TOP FLITE

Beechcraft STAGGERWING

Almost-Ready-to-Fly 1.60 Sport Scale Airplane

Wingspan: 72.5 in [1840mm]
Wing Area: 1525 sq in [97.6 dm²]
Weight: 17-19 lb [7.7-8.6 kg]
Wing Loading: 26-28 oz/sq ft [80-90 g/dm²]
Length: 62.5 in [1590mm]
Radio: 6-Channel w/7 servos (minimum) *or* 8/9-Channel w/9 servos (w/retracts)
Engines: 1.60 cu in [25 cc] two-stroke, 1.60 cu in [25 cc] four-stroke

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

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

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

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

With its clean lines, negatively staggered wings, and retractable landing gear, the natural aesthetic beauty of the "Staggerwing" has made it an uncontested classic airplane. Even today the Beechcraft Model 17 Staggerwing is comparable to modern private aircraft. This classiest of classic airplanes transported military generals and executives throughout the Second World War and for years afterwards. Top Flite has returned this vintage airplane to the modeling community in the form of a "World Class" ARF that we are sure will bring you hours of great fun.

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

We urge you to join the AMA (Academy of Model Aeronautics) and a local R/C club. 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 Staggerwing is an excellent sport-scale model and is eligible to fly in IMAA events. The IMAA (International Miniature Aircraft Association) is an organization that promotes non-competitive flying of giant-scale models. If you plan to attend an IMAA event, obtain a copy of the **IMAA Safety Code** by contacting the IMAA at the address or telephone number below, or by logging on to their web site at:

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

SCALE COMPETITION

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

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

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

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

DECISIONS YOU MUST MAKE

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

RADIO EQUIPMENT

- ❏ 6-channel w/7 servos (6- 50oz/in, 1- 30oz/in) or (with retracts) 8/9-channel w/9 servos (6- 50oz/in, 2- 30oz/in, 1- 90oz/in)
- ❏ 2 - 6" [150mm] servo extension (HCAM2701 for Futaba®)
- ❏ 2 - 12" [300mm] servo extension (HCAM2711 for Futaba)
- ❏ 2 - Y-harness (HCAM2751 for Futaba)
- ❏ 1000 mAh battery (minimum)
- ❏ 6 - 54 oz/in servos (2-tail, 2-flaps, 1-rudder, 1-elevator)
- ❏ 2 - 30 oz/in servos (1-throttle, 1-retracts)

ENGINE RECOMMENDATIONS

The recommended engine for the Staggerwing is an O.S.® 1.60 two-stroke or four-stroke.

- ❏ For the 2-stroke engine we used the Bisson Pitts muffler. (BISG4116)
- ❏ The O.S. 1.60 4-stroke engine can use the O.S. Flex-pipe. (OSMG2672)

RETRACTS

If you choose to put retracts on your Staggerwing, we used the following:

- ❏ Robart #530STAG Retracts (ROBQ0536)
- ❏ Robart #188VR Air Control Kit Standard with VR Valve (ROBQ2302)
- ❏ Robart #169 Pressure Tubing (ROBQ2369)
- ❏ Robart #121 Scale Retract Tail Wheel (ROBQ2210)
- ❏ 90 oz-in Servo (such as the Futaba S3305, FUTM0035 for the tail wheel)

ADDITIONAL ITEMS REQUIRED

ADHESIVES & BUILDING SUPPLIES

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

- ❏ 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)
- ❏ R/C Foam Rubber (1/4" [6mm] - HCAQ1000
- ❏ 3' [900mm] Standard Silicone Fuel Tubing (GPMQ4131)
- ❏ Drill Bits: 1/16" [1.6mm], 5/64" [2mm], 3/32" [2.4mm], 7/64" [2.8mm], 1/8" [3.2mm], 9/64" [3.6mm], 5/32" [4mm], 3/16" [4.8mm]
- ❏ 4-40 Tap and Drill Set (GPMR8101)
- ❏ 8-32 Tap and Drill Set (GPMR8103)
- ❏ Small T-Pins (100, HCAR5100)
- ❏ #1 Hobby Knife (HCAR0105)
- ❏ #11 Blades (5-pack, HCAR0211)
- ❏ Stick-On Segmented Lead Weights (GPMQ4485)
- ❏ Silver Solder w/Flux (GPMR8070)
- ❏ 21ST Century® Sealing Iron (COVR2700)
- ❏ 4 oz. [113g] Aerosol CA Activator (GPMR634)
- ❏ CA Applicator Tips (HCAR3780)
- ❏ Epoxy Brushes (6, GPMR8060)
- ❏ Mixing Sticks (50, GPMR8055)
- ❏ Mixing Cups (GPMR8056)
- ❏ Microballoons (TOPR1090)
- ❏ Threadlocker Thread Locking Cement (GPMR6060)

OPTIONAL SUPPLIES & TOOLS

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

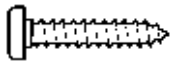
- ❏ Hobbico® Duster™ Compressed Air (HCAR5500)
- ❏ Masking Tape (TOPR8018)
- ❏ Denatured Alcohol (for epoxy clean up)
- ❏ Panel Line Pen (TOPQ2510)
- ❏ Rotary Tool (such as Dremel)
- ❏ Rotary Tool Reinforced Cut-Off Wheel (GPMR8020)
- ❏ Servo Horn Drill (HCAR0698)
- ❏ Hobby Heat™ Micro Torch (HCAR0750)
- ❏ AccuThrow™ Deflection Gauge (GPMR2405)
- ❏ Precision Magnetic Prop Balancer (TOPQ5700)
- ❏ CG Machine™ (GPMR2400)
- ❏ Dead Center™ Engine Mount Hole Locator (GPMR8130)

IMPORTANT BUILDING NOTES

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

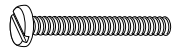
Sheet metal screws are designated by a number and a length. For example #6 x 3/4" [19mm]

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



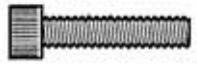
Machine screws are designated by a number, threads per inch, and a length. For example 4-40 x 3/4" [19mm]

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, 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 Staggerwing is factory-covered with Dark Red Top Flite MonoKote® film (TOPQ0218 for a six foot roll). 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.

METRIC CONVERSIONS

To convert inches to millimeters, multiply inches by 25.4

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

ORDERING REPLACEMENT PARTS

Replacement parts for the Top Flite Staggerwing 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

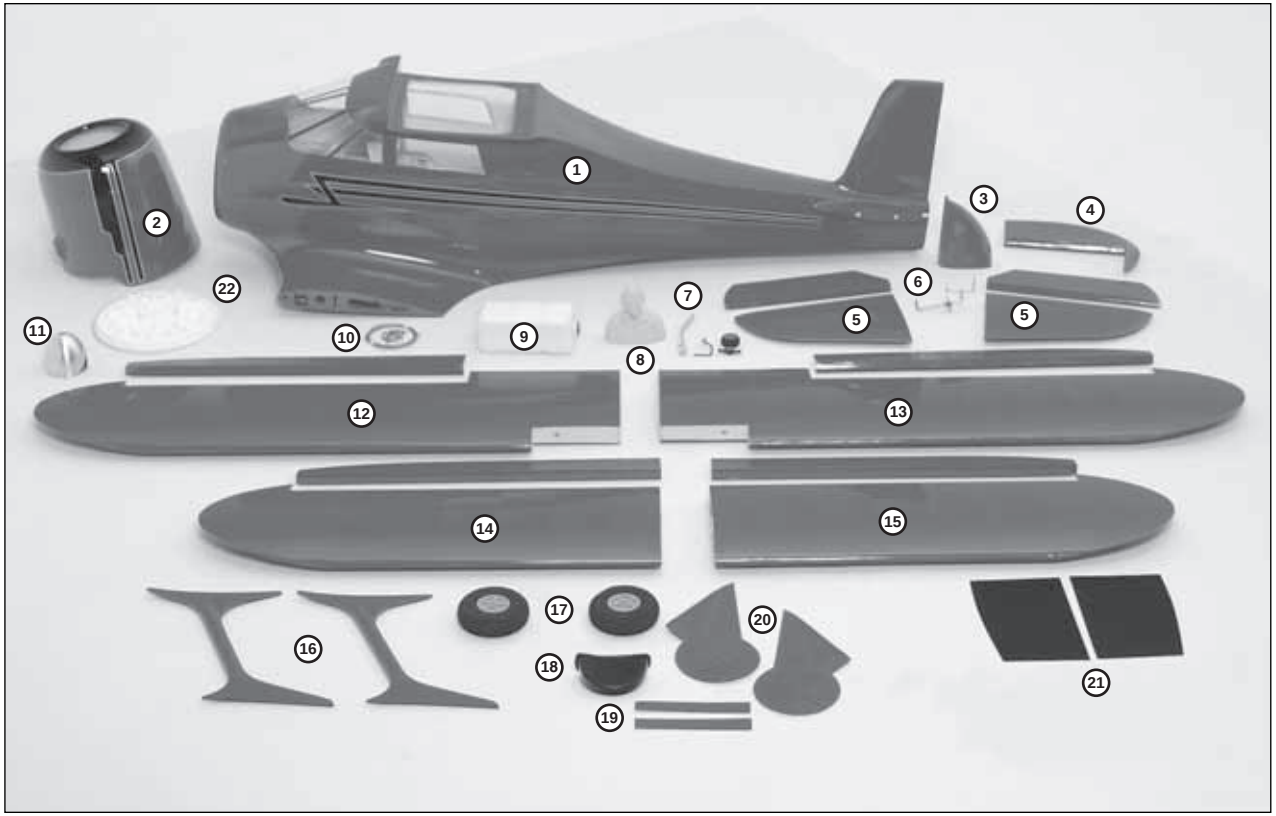
REPLACEMENT PARTS LIST

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

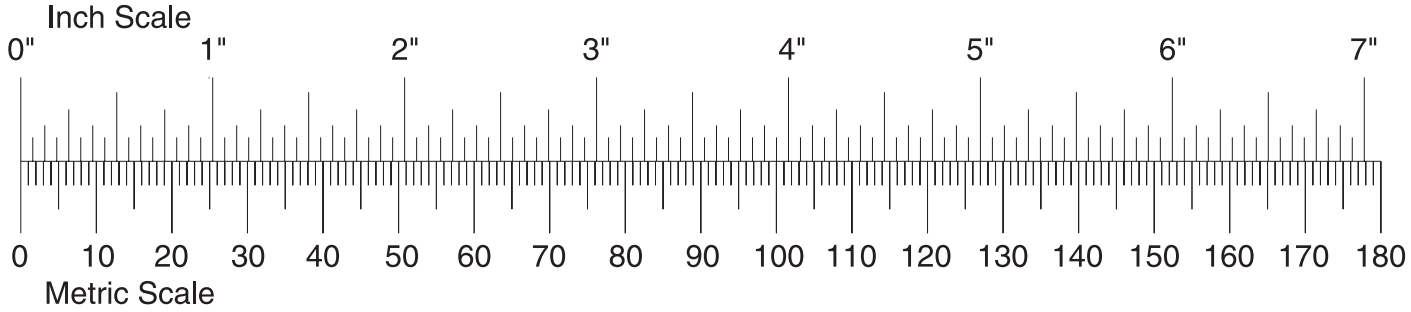
Order #	***Description***
TOPA1680	Top Wing w/Joiner
TOPA1681	Bottom Wing
TOPA1682	Fuselage
TOPA1683	Rudder w/Hinges
TOPA1684	Horizontal Stabilizer
TOPA1685	Landing Gear w/Tailwheel
TOPA1686	Gear Doors & Wheel Covers w/Actuating Wires
TOPA1687	Cowl
TOPA1688	Cockpit Floor w/ Seat Backs
TOPA1689	Tail Cone
TOPA1690	Horizontal Stabilizer Tubes
TOPA1691	Interplane Wing Strut Mounts
TOPA1692	Interplane Wing Strut
TOPA1693	Wing Mounting Blades

KIT CONTENTS

1. Fuselage
2. Cowl
3. Tail Cone
4. Rudder
5. Stab with Elevators
6. Elevator Control Wire
7. Tail Wheel Hardware
8. Pilot
9. Fuel Tank
10. Pull-Pull Wire with Hardware
11. Spinner
12. Top Right Wing with Aileron
13. Top Left Wing with Aileron
14. Bottom Right Wing with Flap
15. Bottom Left Wing with Flap
16. Struts
17. Main Wheels
18. Seat Backs
19. Tail Wheel Doors
20. Landing Gear Doors
21. Cockpit Floor
22. Dummy Engine



To convert inches to millimeters, multiply inches by 25.4



PREPARATIONS

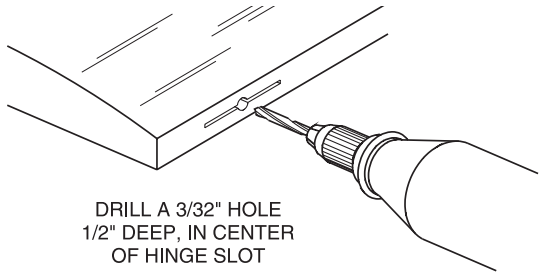
❏ 1. If you have not done so already, remove the major parts of the kit from the box and inspect for damage. If any parts are damaged or missing, contact Product Support at the address or telephone number listed in the “Kit Contents” section on page 6.

❏ 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.

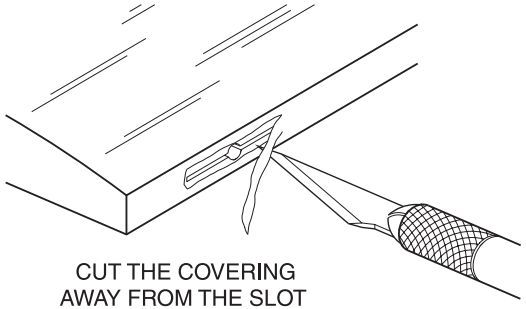
BUILD THE WING

Install the Flaps/Ailerons

Do the bottom right wing first so your work matches the photos the first time through.

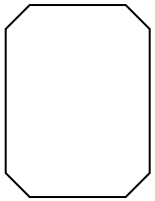


❏❏❏❏ 1. Drill a 3/32" [2mm] hole, 1/2" [13mm] deep in the center of each hinge slot to allow the CA to “wick” in. Follow-up with a #11 blade to clean out the slots. **Hint:** If you have one, use a high-speed rotary tool to drill the holes.

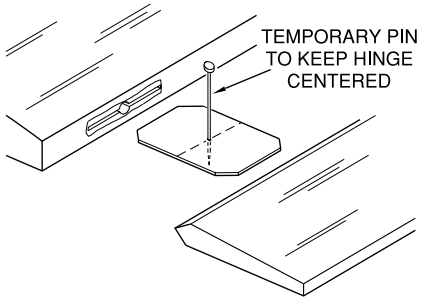


❏❏❏❏ 2. Use a sharp #11 blade to cut a strip of covering from the hinge slots in the wing and aileron.

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

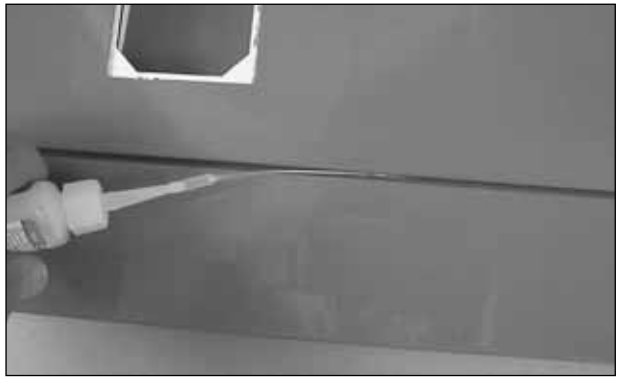


Note: *The following steps refer to the installation of the flaps/ailerons. The bottom wing of the Staggerwing has flaps. The top wing has ailerons. If you look at the location of the hinge slots of each you will see the flaps are hinged off the centerline of the flap and the aileron is hinged on the centerline.*



❏❏❏❏ 4. Test fit the **flap/aileron** 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 flap / 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.

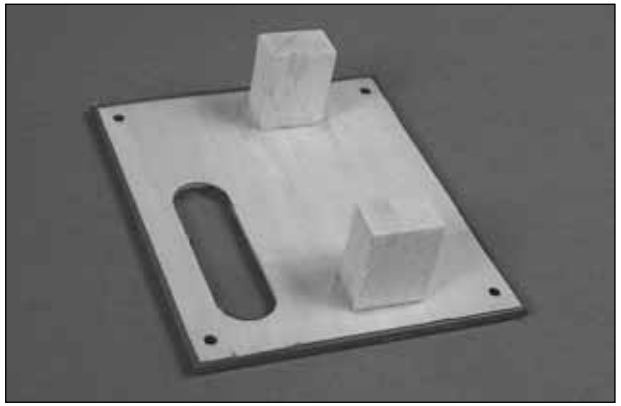


❏❏❏❏ 6. Apply six drops of thin CA to the top and bottom of each hinge. Do not use CA accelerator. After the CA has fully hardened, test the hinges by pulling on the aileron.

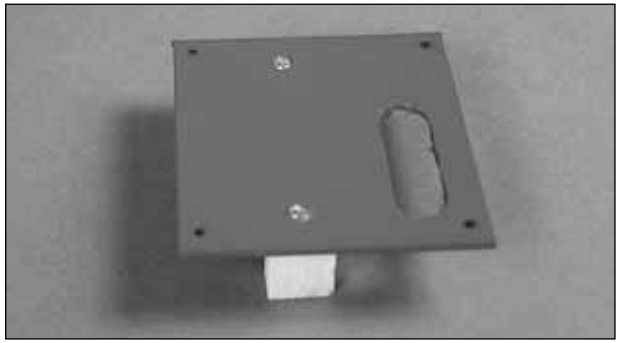
❏ 7. Repeat steps 1- 6 for the left wing panel and the two wing panels for the top wing.

Did you know...*At the height of the Great Depression, aircraft executive* ***Walter H. Beech*** *and airplane designer T.A. "Ted" Wells joined forces to collaborate on a project many considered foolhardy—a large, powerful, and fast biplane built specifically for the business executive. The Beech Model 17, popularly known as the "Staggerwing," was first flown on* ***November 4, 1932.***

Install the Aileron Servos and Pushrods

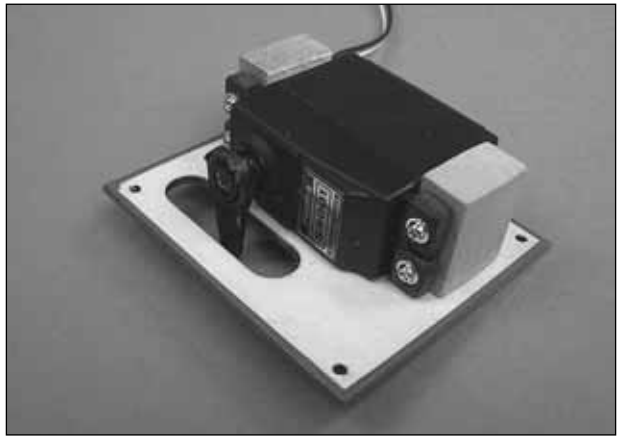


❏ ❏ 1. Glue two 5/16" x 1/2" x 11/16" [8mm x 13mm x 18mm] hardwood blocks to the **servo cover**. Position the blocks so the servo fits between the blocks.

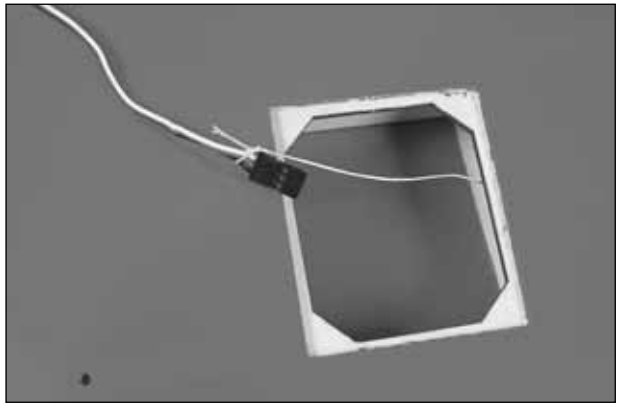


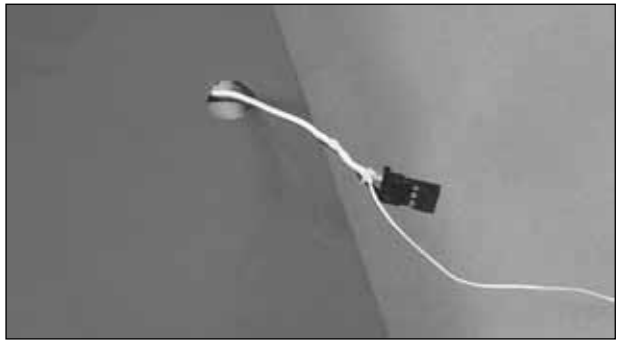
❏ ❏ 2. Drill a 1/16" [1.6mm] hole through the servo cover into the center of the servo mounting blocks. Install and then remove a #2 x 3/8" [10mm] wood screw into the holes you drilled. Apply a drop of thin CA into the holes to harden the threads. Once the glue has cured, install the screws into the servo cover.

❏ ❏ 3. Install a 12" [305mm] servo extension onto the 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.

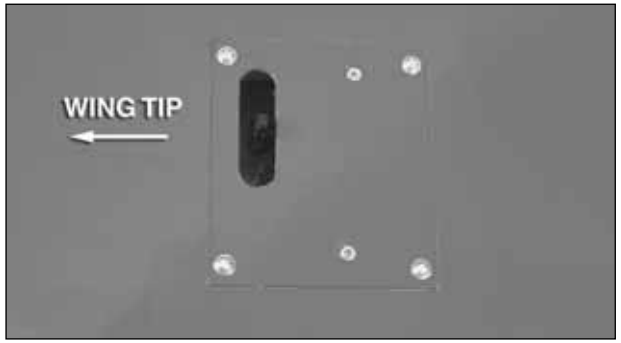


❏ ❏ 4. Place the servo onto the servo mounting blocks. Drill through the servo mounting holes with a 1/16" [1.6mm] drill bit. Remove the servo from the servo cover. Install and then remove a servo mounting screw into each of the holes you have drilled. Apply a drop of thin CA into the holes to harden the threads. Once the glue has cured, install the servo onto the servo cover using the hardware included with your servo. Center the servo and then install a servo arm as shown.



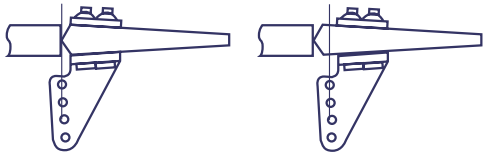


❏ ❏ 5. Inside the servo bay a string is taped. Tie the string to the servo extension. Pull the string and the servo lead through the wing. Untie the string from the lead and insert the lead through the small hole on the top of the wing at the root. Tape the lead to the wing to prevent it from falling back into the wing.



