Cessna 310

Almost Ready-to-Fly .46 Sport Scale Airplane

Wingspan: 81 in [2057mm]
Wing Area: 914 sq in [58.9dm²]
Weight: 17-20 lb [7710-9070g]
Wing Loading: 43-50 oz/sq ft [131-153g/dm²]
Length: 66 in [1680mm]
Radio: 6-Channel minimum w/8 servos (8- or 9-channel w/9 servos required for optional retracts)
Engines (2): .46-.51 cu in [7.5-8.5 cc] 2-stroke or .70-.80 cu in [11.5-13 cc] 4-stroke

WARRANTY.....

Top Fite® 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 Flites' 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 the following 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.

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

Top Flite Models Champaign, IL **Telephone (217) 398-8970, Ext. 5** **airsupport@top-flite.com**

TABLE OF CONTENTS

INTRODUCTION

Congratulations on the purchase of your Cessna 310! This is one of the finest ARF aircraft we have ever produced. It is an airplane that is sure to turn heads at the field and get everyone's attention as soon as you are airborne. The molded fiberglass fuselage and wing tips have faithfully re-created this classic twin with many fine details and a tremendous paint finish. Many of the bad tendencies of twin engine aircraft have been engineered out of this model so this plane is easily within the capability of the average intermediate pilot. We are sure this plane will bring you many hours of flying enjoyment!

For the latest technical updates or manual corrections to the Cessna 310 visit the Top Flite web site at www.top-flite.com. Open the "Airplanes" link, then select the Cessna 310 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.

AMA

In addition to joining a radio control club, we strongly recommend you join the AMA (Academy of Model Aeronautics). The AMA is the governing body of model aviation and membership is required to fly at AMA clubs. Though joining the AMA provides many benefits, one of the primary reasons to join is liability protection. Coverage is not limited to flying at contests or on the club field. It even applies to flying at public demonstrations and air shows. Failure to comply with the Safety Code (excerpts printed in the back of the manual) may endanger insurance coverage. Additionally, training programs and instructors are available at AMA club sites to help you get started the right way. There are over 2,500 AMA chartered clubs across the country. Contact the AMA at the address or toll-free phone number below:

Academy of Model Aeronautics
5151 East Memorial Drive
Muncie, IN 47302-9252
Tele. (800) 435-9262
Fax (765) 741-0057
Or via the Internet at: 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 Cessna 310 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 following address or telephone number, or by logging on to their web site.

IMAA
205 S. Hilldale Road
Salina, KS 67401
(913) 823-5569
www.fly-imaa.org/imaa/sanction.html.

SCALE COMPETITION

Though the Top Flite Cessna 310 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.

If you would like photos of full-size Cessna 310s for scale documentation, or if you would like to study the photos to add more scale details, photo packs are available from:

Bob's Aircraft Documentation
3114 Yukon Ave
Costa Mesa, CA 92626
Telephone: (714) 979-8058
Fax: (714) 979-7279
www.bobsairdoc.com

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

1. Your Cessna 310 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 Cessna 310, 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 first-class condition, and correctly sized engines and components (fuel tank, wheels, etc.) throughout the building process.

5. You must correctly install all R/C and other components so that the model operates correctly on the ground and in the air.

6. You must check the operation of the model before **every** flight to insure that all equipment is operating and that the model has remained structurally sound. Be sure to check clevises or other connectors often and replace them if they show any signs of wear or fatigue.

7. 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.

8. **WARNING:** The cowl, fuselage, nacelles and tail cone 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 depend 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 Cessna 310 that may require planning or decision making before starting to build. Order numbers are provided in parentheses.

RADIO EQUIPMENT

Transmitter and Receiver
A minimum of a 6 channel radio is required but because of the number of servos in this model you may wish to eliminate the use of "Y" connectors. An 8- or 9- channel radio may be preferable.

Servos
(2) 40 oz-in servos for the throttles
(1) 40 oz-in servo for the retract (optional)
(6) 54 oz-in servos 2-flaps, 2-ailerons,
1-rudder, 1-elevator

Servo Extensions
(3) Y-harness (HCAM2751 for Futaba®)
(4) 6" [150mm] extension (HCAM2701 for Futaba)
(2) 12" [300mm] extension (HCAM2711 for Futaba)
(4) 24" [610mm] extension (HCAM2721 for Futaba)

Batteries
1000 mAh NiCd battery for the receiver
500 mAh NiCd battery for the lighting system

ENGINE RECOMMENDATIONS

Engine
The recommended engine size for the Cessna 310 is a .46-.50 two-stroke. This airplane was extensively flown on the O.S.® .46AX two stroke engines and Bisson muffler. Though your instincts might tell you that a plane of this size and weight will be underpowered with these engines, this is not true. During our test flights we used these engines for taking off from grass and asphalt with no problems. The climb out from take off was impressive. Once the plane was at altitude the plane was flown at 1/2 to 3/4 throttle. As part of our testing the plane was flown on a single engine from both the right and left nacelle. The O.S. .46 was enough power to maintain flying altitude, fly a figure eight, and a rectangle approach to the runway. The airplane has the power to fly on one engine but not enough to climb out from a missed landing approach. The O.S. .46 or .50 SX is the engine of choice to keep everything hidden under the nacelle.

Muffler
The Bisson Pitts Muffler (BISG4046) fits very well in the nacelle and is the recommended after market muffler for the Cessna 310.

OPTIONAL RETRACTABLE LANDING GEAR

Robart Cessna 310 Retracts (ROBQ1623)
Robart Standard Air Kit with variable rate valve (ROBQ2302)
10' [1meter] Pressure tubing (ROBQ2369)
(2) Air line quick disconnects (ROBQ2395)

ADDITIONAL ITEMS REQUIRED

ADHESIVES & BUILDING SUPPLIES

This is the list of Adhesives and Building Supplies that are required to finish the Cessna 310.

- ❑ 3' [900mm] standard silicone fuel tubing (GPMQ4131)
- ❑ 1/2 oz. [15g] Thin Pro™ CA (GPMR6001)
- ❑ 1 oz. [30g] Medium Pro CA+ (GPMR6008)
- ❑ Pro 30-minute epoxy (GPMR6047)
- ❑ Pro 6-minute epoxy (GPMR6045)
- ❑ Drill bits: 1/16" [1.6mm], 5/64" [2mm], 3/32" [2.4mm], 7/64" [2.8mm], 1/8" [3.2mm], 11/64" [4.4mm]
- ❑ Silver solder w/flux (GPMR8070)
- ❑ #1 Hobby knife (HCAR0105)
- ❑ #11 blades (5-pack, HCAR0211)
- ❑ Medium T-pins (100, HCAR5150)
- ❑ Masking tape (TOPR8018)
- ❑ Threadlocker thread locking cement (GPMR6060)
- ❑ Denatured alcohol (for epoxy clean up)
- ❑ Hot melt glue and glue gun (available at hobby, craft and hardware outlets)

OPTIONAL SUPPLIES & TOOLS

Here is a list of optional tools mentioned in the manual that will help you build the Cessna 310.

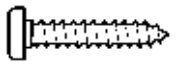
- ❑ 21st Century® sealing iron (COVR2700)
- ❑ 21st Century iron cover (COVR2702)
- ❑ 4 oz. [113g] aerosol CA activator (GPMR634)
- ❑ CA applicator tips (HCAR3780)
- ❑ Epoxy brushes (6, GPMR8060)
- ❑ Mixing sticks (50, GPMR8055)
- ❑ Mixing cups (GPMR8056)
- ❑ Hobbico Duster™ compressed air (HCAR5500)
- ❑ Rotary tool such as Dremel®
- ❑ Rotary tool reinforced cut-off wheel (GPMR8020)
- ❑ Servo horn drill (HCAR0698)
- ❑ Dead Center™ Engine Mount Hole Locator (GPMR8130)
- ❑ AccuThrow™ Deflection Gauge (GPMR2405)
- ❑ CG Machine™ (GPMR2400)
- ❑ Precision Magnetic Prop Balancer (TOPQ5700)

IMPORTANT BUILDING NOTES

• There are two types of screws used in this kit:

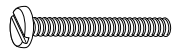
Sheet metal screws are designated by a number and a length. For example #6 x 3/4" [19mm]

This is a number six screw that is 3/4" [19mm] long.



Machine screws are designated by a number, threads per inch, and a length. For example 4-40 x 3/4" [19mm]

This is a number four screw that is 3/4" [19mm] long with forty threads per inch.



Socket head cap screws are designated by a number, **threads per inch** and a length. For example 4-40 x 3/4" [19mm]

This is a number four screw that is 3/4" [19mm] long with forty threads per inch.

• When you see the term test fit in the instructions, it means that you should first position the part on the assembly without using any glue, and then slightly modify or custom fit the part as necessary for the best fit.

• Whenever the term glue is written you should rely upon your experience to decide what type of glue to use. When a specific type of adhesive works best for that step, the instructions will make a recommendation.

• Whenever just epoxy is specified you may use either 30-minute (or 45-minute) epoxy or 6-minute epoxy. When 30-minute epoxy is specified it is highly recommended that you use only 30-minute (or 45-minute) epoxy, because you will need the working time and/or the additional strength.

• 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 Cessna 310 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.

White - TOPQ0204
Sky Blue - TOPQ0206
Insignia Blue - TOPQ0207

METRIC CONVERSIONS

To convert inches to millimeters, multiply inches by 25.4

.4mm = 1/64"
.8mm = 1/32"
1.6mm = 1/16"
2.4mm = 3/32"
3.2mm = 1/8"
4mm = 5/32"
4.8mm = 3/16"
6.4mm = 1/4"
9.5mm = 3/8"
12.7mm = 1/2"
15.9mm = 5/8"
19mm = 3/4"
25.4mm = 1"
50.8mm = 2"
76.2mm = 3"
152.4mm = 6"
304.8mm = 12"
381mm = 15"
457.2mm = 18"
533.4mm = 21"
609.6mm = 24"
762mm = 30"
914.4mm = 36"

ORDERING REPLACEMENT PARTS

Replacement parts for the Top Flite Cessna 310 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.

To locate a hobby dealer, visit the Hobbico web site at www.hobbico.com. Choose “Where to Buy” at the bottom of the menu on the left side of the page. 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.

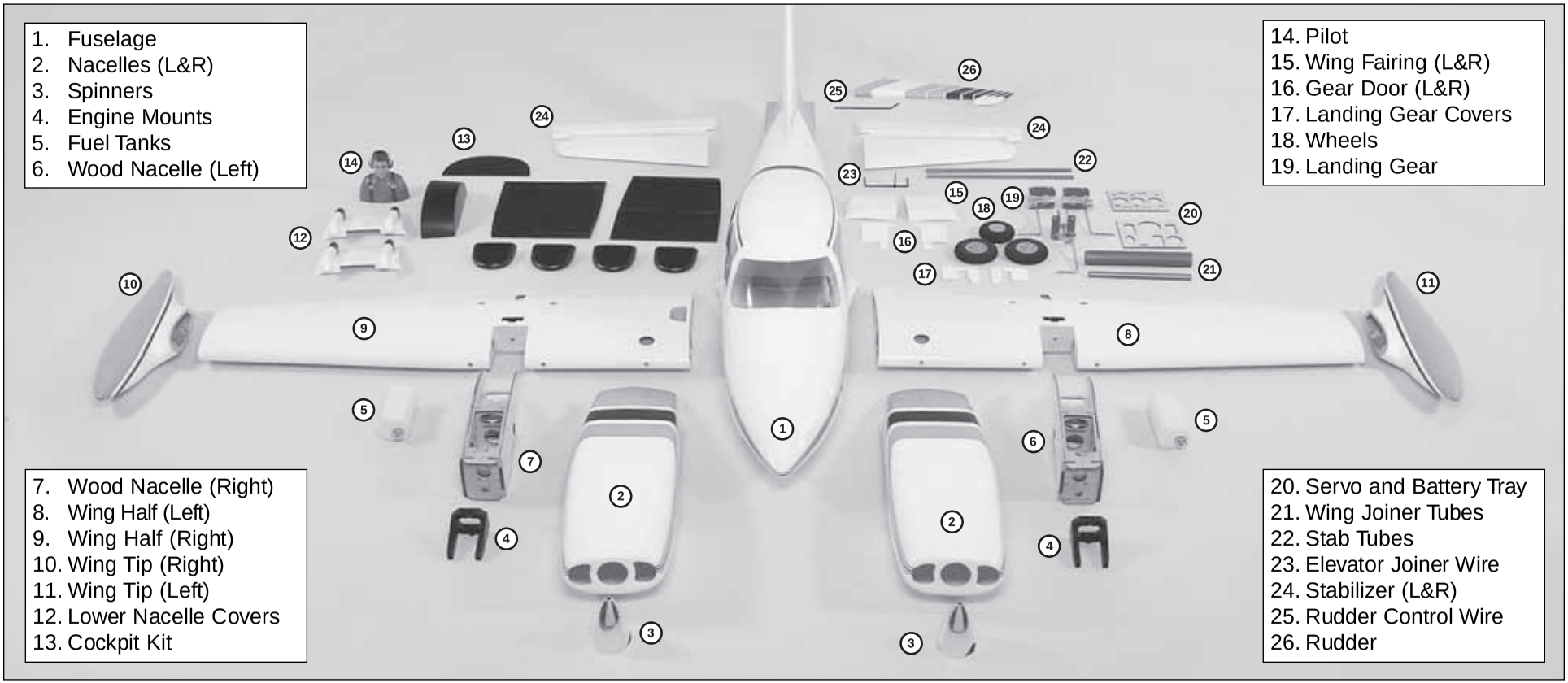
If additional assistance is required for any reason contact Product Support at:
(217) 398-8970
productsupport@greatplanes.com

REPLACEMENT PARTS LIST

Description	***How to purchase***
Missing pieces	Contact Product Support
Instruction manual	Contact Product Support
Full-size plans	Not available

Order #	***Description***
TOPA1660	Wing Set
TOPA1661	Fuselage Set
TOPA1662	Wing Tip Set
TOPA1663	Tail Set
TOPA1664	Left Engine Pod
TOPA1665	Right Engine Pod
TOPA1666	Landing Gear
TOPA1667	Decal Set
TOPA1668	Wing Tubes (2)
TOPA1669	Tail Tubes (2)
TOPA1670	Windshield/Windows
TOPA1671	Gear Doors
TOPA1672	Aluminum Spinner
TOPA1673	Tail Cone
TOPA1674	Rudder

KIT CONTENTS



PARTS NOT PHOTOGRAPHED			
(2) 2-56 Metal Clevis	(2) Large Black Control Horn	(8) #2 x 3/8" [10mm] Wood Screw	(4) Flat Nylon Strap
(1) 4-40 Threaded Metal Clevis	(1) 2-56 Nylon Ball Link Socket	(2) 8-32 x 1" [25mm] SHCS	(4) Humped Landing Gear Strap
(2) 4-40 Solder Clevis	(4) Nylon Retainer	(4) 4-40 x 1/8" [3mm] SHS	(3) 4x200mm Nylon Tie Strap
(4) Brass Screw Lock Connector	(2) CA Hinge Strip	(8) #2 x 1/2" [13mm] SMS	(1) .5 x 1000mm Cable
(2) 4-40 Nut	(5) Faslink	(2) .074 x12" Wire [305mm]	(2) 8x40mm Nylon Dowel with Pin
(8) 6-32 Blind Nut	(2) 36" Gray outer Pushrod Tube	(5) .074 x 6" [152mm] Wire	(4) 8x30mm Nylon Dowel
(2) 8-32 Blind Nut	(9) Silicone Clevis Keeper	(2) 4-40 x 36" [914mm] Threaded Rod	(2) 2-56 Brass Connector
(2) 2-56 Nut	(8) #4 x 1/2" [13mm] Sheet Metal Screw	(32) #6 Flat Washer	(8) Pinned Hinge
(3) .080 Nut	(2) 4-40 x 1/4" [6mm] SHCS	(2) #4 Flat Washer	(2) Aluminum Door Mount Brackets
(7) 1/4-20 Blind Nut	(32) #2 x 3/8" [10mm] SMS	(20) #2 Flat Washer	(8) 2 x 10mm Screws
(2) Large Nylon Control Horn	(16) #6 x 1/2" [13mm] SMS	(2) #8 Lock Washer	(8) 2mm Nuts
(6) 1/4-20 Bolts	(4) 8-32 x 1" [25mm] Slotted MS	(14) #8 Flat Washer	(6) Wheel Collars and Set Screws
(4) 2-56 Nylon Clevis	16 6-32 x 3/4" [19mm] SHCS	(28) #6 Lock Washer	(3) Fiberglass Landing Gear Doors
	(3) .080 Ball	(4) Crimp Connector	(1) 4-40 x 12" [305mm] Fully Threaded Rod
		(1) 1/4-20 Thumb Screw	

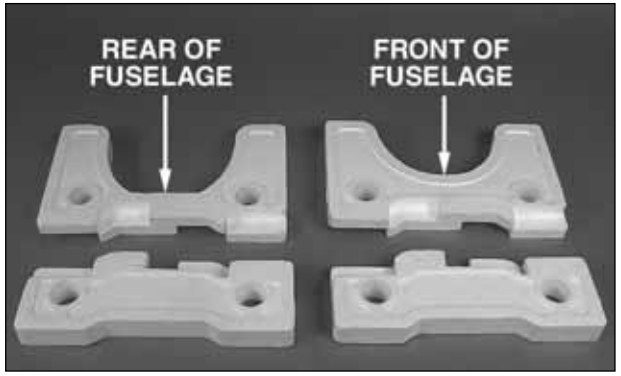
PREPARATIONS

❏ 1. If you have not done so already, remove the major parts of the kit from the box and inspect for damage. If any parts are damaged or missing, contact Product Support at the address or telephone number listed in the “Ordering Replacement Parts” section on page 5.

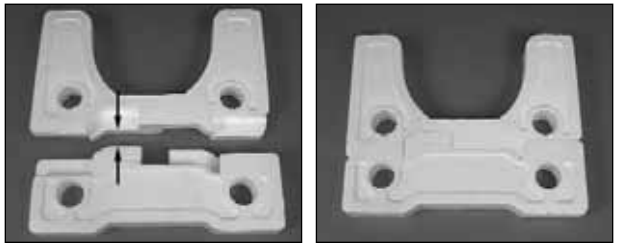
❏ 2. Remove the tape and separate the ailerons and flaps from the wing and the elevators from the stab. Use a covering iron with a covering sock on high heat to tighten the covering if necessary. Apply pressure over sheeted areas to **thoroughly** bond the covering to the wood.

