Pitts M-12S

INSTRUCTION MANUAL

SPECIFICATIONS

Wingspan:	68.5 in [1740mm]	**Weight:**	19– 20 lb [8620 – 9070 g]	**Length:**	80.5 in [2045mm]
Wing Area:	1545 in² [99.7 dm²]	**Wing Loading:**	28– 30 oz/ft² [85– 92 g/dm²]	**Radio:**	7-Channel minimum
				Engine:	3.0 cu in [50cc]

WARRANTY

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

In that Great Planes 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 below:

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.

GREAT PLANES® MODEL MANUFACTURING COMPANY

Champaign, Illinois
(217) 398-8970, Ext 5
airsupport@greatplanes.com

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INTRODUCTION

For the latest technical updates or manual corrections to the Pitts M-12s visit the Great Planes web site at ***www.greatplanes.com***. Open the "Airplanes" link, then select the Pitts M-12s 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

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

Academy of Model Aeronautics
5151 East Memorial Drive
Muncie, IN 47302-9252
Tele. (800) 435-9262
Fax (765) 741-0057
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 Great Planes Pitts M-12s is an excellent sport-scale model and is eligible to fly in IMAA events. The IMAA (International Miniature Aircraft Association) is an organization that promotes non-competitive flying of giant-scale models. If you plan to attend an IMAA event, obtain a copy of the **IMAA Safety Code** by contacting the IMAA at the address or telephone number below, or by logging on to their web site at:

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

Scale Competition

Though the Great Planes Pitts M-12s 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 Great Planes 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 a full-size Pitts M-12s for scale documentation, or if you would like to study 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 Pitts M-12s 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 Pitts M-12s, if not assembled and operated correctly, could possibly cause injury to yourself or spectators and damage to property.

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

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

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

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

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

7. **WARNING:** The cowl, wheel pants 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 (wheel pant, cowl) 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 Pitts M-12s that may require planning or decision making before starting to build. Order numbers are provided in parentheses.

Radio Equipment

- ❏ 7-channel minimum but 9-channels or more is preferred. Servos of at least 150 oz.-in. on all control surfaces are required, such as the Futaba® 9155 (FUTM0215). The throttle can be a standard servo of at least 50 oz.-in. like the Futaba 9001 (FUTM0075).
- ❏ 7-10 channel receiver. Either a 2.4GHz receiver or 72MHz. All of our testing was done using the Futaba R617FS 2.4GHz receiver (FUTM7627)
- ❏ The radio must have the capability of independent reversing for each of the elevator servos or you will require the use of an in line servo reverser. The Futaba SR10 Dual Servo Reverser (FUTM4150) works well for this application.
- ❏ (2) 24" [610mm] servo extensions (HCAM2711 for Futaba)
- ❏ (5) 12" [305mm] servo extensions (HCAM2721 for Futaba)
- ❏ (2) 6" Futaba dual servo extensions (FUTM4135)
- ❏ (2) Heavy-duty switch harness (FUTM4385 for Futaba)
- ❏ (2) Ernst charge jack (ERNM3001 for Futaba)
- ❏ (2) Batteries, one 1500mAh minimum for the receiver and one 500mAh minimum for the electronic ignition.

Engine Recommendations

The recommended engine size for the Pitts M-12s is a 50cc gasoline engine with 3" [76mm] stand-offs. We used the Desert Aircraft DA-50 rear carb engine for all of our flight testing. This engine proved to be more than enough power for vertical and hovering maneuvers. Remember that this is a scale model that is intended to fly at scale-like speeds, so throttle management should be practiced. Information on the DA-50 can be found at the Desert Aircraft website: ***www.desertaircraft.com***

Engine Spinner

Great Planes has a scale spinner made specifically for the M-12s (GPMQ4020). This is a machine turned aluminum spinner that rivals the highest quality spinners on the market. The spinner is finished in metallic charcoal and matches the metallic covering and paint on the airplane.

ADDITIONAL ITEMS REQUIRED

Required Hardware and Accessories

This is the list of hardware and accessories required to finish the Pitts M-12s. Order numbers are provided in parentheses.

- ❏ (6) Large scale 1" [25.4mm] single-sided servo arm (GPMM1100)
- ❏ (1) Large scale 2.5" [64mm] double-sided servo arm (GPMM1600)
- ❏ (1) R/C foam rubber (1/4" [6.4mm] - HCAQ1000
- ❏ (2) [914mm] 3' Dubro extra large tygon gasoline fuel tubing [DUBQ0247]
- ❏ Drill bits: 1/16" [1.6mm], 5/64" [2mm], 3/32" [2.4mm], 1/8" [3.2mm], 3/16" [4.8mm], 1/4" [6.4mm].
- ❏ Silver solder w/flux (STAR2000)
- ❏ #1 Hobby knife (HCAR0105)
- ❏ #11 blades (5-pack, HCAR0211)

Adhesives and Building Supplies

This is the list of Adhesives and Building Supplies that are required to finish the Pitts M-12s.

- ❏ 1 oz. [30g] Thin Pro™ CA (GPMR6002)
- ❏ 1 oz. [30g] Medium Pro CA+ (GPMR6008)
- ❏ Pro 30-minute epoxy (GPMR6047)
- ❏ Pro 6-minute epoxy (GPMR6045)
- ❏ Microballoons (TOPR1090)
- ❏ Threadlocker thread locking cement (GPMR6060)
- ❏ Denatured alcohol (for epoxy clean up)
- ❏ Masking tape (TOPR8018)
- ❏ CA applicator tips (HCAR3780)

Optional Supplies and Tools

Here is a list of optional tools mentioned in the manual that will help you build the Pitts M-12s.

- ❏ Small metal file
- ❏ 21st Century® sealing iron (COVR2700)
- ❏ 21st Century iron cover (COVR2702)
- ❏ 4 oz. [113g] aerosol CA activator (GPMR6034)
- ❏ Epoxy brushes (6, GPMR8060)
- ❏ Mixing sticks (50, GPMR8055)
- ❏ Mixing cups (GPMR8056)
- ❏ Rotary tool such as Dremel
- ❏ Rotary tool reinforced cut-off wheel (GPMR8200)
- ❏ Stick-on segmented lead weights (GPMQ4485)

IMPORTANT BUILDING NOTES

• 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 Pitts M-12s is factory-covered with Top Flite® MonoKote® film. Should repairs ever be required, MonoKote can be patched with additional MonoKote purchased separately. MonoKote is packaged in six-foot rolls, but some hobby shops also sell it by the foot. If only a small piece of MonoKote is needed for a minor patch, perhaps a fellow modeler would give you some. MonoKote is applied with a model airplane covering iron, but in an emergency a regular iron could be used. A roll of MonoKote includes full instructions for application. Following are the colors used on this model and order numbers for six foot rolls.

White (TOPQ0204)	Metallic Charcoal (TOPQ0407)
Orange (TOPQ0202)	Metallic Teal (TOPQ0409)

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

ORDERING REPLACEMENT PARTS

Replacement parts for the Pitts M-12s 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 Great Planes web site at **www.greatplanes.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 fax at (217) 398-7721, but full retail prices and shipping and handling charges will apply. Illinois and Nevada residents will also be charged sales tax. If ordering via fax, include a Visa® or MasterCard® number and expiration date for payment.

Mail parts orders and payments by personal check to:

Hobby Services
3002 N. Apollo Drive, Suite 1
Champaign, IL 61822

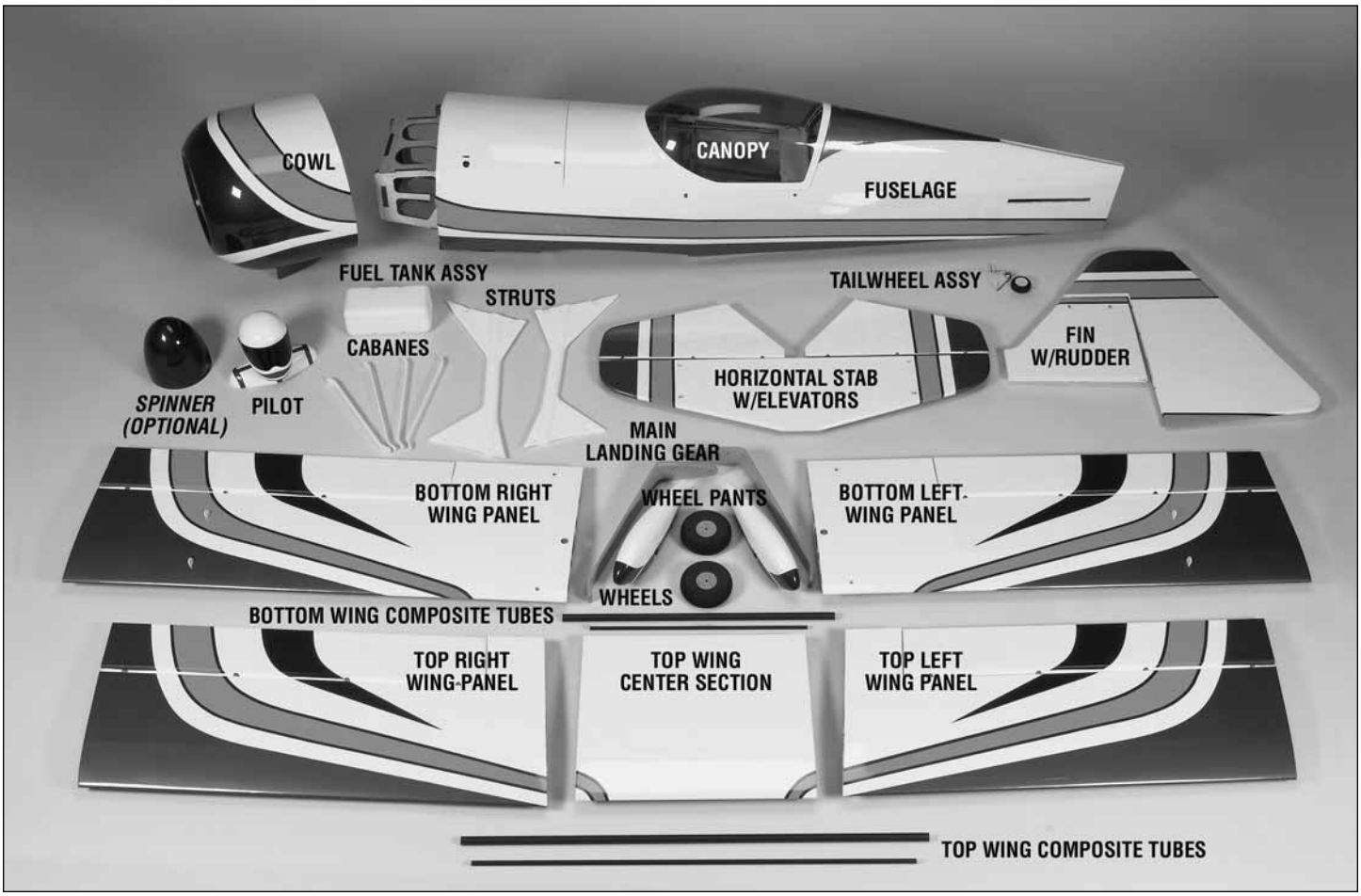
Be certain to specify the order number exactly as listed in the **Replacement Parts List**. Payment by credit card or personal check only; no C.O.D.

If additional assistance is required for any reason, contact Product Support by telephone at (217) 398-8970, or by e-mail at **productsupport@greatplanes.com**.

REPLACEMENT PARTS LIST

Order No.	Description
GPMA4018	Bottom Wing Set
GPMA4019	Top Wing Set
GPMA4020	Aluminum Spinner
GPMA4021	Belly Pan
GPMA4022	Fuselage Set
GPMA4023	Tail Set
GPMA4024	Cowling
GPMA4025	Landing Gear
GPMA4026	Wheel Pants
GPMA4027	Canopy Hatch
GPMA4028	Tailwheel Assembly
GPMA4029	Wing Struts
GPMA4030	Cabane Struts
GPMA4031	Tail Wires
GPMA4032	Decal Set
NOTE ▶	Full-size plans are not available. You can download a copy of this manual at www.greatplanes.com.

KIT CONTENTS



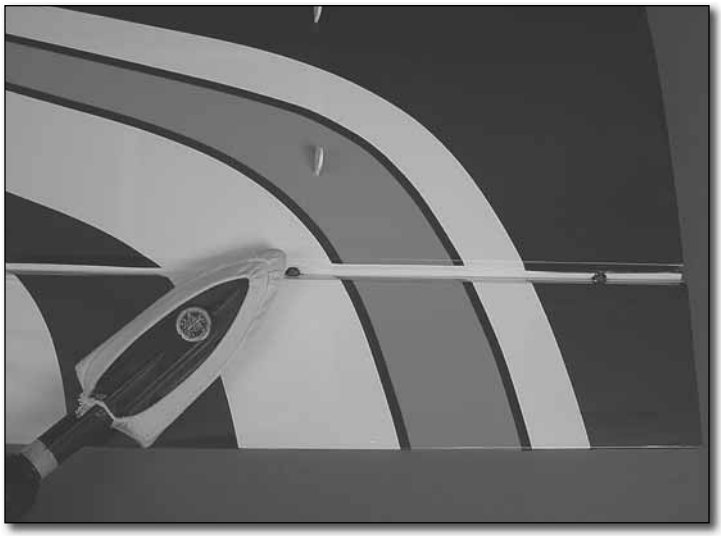
KIT INSPECTION

Before starting to build, inspect the parts to make sure they are of acceptable quality. If any parts are missing or are not of acceptable quality, or if you need assistance with assembly, contact **Product Support**. When reporting defective or missing parts, use the part names exactly as they are written in the Kit Contents list.

Great Planes Product Support
3002 N. Apollo Drive, Suite 1
Champaign, IL 61822
Telephone: (217) 398-8970, ext. 5
Fax: (217) 398-7721
E-mail: ***airsupport@greatplanes.com***

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 Inspection” section on page 5.

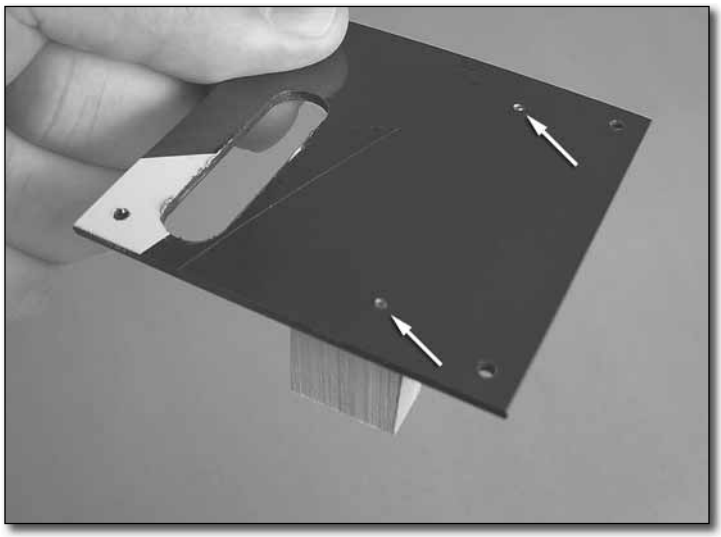


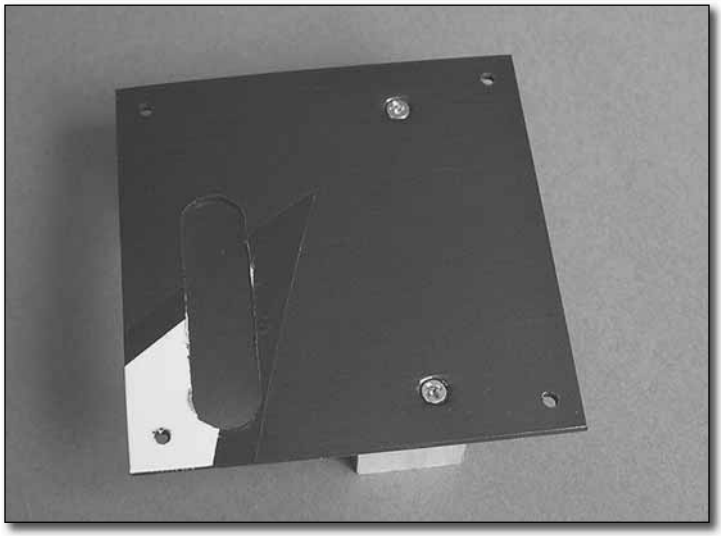
❏ 2. Use a covering iron with a covering sock on high heat to tighten the covering if necessary. Apply pressure over sheeted areas to **thoroughly** bond the covering to the wood.