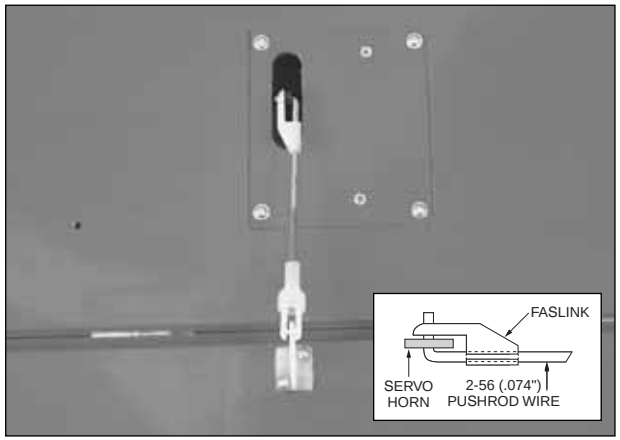
❏ ❏ 6. Place the servo cover onto the wing. The opening for the **servo arm should be pointed towards the wingtip**. Drill a 1/16" [1.6mm] hole

through each corner of the cover. Remove the cover. Then, install and remove a #2 x 3/8" [10mm] screw into the holes you drilled. Apply a drop of thin CA into the holes to harden the threads. Once the glue has hardened, mount the servo cover with #2 x 3/8" [10mm] screws and #2 flat washers.



Correct Incorrect

❏ ❏ 7. Place a nylon control horn in line with the outer hole in the servo arm. When positioned properly the control horn will rest on a hardwood plate in the aileron. 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 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 hardened attach the horn to the aileron with two #2 x 3/8" [10mm] screws.



❏ ❏ 8. 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 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.

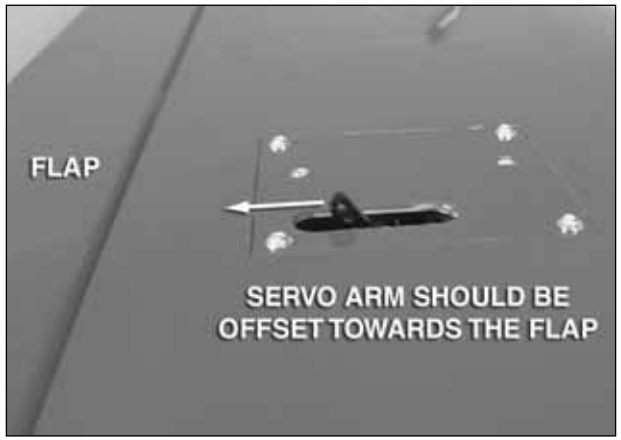
❏ 9. Repeat steps 1-8 for the left wing panel.

Install the Flap Servos and Pushrods

❏ ❏ 1. Glue two 5/16" x 1/2" x 11/16" [8mm x 13mm x 18mm] hardwood blocks to the **servo cover**. Position the blocks so the servo fits between the blocks.

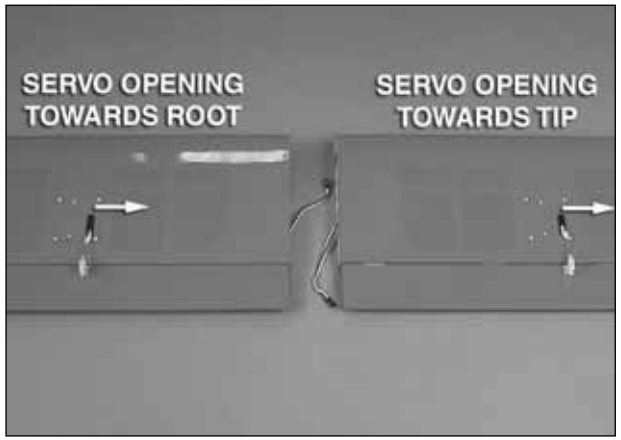
❏ ❏ 2. Drill a 1/16" [1.6mm] hole through the servo cover into the center of the servo mounting blocks. Install and then remove a #2 x 3/8" [10mm] wood screw into the holes you drilled. Apply a drop of thin CA into the holes to harden the threads. Once the glue has cured, install the screws into the servo cover.

❏ ❏ 3. Install a 6" [152mm] servo extension onto the 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.

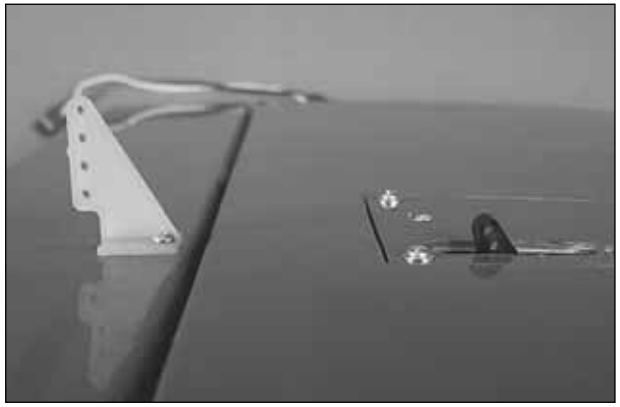


❏ ❏ 4. Place the servo onto the servo mounting blocks. Drill through the servo mounting holes with a 1/16" [1.6mm] drill bit. Remove the servo from the servo cover. Install and then remove a servo mounting screw into each of the holes you have drilled. Apply a drop of thin CA into the holes to harden the threads. Once the glue has cured, install the servo onto the servo cover using the hardware included with your servo. Center the servo and then offset the servo arm as shown.

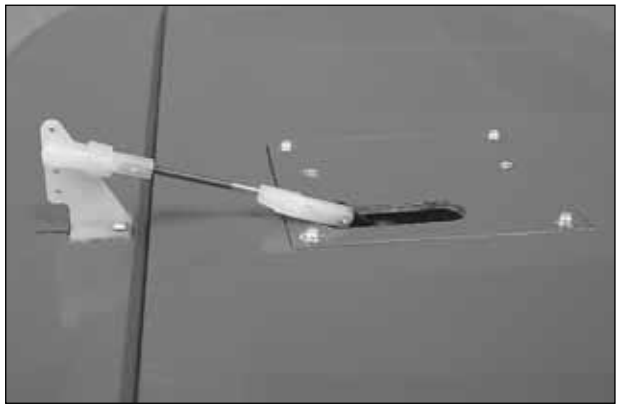
❏ ❏ 5. Inside the servo bay a string is taped. Tie the string to the servo extension. Pull the string and the servo lead through the wing. Untie the string from the lead and insert the lead through the small hole on the top of the wing at the root. Tape the lead to the wing to prevent it from falling back into the wing.



❏ ❏ 6. Place the servo cover onto the wing. The opening for the **servo arm should be pointed towards the wing root on the right wing**. (When installing the left wing the opening will be towards the wing tip). Drill a 1/16" [1.6mm] hole through each corner of the cover. Remove the cover. Then, install and remove a #2 x 3/8" [10mm] screw into the holes you drilled. Apply a drop of thin CA into the holes to harden the threads. Once the glue has hardened, mount the servo cover with #2 x 3/8" [10mm] screws and #2 flat washers.



❏ ❏ 7. Place a nylon control horn backwards from what would be considered the normal mounting position, in line with the outer hole in the servo arm. When positioned properly the control horn will rest on a hardwood plate in the flap. Mark the location of the mounting holes onto the flap. Drill a 1/16" [1.6mm] hole on the marks, drilling through the plywood plate ***but not*** through the top of 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 hardened, attach the horn to the aileron with two #2 x 3/8" [10mm] screws.

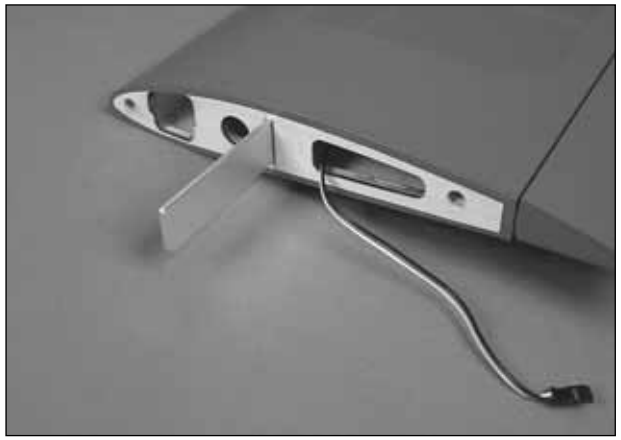


❏ ❏ 8. Screw a nylon clevis onto a .074 x 6" [152mm] threaded wire 20 turns. Slide a nylon clevis retainer onto the clevis. Install the clevis into the second hole from the end of the control horn. Then, slide the silicone retainer over the clevis. Drill a 5/64" [2mm] hole in the outer hole of the servo arm. Center the servo and the flap. 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.

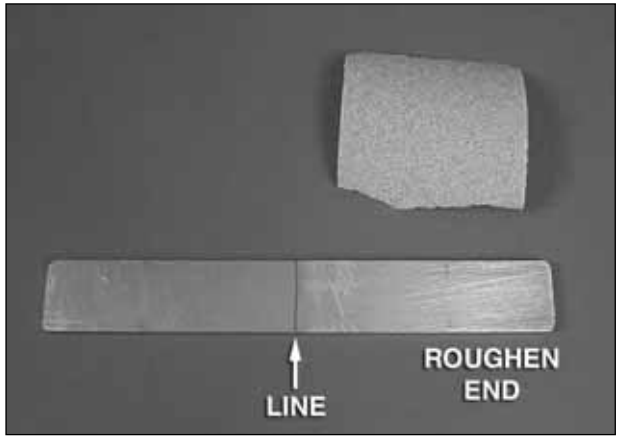
❏ 9. Repeat steps 1-8 for the left wing panel.

Did you know... *The Model 17s could achieve a top speed of 201 miles per hour (323 kilometers per hour), which made it faster than most military aircraft of the era. Staggerwing's speed also made it the darling of the air racers of the 1930s. An early version of Model 17 won the* ***1933 Texaco Trophy Race****. In 1935, a British diplomat,* ***Capt. H.L. Farquhar****, successfully flew around the world in a Model B17R, traveling 21,332 miles (34,331 kilometers) from New York to London, by way of Siberia, Southeast Asia, the Middle East, North Africa and back across Europe. Aviatrices* ***Louise Thaden*** *and* ***Blanche Noyes*** *won the* ***1936 Bendix Trophy Race*** *in a Model C17R Staggerwing. Thaden also won the Harmon Trophy for her achievement. Aviatrix* ***Jackie Cochran*** *set a women's speed record of 203.9 mph, established an altitude record of over 30,000 feet (9.144 meters), and finished third in the* ***1937 Bendix Trophy Race****, all while flying a special Model D17W Staggerwing.*

Install the Wing Joiners



❏ ❏ 1. Locate three aluminum **wing joiners**. Slide one joiner completely into the joiner pocket of the **lower** right wing. The lower wing is the shorter wing panel with the flaps.

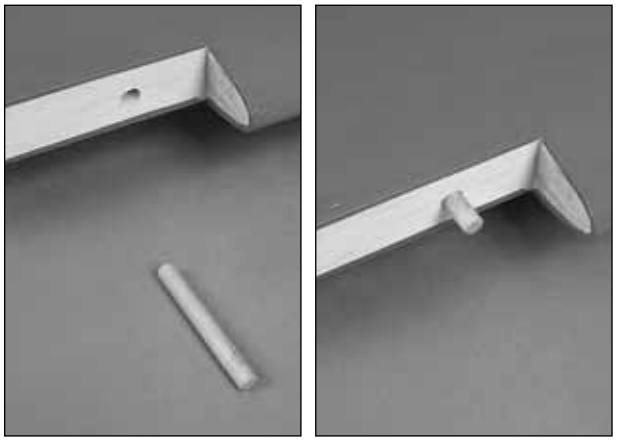


❏ ❏ 2. Draw a line on the joiner where it extends out of the joiner pocket. Roughen the portion of the joiner that extends into the joiner pocket with 80-grit sandpaper.

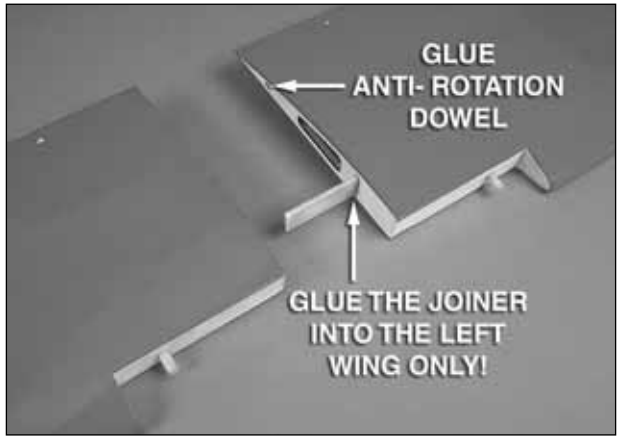
❏ ❏ 3. Apply 30-minute epoxy to the inside of the joiner pocket and the roughened end of the aluminum joiner. Insert the joiner into the joiner pocket. Be sure to insert the joiner fully into the pocket. Clean any excess epoxy away from the wing and joiner with rubbing alcohol.

❏ ❏ 4. Using 30-minute epoxy, glue two nylon anti-rotation dowels into the holes at the root of the wing. Glue them in so 1/2" of the dowels extends from the wing.

❏ 5. Repeat steps 1-4 for the other wing.



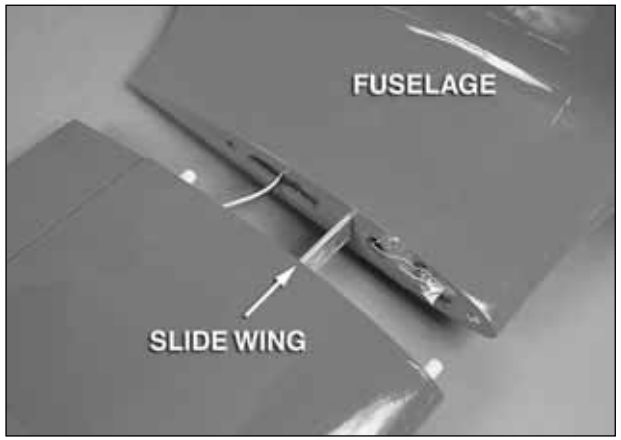
❏ 6. Test fit a 3/8" x 2-1/2" [10mm x 64mm] wood dowel into the hole at the leading edge of the top wing. Push it into the wing, making sure it catches in the hole further inside of the wing. Once you are satisfied with the fit, epoxy them in place. Repeat this for the other wing panel.



❏ 7. Glue the remaining wing joiner into the joiner pocket of the top left wing using the same procedure used for installing them in the bottom wing. ***Only glue the joiner into the left wing!*** Glue the remaining nylon anti-rotation dowel in the hole in the wing root.

Did you know…*The Model 17's unusual wing configuration—the upper wing inversely staggered behind the lower—and unique shape resulted in a design that maximized the pilot's visibility while minimizing the aircraft's tendency to stall. The fabric-covered fuselage was faired with wood formers and stringers. The Staggerwing's use of retractable conventional landing gear, uncommon at that time, combined with streamlining, reducing the weight of the materials, and its use of powerful radial engines ranging from 225 to 710 horsepower produced an aircraft with impressive performance.*

Attach the Wings to the Fuselage

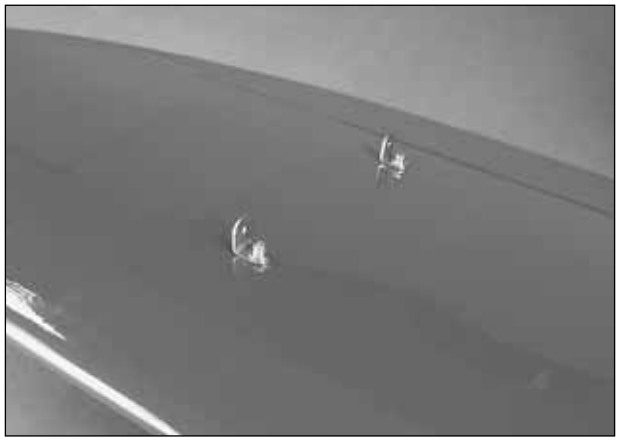


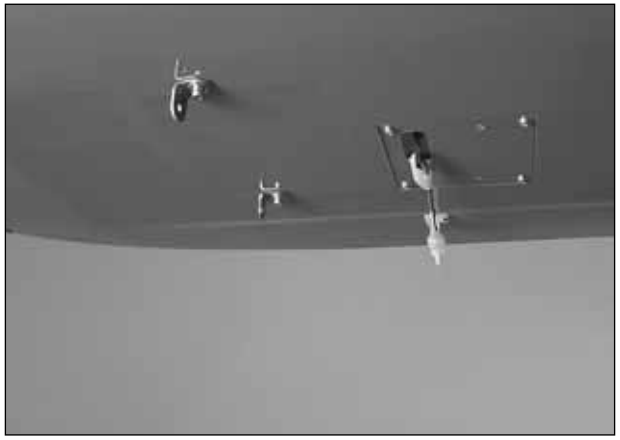
❏ 1. Slide the bottom wing panels into the sides of the fuselage. Install a 6-32 x 1/4" [6mm] socket head cap screw into the threaded holes on the bottom of the fuselage. Push the wing tight to the fuselage. Then, tighten the screw against the wing joiner.

❏ 2. Slide the two top wings together. On the bottom of the right wing you will see a threaded hole. Install a 6-32 socket head cap screw into the hole. Make sure the wings are tight against each other and then tighten the screw against the wing joiner.

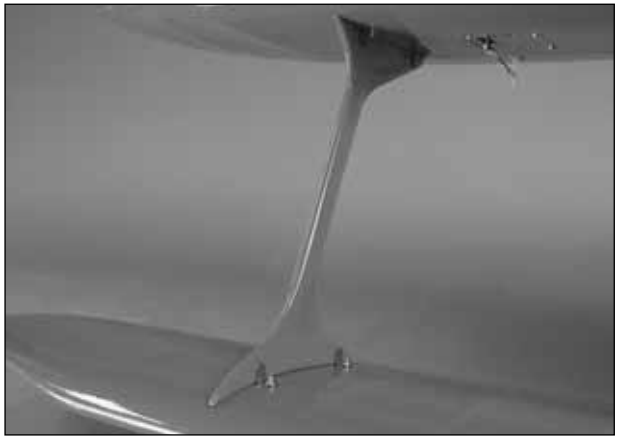
❏ 3. Install the top wing onto the top of the fuselage. Secure the wing to the fuselage with two 1/4-20 x 2" [50mm] nylon wing bolts.

Install the Struts



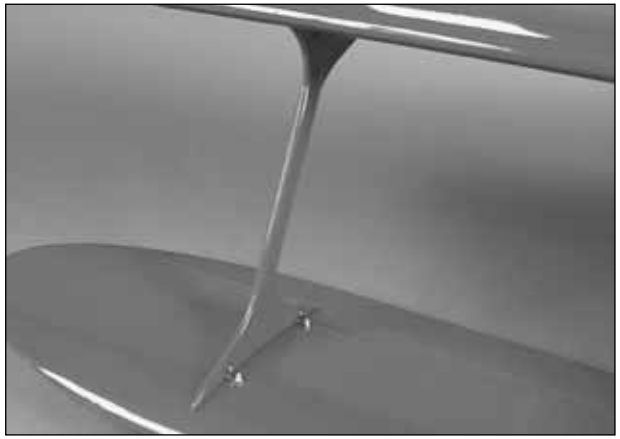


❏ 1. On the top of the bottom wing and the bottom of the top wing locate the pinholes that the manufacturer made in the MonoKote film. Cut the covering on the pinholes to reveal the 4-40 blind nuts pre-installed in the wing. Install a metal bracket in each of the holes with a 4-40 x 1/2" [13mm] socket head cap screw, #4 flat washer and #4 lock washer. Do this for both the left and right wings.



❏ 2. Slide the struts in place for both the left and right wings. When positioning them the trailing edge of the strut should be just in front of the hinge line for the flap.

❏ 3. When you are satisfied with the positioning of the struts, mark the location of the holes from the bracket onto the strut. Drill a pilot hole through the marks with a 1/16" [1.6mm] drill. Then, drill through the pilot hole with a 1/8" [3mm] bit.

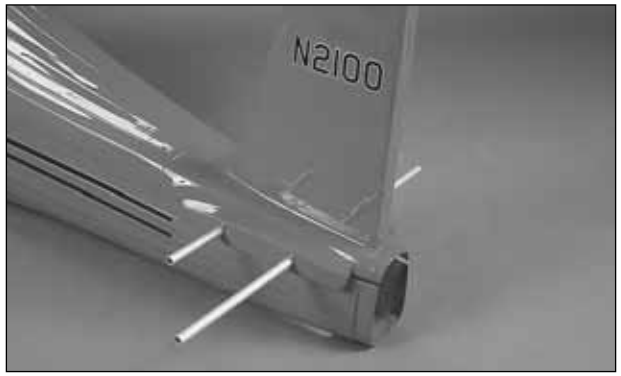


❏ 4. Mount the strut to the bracket with a 4-40 x 1/2" [13mm] Philips head screw, flat washer and 4-40 nylon lock nut. Do this for all four holes. Repeat this for the other wing.

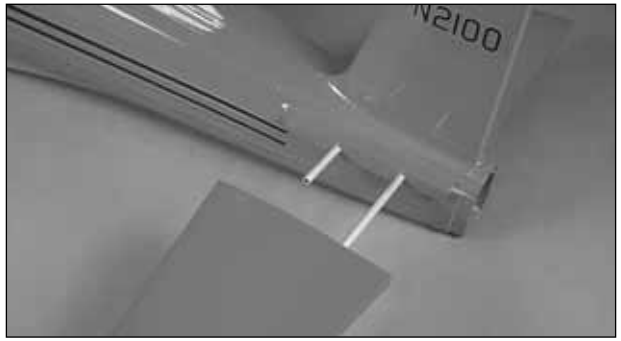
❏ 5. Remove the wings before moving on to the next section.

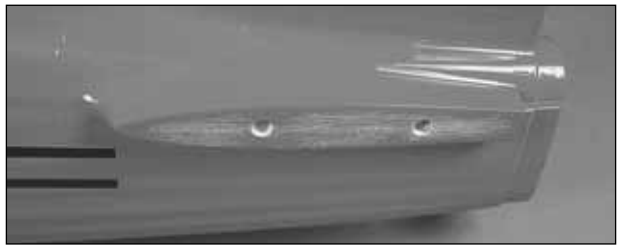
BUILD THE FUSELAGE

Install the Stabilizers, Elevators and Rudder

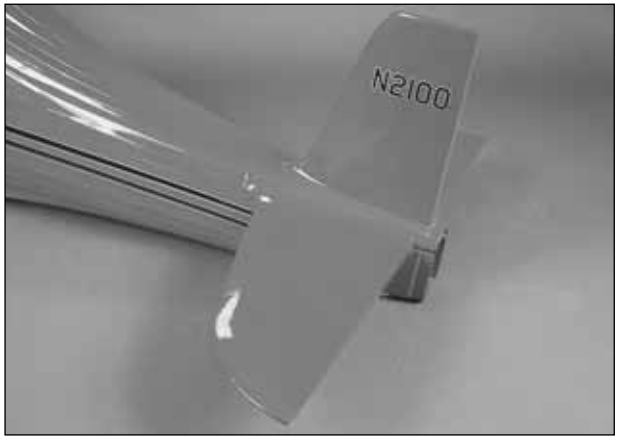


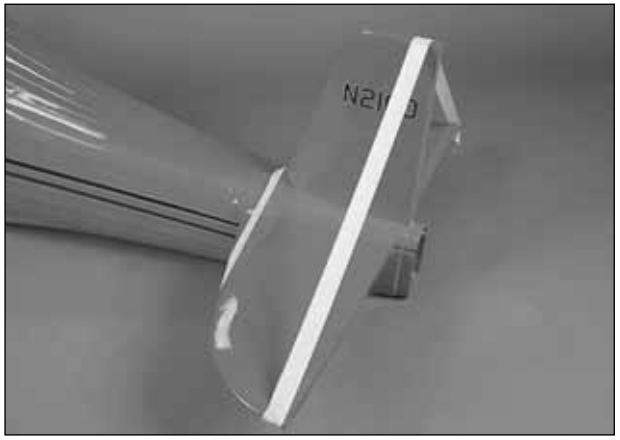
❏ 1. Slide the two aluminum **stab tubes** into the back of the fuselage. The longer of the tubes goes into the rear-most hole.