ASSEMBLE THE FUSELAGE STAND

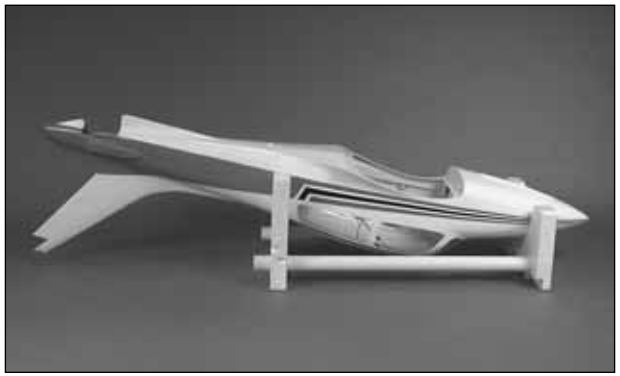
Your kit includes a stand that can be used during the assembly process and as a useful tool for transporting the airplane to the field as well as assembly of the airplane at the field.



❏ 1. The stand consists of four foam cradle components and two PVC tubes. There are two different cutouts in the cradle. The curved section fits the front of the fuselage while the one that has the flat cut fits the rear half of the fuselage.



❏ 2. The top and bottom stand components will fit snugly together. Fit the bottom with the top cradle (the one with the flat cut) as shown.

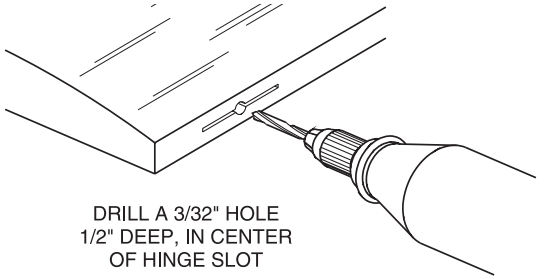


❏ 3. When placed into the cradle upside down the fuselage is elevated so the tail and the cabin top are off of your work bench. You can also place the fuselage upright in the cradle. If you install the fixed landing gear and wish to transport the fuselage or work on it on your workbench, you will want to place the other bottom cradle component onto the front cradle. This will allow enough clearance for the nose gear.

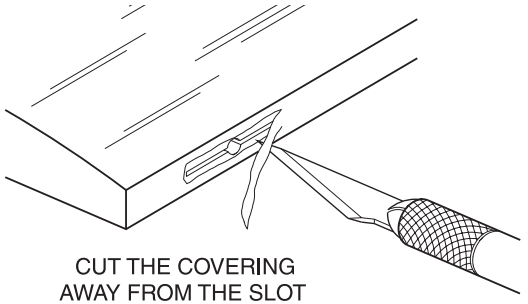
ASSEMBLE THE WING

Install the Ailerons and Flaps

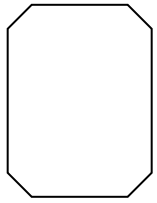
Assemble the right wing first so your work matches the photos.



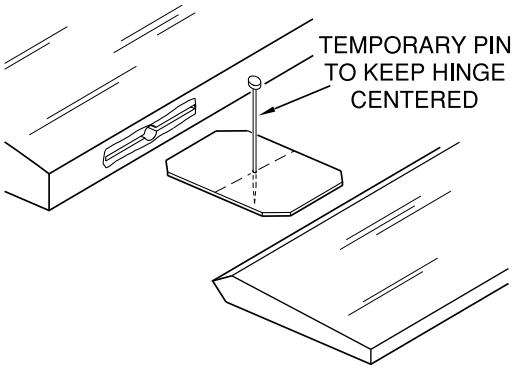
❏ ❏ 1. Drill a 3/32" [2.4mm] hole, 1/2" deep in the center of each hinge slot to allow the CA to “wick” in. Follow-up with a #11 blade to clean out the slots. **Hint:** If you have one, use a high-speed rotary tool to drill the holes.



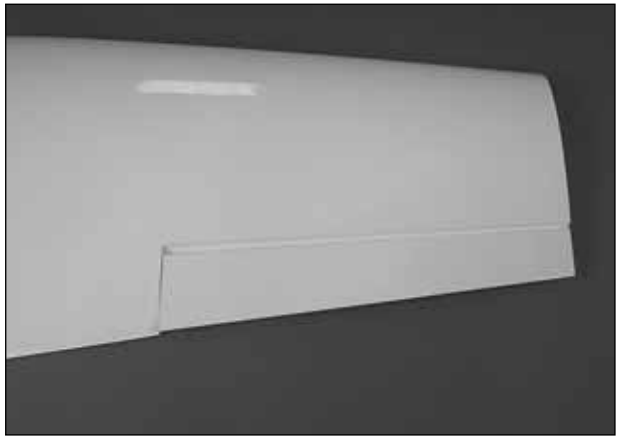
❏ ❏ 2. Use a sharp #11 blade to cut a strip of covering from the hinge slots in the wing and aileron.



❏ ❏ 3. Cut three 1" x 1" [25mm x25mm] **hinges** from the **CA hinge strip**. Snip off the corners so they go in easier.

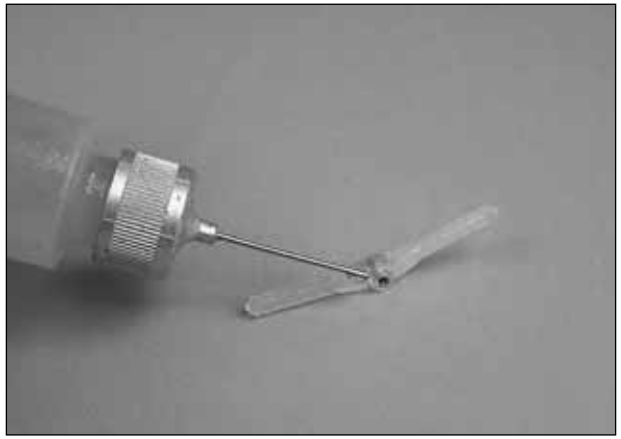


❏ ❏ 4. Test fit the **ailerons** to the **wing** with the hinges. If the hinges don't remain centered, stick a pin through the middle of the hinge to hold it in position.

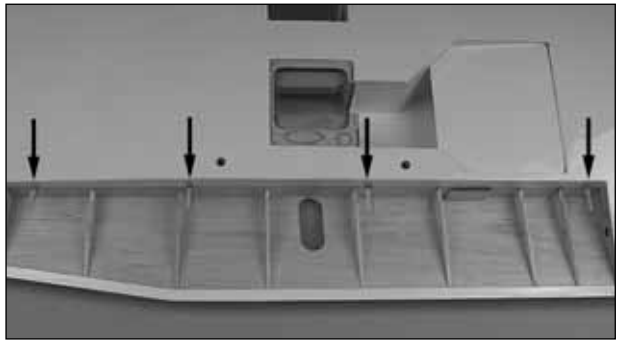


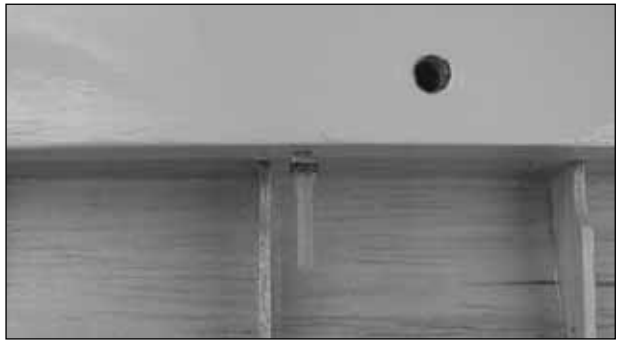
❏ ❏ 5. Remove any pins you may have inserted into the hinges. Adjust the aileron so there is a small gap between the LE of the aileron and the wing. The gap should be small, just enough to see light through or to slip a piece of paper through.

❏ ❏ 6. Apply six drops of thin CA to the top and bottom of each hinge. Do not use CA accelerator. After the CA has fully hardened, test the hinges by pulling on the aileron.

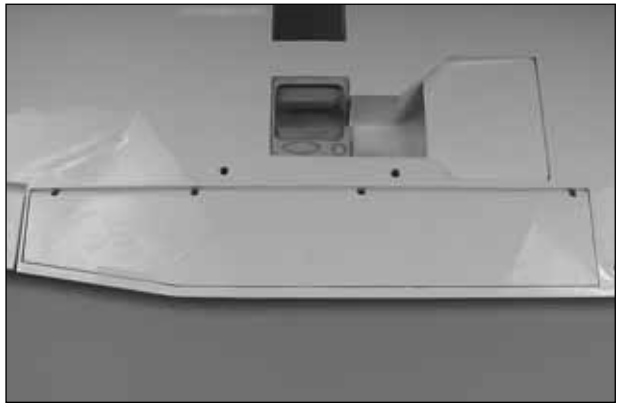


❏ ❏ 7. If you have not removed the **flap** from the wing, do so. Locate four nylon pinned hinges. Apply a drop of oil or work Vaseline into the hinge. This will prevent glue from getting into the hinge in the next step. Be careful not to get oil on the portion of the hinge that slides into the wing and flap. If this should happen be sure to clean the hinge with alcohol before applying the glue.





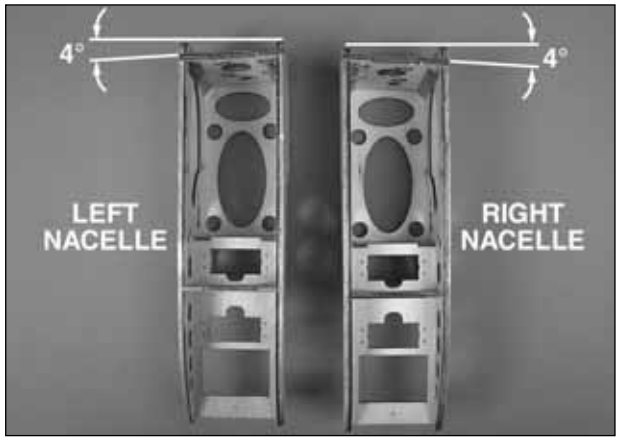
❏ ❏ 8. Apply epoxy to one end of each hinge and into each of the four holes in the wing trailing edge in the flap compartment. Insert the hinge into the hole, positioning the hinge as shown.



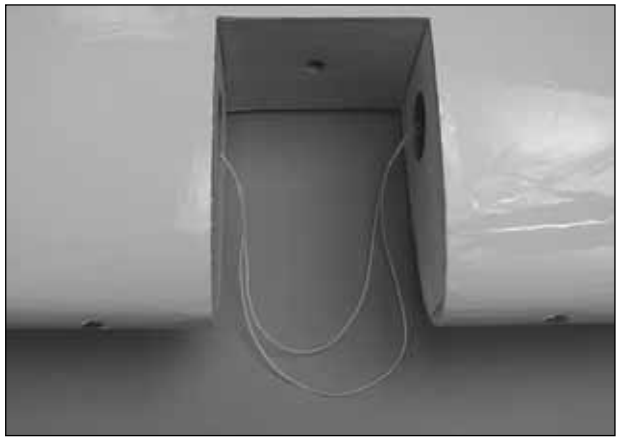
❏ ❏ 9. Apply epoxy to the opposite end of the hinge and the hinge holes in the flap. Insert the flap onto the hinges. Set the wing aside until the glue has cured.

❏ 10. Repeat steps 1- 9 for the left wing panel.

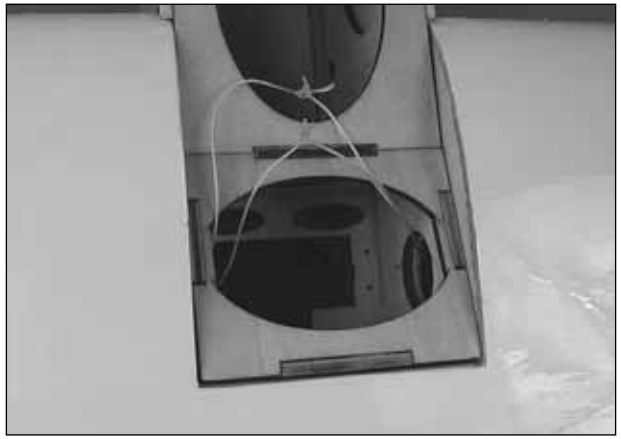
Mount the Plywood Engine Nacelles



❏ 1. Remove the top plate and fuel tank from the **plywood engine nacelle**. Set the two plywood engine nacelles on your workbench as shown in the photograph. Looking at the top of the nacelle you **must** note the difference in the angle of the firewall of each nacelle. Each nacelle has 4° of outward thrust built into it. Write the word “left” and “right” on each nacelle so you can easily identify each one.

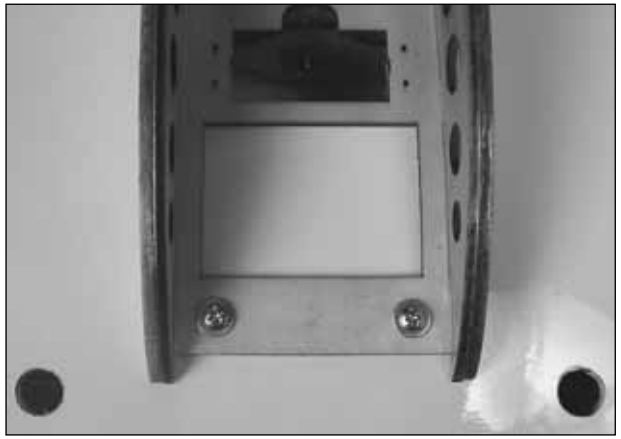


❏ ❏ 2. The wing has strings running through it for pulling servo leads through the wing. The string is taped at the root rib, the wing tip and inside the aileron servo compartment. Remove the tape and pull the excess string into the front of the wing where the nacelle will be mounted. Re-tape the end of the string to the rib.



❏ ❏ 3. Cut the strings. Begin sliding the right nacelle in place and at the same time feed the string through the holes in each side of the nacelle. Re-tie the strings. Apply a drop of thin CA to the knot to prevent it from coming apart.

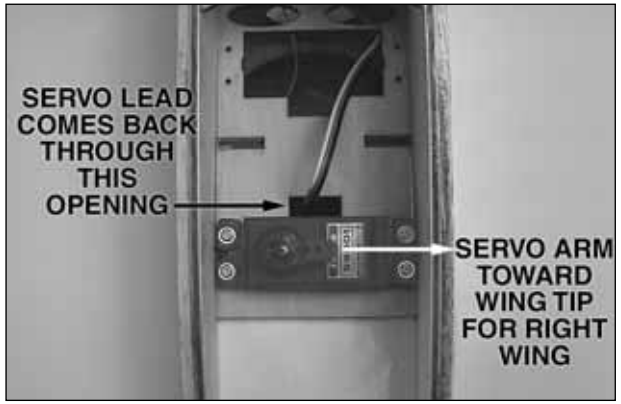
❏ ❏ 4. Slide the nacelle completely into the wing. Attach the nacelle to the wing with an 8-32 x 1" [25mm] socket head cap screw, a #8 lock washer and a #8 flat washer. Apply a couple of drops of thread locker onto the bolt before tightening the bolt to the wing and nacelle.



❏ ❏ 5. Drill 3/32" [2.4mm] holes through each of the two pilot holes located at the back of the nacelle. Drill through the nacelle and into the hardwood block located in the wing. Insert and remove a #6 x 1/2" [13mm] screw into each of the holes. Apply a couple drops of thin CA into the holes to harden the threads. Once the glue has cured install the #6 screws and #6 flat washers into each of the holes.

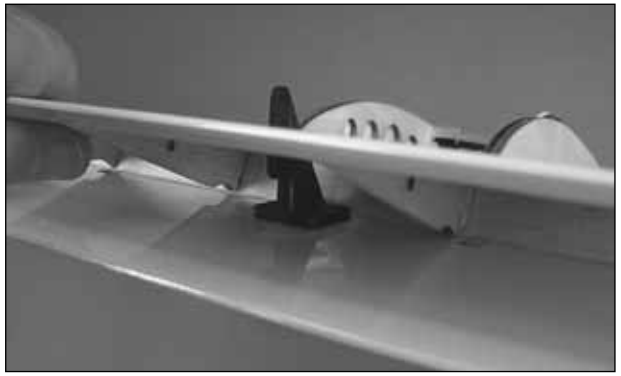
❏ 6. Repeat steps 1- 5 for the left wing panel.

Install Flap, Throttle and Aileron Servos and Pushrods

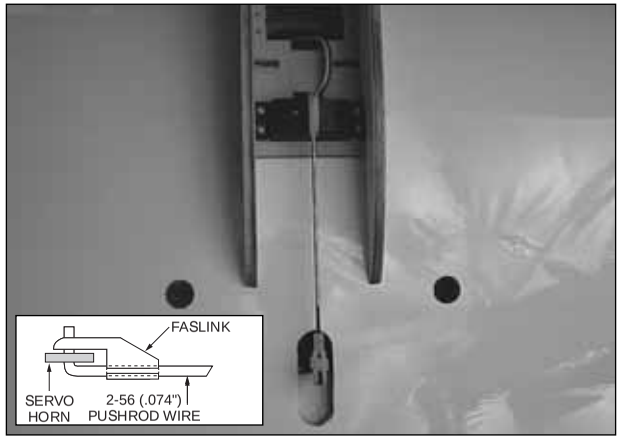


❏ ❏ 1. Install the flap servo into the rear servo opening. Insert and remove a servo mounting screw into each of the pre-drilled holes. Apply a couple drops of thin CA

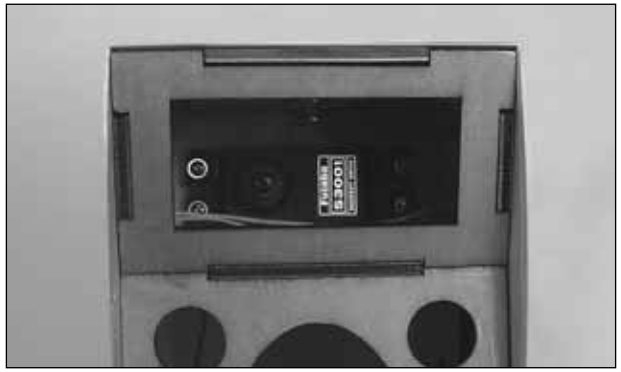
into the holes to harden the threads. Once the glue has cured re-install the servo mounting screws. Be sure the servo lead comes up through the slot alongside of the servo. When installing the flap servo in the right wing panel, the servo arm should be pointed towards the wing tip. When installing the servo in the left wing, the arm should be pointed towards the wing center.