BUILD THE WINGS

Install the Aileron Servos & Pushrods

Begin with the lower right wing to assure your work matches the photos.



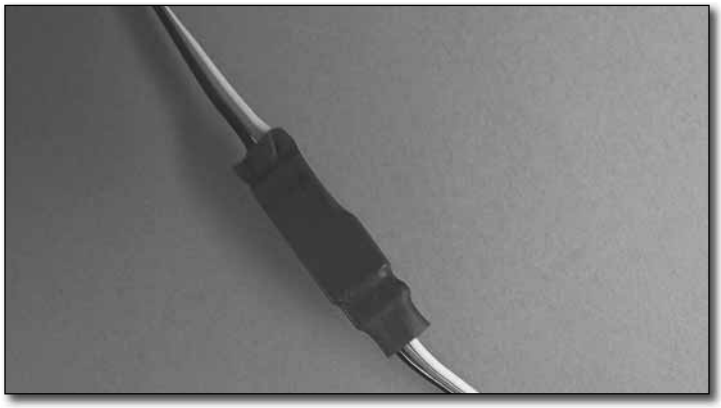


❏ ❏ ❏ ❏ 1. Remove the tape holding the **servo cover** to the **wing**. Drill a 1/16" [1.6mm] hole through the cover into the hardwood blocks.

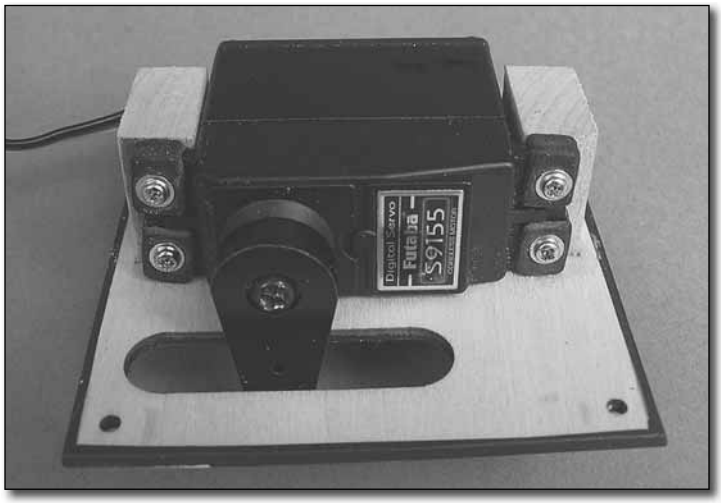
IMPORTANT: *Throughout this manual you will be installing screws to secure servo hatches, servos, hardwood blocks, etc. We recommend that you insert and then remove the screw into each of the holes you have drilled. Apply a drop of thin CA into the holes to harden the threads and then once the glue has cured install the screws into the holes. Though we will not mention this every time you install a screw, you should use this procedure for all screws.*

Install #2 x 3/8" [9.5mm] wood screws into the holes you drilled.

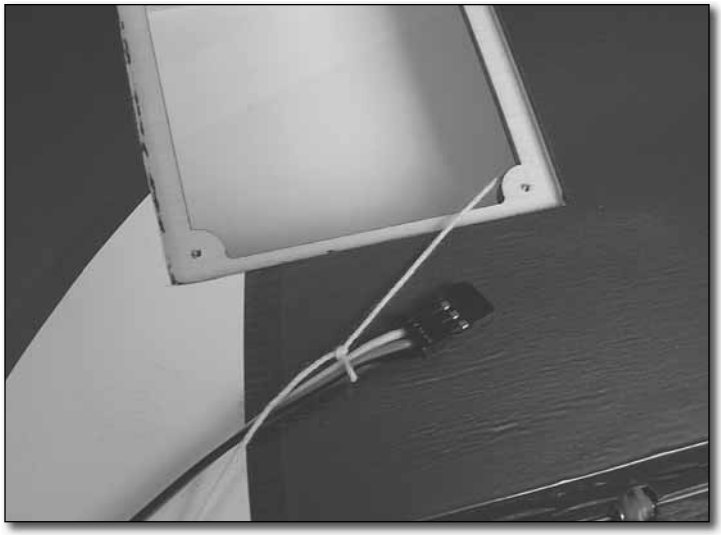
❑ ❑ ❑ ❑ 2. Install a 1" [25.4mm] servo arm onto your servo. It's recommended that you use an aluminum servo arm. Many different brands are available but we used the Great Planes 1" [25.4mm] aluminum servo arm (GPMM1100).

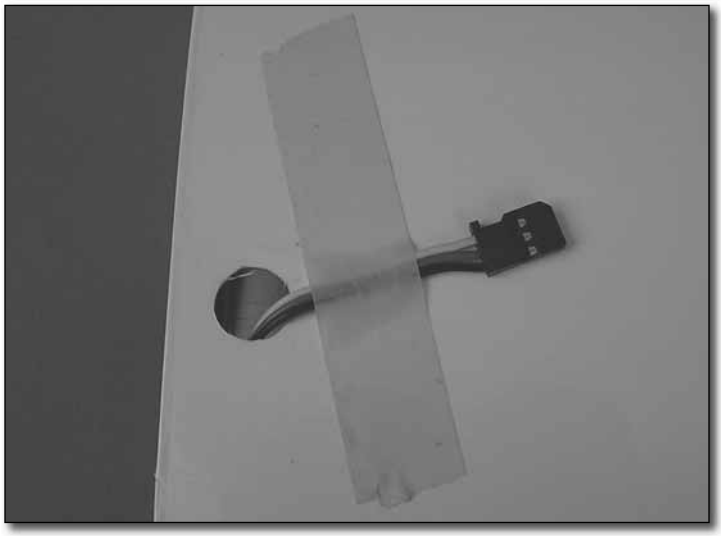


❑ ❑ ❑ ❑ 3. Install a 12" [305mm] servo extension onto the servo lead. Secure the extension to the lead with tape, a piece of shrink tube or some other method to keep them from coming unplugged.



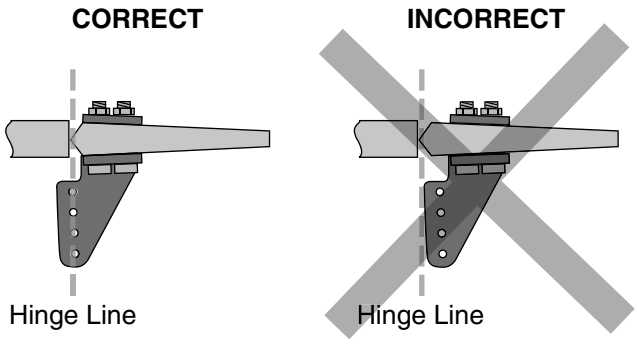
❑ ❑ ❑ ❑ 4. Place the servo onto the servo mounting blocks. Drill through the servo mounting holes with a 1/16" [1.6mm] drill bit. Install the servo onto the servo cover using the hardware included with your servo. Center the servo and then install a servo arm as shown.

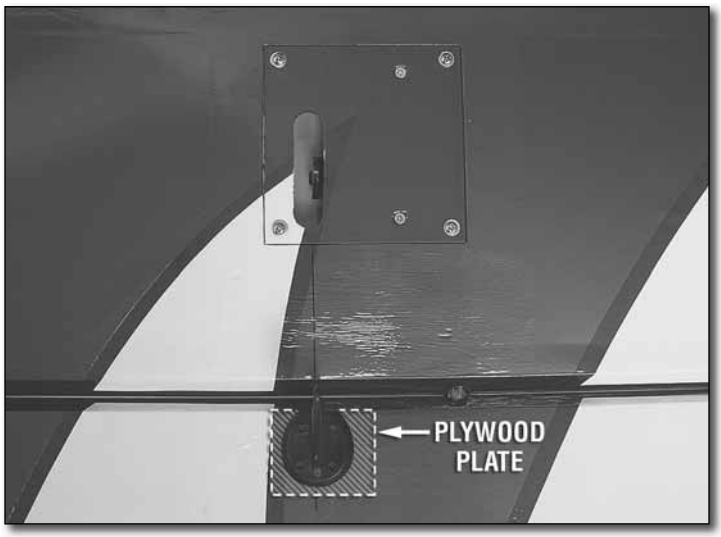


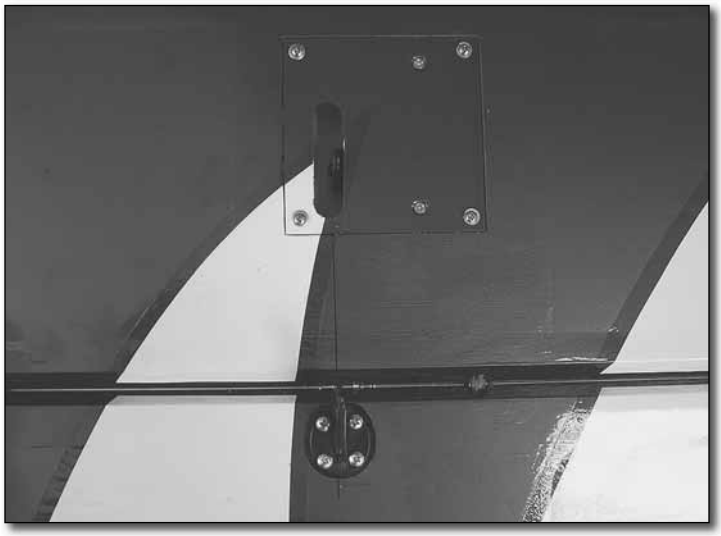


❑ ❑ ❑ ❑ 5. Inside the servo bay a string is taped. Tie the string to the servo extension. Pull the string and the servo lead through the wing. Untie the string from the lead and insert the lead through the small hole on the top of the wing at the root. Tape the lead to the wing to prevent it from falling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

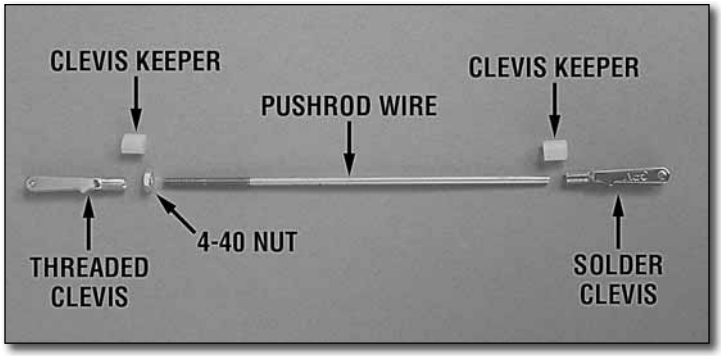
❑ ❑ ❑ ❑ 6. Place the servo cover onto the wing. The opening for the servo arm should be pointed towards the wingtip. Mount the servo cover with #2 x 3/8" [9.5mm] washer head screws.





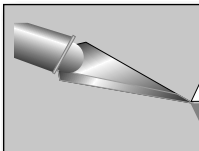


❑ ❑ ❑ ❑ 7. Place a nylon control horn in line with the outer hole in the servo arm. When positioned properly the control horn will rest on a hardwood plate in the aileron. Mark the location of the mounting holes onto the aileron. Drill a 3/32" [2.4mm] hole on the marks, drilling through the plywood plate *but not* through the top of the aileron. Attach the horn to the aileron with four #4 x 1/2" [12.7mm] screws.



❑ ❑ ❑ ❑ 8. The parts shown are required for making the servo pushrod. Locate all the needed components.

❑ ❑ ❑ ❑ 9. Install the clevis to the servo arm and install the solder clevis to the aileron control horn. Center the aileron and the aileron servo arm. Make a mark on the wire that aligns with the front of the round portion of the clevis. Remove the pushrod assembly from the servo. Cut the wire on the mark and then solder the 4-40 solder clevis to the un-threaded end of the pushrod wire. The following "Soldering Tip" may be helpful if you are not familiar with soldering techniques.



EXPERT TIP

HOW TO SOLDER

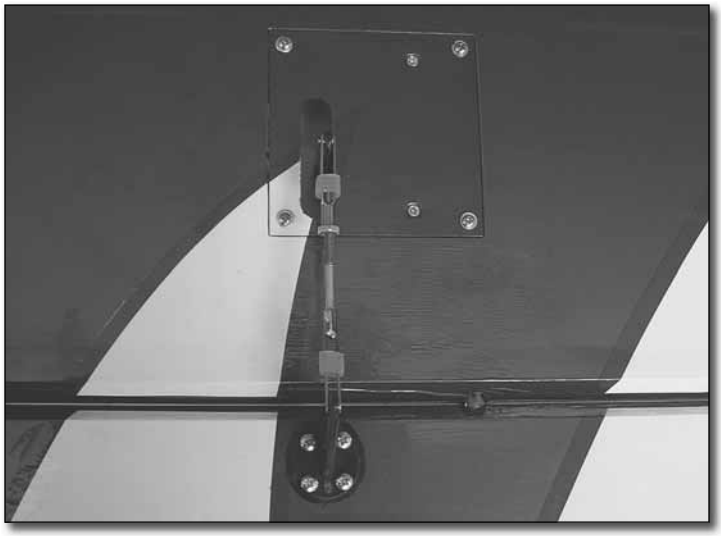
1. Use denatured alcohol or other solvent to thoroughly clean the pushrod. Roughen the end of the pushrod with coarse sandpaper where it is to be soldered.

2. 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 by applying the solder to the end. The heat of the pushrod should melt the solder – not the flame of the torch or soldering iron – thus allowing the solder to flow. The end of the wire should be coated with solder all the way around.

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

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

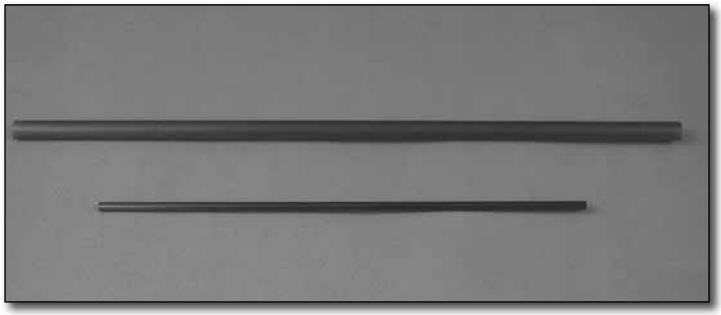
This is what a properly soldered clevis looks like – shiny solder with good flow, no blobs and flux removed.



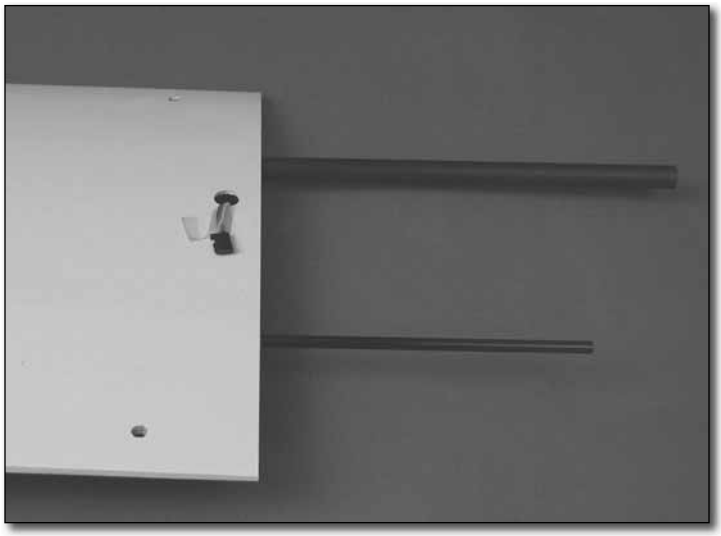
10. Once the solder has cooled, install the pushrod to the servo arm and the second hole from the end of the aileron control arm. Be sure to slide the clevis keepers over the clevis and tighten the 4-40 nut.