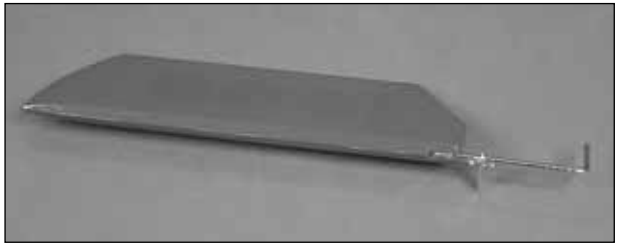


❏ 2. Slide the **stabs** onto the tubes, making sure that they slide on and fit tight to the fuselage. When you are satisfied with the fit, remove the stabs. Then roughen the fuselage with 80-grit sandpaper where the stab meets with the fuselage.



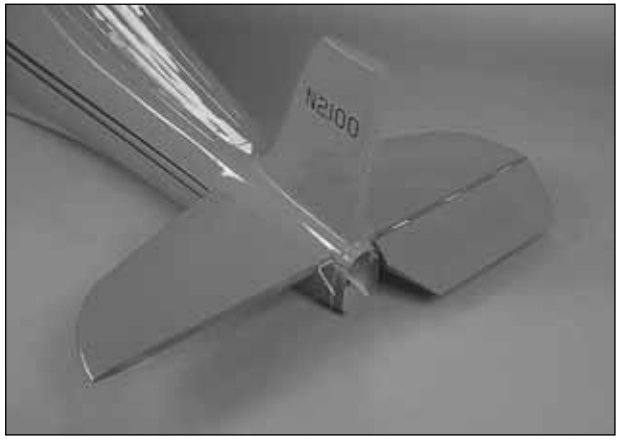


❏ 3. Apply epoxy to the root of each stab and the fuselage side you roughed up. Slide the stabs onto the aluminum tubes, pressing them firmly against the stab. Hold the stabs tight to the fuselage with masking tape.

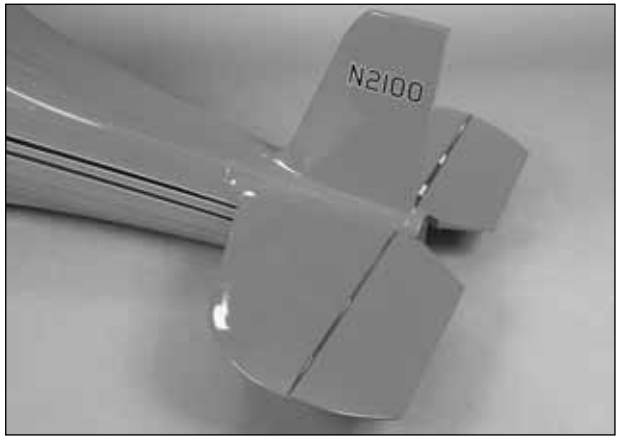


❏ 4. Test fit the joiner and the right elevator to the stab, making sure that the elevator control arm is inside of the fuselage. Epoxy the wing joiner to the right elevator.

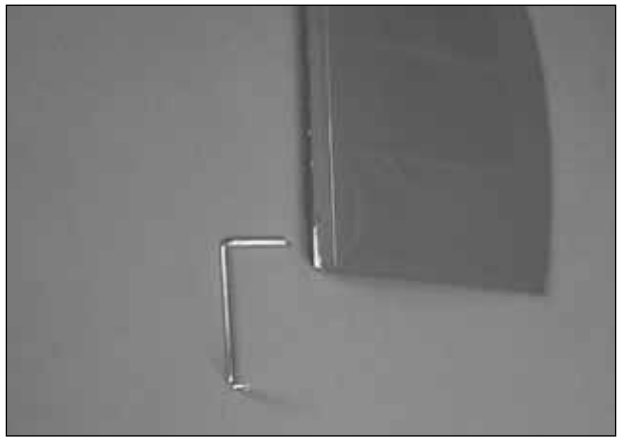
❏ 5. Cut nine 1" x 1" [25mm x 25mm] hinges from a CA hinge strip. Insert three hinges into the elevator. If the hinges don't remain centered, stick a pin through the middle of the hinge to hold it in position. Slide the hinges into the elevator



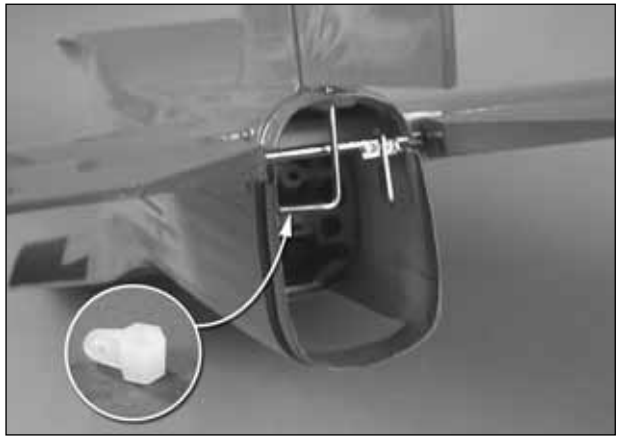
❏ 6. Remove any pins you may have inserted into the hinges. Adjust the elevator so there is a small gap between the LE of the elevator and the stab. The gap should be small, just enough to see light through or to slip a piece of paper through. Apply six drops of thin CA to the top and bottom of each hinge. Do not use CA accelerator. After the CA has fully hardened, test the hinges by pulling on the elevator.



❏ 7. Install three hinges into the left elevator. Test fit the elevator to the stab, making sure you fit the elevator joiner into the hole in the leading edge of the elevator. Once you are satisfied with the fit, apply epoxy into the hole in the leading edge of the left elevator and then slide the hinges into the stab. Secure the hinges with thin CA the same as was done with the right elevator.



❏ 8. Glue the rudder control horn into the **rudder** with epoxy. When gluing it into the rudder be sure to glue the end of the wire ***without the threads*** into the rudder. Allow the glue to completely harden before moving on to the next step.

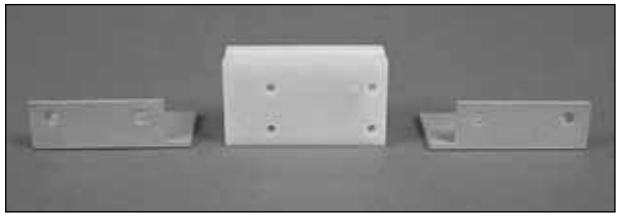


❏ 9. Install three hinges into the rudder the same as was done with the elevator. Insert the end of the rudder control horn into the hole in the top of the fuselage. Thread the nylon clevis link onto the threaded end of the rudder control wire. Guide the hinges into the vertical fin. Once satisfied with the fit, apply six drops of thin CA to the top and bottom of each hinge.

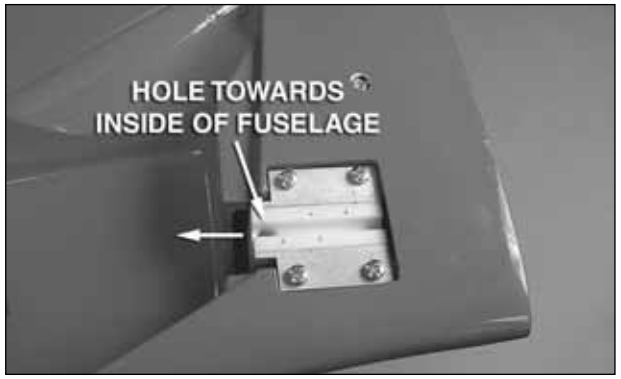
INSTALL THE LANDING GEAR

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 instructions 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.

Fixed Landing Gear



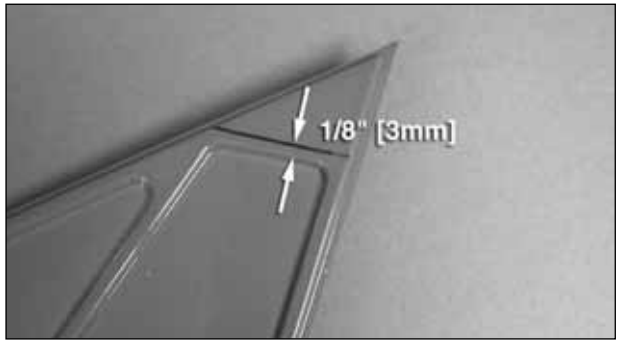
❏ ❏ 1. Locate the components of the landing gear blocks. Assemble them as shown using eight #4 x 3/8" [10mm] screws on each landing gear block.

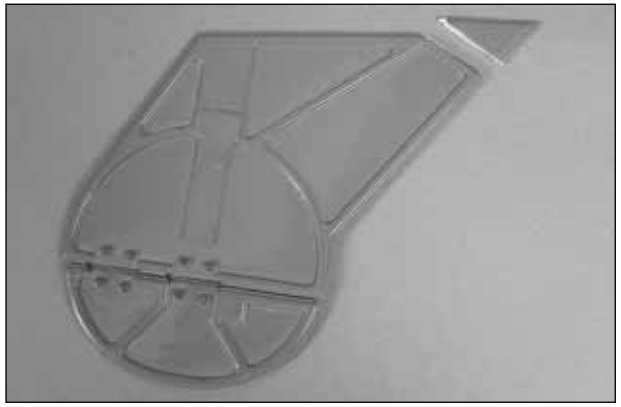


❏ ❏ 2. Place the assembly into the opening in the fuselage*. Note that the hole for the landing gear wire should be towards the inside of the fuselage.* Drill a 5/32" [4mm] hole through each of the mounting holes and into the landing gear rails. Mount the block to the landing gear rails with four #6 x 1/2" [13mm] screws and a #6 lock washer.

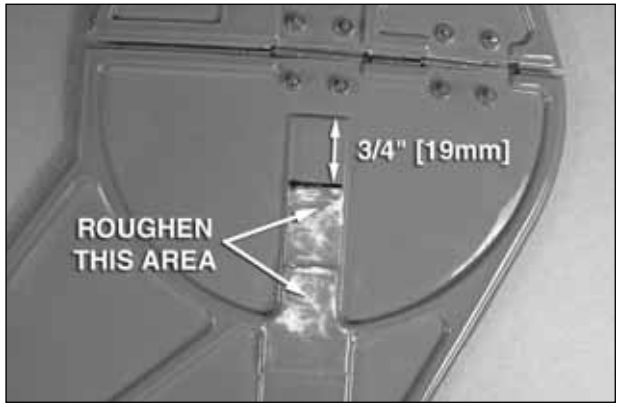
❏ ❏ 3. Test fit the landing gear wire into the hole in the landing gear block. When positioned properly the wire should fit into the slot. If the wire does not fully seat, grind away some of the nylon with a Dremel tool to allow the radius of the wire to fully seat into the block.

❏ ❏ 4. Insert the landing gear wire into the landing gear block. Using #2 x 3/8" [910mm] screws, attach two nylon landing gear straps to the landing gear block as shown.

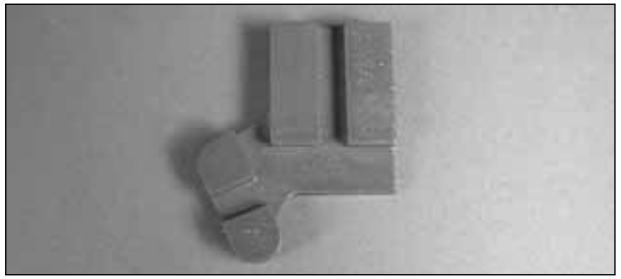


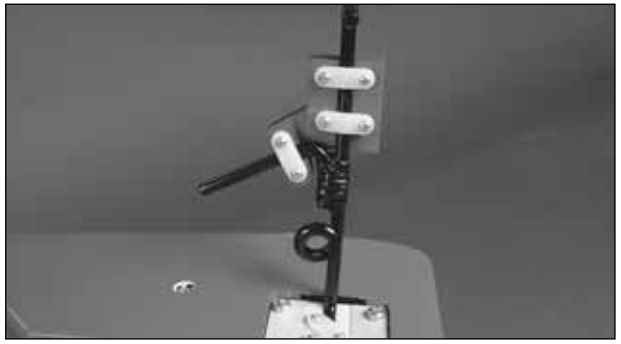


❏ ❏ 5. Mark a line parallel to the mold line at the bottom of the landing gear door. Mark the line 1/8" [3mm] from the mold line. Cut on the line you have drawn with a razor saw.

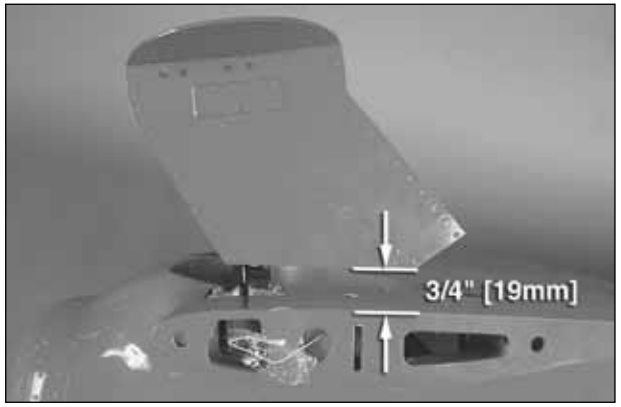


❏ ❏ 6. Measure 3/4" [19mm] from the mold line and draw a line. Roughen the area shown with 80 grit sandpaper.

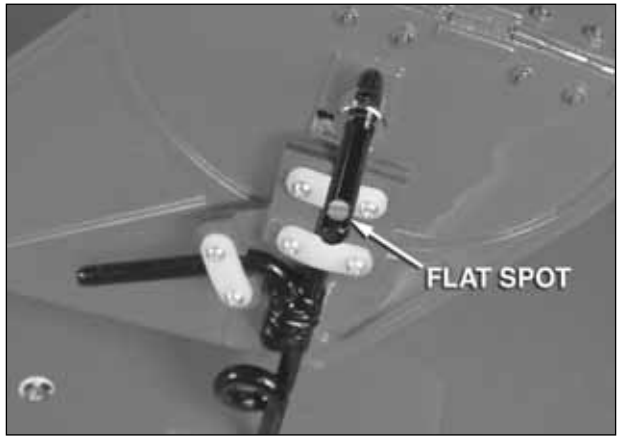




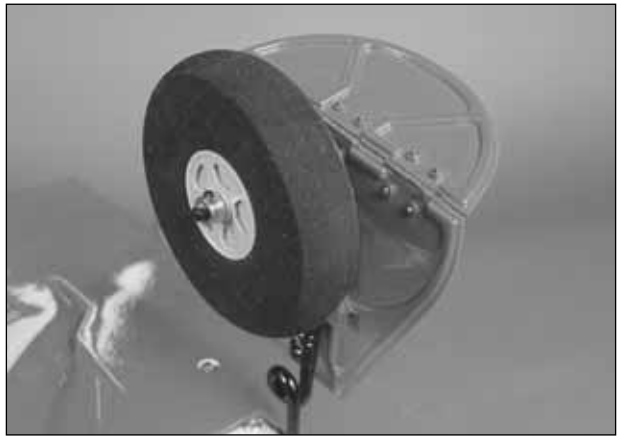
❏ ❏ 7. Locate the landing gear door wood mounting bracket. Place it on the landing gear wire as shown. Drill a 1/16" [1.6mm] hole for each of the landing gear strap mounting holes. Install three flat nylon landing gear straps with #2 x 3/8" [10mm] sheet metal screws.



❏ ❏ 8. Apply 6-minute epoxy to the part of the door that you roughened up. Place the door onto the wood mounting bracket, positioning the door so the axle is in the center of the door and the bottom of the door is approximately 3/4" from the bottom of the fuselage. Hold the door in position while the glue hardens.

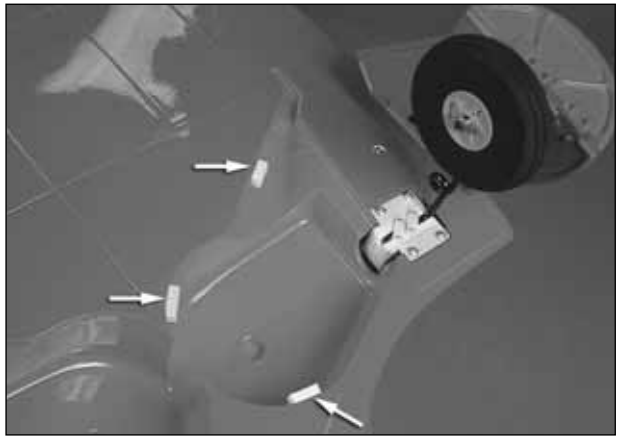


❏ ❏ 9. File a flat spot on the end of the axle. Install a 5mm wheel collar and set screw onto the axle.

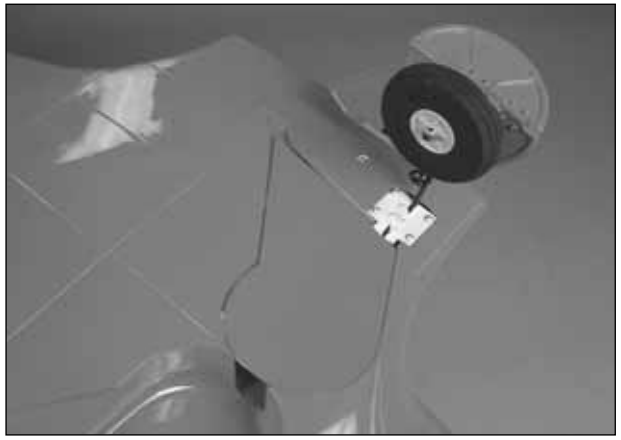


❏ ❏ 10. Slide a wheel onto the axle followed by the wheel collar. Tighten the set screw against the flat spot you made. Open the lower portion of the landing gear door as shown. Apply a couple of drops of thin CA to the hinge to keep the door fixed in place.

Note: Read step 11 and 12 before proceeding with them. The installation of a cover to close the wheel well is optional. The door will reduce the overall drag but is not required for good flight performance.



❏ ❏ 11. From the 1/4" x 1/4" x 12" [6mm x 6mm x 300mm] balsa stick, cut pieces 3/4" [19mm] in length. Glue them in the wheel well 1/16" [1.6mm] below the bottom of the fuselage.



❏ ❏ 12. Glue the plywood **wheel cover** to the balsa blocks and the fuselage.

❏ 13. Repeat steps 1-12 for the left landing gear.

Fixed Tail Wheel

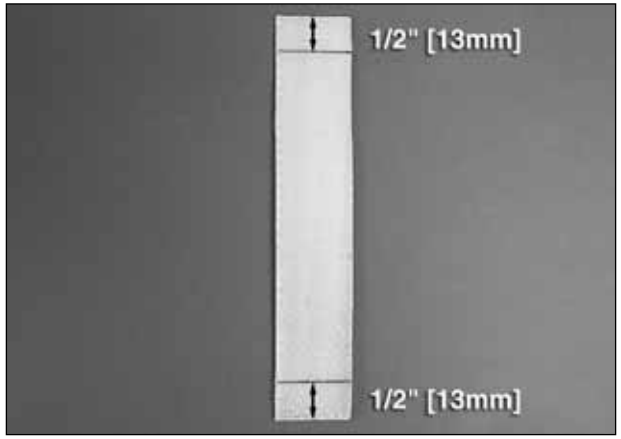
❏ 1. Using the hardware in the tail wheel bag, assemble the **tail wheel** components as shown. Be sure to apply thread locker to the set screws during assembly.

❏ 2. Insert the tail wheel mounting bracket into the fuselage, aligning the holes in the mounting bracket with the holes in the wood mounting plate inside of the fuselage. Mount the tail wheel to the wood mounting plate with two 4-40 x 1/2" [13mm] socket head cap screws, #4 flat washers and #4 lock washers.

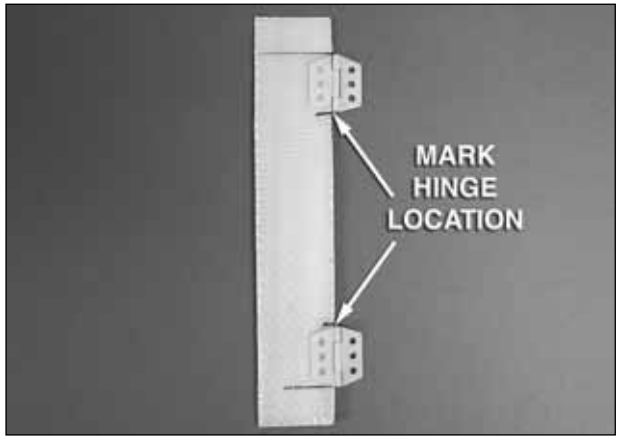
Tail Wheel Door Installation (Fixed)

The following steps cover the installation of the tail wheel doors. This is optional and not required for flight performance. If you fly from a grass field that is very rough or has long grass, you might wish to omit the installation of the doors due to the amount of clearance between the doors and the ground. If you omit the doors you might also consider replacing the 1-1/4" [32mm] tail wheel with the 2" [51mm] wheel included in this kit.

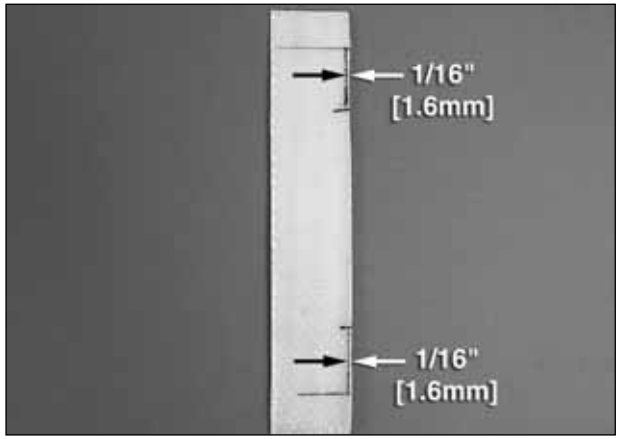
❏ ❏ 1. Locate the fiberglass **tail wheel doors** and four pinned hinges. Place the doors into the opening aligning the simulated stringers on the fuselage with the doors to determine which door is the right and left.



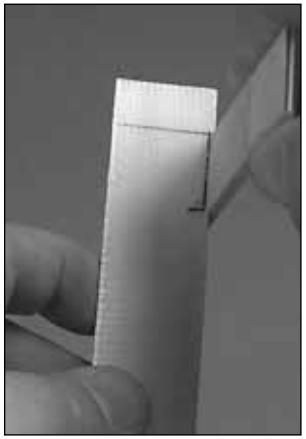
❏ ❏ 2. On the backside of the door make a mark 1/2" [13mm] in from each end of the door.

