the large capacity of the air tank in this model. A small, 12V electric pump is recommended and can be purchased at any automotive or hardware store.

ADDITIONAL ITEMS REQUIRED

REQUIRED HARDWARE & ACCESSORIES

In addition to the items listed in the ***“Decisions You Must Make”*** section, following is the list of hardware and accessories required to finish the Top Flite Giant Spitfire Mk IX ARF. Order numbers are provided in parentheses.

- ❍ (2) Dubro #813 1/8" Fuel Line Barb (DUBQ0670)
- ❍ (1) Dubro #554 X-large Tygon Fuel Line (DUBQ0427)
- ❍ (1) R/C foam rubber (1/4" [6mm] (HCAQ1000) or ½" [13mm] (HCAQ1050)
- ❍ Propeller and spare propellers suitable for your engine.
- ❍ (1) Painted Pilot (GPMQ9115)

ADHESIVES AND BUILDING SUPPLIES

This is the list of Adhesives and Building Supplies that are required to finish the Giant Spitfire Mk IX ARF.

- ❍ 1/2 oz. [15g] Thin Pro CA (GPMR6001)
- ❍ 1/2 oz. [15g] Medium Pro CA+ (GPMR6007)
- ❍ Pro 30-minute epoxy (GPMR6047)
- ❍ Pro 6-minute epoxy (GPMR6045)
- ❍ Threadlocker thread locking cement (GPMR6060)
- ❍ Mixing sticks (50, GPMR8055)
- ❍ Mixing cups (GPMR8056)
- ❍ Epoxy brushes (6, GPMR8060)
- ❍ Denatured alcohol (for epoxy clean up)
- ❍ R/C-56 canopy glue (JOZR5007)
- ❍ Shoe Goo (DTXC2450)
- ❍ Masking tape
- ❍ Plan protector (GPMR6167) or wax paper

❍ Drill
❍ Drill bits: 1/16" [1.6mm], 5/64" [2mm], 3/32" [2.4mm], 1/8" [3.2mm], 3/16" [4.8mm], 13/64" [5.2mm], 1/4" [6.4mm]
❍ Small metal file
❍ Stick-on segmented lead weights (GPMQ4485)
❍ Silver solder w/flux (STAR2000)
❍ Hobby Heat micro torch (HCAR0755)
❍ #1 Hobby knife (RMXR6903)
❍ #11 blades (5-pack, RMXR6930)
❍ Sanding tools and sandpaper assortment (*see* Easy-Touch Bar Sander section)
❍ Curved-tip canopy scissors for trimming plastic parts (HCAR0667)
❍ DLE-55 Propeller Drill Guide (DLEQ0551)

COVERING TOOLS

❍ Top Flite MonoKote Sealing Iron (TOPR2100)
❍ Top Flite Hot Sock Iron Cover (TOPR2175)
❍ Top Flite MonoKote Trim Seal Iron (TOPR2200)
❍ Top Flite MonoKote Heat Gun (TOPR2000)
❍ Coverite 21st Century Sealing Iron (COVR2700)
❍ Coverite 21st Century Cover Sock (COVR2702)
❍ Coverite 21st Century Trim Sealing Iron (COVR2750)

OPTIONAL SUPPLIES AND TOOLS

Here is a list of optional tools mentioned in the manual that will help you build the Giant Spitfire Mk IX ARF.

❍ 2 oz. [57g] spray CA activator (GPMR6035)
❍ CA applicator tips (HCAR3780)
❍ CA debonder (GPMR6039)
❍ Builder's Triangle Set (HCAR0480)
❍ Scale Warbird Template (TOPR2187)
❍ 36" metal ruler (HCAR0475)
❍ Hobbico High Precision Diagonal Cutter 5" (HCAR0630)
❍ Pliers with wire cutter (HCAR0625)
❍ Robart Super Stand II (ROBP1402)
❍ Switch & Charge Jack Mounting Set (GPMM1000)
❍ Panel Line Pen (TOPQ2510)
❍ Rotary tool such as Dremel
❍ Rotary tool reinforced cut-off wheel (GPMR8200)
❍ Servo horn drill (HCAR0698)
❍ AccuThrow Deflection Gauge (GPMR2405)
❍ CG Machine (GPMR2400)
❍ Precision Magnetic Prop Balancer (TOPQ5700)

IMPORTANT BUILDING NOTES

● Anytime a sheet metal screw is installed in wood, first install the screw, remove the screw and apply a couple of drops of thin CA in the hole to harden the threads. After the CA has cured, reinstall the screw.

● **Photos** and **sketches** are placed **before** the step they refer to. Frequently you can study photos in following steps to get another view of the same parts.

● The Giant Spitfire Mk IX ARF is factory-covered with Top Flite MonoKote film. Should repairs ever be required, MonoKote can be patched with additional MonoKote purchased separately. MonoKote is packaged in six-foot rolls, but some hobby shops also sell it by the foot. If only a small piece of MonoKote is needed for a minor patch, perhaps a fellow modeler would give you some. MonoKote is applied with a model airplane covering iron, but in an emergency a regular iron could be used. A roll of MonoKote includes full instructions for application. Following are the colors used on this model and order numbers for six foot rolls.

CubYellow	(TOPQ0220)
Flat Olive Drab	(TOPQ0510)
Flat Dove Gray	(TOPQ0511)
Flat Tan	(TOPQ0516)
True Red	(TOPQ0227)

● The stabilizer and wing incidences and engine thrust angles have been factory-built into this model. However, some technically-minded modelers may wish to check these measurements anyway. To view this information visit the web site at www.top-flite.com and click on "Technical Data." Due to manufacturing tolerances which will have little or no effect on the way your model will fly, please expect slight deviations between your model and the published values.

MODEL INSPECTION

Before starting to build, take an inventory of this model to make sure it is complete, and inspect the parts to make sure they are of acceptable quality. If any parts are missing or are not of acceptable quality, or if you need assistance with assembly, contact **Product Support**. When reporting defective or missing parts, use the part names exactly as they are written in the instruction manual.

Top Flite Product Support
3002 N Apollo Drive, Suite 1
Champaign, IL 61822

Ph: (217) 398-8970, ext. 5 Fax: (217) 398-7721
E-mail: productsupport@top-flite.com

ORDERING REPLACEMENT PARTS

Replacement parts for the Top Flite Giant Spitfire Mk IX ARF are available using the order numbers in the **Replacement Parts List** that follows. The fastest, most economical service can be provided by your hobby dealer or mail-order company. Not all parts are available separately (an aileron cannot be purchased separately, but is only available with the wing kit). Replacement parts are not available from Product Support, but can be purchased from hobby shops or mail order/Internet order firms. Hardware items (screws, nuts, bolts) are also available from these outlets.

To locate a hobby dealer, visit www.top-flite.com and click on "Where to Buy". Follow the instructions provided on the page to locate a U.S., Canadian or International dealer.

Parts may also be ordered directly from Hobby Services by calling (217) 398-0007, or via facsimile at (217) 398-7721, but full retail prices and shipping and handling charges will apply. Illinois and Nevada residents will also

be charged sales tax. If ordering via fax, include a Visa® or MasterCard® number and expiration date for payment.

Mail parts orders and payments by personal check to:
Hobby Services
3002 N Apollo Drive, Suite 1
Champaign IL 61822

Be certain to specify the order number exactly as listed in the **Replacement Parts List**. Payment by credit card or personal check only; no C.O.D.

If additional assistance is required for any reason contact **Product Support:**

by e-mail at
productsupport@top-flite.com

or by telephone at
(217) 398-8970

REPLACEMENT PARTS LIST

TOPA1920.....Wing Kit
TOPA1921.....Fuselage Kit
TOPA1922.....Rudder
TOPA1923.....Horizontal Stabilizer Set
TOPA1924.....Canopy
TOPA1925.....Tail Cover
TOPA1926.....Gear Door Set
TOPA1927.....Spinner
TOPA1928.....Decals
TOPA1929.....Cockpit Kit
TOPA1930.....Cannon Set
TOPA1931.....Cowl
TOPA1819.....Tail Wheel Assembly
TOPA1932.....Antenna

COMMON ABBREVIATIONS

Stab = Horizontal Stabilizer
Fin = Vertical Stabilizer
LE = Leading Edge
TE = Trailing Edge
" = Inches
MM = millimeters
SHCS = Socket Head Cap Screw

To convert inches to millimeters, multiply inches by 25.5 (25.4mm = 1")

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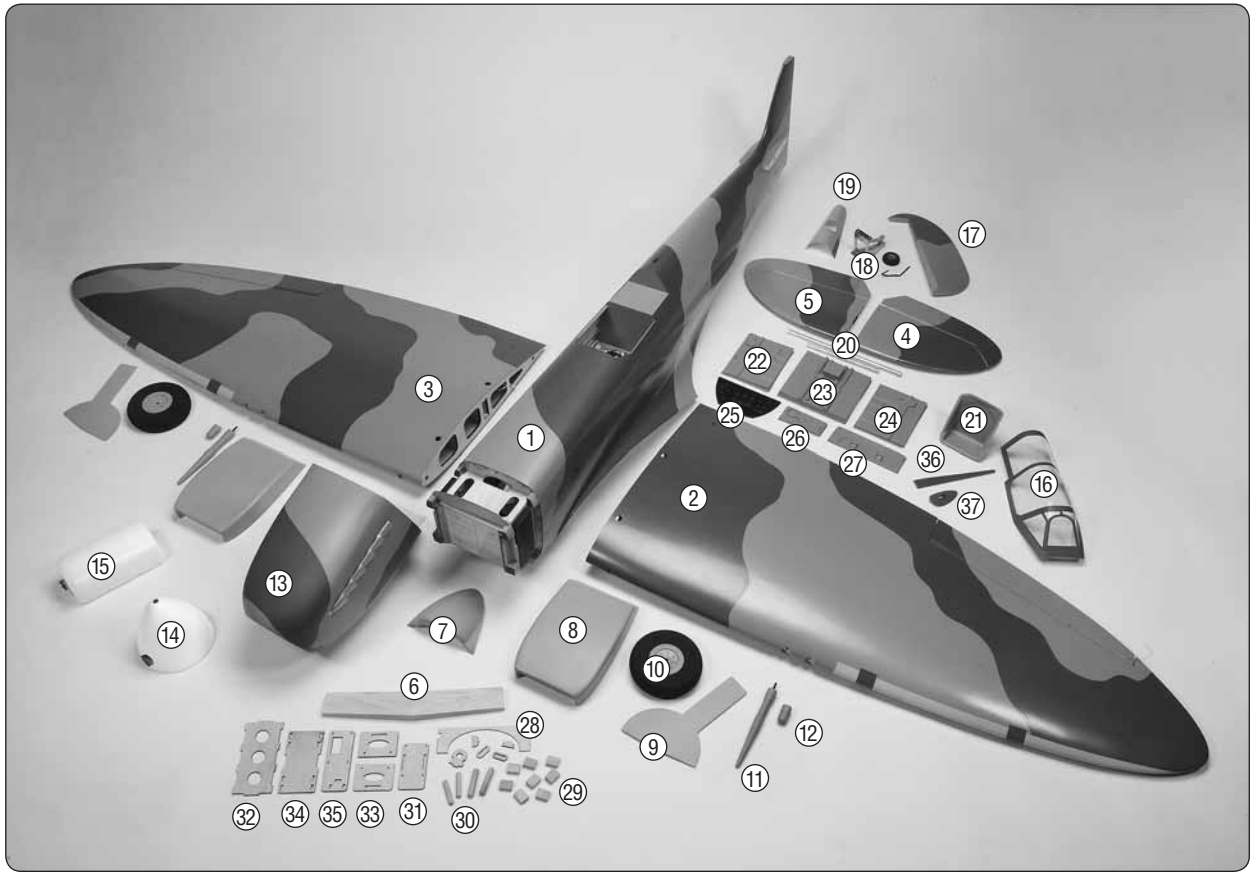


1. Fuselage
2. Left Wing Panel
3. Right Wing Panel
4. Left Stabilizer Panel
5. Right Stabilizer Panel
6. Wing Joiner
7. Air Intake
8. Radiator
9. Landing Gear Cover
10. Wheel
11. Cannon
12. Cannon Muzzle Cover
13. Cowl
14. Spinner
15. Fuel Tank
16. Canopy
17. Rudder
18. Tail Wheel Assembly
19. Tail Wheel Cover
20. Stabilizer Joiner Tubes
21. Seat
22. Right Cockpit Side
23. Floor
24. Left Cockpit Side
25. Instrument Panel
26. Control Column
27. Rudder Pedal
28. Rudder Pedal Spacer
29. Servo Mounting Blocks
30. Wing Alignment Dowels
31. Receiver Tray
32. Receiver Battery Tray
33. Receiver Battery Tray Ends
34. Ignition Module Tray
35. Retract Servo Tray
36. Antenna
37. Antenna Base

ASSEMBLE THE WINGS

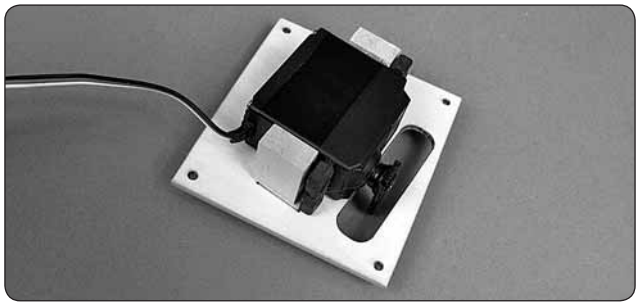
Start with the left wing so the assembly matches the photos the first time through.

❏ 1. Lay a few paper towels on top of each other and cut them into small squares. These paper towel squares will come in handy for wiping away excess epoxy throughout the assembly process (and will save you from wasting whole paper towels).

❏ 2. If necessary, use a covering iron with a covering sock to go over the wing, flap and aileron to remove any wrinkles. The best method to remove the wrinkles is to glide the iron over the covering until the wrinkles disappear, then go over the area again, pushing down on the iron to bond the covering to the wood. If the wrinkles don't disappear, the balsa in that area might be flexing inward. If this is happening, don't press down. Simply let the heat of the iron shrink the covering. If the wrinkles momentarily disappear, then immediately reappear, the iron may be too hot, thus causing air bubbles. Lower the temperature of the iron or use a sharp #11 blade to puncture several holes in the covering, then reheat. The suggested iron temperature is around 360° F.

MOUNT THE AILERON SERVOS

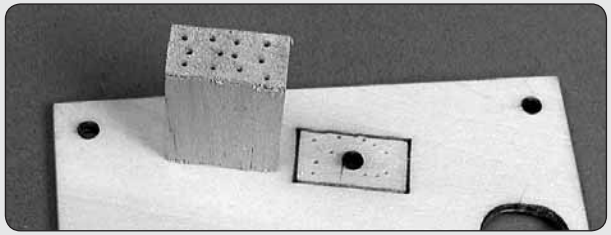
❏ ❏ 1. Carefully remove the left aileron servo hatch from the wing by peeling off the masking tape holding hatch to the wing. Use a paper towel square dampened with naphtha lighter fluid or similar solvent to remove any glue left behind from the tape.



❏ ❏ 2. Install the rubber bushings and metal grommets in the aileron servo. Install a servo arm on the aileron servo. Position the aileron servo on the aileron servo hatch cover as shown. Set the two 9/16" x 3/4" x 3/8" [15 x 20 x 8mm] hardwood blocks over the embossed servo block locations to check that the block locations are correct. If not, mark the new locations.

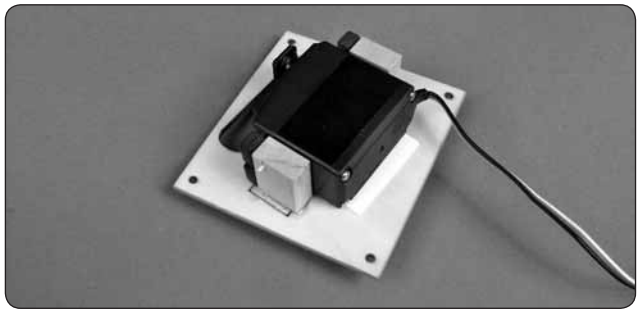
Hot Tip

When mounting the servo blocks on the bottom of the servo hatch, make sure that the grain of the wood is perpendicular to the hatch.



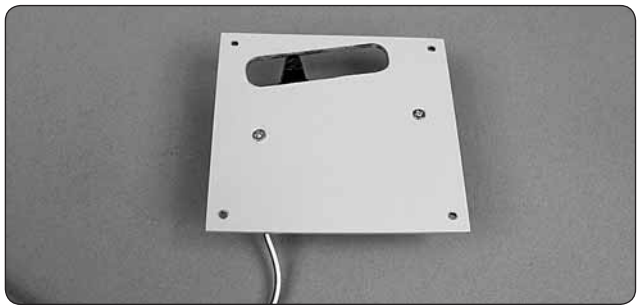
To increase the strength of the glue joint, use a T-pin to prick holes into the gluing surface of the servo blocks and the plywood servo hatch. Be careful not to prick holes completely through the servo hatch and covering.

❏ ❏ 3. Use 6-minute epoxy to glue the two blocks to the bottom of the servo hatch over the embossed servo block locations. Thoroughly coat the end of the blocks and allow them to set for a few seconds to allow the blocks to absorb the epoxy, then recoat the blocks. Use clamps to hold the blocks to the servo hatch.



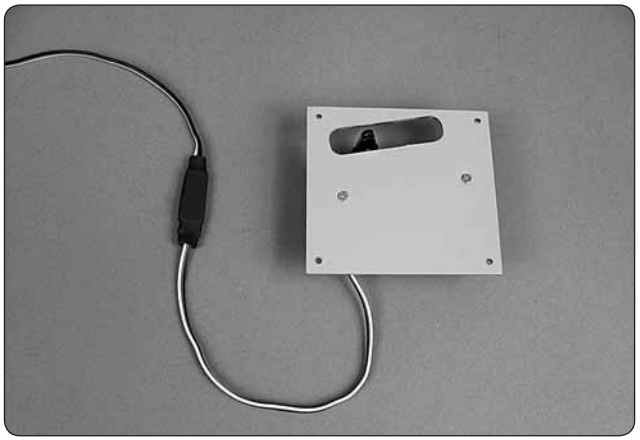
❏ ❏ 4. Once the epoxy has cured, remove the clamps. Place a 1/16" [1.6mm] spacer, such as a piece of cardstock from the header card of the servo extension or a piece of paper folded several time, under the servo and between each mounting block. After the servo is installed the spacer will be removed, providing adequate spacing for vibration isolation.

❏ ❏ 5. Drill 1/16" [1.6mm] holes through the blocks for the servo mounting screws. Mount the servo to the blocks with the screws that came with the servo. Remove the servo mounting screws and apply a couple of drops of thin CA in each hole to harden the threads. Allow the CA to fully harden. Then, reinstall the servos and remove the spacer.



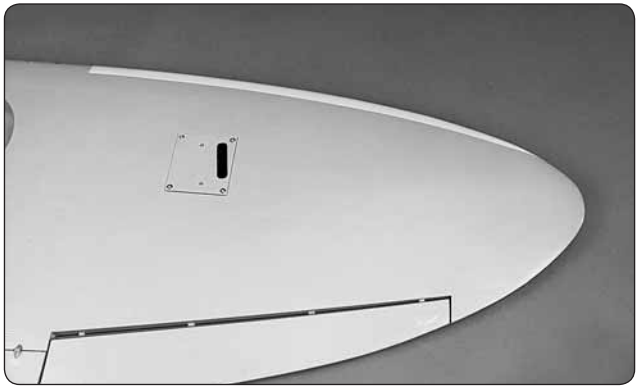
❏ ❏ 6. Drill 1/16" [1.6mm] holes through the blocks at the two hole locations on the top of the hatch. Install two #2 x 3/8" [9.5mm] flat head sheet metal screws to

secure the servo mounting blocks to the aileron servo hatch. Use thin CA to harden the screw threads



❏ ❏ 7. Connect a 24" [610mm] servo extension wire (not included) to the aileron servo. Cut a piece of the included heat shrink tubing in half and slide it over the servo connections. Shrink the tubing by applying heat.

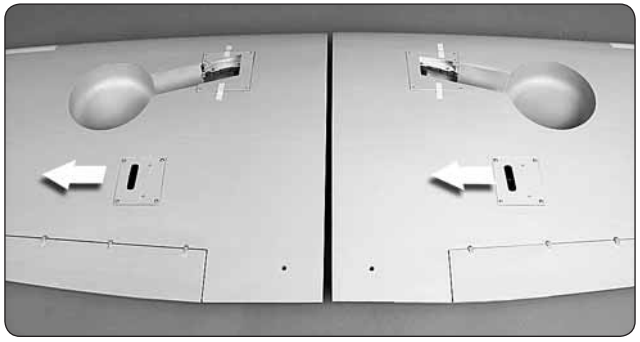
❏ ❏ 8. Use the string in the wing to pull the aileron wire through the wing.