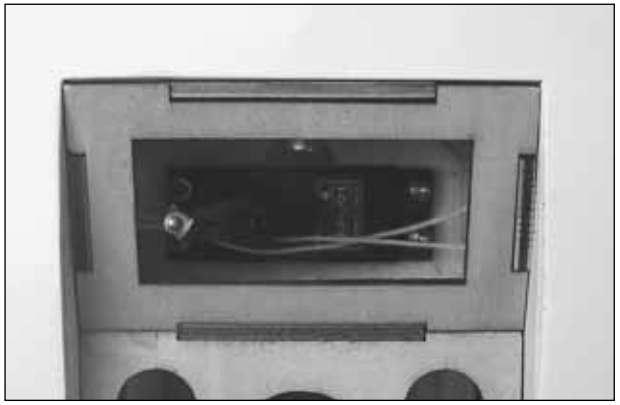
❏ ❏ 2. Center a black control horn in the opening above the flap, positioning it as shown (the control horn should be backwards from what would be considered the normal direction of a control horn.) Drill a 1/16" [1.6mm] hole through each of the mounting holes in the control horn and into the plywood plate in the flap. Drill only through the plywood plate. **DO NOT** drill through the flap. Insert and remove a #2 x 3/8" [10mm] screw into each of the holes. Apply a couple drops of thin CA into the holes to harden the threads. Once the glue has cured attach the horn to the flap with four #2 x 3/8" [10mm] screws.



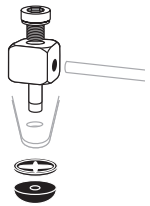
❏ ❏ 3. Screw a nylon clevis onto a .074 x 6" [152mm] threaded wire 20 turns. Slide a nylon clevis retainer onto the clevis. Install the clevis into the outermost hole of the control horn. Then slide the silicone retainer over the clevis. Drill a 5/64" [2mm] hole in the outer hole of the servo arm. Position the servo arm as shown and be sure the flap is fully closed. With a fine tip marker, mark the wire where it aligns with the outer hole of the servo arm. Make a 90 degree bend on the mark. Cut the wire so the wire is 3/8" [10mm] in length after the bend. Insert the wire into the servo arm and lock it in place with a nylon Faslink.



❏ ❏ 4. Install the throttle servo into the servo opening. (Note that the servo is mounted on the bottom of the nacelle). Insert and remove a servo mounting screw into each of the pre-drilled holes. Apply a couple drops of thin CA into the holes to harden the threads. Once the glue has cured, re-install the servo mounting screws.



❏ ❏ 5. Install a brass screw lock connector, nylon retainer ring and a 4-40 x 1/4" [6mm] socket head cap screw onto the servo arm. Then center the servo and install the arm onto the servo.



❏ ❏ 6. Install a 6" [152mm] servo extension onto the throttle and flap servo leads. Secure the extension to the lead with tape, a piece of shrink tube or some other method to keep them from coming unplugged.

❏ ❏ 7. Install a 24" [610mm] servo extension onto the aileron servo lead. Secure the extension to the lead with tape, a piece of shrink tube or some other method to keep them from coming unplugged.

❏ ❏ 8. Install the aileron servo between the wooden rails under the **aileron servo cover** using the

hardware that came with the servo. Drill a 1/16" [1.6mm] hole through each of the servo mounting holes and into the servo mounting rails. Insert and remove a servo mounting screw into each of the holes. Apply a couple drops of thin CA into the holes to harden the threads. Once the glue has cured, re-install the servo mounting screws.

❏ ❏ 9. Center the servo. Then, install a large servo horn to the servo.

❏ ❏ 10. Tie the string from the servo compartment to the servo lead. Pull the lead through the wing exiting at the nacelle. Leave the string attached to the lead for now.

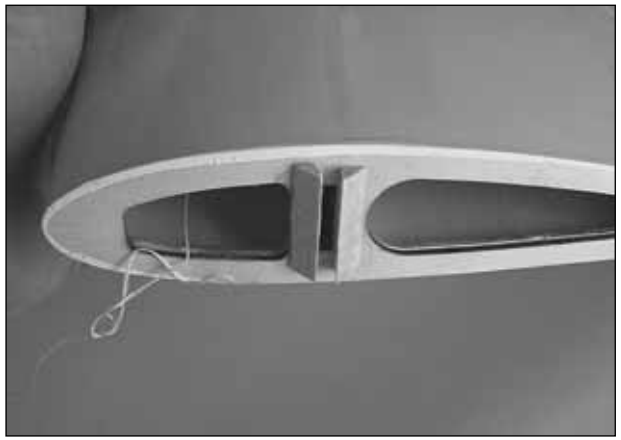
❏ ❏ 11. Install the aileron servo cover to the wing with four #2x 3/8"[10mm] wood screws.

❏ ❏ 12. Look closely under the covering of the aileron and you will see a plywood mounting plate for the control horn. Place a nylon clevis on the plate in line with the servo arm. Mark the location of the mounting holes onto the aileron. Drill a 1/16" [1.6mm] hole on the marks, drilling through the plywood plate ***but not*** through the top of the aileron. Insert and remove a #2 x3/8" [10mm] screw into each of the holes. Apply a couple drops of thin CA into the holes to harden the threads. Once the glue has cured, attach the horn to the aileron with two #2 x 3/8" [10mm] screws.

❏ ❏ 13. Screw a nylon clevis onto a .074 x 6" [152mm] threaded wire 20 turns. Slide a nylon clevis retainer onto the clevis. Install the clevis into the second hole from the end of the control horn. Then slide the silicone retainer over the clevis. Drill a 5/64" [2mm] hole in the outer hole of the servo arm. Center the servo and position the servo arm as shown. Then, center the aileron. With a fine tip marker, mark the wire where it aligns with the outer hole of the servo arm. Make a 90 degree bend on the mark. Cut the wire so the wire is 3/8" [10mm] in length after the bend. Insert the wire into the servo arm and lock it in place with a nylon Faslink.

❏ 14. Repeat steps 1- 13 for the left wing panel.

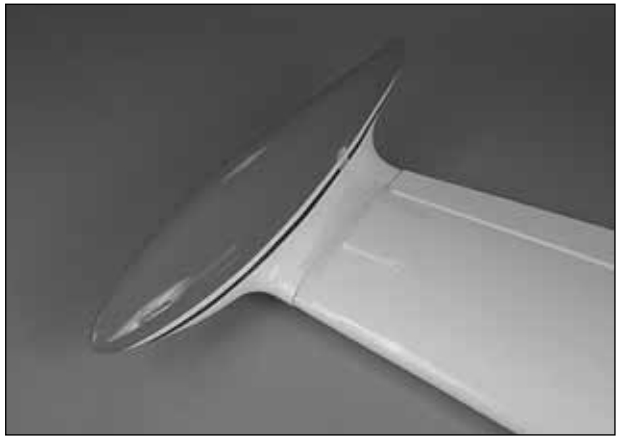
Mount the Wing Tip to the Wing



❏ ❏ 1. Glue two 1/4" x1/4" x 3/4" [6mm x 6mm x 19mm] balsa triangle blocks onto each side of the slot in the wing.

❏ ❏ 2. Examine both wing tips to determine which is the left and the right. When installed on the wing the tip should curve upward towards the top of the wing.

❏ ❏ 3. Pull the wires for the wing tip lights from inside of the wing tip. Tie the end of the wire to the string located on the end of the wing. Pull the wire through the wing exiting at the nacelle. Note: at this point all of the servo leads and the wire for the light should be at the nacelle.

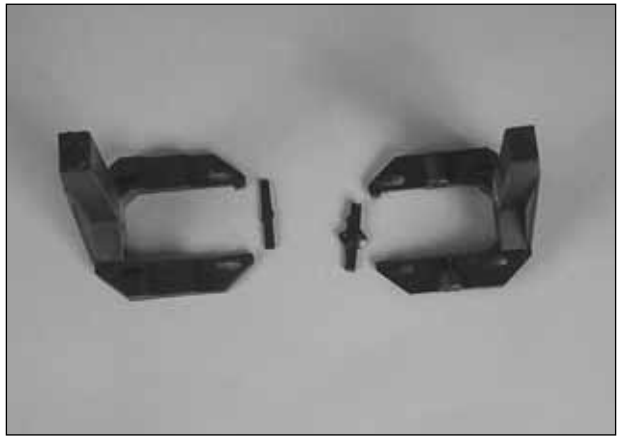


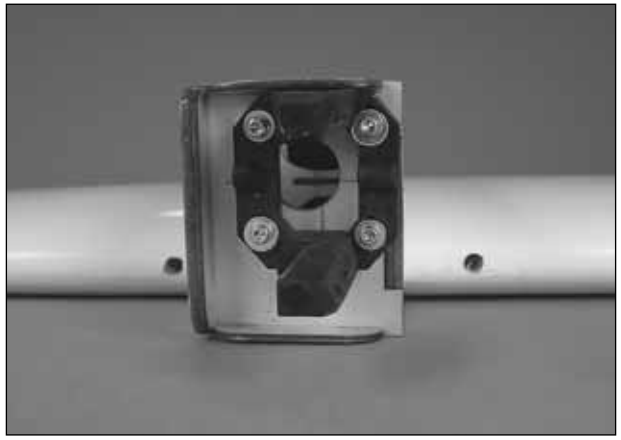
❏ ❏ 4. Test fit the wing tip to the wing. Once you're satisfied everything fits, apply epoxy into the pocket in the end of the wing, the plywood tongue on the wing tip, the tip of the wing and the root rib of the wing tip. Tape the wing tip to the wing. Set it aside until the glues has cured.

❏ ❏ 5. At this point the servo leads as well as the lead for the wing tip lights should be located at the nacelle. Untie both of the strings from the servo leads. If you will be installing retractable landing gear, tape one of the strings to the wing. This will be used later to pull the air lines through the wing. Tie all of the leads to the other string. If you will be installing fixed gear tie two leads to each string. This will make it easier to pull the leads through the wing. Pull all of the servo leads and the wing tip light wire through the wing, exiting through the hole in the top of the wing. Untie the leads and then tape all of the leads to the top of the wing, preventing the leads from falling back into the wing. If you are installing retracts be sure to leave the string taped to the root rib.

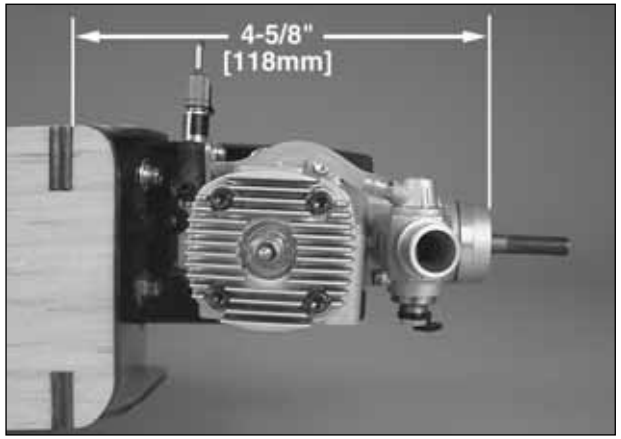
❏ 6. Repeat steps 1- 5 for the left wing panel.

Install Engine and Fuel Tank

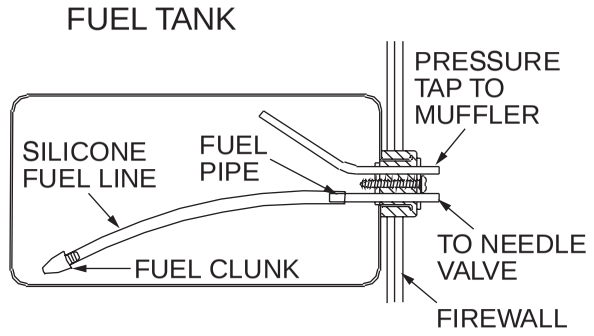




❏ ❏ 1. Cut the tabs from the **engine mount**. Install the engine mount to the firewall with four 6-32x 3/4" [25mm] socket head cap screws, #6 flat washers and #6 lock washers.

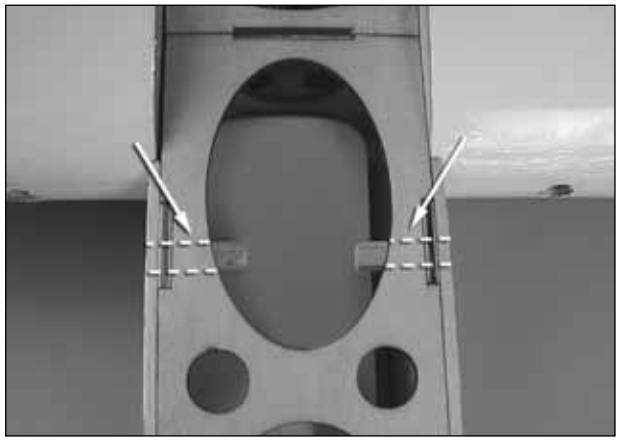


❏ ❏ 2. Position the engine on the engine mount so the distance from the firewall to the thrust washer measures 4-5-8" [118mm]. Mark the location of the mounting holes onto the engine mount. Drill and tap the engine mount with a 6-32 tap for each of the four bolts. Mount the engine to the mount with four 6-32 x 3/4" [25mm] socket head cap screws, #6 flat washers and #6 lock washers.



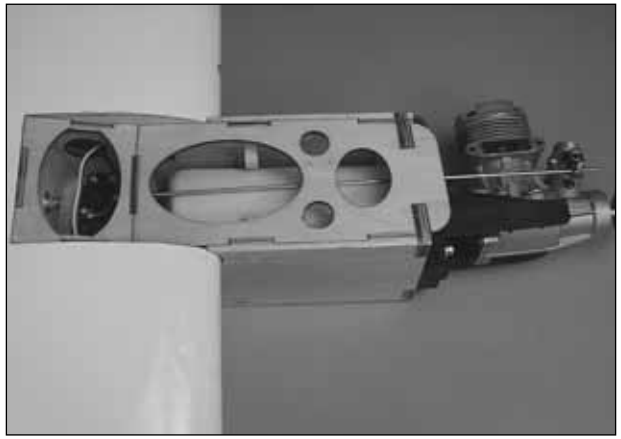
❏ ❏ 3. Assemble the **fuel tank** as shown in the sketch. When tightening the center screw be sure not to over tighten it. You just want it snug enough to pull the rubber stopper tight against the tank.

❏ ❏ 4. Install the tank into the fuselage with the neck of the tank through the firewall.

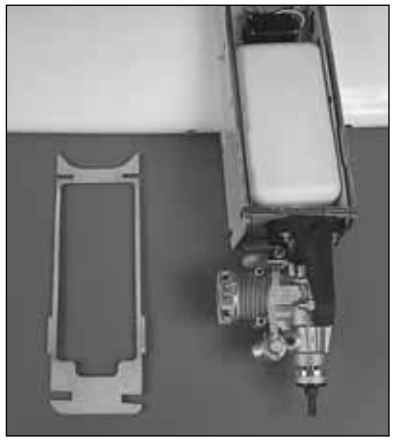


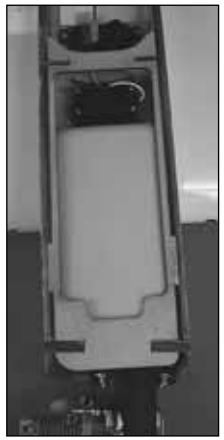
❏ ❏ 5. From one of the 1/4" x 1/4" x 12" [6mm x 6mm x 305mm] balsa sticks, cut two sticks to a length of 1" [25mm]. Insert them into the square openings on each side of the bottom of the nacelle. Make sure they extend into the nacelle far enough to support the fuel tank. Then, glue them in place.

❏ ❏ 6. Install silicone fuel tubing onto the aluminum tubes from the fuel tank. The line with the fuel clunk will feed to the fuel inlet at the needle valve and the other will attach to the pressure tap on the muffler. If you choose to use some kind of an external fuel valve, follow the instructions with your particular brand of fuel valve. You can also install a third line to the tank and use it for filling the tank. The method you use is your choice but make your decision before moving onto the installation of the fuel tank.



❏ ❏ 7 Install a brass screw lock connector, nylon retainer ring and a 4-40 x 1/4" [6mm] socket head cap screw onto the throttle arm on the engine. Cut the threaded portion off of a 2-56 x 12" [305mm] pushrod wire. Slide the wire through the screw lock connector on the throttle arm, pushing it back towards the throttle servo. Bend the wire as needed to clear the top of the fuel tank and reach the screw lock connector. Tighten the set screws against the wire pushrod.





❏ ❏ 8. Epoxy the top of the nacelle in place.

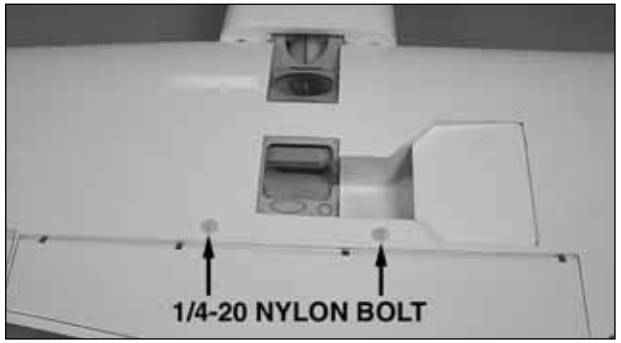
A note about the muffler: *A wide variety of mufflers are available. On our O.S .46 we used the Bison muffler (BISG4046) and cut the pipes to a length of 3/8" [10mm]. This allowed the cowl to slip over the engine and muffler yet still allows the exhaust to clear the inside of the nacelle. Cut the pipes as shown. Leave the muffler off the engine for now. This will make the installation of the* ***fiberglass nacelle*** *easier.*

❏ 9. Repeat steps 1- 8 for the left wing panel.

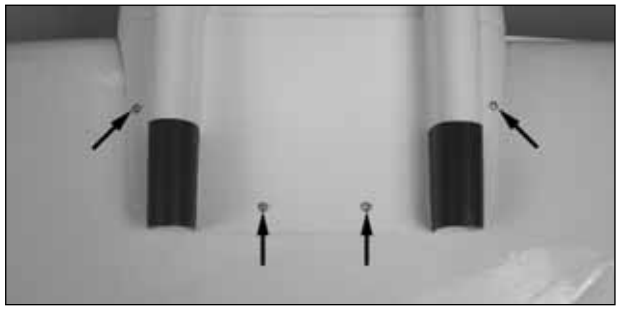
Install Fiberglass Nacelle

❏ ❏ 1. Glue two of the 1/4 x 1-1/8" [6mm x 30mm] **nylon dowels** into the leading edge of the wing on each side of the nacelle with epoxy. The dowels should extend from the leading edge of the wing approximately1/2" [13mm].

❏ ❏ 2. Place the two nacelles side by side. Each have outboard thrust angles built into the front of the nacelle. Identify the right and left and mark this on the inside of the nacelle.