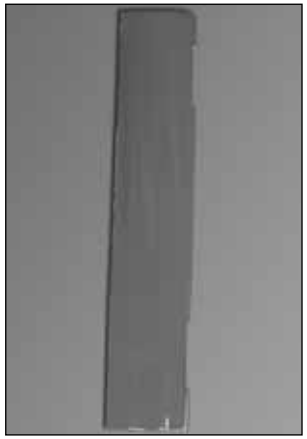


❏ ❏ 3. Place the hinges on the line and make another mark at the other end of the hinge to mark the exact placement of the hinge. Do this for both hinges.



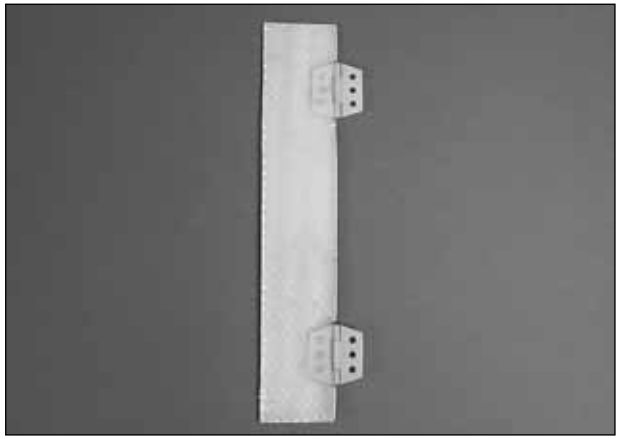
❏ ❏ 4. Measure in from the side of the door 1/16" [1.6mm] and draw a line as shown.



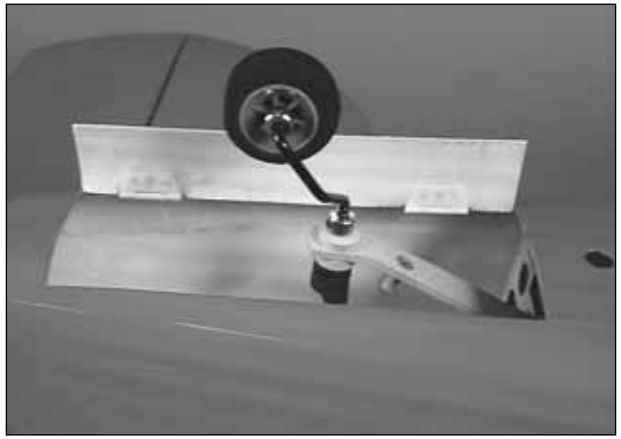


❏ ❏ 5. Make a file by cutting a piece of plywood the width of the hinge. Apply 180-grit sandpaper to the plywood. Sand the door to make a 1/16" [1.6mm] groove in the door at the location of each hinge.

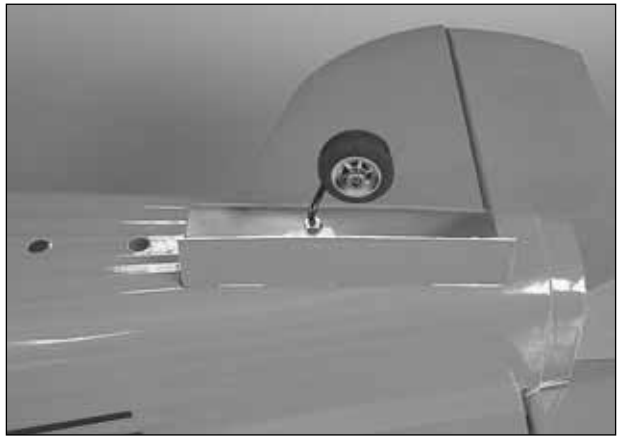
❏ ❏ 6. Roughen the fiberglass with sandpaper in the area the hinges will be glued to the doors. After sanding, clean the area with rubbing alcohol.



❏ ❏ 7. Apply a couple of drops of lightweight oil to the hinge pin to prevent glue from getting into the hinge. Glue the hinges to the door.



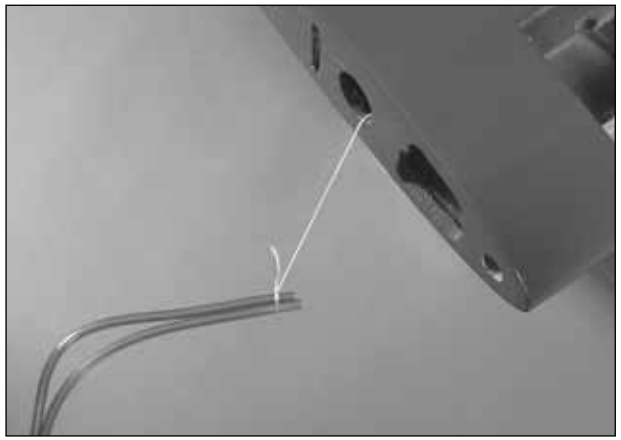
❏ ❏ 8. Place the door into the opening in the fuselage. Mark the area the hinge will be glued to the fuselage. Sand and clean the areas inside of the fuselage where the hinges will be glued. Then, epoxy the doors in place.



❏ 9. Repeat steps 1-8 for the other door.

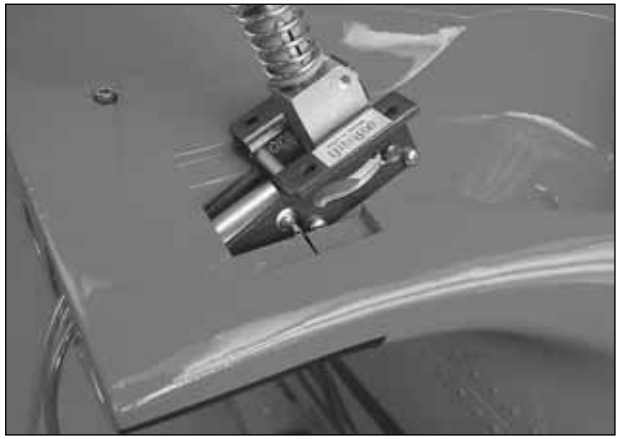
❏ 10. Spread the doors as far open as they will go. Clean any remaining oil in the hinge pin with rubbing alcohol. Apply a couple of drops of thin CA into the hinge to lock the doors open. (**Note:** If you have any thoughts of installing a retractable tail wheel in the future, do not glue the hinges. Leave them free. This will not interfere with the tail wheel operation.

Retractable Landing Gear

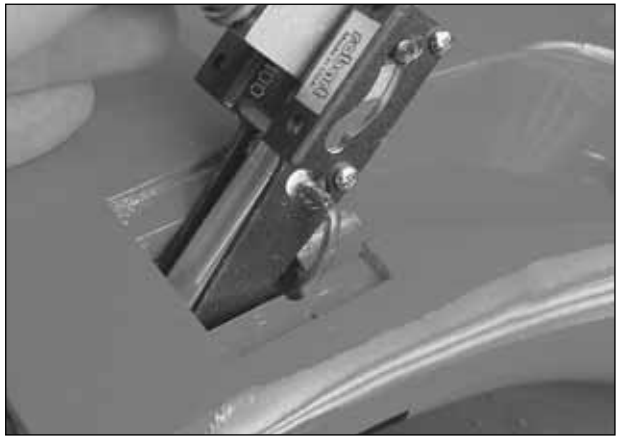


❏ ❏ 1. Cut two air lines 24" [610mm] long. Remove the string taped at the root of the fuselage and tie it tightly around the two air lines.

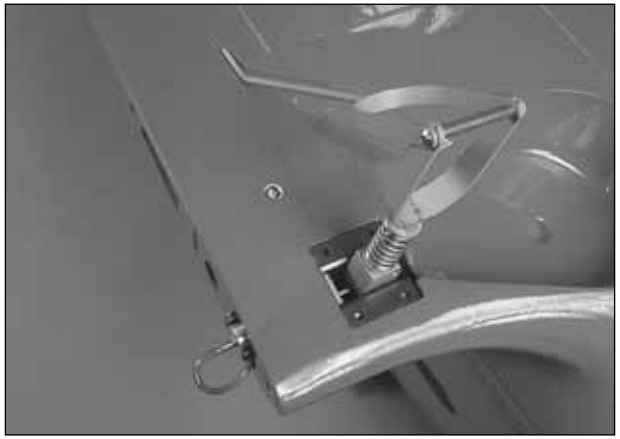
❏ ❏ 2. Inside of the fuselage at the wheel well you will find the other end of the string taped in place. Pull the string into the wheel well, pulling the airlines through the fuselage. Insert each of the lines onto the air inlets on the landing gear.



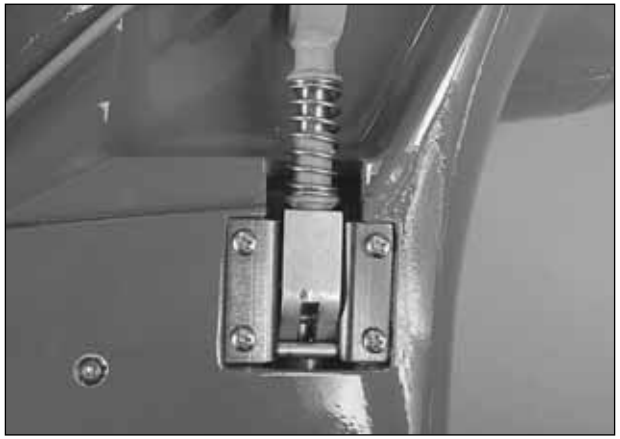
❏ ❏ 3. Partially insert the landing gear into the wing. Make a mark where the airline will contact the landing gear rail.



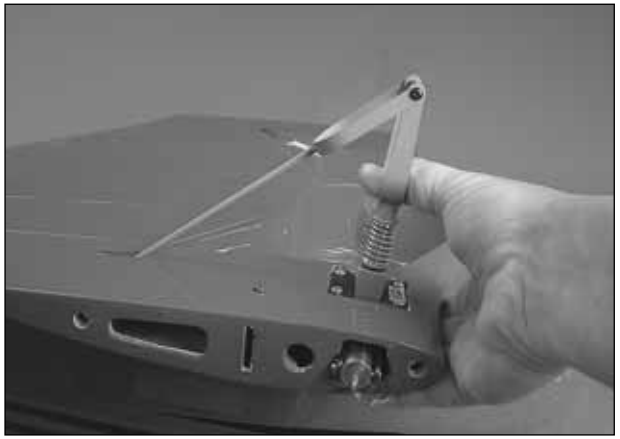
❏ ❏ 4. Using a high speed motor tool or a small round file make a groove in the landing gear rail just big enough to allow the air line to clear the landing gear rail without pinching the airline.

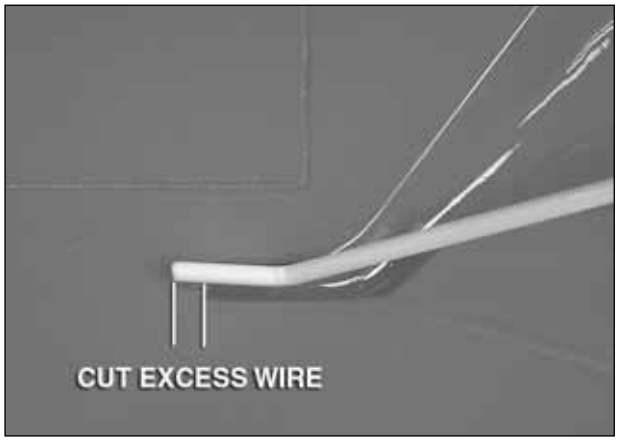


❏ ❏ 5. Position the landing gear onto the landing gear rails. The air cylinder will exit the side of the fuselage as shown. When positioning the landing gear be sure you do not kink either of the air lines.

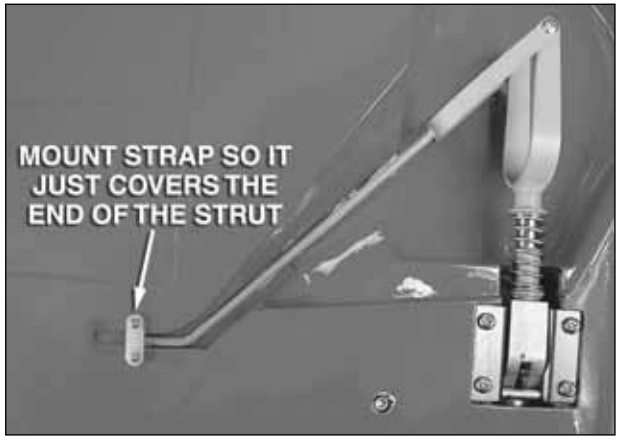


❏ ❏ 6. Drill a 7/64" [2.8mm] hole into the landing gear rails for each of the mounting holes. Screw the landing gear to the rails with four #6 x 1/2" [13mm] screws.

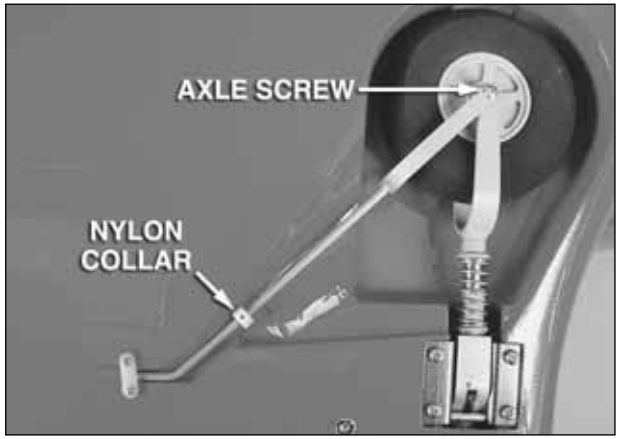




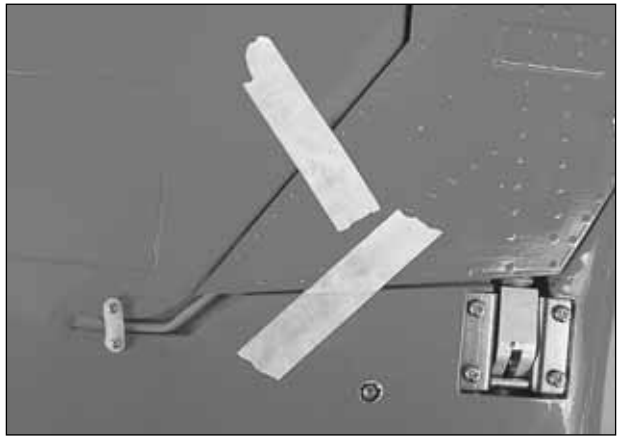
❏ ❏ 7. Compress the landing gear strut completely. While it is compressed, look at the positioning of the back strut. Under compression the end of the back strut should be at the end of molded channel. If the landing gear back strut is too long, cut the end of the strut so it will fit.



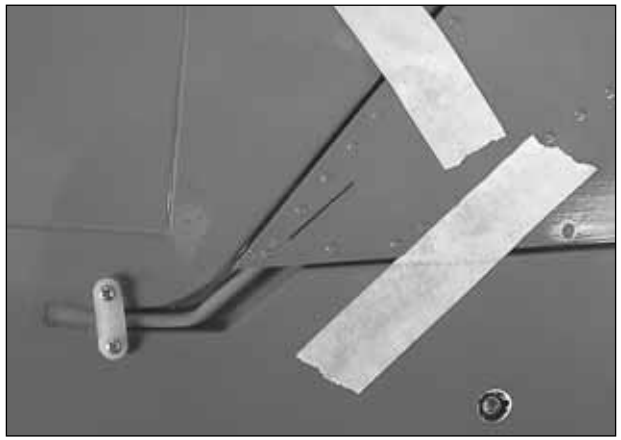
❏ ❏ 8. Place the back strut of the landing gear into the slot molded in the fuselage. Place a flat landing gear strap over the end of the strut. Mark the location of the holes for the nylon strap. Then, drill a 1/16" [1.6mm] hole through each of them, drilling into the wood mounted under the skin of the fuselage. Secure the strap with two #2 x 3/8" [10mm] screws.



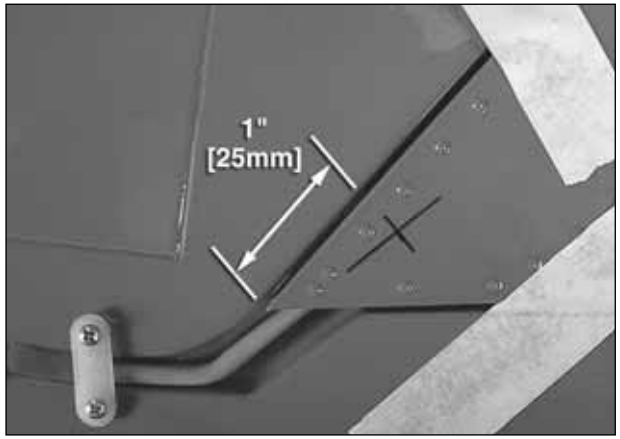
❏ ❏ 9. Remove the screws that hold the axle and the rear strut to the main landing gear. Install a wheel onto the axle and the nylon collar over the back strut. Screw the axle and rear strut back to the landing gear. Be sure the back strut is under the nylon landing gear strap and the nylon collar is positioned over the recess molded into the wheel well. Push the landing gear into the wheel well.



❏ ❏ 10. Place the landing gear door over the landing gear, making sure it is centered in the wheel well. Once satisfied with its position tape the door in place.

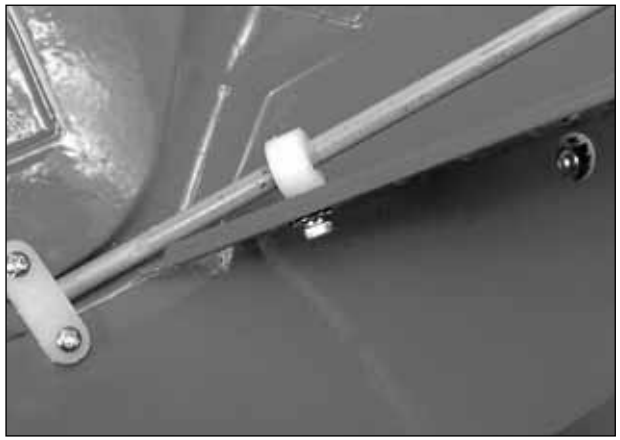


❏ ❏ 11. Draw a line on the door that is in line with the angle of the back strut.

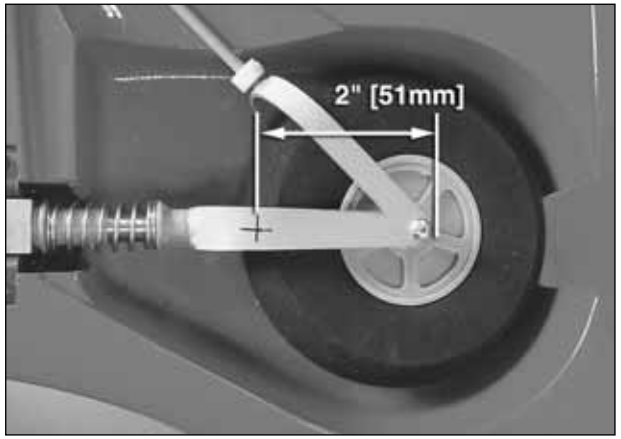


❏ ❏ 12. Measure from the tip of the door 1" [25mm] and then draw a crossing line.

❏ ❏ 13. At the intersection of the two lines drill a 1/8" [3mm] hole through the door.



❏ ❏ 14. Insert a 4-40 x 1/4" [6mm] socket head cap screw and a #4 flat washer into the gear door. Thread the screw into the nylon collar. ***Do not*** over tighten the screw causing the hole in the collar to strip. The screw does not have to be overly tight and the screw will not be tight against the back strut.

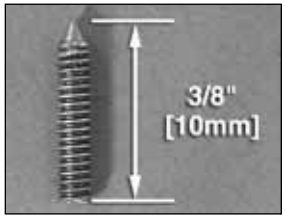


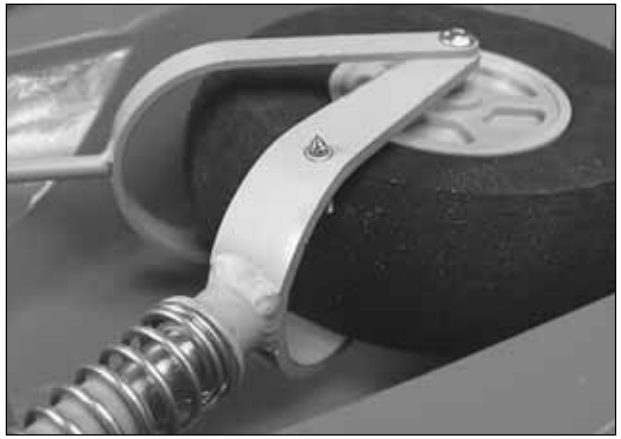
❏ ❏ 15. Measure from the bottom of the landing gear 2" [51mm]. Make a cross centered in the landing gear. On the intersection of the two lines, use a punch to make a punch mark for the drill bit to start in.

❏ ❏ 16. Drill a 3/32" or #43 [2.4mm] hole on the mark. ***Important!*** When you drill the hole, be sure the drill is perpendicular to the surface of the fuselage. Do not drill the hole perpendicular to the side of the landing gear.

❏ ❏ 17. Tap the hole you just drilled with a 4-40 tap.

❏ ❏ 18. Using a file or grinder, taper the end of the 4-40 x 6" [152mm] threaded rod to a point. Cut the threaded portion to a length of 3/8" [10mm].

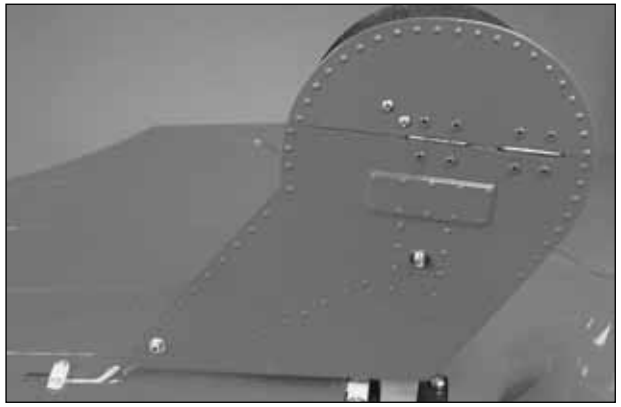




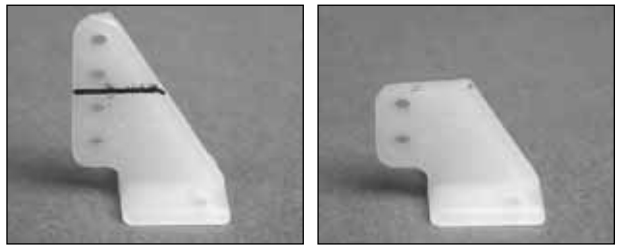
❏ ❏ 19. Screw the pointed threaded rod into the hole you tapped in the landing gear with the pointed end pointing out of the gear. The point needs to be just above the landing gear.

❏ ❏ 20. Carefully position the door over the opening in the fuselage. When you are satisfied with the position, press the door firmly onto the point of the rod. Press hard enough to leave a mark inside of the door.

❏ ❏ 21. Locate a 4-40 x 1/2" [13mm] socket head cap screw. Cut it so the threaded portion of the screw is 3/8" [10mm] long.