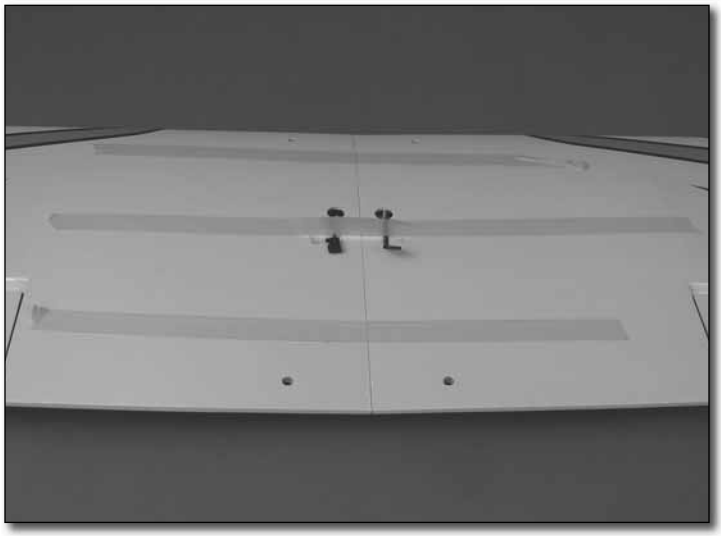
❏ 11. Repeat steps 1-10 for the lower left wing panel, the top right wing panel and the top left wing panel. **Note:** When the servo leads get pulled through the top wings the leads will exit out the holes in the bottom of the wing.

Join the Bottom Wing Panels



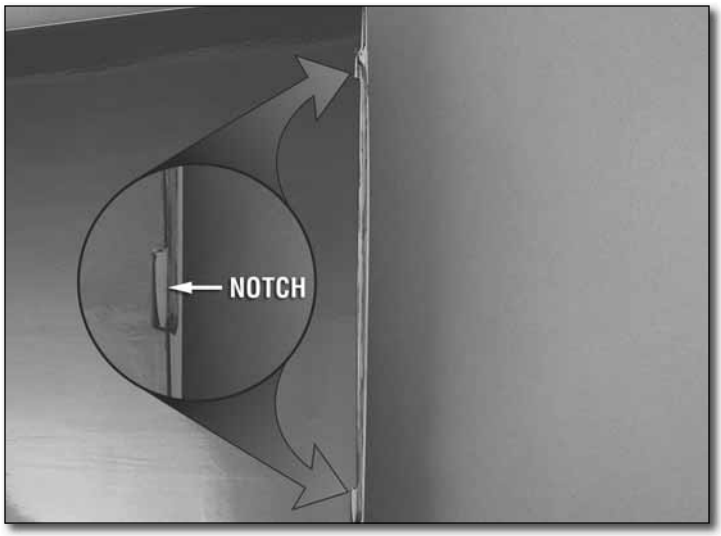
❏ 1. Locate the 1/4" x 12-1/4" [6.4mm x 311mm] and the 1/2" x 17-3/4" [12.7mm x 450mm] composite tubes. Test fit them into the holes in the root rib.



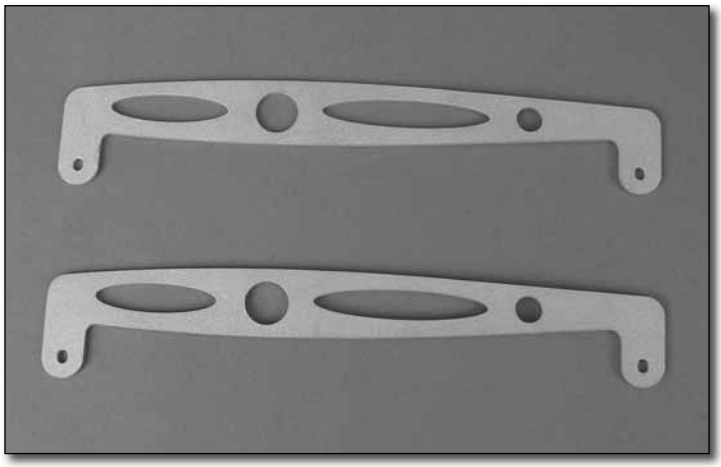


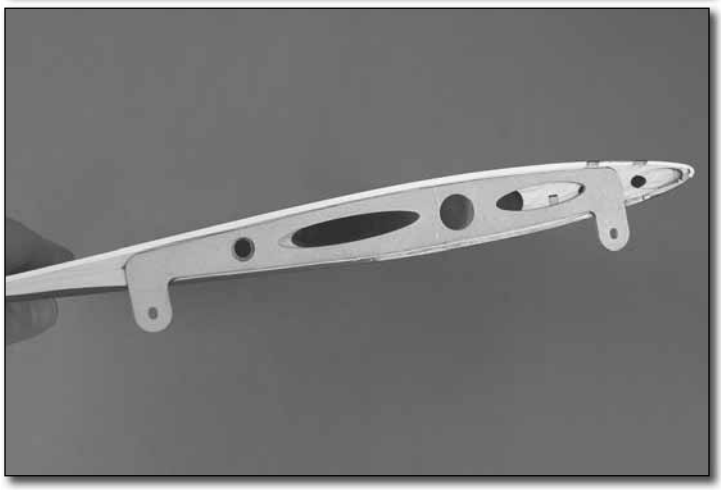
❏ 2. Mix 1/2 ounce [15 mL] of 30 minute epoxy. Apply epoxy into the tube holes in the right and left wings as well as the root rib of each wing. Brush a thin film of epoxy onto each of the tubes and then insert the tubes into the right wing. Remove excess glue that may have worked its way out of the tube holes and then place the left wing onto the tubes and slide the wings together. Clean excess epoxy from the wing with rubbing alcohol and a paper towel. Tape the wing halves together and then set the wing aside while the glue cures.

Join the Top Wing Panels with the Wing Center Section

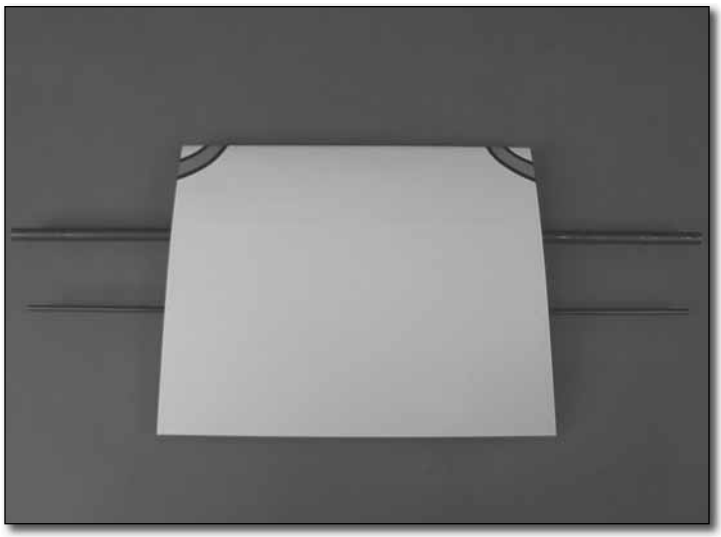


❏ 1. Trim the covering from the two notches on both ends of the top wing center section





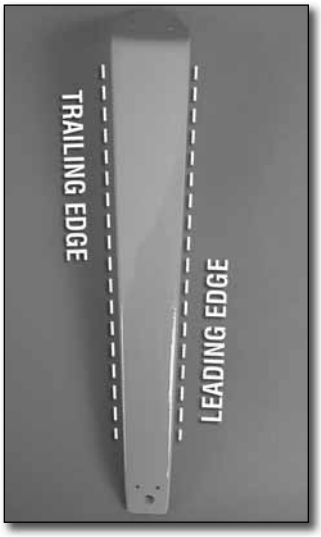
❏ 2. Locate the two aluminum wing brackets. Test fit them to the root rib at each end of the wing center section. When positioned properly the aluminum rib will fit flush to the end of the wing center section and the tabs will fit into the notches in the end of the wing center section. When you are satisfied with the fit, epoxy the aluminum ribs to both ends of the wing center section. Set it aside, allowing the glue to harden.



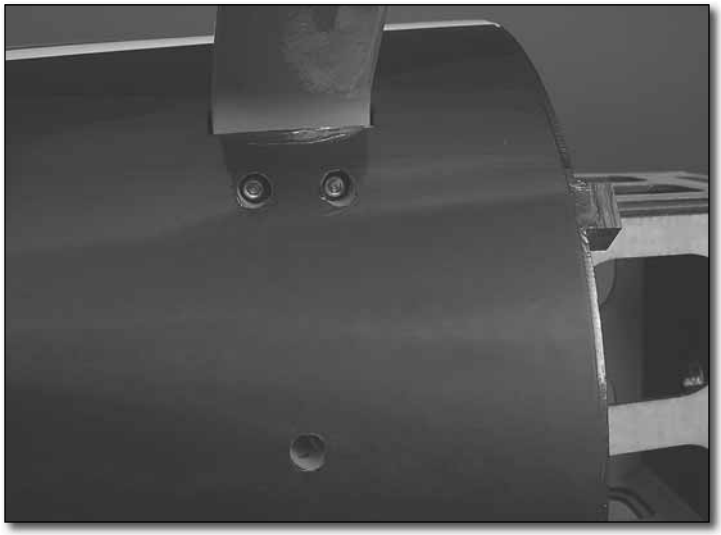
❏ 3. Insert the 1/2" x 27-1/4" [12.7mm x 692mm] and the 1/4" x 25" [6.4mm x 635mm] composite tube into the holes in the center section of the top wing, centering the tubes.

❏ 4. Use the same procedure used on the bottom wing to assemble the top wing. Mix 3/4 ounces [22mL] of 30 minute epoxy. Pull the tubes out about 1" [25.4mm]. Brush a thin film of epoxy onto the tubes. Push the tubes back into the center section with a twisting motion to spread the glue. Do this on the other end of the wing center section. Apply epoxy into the tube holes in the right and left wings as well as the root rib of each wing. Brush a thin film of epoxy onto each of the tubes and then insert the tubes into the right wing. Remove excess glue that may have worked its way out of the tube holes and then place the left wing onto the tubes and slide the wings together. Clean excess epoxy from the wing with rubbing alcohol and a paper towel. Tape the wing halves together and then set the wing aside while the glue cures.

Install the Landing Gear



❏ ❏ 1. Look closely at the **landing gear** legs. You will notice one side is straight and the other is slightly angled. The straight side is the leading edge of the gear. Determine the right gear from the left. Then insert one of the gear legs into the slot in the side of the fuselage.

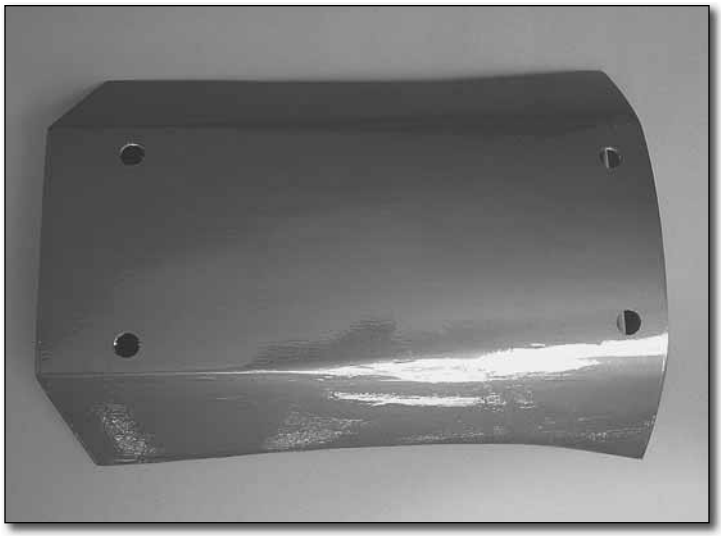


❏ ❏ 2. Secure the landing gear to the **fuselage** with three 8-32 x 3/4" [19.1mm] socket head cap screws, #8 lock washers and a drop or two of thread locker.

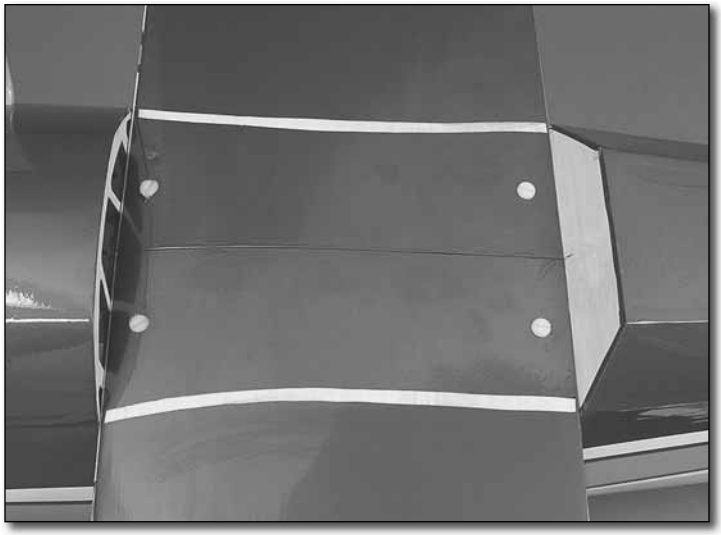
❏ 3. Repeat this for the other landing gear leg.

Install the Upper and Lower Wings

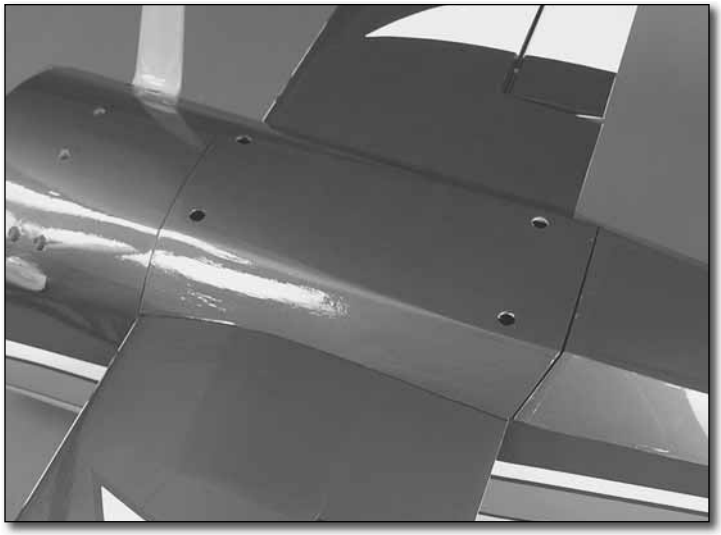
❏ 1. Install the lower wing to the fuselage with four 1/4-20 x 2" [51mm] nylon wing bolts.



❏ 2. Locate the lower wing **belly pan**. Place in onto the bottom of the lower wing. Mark the outline of the belly pan to the bottom of the wing with a fine tip felt marker.



❏ 3. Using a sharp hobby knife or the method in the “Expert Tip” that follows, cut 1/4" [6.4mm] of covering inside the line you have marked on the wing. Be careful to only cut through the covering, not the wood.