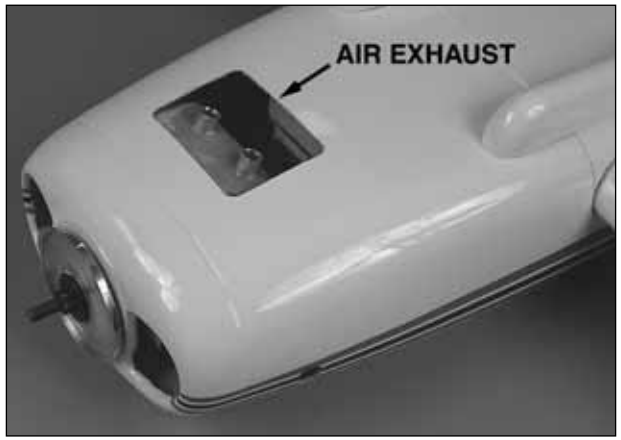


❏ ❏ 3. Slide the nacelle over the engine and onto the locating dowels on the leading edge of the wing. **Note:** You may have to remove the needle valve and/or the needle valve spring to get the nacelle completely over the engine. Secure the nacelle to the wing with two 1/4-20 x 2" [51mm] nylon bolts on the bottom of the wing.



❏ ❏ 4. Place the nacelle belly pan onto the bottom of the wing, placing it tight against the nacelle. Drill a 1/16" [1.6mm] hole at the location shown, making sure to drill only through the wood under the pan. Install and then remove a #2 x 1" [25mm] sheet metal screw into each of the holes. Apply a few drops of thin CA into the holes. After the glue has cured, screw the belly pan in place.

❏ ❏ 5. Make the necessary cut-outs for the needle valve, muffler, glow driver, etc.



❏ ❏ 6. It is very important that you provide an air exhaust to allow the engine to be cooled properly. With the engine completely cowled, you must provide approximately 5 sq. in. [.35 dm^2] of exhaust area on the bottom of the wing nacelle.

❏ ❏ 7. Epoxy one of the two 5/16 x 1-1/2" [8mm x 40mm] nylon dowels with the steel pin in its center into the hole in the leading edge of the wing. Insert the pin fully into the hole in the leading edge.

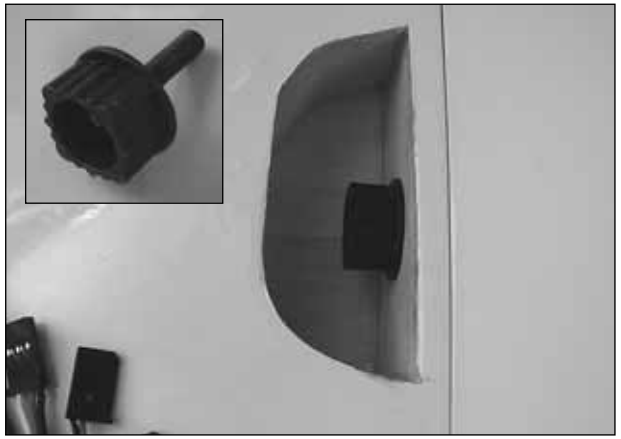
❏ 8. Repeat steps 1-7 for the other wing.

Install the Spinners

❏ ❏ Install the spinners to the engine with the hardware included with the spinners. When mounting the propellers you will need to use the nut that came with the spinners rather than the nut that came with the engine.

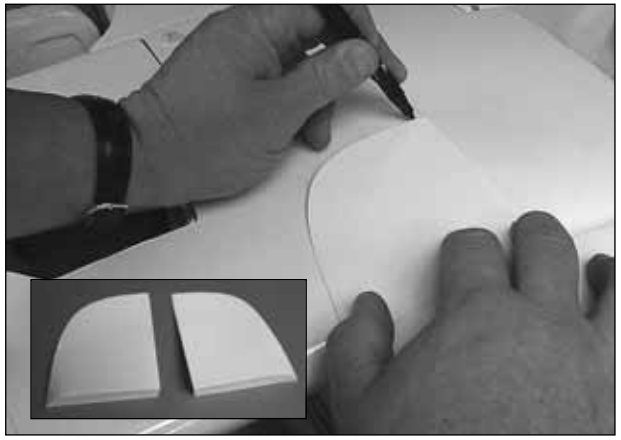
Join the Wings

❏ 1. Slide the two aluminum tubes into one of the wing halves. Slide the other wing onto the tubes. Push the wings tightly together.



❏ 2. Insert the 1/4-20 thumbscrew into the opening in the right wing panel. Tighten the screw, pulling the wings together.

❏ 3. Place the fuselage upside down into the foam stand. Install the wing onto the fuselage, securing it with two 1/4-20 nylon wing bolts.

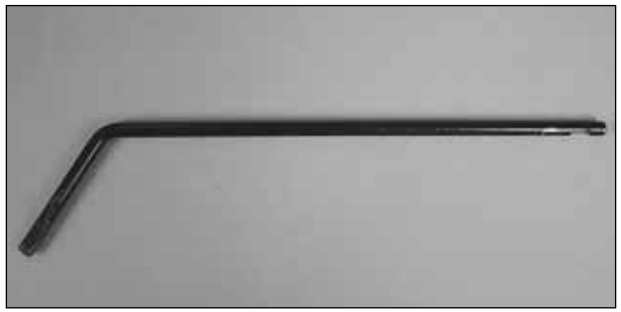


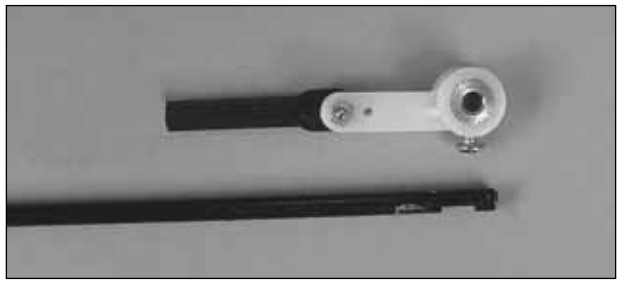
❏ 4. Locate the two fiberglass wing fairings. Place them on each wing. Trace the outline of the fairing onto the wing. Using a sharp modeling knife, carefully cut the covering from the wing. Be careful to only cut through the covering, not the surface of the wing.

❏ 5. Glue the fairings to the wing. After the glue has cured, remove the wing from the fuselage and separate the two halves of the wing.

ASSEMBLE THE FUSELAGE

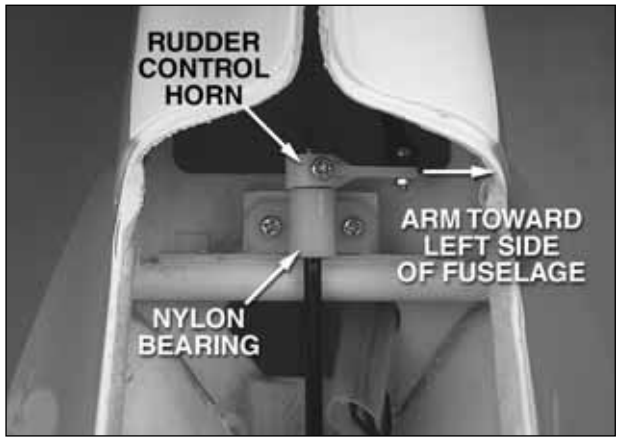
Install the Elevator and Rudder



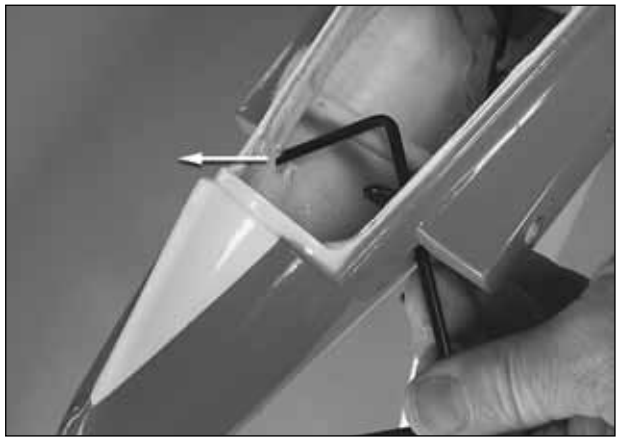


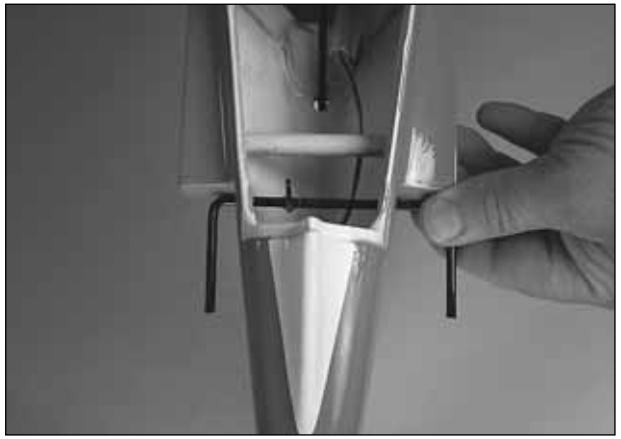
❏ 1. Locate the rudder control wire and the rudder control horn. Note that the wire has a flat spot pre-cut in the end of the wire.

❏ 2. Slip the rudder control wire into the hole in the top of the fuselage.

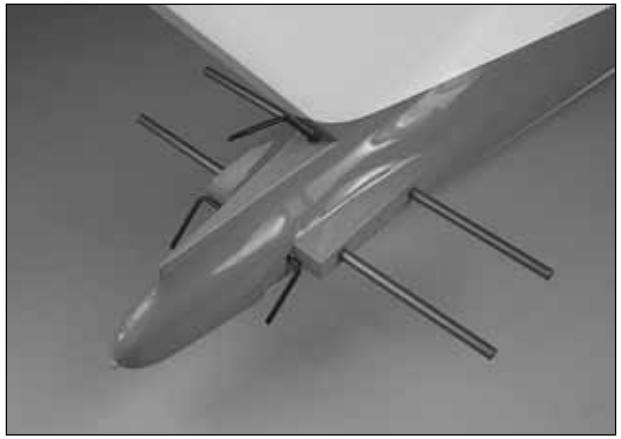


❏ 3. Put a 4-40 nut onto a 4-40 x 36" [914mm] wire pushrod. Screw the wire pushrod into the nylon swivel connector approximately 20 turns. Lock the nut against the connector. From the back of the fuselage, slide the pushrod wire into the center plastic guide tube that is pre-installed in the fuselage. Slide the rudder control wire through the nylon bearing. Place the rudder control horn onto the rudder control wire. When installing it over the wire be sure the control arm is on the left side of the fuselage. Remove the set screw from the control horn and apply a couple of drops of thread locker to the threads. Re-insert the screw into the control horn, tightening the set screw against the flat spot on the rudder control wire.

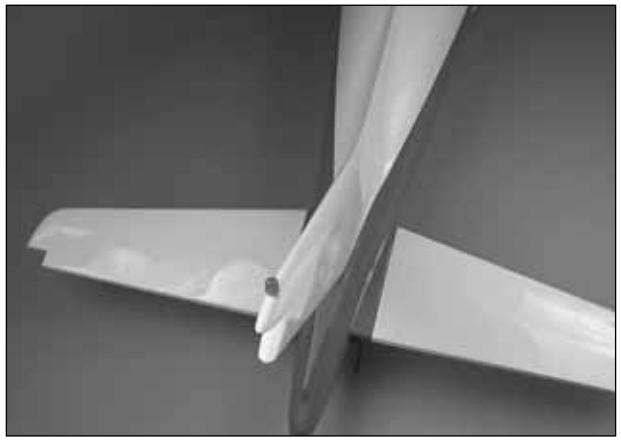




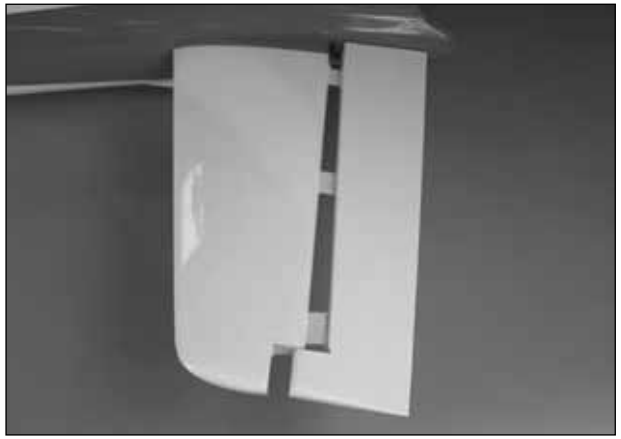
❏ 4. Insert the elevator joiner wire into the holes in the sides of the fuselage following the sequence shown.



❏ 5. Slide the aluminum stabilizer tubes into the back of the fuselage. Test fit the two stabilizer halves onto the tubes. Be sure the stabilizer fits snug to the sides of the fuselage. Once you are satisfied with the fit, remove the stabilizers from the tubes.

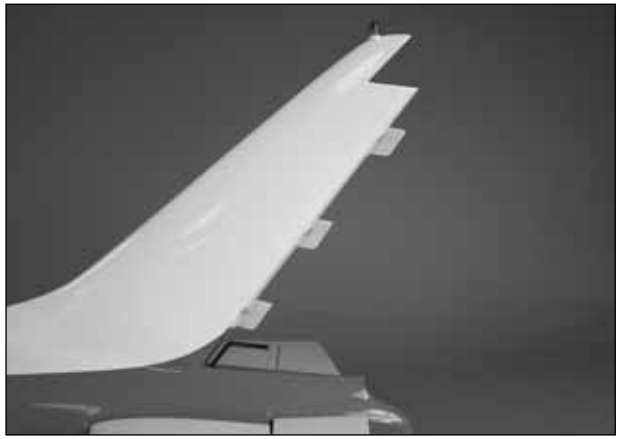


❏ 6. WIth 200-grit sandpaper, roughen the fuselage where the stabilizers make contact with the fuselage. Glue the stabilizer halves to the fuselage with epoxy. Tape the stabilizers in place until the glue has hardened.

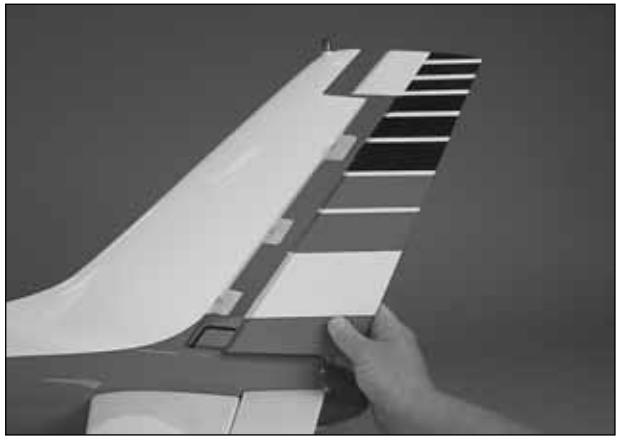


❏ 7. Cut six 1" x 1" [25mm x 25mm] hinges from the CA hinge strip. Snip off the corners so they go in easier. Install three hinges into each of the elevator halves and trial fit the elevators to the stab. Once satisfied with the fit, remove the elevators from the stab. Apply a small amount of epoxy to the elevator joiner wires. With the hinges installed in the elevator, slide the elevators onto the joiner wire and into the hinge slots, securing the hinges to the stabilizer with thin CA the same way you did the ailerons.

❏ 8. Cut three 1" x 1" [25mm x 25mm] hinges from the CA hinge strip. Snip off the corners so they go in easier.



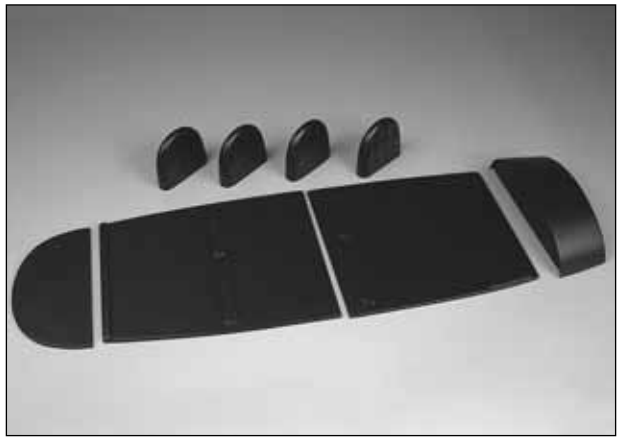
❏ 9. Insert the hinges into the hinge slots of the vertical fin. Keep the hinges centered using a pin.

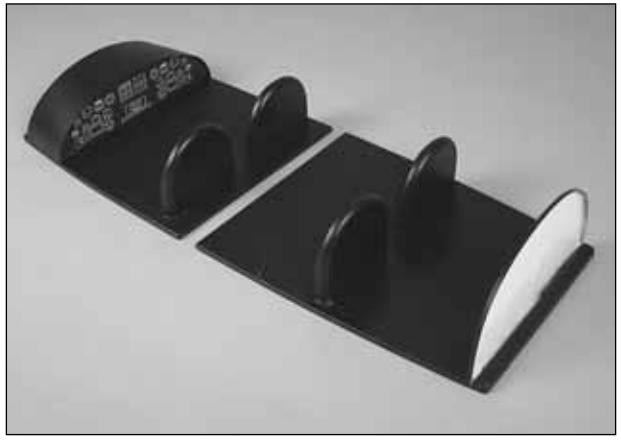


❏ 10. Trial fit the rudder onto the hinges and the vertical fin. Once satisfied with the fit, remove the rudder. Apply a small amount of epoxy to the rudder wire. With the hinges installed in the rudder, slide the rudder in position. Secure the hinges with thin CA the same way as was done for the elevator.

Install the Cockpit

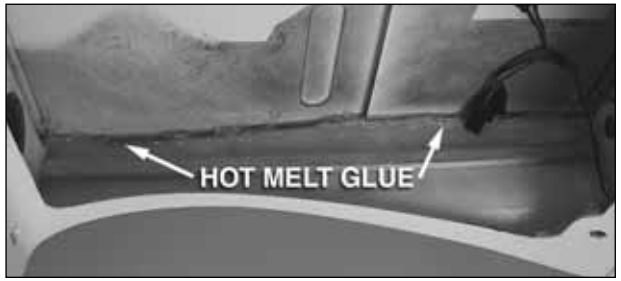
The cockpit needs to be installed now, before the installation of the servos. Do not skip this step thinking you will install the cockpit after the rest of the plane is complete. The cockpit can be installed permanently but if you're like most modelers you may like the ability to remove it at a future date. The following instructions will allow the cockpit to be removed should there ever be a need to do so.





❏ 1. Locate the components of the cockpit interior. Cut the instrument panel decal from the decal sheet and install it to the instrument panel bulkhead. Glue the four seat backs, the instrument panel and the back of the cockpit in place. Glue pilot in place.