❏ ❏ 9. Place the aileron servo hatch with the servo in the wing. Be certain that the hatch is positioned correctly as shown. Secure the hatch using four #2 x 3/8" [9.5mm] sheet metal screws and #2 flat washers. Use thin CA to harden the screw threads.

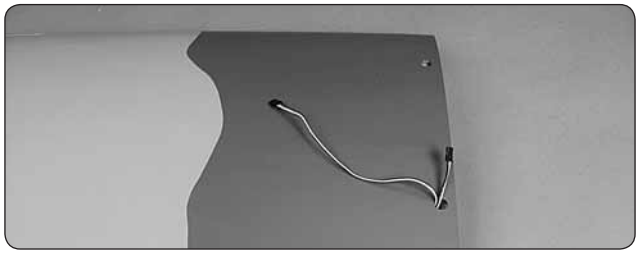
❏ 10. Go back to step 1 and install the right aileron servo following the same procedure. Firmly pull on the ailerons and flaps to check that the hinges are securely glued.

INSTALL THE FLAP SERVOS



❏ ❏ 1. Install the flap servos following the same procedure used to install the aileron servos. Note that the flap servos face the same direction.

❏ ❏ 2. Connect a 12" [304mm] servo extension wire to the flap servo. Secure the extension to the servo with a piece of heat shrink or electrical tape.

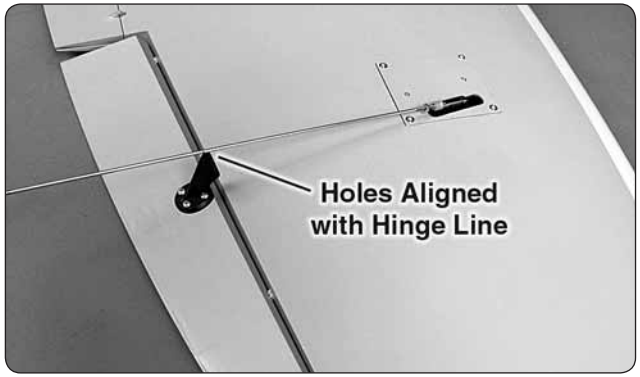


❏ ❏ 3. Route the flap and aileron servo leads to the root of the wing and out the hole in the top of the wing.

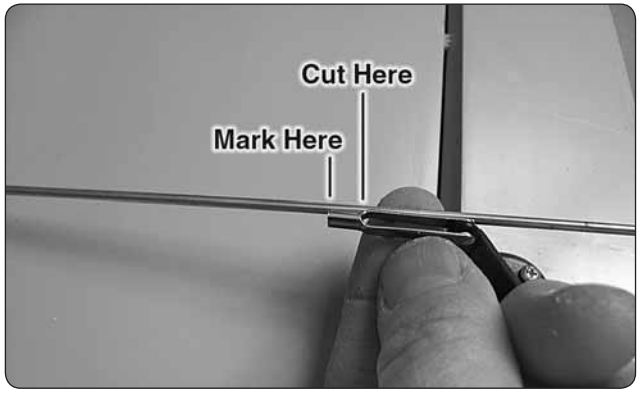
INSTALL THE AILERON AND FLAP PUSHRODS

Do the left aileron first.

❏ ❏ 1. Slide a silicone clevis retainer over a 4-40 threaded metal clevis. Thread a 4-40 nut followed by the 4-40 metal clevis, threaded 12 turns onto a 4-40 x 12" [304mm] metal pushrod. Attach the clevis to the aileron servo arm 5/8" [16mm] from the center of the arm.



❏ ❏ 2. Position the control horn so that it is in line with the pushrod and over the plywood mounting plate. The pushrod holes in the control horn should be aligned with the hinge line of the aileron. On the aileron, mark the four mounting holes. Remove the control horn and drill a 5/64" [2mm] pilot hole at each mark. Do not drill completely through the aileron. Attach the control horn using four #4 x ½" sheet metal screws. Use thin CA to harden the holes.



❏ ❏ 3. Install the metal solder clevis in the hole at the end of the control horn. Center the aileron servo and aileron. Mark the pushrod where it meets the solder clevis. Remove the pushrod and the solder clevis and cut the pushrod ¼" [6.4mm] **past** the mark. Solder the solder clevis to the pushrod using the techniques described in the following **Hot Tip**.

Hot Tip

HOW TO SOLDER

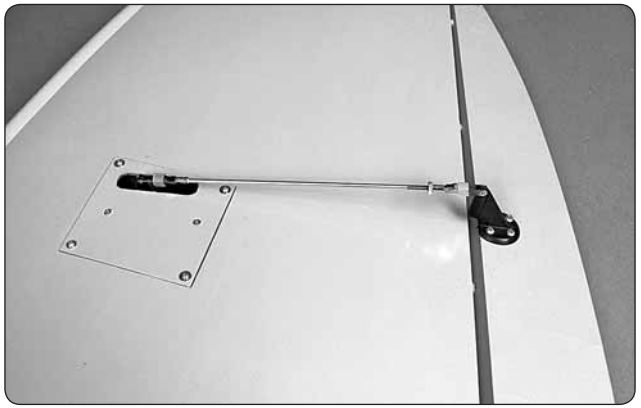
1. Roughen the end of the pushrod with coarse sandpaper where it is to be soldered. Use denatured alcohol or other solvent to thoroughly clean the pushrod.

2. Apply a few drops of soldering flux to the end of the pushrod, then use a soldering iron or a torch to heat it. “Tin” the heated area with silver solder by applying the solder to the end. The heat of the pushrod should melt the solder – not the flame of the torch or soldering iron – thus allowing the solder to flow. The end of the wire should be coated with solder all the way around.

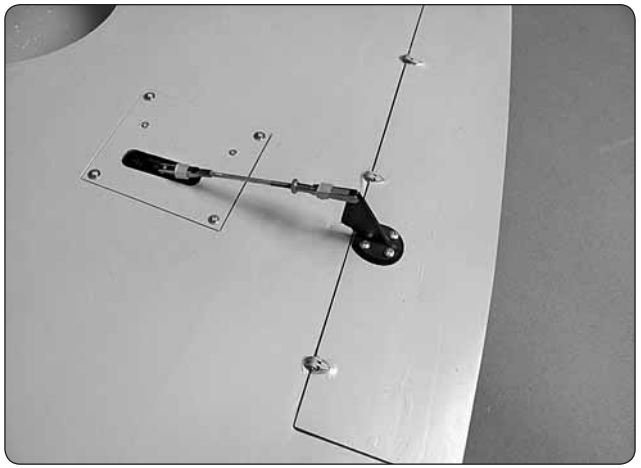
3. Place the clevis on the end of the pushrod. Add another drop of flux, then heat and add solder. The same as before, the heat of the parts being soldered should melt the solder, thus allowing it to flow. Allow the joint to cool naturally without disturbing. Avoid excess blobs, but make certain the joint is thoroughly soldered. The solder should be shiny, not rough. If necessary, reheat the joint and allow to cool.

4. Immediately after the solder has solidified, but while it is still hot, use a cloth to quickly wipe off the flux before it hardens. **Important:** After the joint cools, coat the joint with oil to prevent rust. **Note:** Do not use the acid flux that comes with silver solder for electrical soldering.

This is what a properly soldered clevis looks like – shiny solder with good flow, no blobs and flux removed.



❏ ❏ 4. Slide a silicone clevis retainer over the solder clevis. Reinstall the aileron pushrod with the threaded clevis attached to the control horn. Adjust the threaded clevis so that the aileron is centered. Apply a drop of thread locker to the threads of the pushrod behind the clevis. Tighten the 4-40 nut against the clevis.

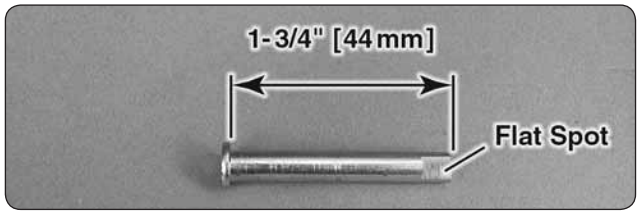


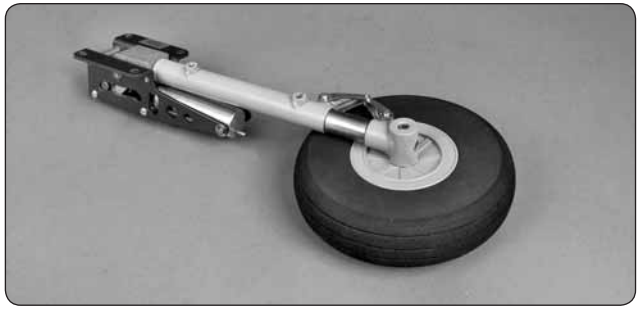
❏ ❏ 5. Assemble and connect the flap pushrods following the same procedure, except, adjust the flap control on your transmitter to the flap up position. Position the flaps in the up position. We installed the pushrod in the outer hole of the control horn and the hole 5/8" [16mm] from the center of the servo arm. Use #4 x ½" sheet metal screws in the forward holes and #4 x 3/8" sheet metal screws in the aft holes.

❏ 6. Return to step 1 and install the aileron and flap pushrods on the right wing.

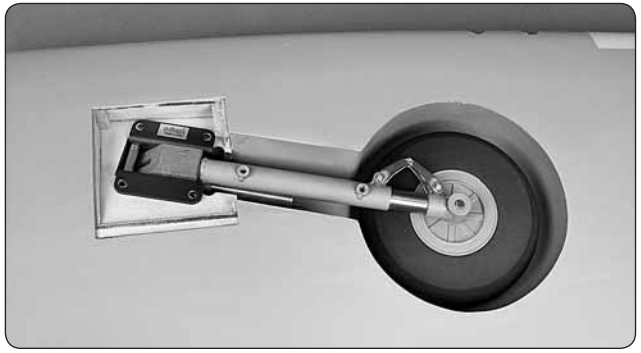
MOUNT THE RETRACTS

Install the left retract first.

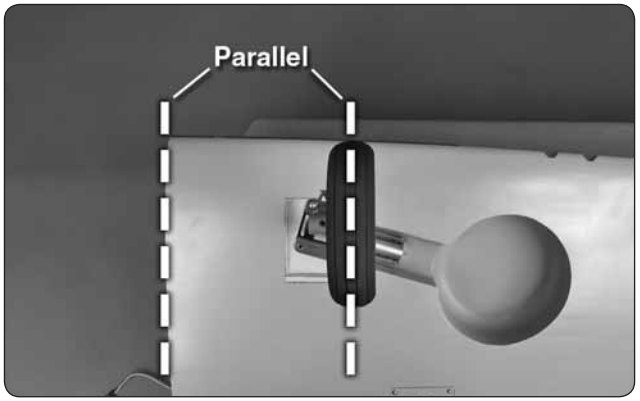




❏ ❏ 1. Trim the axle that is included with the Robart retracts to 1-3/4" [44mm] long. File a flat spot at the end of the axle. Insert the axle through the included 5" [127mm] wheel. Insert the axle into the retract. Apply a drop of threadlocker to the 10-32 x 3/16" [4.8mm] set screw, included with the retract, and tighten the set screw onto the flat of the axle. Make sure that the wheel rotates freely.

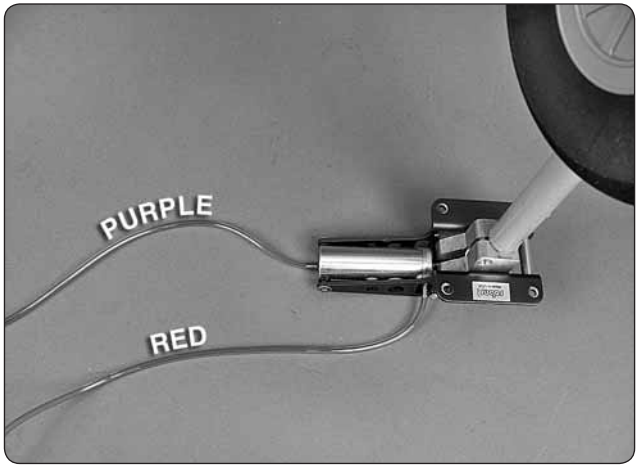


❏ ❏ 2. Test fit the retract unit with the wheel into the wing. Position the retract so the wheel is centered in the wheel well. Adjust the strut position in the retract body as necessary to achieve the correct spacing all the way around the wheel.



❏ ❏ 3. Temporarily attach the retract to the wing with two 6-32 x ¾" [19mm] machine screws. Extend the retract. View the wheel from directly above. Adjust the strut so that the wheel is parallel to the root of the wing. Lock the strut in position by applying a drop of threadlocker to the threads and securely tightening the bolt at the top of the strut.

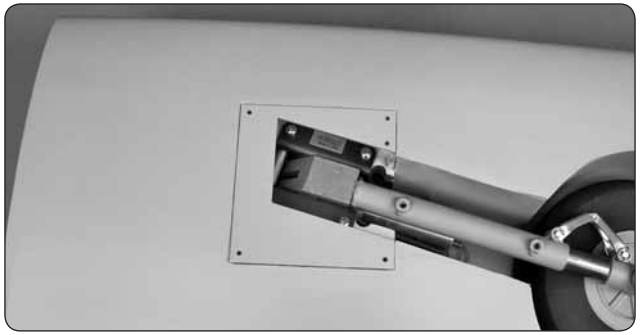
❏ ❏ 4. Double check that the wheel will fully retract into the wing. Extend the retract to make sure it does not interfere with any part of the wing and that the retract is operating smoothly.



❏ ❏ 5. Cut a 12" [305mm] piece of red pressure tubing and a 14" [356mm] piece of purple pressure tubing from the tubing included with the Robart Air Control Kit (not included). Connect the red tube to the side of the air cylinder and the purple to the end of the air cylinder.

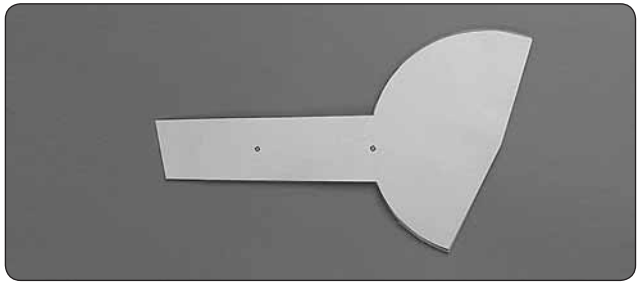
❏ ❏ 6. Route the pressure tubing through the ribs and out the hole in the top of the wing. Tape the pressure tubing to the top of the wing.

❏ ❏ 7. Secure the retracts in the wing. Apply a drop of threadlocker to the threads of four 6-32 x ¾" [19mm] machine screws and #6 lock washers before threading them into the retract plate.

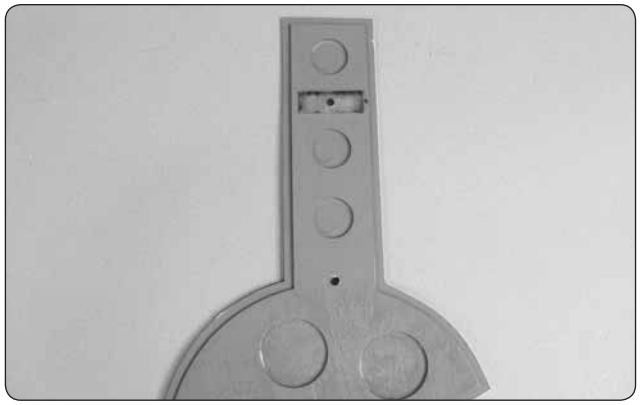


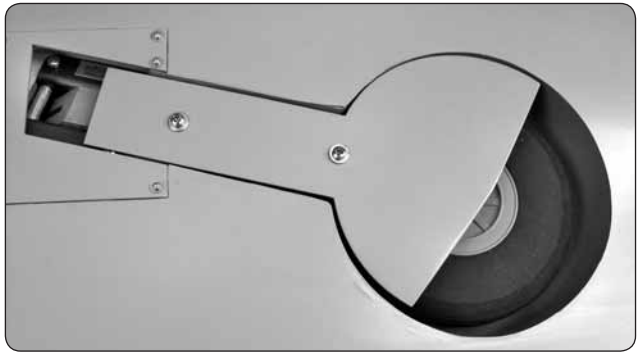
❏ ❏ 8. Set the retract cover over the retract and drill a 1/16" [1.6mm] pilot hole using the holes in the cover as a guide.

❏ ❏ 9. Mount the retract cover to the wing with five #2 x 3/8" sheet metal screws and five #2 flat washers. Use thin CA to harden the holes.



❏ ❏ 10. Cut out the landing gear cover template from the back of the instruction manual. Tape the template to the top of the left landing gear cover. Center the landing gear cover over the retract. Check that the two marks are aligned with the mounting holes on the retracts.





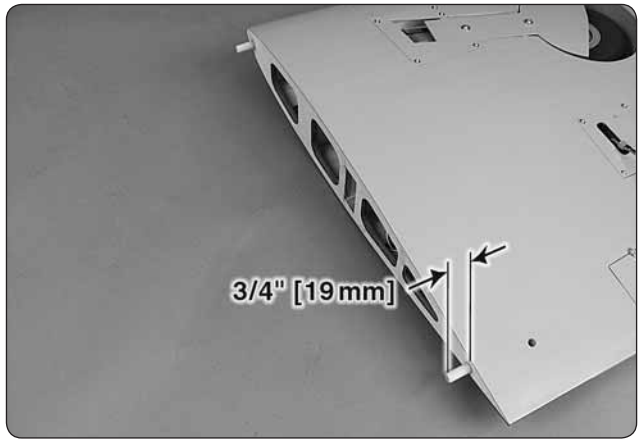
❏ ❏ 11. Drill 1/16" [1.6mm] pilot holes at the two locations shown on the template. Enlarge the holes

with a 5/32 [4mm] drill bit. Secure the landing gear cover to the retract with two 6-32 x 1/4" machine screws and #6 flat washers. **Note** that clear plastic shims have been provided to raise the landing gear cover so that it is flush with the bottom of the wing if needed.

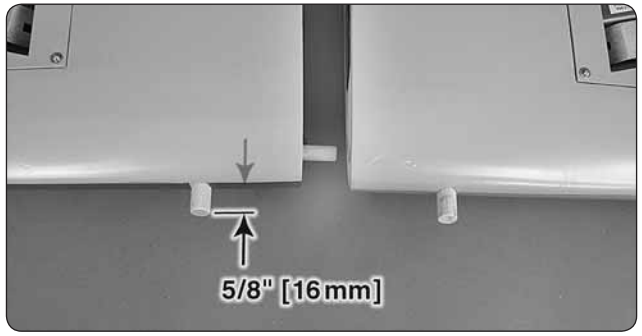
❏ 12. Return to step 1 and mount the right retract in the right wing.

JOIN THE WING

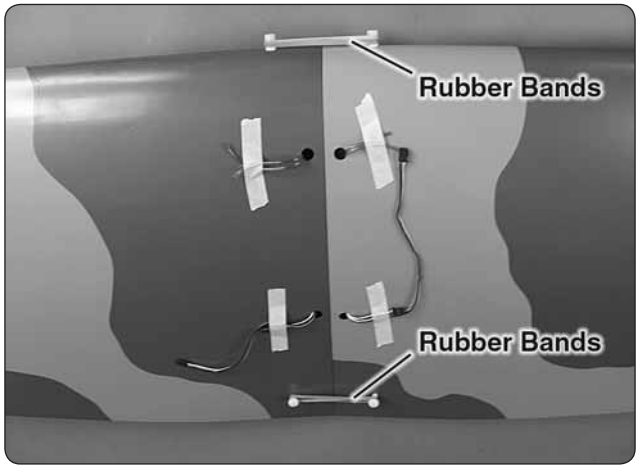
Note: Keep the retracts in the retracted (up) position so they do not extend and retract as you handle the wing.



❏ 1. Use 6-minute epoxy to glue the two 5/16 x 1-5/8" [8 x 41mm] wing alignment dowels into the root of the left wing half.



❏ 2. Use 6-minute epoxy to glue the two 3/8 x 1-3/4" [9.5 x 44mm] diameter forward wing dowels in the leading edge of both wing halves. The wing dowels should protrude approximately 5/8" [16mm] from the wing.