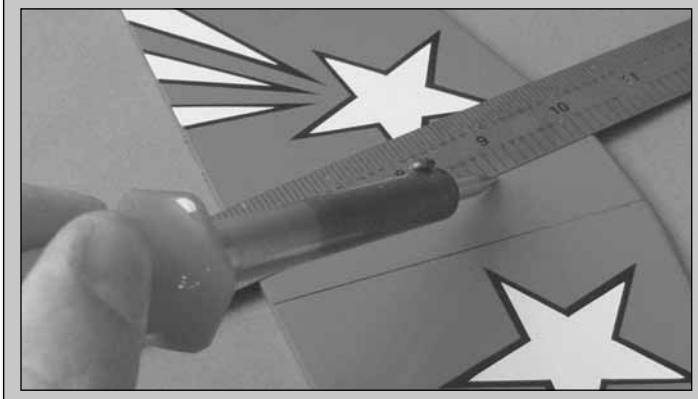


❏ 4. Glue the belly pan to the lower wing. Once the glue has dried you may wish to remove the lower wing if you have limited space in your shop. However, you will need to re-install it again at step 8. The choice is yours.

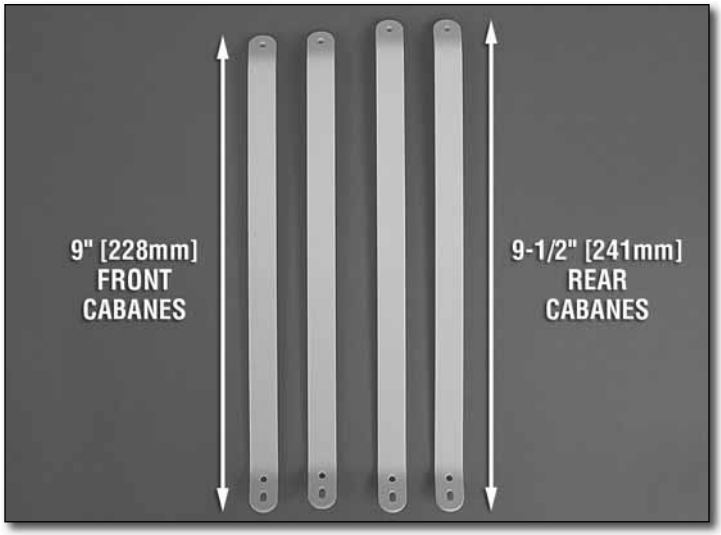
EXPERT TIP

HOW TO CUT COVERING FROM BALSA

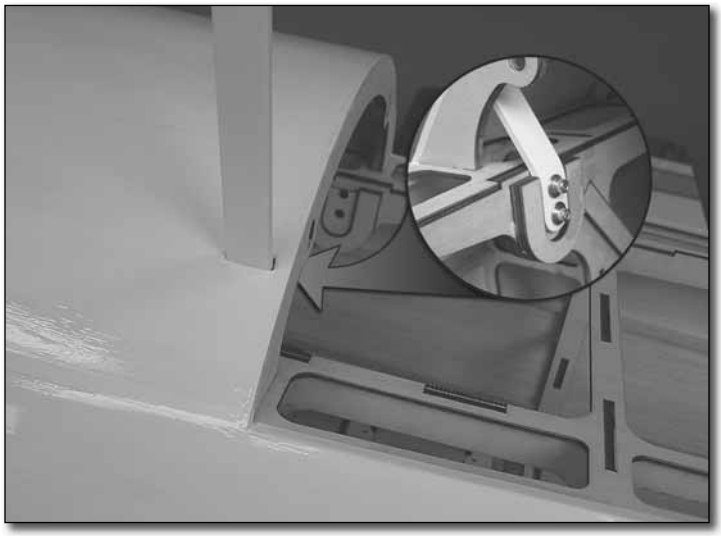
Use a soldering iron to cut the covering from the stab. The tip of the soldering iron doesn’t have to be sharp, but a fine tip does work best. Allow the iron to heat fully.

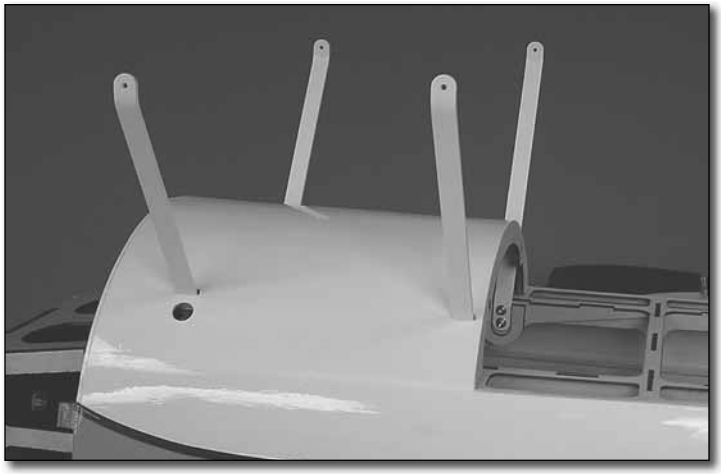


Use a straightedge to guide the soldering iron at a rate that will just melt the covering and not burn into the wood. The hotter the soldering iron, the faster it must travel to melt a fine cut. Peel off the covering.



❏ 5. Locate the four aluminum center **cabanes**. Two of them are 9" [228mm] long and two are 9-1/2" [241mm] long. The longer two are the rear cabanes and the shorter are the front cabanes.





❏ 6. One end of the cabane has two holes. This is the end that gets inserted into the fuselage. Slide one of the long cabanes in place into the rear slot in the fuselage. Secure the cabane to the fuselage with two 4-40 x1/2" [12.7mm] socket head cap screws, #4 lock washers and #4 flat washers. Be sure to apply a couple of drops of thread locker onto each of the bolts. Do this for the remaining three cabanes, placing the shorter cabanes in the forward slots.

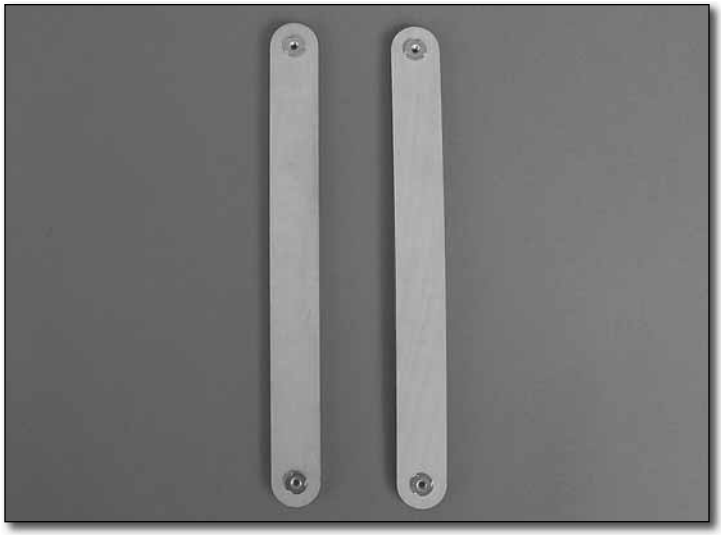
❏ 7. Install the top wing onto the cabanes, securing it with four 4-40 x 1/2" [12.7mm] socket head cap screws, flat washers and a 4-40 nylon lock nuts.

❏ 8. If you do not have the lower wing mounted to the airplane do so now. Attach a fiberglass wing **strut** to the tabs on each of the wings. Secure them with 4-40 x 1/2" [12.7mm] socket head cap screws, #4 flat washers and 4-40 lock nuts. Do this for both wings. Once you are satisfied everything fits well, remove the outer struts and the top wing. Leave the bottom wing on the airplane.

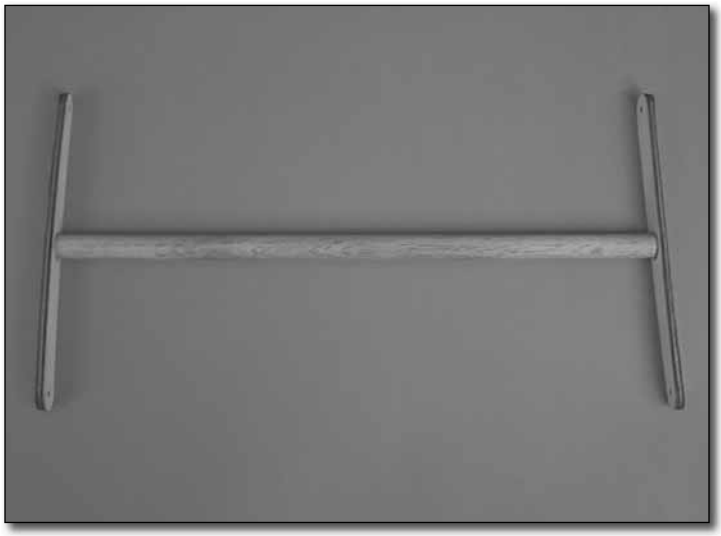
Assemble and Install the Carry Handle

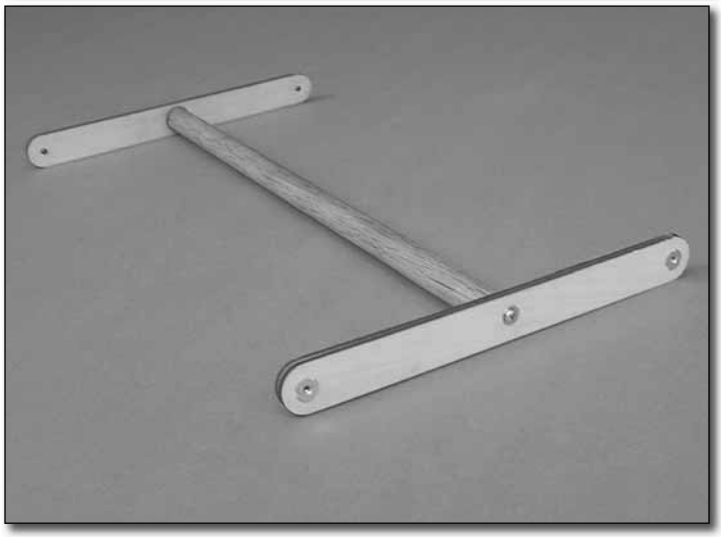
We have included a carrying handle that we strongly advise using when you are not flying the airplane. In addition to providing a safe method for handling the airplane, it also keeps the cabanes aligned and allows you to set the airplane upside down.

❏ 1. Locate the five components of the carrying handle. Align and glue one of the side components with one of the components with the hole in the center. Do this to create the two side pieces.



❏ 2. Place the side piece with the hole facing the bench. Insert a 4-40 blind nut into each corner of the parts.





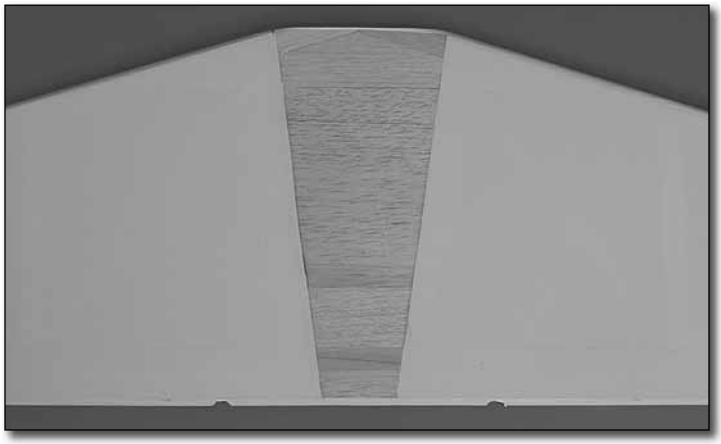
❏ 3. Glue the hardwood handle into the hole as shown. Drill a 3/32" [2.4mm] hole through the end of each end, through the handle and then screw a #4 x 1/2" [12.7mm] screw with a #4 flat washer into the hole you drilled.

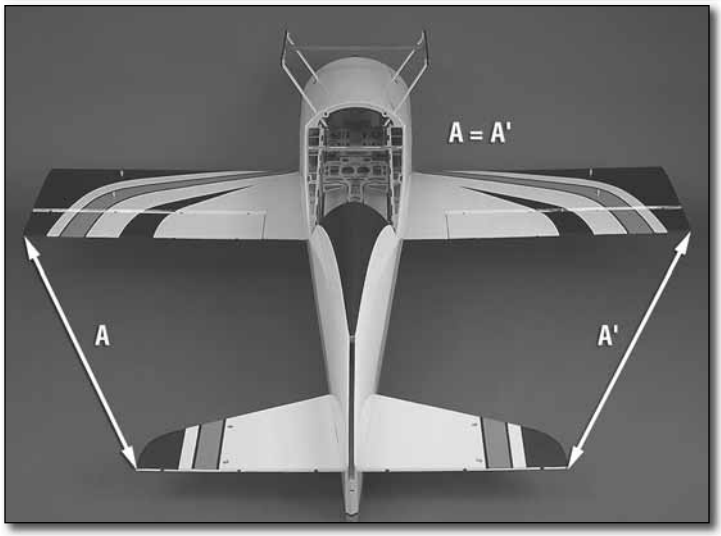
❏ 4. Secure the handle to the cabane with a 4-40 x 1/2" [12.7mm] socket head cap screw and a #4 flat washer.

ASSEMBLE THE FUSELAGE

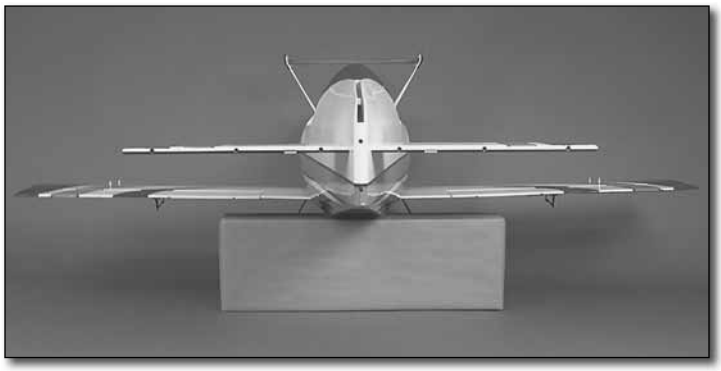
Install the Stab, Elevators, Fin and Rudder

For the following steps you will need to have the bottom wing attached to the fuselage. If you have removed the wing, re-install it now.

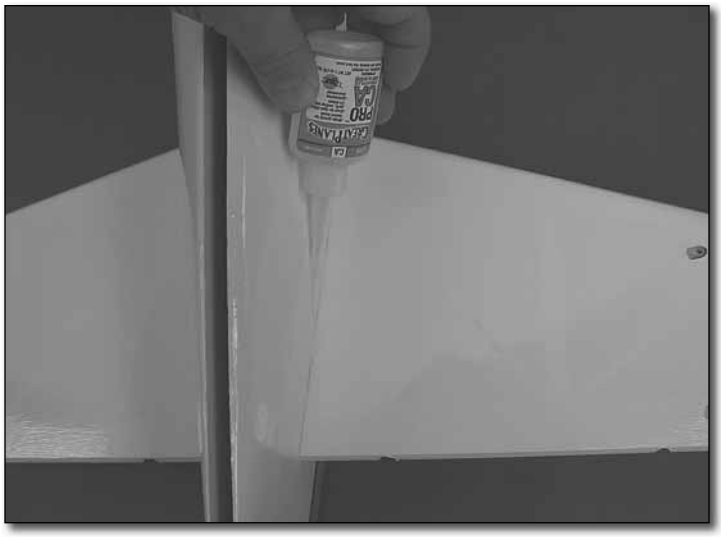




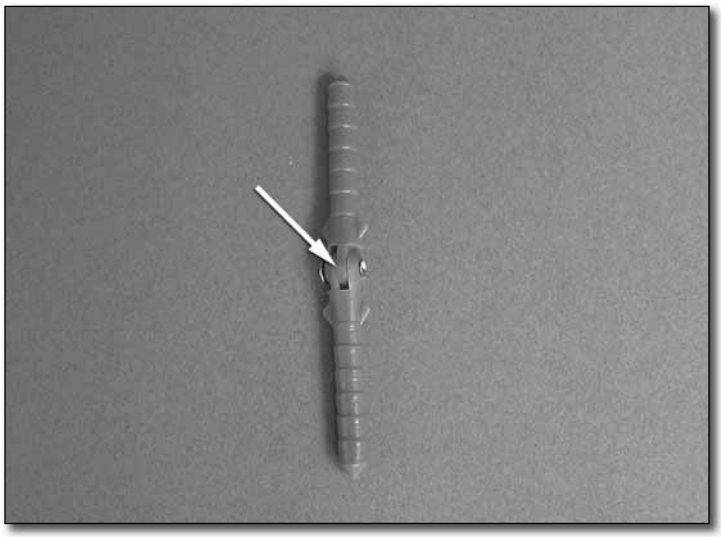
❏ 1. The center of the **stab** has been left uncovered for an easier stab installation. Insert the stab into the opening in the fuselage. Position the stab so that it is equal in length on both sides of the fuselage and that the distance from the wing tip to the stabilizer tip is equal.