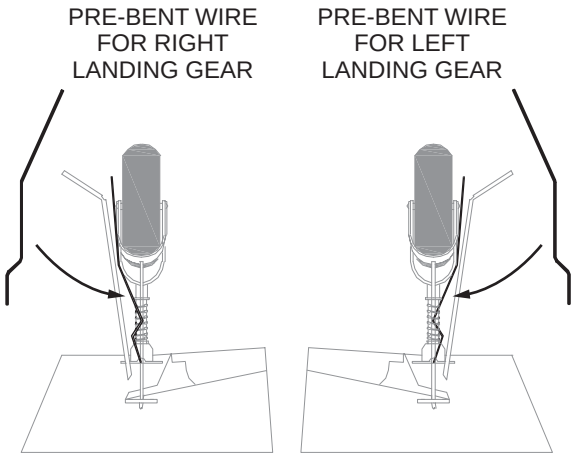


❏ ❏ 22. Remove the pointed rod from the landing gear. Drill a 1/8" [3mm] hole through the mark you made in the door. Position the door so the hole in the door and the hole in the landing gear are aligned. Attach the door to the landing gear with the 4-40 screw you cut and a #4 flat washer.



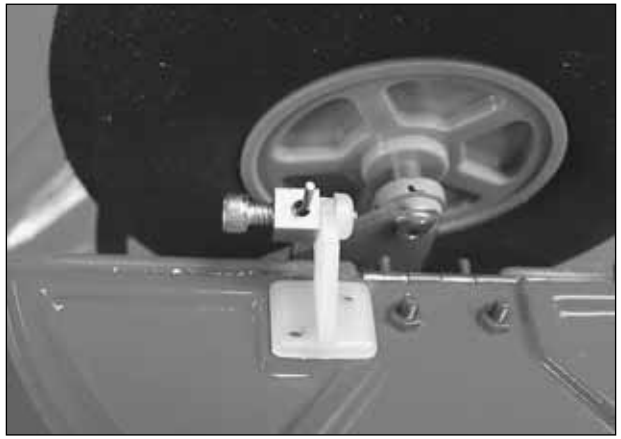
❏ ❏ 23. Cut a small nylon control horn as shown.

❏ ❏ 24. Apply a drop of medium CA to the control horn and glue it to the square molded in the door. (You do not need to use too much glue as the glue is only being used as a temporary mounting procedure. Once you are assured everything is working properly the control horn will be permanently mounted).



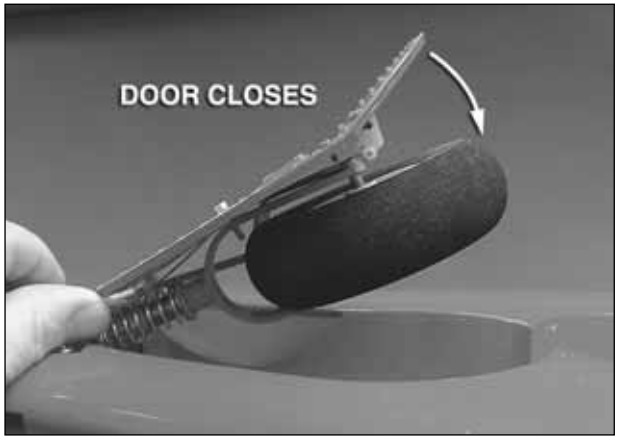
LANDING GEAR VIEWED FROM THE BACK/BOTTOM OF THE FUSELAGE

❏ ❏ 25. The kit has two pre-bent wires used for closing the gear door. There is a left and a right. Examine the sketch and photos to determine the wire required for the door you are installing. Remove the two mounting screws from the rear landing gear plate. Insert the bent end of the wire into the hole in the nylon plate. Place the wire along the landing gear door as shown. Then, mount the nylon plate on top of the landing gear plate with the screws you removed and #6 flat washers. When tightening the screws, do not over tighten them.



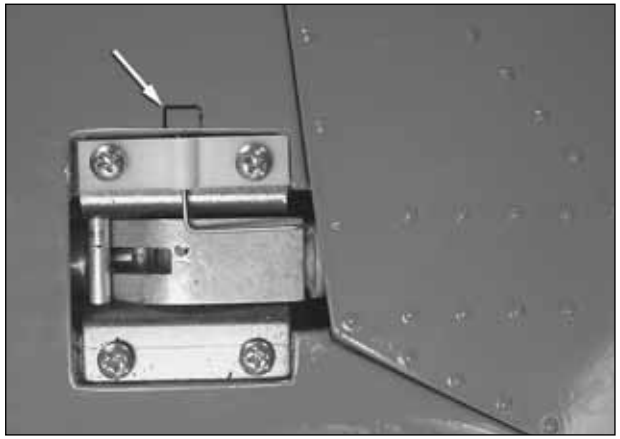
❏ ❏ 26. Slide a brass screw lock connector onto the wire. Then insert the pin on the connector into the outermost hole of the control horn. Secure it to the control arm with the nylon retainer. Start a 4-40 x 1/4" [6mm] socket head cap screw into the connector. Do not tighten the screw against the wire yet.

❏ ❏ 27. Open the hinged portion of the door about as much as is shown in the photo. Tighten the screw against the wire.

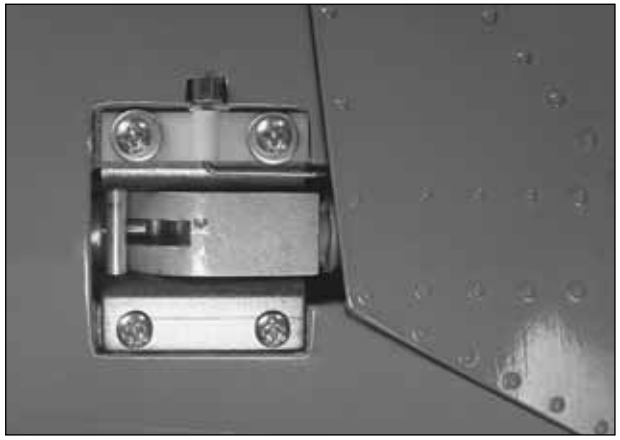


❏ ❏ 28. Manually begin retracting the landing gear into the wheel well. As the gear moves closer to the fuselage you will see the door start to close over the wheel. When the gear is fully retracted into the wheel well the door should be flush with the fuselage. If not, loosen the screw, adjust the door position, tighten the screw and then fully retract the gear until you have a good fit.

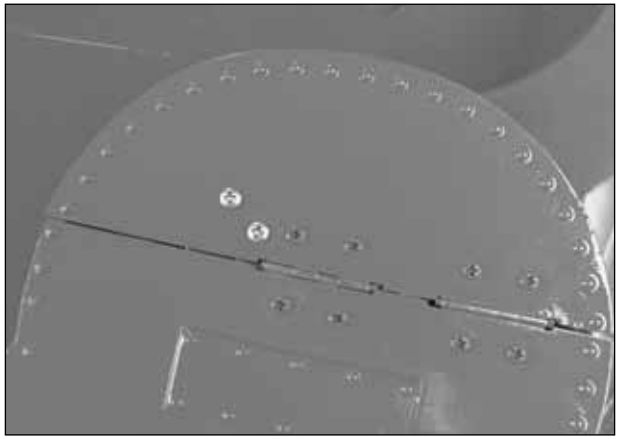
Note: Those of you who have installed retracts in other airplanes know that there is always some adjustments that need to be made. This airplane is no exception. The pre-bent wires are very close to the correct shape but if needed, don't be afraid to make minor adjustments to get them to work properly.

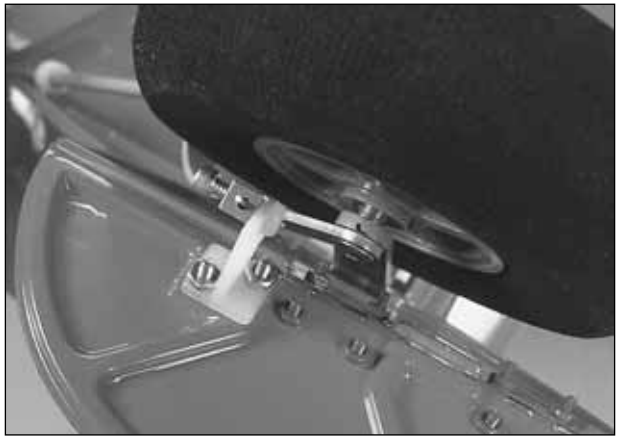


❏ ❏ 29. Mark a 3/16" x 3/16" x 3/16" [4.8mm x 4.8mm x 4.8mm] square centered on the fuselage, centered on the position the wire goes through the nylon mounting bracket.



❏ ❏ 30. Use a rotary tool or file to cut the marked portion away. Slide the wire through the nylon mount, into a 1/16" [1.6mm] wheel collar. Install and tighten a 4-40 set screw against the wire.





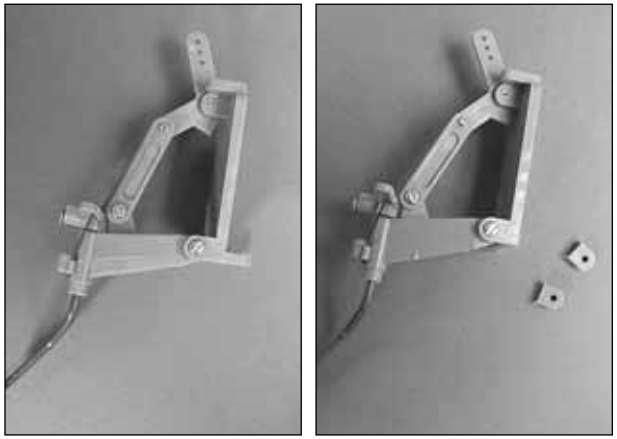
❏ ❏ 31. Drill a 3/32" [2.4mm] hole through each of the mounting holes in the nylon control horn, drilling through the landing gear door. Insert a 2-56 x 3/8" [9.5mm] screw into each of the holes and secure them to the door with a 2-56 nut. Be sure to apply a drop of thread locker to the screw.

❏ ❏ 32. Manually move the landing gear in and out of the wheel well a few times. When you are satisfied that everything is working well, go through the completed door installation and apply a drop of thread locker to each of the nuts and bolts. As mentioned earlier the bolt that goes into the nylon collar should not be over tightened. The collar should be able to move on the back strut. Instead of thread locker, use a drop of aliphatic glue on the threads of the bolt going into the nylon collar. While going through all of your installation, remove the axle from the landing gear and slide two #8 flat washers onto the axle on both sides of the wheel to keep it centered in the landing gear. Be sure to use thread locker on the axle screws during the final installation.

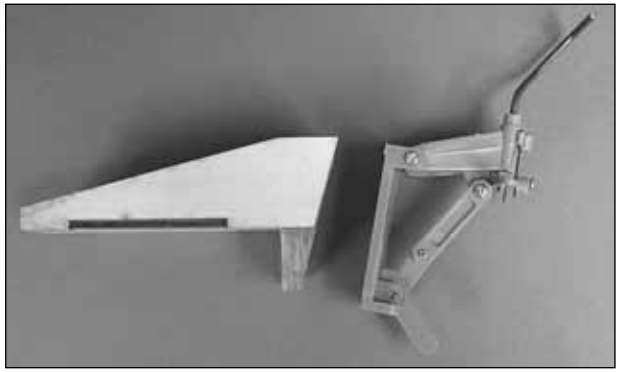
❏ 33. Repeat steps 1-29 for the other landing gear. **Note:** When you have completed the installation of the gear you might wish to apply a bit of deep red paint to the heads of the screws you installed in the door.

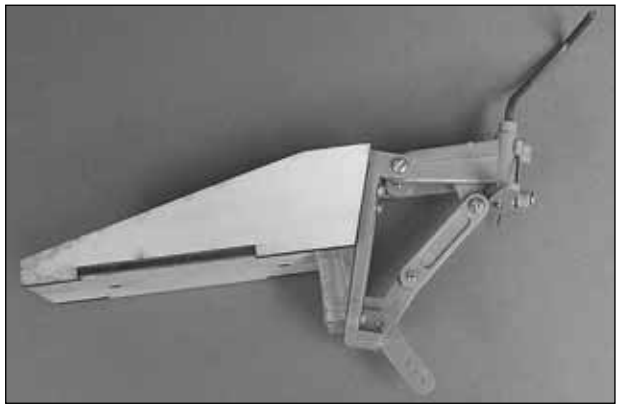
Retractable Tail Wheel

Installation of the retractable landing gear for the main landing gear does not require that you use a retractable landing gear for the tail wheel. Some versions of the Staggerwing that have been restored have not always utilized a retractable tail wheel. If you wish to use a fixed tail wheel go back to page 17 for the instructions on its installation. If you use the retractable tail wheel it will require the use of one additional 90 oz-in servo (the Futaba S3305 [FUTM0035] is an inexpensive servo suitable for this), pushrod wire and the Robart #121 scale retract tail wheel (ROBQ2210).

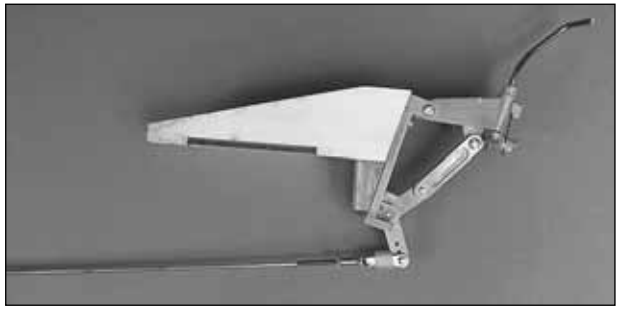


❏ 1. Cut off the mounting lugs from the Robart tail wheel retract unit as shown.

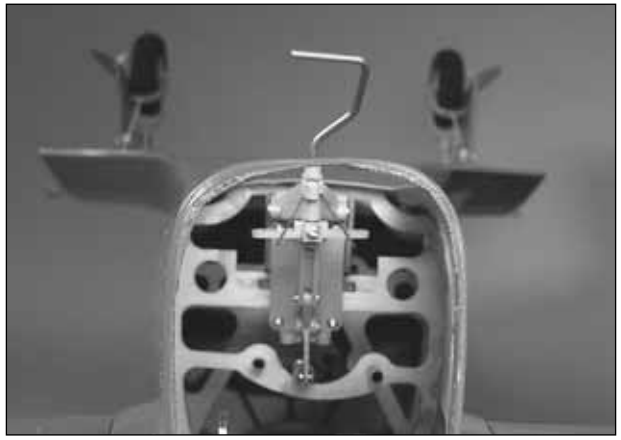




❏ 2. Position the retract against the wood **mounting bracket** so the bottom of the retract is flush with the bottom of the bracket. Drill a 1/16" hole through each of the mounting holes. Then, install the retract to the mounting bracket with four #2 x 3/8" [10mm] screws.



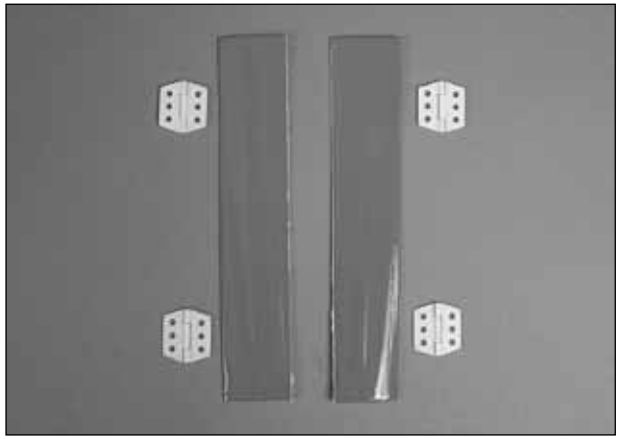
❏ 3. Install a 2-56 nut, 2-56 threaded clevis and silicone clevis retainer onto a 2-56 x 36" [914mm] threaded rod. Install the clevis into the outermost hole in the arm of the retract.



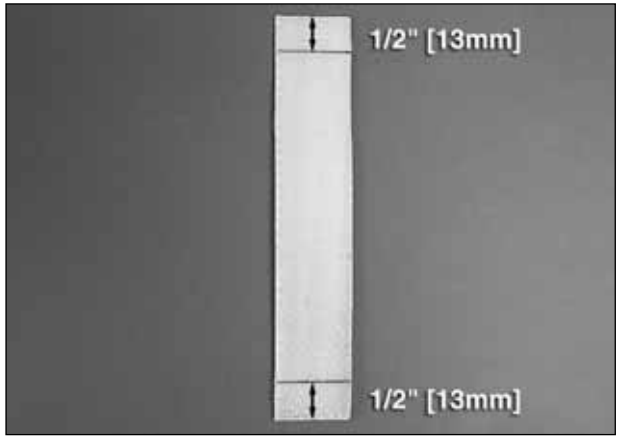
❏ 4. Insert the threaded rod and retract unit into the rear of the fuselage, sliding the rod into the plastic tube in the center of the fuselage. Attach the retract to the fuselage by inserting two 4-40 x 1/2" [13mm] socket head cap screws and #4 flat washers through the two holes in the bottom of the fuselage, attaching the mounting plate and retract to the plywood plate with pre-installed blind nuts inside of the fuselage. Mount the tail wheel to the landing gear with a 3/32" [2.5mm] wheel collar and 4-40 set screw on each side of the wheel.

Tail Wheel Door Installation (Retractable)

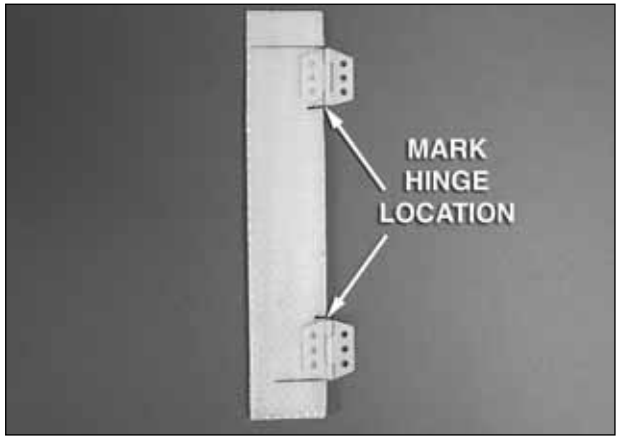
The following steps cover the installation of the tail wheel doors. This is optional and not required for flight performance. If you fly from a grass field that is very rough or has long grass, you might wish to omit the installation of the doors due to the amount of clearance between the doors and the ground.



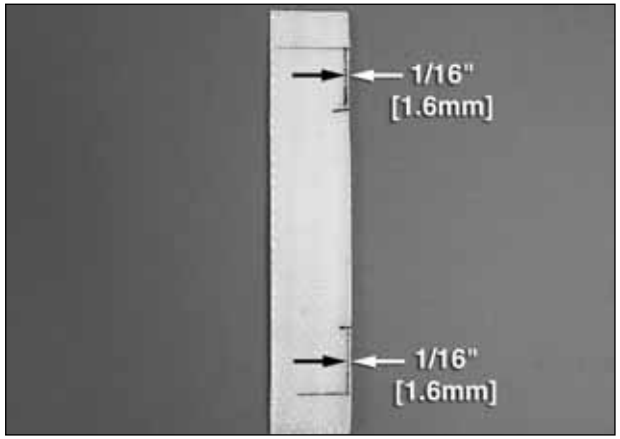
❏ ❏ 1. Locate the fiberglass **tail wheel doors** and four pinned hinges. Place the doors into the opening aligning the simulated stringers on the fuselage with the doors to determine which door is the right and left.



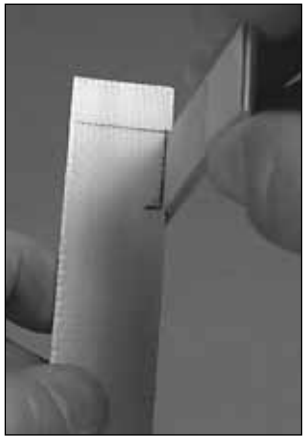
❏ ❏ 2. On the backside of the door make a mark 1/2" [13mm] in from each end of the door.

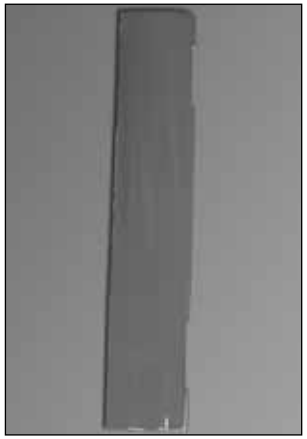


❏ ❏ 3. Place the hinges on the line and make another mark at the other end of the hinge to mark the exact placement of the hinge. Do this for both hinges.

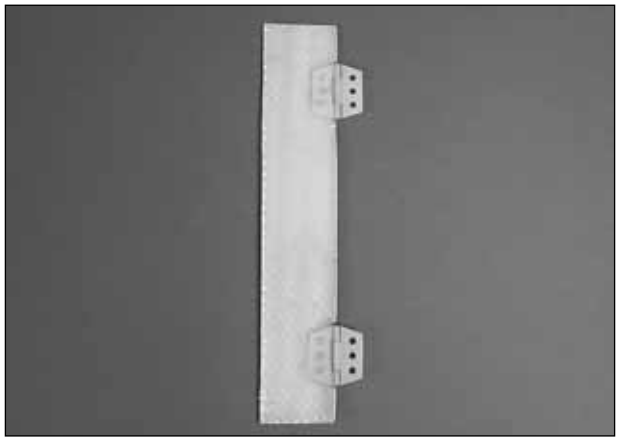


❏ ❏ 4. Measure in from the side of the door 1/16" [1.6mm] and draw a line as shown.





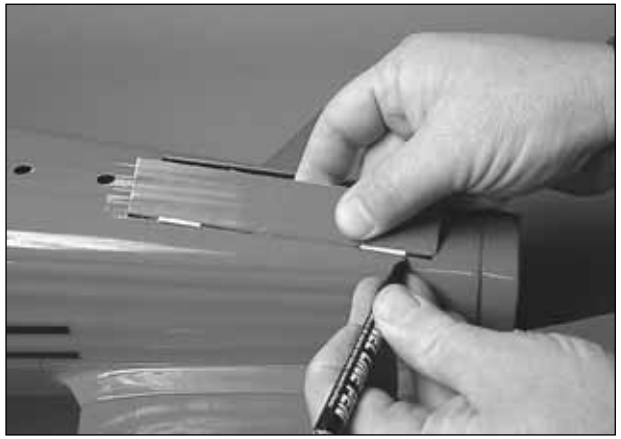
❏ ❏ 5. Make a file by cutting a piece of plywood the width of the hinge. Apply 180-grit sandpaper to the plywood. Sand the door to make a 1/6" [1.6mm] groove in the door at the location of each hinge.



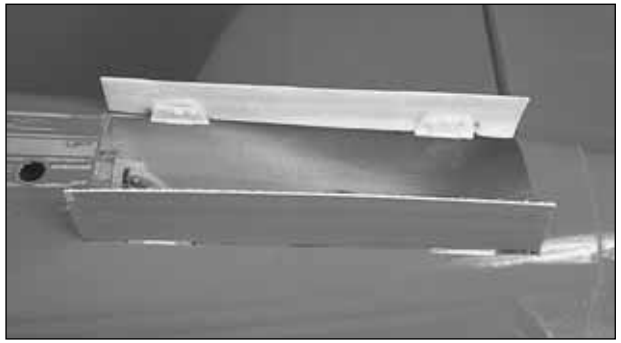
❏ ❏ 6. Roughen the fiberglass with sandpaper in the area the hinges will be glued to the doors. After sanding, clean the area with rubbing alcohol.