❏ 2. Located inside of the fuselage, on both sides of the fuselage, are wood tabs. These are to be used to help locate the cockpit floor. Position the cockpit just above these blocks.

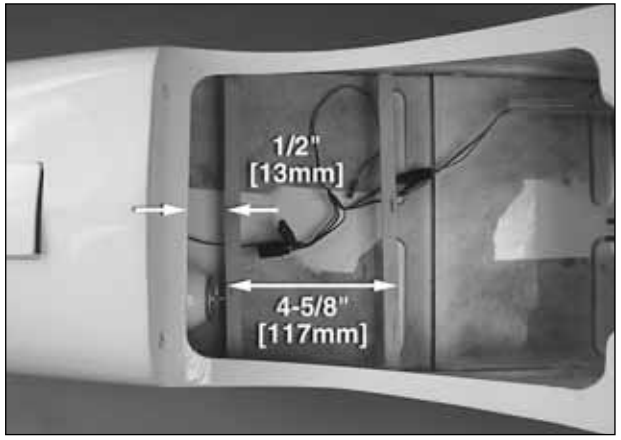


❏ 3. Install the cockpit into position with a hot melt glue gun. This glue sets quickly yet is easily removable should you ever need to remove the cockpit. If you do not have a hot melt glue gun you can also use silicone though this will take longer to set up.

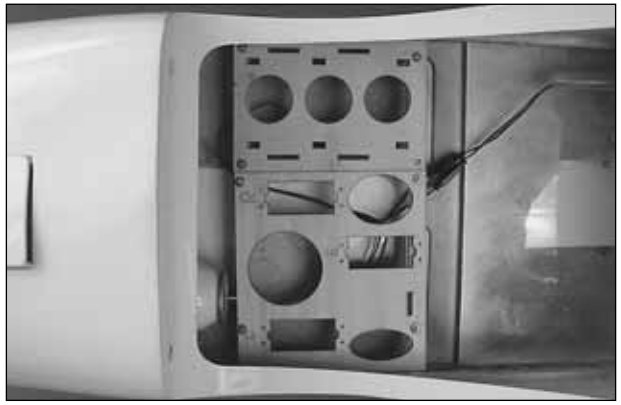
Install Radio, Elevator & Rudder Servos

❏ 1. Plug the wire from the landing light located in the nose of the fuselage into the wiring harness inside the fuselage.

❏ 2. If you plan to install retractable landing gear you need to install the air tank now. Glue the tank into the opening on the right side of the fuselage. Hot melt glue or epoxy mixed with microballoons works well.

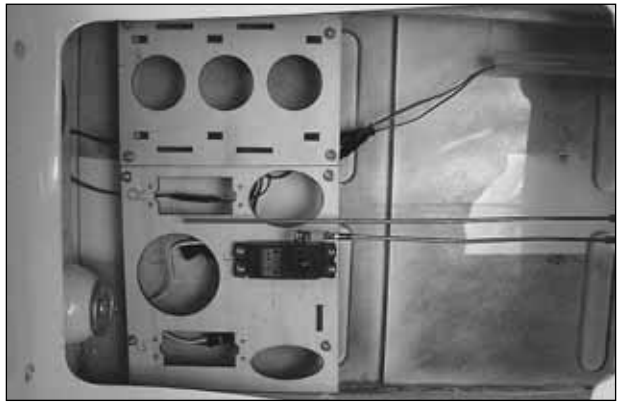


❏ 3. Glue the two 3/16" x 3/8" x 9" [4mm x 10mm x 230mm] hardwood servo tray mounting rails inside the fuselage. The mounting rails must be located on the top of the balsa rails already glued to the fuselage sides and spaced as shown in the photo.



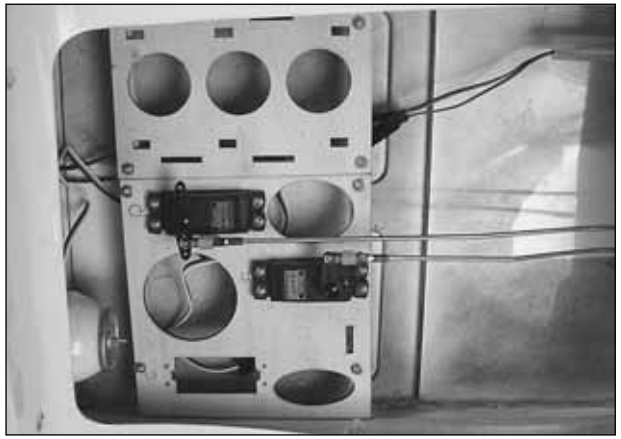
❏ 4. Test fit the radio and servo tray to the rails you glued into the fuselage. Note that the trays fit between the balsa longerons on the fuselage sides. Once you are satisfied with the fit of the trays, drill a 1/16" [1.6mm] hole through the servo and radio trays, drilling through the servo mounting rails. Secure both trays to the rails with eight #2 x 3/8" [10mm] sheet metal screws and #2 flat washers.

❏ 5. Install a 4-40 nut, 4-40 threaded clevis and silicone clevis keeper onto the threaded end of a 4-40 x 36" [914mm] wire pushrod. From the back of the fuselage slide the elevator wire into the pre-installed plastic pushrod tube for the elevator. Attach the clevis to the elevator control horn.

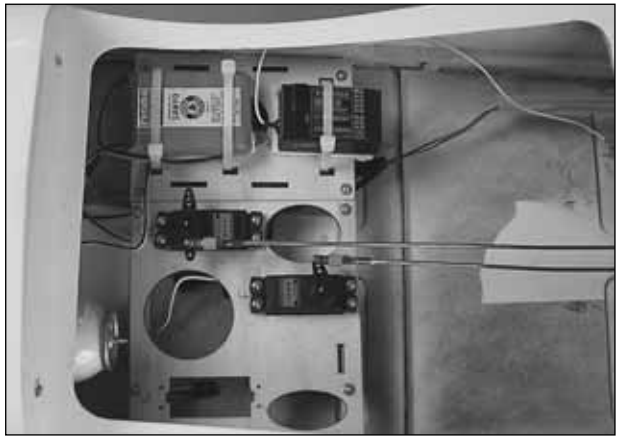


❏ 6. Using the hardware provided with the servos, install the elevator servo into the servo tray as shown. Center the elevator servo. Align the elevator pushrod wire with the servo arm. To get a good alignment with the servo arm, adjust the pushrod wire by making slight bends as needed to the wire. Install a 4-40 solder clevis onto the servo arm. Center the elevator and then mark the pushrod wire and cut it to length. Remove the clevis from the servo arm.

❏ 7. Solder the clevis to the wire. Slide a clevis keeper over the clevis. Then, attach the clevis to the servo arm.



❏ 8. Install the rudder servo following the same procedure used with the elevator servo. For the rudder use a double servo arm and install the clevis one hole in from the outermost hole as shown.



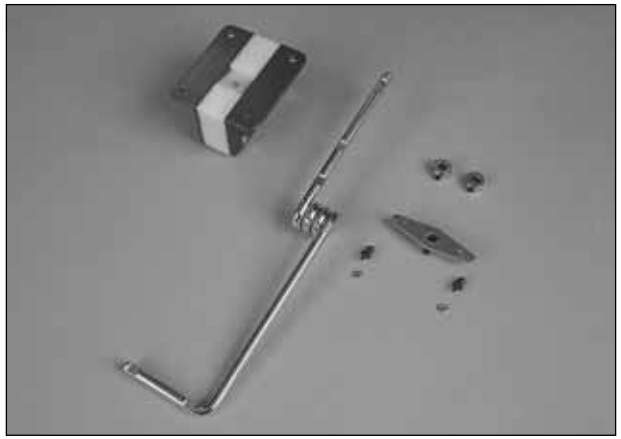
❏ 9. Place 1/4" [6mm] foam under the receiver and battery. Hold them to the tray with the plastic tie wraps. Route the receiver antenna through the antenna tube, securing the antenna at the back of the fuselage. Note: If you are going to be utilizing the lighting system on this airplane, you should hold off on installing the receiver battery until you are instructed to install the battery for the lights. The same plastic tie wraps used for the receiver battery will be used to hold the battery for the lighting system in place.

❏ 10. Position the tail cover in place on the bottom of the fuselage. Drill a 1/16" [1.6mm] hole in each corner of the cover. Remove the cover and drill a 3/32" [2.4mm] hole through each of the holes you drilled in the cover. Secure the cover to the fuselage with four #2 x 3/8" [10mm] screws and #2 flat washers.

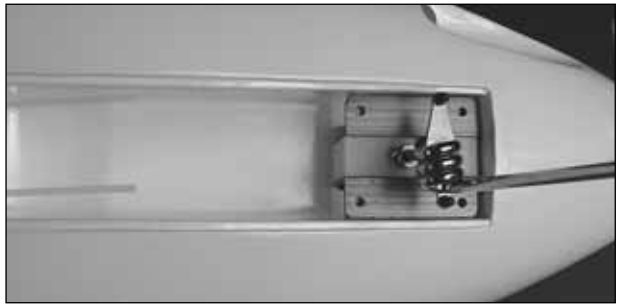
INSTALL THE LANDING GEAR

The following instructions are for the installation of the fixed landing gear. If you will be installing the retractable landing gear, skip ahead to the instruction for the retractable landing gear. Should you later decide to change over to the retractable landing gear, the mounting holes match so the gear is interchangeable.

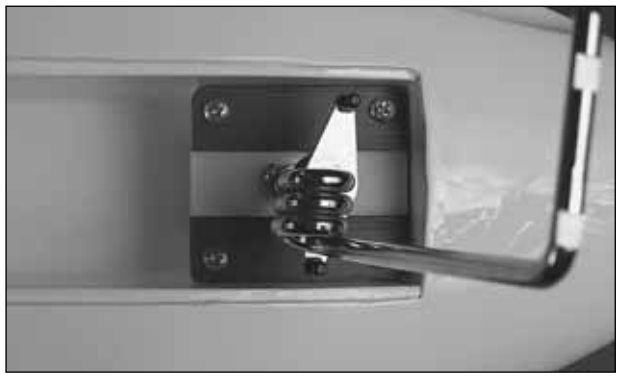
Nose Gear



❏ 1. Locate the components for the nose gear assembly. Assemble it as shown, making sure to use thread locker on all of the bolts.

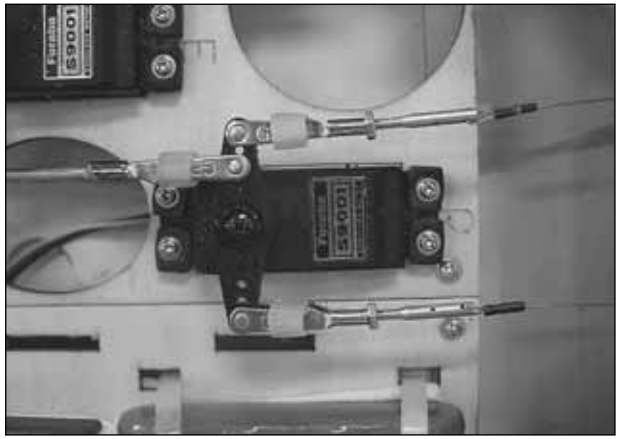


❏ 2. Place the nose gear assembly onto the mounting rail in the fuselage. You will find that the nose gear wire touches the fuselage. Mark the spot where the wire makes contact and make a clearance hole in the fuselage with a high speed motor tool.



❏ 3. Place the nose gear onto the mounting rails. Mark the hole locations. Then, drill a 7/64" [2.8mm] hole on each of the marks. Install the nose gear assembly with four #6 x 1/2" [13mm] machine screws, #6 flat washers and #6 lock washers.

❏ 4. Cut the 39" [990mm] pull-pull wire in half. Slip a crimp connector onto one of the wires. Wrap the wire around each of the ball links on the nose gear steering. Pull the wires tight and squeeze the crimp connector. Insert the opposite end of the wire into the plastic tube.

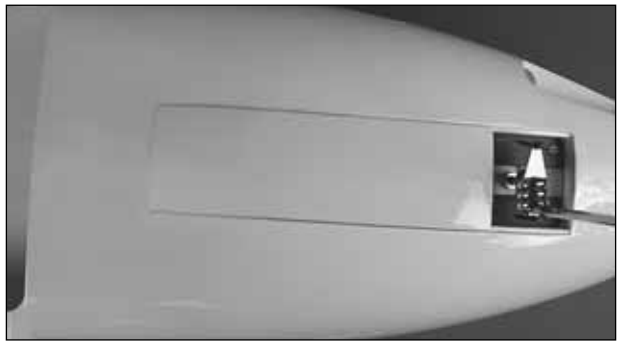


❏ 5. Install a 2-56 nut and clevis onto two threaded brass couplers. Install the clevis onto the outer holes of the servo arm. Slide a crimp connector onto the wire. Then, feed the wire through the hole in the side of the brass coupler and back through the crimp connector. Do this for both of the wires. Pull the wires, making them equal in tension and making sure the rudder is centered. Crimp the connectors against the wire.

❏ 6. Apply thread locker to two of the wheel collar set screws. Insert the screws into two wheel collars. Slide a wheel collar onto the nose gear wire, tightening it against the inner most flat spot on the nose gear wire. Install the nose wheel onto the axle followed by another wheel collar, tightening it against the remaining flat spot on the wire.

Decision you must make...

Included in the kit is a fiberglass door that fits the opening in the fuselage for the landing gear. If you are planning to only fly this airplane with fixed landing gear, then you might wish to proceed with step 7. If you think you might be installing retracts at some time in the future, you should skip step 7 and move onto the main landing gear. The procedure outlined in step 7 may be skipped with no effect on the flying performance of the airplane.

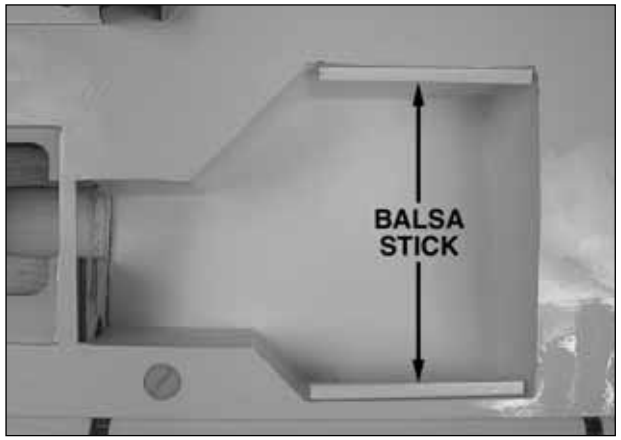


❏ 7. You might wish to close off the nose gear compartment to minimize drag to the aircraft. If so, trim the door as shown and glue it permanently in place on the fuselage.

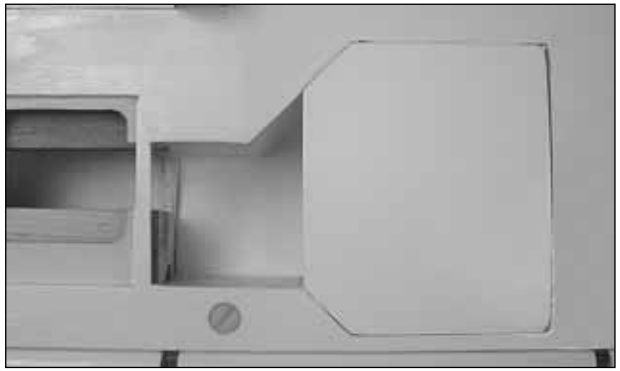
Main Gear

Decision you must make...

Look closely at the bottom of the right wing. Adjacent to the mounting rails for the landing gear you will find the wheel opening for the retracts is covered with Monokote. This covering can be left in place to minimize drag. If you are interested in a more scale like appearance, you might wish to permanently mount the fiberglass gear doors as shown in the following instructions. If there is a chance that you might install retracts in the future, it is recommended that you leave the covering in place and not install the gear doors. If you choose to leave the covering in place skip ahead to step 3.

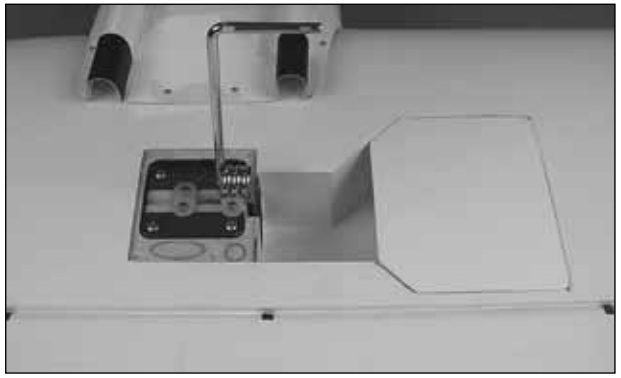


❏ ❏ 1. Cut the covering from the wheel wells. From the 1/8" x 3/16" x 15-1/2" [3mm x 5mm x 390mm] white balsa stick, cut four 3" [76mm] sticks. Glue two into each wheel well to support the door when it is glued in place. Position the sticks 1/8" [3mm] above the bottom skin of the wing.

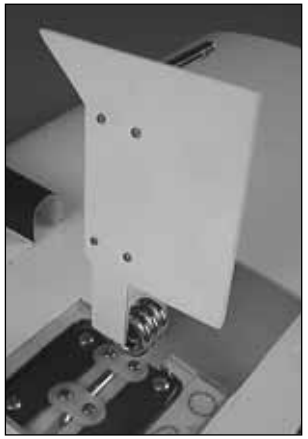


❏ ❏ 2. Glue the gear door to the sticks.

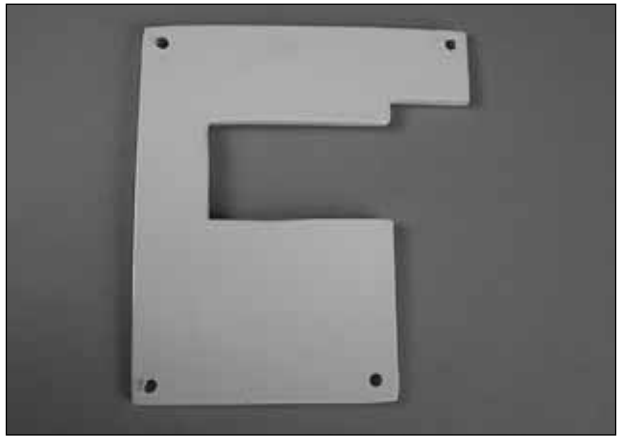
❏ ❏ 3. Install the landing gear into the landing gear mounting block. Secure the gear to the blocks with two nylon landing gear straps and four #4 x 1/2" [3mm x 13mm] sheet metal screws.