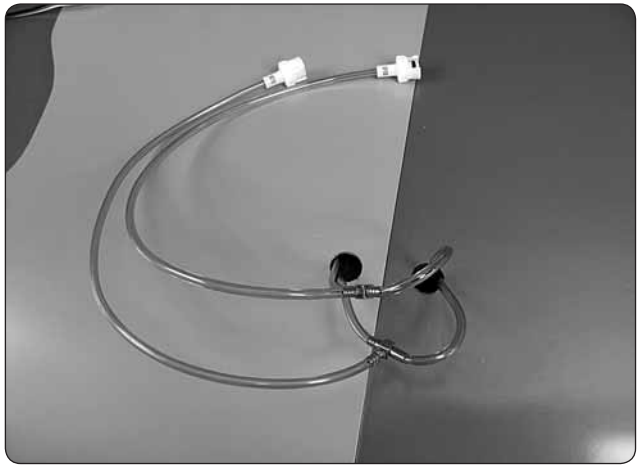


❏ 3. Test fit the hardwood wing joiner in each wing half, making sure that both wing halves fit together at the root without any gaps. Trial fit clamping the wing together with rubber bands around the wing dowels at the leading edge. Insert the two ¼ - 20 x 2" [51mm] nylon wing bolts and stretch rubber bands around the wing bolts on the top and bottom of the wing.

❏ 4. **Read through the next three steps before mixing any epoxy.** Gather everything required for gluing the wing together including 30-minute epoxy, mixing sticks, epoxy brushes, 12" [305mm] long dowel or wire, denatured alcohol and paper towels. Remove the rubber bands and separate the wing halves. Remove the wing joiner. Mix 2 oz. [59.1cc] of 30-minute epoxy. Working quickly, pour a generous amount into the joiner pocket of one wing half. Use your wire or dowel to thoroughly distribute the epoxy, coating all surfaces inside the joiner pocket. Coat the root rib and one half of the wing joiner that goes into the wing. Insert the joiner in the wing.

❏ 5. Coat the joiner pocket of the other wing half and the other end of the wing joiner. Join the wing halves together. Then, stand the wing on end with one of the wing tips resting on the floor. Use a piece of R/C foam or something similar to cushion and stabilize the wing so it won't slide around.

❏ 6. With the wing resting on end, use a paper towel dampened with denatured alcohol to wipe off any excess epoxy as it squeezes out. Wrap the rubber bands around the wing dowels and wing bolts. Add several strips of masking tape to tightly hold the wings together as you continue to wipe off excess epoxy as it squeezes out. Be certain the leading edge and trailing edges of the wing accurately align. Do not disturb the wing until the epoxy has fully cured.



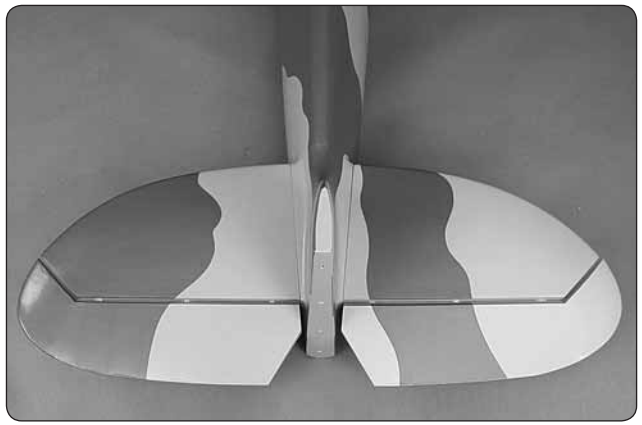
❏ 7. Join the matching air lines from each wing half with a couple of T-fittings that came with the air control kit. Cut two 10" [250mm] pieces of corresponding color air line (also from the control kit) and fit each line to the T-fittings. Connect one quick-connector **with** an O-ring to one of the air lines and one of the quick connectors **without** an O-ring to the other line. This will prevent improper connection to the quick-connectors on the air valve when mounting the wing to the fuselage.

❏ 8. Connect both servo wires from the aileron servos to a Y-harness and both servo wires from the flap servos to a Y-harness.

ASSEMBLE THE FUSELAGE

Firmly pull on the elevators to check that the hinges are securely glued.

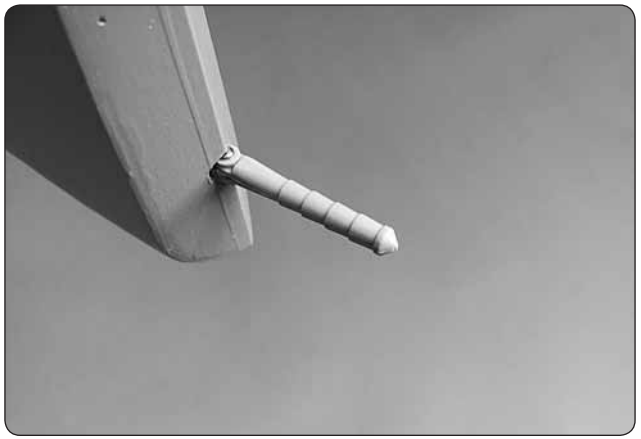
INSTALL THE STABILIZER

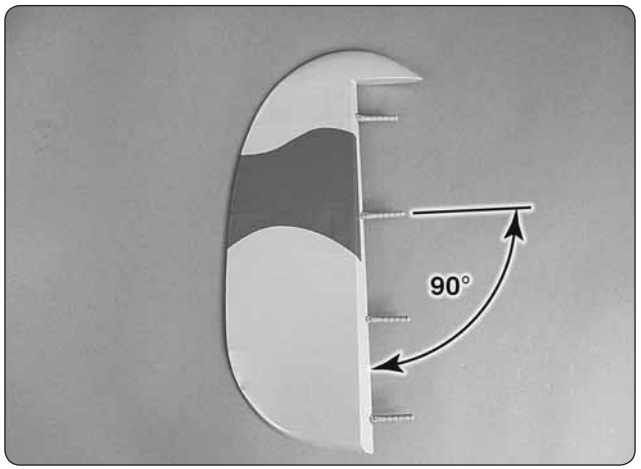


❏ 1. Test fit the two aluminum stabilizer tubes in the fuselage and slide the stabilizers on the tubes. The shorter tube goes in the front hole. If the aluminum tubes are too tight to slide through the holes, take a sharp hobby knife and gently scrape the inside of the holes. During the manufacturing process a small amount of resin or filler may be left behind in the hole.

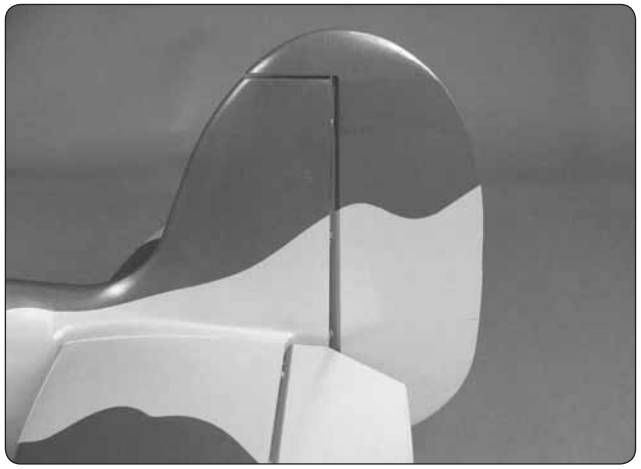
❏ 2. Once you are satisfied with the fit of the stabilizer halves, remove the stabilizer halves and the joiner tubes. Use medium grit sandpaper to roughen up the aluminum tubes. Clean the tubes with denatured alcohol and insert both tubes back into the fuselage until the end exits on the opposite side by approximately 1" [25mm].

❏ 3. Gather everything required for gluing the stabilizer halves to the fuselage including 30-minute epoxy, mixing sticks, epoxy brush, 12" [304mm] long dowel or wire, masking tape, denatured alcohol and small paper towel squares. Mix up 3/4 oz. [22.1cc] of 30-minute epoxy. Apply a generous amount of epoxy to the long side of the aluminum joiner tubes. Pull the tubes through the fuselage so that they are close to centered. Pour a small amount of epoxy into both holes of one of the stabilizer halves and using a dowel or wire, coat the inside of the holes. Apply epoxy to the root rib of the stabilizer and the fuselage. Insert the end of the aluminum tubes with epoxy on them into the stabilizer and press the stabilizer against the fuselage. Wipe off any excess epoxy that may have squeezed out before it runs down the fuselage. Quickly repeat the process on the other side. Wipe off any excess epoxy with a dampened paper towel and denatured alcohol. Use pieces of masking tape to hold the stabilizer tight against the fuselage until the epoxy cures.

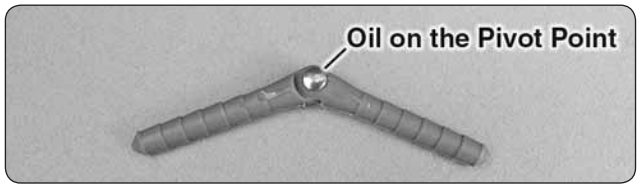




❏ 4. Without using any glue, install four hinges into the rudder. Note that the pivot point of each hinge must align with the center of the leading edge of the rudder. To achieve this alignment, the hinges will be fairly deep in the rudder. Also note that the hinges must be perpendicular to the leading edge.



❏ 5. Again without glue, test fit the rudder to the fin. Move it left and right a few times to align the hinges. The rudder doesn't have to move very far, only 1-3/4" [44mm] left and 1-3/4" [44mm] right measured at the widest part of the rudder at the trailing edge. If there is too much resistance, or if you are not able to move the rudder left and right 1-3/4" [44mm], widen the gap slightly between the rudder and fin.



❏ 6. Remove the rudder and all the hinges. Add a small drop of oil to the pivot point on the hinges. This will prevent the epoxy from adhering to the pivot point. Make sure oil does not get on the gluing surface of the hinge. If it does, clean the oil off with a paper towel dampened with denatured alcohol.

❏ 7. Please read the complete instructions in this step before mixing up the epoxy. Mix up approximately ¼ oz. [7.4cc] of 30-minute epoxy. Use a toothpick to thoroughly apply the epoxy in the holes in the fin and rudder. Use the toothpick to get the epoxy out of the opening of the holes in the rudder and fin so it doesn't get into the pivot point. Wipe away any excess epoxy around the outside of the holes with a paper towel dampened with denatured alcohol.

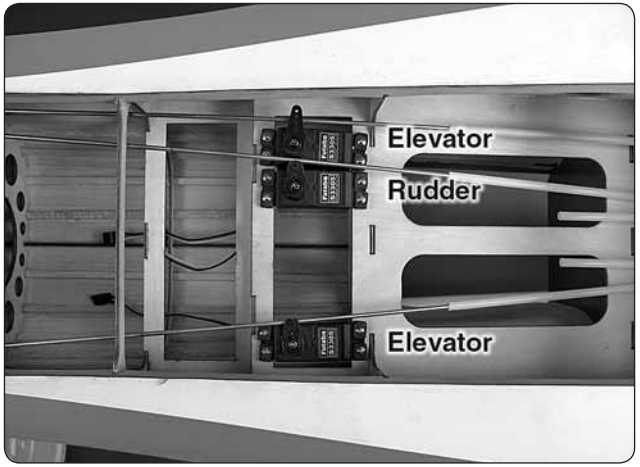
Use the toothpick to apply epoxy to the ends of the rudder hinges that go into the fin. Insert each hinge into the fin and wipe away any excess epoxy that squeezes out of the hole.

Apply epoxy to the other end of the hinges. Join the rudder to the fin, pushing the hinges only about ¾ of the way into the rudder. Use a toothpick to wipe away any epoxy that squeezes out. Then, fit the rudder the rest of the way on.

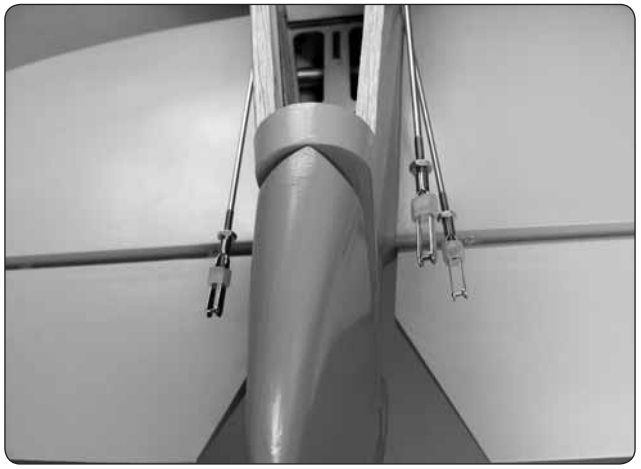
Move the rudder left and right a few times to align the hinges and make certain that the rudder deflects left and right enough. Allow the epoxy to cure, checking it a couple of times while it cures.

Once the epoxy has cured, firmly pull on the rudder to check that the hinges are securely glued.

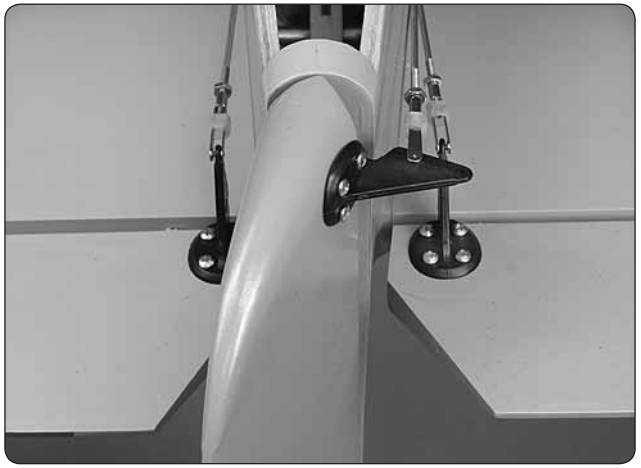
INSTALL THE ELEVATOR & RUDDER SERVOS



❏ 1. Insert the three 4-40 x 48" [1220mm] metal pushrods in the elevator and rudder pushrod outer pushrod tubes at the aft end of the fuselage. Install two elevator and one rudder servo in the servo tray as shown. The elevator pushrods will be attached to the servo arm in the hole 7/16" [11mm] from the center of the arm. The rudder pushrod will be attached to the servo arm in the hole 5/8" [16mm] from the center of the arm.

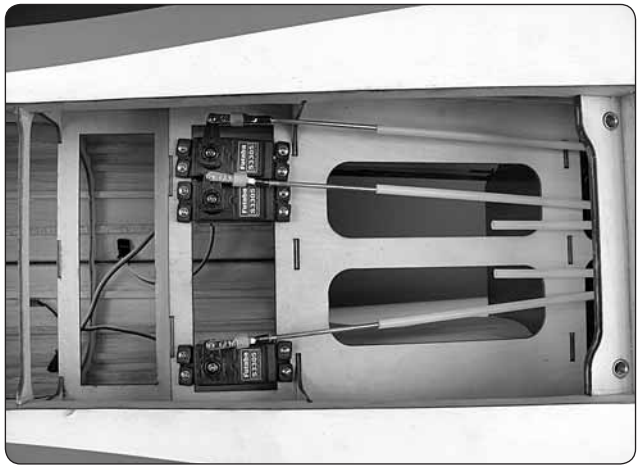


❏ 2. Thread a 4-40 nut, threaded clevis and a silicone clevis retainer 12 turns onto both elevator pushrods and the rudder pushrod.



❏ 3. Mount the control horns to the elevators and the rudder the same way they were mounted on the ailerons, by drilling 3/32" [2.4mm] pilot holes and using #4 x ½" [13mm] sheet metal screws. Don't forget to harden the holes with thin CA after first installing, then removing the screws.

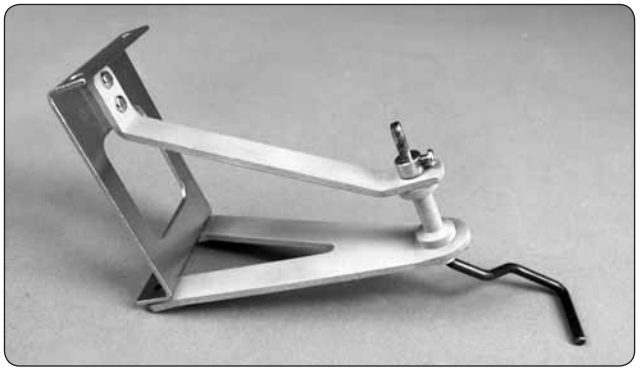
❏ 4. Connect the receiver battery, rudder and elevator servos to the receiver. Switch on the transmitter and center the servos.



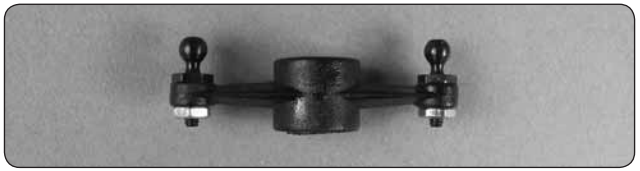
❏ 5. Install solder clevises on the elevator servo arms in the hole 7/16" [11mm] from the center of the servo arm. Install a solder clevis on the rudder servo arm in the hole 5/8" [16mm] from the center of the servo arm. Following the same procedure that was done for the aileron pushrods, mark the elevator and rudder pushrods where they are to be cut for the solder clevises. One at a time, remove the threaded metal clevis from the control horn end, remove the pushrod from the fuselage, cut it to the correct length and solder a metal solder clevis on the end. Reinstall the pushrod from the front and connect the solder clevis to the servo arms. Reinstall and connect the threaded metal clevis and 4-40 nut to the control horn. ***Don't forget to use a silicone clevis retainer on all the clevises.***

MOUNT THE FIXED TAIL GEAR

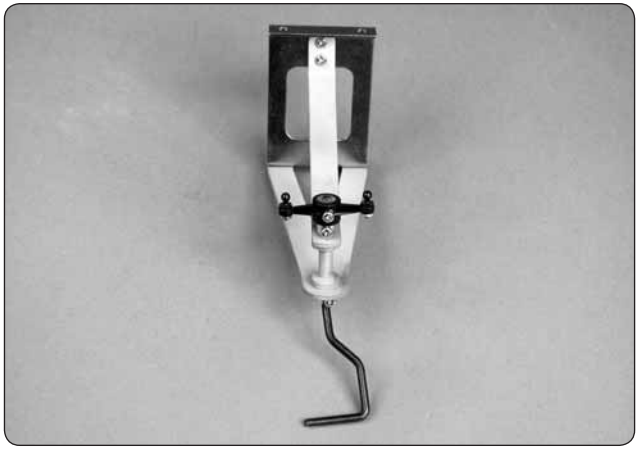
❏ 1. Slide a 3.5mm wheel collar on the tail gear wire. Apply a drop of threadlocker to the threads of a 2.5 x 4mm machine screw. Secure the wheel collar on the flat spot with the machine screw.



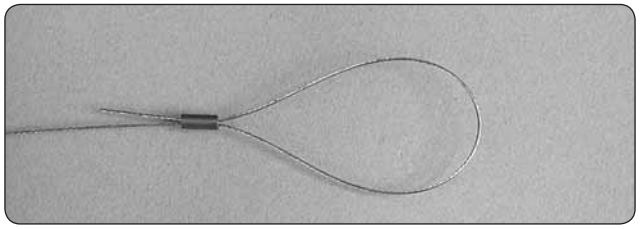
❏ 2. Slide the tail gear wire into the fixed tail gear frame. Secure the tail gear wire in the frame with a second 3.5mm wheel collar and 2.5 x 4mm machine screw. Be sure to use threadlocker on all the screws.



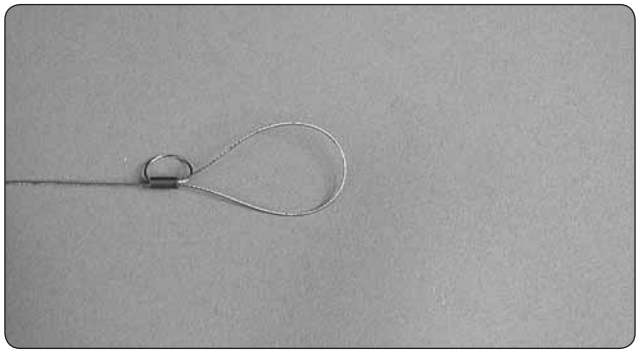
❏ 3. Use a 5/64" [2mm] drill bit to enlarge the two holes in the nylon steering arm. Thread a 2-56 ball link ball in both holes of the steering arm. Secure each ball with a 2-56 nut and a drop of threadlocker.



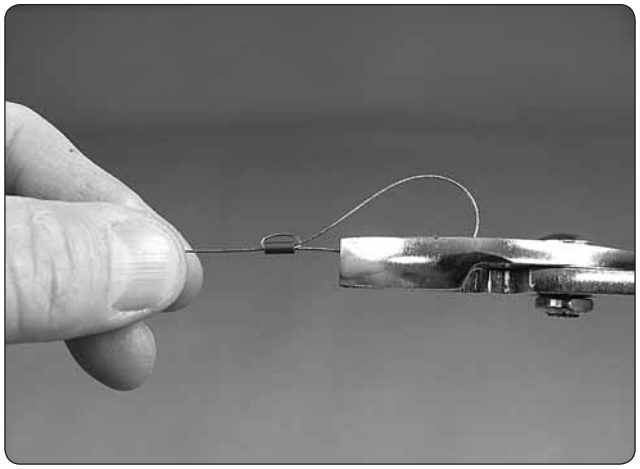
❏ 4. Install the nylon steering arm on the tail gear wire. Secure the steering arm with a 2.5 x 4mm machine screw and a drop of threadlocker. Align the steering arm and tail gear axle so that they are parallel.