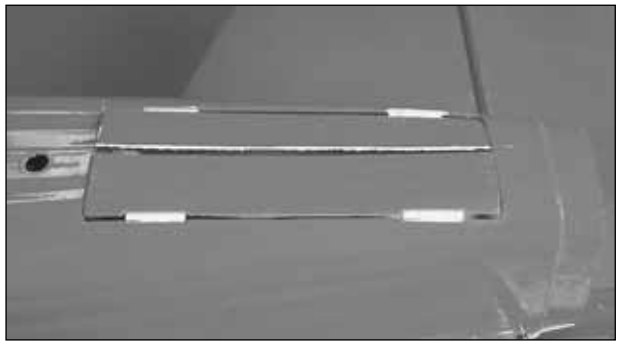
❏ ❏ 7. Apply a couple of drops of lightweight oil to the hinge pin to prevent glue from getting into the hinge. Glue the hinges to the door.

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



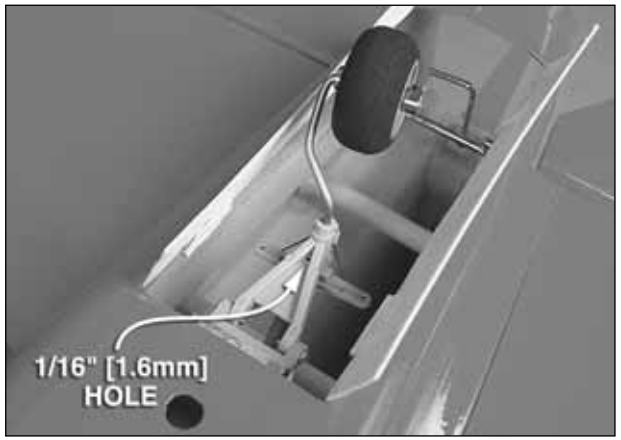
❏ 9. Place the door in position on the fuselage. Mark the hinge location onto the fuselage. Then, sand the fuselage to make a 1/16" [1.6mm] groove the same as was done on the doors. Do this for both doors.



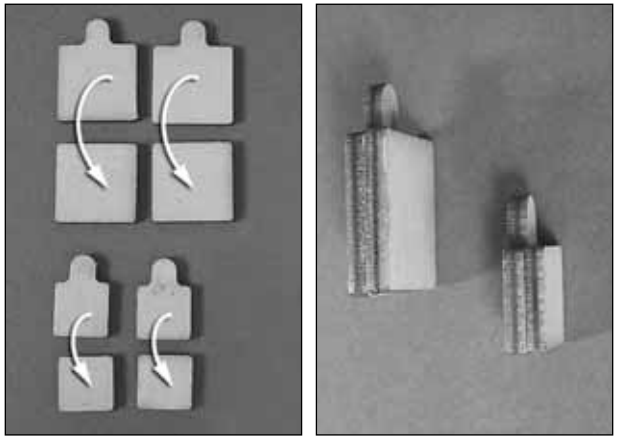


❏ 10. Test fit the doors in the opening. It may be necessary to sand the edges of the doors to fit when the doors are closed. Sand as needed. Apply a drop of oil to the hinge to prevent glue from getting into the

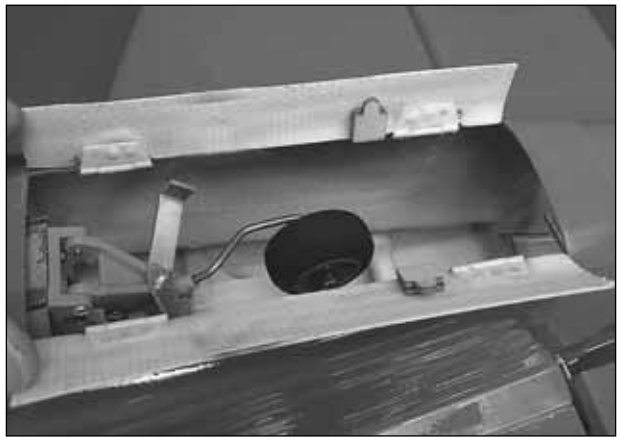
hinges, and then glue the doors into the fuselage. Note: We glued the door to the fuselage with medium CA before applying epoxy over the top of the hinge, working the epoxy into the holes in the hinge. If you have long grass that could drag against the doors, you might wish to install a small bolt and nut through the hinge and the fuselage.



❏ 11. Drill a 1/16" [1.6mm] hole in the landing gear as shown. Mount the aluminum **door spreader** to the landing gear with a #2 x 3/8" [10mm] screw.

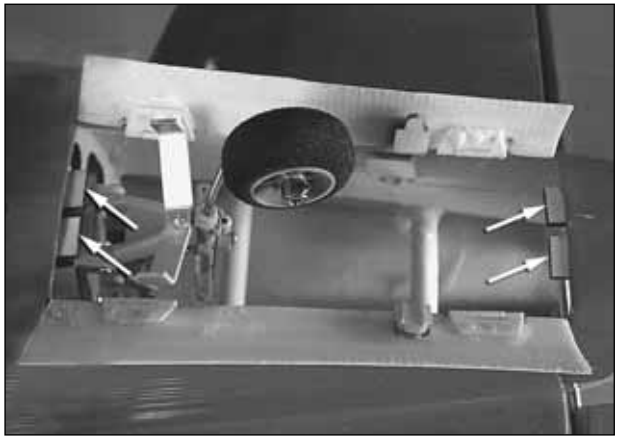


❏ 12. Locate the plywood parts shown and glue them together as shown.

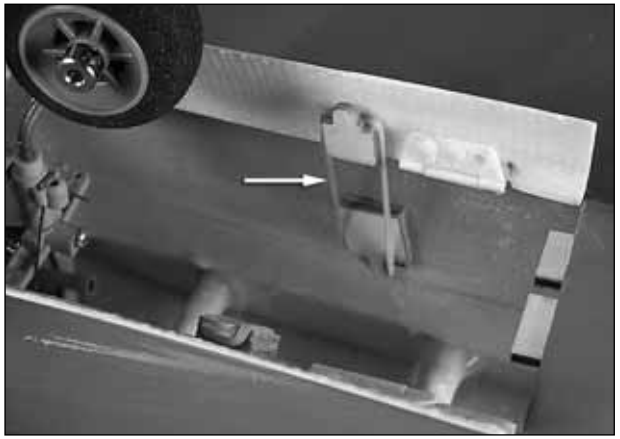


❏ 13. Glue one of the smaller blocks to the gear door just ahead of the rear door hinge. Be sure the tap is pointed towards the bottom of the door. Do this for both doors.

❏ 14. Glue one of the larger blocks below the smaller block approximately 1" [25mm] from the bottom of the fuselage, making sure the tab is towards the top of the fuselage. Do this on both sides of the fuselage.



❏ 15. Glue four 1/2" [13mm] square plywood blocks to the fuselage as shown. The doors will be pulled down against these blocks, creating a door stop.

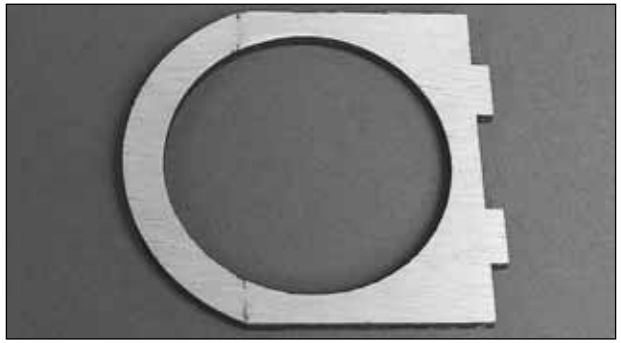


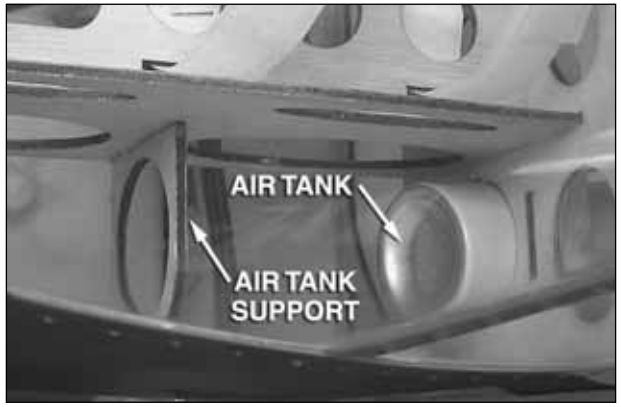
❏ 16. Install a small rubber band to the blocks on both sides of the doors. The rubber bands will pull the doors shut when the gear is retracted and the door spreader will hold them open when the gear is extended.

Install the Retract Hardware

❏ 1. Decide on a location to mount the air fill valve. Glue the plywood air valve mounting plate inside the fuselage. *We mounted ours on the bottom of the fuselage. 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 it on the fuselage in a place more convenient for filling the air tank.* Using a Dremel tool and grinding bit, make a hole in the fiberglass fuselage through the hole in the plywood air valve mounting plate.

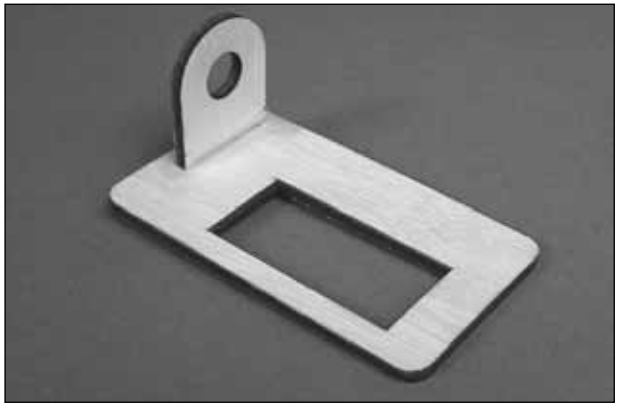
❏ 2. Following the manufacturer's instructions for your air system, install the air lines required for installation to the air tank. Install the tank into the hole in the bulkhead that will hold the tank.



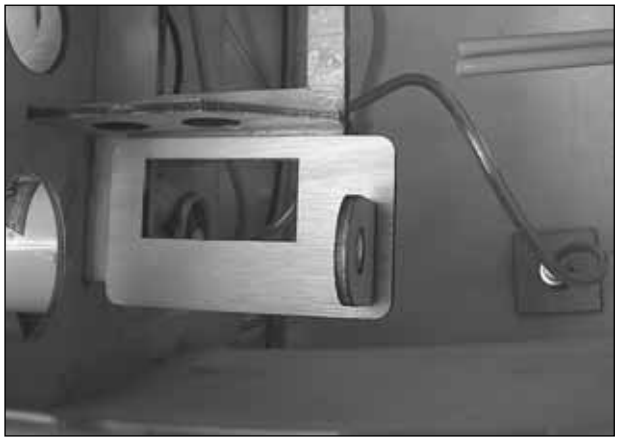


❏ 3. Locate the plywood air tank support. Glue it in place in the cut outs in the fuel tank structure.

❏ 4. Slide the tank into the support, positioning it so that the air tank does not protrude into the location for the retract servo. Glue the tank to the supports with either hot melt glue or a mixture of epoxy and micro balloons.

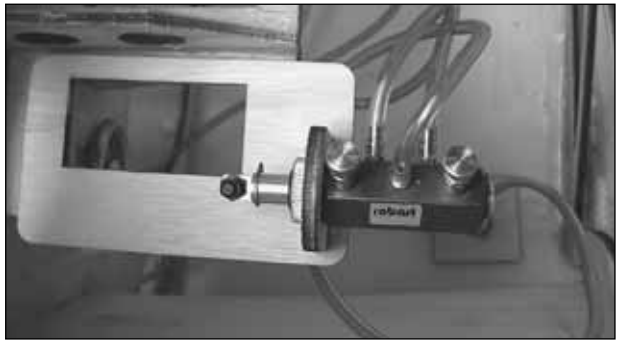


❏ 5 Glue the components of the air valve tray together.

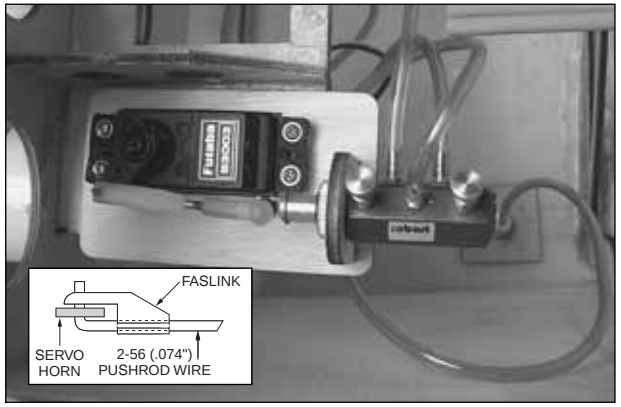


❏ 6. Glue the air valve tray over the servo opening just above the air tank.

❏ 7. Install the threaded ball through the hole in the air valve, securing it with an 0-80 nut and thread locker.



❏ 8. Install the air lines to the air valve. Remove the retaining nut from the air valve, insert the valve into the hole in the air valve tray, and secure the valve to the tray with the retaining nut and thread locker.



❏ 9. Place the retract servo into the tray. Drill a 1/16" [1.6mm] hole through the servo mounting holes and into the tray. Insert and remove the mounting screws that came with your servo. Apply a couple of drops of thin CA to harden the threads. Once the glue has hardened re-install the mounting screws.

❏ 10. 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.

Adjusting the Retractable Landing Gear

After connecting the air lines as explained 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.

The gear does not move up or down:

Check to be sure the control screws on the variable rate valve are open.

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.

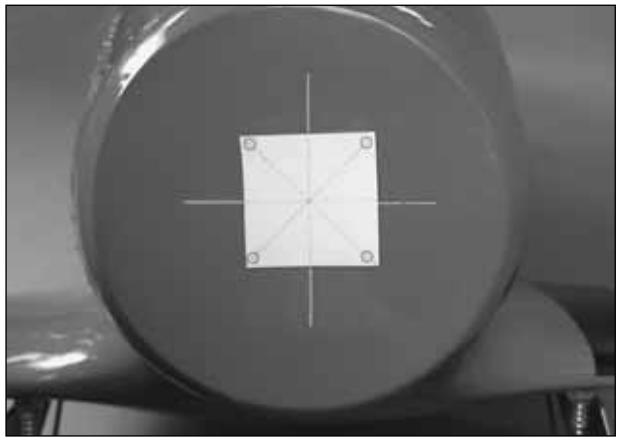
***One of the landing gear goes up while the other goes down*:**

Most likely you have crossed one of the air lines.

Did you know… Early in World War II, the need for a compact executive-type transport or courier aircraft became apparent and in 1942 the United States Army Air Force ordered the first of 270 Model 17s for service within the United States and overseas as the UC-43.

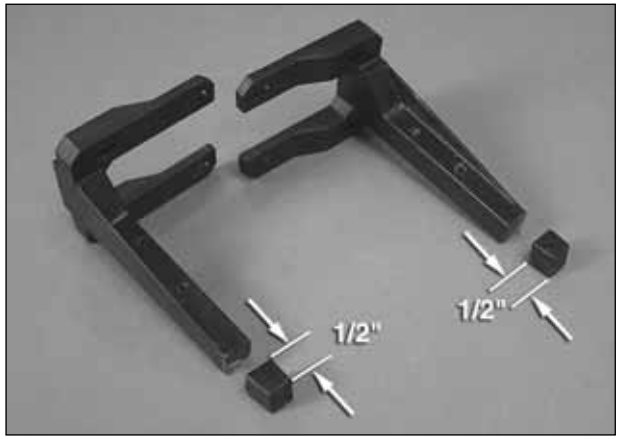
INSTALL ENGINE & THROTTLE SERVO

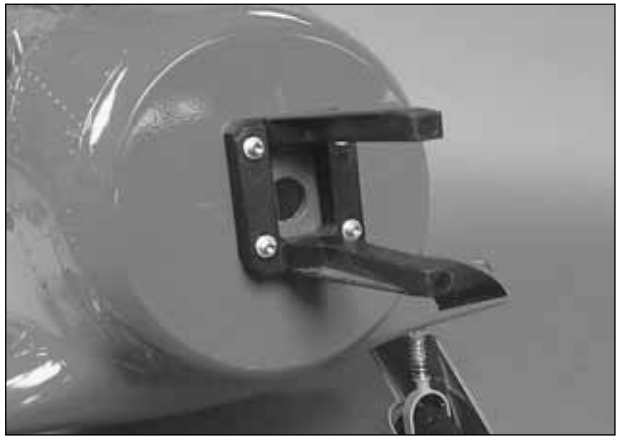
O.S. 1.60 Two-Stroke Engine



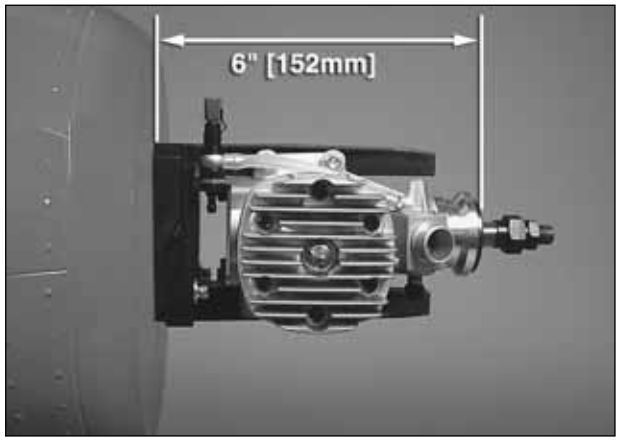
❏ 1. On page 43 of this manual you will find the engine mounting template. Cut out the template from the manual and tape it to the firewall, aligning the lines of the template with the lines on the firewall.

❏ 2. On each of the four marks drill a 7/32" [5.6mm] hole. Install an 8-32 blind nut into each of the holes from the back of the firewall. Install a #8 flat washer onto an 8-32 x 1" [25mm] socket head cap screw. Then, tighten the screw into the blind nut, pulling it into the firewall. Do this for all four blind nuts.



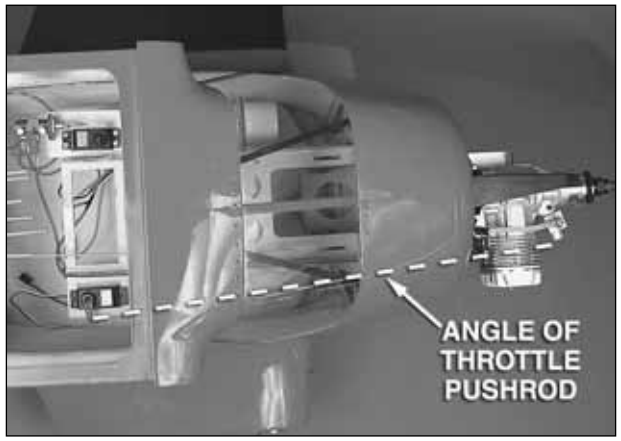


❏ 3. Cut the tabs from the **engine mount.** Then, cut 1/2" [13mm] from the front of each mounting rail. *(This is needed to allow room for mounting the dummy engine later in this manual).* Install the engine mount to the firewall with four 8-32 x 1-1/4" [32mm] socket head cap screws, #8 flat washers and #8 lock washers. When installing the mount, be sure that you have the mount positioned allowing the engine to be mounted on its side.



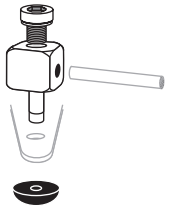
❏ 4. Position the engine on the mount so the distance from the firewall to the front of the thrust washer measures 6" [152mm]. Mark the location of the engine on the mount. The Great Planes® "Dead Center" Hole Locator (GPMR8130) works well for this. Drill through the marks you have made with a #29 or 9/64" [3.6mm] drill bit. Tap each hole with an 8-32 tap.

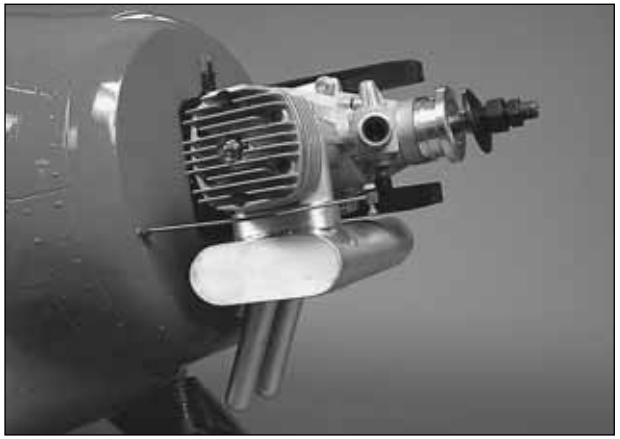
❏ 5. Install the engine to the mount with four each, 8-32 x 1" [25mm] socket head cap screws, #8 lock washers and #8 flat washers.



❏ 6. Install the muffler onto the engine. Examine the photo and you can see the line the throttle servo must follow. Install the throttle servo into the servo opening in the fuselage and drill a 1/16" [1.6mm] hole through each of the mounting holes. Remove the servo. Then, install and remove a servo mounting screw into each hole. Apply a couple drops of thin CA into the holes to harden the threads. When the glue has cured, permanently mount the servo. Using the location of the throttle arm and the photograph as references, determine the location the throttle wire will pass through the firewall. Mark the location and then drill a 3/16" [4.8mm] hole on the mark. Cut the 36" [914mm] white plastic tube to 12-1/2" [318mm]. Roughen one end of the tube with 220-grit sandpaper. Insert the smooth end of the tube into the hole you drilled. Then, glue the roughened end of the tube to the firewall.

❏ 7. Install a brass screw lock connector, nylon retainer ring and a 4-40 x 1/8" [3mm] socket head cap screw onto the outer hole of the servo arm and the throttle arm.

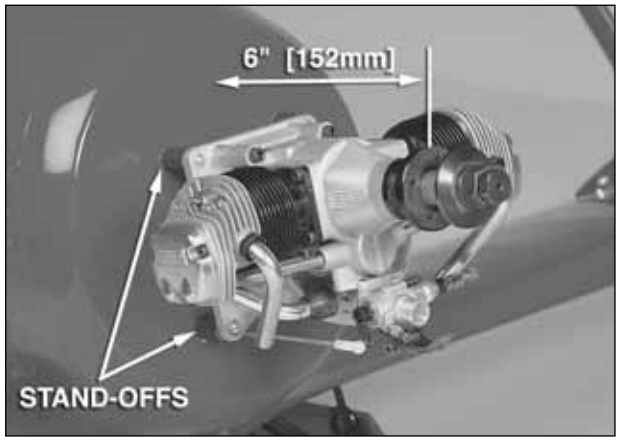




❏ 8. Cut the threads from an .074 x 36" [914mm] threaded rod. Bend it to fit from the throttle servo arm to the throttle arm. When bending the wire be sure that you have clearance between the pushrod and any of the engine/muffler components. Metal contact may create radio interference. Slide the pushrod wire into the brass screw lock connectors. Then, tighten the 4-40 x 1/8" [3mm] socket head cap screw against the throttle pushrod wire. Cut off any excess wire.

O.S. 1.60 Four-Stroke Engine

(Mounting hardware not included with kit.)



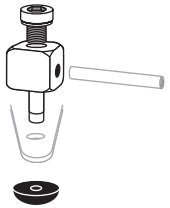
❏ 1. Make stand-offs from dowels or a plywood plate that will position the engine a distance of 6" [152mm] from the firewall to the front of drive washer. Center the engine so the engine will be centered in the cowl. Make marks on the firewall for the location of the mounting holes of the engine backplate.