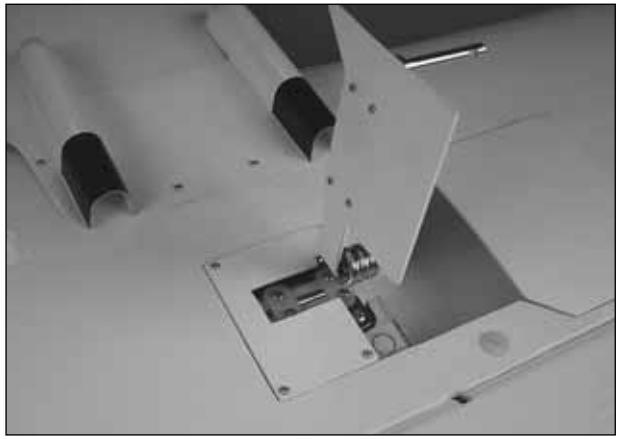
❏ ❏ 4. Position the landing gear over the hardwood rails. Be sure the axle is pointed towards the root rib of the wing. Drill four 7/64" [2.8mm] holes through the mounting holes and into the hardwood rails. Use four #6 x 1/2" [13mm] sheet metal screws, #6 lock washers and #6 flat washers to hold the gear in place.



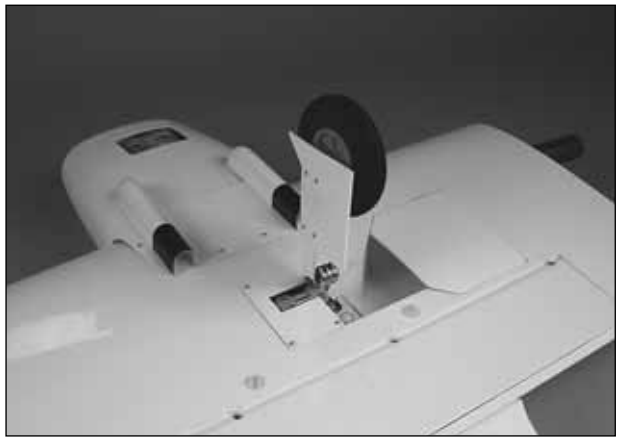
❏ ❏ 5. Position two nylon humped landing gear straps onto the landing gear wire and position the landing gear door over the landing gear wire. Mark the location of the holes for the landing gear straps onto the door. On the marks, drill a 5/64" [2mm] hole through the door. Secure the door to the landing gear straps with four 2mm x 10mm machine screws and 2mm nuts. When positioning the landing gear doors note that the bottom of the door extends beyond the axle.



❏ ❏ 6. Drill a 3/32" [2.4mm] hole in each of the corners of the landing gear plate as shown.



❏ ❏ 7. Place the landing gear plate in position over the landing gear block. Drill a 1/16" [1.6mm] hole through each of the four holes, drilling through the hardwood plate. Mount the plate with four #2 x 3/8" [9.5mm] sheet metal screws.



❏ ❏ 8. Install a set screw into two 3/16" [5mm] wheel collars. Slide a wheel collar onto the axle followed by the wheel and another wheel collar. Tighten the set screw against the flat spots on the axle.

❏ 9. Repeat steps 1–8 for the opposite landing gear.

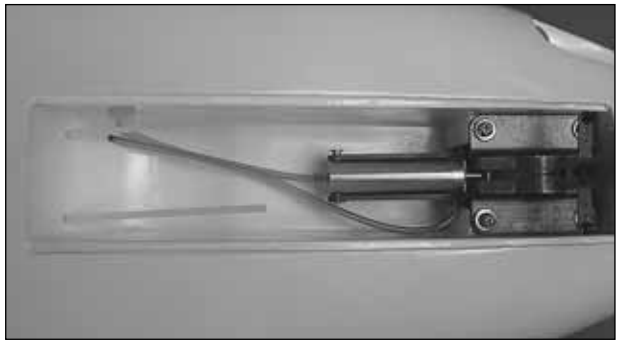
Skip ahead to Final Assembly.

RETRACTABLE LANDING GEAR

The following instructions will take you through the installation of the retractable landing gear. To maximize the scale appearance of the airplane we have included landing gear doors for the nose gear and the main gear. These doors are intended for use with the installation of the fixed landing gear. Though we are not providing instructions for their use on retractable landing gear, the more "scale-minded" pilot might wish to use them and create their own door hinging and closure mechanisms.

Nose Gear

❏ 1. Drill two 1/8" [3mm] holes in the corner of the nose gear wheel well for the air lines.



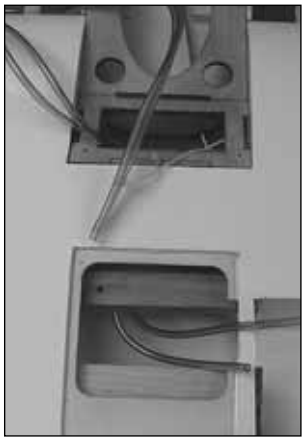
❏ 2. Install 18" [460mm] of air line onto each air inlet on the landing gear. Feed each line into the holes you drilled, pulling the lines into the radio compartment. Place the nose gear onto the mounting rails. Mark the hole locations and then drill a 7/64" [2.8mm] hole on each of the marks. Install the nose gear assembly with four #6 x 1/2" [13mm] machine screws, #6 flat washers and #6 lock washers.

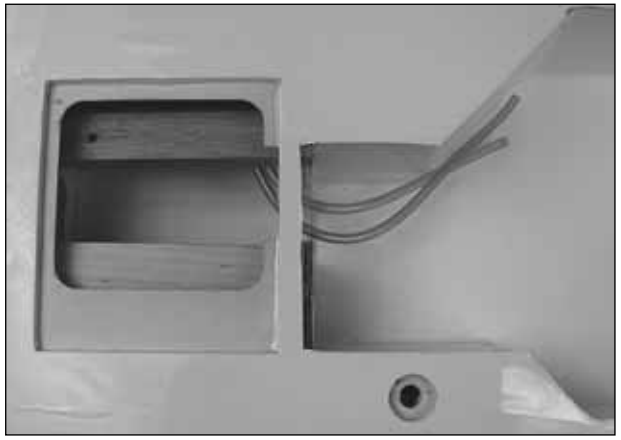
❏ 3. Install the nose wheel. Use two #8 flat washers on each side of the wheel to keep it centered in the fork.

❏ 4. Cut the 39" [990mm] pull-pull wire in half. Slip a crimp connector onto one of the wires. Wrap the wire around each of the ball links on the nose gear steering. Pull the wires tight and squeeze the crimp connector. Insert the opposite end of the wire into the plastic tube.

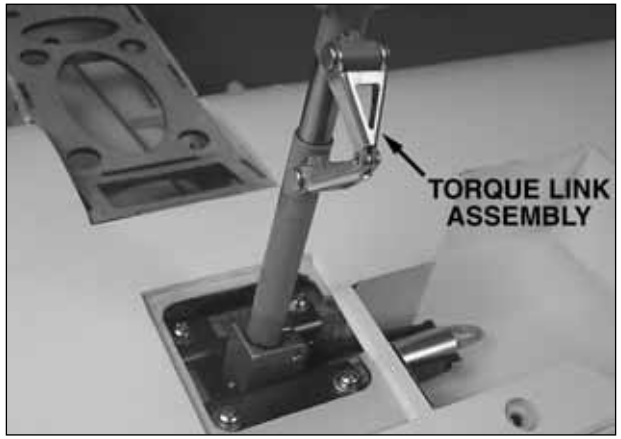
❏ 5. Install a 2-56 nut and clevis onto two threaded brass couplers. Install the clevis onto the outer holes of the servo arm. Slide a crimp connector onto the wire. Then, feed the wire through the hole in the side of the brass coupler and back through the crimp connector. Do this for both of the wires. Pull the wires, making them equal in tension and making sure the rudder is centered. Crimp the connectors against the wire.

Main Gear

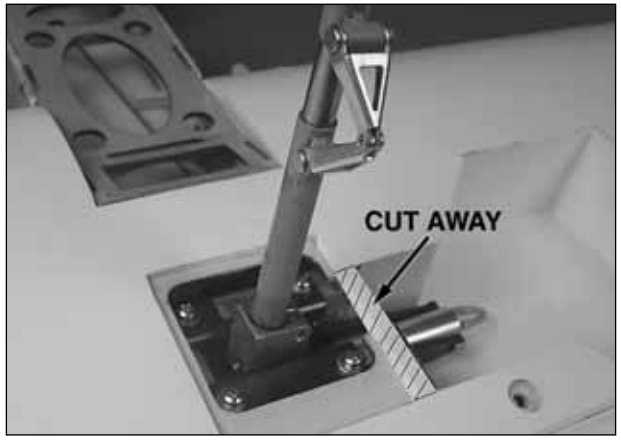




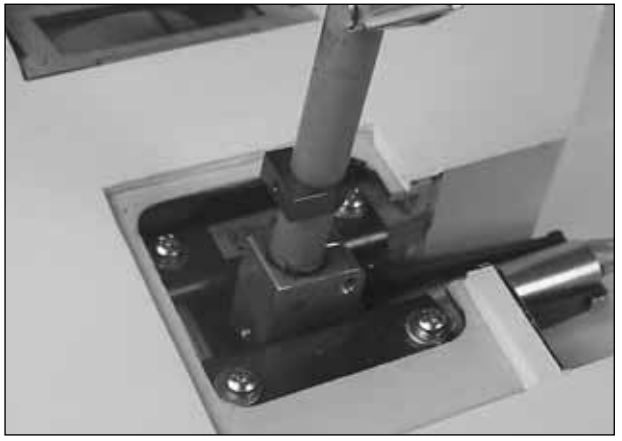
❏ ❏ 1. Cut two airlines to a length of 24" [610mm]. They need to be fed from the wheel well to the center of the wing where they will be pulled through the wing with the string that was left in place during the servo installation. The lines can be fed through the openings for the servo leads as shown in the photos. Once the line is installed between the wheel well and the wing, tie the string to the two airlines and pull them through the hole at the root of the wing.



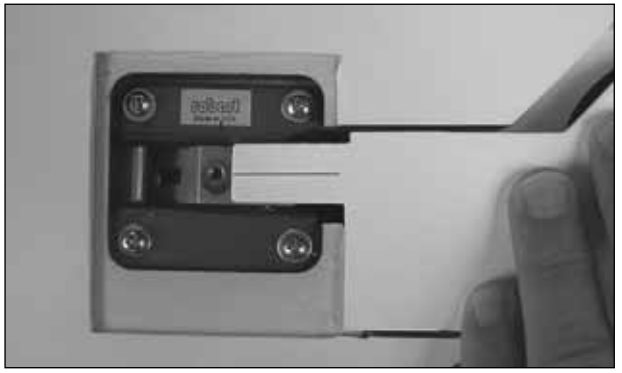
❏ ❏ 2. Attach the airlines to the air inlets on the landing gear. Place the landing gear onto the landing gear rails. (*Note: When installing the landing gear, the torque link assembly will be towards the back of the wing.*) Drill a 7/64" [2.8mm] hole through the landing gear plate for each of the mounting holes. Insert and then remove a #6 x 1/2" [13mm] screw into each hole. Apply a small amount of thin CA onto the threads to harden them. After the glue has hardened, mount the landing gear with a #6 x 1/2" [13mm] screw, #6 flat washer and #6 lock washer.



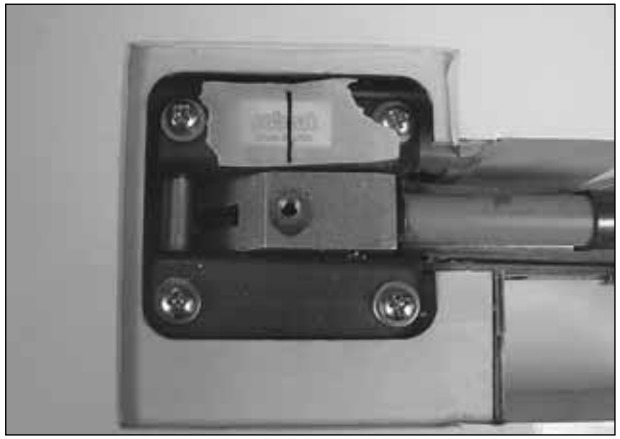
❏ ❏ 3. Cut away the wood as shown.



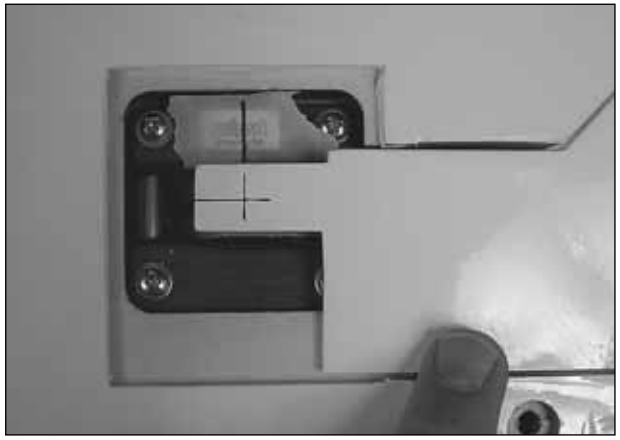
❏ ❏ 4. Loosen the set screw for the landing gear. Remove the landing gear leg. Then, slide one of the landing gear door cover mounting brackets onto the leg. Reinstall the leg and tighten the set screw.



❏ ❏ 5. Retract the landing gear. Then, position the landing gear door so it is centered in the opening as shown. Make a line on the door in line with the hole in the landing gear.

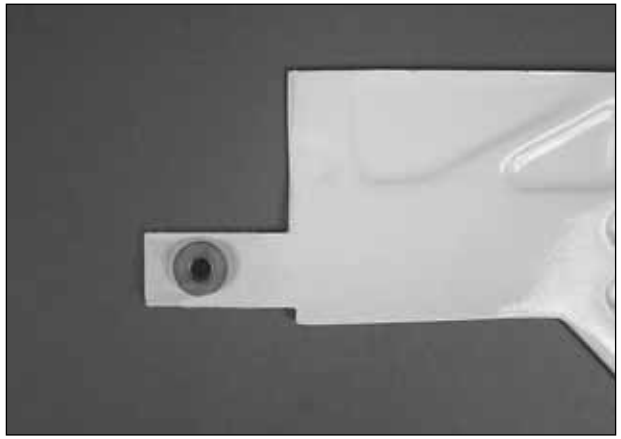


❏ ❏ 6. Place a piece of masking tape onto the mounting flange. Make a line on the masking tape in line with the hole in the landing gear.



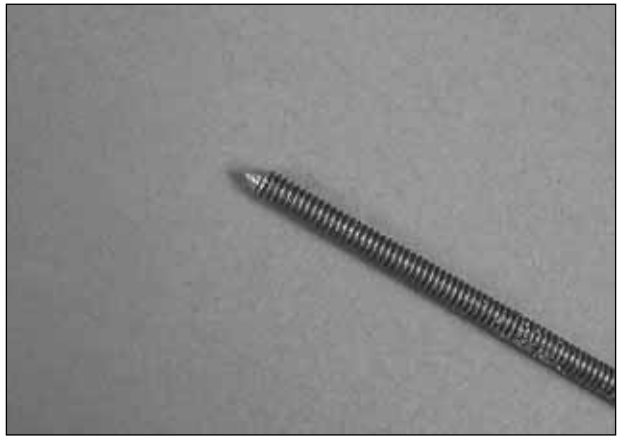
❏ ❏ 7. Position the landing gear door in the opening in the bottom of the wing. When you are satisfied with the position of the door, draw a line across the line already drawn on the landing gear door.

❏ ❏ 8. At the intersection of the two lines drill a 1/16" [1.6mm] pilot hole. Then drill through the pilot hole with a 11/64" [4.4mm] drill.

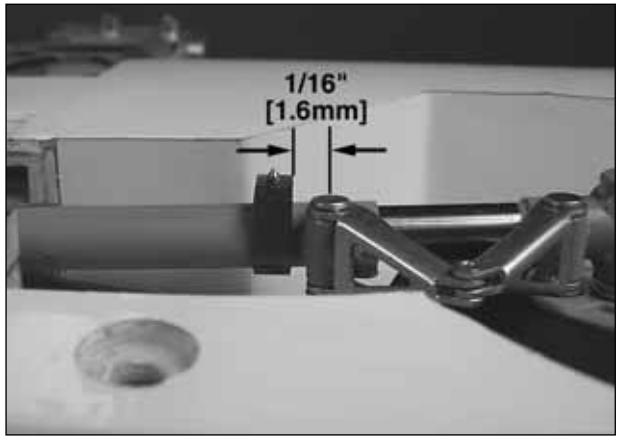


❏ ❏ 9. Glue two #8 flat washers to the inside of the landing gear door.

❏ ❏ 10. Locate a #8 x 1" [25mm] phillips head machine screw. Use a high speed motor tool or hacksaw and cut the bolt so the threaded length of the bolt is 5/16" [7.9mm].



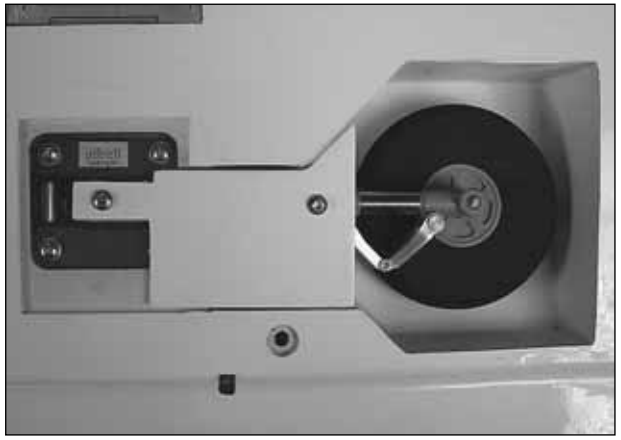
❏ ❏ 11. Locate the 4-40 x 12" [305mm] threaded rod. File a point onto one end of the rod. Cut the pointed end from the rod to a length of 1/4" [6mm].

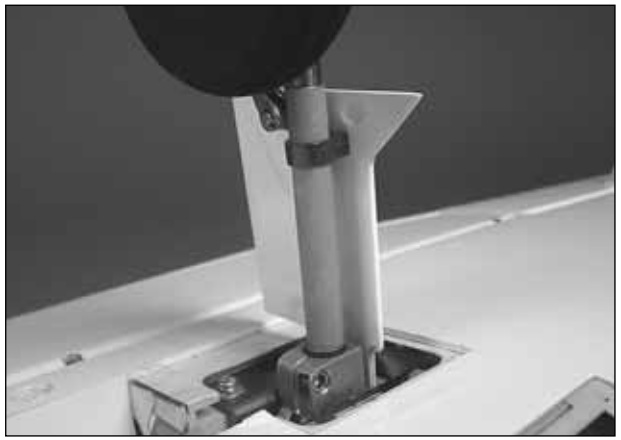


❏ ❏ 12. Position the landing gear door cover mounting bracket so that it is approximately 1/16" [1.6mm] above the torque link assembly. Install the pointed rod into the hole in the bracket as shown. Be sure the flat portion of the bracket is aligned with the surface of the wing and then tighten the threaded rod against the landing gear.