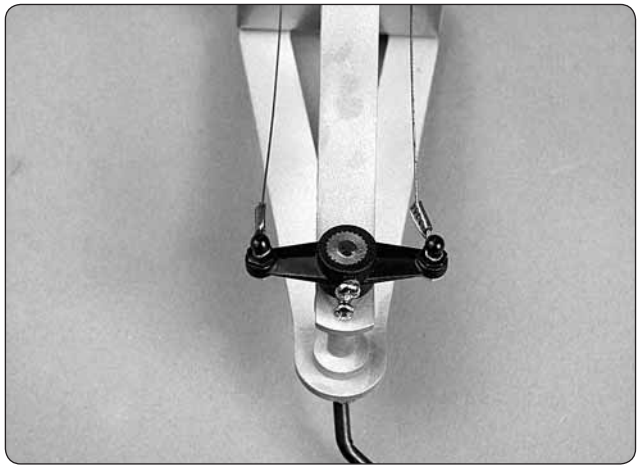
❏ 5. Cut the .018 x 84" [.45 x 2100mm] braided cable in half. Slide a small copper tube (called a swage) over one end of both braided cables, then guide the end of the cable back through.



❏ 6. Wrap the cable back around the swage and back through the swage.

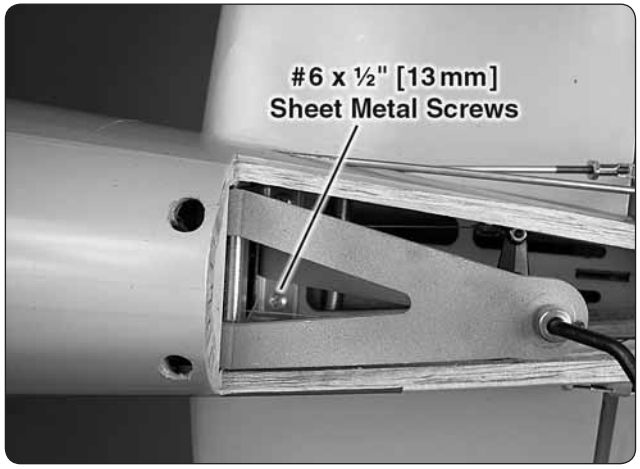


❏ 7. Use pliers to pull the cable from the first loop to reduce the size of the second loop.

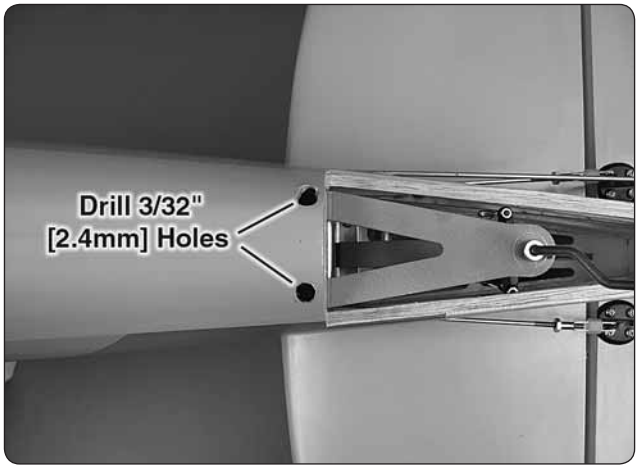


❏ 8. Now pull on the long end of the cable to reduce the size of the first loop. Slip the loop over one of the ball link balls on the steering arm. Tighten the loop until it is small enough to remain secure on the ball, yet may still be pried off. Squeeze the swage with pliers. Connect the other cable to the other ball link ball the same way.

❏ 9. Place the tail gear in the fuselage while simultaneously guiding the pull/pull cable through the white plastic guide tubes.

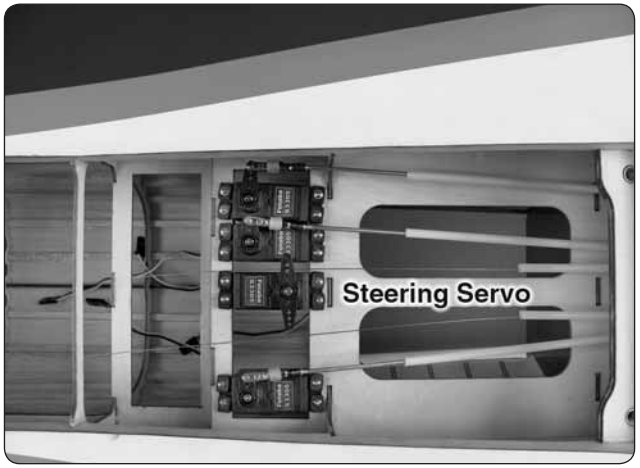


❏ 10. Use two #6 x ½" [13mm] sheet metal screws to attach the tail gear to the top rail. Remove the screws and use thin CA to harden the screw holes.

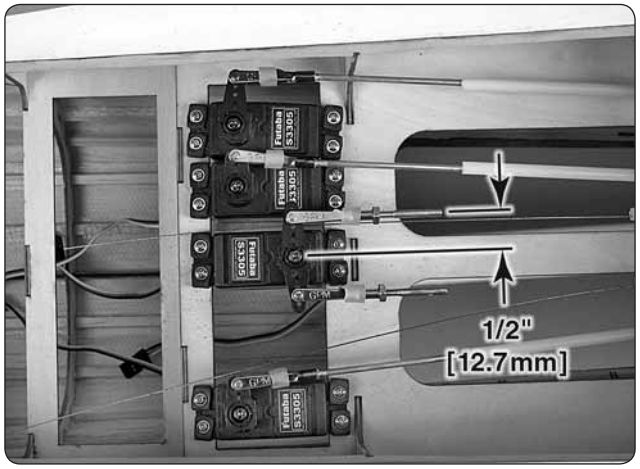


❏ 11. Drill two 3/32" [2.4mm] holes through the bottom rails for the tail gear. Mount the tail gear to the bottom rail with two #6 x ½" [13mm] sheet metal screws. Remove the screws and harden the screw holes with thin CA.

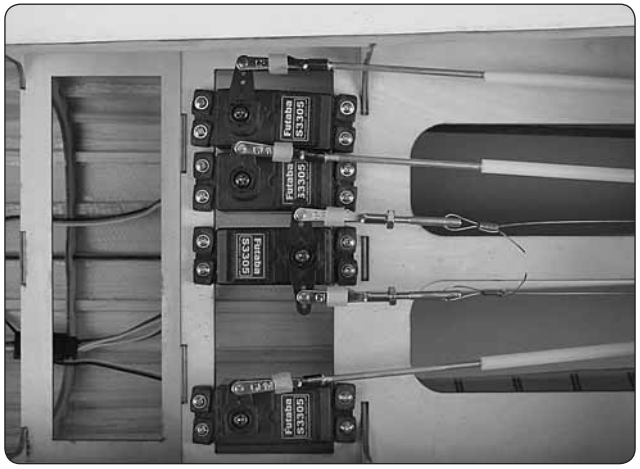
❏ 12. Rotate the tail gear back and forth. If the steering arm rubs on the stringers, use a hobby knife to trim the stringer.



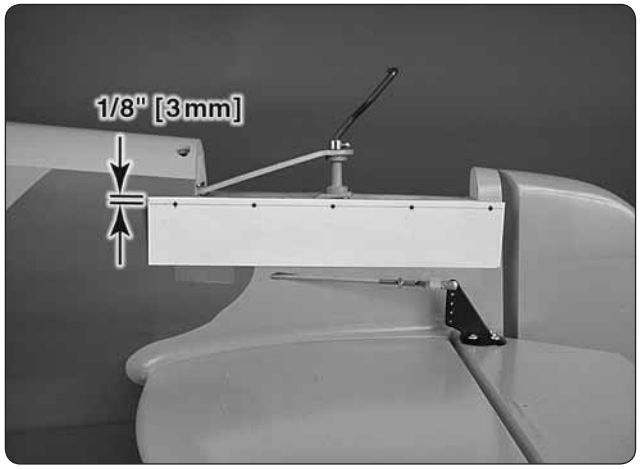
❏ 13. Install the tail wheel steering servo in the center of the servo tray. Remember to harden the screw holes with thin CA. Connect the rudder servo and steering servo to a Y-harness. Plug the Y-harness into the receiver.



❏ 14. Thread a 4-40 nut and a 4-40 metal clevis on to each of the 4-40 rigging couplers. Slide a silicone clevis retainer over each clevis. Install the clevises on the steering servo arm in the hole 1/2" [12.7mm] from the center of the servo arm.



❏ 15. Center the servo arm and the tail gear. Install a swage on each cable, route the cable through the 4-40 rigging coupler and secure the cable following the same procedure used on the tail gear. Use a pliers to crimp the swage tightly on the cable.

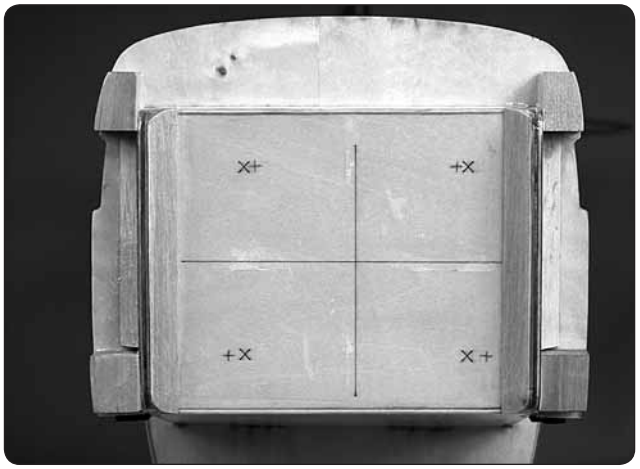


❏ 16. The tail gear cover can be permanently installed using CA glue or with screws. If CA glue is used it will be difficult to remove the cover and access the tail gear if needed. To install the cover with screws, tape a piece of paper to the fuselage, flush with the edge of the tail gear opening. Make five marks, evenly spaced, 1/8" [3mm] from the edge.

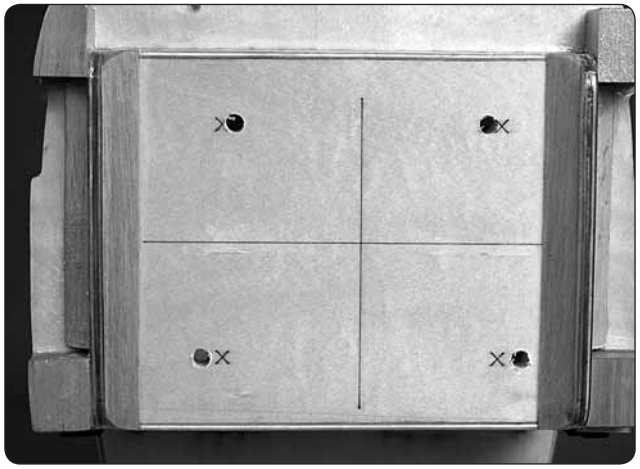
❏ 17. Center the tail gear cover over the opening and flush with the aft end of the fuselage. Tape it in place. Drill 1/16" [1.6mm] pilot holes through the cover and the fuselage at each mark. Remove the cover and enlarge the holes in the cover only with a 3/32" [2.4mm] drill bit. Attach the cover to the fuselage with #2 x 3/8" [9.5mm] sheet metal screws. Harden the screw holes with thin CA glue.

❏ 18. Slide a 3.5mm wheel collar followed by the tail wheel and a second wheel collar on the tail gear wire. Apply a drop of threadlocker to the threads of the 2.5 x 4mm machine screws. Secure the wheel collar on the tail gear wire with the machine screws. Make sure the screw in the outer wheel collar is tightened on the flat spot.

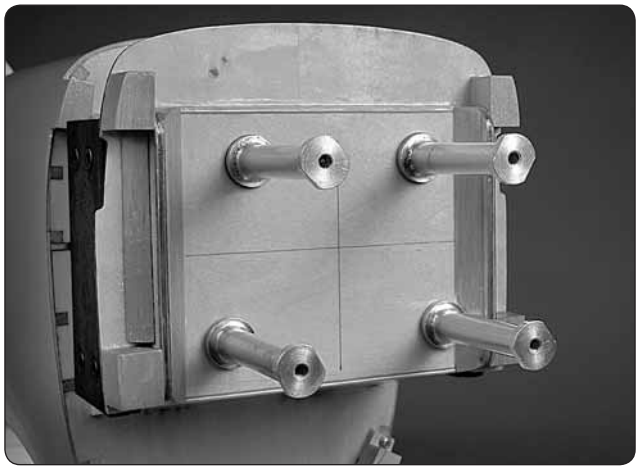
INSTALL THE ENGINE



❏ 1. The firewall has two sets of engine mounting bolt patterns embossed on it. The "+" are for the DLE-55 Rear Exhaust gas engine and the "X" are for the DA-50, DLE-55 Side Exhaust, and O.S. GT55 gas engines. If you are installing an engine with a different mounting bolt pattern the firewall also has crosshairs embossed on it to help locate the correct mounting location.

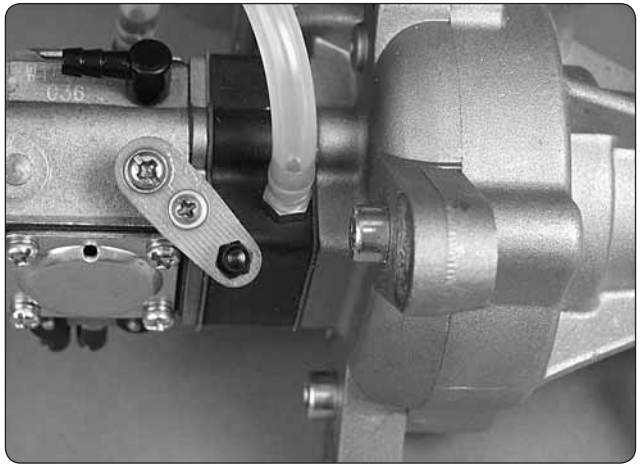


❏ 2. Drill a 13/64" [5mm] hole through the firewall at each of the appropriate locations marked with an "X" or "+".

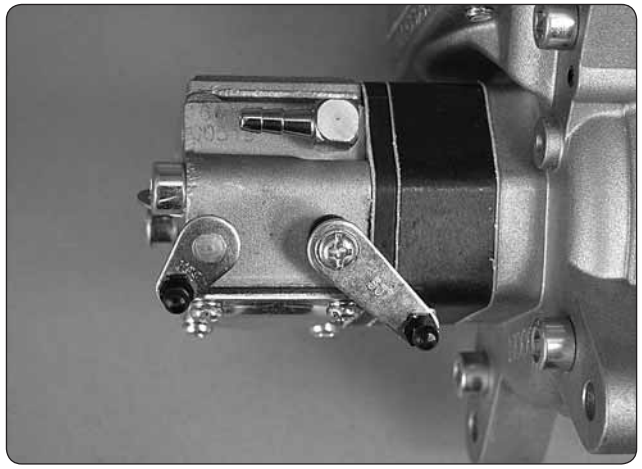


❏ 3. Insert four 10-32 x 1-1/2" [38mm] socket head cap screws, #10 lock washers and #10 Fender washers (not included) through the holes from the backside of the firewall. Apply a drop of threadlocker to the threads of each screw. Thread the engine standoffs onto the screws and tighten them against the firewall. For a reference, once the engine is installed, the front of the engine drive washer should be approximately 6-3/4" (171mm) from the front of the firewall.

❏ 4. If installing the DLE-55 Side Exhaust engine, install a 2-56 ball link ball on the throttle arm extension and secure it with a 2-56 nylon locknut. If installing the DLE-55 Rear Exhaust engine, install a 2-56 ball link ball on the throttle arm and secure it with a 2-56 nylon locknut.

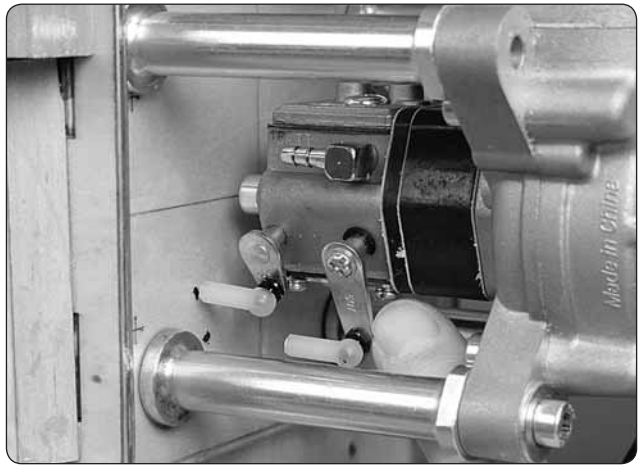


❏ 5. On the DLE-55 Side Exhaust engine, use the screw and nut supplied with the throttle arm extension. Attach the extension to the throttle arm. Again, use threadlocker on the threads.



❏ 6. Install a 2-56 ball link ball on the choke arm and secure it with a 2-56 nylon nut.

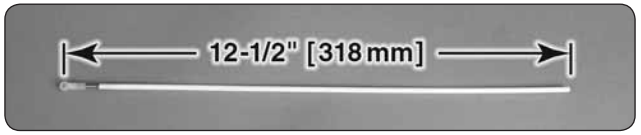
❏ 7. Temporarily install the engine inverted on the aluminum standoffs. Determine on which side of the fuselage the throttle and choke servos need to be installed.



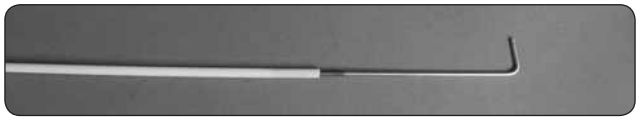
❏ 8. Snap a nylon ball socket onto both pivot balls. Center the choke and throttle arms and mark the firewall where the pushrods will need to pass through.

❏ 9. Drill a 3/16" [4.8mm] hole at the marks on the firewall for the throttle and choke pushrods. You may find it easier to remove the engine before drilling the holes. Cut two 11" [279mm] long outer pushrod tubes from the 36" [914mm] long outer pushrod tube. Use medium sandpaper to roughen the outer pushrod tubes. Clean the tubes with denatured alcohol and insert the tubes into the previously drilled holes in the firewall. Route the tube through the slot in the former until it is flush with the front of the firewall. Use thin CA to glue the tubes to the firewall.

❏ 10. Apply a drop of threadlocker to the engine mounting bolts. Reinstall the engine on the standoffs using the bolts and washers supplied with the engine.

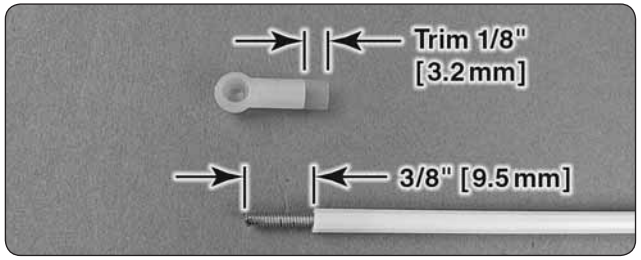


❏ 11. To make a throttle pushrod, thread a 2-56 x 1" [25mm] threaded rod approximately 3/8" [9mm] into the end of the white inner pushrod tube. Thread a nylon ball link socket onto the threaded rod. For the DLE engine, trim the throttle pushrod 12-1/2" [318mm] long.



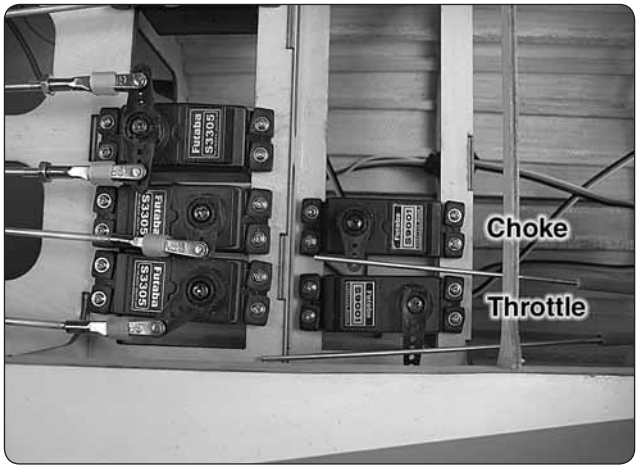
❏ 12. Make a ½" [12mm] long L-bend at the non-threaded end of the 2-56 x 6" [152mm] metal pushrod. Thread the other end ¾" [19mm] into the end of the throttle pushrod tube. The L-bend makes it easier to thread in.

❏ 13. Cut off the L-bend from the 2-56 x 6" [152mm] pushrod. Insert the throttle pushrod into the throttle outer pushrod tube. Attach the ball link socket to the ball link ball on the throttle arm.