❏ 2. On each of the four marks drill a 7/32" [5.6mm] hole. Install an 8-32 blind nut into each of the holes from the back of the firewall. Install a #8 flat washer onto an 8-32 x 1" [25mm] socket head cap screw. Then, tighten the screw into the blind nut, pulling it into the firewall.

❏ 3. Mark the location where the throttle pushrod will come through the firewall. *(**Note:** Because the carburetor is an up-draft carburetor, the fuel tank is going to have to be relocated from the location for a two-stroke engine to the lowest point in the fuselage. Keep this in mind when determining the location for the pushrod. The pushrod must not conflict with the fuel tank).*

❏ 4. Install the throttle servo into the servo opening in the fuselage and drill a 1/16" [1.6mm] hole through each of the mounting holes. Remove the servo, and then install and remove a servo mounting screw into each hole. Apply a couple drops of thin CA into the holes to harden the threads. When the glue has cured permanently mount the servo.

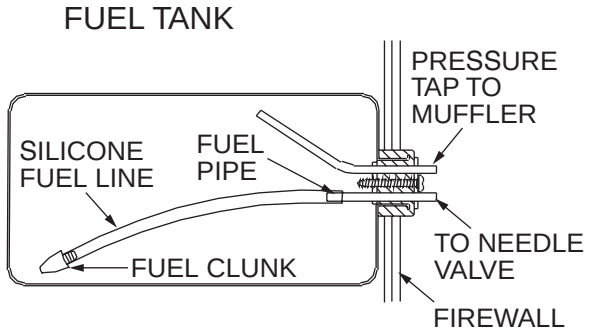
❏ 5. Install a brass screw lock connector, nylon retainer ring and a 4-40 x 1/8" [3mm] socket head cap screw onto the outer hole of the servo arm and the throttle servo arm.



❏ 6. Cut the threads from an .074 x 36" [914mm] threaded rod. Bend it to fit from the throttle servo arm to the throttle arm. When bending the wire be sure that you have clearance between the pushrod and any of the engine/muffler components. Metal contact may create radio interference. Slide the pushrod wire into the brass screw lock connectors. Then, tighten the 4-40 x 1/8" [3mm] socket head cap screw against the throttle pushrod wire. Cut off any excess wire.

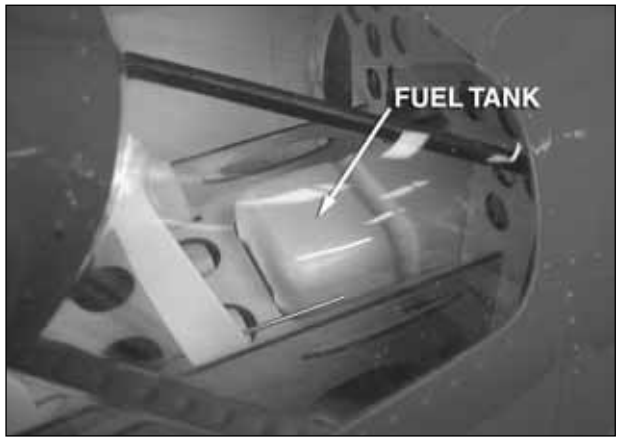
Install the Fuel Tank for the O.S. 1.60 Two-Stroke Engine

Follow these instructions for any engine that does not have an up-draft carburetor.



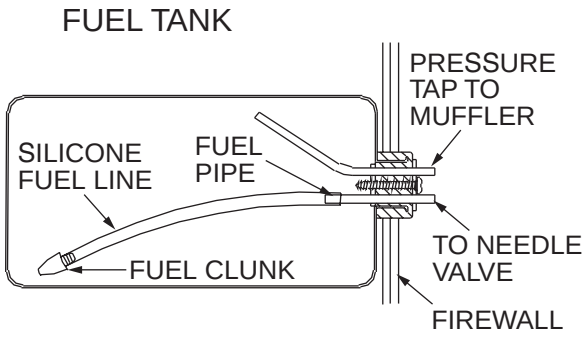
❏ 1. Assemble the **fuel tank** as shown in the sketch. When tightening the center screw be sure not to over tighten it. You just want it snug enough to pull the rubber stopper tight against the tank.

❏ 2. Install silicone fuel tubing (not supplied) 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.



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

Install the Fuel Tank for the O.S. 1.60 Four-Stroke Engine



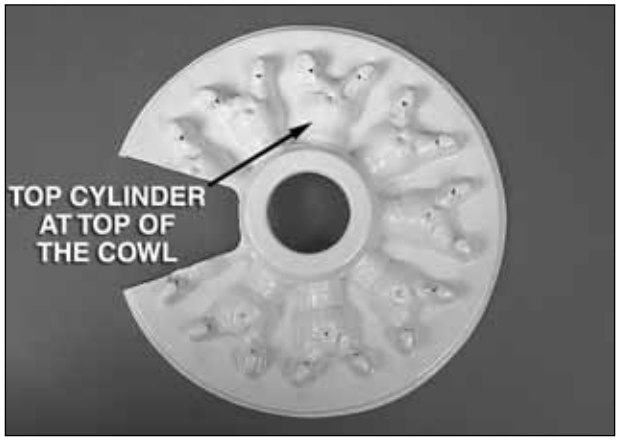
❏ 1. Assemble the **fuel tank** as shown in the sketch. When tightening the center screw be sure not to over tighten it. You just want it snug enough to pull the rubber stopper tight against the tank.

❏ 2. The up-draft carburetor requires that the fuel tank be mounted as low as possible in the fuselage. Because of this the tank cannot be mounted in the area designated in the model. To move the tank location to the bottom of the fuselage, cut the floor out of the fuel tank area, locate the tank to the bottom of the fuselage and drill new holes for the fuel line so they can exit out from the bottom of the firewall in line with the fuel inlet on the carburetor. This process will be cumbersome due to the limited amount of space you have to work in. Patience will help to assure a good installation.

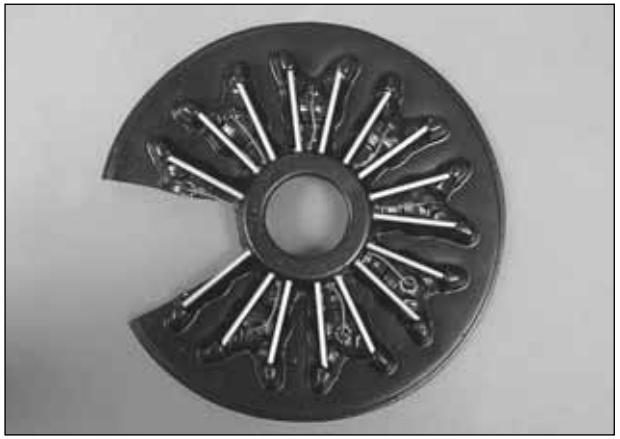
Install the Cowl and Dummy Engine

❏ 1. Remove the muffler. This will make the installation of the cowl easier.

❏ 2. Cut out the center of the **dummy engine**. Slide it over the engine crankshaft. Mark the area where the dummy engine covers the cylinder head of your engine. *(If you are installing a twin cylinder engine then you must cut out the dummy engine to provide cooling for both cylinders).* Remove the dummy engine and cut out the area you marked. **Note:** When installing the dummy engine, one cylinder head should be at the top of the cowl. Trim the cowl as needed to get it to fit completely forward into the cowl.

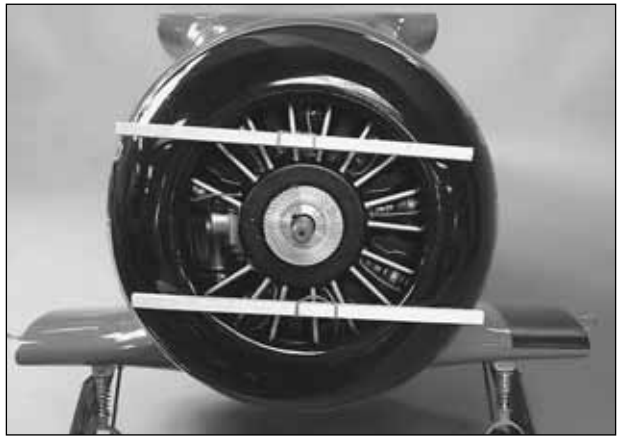


❏ 3. Drill 1/8" [3mm] holes in each of the rocker covers and the center of the engine for the aluminum pushrod tubes. If you would like to add some additional detail you may wish to use wire (not included) as a spark plug lead. We used a 20 gauge red wire and then drilled 1/16" [1.6mm] holes in each cylinder for the wire.



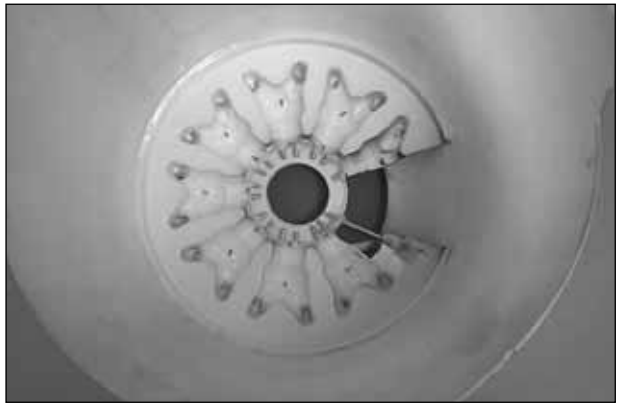
❏ 4. Paint the engine flat black. After the paint dries install the aluminum tubes and wire into the holes you drilled. On the backside of the engine apply a small amount of glue to each wire and aluminum tube to hold them in place.

❏ 5. This step will be easier if you have a second set of hands to help you with the positioning of the cowl. Slide the **cowl** onto the front of the fuselage. Press the cowl back against the fuselage so that the sides of the cowl are tight to the sides of the fuselage. Note that the cowl has a pre-drilled hole in the top and both sides of the cowl for the mounting screws. With the cowl pressed in place and the engine centered in the cowl, drill a 1/16" [1.6mm] pilot hole through the top mounting hole in the cowl drilling into the fuselage. *(Note: When the cowl is properly placed, your pilot hole will be through the fiberglass as well as a wood plate that is pre-installed inside of the fuselage. Be sure you have drilled through the wood plate).* Temporarily install a #2 x 3/8" [10mm] screw into the hole in the top of the cowl and into the hole you drilled. Re- center the cowl with the engine and repeat this procedure for the other two mounting holes.



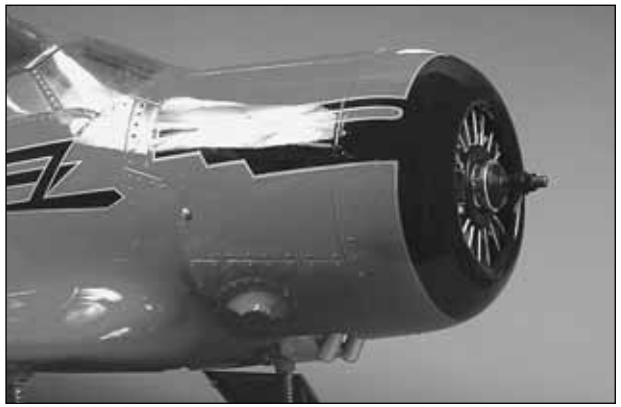
❏ 6. Place the dummy engine over the engine. Then, place the cowl over the dummy engine. Attach the cowl to the fuselage with the temporary screws. To position the dummy engine you will need two 7" [180mm] balsa sticks and two small rubber bands (not included). Loop a rubber band through a couple of the aluminum tubes on one side of engine crankshaft. Insert the stick through the rubber bands and place the stick onto the front of the cowl. This will pull the dummy engine into the front of the cowl. Repeat this with the second stick and rubber band on the other side of the engine crankshaft.

❏ 7. Position the dummy engine so that the cut out is over the engine cylinder and the hole you cut in the center of the dummy engine is centered on the engine drive washer. Be sure the center cylinder on the dummy engine is centered at the top of the fuselage. When you are satisfied with the positioning of the dummy engine, carefully remove the cowl from the fuselage, being careful not to disturb the dummy engine.



❏ 8. Using medium CA, tack-glue the dummy engine to the cowl from inside the cowl. Re-install the cowl to the fuselage to verify that the dummy engine is placed properly. When you are satisfied with the way it fits, remove the cowl from the fuselage and permanently glue the dummy engine to the cowl from inside the cowl with 6-minute epoxy mixed with microballoon filler.

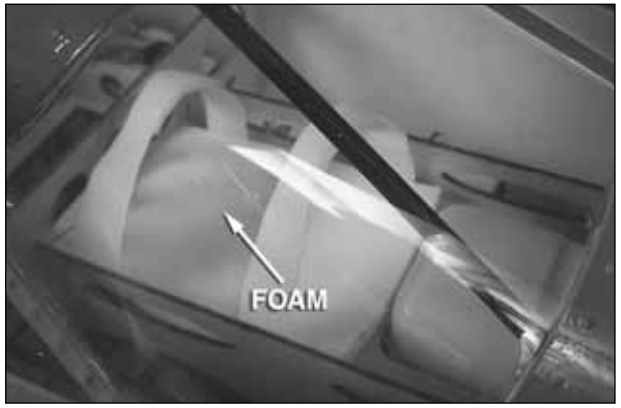
❏ 9. Drill through each of the three mounting holes you drilled in the fuselage with a 5/64" [2mm] drill bit. Install and remove a #4 x 1/2" [13mm] screw into each hole. Apply a couple of drops of thin CA into the holes to harden the threads. After the glue has hardened, the cowl will be mounted to the fuselage with three #4 x 1/2" [13mm] screws and three #4 flat washers.



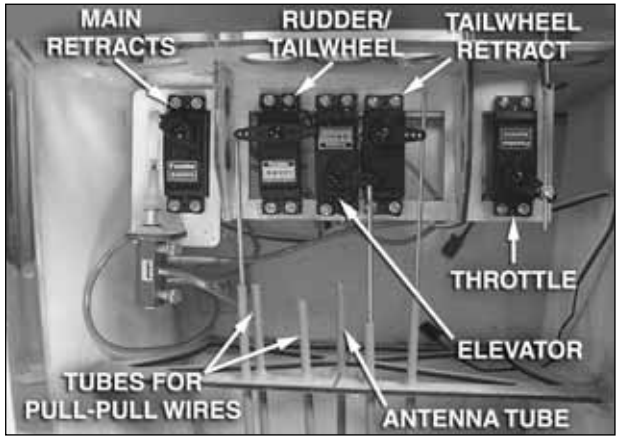
❏ 10. Make any necessary cut-outs for the muffler, needle valve, etc. If you are using an engine that would

hide the mufflers completely inside of the engine, be sure you allow for an air exhaust area of at least 6 sq. in. [.387 sq. dm.]. This is required for engine cooling due to the tight fit of the cowl to the fuselage.

Install the Radio System

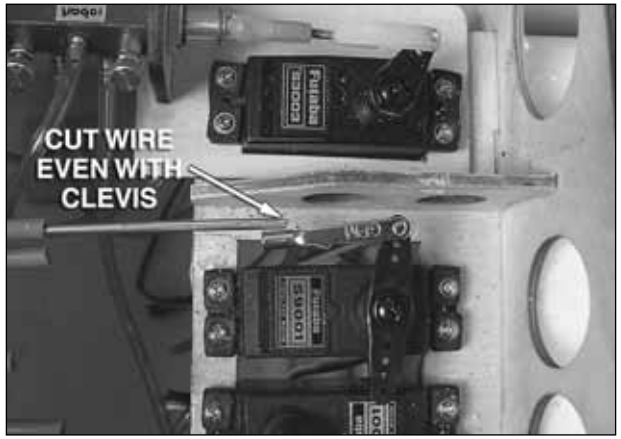


❏ 1. Cut a piece of 1/4" foam 4" x 5" [102mm x 127mm] and place it in the receiver/battery compartment.



❏ 2. Locate the .074 x 36" [914mm] pushrod wires. From the back of the fuselage, slide them into the plastic tubes for the elevator and the rudder. Use the wires as your guide for positioning the servos. Install the servos using the same procedure used for the other servos, mounting them onto the servo rails. Install the servo arms onto the servos as shown.

❏ 3. Remove the wires from the fuselage. On the threaded end of one of the wires install a 4-40 nut and a 4-40 threaded metal clevis approximately 20 turns. Slide the wire into the plastic tube for the rudder and attach the clevis to the nylon torque link on the rudder control wire. Center the rudder.



❏ 4. Mark the wire where it lines up with the end of the clevis. Cut the wire on that line.

❏ 5. Remove the wire from the tube. Remove the threaded metal clevis and the nut you previously installed onto the wire. Solder a 4-40 solder clevis onto the wire, aligning the wire and the clevis where they were when you cut the wire.

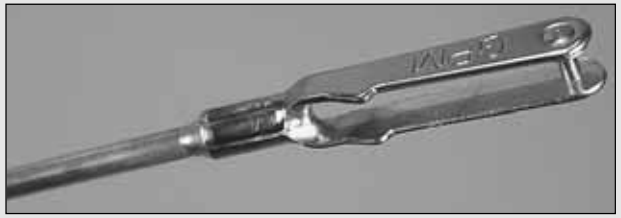
HOW TO SOLDER

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

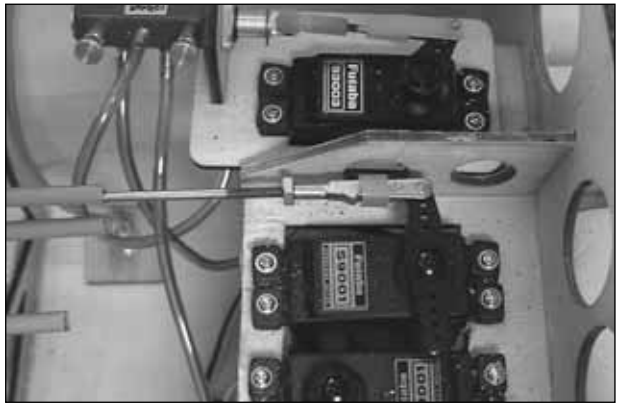
❏ B. Apply a few drops of soldering flux to the end of the pushrod, and then use a soldering iron or a torch to heat it. “Tin” the heated area with **silver solder** (GPMR8070) by applying the solder to the end. The heat of the pushrod should melt the solder—not the flame of the torch or soldering iron—thus allowing the solder to flow. The end of the wire should be coated with solder all the way around.

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

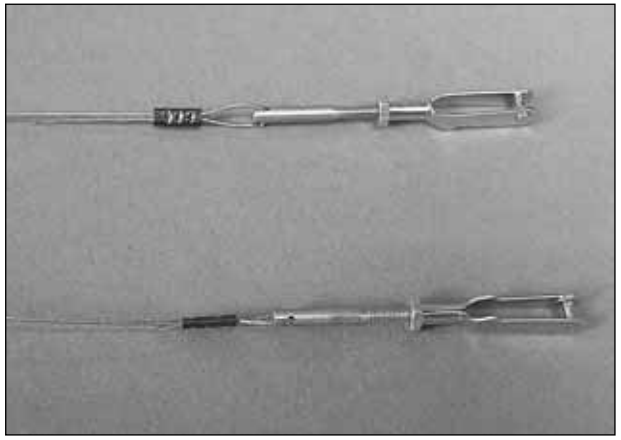
❏ D. Immediately after the solder has solidified, but while it is still hot, use a cloth to quickly wipe off the flux before it hardens. **Important:** After the joint cools, coat with oil to prevent rust. **Note:** Do not use the acid flux that comes with silver solder for electrical soldering.



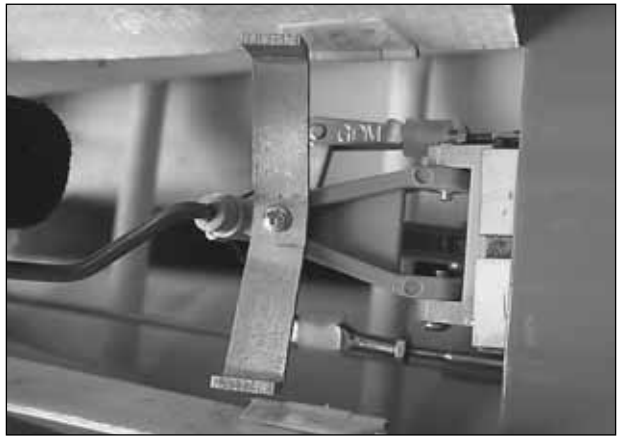
This is what a properly soldered clevis looks like—shiny solder with good flow, no blobs, flux removed.



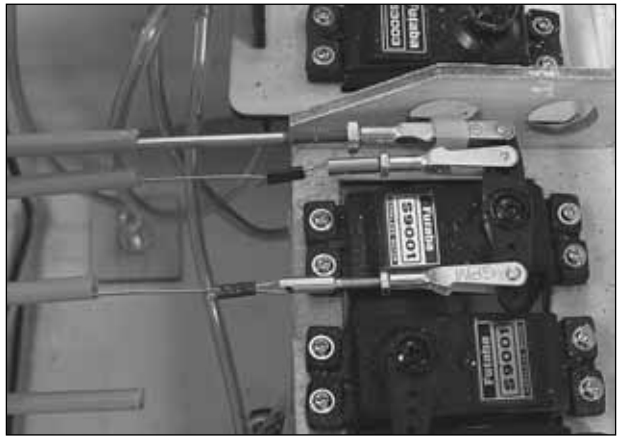
❏ 6. Slide a silicone clevis retainer over the clevis you soldered to the wire. Slide the threaded end of the wire into the tube and attach the solder clevis to the nylon torque link. Install the 4-40 nut threaded clevis and silicone clevis retainer onto the threaded end of the wire. Attach the clevis to the outer hole in the servo arm as shown.



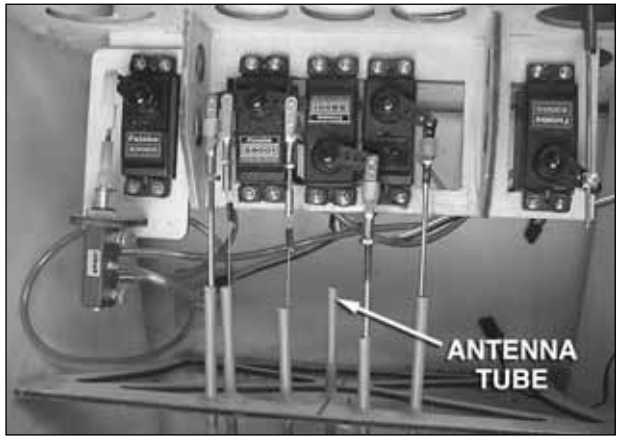
❏ 7. Locate the coil of wire for the pull-pull system. Cut it into two equal lengths. Install the hardware (2-56 nut, thread brass coupler, silicone clevis retainer and swag) onto one end of each of the wires and crimp the swag.



❏ 8. Attach each of the clevises onto the steering arms of the tail wheel assembly (either the fixed tail wheel or the retractable). Then, from the back of the fuselage, insert the wires into the plastic tubes feeding the wire up to the servo compartment.