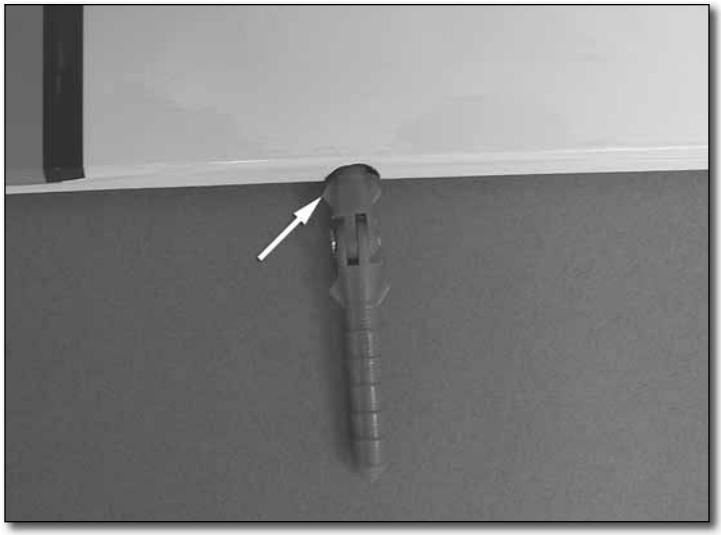
❏ 2. Stand back a few feet and look at the stab in relation to the wing. The stab should be parallel and in line with the wing. If you find that your stab is not aligned, adjust the stab by removing small amounts of the stab saddle with 100 grit sandpaper.

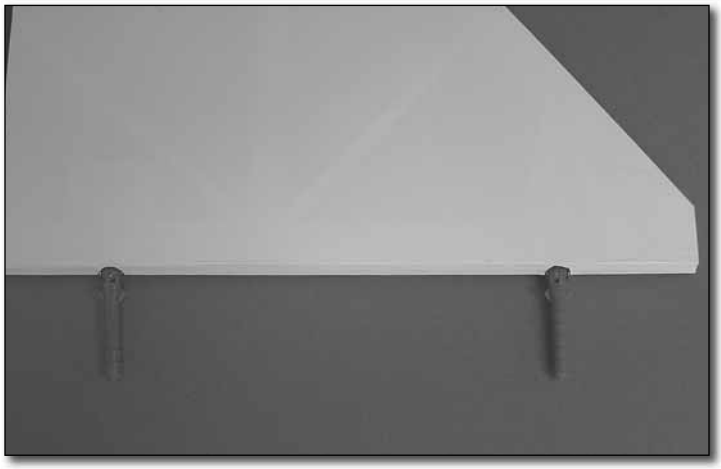


❏ 3. When you are satisfied everything is aligned properly, wick CA into the stab and the stab opening. Work slowly, making sure that you apply adequate amounts of glue to secure the stab. Leave the stab undisturbed while the glue hardens. After the glue has dried you can remove the lower wing from the fuselage. Leave the handle in place to keep the cabanes secure while completing the remainder of the construction.

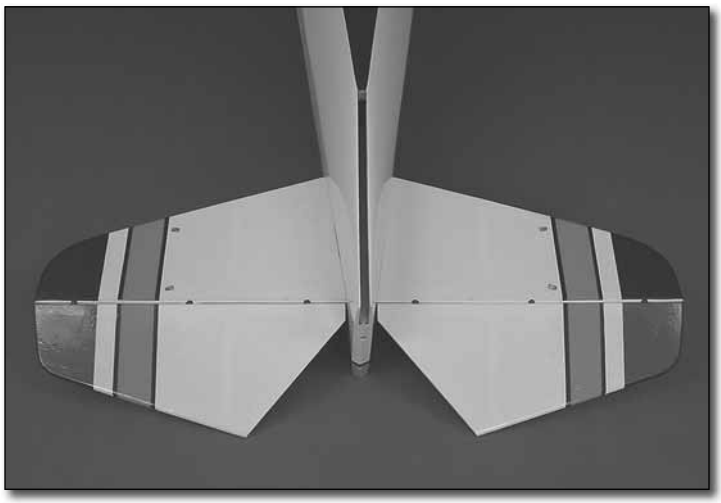


❏ 4. Apply a drop of oil or work petroleum jelly to the center of the hinge. This will prevent glue from getting into the hinge when you glue them in place.

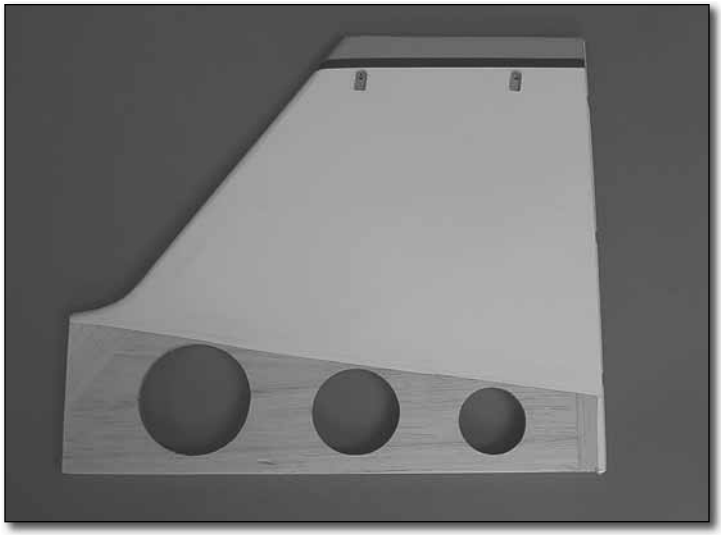


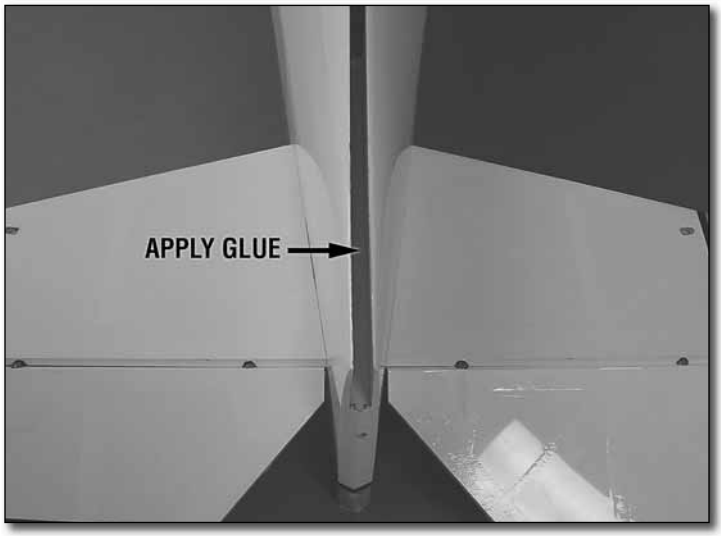


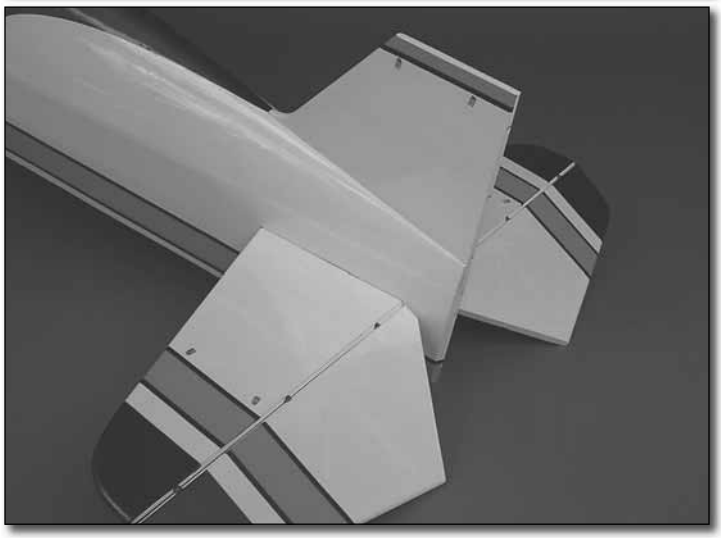
❏ 5. In a moment you will be instructed to install the hinges. These hinges have small flanges on each side. When you install the hinges into the control surface the flange must be in line with the hinge line. And the center of the hinge should be in line with the end of the control surface.



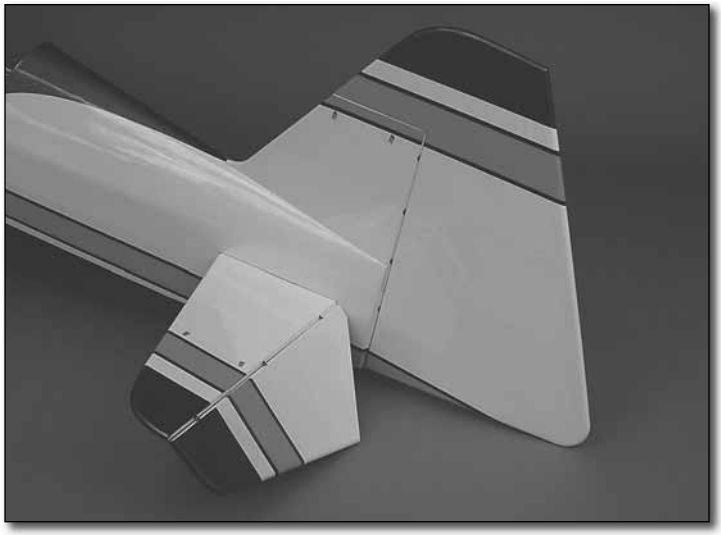
❏ 6. Apply 30-minute epoxy into the holes in the stab and onto one half of each of the hinges. Insert a hinge into each of the holes in the stab. Apply glue into the holes in the elevators and onto the other half of each hinge. Slide the elevators onto the hinges, pressing them tightly against the stab. Clean any excess epoxy with a paper towel and rubbing alcohol. Allow the glue to fully harden.





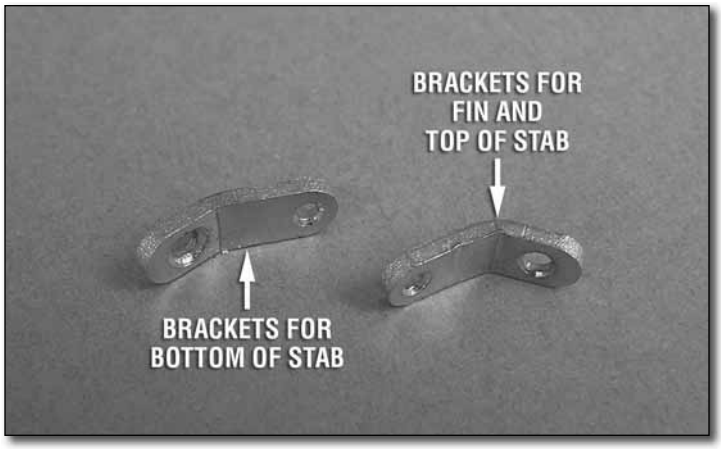


❏ 7. Apply a light coat of epoxy to the exposed wood of the vertical fin and inside the fin slot at the back of the fuselage. Slide the fin into the slot. Clean any excess epoxy with a paper towel and rubbing alcohol.

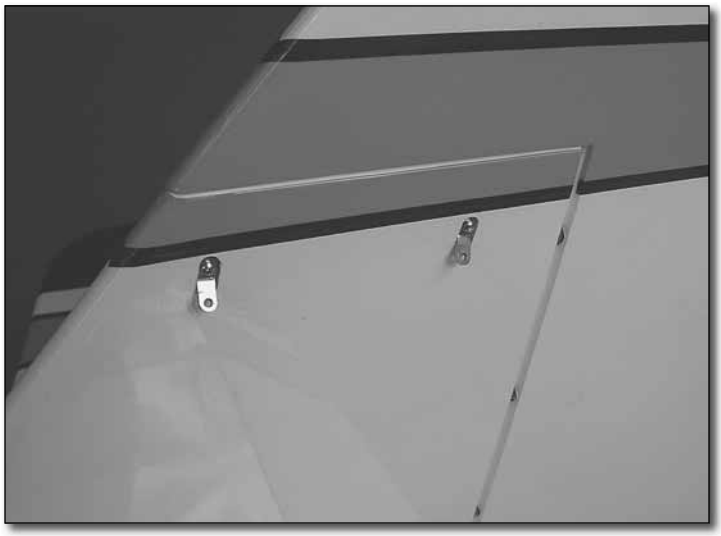


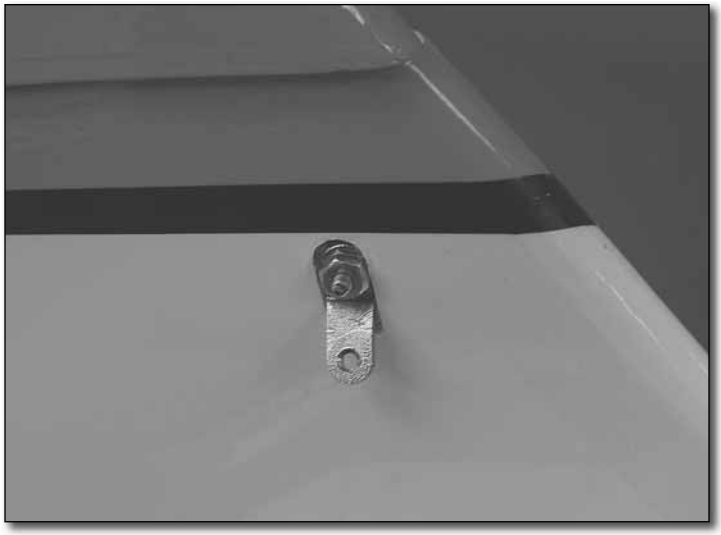
❏ 8. Install the **rudder** and the rudder hinges using the same technique used for the elevators.

Install the Tail Braces

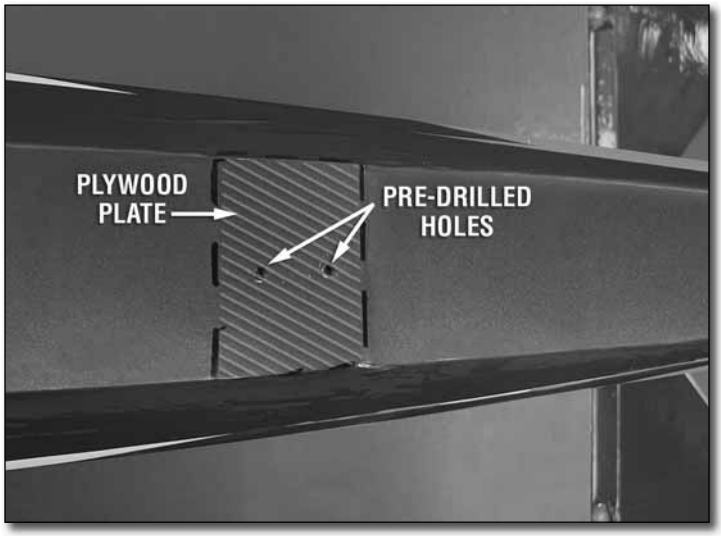


❏ 1. Your kit includes two different tail wire brackets. One bracket has a distinctly sharper angle than the other. The eight brackets with the steeper angle attach to the top of the stab and fin. The four brackets with the shallow angle attach to the bottom of the stab.