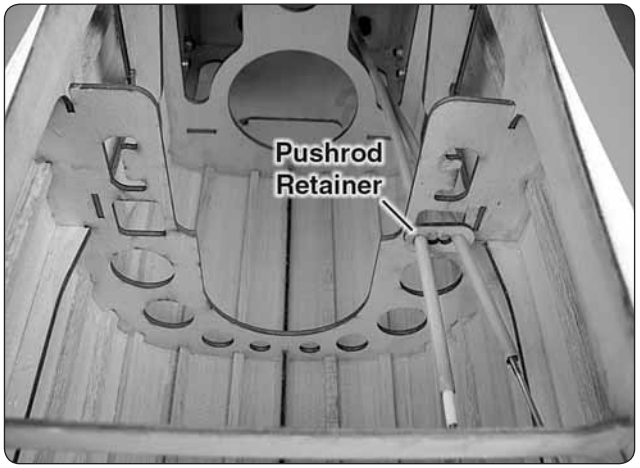


❏ 14. To make the choke pushrod, trim approximately 1/8" [3.2mm] from the end of the nylon ball socket before threading the 2-56 x 1" [25mm] threaded rod into the end. Also trim the threaded rod so that 3/8" [9.5mm] of the rod remains from the white inner pushrod tube. Trim the choke pushrod 12" [305mm] long.

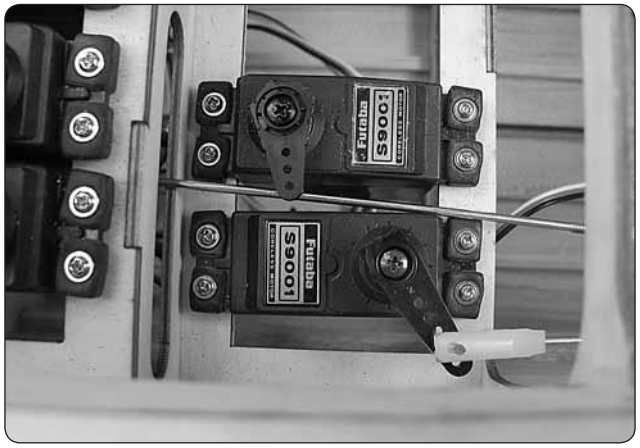
❏ 15. Make a ½" [12mm] long L-bend at the non-threaded end of the 2-56 x 6" [152mm] metal pushrod. Thread the other end ¾" [19mm] into the end of the choke pushrod tube. Cut off the L-bend from the 2-56 x 6" [152mm] pushrod. Insert the choke pushrod into the choke outer pushrod tube. Attach the ball link socket to the ball link ball on the choke arm.



❏ 16. Install the throttle and choke servos in the servo tray. Remove the screws and servos and harden the screw holes with thin CA.

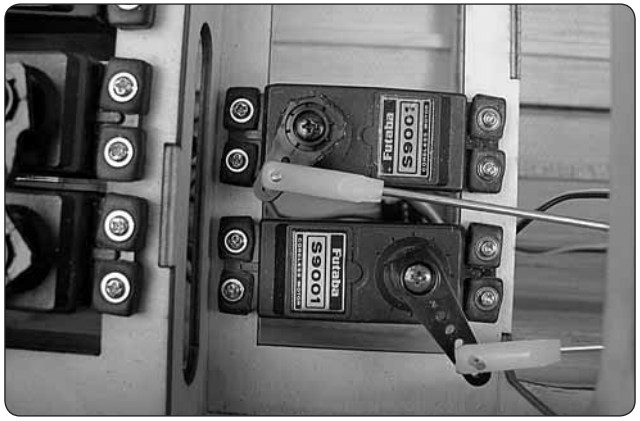


❏ 17. Slide a plywood pushrod retainer over the throttle and choke outer pushrod. Position the retainer against the former but do not glue it until the pushrods have been connected to the servos.

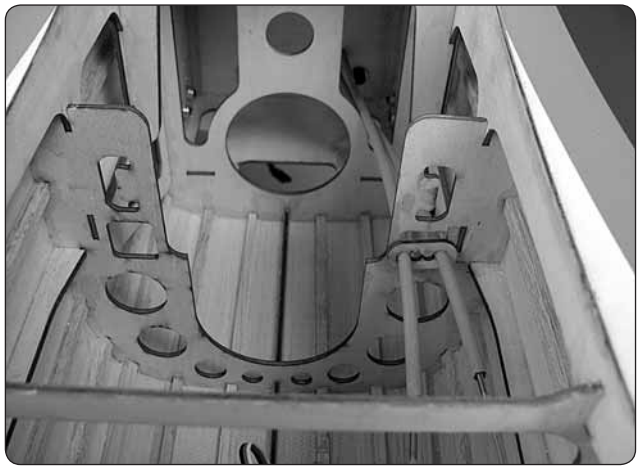


❏ 18. Plug the throttle and choke servo into the receiver. Position the throttle stick so that it is centered on the transmitter. Adjust the throttle servo arm so that it is centered on the throttle servo. Move the throttle arm on the carburetor so that the throttle is open approximately half way. Mark the throttle pushrod where it crosses the servo arm 5/8" [16mm] from the center of the servo. Make a 90 degree bend at the mark and secure the throttle pushrod to the servo arm with a nylon Faslink.

❏ 19. Now it should only require minor adjustments to the throttle endpoints on the transmitter so that the throttle opens and closes completely. Be sure to also set up a switch on your transmitter to close the throttle completely, stopping the engine.

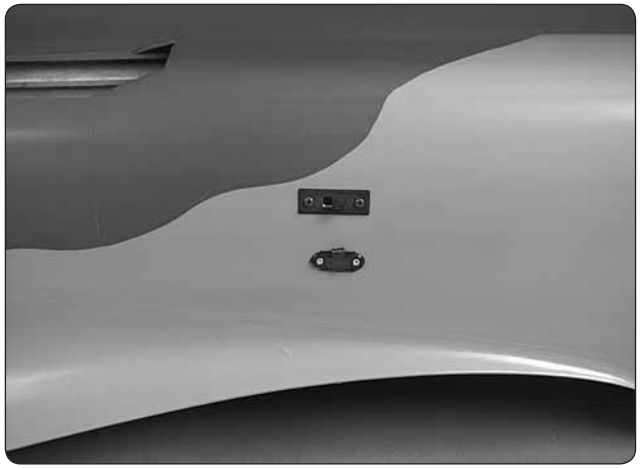


❏ 20. Install the servo operated choke following the same procedure. Mark and bend the choke pushrod where it crosses the servo arm 3/8" [9.5mm] from the center of the servo.

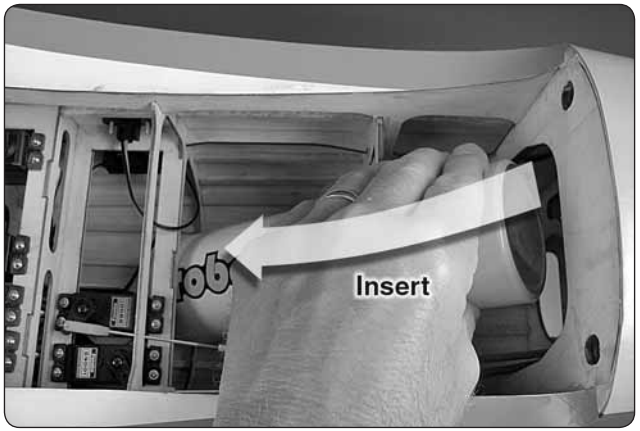


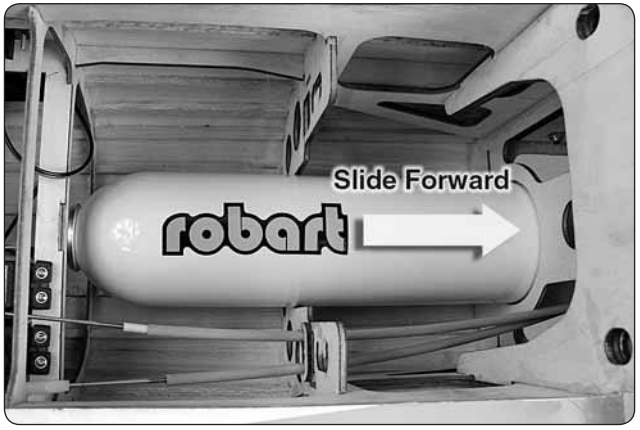
❏ 21. Glue the plywood pushrod retainer to the former.

INSTALL THE AIR RETRACT CONTROLS

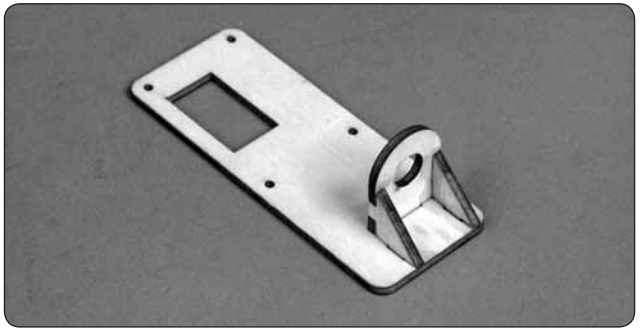


❏ 1. Install the receiver switch and charge receptacle. We installed ours on the opposite side from the throttle servo.

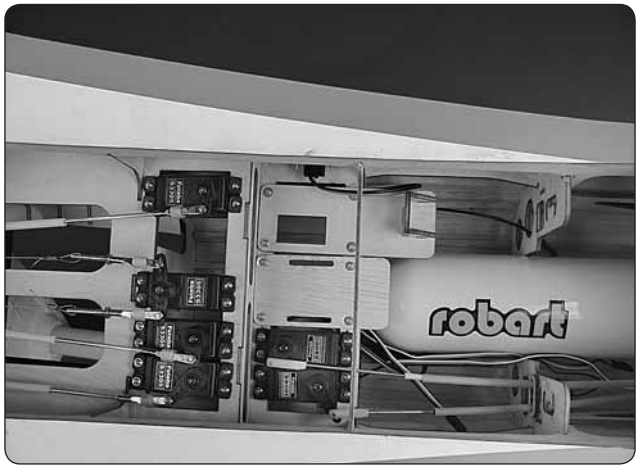




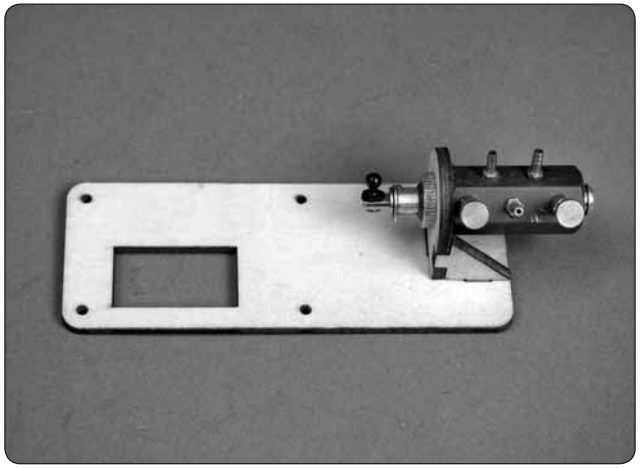
❏ 2. Attach a 12" [305mm] piece of pressure tubing to the front of the retract pressure tank. Use Shoe Goo or an RTV adhesive to glue the pressure tank in the fuselage. Note that the front of the tank is inserted under the throttle servo tray and then slide forward.



❏ 3. Glue the retract servo tray together as shown.

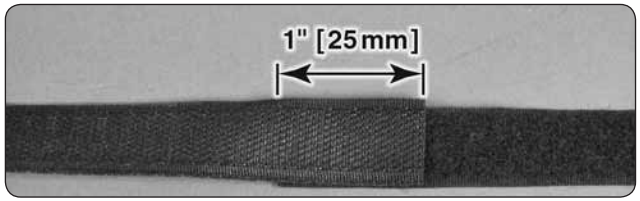


❏ 4. Test fit the retract servo tray and receiver tray in the fuselage. Drill a 1/16" [1.6mm] pilot hole in throttle servo tray, using the eight mounting holes as guides. Attach the retract servo tray and receiver tray with #2 x 3/8" [9.5mm] sheet metal screws and #2 washers. Remove the screws and the trays and harden the screw holes with thin CA.

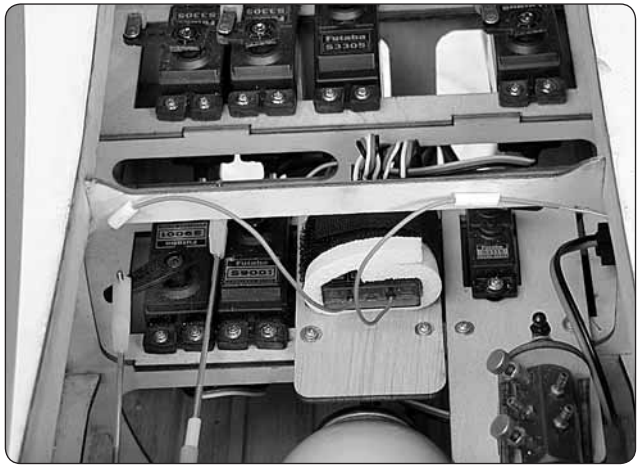


❏ 5. Install the retract control valve in the plywood mount. Install a .080 ball link ball and .080 nut on the valve. Be sure to use a drop of threadlocker on the threads of the ball link ball and the control valve mounting ring.

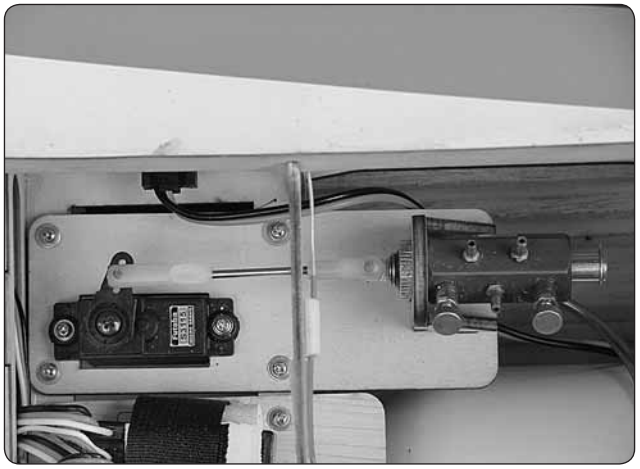
❏ 6. Reinstall the retract servo tray in the fuselage.



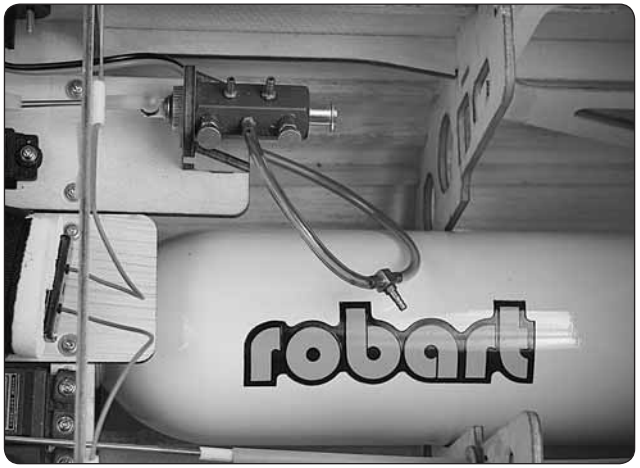
❏ 7. Wrap the receiver in foam and secure it to the servo tray with hook and loop material. To make the strap, overlap by 1" [25mm] the hook material with the loop material. Mount the receiver tray in the fuselage. Install the retract control valve servo in the retract servo tray and plug it into the receiver.



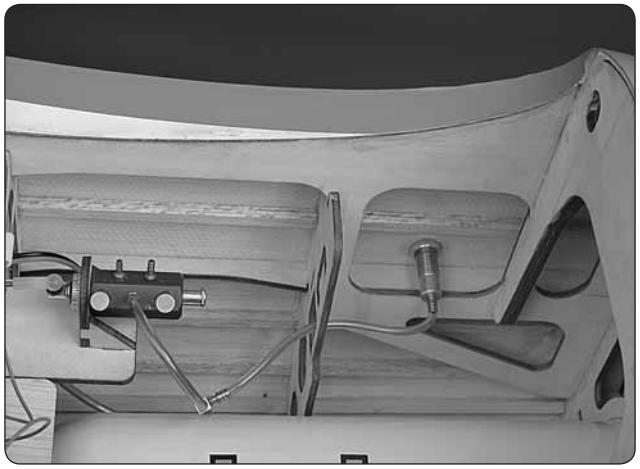
❏ 8. Glue short pieces of remaining white pushrod tubing to the former to support the antenna.



❏ 9. Cut off ½" [13mm] from the threaded end of the 2-56 x 6" [152mm] metal pushrod. Thread the nylon ball socket on the pushrod. Snap the ball socket onto the ball link ball on the retract control valve. Center the servo arm and mark the pushrod where it crosses the servo arm. Make a 90 degree bend at the mark. Install the pushrod in the servo arm and install a nylon Faslink. Cut the pushrod 1/8" [3mm] past the Faslink.



❏ 10. Connect a T-fitting to the air line from the pressure tank. Connect a second air line from the retract control valve to the T-fitting.

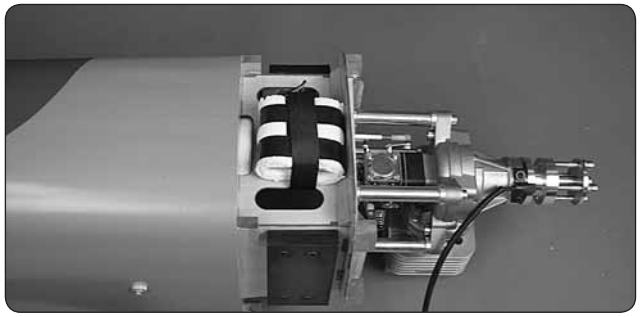


❏ 11. Install the air fill valve. Connect a third air line from the fill valve to the T-fitting.

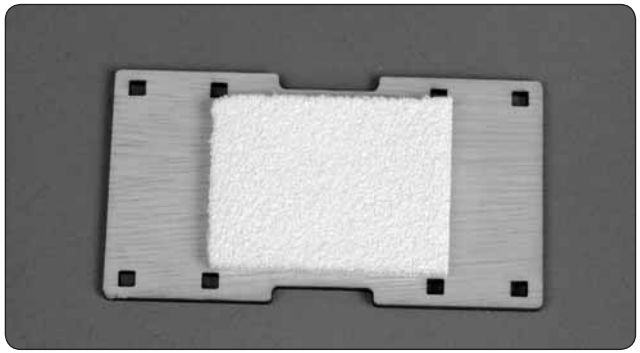
❏ 12. Connect an 8" [203mm] long red and purple air line to the air control valve. Install quick connects on the other end of the two air lines. Important: Check the wing as to which quick connect to install on which color air line. Use the retract instructions as a guide.

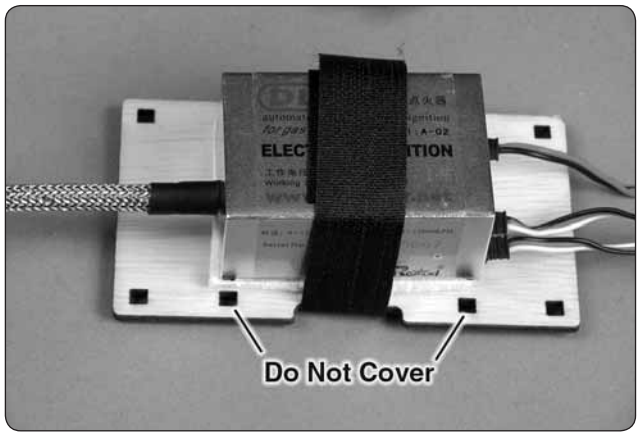
INSTALL THE IGNITION SYSTEM

❏ 1. Install the ignition battery switch and charge jack towards the front of the fuselage.

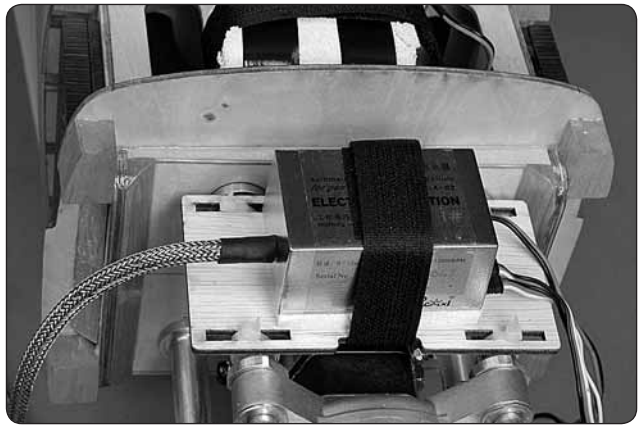


❏ 2. Wrap the ignition battery in foam rubber. Secure it to the top of the engine box with a hook and loop strap. Connect the plug from the ignition battery to the ignition switch. Secure the connection with a piece of heat shrink tubing.