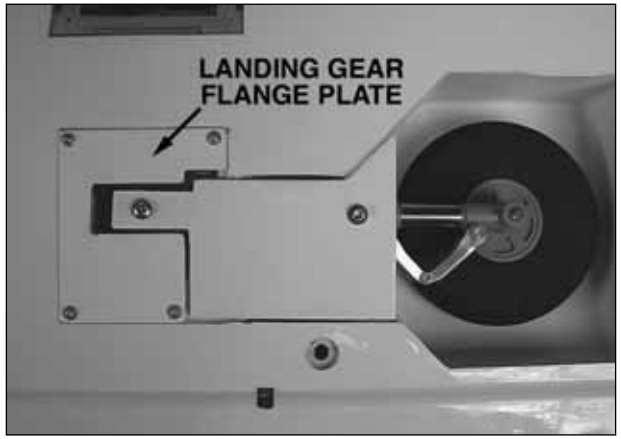
❏ ❏ 13. Place the landing gear door in position over the wheel well. Install the 8-32 bolt that you cut through the hole in the gear door, tightening it to the landing gear. Adjust the door as needed to make sure it is properly centered in the wheel well. Once you are satisfied with the position, press firmly on the landing gear door where the pointed rod is making contact with the door. Press firmly enough to make a small mark on the inside of the door.

❏ ❏ 14. Remove the gear door from the landing gear. On the mark you made drill a 1/16" [1.6mm] pilot hole through the mark. Drill though the pilot hole with a 7/64" drill bit.





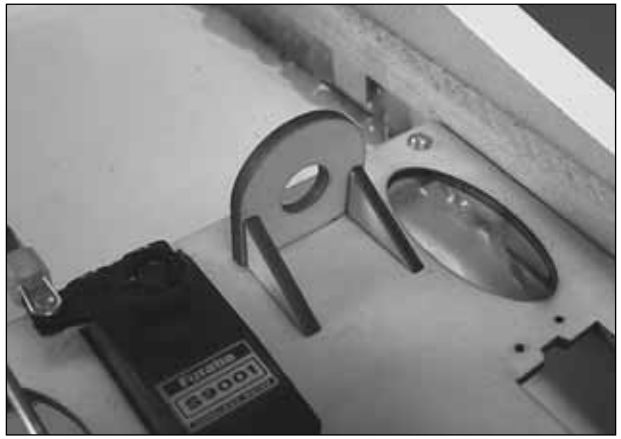
❏ ❏ 15. Reinstall the landing gear door onto the landing gear with the 8-32 bolt. Using a 4-40 x 1/4" [13mm] socket head cap screw and a #4 washer, secure the bottom of the door to the landing gear door cover mounting bracket. Be sure to use thread locker on both mounting screws.



❏ ❏ 16. Position the landing gear flange plate over the landing gear mounting plate. Drill a 1/16" [1.6mm] hole in each corner of the plate. Remove the flange plate from the wing and drill a 3-32" [2.4mm] hole through each of the holes you drilled in the flange plate. Secure the flange plate to the wing with four #2 x 3/8" [10mm] screws and #2 flat washers.

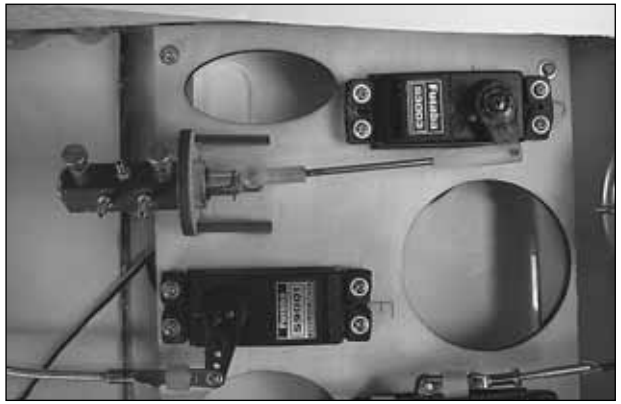
❏ 17. Repeat steps 1-16 for the other landing gear.

Install the Retract Hardware

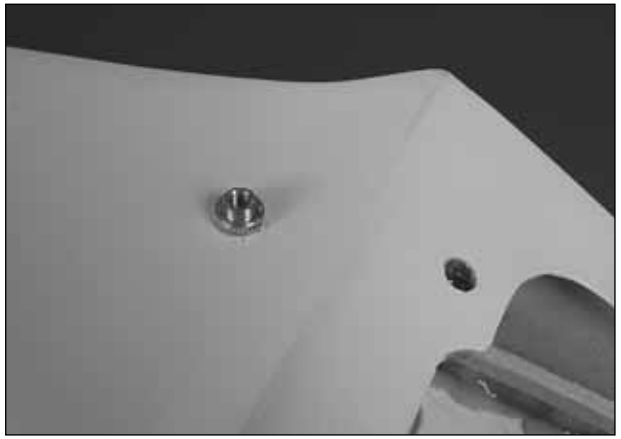


❏ 1. Glue the plywood **air control valve plate** to the servo tray and glue the two plywood triangle shaped gussets as shown.

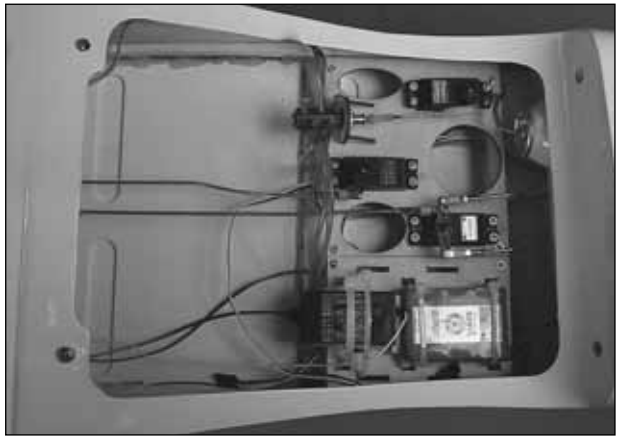
❏ 2. Install a ball link ball to the control valve with a .080 nut. Be sure to use a small amount of thread locker when securing the nut. Insert the air control valve into the plate. Secure the valve to the plate with the nut. Be sure to use a small amount of thread locker when securing the nut.



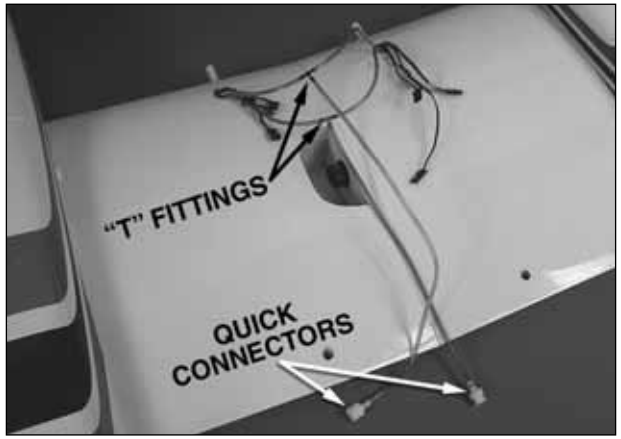
❏ 3. Install the retract servo into the servo opening in the tray. Secure it the same way you did the other servos. Install a nylon ball link onto the 2-56 x 6" [152mm] threaded rod approximately 15 turns. Then install the nylon ball link onto the ball. Center the air control valve arm and center the servo. With a fine tip marker, mark the wire where it aligns with the outer hole of the servo arm. Make a 90 degree bend on the mark. Cut the wire so the wire is 3/8" [10mm] in length after the bend. Insert the wire into the servo arm and lock it in place with a nylon Faslink.



❑ 4. Decide on a location to mount the air fill valve. We mounted ours on the bottom of the fuselage just behind the trailing edge of the wing. This keeps the valve somewhat hidden but it is not the most easily accessible location. If you do not mind it being visible you may wish to locate in on the fuselage in a place more convenient for filling the air tank.



❑ 5. Install the air lines to the air tank, fill valve and air control valve as shown in the instructions that came with the air control kit. Install the connectors that will connect the airlines from the main gear to the airlines in the fuselage.



❑ 6. You now have to make a couple of decisions regarding the wing. The wing is designed in two pieces for easier transportation and storage. Those of you that have an appropriately sized vehicle and adequate storage area may wish to leave the wing assembled in one piece. If you will be leaving the wing together, join the two air lines that will retract the landing gear with a "T" fitting. Join the remaining two lines with another "T" fitting. Install a 12" [310mm] length of air line onto the "T" fitting and an air line quick connector on the other end. If you will be taking your wings apart, substitute a pair of quick connectors for the "T" fittings.

FINAL ASSEMBLY

Completing the Radio Installation

❑ 1. Connect the elevator and rudder servos to the receiver. If you have installed retracts, connect the retract servo to the receiver too.

❑ 2. You have a few options when connecting the aileron, flap and throttle servos. Depending on the number of channels you have available on your radio system, you may wish to have each servo lead plug into its own receiver slot. If you choose to do this follow the instructions included with your radio system. The option of using a "Y" connector is probably the simplest method. Install a "Y" connector between the two aileron connections coming out of each wing and one between the flap connections in each wing. If you intend to leave your wings together, secure the connectors together with heat shrink tubing, tape or some other method. If you want the ability to separate the two wings, secure the connectors on one wing only.

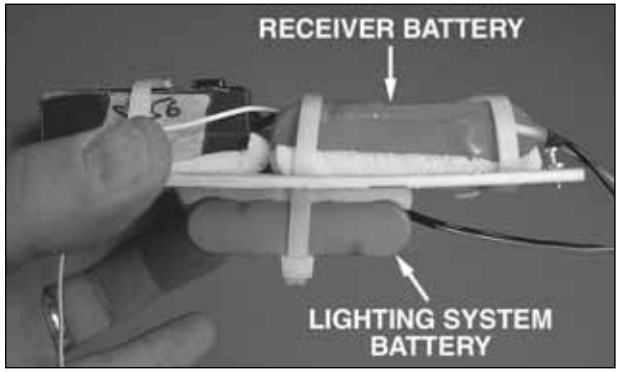
❑ 3. For the throttle linkage you can use "Y" connectors the same way done for the ailerons and flaps. Again, if your radio has the ability to plug each throttle servo into its own slot, you might want to consider doing this. Even if you chose to use "Y" connectors on the ailerons and flaps, you might want to have the throttles on separate channels and mix them with the radio. This would give you the option of starting and operating each engine independently of each other during the start up of the engines.

❑ 4. Install a 6" [152mm] servo extension into the slots in your receiver for each of the aileron, flap and throttle servo leads. This will make plugging the connections in the wing to the receiver easier.

❑ 5. Install the radio switch and charge jack for your particular brand of radio and plug it into the receiver. We chose to mount ours on the bottom of the fuselage. For easier access you might want to consider mounting it to the side of the fuselage.

Connect the Lighting System

The lighting system is a nice scale option but is not required in order to fly the airplane. If you choose not to use the lights you can skip this section of the manual. ***Do not operate the lighting system from the receiver battery pack!*** The lighting system will require the use of a separate 500 mAh battery pack and a switch harness for installation.



❏ 1. You may wish to balance your airplane before deciding on the final location of the battery for the lighting system, but most likely the battery placement will not be crucial for purposes of balancing the airplane. Mount the battery for the lighting system on the opposite side of the battery/receiver tray from the battery for the radio system. Use the plastic tie wraps to hold them in place.

❏ 2. Install a switch and charge jack on the fuselage the same way done for the receiver.

❏ 3. Be sure the main landing light from the front of the fuselage is plugged into the pre-installed lighting harness. Plug the wires from the switch into the wiring harness and the battery pack.

❏ 4. Once everything in the fuselage is connected properly, use tie wraps or tape to bundle the excess wire together to help clean up the entire installation. When doing this be sure that you leave the male connector for the lights in the wing accessible.

❏ 5. Install a "Y" harness to the wires from the left and right wing tip light. When you assemble the airplane for flight, plug the lights from the wing into the connector on the lighting harness.

Apply the Decals

1. Use scissors or a sharp hobby knife to cut the decals from the sheet.

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 one teaspoon of soap per gallon of water. Submerse the decal in the soap and water 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 and water allows accurate positioning and reduces air bubbles underneath.

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

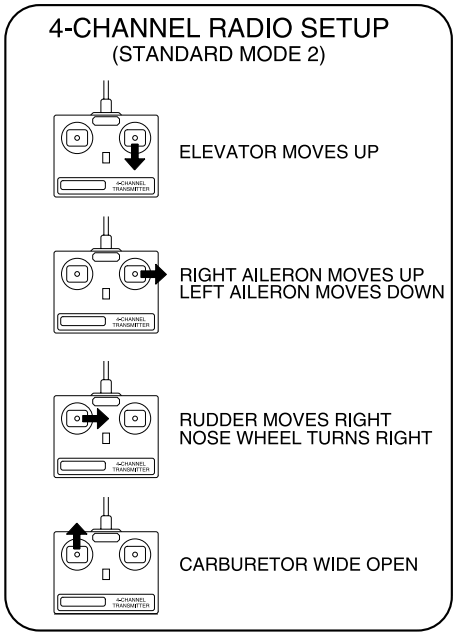
4. Use a piece of soft balsa or something similar to squeegee remaining water from under the decal. Apply the rest of the decals the same way.

GET THE MODEL READY TO FLY

Check the Control Directions

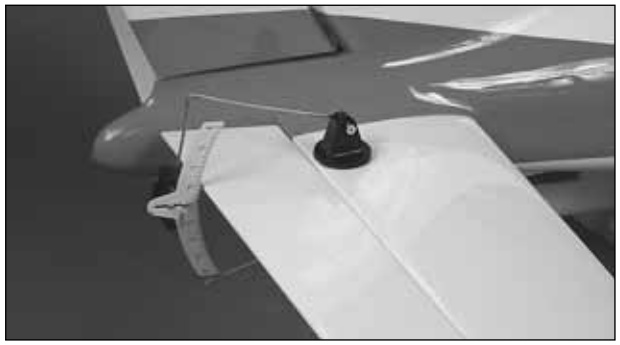
❏ 1. Turn on the transmitter and receiver and center the trims. If necessary, remove the servo arms from the servos and reposition them so they are centered. Reinstall the screws that hold on the servo arms.

❏ 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.



❏ 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



Use a Great Planes AccuThrow™ (or a ruler) to accurately measure and set the control throw of each control surface as indicated in the chart that follows. If your radio does not have dual rates, we recommend setting the throws at the high rate setting. **NOTE:** The throws are measured at the **widest part** of the elevators, rudder and ailerons.

These are the recommended control surface throws:

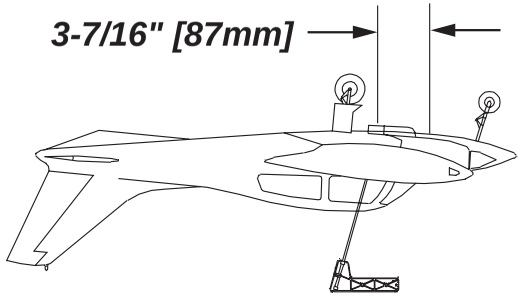
	High Rate	Low Rate
ELEVATOR	1" up 1" down [25mm]	3/4" up 3/4" down [19mm]
RUDDER	1-1/2" right 1-1/2" left [38mm]	1" right 1" left [25mm]
AILERONS:	3/4" up 3/4" down [19mm]	1/2" up 1/2" down [19mm]
FLAPS:	1-5/8" [40mm] down	

IMPORTANT: The Cessna 310 has been **extensively** flown and tested to arrive at the throws at which it flies best. Flying your model at these throws will provide you with the greatest chance for successful first flights. If, after you have become accustomed to the way the Cessna 310 flies, you would like to change the throws to suit your taste, that is fine. However, too much control throw could make the model difficult to control, so remember, "more is not always better."

Balance the Model (C.G.)

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

At this stage the model should be in ready-to-fly condition with all of the systems in place including the engines, landing gear and the radio system.



❏ 1. Use a felt-tip pen or 1/8" [3mm]-wide tape to accurately mark the C.G. on the top of the wing on both sides of the fuselage. The C.G. is located 3-7/16" [87mm] back from the leading edge of the wing at the fuselage sides.

This is where your model should balance for the first flights. Later, you may wish to experiment by shifting the C.G. up to 5/16" [8mm] forward or 5/16" [8mm] back to change the flying characteristics. Moving the C.G. forward may improve the smoothness and stability, but the model may then require more speed for takeoff and make it more difficult to slow for landing. Moving the C.G. aft makes the model more maneuverable, but could also cause it to become too difficult to control. 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 upsidedown 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" and the battery pack and/or receiver must be shifted forward or weight must be added to the nose to balance. If the nose drops, the model is "nose heavy" and the battery pack and/or receiver must be shifted aft or weight must be added to the tail to balance. If possible, relocate the battery pack or eliminate any additional ballast required. Use Great Planes (GPMQ4485) "stick on" lead. A good place to add stick-on nose weight is in the nose of the fuselage. Begin by placing incrementally increasing amounts of weight on the inside of the fuse until the model balances. Once you have determined the amount of weight required, it can be permanently attached. If required, tail weight may be added inside the rear of the fuselage.

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

Balance the Model Laterally

❏ 1. With the wing level, have an assistant help you lift the model at the tip of the nose and the tail. 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.**

Adjusting the Retractable Landing Gear

After connecting the air lines as instructed in the instructions that came with the Air Control kit, fill the air tank to 100psi and try cycling the landing gear. The landing gear should cycle up and down freely. If they do not, here are some troubleshooting tips:

❑ 1. **The gear does not move up or down:** Check to be sure the control screws on the variable rate valve are open.

❑ 2. **The landing gear moves up and down but is not smooth:** When mounting the landing gear onto the landing gear rails it is important that the rails are exactly parallel to one another. If not, when you tighten the screws the mounting flange of the gear mechanism can twist slightly. Try loosening the mounting screws a little and try cycling the landing gear again. If the gear now works, re-tighten the screws one at a time, cycling the gear after each screw is tightened. When you find out which screw is pulling down too hard on the mounting flange, slip a shim under the mounting flange and then re-tighten the screw.

❑ 3. **One of the landing gear goes up while the other goes down:** Most likely you have crossed one of the air lines.

❑ 4. **The main landing gear seems to lock in the "gear up" position:** The screw that you cut to length to hold the bottom of the landing gear door to the strut can extend too far into the thread, causing the gear to bind. Slightly loosen that screw and try cycling the gear again. If it now works smoothly grind a little off the end of the bolt.