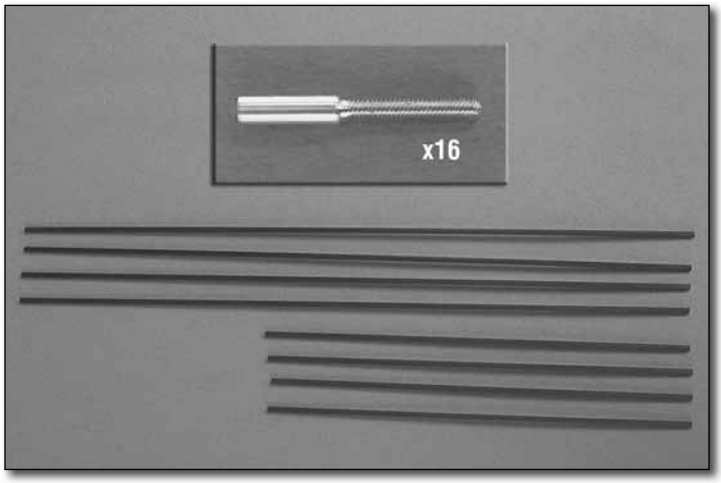


❏ 2. Install the brackets in the recesses in the stab and fin. Secure the brackets with a 2-56 x 1/2" [12.7mm] machine screw. Be sure to apply thread locker to the nut. Do this for all of the brackets.

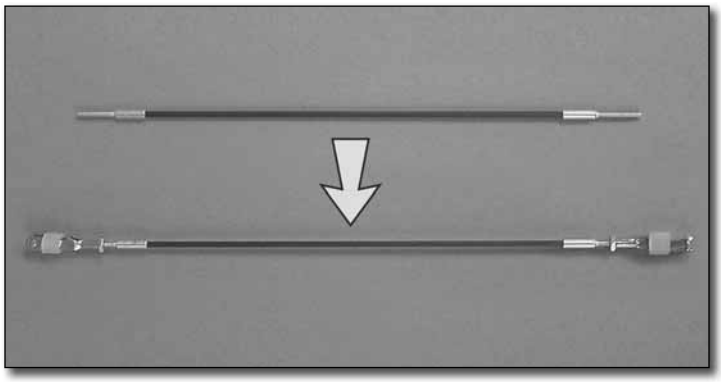


❏ 3. There is a plywood plate located on the bottom of the fuselage. You can see the outline of the plate if you look at the covering at a slight angle. Use a pin to locate the pre-drilled holes in the plywood plate.

❏ 4. Install the four-armed metal bracket to the bottom of the fuselage with two #4 x 1/2" [12.7mm] sheet metal screws.

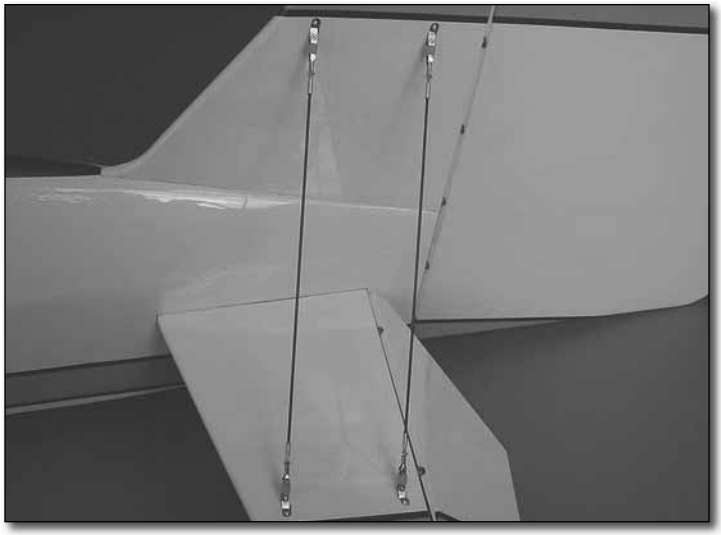


❏ 5. There are four 6" [152mm] and four 9-3/4" [248mm] carbon rods, and sixteen brass couplers that form the tail wires. Using 220 grit sandpaper, lightly sand 1/4" [6.4mm] on each end of each rod.



❏ 6. Apply a small amount of CA glue to the end of the rod. Insert a brass coupler onto the end of the rod with a slight twisting motion to help spread the glue in the coupler. Glue a brass coupler to both ends of each of the eight carbon rods. Allow the glue to thoroughly harden.

❏ 7. Install a 2-56 nut, silicon clevis keeper and a 2-56 metal clevis onto each of the threaded couplers.



❏ 8. Attach the long rods between the fin and the top of the stab and install the shorter rods to the bottom of the stab and the bottom of the fuselage. Adjust each rod so they are snug. Back the nuts away from the clevis. Apply a drop of thread locker to the threads and then tighten the nuts against the clevis. Do this for all of the connectors. Once the nuts have all been tightened against the clevis, slide the silicone clevis keeper over the clevises.

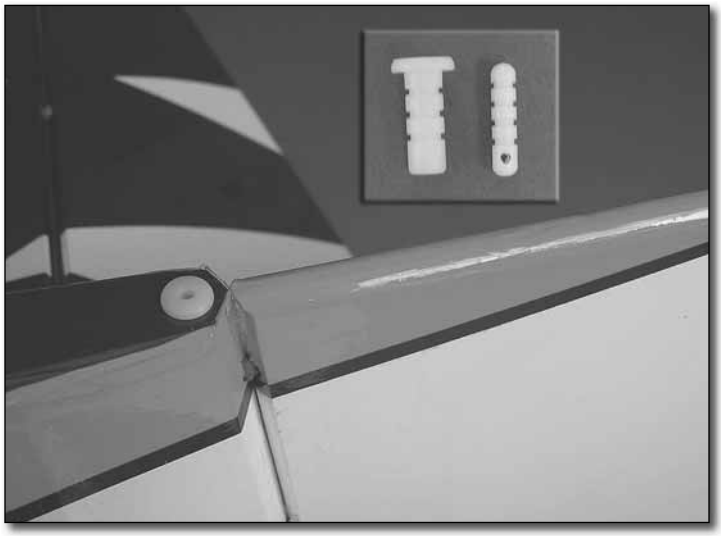
Install the Wheels, Wheel Pants, and Tail Wheel Assembly

❏ ❏ 1. Install a bolt-on axle into the hole in the landing gear. Apply thread locker to the threads of the axle. Then secure the axle with the axle bolt. Be sure when installing the axle that the flat spot on the axle is facing the bottom of the landing gear.

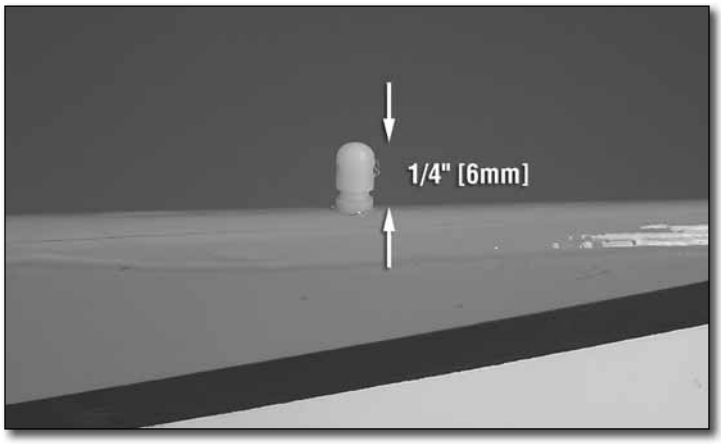
❏ ❏ 2. Insert a 6-32 x 1/4" [6.4mm] socket head cap screw into two 3/16" [5mm] wheel collars. Be sure to apply a couple of drops of thread locker to the screws. Slide a wheel collar onto the axle followed by the wheel and another wheel collar. Tighten one wheel collar against the flat spot on the axle and then tighten the other wheel collar against the wheel. Be sure the wheel spins freely. Adjust the wheel collars as needed to assure the wheel spins freely.

❏ ❏ 3. Slide the wheel pant over the wheel and axle. Attach the wheel pant to the landing gear with two 4-40 x 1/2" [12.7mm] socket head cap screws, #4 lock washer and #4 flat washer. If the wheel is not centered in the wheel pant, adjust the wheel collars to allow the wheel to spin free without touching the wheel pants.

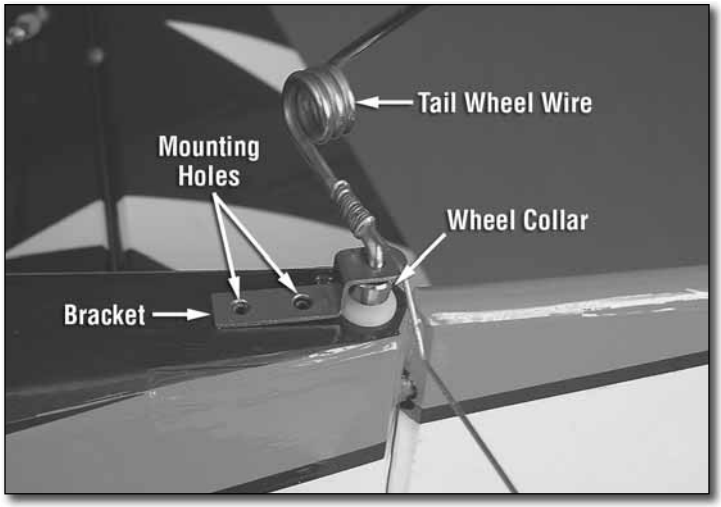
❏ 4. Repeat these steps for the other wheel and wheel pant.



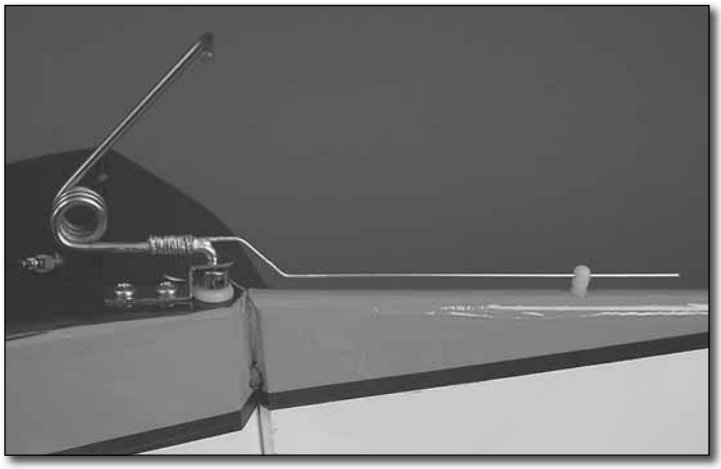
❏ 5. Locate the nylon bushing and nylon pin. Glue the bushing into the hole in the back of the fuselage.



❏ 6. Glue the nylon pin into the hole in the rudder. Install the end of the pin without the hole into the rudder. The hole in the pin should be in line with the rudder and the pin should extend from the hole 1/4" [6.4mm].



❏ 7. Slide the tail wheel wire through the hole in the bracket. Insert a 4-40 set screw into a 3/32" [2.4mm] wheel collar. Then slide the wheel collar onto the tail wheel wire. Slide the tail wheel wire into the nylon bearing. Center the bracket to the fuselage. Mark the location of the bracket mounting holes onto the fuselage and then remove the tail wheel wire. On the marks you made, drill a 3/32" [2.4mm] hole through the plywood.



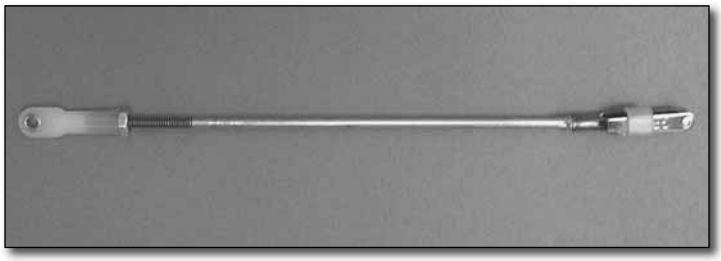
❏ 8. Bend the wire as needed to get a good alignment with the pin and then slide the end of the wire from the tail wheel assembly into the hole in the nylon pin. Secure the tail wheel assembly to the fuselage with two #4 x 1/2" [12.7mm] screws.

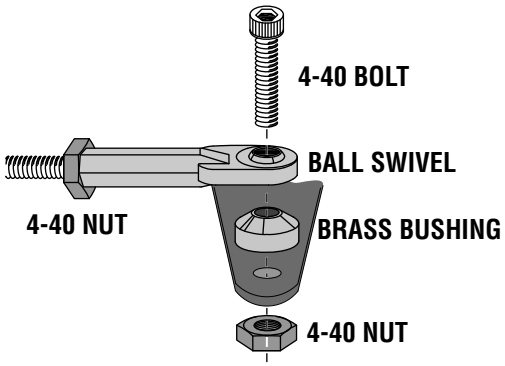
❏ 9. Slide the tail wheel onto the tail wheel wire and secure it in place with a 3/32" [2.4mm] wheel collar and 4-40 set screw.

Install the Elevator and Rudder Servos

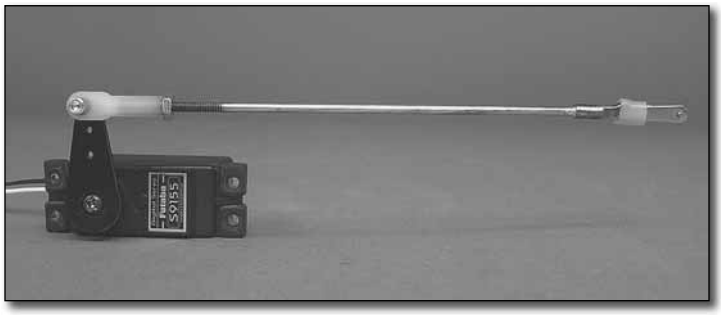
The following instructions will cover installation of the rudder and elevator servos. For the elevator servos to work properly your radio system must have the ability to adjust the servo direction independently from each other. If your radio does not have this capability you will need to purchase an after market "in-line" servo reverser. For Futaba this is the SR-10 dual servo reverser (FUTM4150). A standard "Y"-connector will not work properly.

❏ ❏ 1. Install a 24" [610mm] 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.

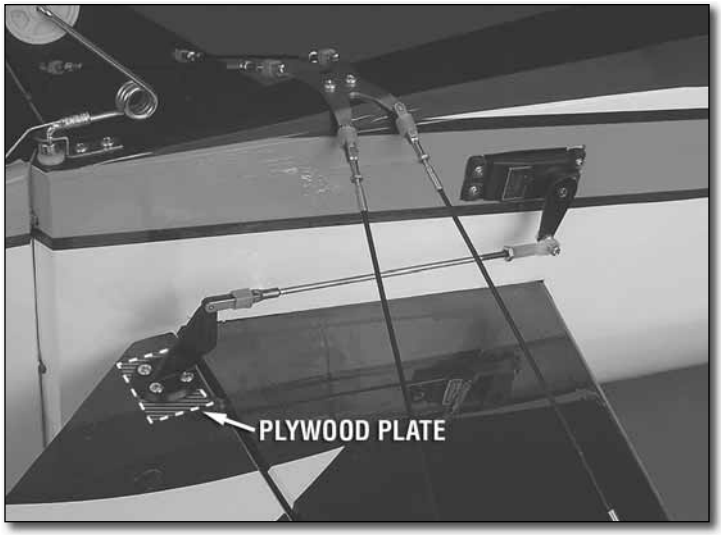




❏ ❏ 2. Cut 1" [25.4mm] from the non-threaded end of two of the 4-40 x 6" [152mm] wire pushrods. Solder a 4-40 solder clevis to the non-threaded end of the wires. Once the solder has cooled install a silicone clevis keeper over the clevis. Thread a nylon swivel ball link onto the threaded portion of the wire. Enlarge the outer hole in a 1" [25.4mm] servo arm to 1/8" [3.2mm] to accommodate the bolt for the swivel connector. Install the swivel ball link into the outer hole. Be sure to apply a drop of thread locker to the threads of the bolt.