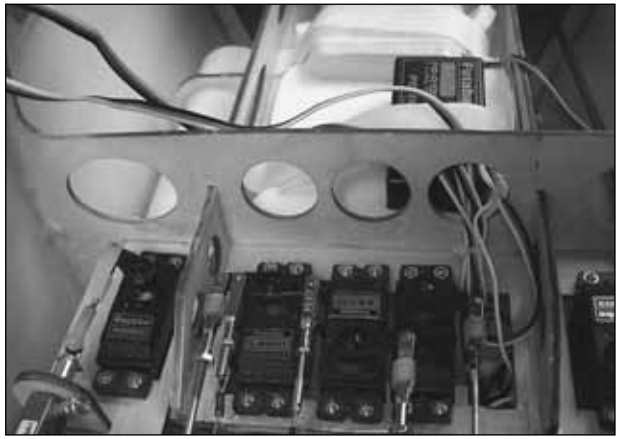


❏ 9. Assemble the hardware (2-56 nut, threaded brass coupler, silicone clevis retainer and swag) and the wire. Center the servo and the tail wheel, pull the wires tight and then crimp the swag onto the wire. Attach the clevis to the servo arm as shown.



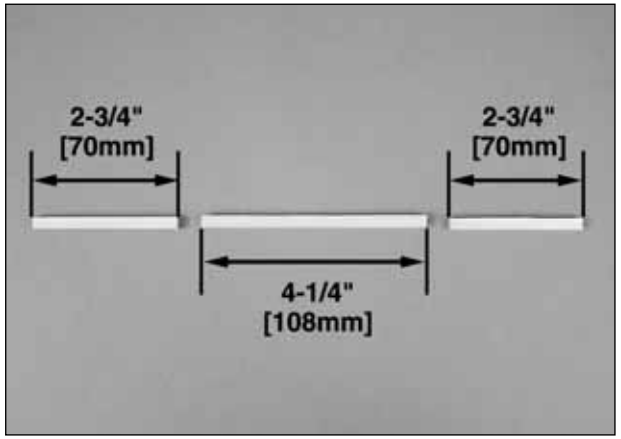
❏ 10. Install the pushrod wire and clevises for the elevator using the same technique that was used for the rudder. If you have a retractable tail wheel, solder the 2-56 clevis to the pushrod wire for the retracting tail wheel.

❏ 11. Place the battery and receiver onto the foam and hold it in place with the Velcro.

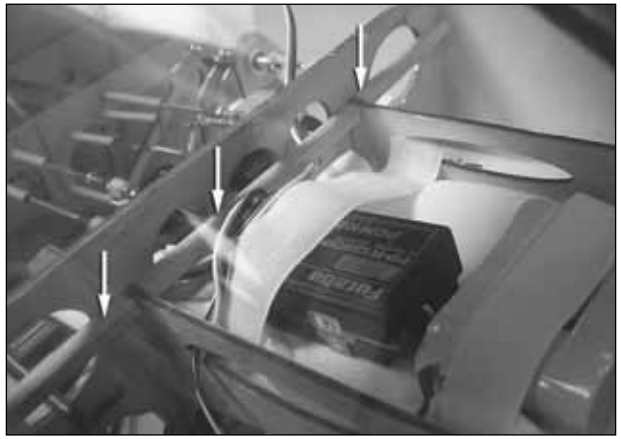


❏ 12. Install the servos to the receiver. Be sure to plug extensions into the receiver for the flaps and ailerons. Slide the receiver antenna into the antenna tube shown in the picture at step 10.

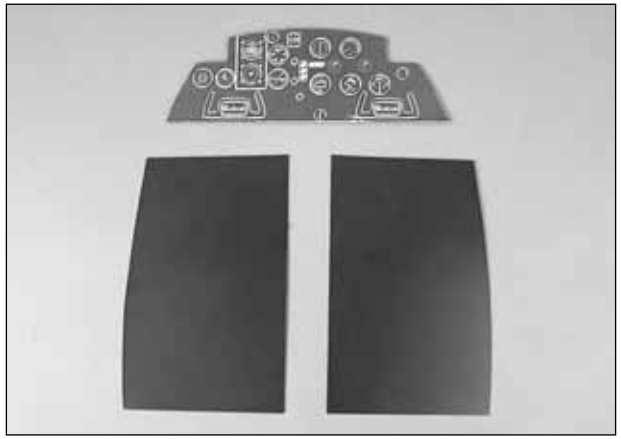
❏ 13. Install a switch and charge jack in the fuselage. We installed ours on the bottom of the fuselage to maintain the scale appearance of the plane. You may wish to locate it in a more convenient place on the fuselage.



❏ 14. Cut the 1/4" x 14" x 10" [6mm x 6mm x 254mm] hardwood stick into three pieces: two sticks 2-3/4" [70mm] long and one stick 4-1/4" [108mm] long.



❏ 15. Glue the sticks to the front of the former and even with the top of the receiver/battery compartment formers.

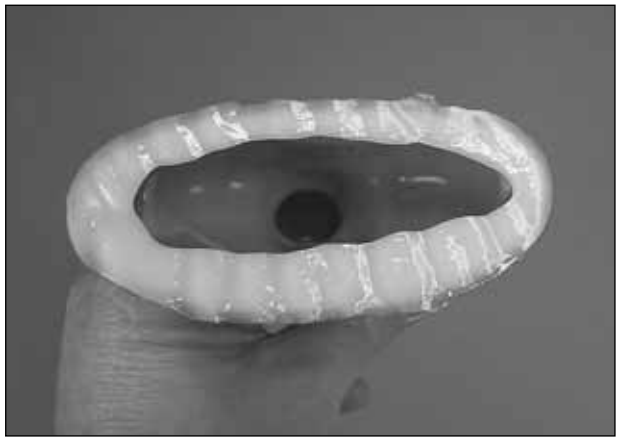


❏ 16. Locate the cockpit floor and the plywood instrument panel. Cut the instrument panel decal from the decal sheet. Then, stick it to the plywood instrument panel.

❏ 17. Place the cockpit floor over the receiver and battery resting on the hardwood sticks you just glued in place. Using a finger drill (if you do not have a finger drill you can make a finger drill with a small dowel and a drill bit), drill a 1/16" [1.6mm] hole through the cockpit floor and the hardwood stick. Install a #2 x 3/8" screw into the hole you drilled to secure the cockpit floor to the hardwood sticks. Drill a 1/16" [1.6mm] hole into the instrument panel. Slide the instrument panel into the cockpit and screw a #2 x 3/8" [10mm] screw into the panel and the former behind the panel. The instrument panel will hold the front of the floor in place.

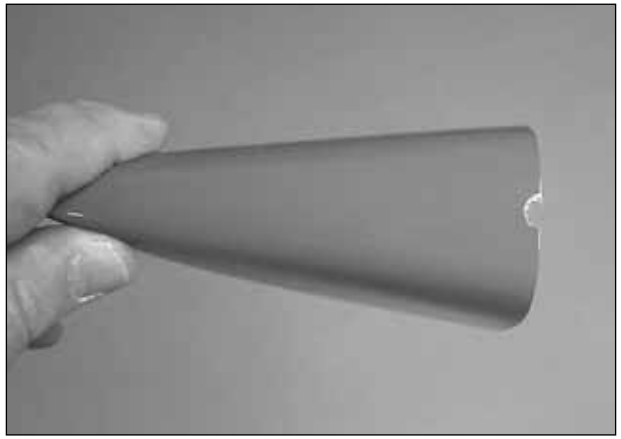
❏ 18. Glue a seat back to the cockpit floor on both the left and right side of the cockpit.

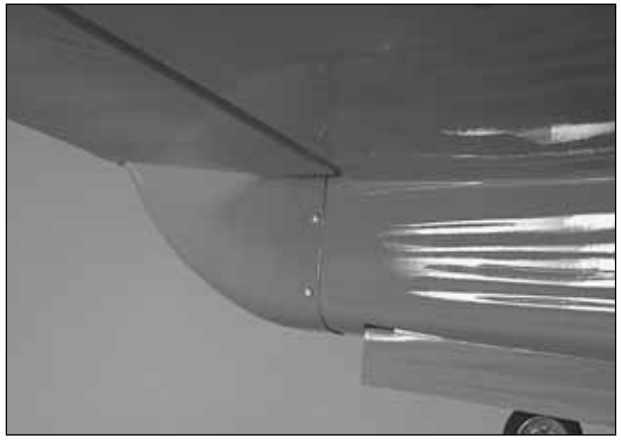
Finishing Touches



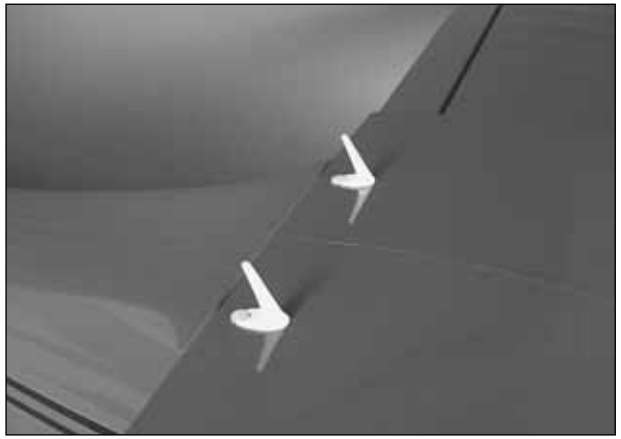
❏ 1. Mix 1/4 ounce [2 drams] of epoxy with microballoon filler. Put the epoxy around the inside of the base of the pilot figure. Place the pilot on plastic or wax paper until the glue hardens. Once hardened the epoxy will form a good base for gluing the pilot to the cockpit.

❏ 2. Glue the pilot to the cockpit floor with epoxy. (**Note:** When you need to remove the pilot you will find that you will have to bend it forward, bending the cockpit floor. The floor is heavy enough plastic to bend as needed to remove the pilot.)





❏ 3. Place the **tail cone** onto the back of the fuselage centering it with the rudder. Drill two 1/16" [1.6mm] holes on each side of the tail cone, drilling into the flange at the back of the fuselage. Remove the tail cone from the fuselage. Glue four 1/8" x 1/2" x 1/2" [3mm x 13mm x13mm] plywood plates inside the fuselage over the holes you drilled. Once the glue has hardened, drill through the plates with the 1/16" [1.6mm] drill. Re-install the tail cone and secure it to the fuselage with four #2 x 3/8" [10mm] screws.



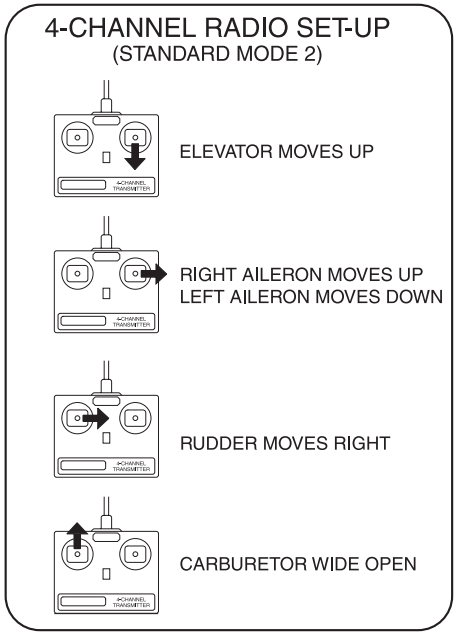
❏ 4. Remove a small amount of covering from the wing around the wing bolts for the antennas. Glue the antennas to the wing so that the back curvature of the antennas fit around the bolt.

GET THE MODEL READY TO FLY

Check the Control Directions

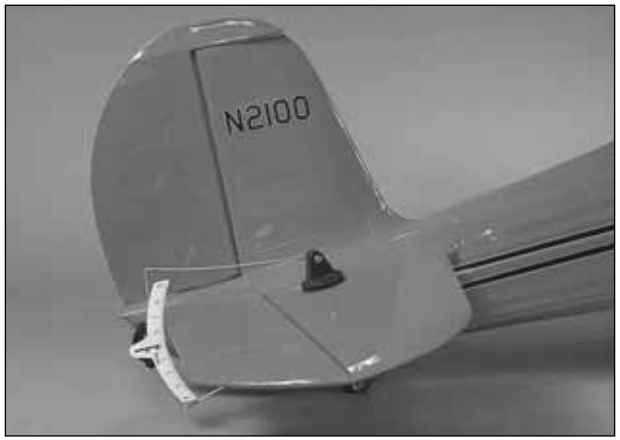
❏ 1. Turn on the transmitter and receiver and center the trims. If necessary, remove the servo arms from the servos and reposition them so they are centered. Reinstall the screws that hold on the servo arms.

❏ 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	3/4" up 3/4" down [19mm]	1/2" up 1/2" down [13mm]
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 [13mm]
FLAPS:	1-3/8" [35mm] down	1" [25mm] down

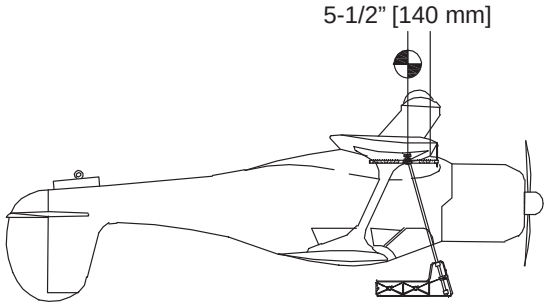
Note: When flaps are deployed you can expect the airplane to balloon slightly. To minimize this we mixed 1/16" [1.6mm] down elevator trim when the flaps were deployed. If you have a flap to elevator mix you may wish to consider this mix as well.

IMPORTANT: The Staggerwing 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 Staggerwing 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 engine, landing gear, covering and paint, 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 bottom wing on both sides of the fuselage. The model should be balanced upside-down. **The C.G. is located 5-1/2" [140mm] back from the leading edge of the bottom wing, measured 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 3/8" [10mm] forward or 3/8" [10mm] 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 upside-down on a Great Planes CG Machine, or lift it upside-down at the balance point you marked.

❏ 3. If the tail drops, the model is "tail heavy" 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 and receiver to minimize or eliminate any additional ballast required. If additional weight is required, nose weight may be easily added by using a "spinner weight" (GPMQ4645 for the 1 oz. [28g] weight, or GPMQ4646 for the 2 oz. [57g] weight). If spinner weight is not practical or is not enough, use Great Planes (GPMQ4485) "stick-on" lead. A good place to add stick-on nose weight is to the firewall (don't attach weight to the cowl—it is not intended to support weight). Begin by placing incrementally increasing amounts of weight on the bottom of the fuse over the firewall 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 by cutting open the bottom of the fuse and gluing it permanently inside.

Note: Do not rely upon the adhesive on the back of the lead weight to permanently hold it in place. Over time, fuel and exhaust residue may soften the adhesive and cause the weight to fall off. Use #2 sheet metal screws, RTV silicone or epoxy to permanently hold the weight in place.

❏ 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 by the engine propeller shaft and the bottom of the fuse under the TE of the fin. Do this several times.

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

PREFLIGHT

Identify Your Model

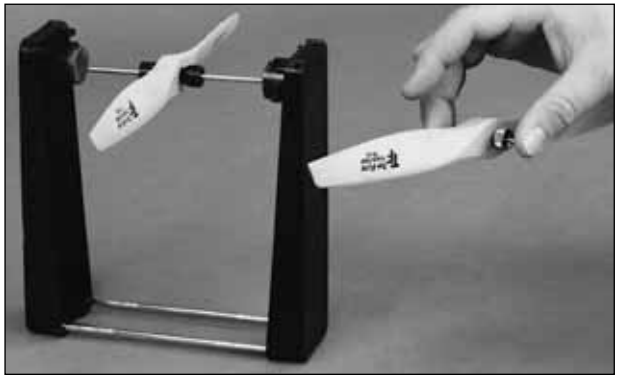
No matter if you fly at an AMA sanctioned R/C club site or if you fly somewhere on your own, you should always have your name, address, telephone number and AMA number on or inside your model. It is **required** at all AMA R/C club flying sites and AMA sanctioned flying events. Fill out the identification tag on the decal sheet 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 propeller 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 engine 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 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 Staggerwing is a great-flying model that flies smoothly and predictably. The Staggerwing does not, however, possess the self-recovery characteristics of a primary R/C trainer and should be flown only by experienced R/C pilots.

Fuel Mixture Adjustments

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

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

Takeoff

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

Remember to take off into the wind. As a general rule the flaps are not required for a good take-off. Unless you have a very thick grass field that limits the ground speed of the model we would not recommend flaps for the takeoff. If you do use flaps, no more than 3/4" [19mm] flap should be needed. When you're ready, point the model straight down the runway, hold a bit of up elevator to keep the tail on the ground to maintain tail wheel steering, and then gradually advance the throttle. As the model gains speed decrease up elevator, allowing the tail to come off the ground. One of the most important things to remember with a tail dragger is to always be ready to apply **right** rudder to counteract engine torque. Gain as much speed as your runway and flying site will practically allow before gently applying up elevator, lifting the model into the air. At this moment it is likely that you will need to apply more right rudder to counteract engine torque. Be smooth on the elevator stick, allowing the model to establish a **gentle** climb to a safe altitude before turning into the traffic pattern.

Flight

For reassurance and to keep an eye on other traffic, it is a good idea to have an assistant on the flight line with you. Tell him to remind you to throttle back once the plane gets to a comfortable altitude. While full throttle is usually desirable for takeoff, most models fly more smoothly at reduced speeds.
Take it easy with the Staggerwing for the first few flights, gradually getting acquainted with it as you gain confidence. Adjust the trims to maintain straight and level flight. After flying around for a while, and while still at a safe altitude with plenty of fuel, practice slow flight and execute practice landing approaches by reducing the throttle to see how the model handles at slower speeds. Add power to see how she climbs as well. Continue to fly around, executing various maneuvers and making mental notes (or having your assistant write them down) of what trim or C.G. changes may be required to fine tune the model so it flies the way you like. Prior to landing you may want to experiment with the use of the flaps and flying at slow speeds. Mind your fuel level, but 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. Allow the nose of the model to pitch downward to gradually bleed off altitude. Deploy the flaps. A small amount of ballooning will occur but the plane should begin to settle as you lose speed. (We found that mixing in 2 degrees of down elevator minimized this tendency. You may wish to experiment with a flap to elevator mix). When deploying the flaps do not allow the plane to pitch up and stall. Make elevator corrections as needed to maintain a steady descent. *(Note: Flaps are not required for landing but they will substantially reduce the landing speed. We recommend the use of flaps for the Staggerwing.)* 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 decrease the engine and touch down level on the main wheels. The tail will settle on the runway as you begin to lose speed. Once the model is on the runway and has lost flying speed, hold up elevator to place the tail on the ground, regaining tail wheel control. From our experience, this plane lands best if you do a two point landing on the main wheels rather than trying to flare to a three point landing.

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). This is not necessarily to improve your skills (*though it is never a bad idea!)*, but more importantly so you do not surprise yourself by impulsively attempting a maneuver and suddenly finding that you've run out of time, altitude or airspeed. Every maneuver should be deliberate, not impulsive. For example, if you're going to do a loop, check your altitude, mind the wind direction (anticipating rudder corrections that will be required to maintain heading), remember to throttle back at the top, and make certain you are on the desired rates (high/low rates). A flight plan greatly reduces the chances of crashing your model just because of poor planning and impulsive moves. **Remember to think.**

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

GOOD LUCK AND GREAT FLYING!

ITEMS AVAILABLE FOR YOUR STAGGERWING

Futaba® S9001 Coreless BB Servo

FUTM0075

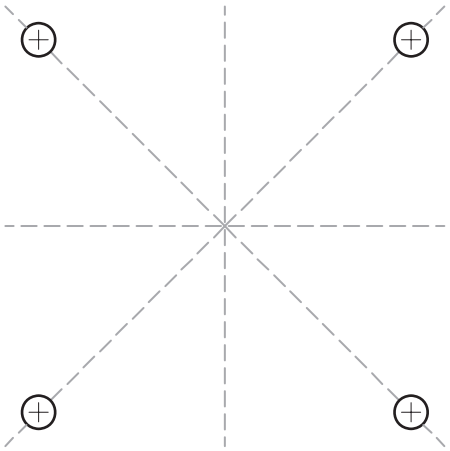
Ideal for airplanes, sailplanes, helis, even nitro or electric boats, the S9001 features a coreless motor for smooth, fast response and a final gear with dual ball bearings for fast transit time. It comes with "J" connector, one attached servo horn, three extra horns and mounting hardware. One year warranty.

Length: 1.59 in.
Width: 0.78 in.
Height: 1.42 in.
Weight: 1.69 oz.
Torque: 54.1 oz-in (4.8V); 72.2 oz-in (6V)
Transit time: 0.22 sec./60° (4.8V); 0.18 sec./60° (6V).

O.S.® 1.60 FX Ringed Engines

OSMG0660 1.60 FX Ringed with Muffler
OSMG0661 1.60 FX Ringed without Muffler

Weight Without Muffler: 32.6 oz
Practical RPM Range: 1,800-10,000
BHP @ RPM: 3.7 @ 9,000



1.60 ENGINE MOUNT
BOLT PATTERN

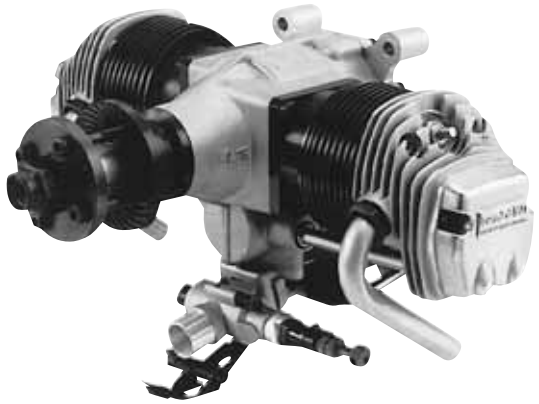
The 1.60 FX features dual ball bearings for durability and smooth operation, plus a low crankcase profile that allows for a proportionally taller, semi-squared head - a design refinement that increases cooling fin area and improves heat dispersion. The threaded portion of the crankshaft is extra-long for more secure prop and spinner nut engagement, and the needle valve is remotely mounted for safety during adjustments. The high-speed needle can also be mounted horizontally, vertically, or separate from the engine for more installation options! Both styles include glow plug and 2-year warranty.

Futaba® 9C Super Computer Radios

FUTK75** 9C Super FM w/R148DF
FUTK77** 9C Super PCM w/R149DP

Enjoy 9-channel PCM and 8-channel FM capacity, easy programming–and with the included 16K CAMPac module, the memory capacity for a whopping 18 models! The 9C's up- and down-timer has a third function that keeps track of total flying time for any particular model. Besides Basic offset trim, there are three other glider offset trims to choose from. 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 airplanes. Plus, the heli mode's Throttle and Pitch Curves feature a delay that smoothes the transition from hover to idle-up. Comes with full NiCds, and is available in FM and PCM modulations.

O.S.® FT-160 Twin Cylinder 4-Stroke



OSMG1160

Weight w/o Header: 38.8 oz (1100g)
Practical RPM Range: 12,000-10,000
HP @ RPM: 12.0 @10,000
Suggested Props: 15X8, 16X6, 18X6, 18X7, 18X8, 10X6

As spectacular in performance as they are in appearance, O.S. Multi-Cylinder engines offer scale modelers the best of both worlds. Superior balance minimizes harmful vibration, emphasizing smooth-running power and realistic sound. Design features include ringed pistons, pushrod overhead valves, geared camshafts and multiple bearings in the crankshaft and camshaft. The FT-160 twin includes a locking prop nut assembly and an opposed cylinder design for minimum vibration, plus choke valve; safety prop nut assembly; engine mount; glow plug; glow plug extension; and 2-year warranty protection.