PREFLIGHT

Identify Your Model

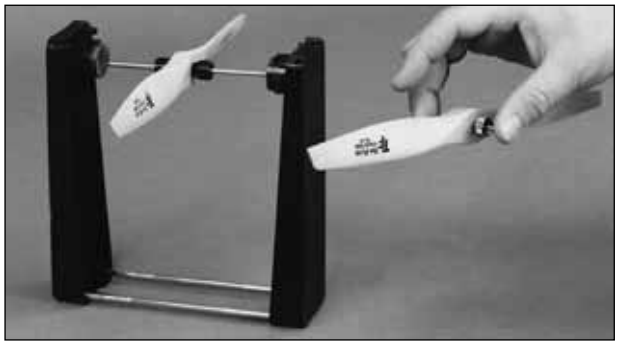
No matter if you fly at an AMA sanctioned R/C club site or if you fly somewhere on your own, you should always have your name, address, telephone number and AMA number on or inside your model. It is **required** at all AMA R/C club flying sites and AMA sanctioned flying events. Fill out the identification tag on page 35 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.

Balance Propellers



Carefully balance your propellers and spare propellers before you fly. An unbalanced prop can be the single most significant cause of vibration that can damage your model. Not only will engine mounting screws and bolts loosen, possibly with disastrous effect, but vibration may also damage your radio receiver and battery. Vibration can also cause your fuel to foam, which will, in turn, cause your engine to run hot or 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.

Ground Check

If the engine is new, follow the engine manufacturer's instructions to break-in the engine. After break-in, confirm that the engine idles reliably, transitions smoothly and rapidly to full power and maintains full power–indefinitely. After you run the engine on the model, inspect the model closely to make sure all screws remained tight, the hinges are secure, the prop is secure and all pushrods and connectors are secure.

Range Check

Ground check the operational range of your radio before the first flight of the day. With the transmitter antenna collapsed and the receiver and transmitter on, you should be able to walk at least 100 feet away from the model and still have control. Have an assistant stand by your model and, while you work the controls, tell you what the control surfaces are doing. Repeat this test **with the engines running** at various speeds with an assistant holding the model, using hand signals to show you what is happening. 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 RUN IN INSTRUCTIONS

Because of the importance for both engines to run through the entire flight we recommend that you follow these engine pre-flight instructions.

1. Before attempting to fly the airplane, remove the nacelles and run a full tank of fuel through one engine. Put a second tank of fuel through the same engine, running it at different speeds from idle to full throttle. It is important that the engine has a solid, reliable idle and that it transitions from idle to mid range and then full throttle without any signs of the engine quitting. Adjust the low speed needle valve to achieve a good idle and low end transition. Then adjust the high speed needle valve. Once you are confident of the engine performance, repeat the procedure for the other engine.

2. Once you are satisfied with both engines, carefully start both of them. When starting a twin engine airplane be careful not to get anything or any part of you in the prop of the running engine! With both engines running, let them idle for a few seconds. Check the RPM of each engine. They should be close but not necessarily exactly the same. Advance the throttle to full. The engines should transition similarly. Once at full throttle the engines should have an RPM very close to one another. Check this with a tachometer. If you do not have a tachometer listen to the sound of the engines. When they are running close to the same RPM they will sound the same. Run the two engines together for the remainder of the tank, running them throughout the engine range.

3. Reinstall the nacelles and run the engines. A fully cowled engine may run at a higher temperature than an un-cowled engine. Adjust the needle valves so the engines run as well with the nacelles as they did when the nacelles were off. Check the RPM measurements, making sure the engines are synchronized with each other. Once you have the engines adjusted to their maximum RPM, richen the engines, allowing the engines to run 150–200 RPM below the maximum achievable RPM. Running the engine slightly rich will help allow the engines to run slightly cooler and minimize chances of the engines overheating. When making your final engine adjustments it is most important that the engines are synchronized at full throttle. At lower RPM it is not as crucial that they are in synch. If, when your engines are at full throttle one engine has a higher RPM than another, richen the stronger engine until it is in synch with the weaker engine.

4. It has been our experience that the .46 AX engines will run approximately 10 minutes with the supplied fuel tanks. We recommend that you run the engines on the ground at 3/4 to full throttle and time them to see how long you can expect them to run while in the air. Use of a timer in flight will assure that you don't lose track of time.

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.
- 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.
- Use a "chicken stick" or electric starter to start the engine. Do not use your fingers to flip the propeller. Make certain the glow plug clip or connector is secure so that it will not pop off or otherwise get into the running propeller.
- Make all engine adjustments from behind the rotating propeller.
- The engine gets hot! Do not touch it 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 glow engine, cut off the fuel supply by closing off the fuel line or following the engine manufacturer's recommendations. Do not use hands, fingers or any other body part to try to stop the engine. Do not throw anything into the propeller of a running engine.

AMA SAFETY CODE (EXCERPTS)

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.

IMAA SAFETY CODE (EXCERPTS)

Since the Cessna 310 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.

What is Giant Scale?

The concept of large or giant-scale is generally considered to apply to radio controlled model aircraft with minimum wingspans of 80 inches for monoplanes and 60 inches for multi-wing aircraft. Quarter-scale or larger replicas of person-carrying aircraft with proper documentation (minimum 3-view drawing) which do not fit the size requirements will also be permitted.

Section 1.0: SAFETY STANDARD

1.1 Adherence to Code: The purpose of this Safety Code is to provide a structure whereby all participants, including spectators, will be aware of the inherent dangers in the operation of radio controlled aircraft. This code is meant to serve as a minimum guideline to all participants. It is understood that the ultimate responsibility for the safety of any aircraft lies with the owner(s), pilot(s) and spectator(s) involved in any event. It is the responsibility of all participants to exercise caution when operating, or observing the operation of all radio controlled aircraft. The pilot/owner of an aircraft will not be dissuaded from taking whatever steps they deem necessary, in addition to this code, to insure that their aircraft is safe.

1.2 The most current AMA Safety Code in effect is to be observed.

Section 3.0: SAFETY REVIEW

3.4 Flight Testing: All aircraft are to have been flight tested and flight trimmed with a minimum of six (6) 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 Review form (see Section 3.2) by the pilot (or owner) shall document, as fact, that the noted aircraft has been successfully flight tested and proven airworthy prior to the IMAA event.

Section 4.0: SPOTTER/HELPER

4.1 Spotter/Helper Definition: An assistant to aid the pilot during start-up, and taxing onto the runway. The spotter/helper will assist the pilot in completing a safe flight.

4.2 Each pilot is required to have a spotter/helper at all IMAA sanctioned events. The event Safety Committee should be prepared to assist those pilots who do not have a spotter/helper to make sure that every registered pilot has the opportunity to fly at a sanctioned event.

Section 5.0: EMERGENCY ENGINE SHUT OFF (Kill Switch)

5.1 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 spotter/helper. This switch is to be operated manually and without the use of the Radio System.

5.2 Engines with battery powered 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 spotter/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 completely close the carburetor throat 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 higher-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. It is expected that IMAA members will avail themselves of technological advances as such become available, to promote the safety of all aircraft and participants.

- 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 ounces of torque. 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 stabilizer half is strongly recommended. Use of dual servos is also recommended on larger aircraft.

- On board batteries should be, at a minimum, 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 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.

- Dependable, redundant and fail safe battery systems are recommended.

- The use of anti-glitch devices for long leads is recommended.

- There is no maximum engine displacement limit, as it is the position of this body that an under powered aircraft presents a greater danger than an over powered aircraft. However, the selections 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 engines. These maximums apply only to AMA Sanction competition events such as 511, 512, 515 and 520. All 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 12 pounds per cubic inch of engine displacement (under powered), or be less than 5 pounds per cubic inch of engine displacement (overpowered). Example: Using a 3 cu. in. engine, a model would likely be under powered 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 control horns should be rated heavy-duty. Glass filled servo arms and control horns are highly recommended.

- Control surface linkages are listed in order of preference:
  1. Cable system (pull pull). A tiller bar is highly recommended along with necessary bracing.
  2. Arrow-shaft, fiberglass or aluminum, 1/4" or 5/16" OD. Bracing every six (6) to ten (10) inches is highly recommended.
  3. Tube in tube (Nyrod). Bracing every few inches is highly recommended. Inner tube should be totally enclosed in outer tube.
  4. Hardwood dowel, 3/8" OD. Bracing every six (6) to ten (10) inches is highly recommended.

- Hinges should be rated heavy-duty and manufactured primarily for use in giant-sized aircraft. Homemade and original design hinges are acceptable if determined to be adequate for the intended use.

- Clevis (steel, excluding heavy-duty ball links) and attachment hardware should be heavy-duty 4-40 thread-and-rod type. 2-56 thread size rod is acceptable for some applications (e.g. throttle). Clevises must have lock nuts and sleeve (fuel tubing) or spring keepers.

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

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.

❏ 1. Fuelproof all areas exposed to fuel or exhaust residue such as the cowl ring, cowl mounting blocks, wing saddle area, etc.

❏ 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. 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), screw-lock pushrod connectors, etc.

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

❏ 8. Make sure all hinges are **securely** glued in place.

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

❏ 10. Confirm that all controls operate in the correct direction and the throws are set up according to the manual.

❏ 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 you may have used do not interfere with other systems (servo arms, pushrods, etc.).

❏ 14. Secure the pressure tap (if used) to the muffler with high temp RTV silicone, thread locking compound or J.B. Weld.

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

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

❏ 17. Tighten the propeller nut and spinner.

❏ 18. Place your name, address, AMA number and telephone number on or inside your model.

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

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

❏ 21. Range check your radio when you get to the flying field.

FLYING

The Cessna 310 is a great-flying model that flies smoothly and predictably. The Cessna 310 does not, however, possess the self-recovery characteristics of a primary R/C trainer and should be flown only by experienced R/C pilots.

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. If necessary, adjust the nose wheel so the model will roll straight down the runway. If you need to calm your nerves before the maiden flight, shut the engines down and bring the model back into the pits. If you have been running the engines for any extended period of time prior to takeoff, top off the fuel, and then check all fasteners and control linkages for peace of mind.

If you are taking off from an asphalt runway there is no need to use flaps for takeoff. If you are taking off from grass you will not need to use flaps as long as you allow the plane to gain adequate ground speed. If you have a short grass field, if it has particularly thick grass or rough conditions you might consider applying 1/2" [13mm] to 3/4" [19mm] of flap. When the plane breaks ground be sure to maintain a shallow climb out and retract the flaps as the plane begins to pick up speed. When you're ready, remember to takeoff into the wind and point the model straight down the runway. As the model gains speed begin adding elevator to achieve a smooth take-off. 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.

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, this model flies more smoothly at reduced speeds.

Take it easy 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 utilizing the flaps. You will find that the plane may balloon slightly when the flaps are deployed. A small amount of down elevator will minimize this and as the plane slows the ballooning will stop. You may wish to mix in 1 to 2 degrees of down elevator to the flaps but it is best to work on the amount of mix after the first flight. 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, use this first flight to become familiar with your model before landing.

Landing

To initiate a landing approach, lower the throttle while on the downwind leg and lower the flaps. When the flaps are deployed you will find that the plane may balloon slightly. A small amount of down elevator will minimize this and as the plane slows the ballooning will stop. You may wish to mix in 1 to 2 degrees of down elevator to the flaps but it is best to work on the amount of mix after the first flight. Allow the nose of the model to pitch downward to gradually bleed off altitude. 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. 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 climb out to make another attempt. When you're ready to make your landing flare and the model is a foot or so off the deck, smoothly increase up elevator until it gently touches down.

Engine Out Procedure

One of the primary concerns everybody has when thinking about flying a twin-engine airplane is "what if an engine quits?" While this is never a desirable situation, through our previous flying experience with other twin-engine models and our flight testing and development with this Cessna 310, we have developed a model that will not suddenly react unexpectedly if an engine quits and can be controlled well enough to get her safely back to the ground.

Thankfully, during straight-and-level flight, if an engine does quit the plane will not do anything sudden or unexpected. The first thing you must do is recognize that an engine has quit and then determine which engine it is. When an engine does quit the plane will gradually yaw towards the dead engine and will soon begin to lose altitude. At this point you must decide if you are going to try and land on one engine or kill the other engine and attempt a dead-stick landing. We have flown left and right hand turns on a single engine, turning into both the dead engine as well as the engine that is running. Both situations will require the use of the ailerons and the rudder. The key to making the turns on a single engine is to steer the plane with the rudder and use the ailerons to keep the wings level. Turning with just the ailerons can result in a stall or a spin depending on which engine you turn into.

Turning towards the running engine will result in a tight turn so it is important to try and make a flat, gradual turn, making the turn with rudder input and keeping the wings level using the ailerons. When turning into the running engine the rudder and ailerons will be very responsive so gradually input the controls.

When making a turn into the dead engine the turn will be much wider. Begin the turn with the rudders and use the ailerons to make any needed correction to keep the wings level.

In either situation it is important to keep the airspeed up. With one engine you will have power enough to fly and maintain altitude for a while before slowly begin to lose altitude. If you lose too much airspeed you will not be able to recover the airspeed with just the engine. You will have to point the nose down towards the ground to recover airspeed. Of course if you are close to the ground you will not have this option so flat large turns are the key to success. Once you have determined which engine is running and which engine is dead, start planning your landing approach. Once you have guided the plane back to the field and are on the final leg, cut the engine power just the same as you would if executing a normal approach. If you use the flaps on landing, do not deploy the flaps until you are over the runway. Otherwise they may slow the plane too much, resulting in a stall. Flaps are not required for a single-engine landing.

If you do not feel you have the proficiency to fly using the rudder and ailerons or are afraid you could become confused executing the procedures just stated, it would be safer to take the second approach which is simply to cut the throttle thus "killing" the running engine and treating the model as though it was a single-engine aircraft in a dead-stick landing.

Whether you land on a single engine or dead-stick you do not have the power to go around for a second landing approach once you are on final. On a single engine approach, if you find you are not aligned properly with the runway and if you have adequate altitude, you can most likely fly around for a second approach. Once you are set up on final you will not have adequate power to climb out and go around again. To put it succinctly, if an engine quits, set up for a landing as quickly as you can. Make smooth, coordinated control adjustments and don't panic. After you have had your first single engine landing, you should find that they are not as bad as you might have thought.

One final note about flying your model. 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). As part of out test flying we set up a condition on the radio that would allow control of the throttles independently. If you have this ability with your system you might want to consider setting your radio up this way. Once the plane is at altitude you can reduce the throttle to idle on one side or the other to get a feel for what the engine out performance is like. Of course using this set up you can easily power the engine back up if you should get in trouble while flying on one engine. This will improve your skills and increase the chances that you will not surprise yourself by impulsively attempting a maneuver and suddenly finding that you've run out of time, altitude or airspeed. 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!

This model belongs to:

_____
Name

_____
Address

_____
City, State, Zip

_____
Phone number

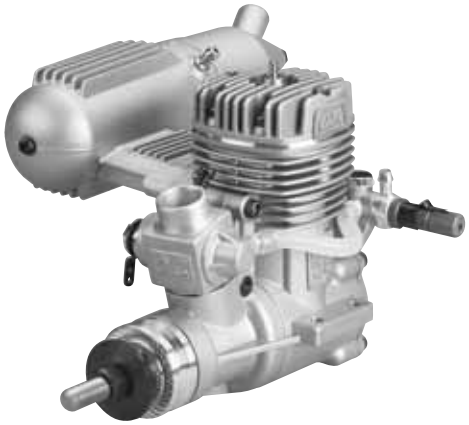
_____
AMA number

Top Flite® Gold Edition™ Beechcraft Staggerwing
TOPA0905

Wingspan: 72.5 in (1840mm)
Wing Area: 1525 sq in (97.6dm²)
Weight: 17-19 lb (7.7-8.6kg)
Wing Loading: 26-28 oz/sq ft (80-90g/dm²)
Fuselage Length: 62.5 in (1590mm)
Engine Required: 2-stroke or 4-stroke 1.60 cu in (25cc) glow engine
Radio Required: 6-channel w/7 servos (minimum) or 8-9 channel w/9 servos (with retracts), (2) 6" (152mm) flap extensions, (2) 12" (305mm) aileron extensions, (2) Y connectors, 1000+ mAh battery, propeller

Unveiled in 1932, Beech Aircraft Corporation's Staggerwing was instantly distinguished by its forward-projecting lower wing. The Staggerwing continues to impress as this 1.60-size sport-scale ARF - a model that sets new high standards for simplicity of scale detail! Top Flite uses only the best materials - premium woods, high-quality fiberglass, and MonoKote covering - and the finest engineering. For easy transport, the wings disassemble into four manageable pieces. At the field, the halves plug into joiner tubes and secure with nylon bolts. The fiberglass wing struts install easily as well, and authentic-looking stringers perfectly complement rivets and panel lines molded into the fiberglass fuselage. Elevator and rudder linkages mount internally to preserve the scale profile. Add a 1.60-size 2- or 4-stroke engine and you'll have plenty of muscle for powering through the air!

O.S.® .50 SX
OSMG0550



There's nothing wrong with wanting more out of aerobatics, and the .50 SX Ring delivers it. It punches out 10% more power than a .46, yet fits in the same space as a .40. It's a clear gain in performance AND options, for sport flying and aerobatics, and here's why. The 1-piece remote needle valve can be repositioned for standard upgright or side mounting and the fuel inlet rotates, for ease either way you go. Also included: dual bearings, an #873 muffler and 2-year warranty.

Displacement: 0.499 cu in (8.18cc)
Bore: 0.866 in (22mm)
Stroke: 0.847 in (21.5mm)

Output: 1.8 bhp @ 17,000 rpm
Practical rpm range: 2000-20,000
Weight: 13.8 oz (391.2g)

Futaba® Super 9C 9-Channel Computer Radios
FUTK85**–FUTK88** 9C Super FM/PCM

Enjoy 9-channel PCM and 8-channel FM capacity, plus easy programming - and more! Using the 16K CAMPac module included with 9C Super radios, you'll have memory for a whopping 18 models. With a selectable switch through channels 5, 7 or 8, you can set up a 2-rate or 3-rate GYA gyro system for your airplane. Plus, the air brake is switch-selectable, and the heli mode's Throttle and Pitch Curves features a delay that smoothes the transition from hover to idle-up. 9C Super radios are available in both FM and PCM modulations on 72MHz, with or without S3151 and/or S9252 digital servos. All come with full NiCds.

For the ultimate in convenience, choose 9C Super systems that feature the 9C/9CS Synthesized Module and R319DPS Synthesized Receiver PCM. They allow pilots to select any channel on 72MHz, without the hassle of selecting and installing crystals!