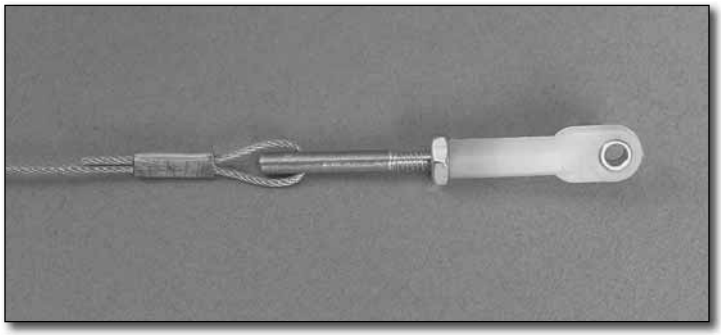


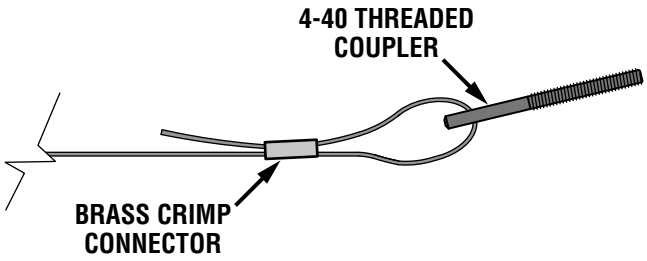
❏ ❏ 3. Center the servo. Then, install the servo arm to the servo.



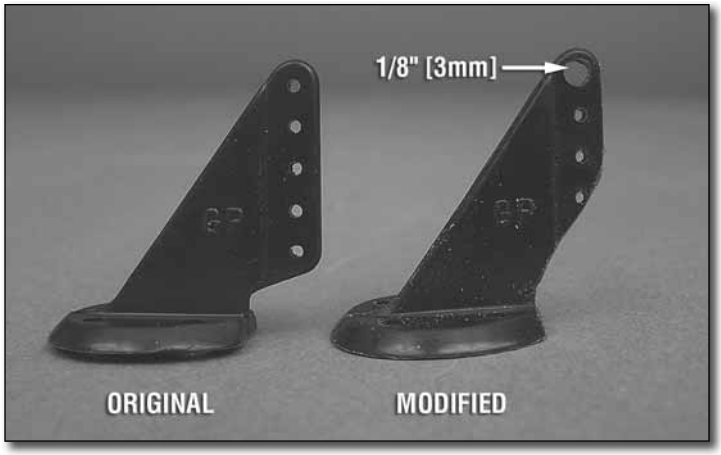
❏ ❏ 4. Install the servo into the fuselage with the servo spline oriented towards the front of the fuselage. Secure the servo with the hardware that came with the servo. Place a nylon control horn in line with the servo arm. When positioned properly the control horn will rest on a hardwood plate in the elevator. Mark the location of the mounting holes onto the elevator. Drill a 3/32" [2.4mm] hole on the marks, drilling through the plywood plate ***but not*** through the top of the elevator. Attach the horn to the elevator with four #4 x 1/2" [12.7mm] screws.

❏ 5. Repeat steps 1-4 for the remaining elevator servo.

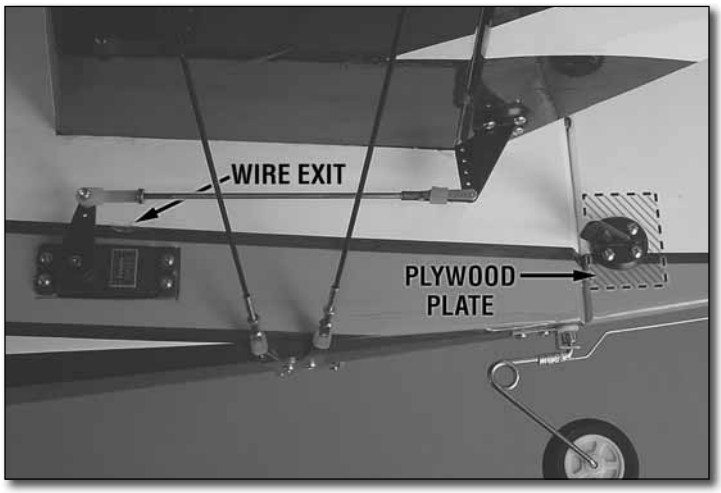




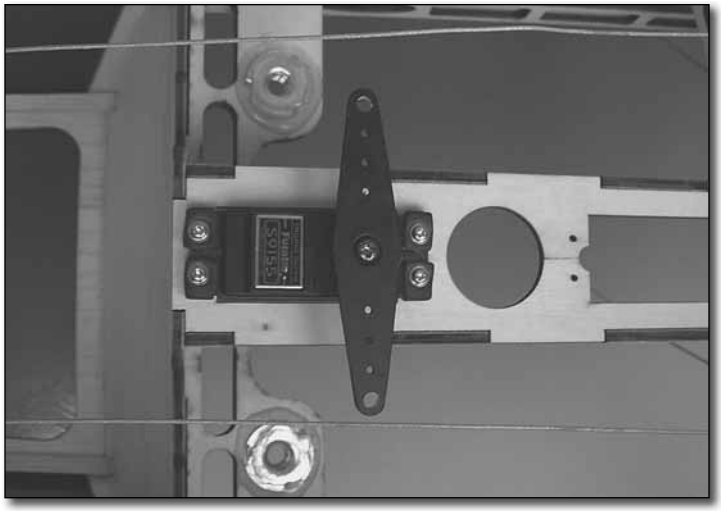
❏ 6. Locate the spool of .038 [.96mm] wire and cut it in half. Slide a brass crimp connector onto one end of the wire followed by the threaded brass connector and then feed the wire back through the crimp connector. Squeeze the crimp connector firmly onto the wire to secure the threaded coupler to the wire. Thread a 4-40 nut onto the coupler followed by the nylon swivel ball link. Do this for both pieces of wire.



❏ 7. Two of the large black control horns need to be modified in order to get full rudder deflection. Using a Dremel tool, modeling knife or other cutting tool, shape the control horn to match the one shown. Drill the outer hole to 1/8" [3.2mm] diameter.

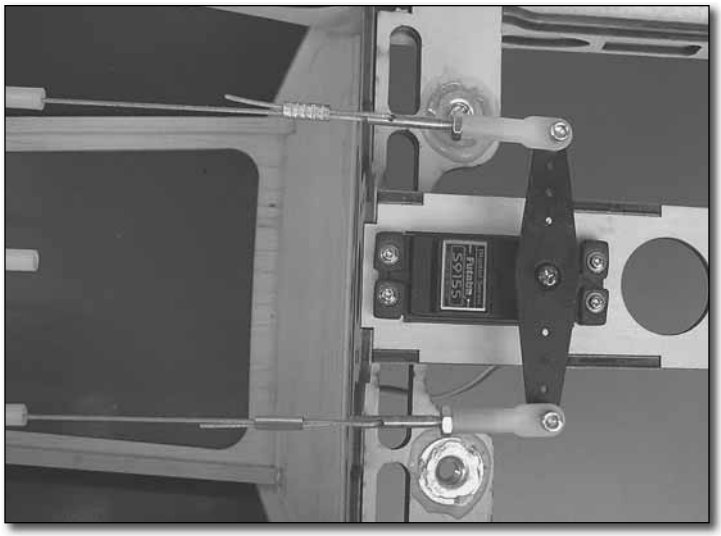


❏ 8. Position a control horn in line with the rudder pull-pull wire exit hole on the side of the fuselage and on the plywood plate located in the rudder. Mark the location of the four mounting holes for the control horn. On each of the marks drill a 1/8" [3.2mm] hole through the plywood plate, drilling completely through the rudder. Attach a control horn on each side of the rudder using four 4-40 x 3/4" [19.1mm] machine screws and four 4-40 nuts. Be sure you use thread locker on each of the nuts.



❏ 9. Install the rudder servo into the rear servo opening in the center of the fuselage with the hardware that came with your servo. Install a 2.5" [64mm] double servo arm onto the servo (GPMM1600) and then center the servo.

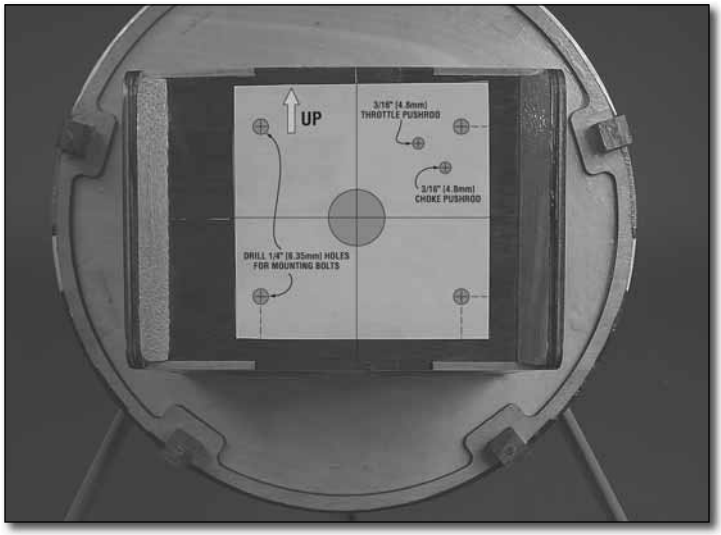
❏ 10. Slide the wire cable with the swivel ball link into the hole in the fuselage until all of the wire is inside of the fuselage. Attach the nylon swivel ball link to the outer hole in the control horn the same as was done for the elevators.



❏ 11. Drill the outer holes of the servo arm to 1/8" [3.2mm]. Install a swivel ball link to both ends of the arm. Attach a brass crimp connector and a threaded brass coupler to each of the wires using the same technique used for the connections to the rudder. *(Adjust the wire until both wires are tight before crimping the connector to the wire).* Cut off any excess wire. If the wire is not tight enough, adjust the tension by turning the swivel ball link further in or out on the threaded brass couplers.

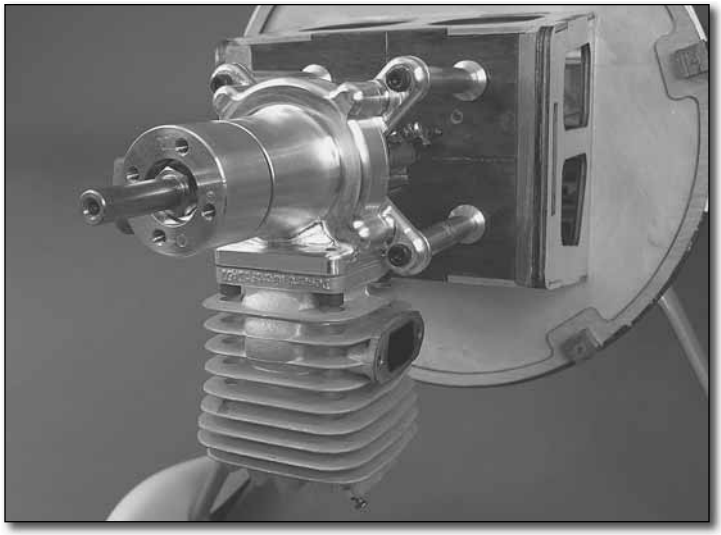
Install the Engine and Throttle Servo

The instructions we have included for engine mounting are for the Desert Aircraft DA-50 rear carb engine with 3" [76mm] stand-offs. If you will be mounting a different brand of engine you will have to modify your installation as needed to accommodate your engine. Whether you will be installing a DA-50 or another brand of engine, it is recommended you take a few minutes to read these instructions prior to beginning the installation so you can be familiar with the process we recommend. We understand that "large scale" modelers have many different preferences for hardware and methods for installation. We have provided what we believe is a simple and reliable installation. Feel free to substitute different hardware or use other installation methods you may prefer.

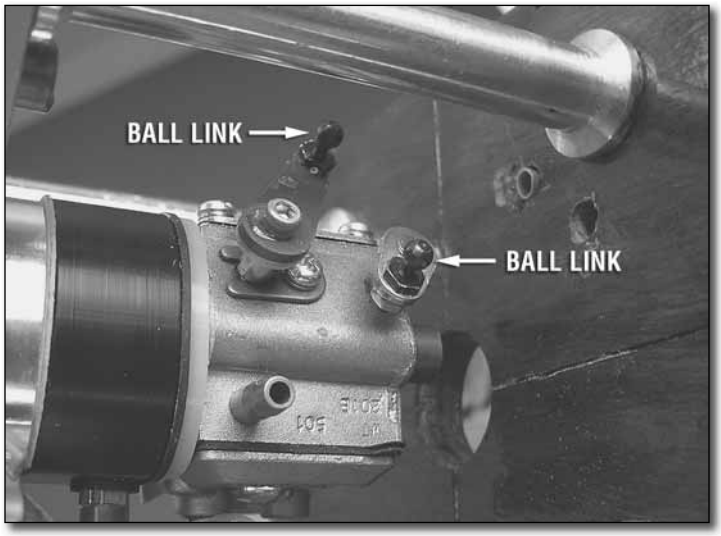


❏ 1. Cut out the engine mounting pattern located on the back cover of this manual. Tape the pattern in place, aligning it with the reference lines etched into the firewall. Notice the pattern has an arrow on it that references "UP". The arrow should be pointed towards the top of the fuselage. This pattern will provide the proper mounting holes for an inverted engine installation.

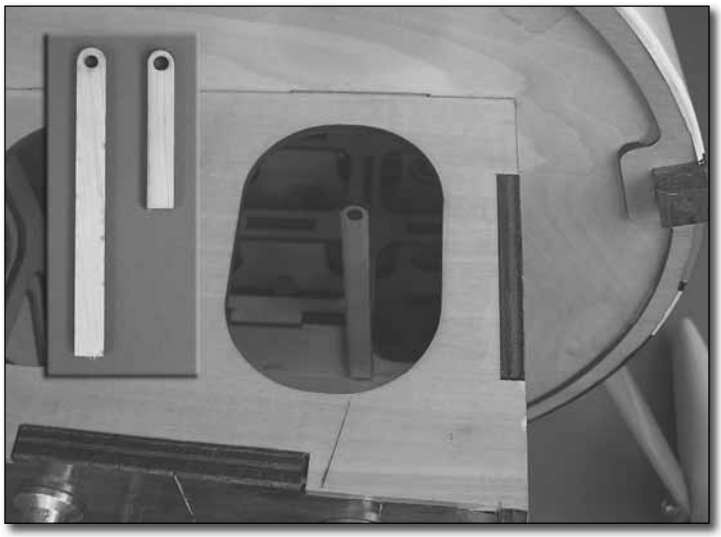
❏ 2. On each of the reference marks drill a 5/64" [2mm] pilot hole. With your pilot hole as a reference, drill each hole the size indicated on the pattern.



❏ 3. Mount the engine with the hardware that came with the engine.