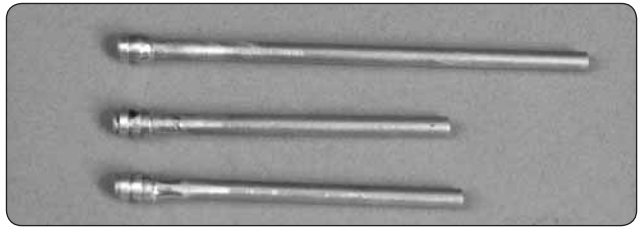
❏ 3. Place a piece of foam rubber on the plywood ignition module tray. Do not cover up the inner four holes. Place the ignition module on the foam rubber and secure it with a strap made from hook and loop material.



❏ 4. Attach the ignition module tray to the aluminum engine standoffs with four nylon tie straps.

❏ 5. Connect the ignition module to the ignition switch and the engine. Use shrink tubing to secure the connections.

ASSEMBLE AND INSTALL THE FUEL TANK

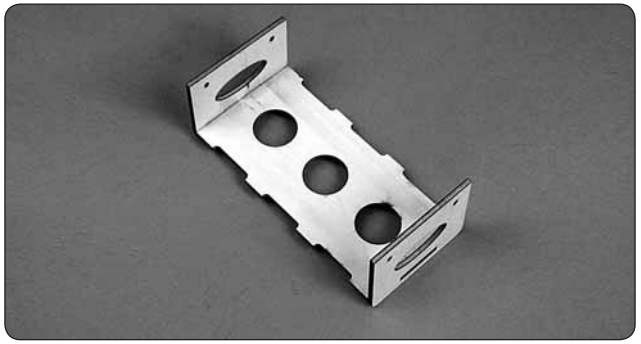


❏ 1. Assemble the fuel tank stopper assembly with the Tygon fuel tubes (not included) as shown. The easiest way is to first solder a fuel line barb (not included) onto one end of all three tubes. Insert the tubes into the stopper with the metal plates, and then solder a barb onto the other end of the two short tubes. Bend the vent tube and connect the pickup and fueling/defueling lines (not included) to the short tubes. Connect the clunks to the lines and secure the lines to the clunk and brass tubing with the small tie straps.

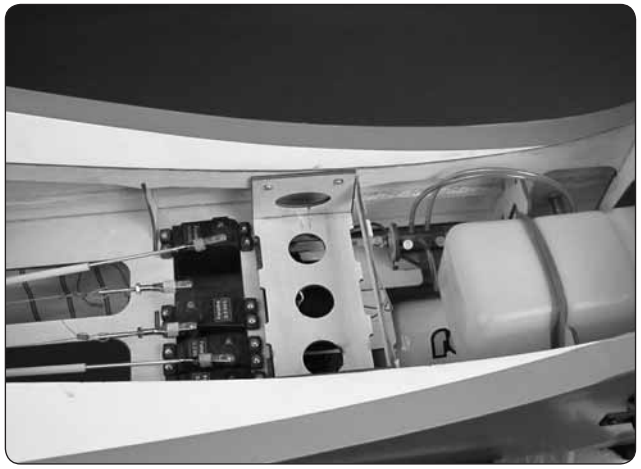
❏ 2. Install the fuel tank stopper assembly in the fuel tank. Check that the clunks move around freely in the fuel tank. Tighten the fuel tank stopper screw. Mark the top of the fuel tank (the side the vent tube is on).

❏ 3. Position the fuel tank in the fuselage and determine how you want to run the fuel line. Drill holes where necessary in the firewall for the line going to the carburetor, the fill line and the vent line. Install an aluminum fuel line plug in the fill line. Secure the fuel tank in the fuselage with the rubber bands.

INSTALL THE RECEIVER BATTERY



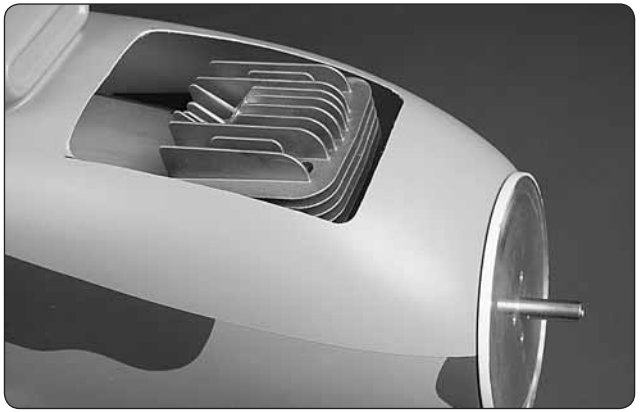
❏ 1. Glue the two plywood sides to the plywood receiver battery tray.



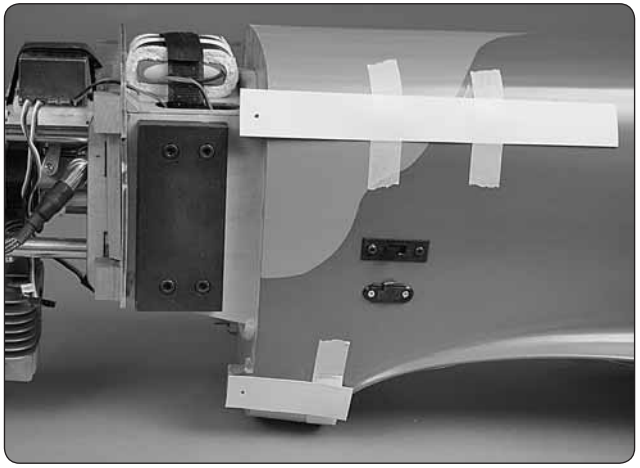
❏ 2. Position the receiver battery tray above the throttle servo and receiver tray. Drill four 1/16" [1.5mm] holes into the fuselage at the four screw hole locations. Use #2 x 3/8" [9.5mm] sheet metal screws and #2 flat washers to mount the receiver battery tray in the fuselage. Be sure to harden the screw holes with thin CA.

❏ 3. Wrap the receiver battery in R/C foam and secure it to the receiver battery tray with two hook and loop straps. Plug the receiver battery into the radio switch harness. Use heatshrink on the connection. Install the receiver battery in the fuselage.

INSTALL THE COWL



❏ 1. Test fit the cowl over the engine. The bottom of the cowl will need to be trimmed to fit over the engine head and the exhaust. Use the spinner to center the cowl.



❏ 2. Cut and tape pieces of paper or card stock to the side of the fuselage to mark the location of the center of the cowl mounting blocks. Position the cowl back on the fuselage. Mark and drill a 3/32" [2mm] pilot hole at each location.

❏ 3. Remove the cowl and enlarge the holes in the cowl to 1/8" [3mm].

❏ 4. Secure the cowl to the fuselage with eight #4 x ½" [12.5mm] sheet metal screws and #4 flat washers. Remove the screws and cowl. Use thin CA to harden the screw holes.

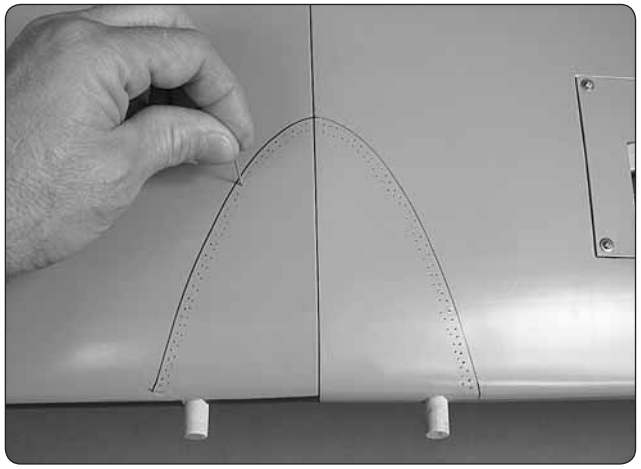
❏ 5. Use 320 grit sandpaper to sand the inside of the cowl at the eight screw hole locations. Also, sand one side of the eight aluminum discs. Clean the disc and the inside of the cowl with denatured alcohol.

❏ 6. Use 6-minute epoxy to glue the aluminum disc to the inside of the cowl, aligned with the mounting holes. A 4-40 x ½" [12.7mm] machine screw, #4 flat washer and 4-40 nut have been provided to hold the disc in position while the epoxy cures.

❏ 7. After the epoxy has cured, reinstall the cowl on the fuselage.

APPLY THE FINAL DETAILS

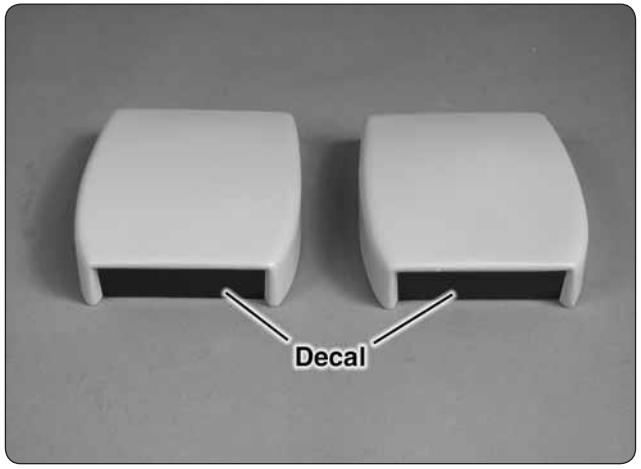
❏ 1. Position the aft air intake behind the cowl and slide the wing into position. Bolt the wing on the fuselage.



❏ 2. Mark the outline of the aft air intake on the bottom of the wing. Remove the wing and use a T-pin to poke holes inside the outline of the aft air intake.

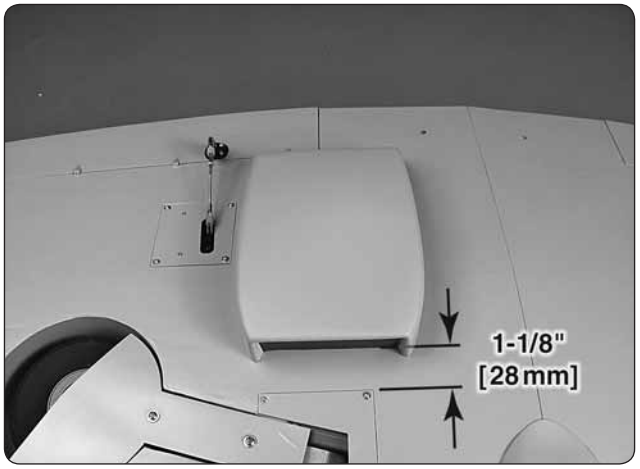
❏ 3. Wipe off the outline. Use sandpaper to roughen the bottom of the aft air intake. Clean the area with denatured alcohol.

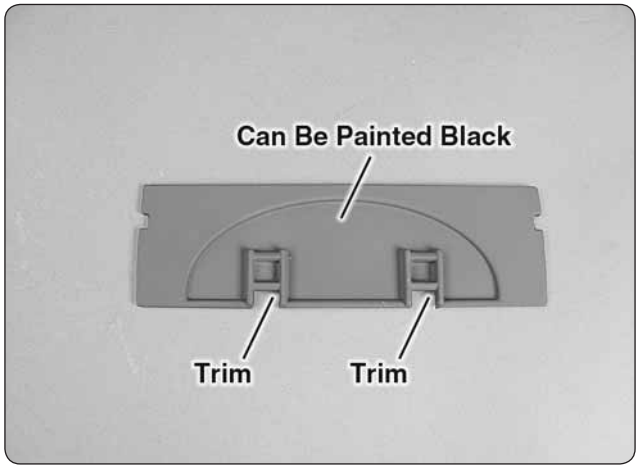
❏ 4. Use epoxy to glue the aft air intake to the bottom of the wing.

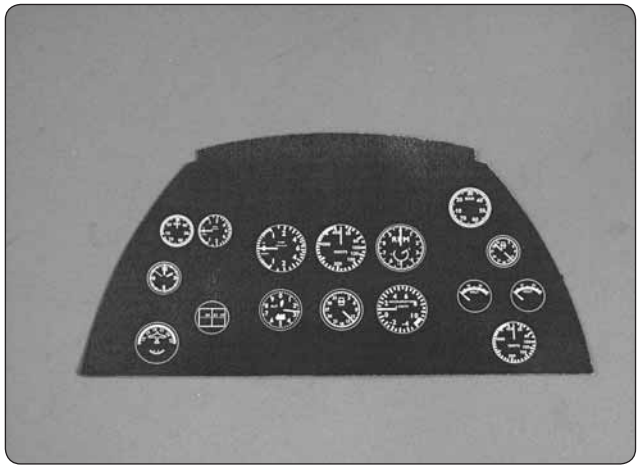


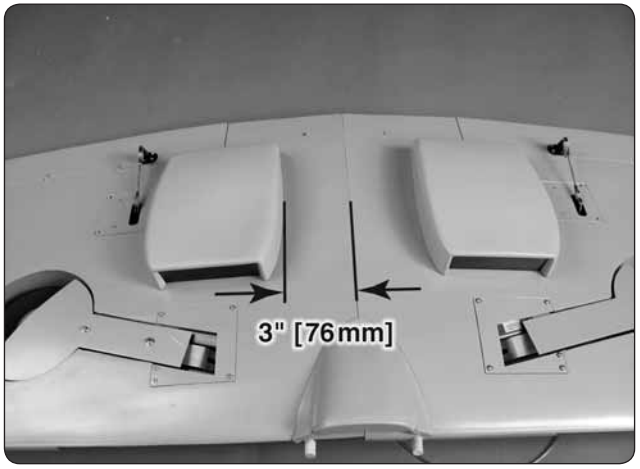
❏ 5. Apply the radiator intake decal on both radiators.

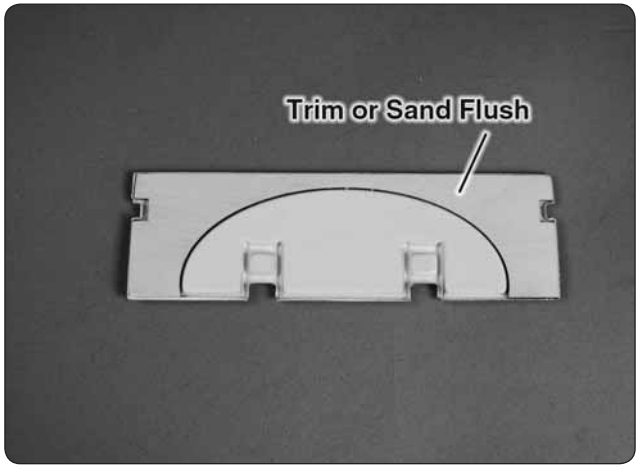
❏ 6. Sand the bottom of both radiators to roughen the surface. Clean the bottom of the radiators with denatured alcohol.

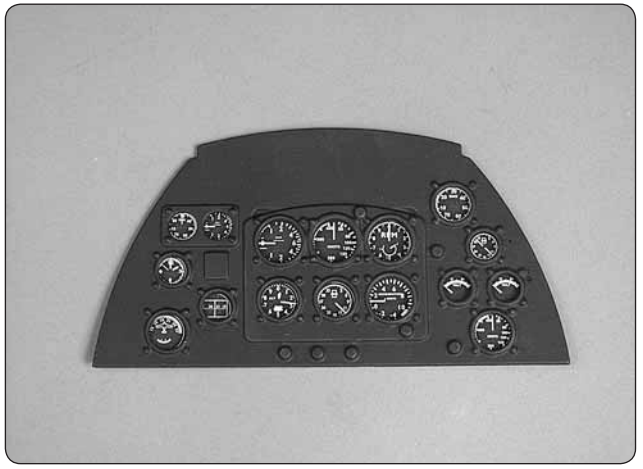








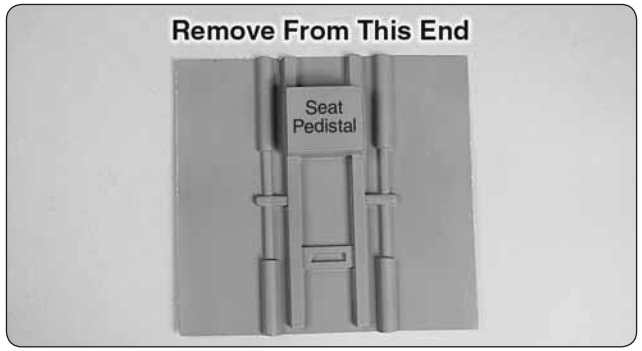




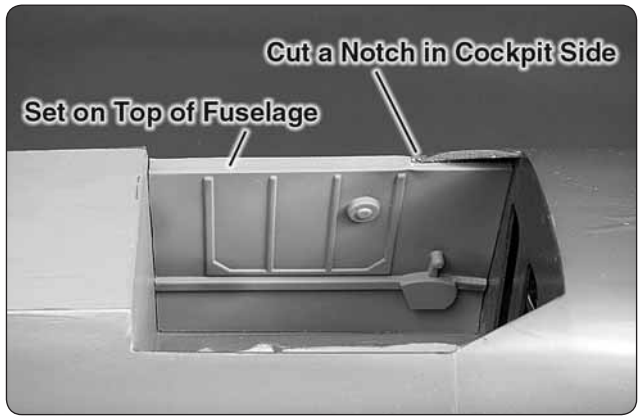
❏ 7. Position the radiators on the bottom of the wing, behind the retract and perpendicular to the root of the wing. Mark the location on the covering and use a T-pin to poke holes in the covering, inside the marks. Glue the radiators to the bottom of the wing with epoxy.

❏ 8. Glue the plywood rudder spacer to the back of the plastic rudder pedal. Trim the rudder pedal so that it is flush with the rudder spacer. A sanding bar can be used to sand the edges of the plastic rudder pedal flush with the spacer. For additional detail, the recessed area around the rudder pedals can be painted flat black.

❏ 9. Apply the instrument panel decal to the plywood instrument panel backplate. Glue the backplate behind the instrument panel, positioning the backplate so that the instrument dials line-up with the openings.



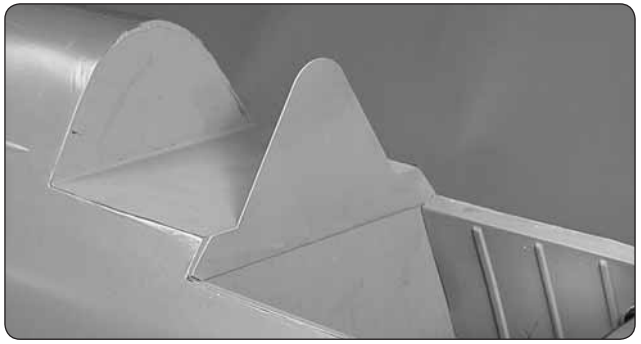
❑ 10. Trim the floor to fit. If the floor needs to be shortened, remove the excess from the aft end of the floor. If you plan on installing a pilot (not included) a scrap of wood should be glued inside the raised seat pedestal for additional support. Remove the floor.



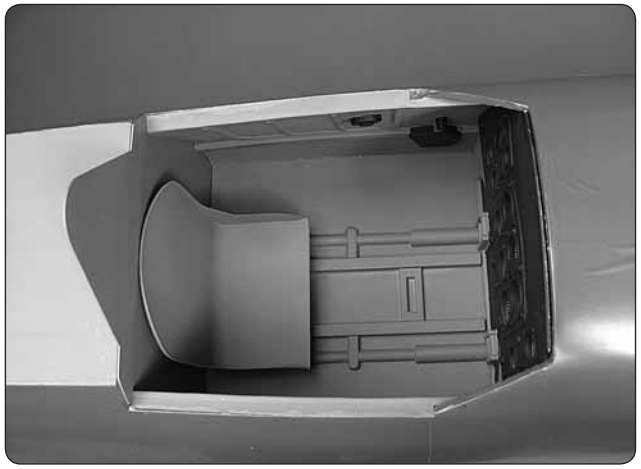
❑ 11. Trim the left cockpit side to fit. The top of the cockpit should set on the top of the fuselage side.

❑ 12. Trim the right cockpit side to fit. The top of the cockpit should set on the top of the fuselage side.

❑ 13. Trial fit all the cockpit parts in the fuselage before gluing. Insert the cockpit floor first. Then, insert the rudder pedal followed by the sides and finally the instrument panel. Make any adjustments needed. Then glue the parts in. Canopy glue works well. It allows time to position the parts and wipe off any excess glue.



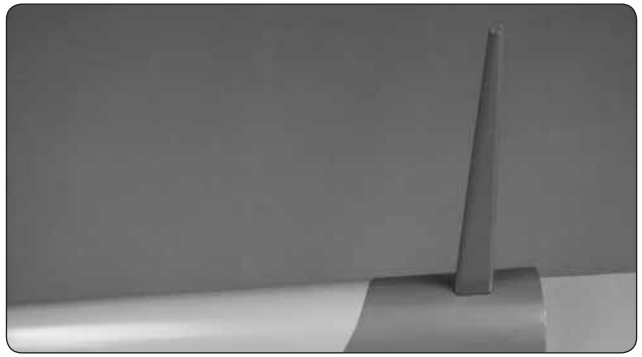
❑ 14. Center and glue the armored head rest to the back of the cockpit.



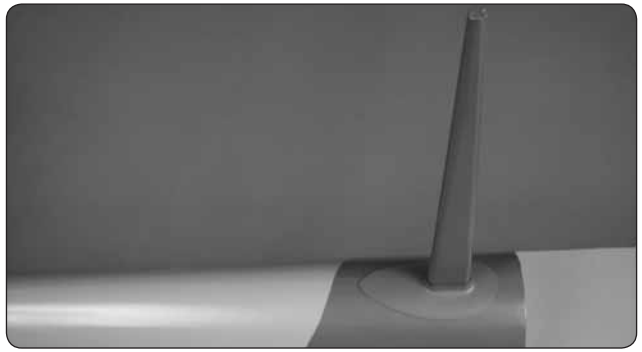
❑ 15. Sand the bottom center of the seat and the top of the seat pedestal. Clean the area with denatured alcohol and glue the seat to the pedestal.

❑ 16. If you are installing a full body pilot, now is a good time to install him before the control column is installed. Trim the control column. The handle can be painted flat black for a more scale appearance. Glue the control column in the slot in the floor.

❏ 17. Install the pilot bust (not included) in the cockpit. You will need to use a block to raise the pilot.

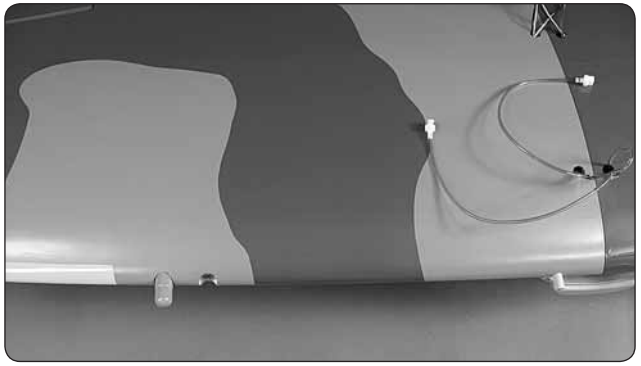


❏ 18. Insert the antenna mast into the slot in the top of the fuselage.

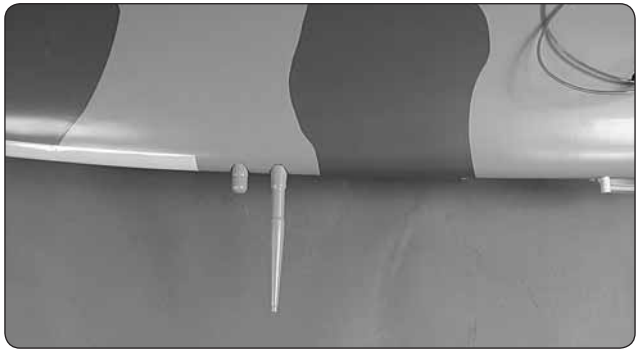


❏ 19. Glue the antenna mast cover to the fuselage. Do not glue the antenna mast. To prevent damage during transportation, the antenna mast is removable.

❏ 20. Wash the canopy in warm water. Then, dry it off. Place the canopy on the fuselage. Be certain it is centered from side-to-side and mark the outline on the fuselage. Use a T-pin to prick holes in the covering or trim and remove the covering, just inside the outline. Use canopy glue to attach the canopy on the fuselage.



❏ 21. Use epoxy to glue the two cannon muzzle covers on the leading edge of the wing.



❏ 22. Apply a drop of threadlocker to the threads of the cannons. Thread the cannons into the leading edge of the wing.

APPLY THE DECALS

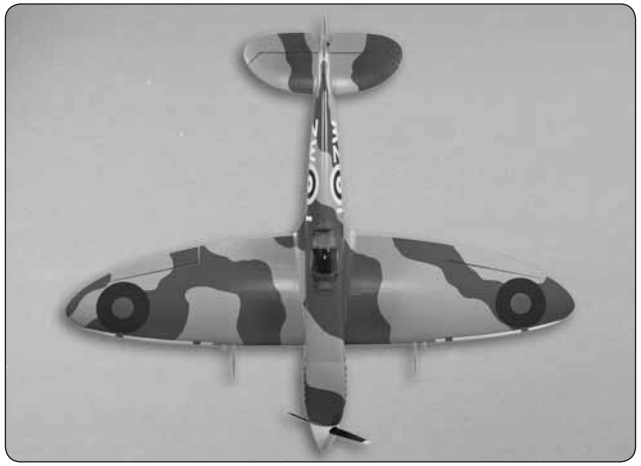
❏ 1. The decals are die-cut from the factory.

❏ 2. Be certain the model is clean and free from oily fingerprints and dust. Prepare a dishpan or small bucket with a mixture of liquid dish soap and warm water—about 1/2 teaspoon of soap per gallon of water. Submerse one of the decals in the solution and peel off the paper backing. **Note:** Even though the decals have a "sticky-back" and are not the water transfer type, submersing them in soap & water allows accurate positioning and reduces air bubbles underneath.

❏ 3. Position decal on the model where desired. Holding the decal down, use a paper towel to wipe most of the water away.

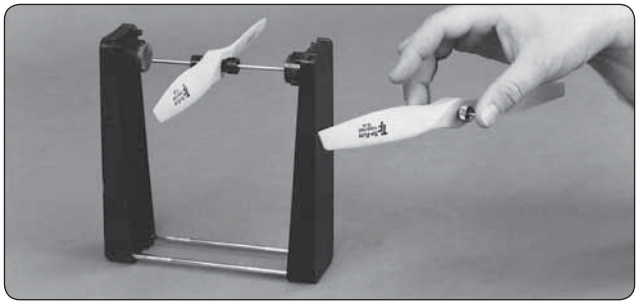
❏ 4. Use a piece of soft balsa or something similar to squeegee remaining water from under the decal. Apply the rest of the decals the same way.

Please use the following pictures and box top as a guide for the decal placement.



GET THE MODEL READY TO FLY

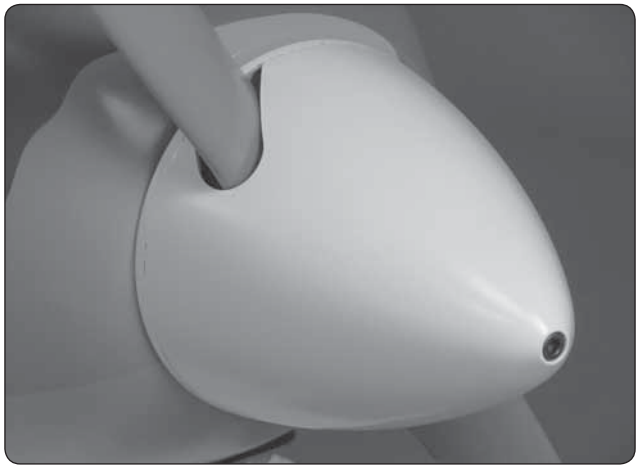
INSTALL THE PROPELLER



❏ 1. Carefully balance the propeller and any spare propellers. An unbalanced propeller can be the single most significant cause of vibration that can damage the model. Not only will engine mounting bolts loosen, possibly with disastrous effect, but vibration may also damage the receiver and receiver batteries. Vibration can also cause the fuel to foam, which will, in turn, cause the engine to run hot and quit.

We use a Top Flite Precision Magnetic Prop Balancer (TOPQ5700) in the workshop and keep a Great Planes Fingertip Prop Balancer (GPMQ5000) in our flight box.

❏ 2. The included aluminum spinner was designed to be used with the DA-50, DLE-55, DLE-55 Rear Exhaust, O.S. GT55 and GT60 gas engines. Use a drill guide to drill the bolt holes through the propeller, slide the spinner backplate, propeller and prop washer on the engine prop shaft and install the prop bolts.



❏ 3. Install the spinner cone on the engine using a M5 x 100mm socket head cap screw. Use a drop of threadlocker on the threads.

BALANCE THE MODEL LATERALLY

❏ 1. With the wing level, have an assistant help you lift the model by the engine propeller shaft and the bottom of the fuse under the TE of the fin. Do this several times.

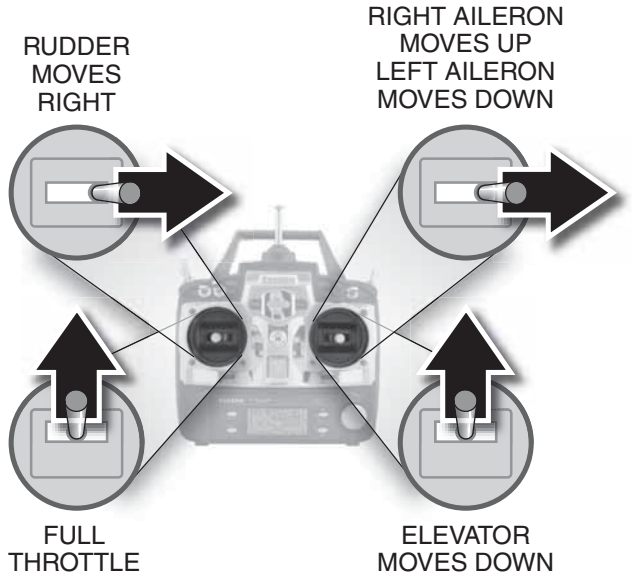
❏ 2. If one wing always drops when you lift the model, it means that side is heavy. Balance the airplane by adding weight to the other wing tip. **An airplane that has been laterally balanced will track better in loops and other maneuvers.**

CHECK THE CONTROL DIRECTIONS

❏ 1. Switch on the transmitter and receiver and center the trims. If necessary, remove the servo arms from the servos and reposition them so they are centered. Reinstall the screws that hold on the servo arms.

❏ 2. With the transmitter and receiver still on, check all the control surfaces to see if they are centered. If necessary, adjust the clevises on the pushrods to center the control surfaces.

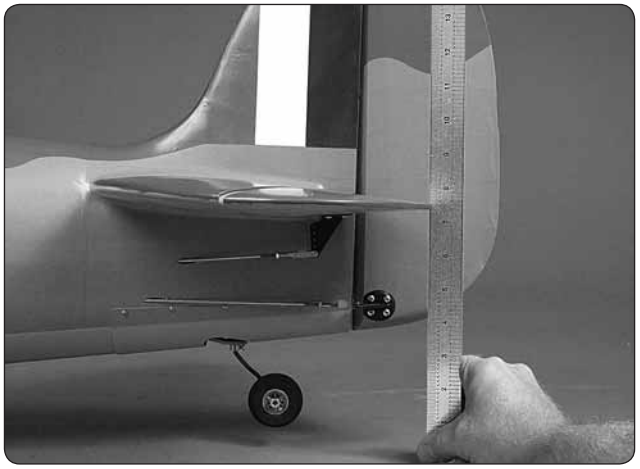
4-CHANNEL RADIO SETUP (STANDARD MODE 2)



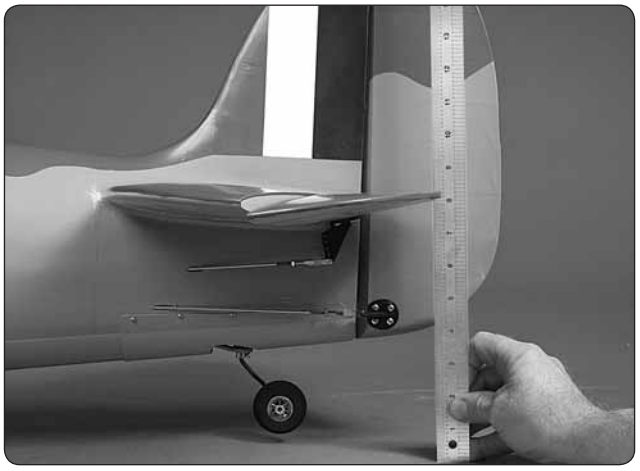
❏ 3. Make certain that the control surfaces and the carburetor respond in the correct direction as shown in the diagram. If any of the controls respond in the wrong direction, use the servo reversing in the transmitter to reverse the servos connected to those controls. Be certain the control surfaces have remained centered. Adjust if necessary.

SET THE CONTROL THROWS

To ensure a successful first flight, set up your Giant Spitfire ARF according to the control throws specified in this manual. The throws have been determined through actual flight testing and accurate record-keeping, allowing the model to perform in the manner in which it was intended. If, after you have become accustomed to the way the Giant Spitfire ARF flies, you would like to change the throws to suit your taste, that is fine. However, too much control throw could make the model too responsive and difficult to control, so remember, “more is not always better.”



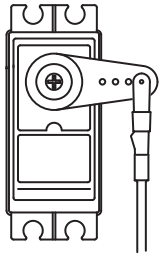
❏ 1. Use a box or something similar to prop up the bottom of the fuselage so the horizontal stabilizer and wing will be level. Hold a ruler vertically on your workbench against the widest part (front to back) of the trailing edge of the elevator. Note the measurement on the ruler.



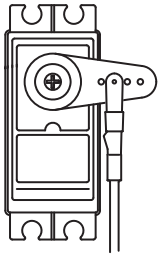
❏ 2. Measure the high rate elevator throw first. Move the elevator up with your transmitter and move the ruler forward so it will remain contacting the trailing edge. The distance the elevator moves up from center is the "up" elevator throw. Measure the down elevator throw the same way.

At the Servos

The pushrod farther out means **More Throw**

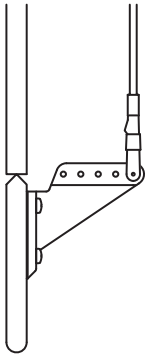


The pushrod closer in means **Less Throw**

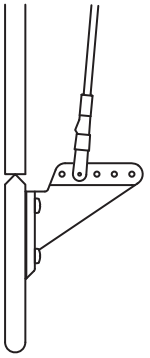


At the Control Surfaces

The pushrod farther out means **Less Throw**



The pushrod closer in means **More Throw**



❏ 3. If necessary, adjust the location of the pushrod on the servo arm or on the elevator horn, or program the ATVs in your transmitter to increase or decrease the throw according to the measurements in the control throws chart.

❏ 4. Measure and set the **low rate** elevator throws and the high and low rate throws for the rest of the control surfaces the same way.

If your radio does not have dual rates, we recommend setting the throws at the high rate settings.

NOTE: The throws are measured at the **widest part** of the elevators, rudder and ailerons.

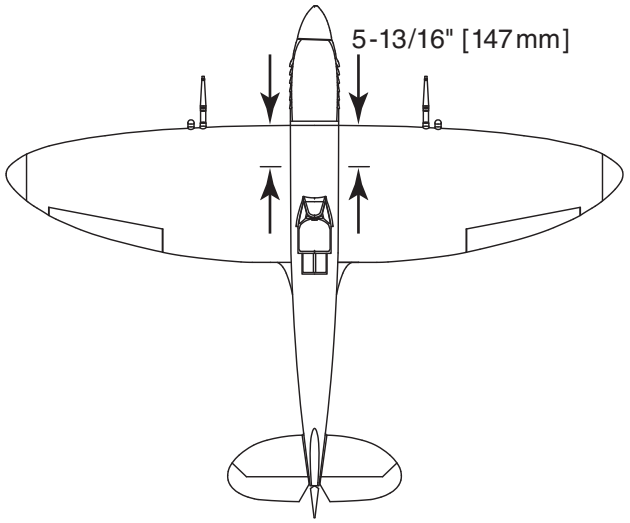
These are the recommended control surface throws:

	LOW RATE		HIGH RATE	
ELEVATOR	**Up**	**Down**	**Up**	**Down**
	7/16" [11mm] 7°	7/16" [11mm] 7°	9/16" [14mm] 9°	9/16" [14mm] 9°
RUDDER	**Right**	**Left**	**Right**	**Left**
	1-1/4" [32mm] 17°	1-1/4" [32mm] 17°	1-5/8" [41mm] 22°	1-5/8" [41mm] 22°
AILERONS	**Up**	**Down**	**Up**	**Down**
	1/2" [13mm] 10°	1/2" [13mm] 10°	7/8" [22mm] 17°	7/8" [22mm] 17°
FLAPS		2" [51mm] 43°		

BALANCE THE MODEL (C.G.)

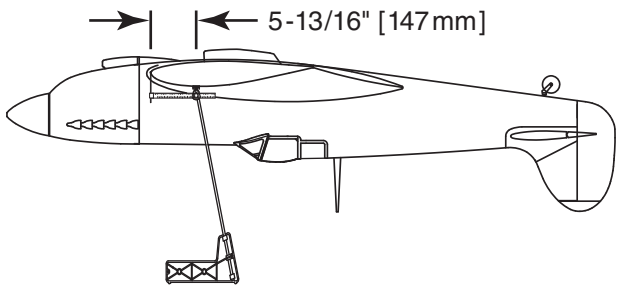
More than any other factor, the C.G. (center of gravity/balance point) can have the greatest effect on how a model flies and could determine whether or not your first flight will be successful. If you value your model and wish to enjoy it for many flights, **DO NOT OVERLOOK THIS IMPORTANT PROCEDURE.** A model that is not properly balanced may be unstable and possibly unflyable.

At this stage the model should be in ready-to-fly condition with **all** of the components in place including the complete radio system, engine, muffler, propeller, spinner and pilot. The fuel tank should be empty.



❏ 1. If using a Great Planes C.G. Machine, set the rulers to 5-13/16" [147mm]. If not using a C.G. Machine, use a fine-point felt tip pen to mark lines on the top of wing on both sides of the fuselage 5-13/16" [147mm] back from the leading edge. Apply narrow (1/16" [2mm]) strips of tape over the lines so you will be able to feel them when lifting the model with your fingers.

This is where your model should balance for the first flights. Later, you may experiment by shifting the C.G. 7/16" [10mm] forward or 7/16" [10mm] back to change the flying characteristics. Moving the C.G. forward will improve the smoothness and stability, but the model will then be less aerobatic (which may be fine for less-experienced pilots). Moving the C.G. aft makes the model more maneuverable and aerobatic for experienced pilots. In any case, **start at the recommended balance point** and do not at any time balance the model outside the specified range.



❏ 2. With the wing attached to the fuselage, all parts of the model installed (ready to fly) and an empty fuel tank, place the model upside-down on a Great Planes CG Machine, or lift it upside-down at the balance point you marked.

❏ 3. If the tail drops, the model is "tail heavy." If the nose drops, the model is "nose heavy." Use Great Planes "stick-on" lead (GPMQ4485) to balance the plane. To find out how much weight is required, place incrementally increasing amounts of weight on the bottom of the fuselage over the location where it would be mounted inside until the model balances. A good place to add stick-on nose weight is to the firewall. Do not attach weight to the cowl—this will cause stress on the cowl and could cause the cowl to crack at the screw holes. **Note:** The manufacturer has already installed some weight on the firewall. If the plane is nose heavy, start by removing some of the pre-installed nose weight before adding tail weight. Once you have determined if additional weight needs to be installed, it can be permanently attached.

Do not rely upon the adhesive on the back of the lead weight to permanently hold it in place. Over time, fuel, vibration and exhaust residue may soften the adhesive and cause the weight to fall off. Instead, permanently attach the weight with glue or screws.

Note: It is highly recommended that with gas powered planes the ignition system and all its components be separated from the radio system components by at least 10"[254mm] to prevent ignition noise from interfering with the radio system. If the plane is tail heavy, do not move the receiver battery forward closer to the ignition system. If the plane is nose heavy, do not move the ignition battery aft closer to the receiver.

❏ 4. **IMPORTANT:** If you found it necessary to add any weight, recheck the C.G. after the weight has been installed.

CHECK LIST

During the last few moments of preparation your mind may be elsewhere anticipating the excitement of the first flight. Because of this, you may be more likely to overlook certain checks and procedures that should be performed before the model is flown. To help avoid this, a check list is provided to make sure these important areas are not overlooked. Many are covered in the instruction manual, so where appropriate, refer to the manual for complete instructions. Be sure to check the items off as they are completed (that's why it's called a *check list!*).

❏ 1. Fuelproof all areas exposed to fuel or exhaust residue.

❏ 2. Check the C.G. according to the measurements provided in the manual.

❏ 3. Be certain the battery and receiver are securely mounted in the fuse. Simply stuffing them into place with foam rubber is not sufficient.

❏ 4. If you still fly on 72MHz, extend your receiver antenna and make sure it has a strain relief inside the fuselage to keep tension off the solder joint inside the receiver.

❏ 5. Balance your model *laterally* as explained in the instructions.

❏ 6. Use threadlocking compound to secure critical fasteners such as the set screws that hold the wheel axles to the struts, screws that hold the carburetor arm (if applicable), engine bolts, etc.

❏ 7. Add a drop of oil to the axles so the wheels will turn freely.

❏ 8. Between flights, give the control surfaces a quick tug to make sure all hinges are **securely** glued in place.

❏ 9. Reinforce holes for wood screws with thin CA where appropriate (servo mounting screws, aileron hatches, etc.).

❏ 10. Confirm that all controls operate in the correct direction and the throws are set up according to the manual. Checking the direction should be performed before every flight. With computer radios it is easy to mistakenly change the model.

❏ 11. Make sure there are silicone retainers on all the clevises and that all servo arms are secured to the servos with the screws included with your radio.

❏ 12. Secure connections between servo wires and Y-connectors or servo extensions, and the connection between your battery pack and the on/off switch with vinyl tape, heat shrink tubing or special clips suitable for that purpose.

❏ 13. Make sure any servo extension cords and air lines you may have used do not interfere with other systems (servo arms, pushrods, etc.).

❏ 14. Make sure the fuel lines are connected and are not kinked.

❏ 15. Balance your propeller (and spare propellers).

❏ 16. Check that the spinner bolt is tight.

❏ 17. Place your name, address, AMA number and telephone number on or inside your model. This is an AMA rule.

❏ 18. Cycle your receiver and ignition battery pack (if necessary) and make sure it is fully charged.

❏ 19. If you wish to photograph your model, do so before your first flight.

❏ 20. Range check your radio when you get to the flying field. Have and assistant hold the plane while running the engine at different throttle settings.

PREFLIGHT

IDENTIFY YOUR MODEL

No matter if you fly at an AMA sanctioned R/C club site or if you fly somewhere on your own, you should always have your name, address, telephone number and AMA number on or inside your model. It is **required** at all AMA R/C club flying sites and AMA sanctioned flying events. Fill out the identification tag on page 33 and place it on or inside your model.

CHARGE THE BATTERIES

Follow the battery charging instructions that came with your radio control system to charge the batteries. You should always charge your transmitter and receiver batteries the night before you go flying, and at other times as recommended by the radio manufacturer.

CAUTION: Unless the instructions that came with your radio system state differently, the **initial** charge on **new** transmitter and receiver batteries should be done for 15 hours **using the slow-charger that came with the radio system**. This will "condition" the batteries so that the next charge may be done using the fast-charger of your choice. If the initial charge is done with a fast-charger the batteries may not reach their full capacity and you may be flying with batteries that are only partially charged.

GROUND CHECK AND RANGE CHECK

Run the engine for a few minutes to make sure it idles reliably, transitions smoothly and maintains full power indefinitely. Afterward, shut the engine off and inspect the model closely, making sure all fasteners, pushrods and connections have remained tight and the hinges are secure. Always ground check the operational range of your radio before the first flight of the day following the manufacturer's instructions that came with your radio. This should be done once with the engine off and once with the engine running at various speeds. If the control surfaces do not respond correctly, **do not fly!** Find and correct the problem first. Look for loose servo connections or broken wires, corroded wires on old servo connectors, poor solder joints in your battery pack or a defective cell, or a damaged receiver crystal from a previous crash.

ENGINE SAFETY PRECAUTIONS

Failure to follow these safety precautions may result in severe injury to yourself and others.

Keep all engine fuel in a safe place, away from high heat, sparks or flames, as fuel is very flammable. Do not smoke near the engine or fuel; and remember that engine exhaust gives off a great deal of deadly carbon monoxide. Therefore **do not run the engine in a closed room or garage**.

Get help from an experienced pilot when learning to operate engines.

Use safety glasses when starting or running engines.

Use a "chicken stick" or electric starter to start the engine. If you do flip the propeller with your fingers, wear a heavy leather glove, such as a welders glove. When hand starting gas engines, if the engine should backfire, the large prop can cause severe injury to your hand and fingers.

Do not run the engine in an area of loose gravel or sand; the propeller may throw such material in your face or eyes.

Keep your face and body as well as all spectators away from the plane of rotation of the propeller as you start and run the engine.

Keep these items away from the prop: loose clothing, shirt sleeves, ties, scarfs, long hair or loose objects such as pencils or screwdrivers that may fall out of shirt or jacket pockets into the prop.

Stop the engine before making any engine adjustments.

The engine and muffler get hot! Do not touch them during or right after operation. Make sure fuel lines are in good condition so fuel will not leak onto a hot engine, causing a fire.

To stop a gasoline powered engine an on/off switch must be connected to the engine ignition. Do not throw anything into the propeller of a running engine.

AMA SAFETY CODE

Read and abide by the following excerpts from the Academy of Model Aeronautics Safety Code. For the complete Safety Code refer to *Model Aviation* magazine, the AMA web site or the Code that came with your AMA license.

GENERAL

1) I will not fly my model aircraft in sanctioned events, air shows, or model flying demonstrations until it has been proven to be airworthy by having been previously, successfully flight tested.

2) I will not fly my model aircraft higher than approximately 400 feet within 3 miles of an airport without notifying the airport operator. I will give right-of-way and avoid flying in the proximity of full-scale aircraft. Where necessary, an observer shall be utilized to supervise flying to avoid having models fly in the proximity of full-scale aircraft.

3) Where established, I will abide by the safety rules for the flying site I use, and I will not willfully and deliberately fly my models in a careless, reckless and/or dangerous manner.

5) I will not fly my model unless it is identified with my name and address or AMA number, on or in the model. Note: This does not apply to models while being flown indoors.

7) I will not operate models with pyrotechnics (any device that explodes, burns, or propels a projectile of any kind).

RADIO CONTROL

1) I will have completed a successful radio equipment ground check before the first flight of a new or repaired model.

2) I will not fly my model aircraft in the presence of spectators until I become a qualified flier, unless assisted by an experienced helper.

3) At all flying sites a straight or curved line(s) must be established in front of which all flying takes place with the other side for spectators. Only personnel involved with flying the aircraft are allowed at or in the front of the flight line. Intentional flying behind the flight line is prohibited.

4) I will operate my model using only radio control frequencies currently allowed by the Federal Communications Commission.

5) **I will not knowingly operate my model within three miles of any pre-existing flying site except in accordance with the frequency sharing agreement listed** [in the complete AMA Safety Code].

9) Under no circumstances may a pilot or other person touch a powered model in flight; **nor should any part of the model other than the landing gear, intentionally touch the ground, except while landing.**

Since the Giant Spitfire ARF qualifies as a "giant scale' model and is therefore eligible to fly in IMAA events, we've printed excerpts from the IMAA Safety Code which follows.

IMAA SAFETY CODE (excerpts)

Definition: For the purpose of the following IMAA Safety Code, the term Giant Scale shall refer to radio controlled model aircraft, either scale or non-scale, which have a wingspan of 80 inches [2032mm] or more for monoplanes and 60 inches [1524mm] or more for multi-winged model aircraft and have a ramp weight (fueled and ready to fly) of 55lbs. [24.75kg.] or less.

Section 1.0: Safety Standard

1.1 Adherence to Code: This safety code is to be strictly followed.

1.2 The most current AMA Safety Code in effect is to be observed. However, the competition sections of the code may be disregarded.

Section 3.0 Safety Check

3.4 Flight Testing: All Giant Scale R/C aircraft are to have been flight tested and flight trimmed with a minimum of six flights before the model is allowed to fly at an IMAA Sanctioned event.

3.5 Proof of Flight: The completing and signing of the Declaration section of the Safety Inspection form by the pilot (or owner) shall document as fact that each aircraft has been successfully flight-tested and proven airworthy prior to an IMAA event.

Section 5.0: Emergency Engine Shut Off (Kill Switch)

5.1 All magneto spark ignition engines must have a coil grounding switch on the aircraft to stop the engine. This will also prevent accidental starting of the engine. This switch shall be readily available to both pilot and helper. This switch is to be operated manually and without the use of the radio system.

5.2 Engine with battery power ignition systems must have a switch to turn off the power from the battery pack to disable the engine from firing. This will also prevent accidental starting of the engine. This switch shall be readily available to both pilot and helper. This switch shall be operated manually and without the use of the radio system.

5.3 There must also be a means to stop the engine from the transmitter. The most common method is to close the carburetor throat completely using throttle trim. However, other methods are acceptable. This requirement applies to all glow/gas ignition engines regardless of size.

Section 6.0: Radio Requirements

6.1 All transmitters must be FCC type certified.

6.2 FCC Technician or high-class license required for 6 meter band operation only.

Additional IMAA General Recommendations

The following recommendations are included in the Safety Code not to police such items, but rather to offer basic suggestions for enhanced safety.

Servos need to be of a rating capable to handle the loads that the control surfaces impose upon the servos. Standard servos are not recommended for control surfaces. Servos should be rated heavy-duty. For flight-critical control functions a minimum of 45 inch/ounces of torque should be considered. This should be considered a minimum for smaller aircraft and higher torque servos are strongly encouraged for larger aircraft. The use of one servo for each aileron and one for each elevator half is strongly recommended. Use of dual servos is also recommended for larger aircraft.

On-board batteries shall be 1000 mAh up to 20 lbs., 1200 mAh to 30 lbs., 1800 mAh to 40 lbs. and 2000 mAh over 40 lbs. flying weight. The number and size

of the servos, size and loads on control surfaces, and added features should be considered as an increase to these minimums. Batteries should be able to sustain power to the onboard radio components for a minimum of one hour total flying time before recharging.

Both redundant and fail-safe battery systems are recommended.

There is no minimum engine displacement limit, as it is the position of this body that an underpowered aircraft presents a greater danger than an overpowered aircraft. However, the selection of engine size relative to airframe strength and power loading mandates good discretionary judgment by the designer and builder. Current AMA maximums for engine displacement are 6.0 cu. in. for two-stroke and 9.6 cu. in. for four-stroke engine. These maximums apply only to AMA Sanctions concerning competition events (such as 511, 512, 515 and 520) and, as such, the maximums apply. All IMAA (non competition) events should be sanctioned as Class "C" events, in which these engine size maximums do not apply.

Generally, it is recommended that no attempt should be made to fly a radio controlled model aircraft with a gasoline engine in which the model aircraft weight would exceed twelve (12) pounds (underpowered) per cubic inch of engine displacement, or be less than five (5) pounds (overpowered) per cubic inch of engine displacement. Example: Using a 3 cu. in. engine, a model would likely be underpowered at an aircraft weight greater than 36 pounds. With the same engine, an aircraft weighing less than 15 pounds would likely be overpowered.

Servo arms and wheels should be rated heavy duty. Glass-filled servo arms and control horns are highly recommended.

Propeller tips should be painted or colored in a visible and contrasting manner so as to increase the visibility of the propeller tip arc.

FLYING

The Giant Spitfire ARF is a great-flying model that flies smoothly and predictably. However, it does not possess the self-recovery characteristics of a primary R/C trainer and should be flown only by experienced R/C pilots.

FUEL MIXTURE ADJUSTMENTS

A fully cowled engine may run at a higher temperature than an un-cowled engine. For this reason, the fuel mixture should be richened so the engine runs at about 200 rpm below peak speed. By running the engine slightly rich, you will help prevent dead-stick landings caused by overheating.

CAUTION (THIS APPLIES TO ALL R/C AIRPLANES): If, while flying, you notice an alarming or unusual sound such as a low-pitched "buzz," this may indicate control surface *flutter.* Flutter occurs when a control surface (such as an aileron or elevator) or a flying surface (such as a wing or stab) rapidly vibrates up and down (thus causing the noise). In extreme cases, if not detected immediately, flutter can actually cause the control surface to detach or the flying surface to fail, thus causing loss of control followed by an impending crash. The best thing to do when flutter is detected is to slow the model **immediately** by reducing power, then land as soon as safely possible. Identify which surface fluttered (so the problem may be resolved) by checking all the servo grommets for deterioration or signs of vibration. Make certain all pushrod linkages are secure and free of play. If it fluttered once, under similar circumstances it will probably flutter again unless the problem is fixed. Some things which can cause flutter are; Excessive hinge gap; Not mounting control horns solidly; Poor fit of clevis pin in horn; Side-play of wire pushrods caused by large bends; Excessive free play in servo gears; Insecure servo mounting; and one of the most prevalent causes of flutter; Flying an over-powered model at excessive speeds.

TAKEOFF

Before you get ready to takeoff, see how the model handles on the ground by doing a few practice runs at **low speeds** on the runway. Hold "up" elevator to keep the tail wheel on the ground. If necessary, adjust the tail wheel so the model will roll straight down the runway. If you need to calm your nerves before the maiden flight, shut the engine down and bring the model back into the pits. Top off the fuel, then check all fasteners and control linkages for peace of mind.

Remember to takeoff directly into the wind. When you're ready, point the model straight down the runway, hold a bit of up elevator to keep the tail on the ground to maintain tail wheel steering, then gradually advance the throttle. As the model gains speed, decrease up elevator allowing the tail to come off the ground. One of the most important things to remember with a tail dragger is to always be ready to apply **right** rudder to counteract engine torque. Gain as much speed as your runway and flying site will practically allow before gently applying up elevator, lifting the model into the air. At this moment it is likely that you will need to apply more right rudder to counteract engine torque. Be smooth on the elevator stick, allowing the model to establish a **gentle** climb to a safe altitude before turning into the traffic pattern.

We normally fly our first flight with the landing gear down. If for some reason the plane has to be landed quickly, for example a dead stick landing, we can concentrate on the landing.

FLIGHT

For reassurance and to keep an eye on other traffic, it is a good idea to have an assistant on the flight line with you. Tell him to remind you to throttle back once the plane gets to a comfortable altitude. While full throttle is usually desirable for takeoff, most models fly more smoothly at reduced speeds.

Take it easy with the Giant Spitfire ARF for the first few flights, gradually getting acquainted with it as you gain confidence. Adjust the trims to maintain straight and level flight. After flying around for a while, and while still at a safe altitude with plenty of fuel, practice slow flight and execute practice landing approaches by reducing the throttle and lowering the flaps to see how the model handles at slower speeds. Add power to see how it climbs as well. Continue to fly around, executing various maneuvers and making mental notes (or having your assistant write them down) of what trim or C.G. changes may be required to fine tune the model so it flies the way you like. Mind your fuel level, but use this first flight to become familiar with your model before landing.

LANDING

One of the keys to landing a giant-scale model is to maintain sufficient airspeed throughout the landing approach. An unusually high airspeed is not necessary, but those unfamiliar with landing giant-scale models are sometimes deceived by the model's larger size. Larger models often appear to be closer than they actually are. Additionally, most giant-scale models slow down rapidly, thus causing the uninitiated to land short. To avoid this initial illusion, make your landing pattern closer than you normally might for a .40-size sport model. Also, don't pull the throttle all the way back and leave it there the way you normally would. Instead, momentarily pull the throttle all the way back, but then advance it a "click" or two to keep the engine RPM up and maintain airspeed. Once over the runway you can cut the throttle the rest of the way and the model will slow for the landing flare.

The Giant Spitfire ARF may be landed with or without flaps. Flaps increase lift and drag, so the plane may be landed slower, thus reducing rollout after touchdown (not as much of a factor on grass runways). To initiate a landing approach, lower the throttle while on the downwind leg. If using flaps, allow the model to slow before extending them. Continue to lose altitude, but maintain airspeed by keeping the nose down as you turn onto the crosswind leg. Make your final turn toward the runway (into the wind) keeping the nose down to maintain airspeed and control. If using flaps, keep a few additional "clicks" of power so the model doesn't slow too much. Level the attitude when the model reaches the runway threshold, modulating the throttle as necessary to maintain your glide path and airspeed. If you are going to overshoot, smoothly advance the throttle (always ready on the right rudder to counteract torque) and retract the flaps when enough airspeed is gained. Climb out to make another attempt. When the model is a foot or so off the deck, smoothly increase up elevator until it gently touches down. Once the model is on the runway and has lost flying speed, hold up elevator to place the tail on the ground, regaining tail wheel control.

Note: If ever the occasion arises when a dead-stick landing must be performed, do not extend the flaps until **certain** the model will be able to reach the landing zone (on dead-stick landings it is common to land with no flaps at all). Without engine power, flaps can unexpectedly reduce the model's range, thus causing you to come up short of the field.

One final note about flying your Giant Spitfire ARF. Have a goal or flight plan in mind for **every** flight. This can be learning a new maneuver(s), improving a maneuver(s) you already know, or learning how the model behaves in certain conditions (such as on high or low rates). This is not necessarily to improve your skills (*though it is never a bad idea!)*, but more importantly so you do not surprise yourself by impulsively attempting a maneuver and suddenly finding that you've run out of time, altitude or airspeed. Every maneuver should be deliberate, not impulsive. For example, if you're going to do a loop, check your altitude, mind the wind direction (anticipating rudder corrections that will be required to maintain heading), remember to throttle back at the top, and make certain you are on the desired rates (high/low rates). A flight plan greatly reduces the chances of crashing your model just because of poor planning and impulsive moves. **Remember to think.**

Have a ball! But always stay in control and fly in a safe manner.

GOOD LUCK AND GREAT FLYING!

Identification Tag

This model belongs to:

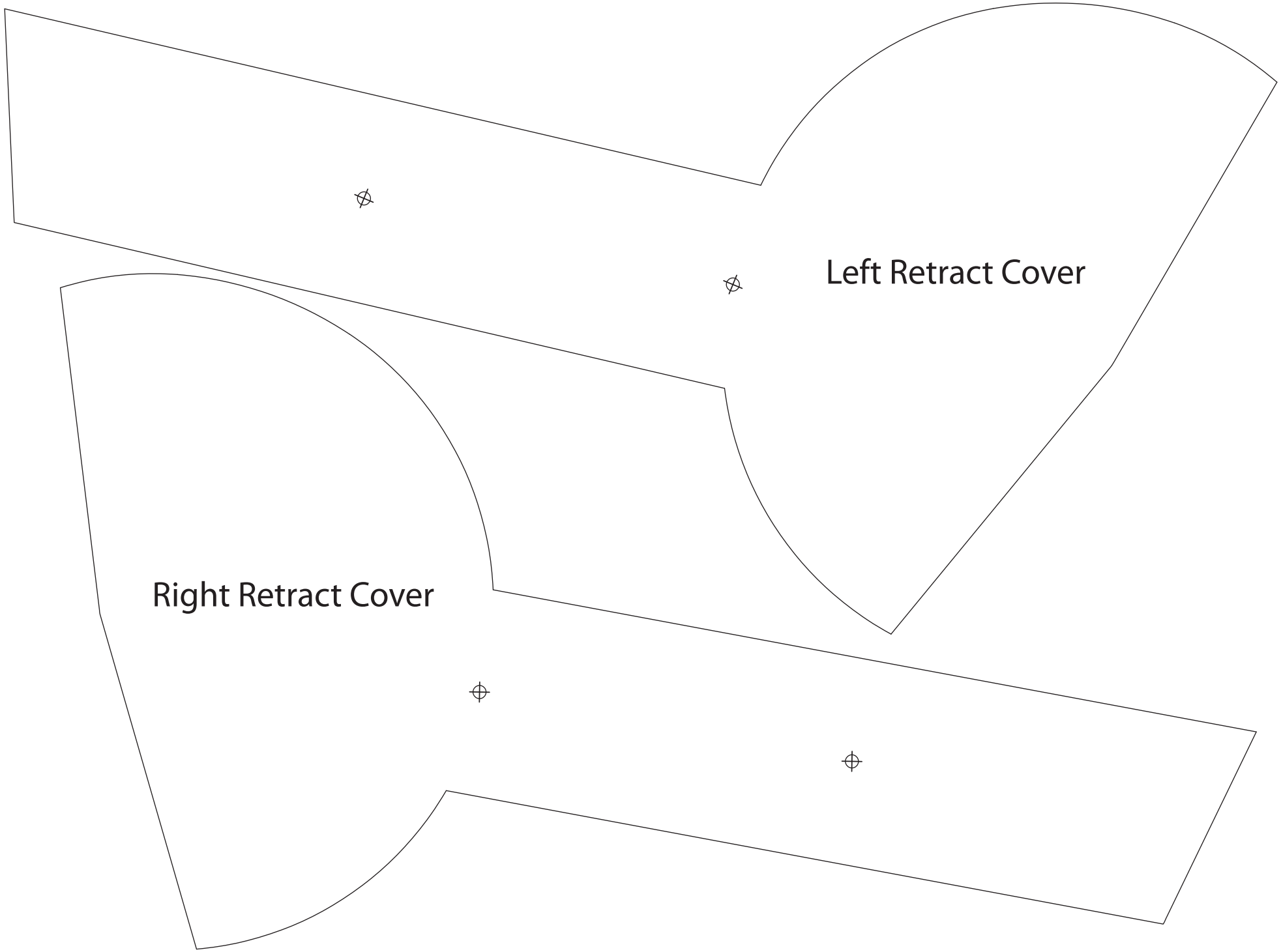
Name

Address

City, State, Zip

Phone Number

AMA Number


Left Retract Cover
Right Retract Cover

notes:

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