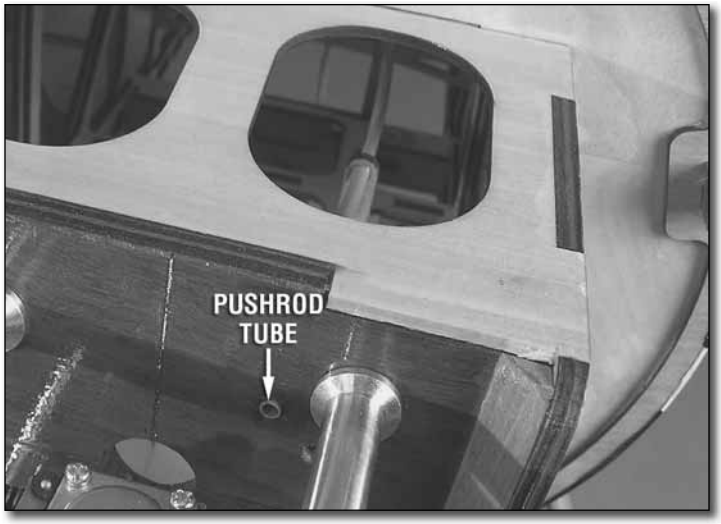


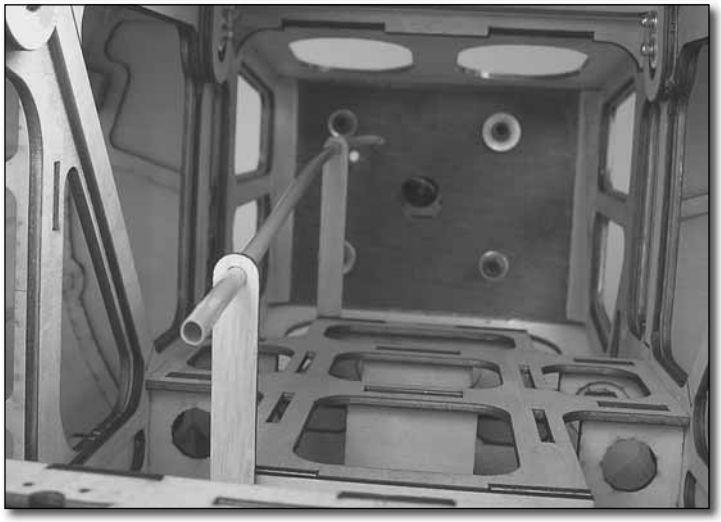
❏ 4. Install a ball link on both the choke arm and the carburetor arm. We have included both .080 and a 2-56 threaded balls, washer and nuts. Choose whichever one best fits the hole in the arms. Be sure that you use thread locker on the threads.



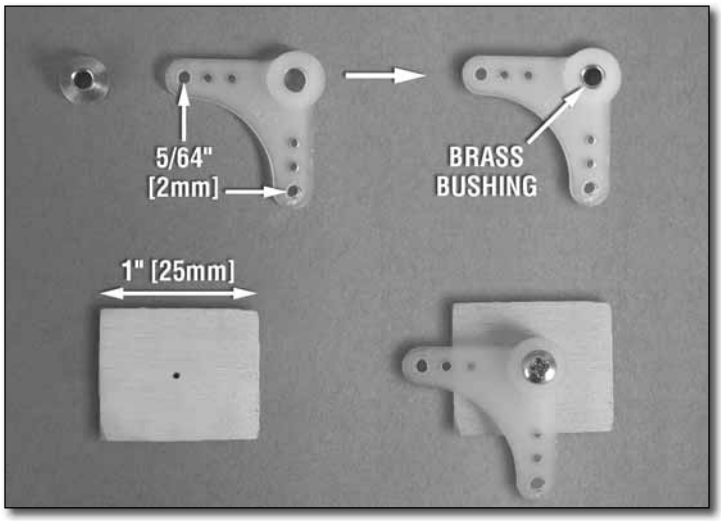
❏ 5. Locate two plywood throttle pushrod supports. Glue the longest support to the former shown in the photograph, aligning it with the edge of the fuel tank tray.

❏ 6. Glue the remaining support inside of the fuselage as shown.



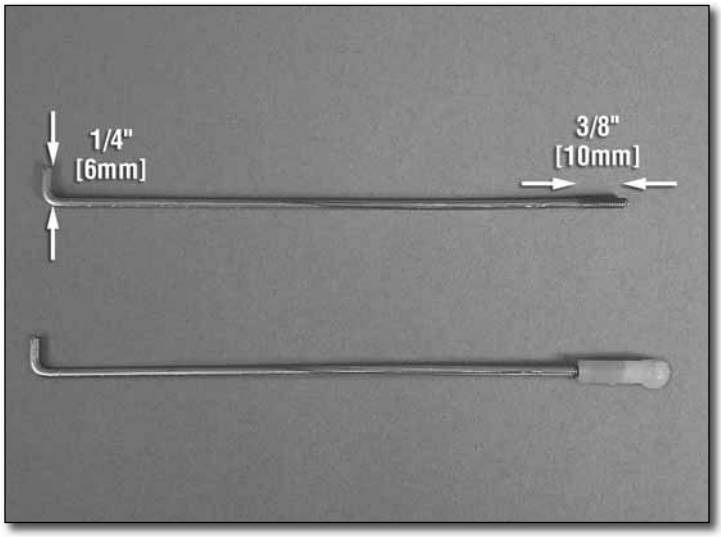


❏ 7. Cut the white plastic throttle pushrod tube to a length of 13-3/4" [350mm] Roughen one end of the tube with 220 grit sandpaper. Slide the tube into the throttle hole (the top hole) in the firewall and into the holes in the two throttle pushrod supports. Apply glue to the roughened end of the pushrod tube. Then position the tube flush with the firewall. Apply a drop of CA glue where the tube passes through the supports.

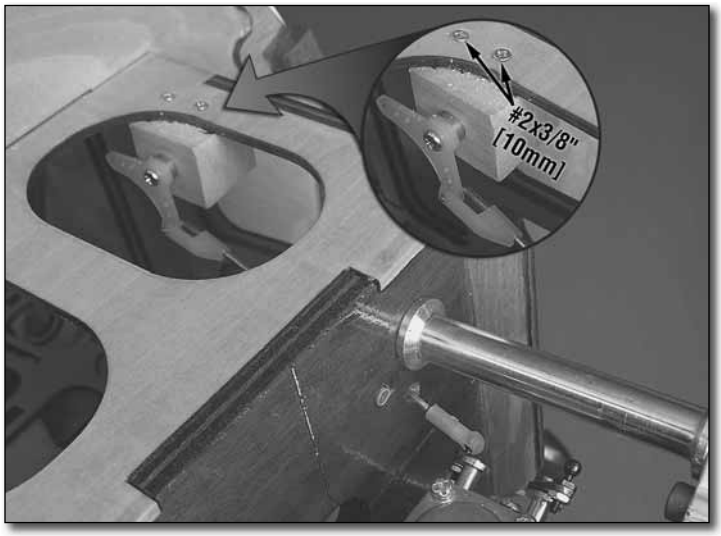


❏ 8. Locate the 3/4" x 3/4" x 1" [19mm x 19mm x 25mm] hardwood block. On the side that is 1" [25.4mm] long, drill a 3/32" [2.4mm] hole in the center of the block.

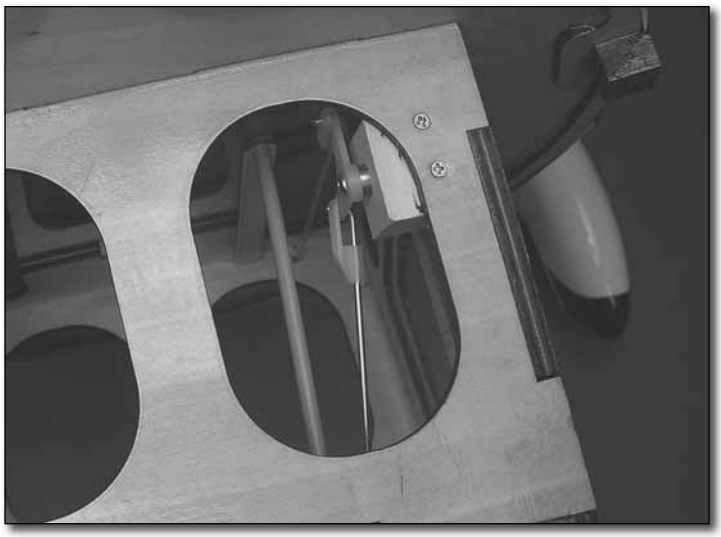
❏ 9. Install the brass bushing into the nylon bellcrank. Screw the bellcrank assembly to the wood block with a #4 x 1/2" [12.7mm] screw. Be sure to orient the bellcrank arm as shown. Enlarge the outer hole in both ends of the bellcrank with a 5/64" [2mm] drill bit.

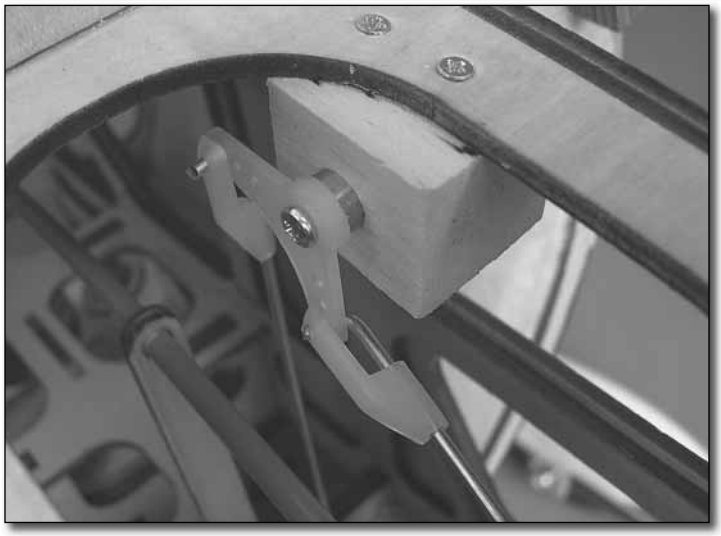


❏ 10. Locate a 2-56 x 6" [152mm] wire pushrod. Cut the threads so only 3/8" [9.5mm] of thread remain. Cut the unthreaded end of the wire so that the overall length of the wire pushrod including the remaining thread is 4-7/16" [112mm]. Bend the un-threaded end of the wire 1/4" [6.4mm] from the end of the wire. Screw a nylon ball link onto the threaded end of the wire. Screw the nylon ball on so that it completely covers the threads.



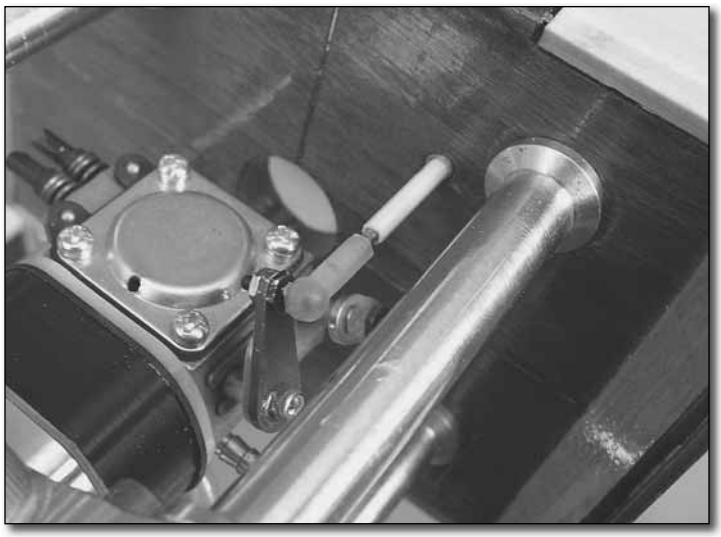
❏ 11. Install the pushrod wire as shown. Slide the bent end of the wire into the lower hole in the firewall. Attach the nylon ball link onto the ball on the choke arm. Position the bellcrank assembly inside the fuselage. Attach the pushrod from the choke to the outer hole in the bellcrank and secure it with a nylon FasLink™. Move the choke am back towards the firewall. Now position the block so the other arm is positioned as shown in the photograph. Glue the block in place with CA glue. Once the glue has hardened drill two 1/16" [1.6mm] holes in the firewall box and into the block. Install a #2 x 3/8" [9.5mm] wood screw into each of the holes you drilled.



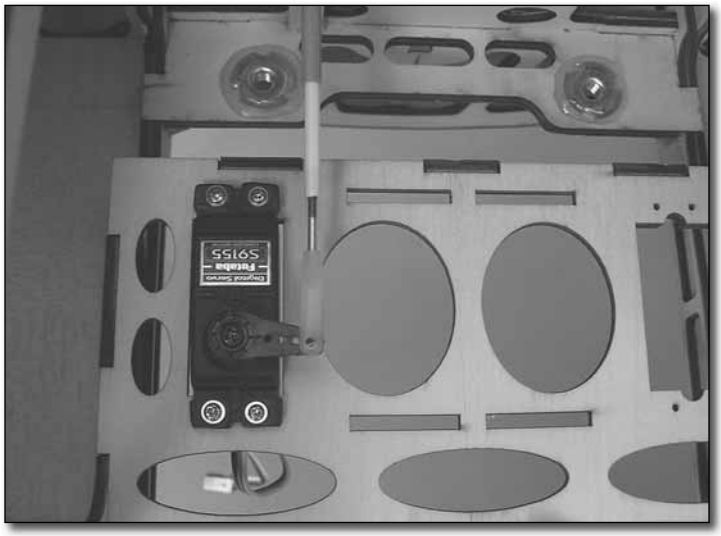


❏ 12. Drill a 3/32" [2.4mm] hole directly below the bellcrank arm. Cut 1" [25.4mm] of threads from the end of a 2-56x12" [305mm] pushrod wire *(Save this piece of thread to be used in the next step)*. Make a 90° bend 1/4" [6.4mm] from the end of one end of the wire. Slide the wire into the hole you drilled and then install the bent end of the wire into the outer hole of the other bellcrank arm. Secure it with a nylon FasLink.

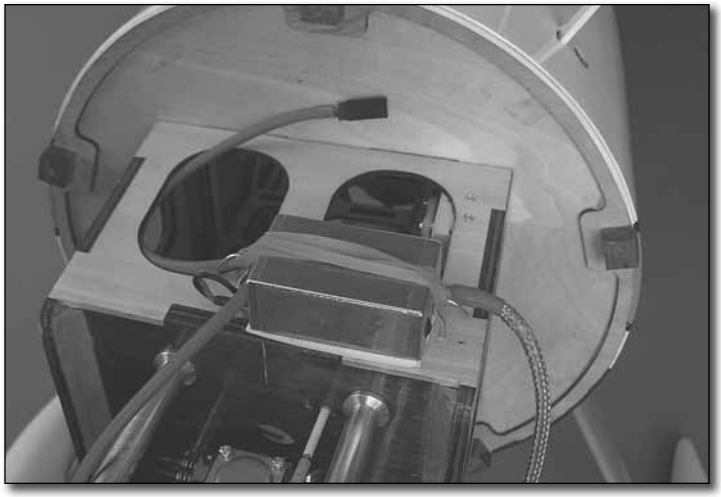
This bellcrank allows you to access the choke mechanism from the bottom of the fuselage using the wire you just installed. The wire extends below the fuselage further than what you might want. Later, after the cowl is completely installed, cut the wire to the length you wish. You may also want to make a bend in the wire to give you something to easily grab onto for activating the choke.



❏ 13. Cut the 24" [610mm] white flexible pushrod to a length of 16" [406mm]. Thread the 1" [25.4mm] thread *(that you previously cut from the wire)* into one end of the flexible pushrod and screw a nylon ball link onto the end. From a 6" [152mm] 2-56 pushrod wire cut 1/2" [12.7mm] of the thread off. Then, on the other end of the flexible pushrod, screw the pushrod wire into it. Slide the pushrod into the tube installed in the firewall. Snap the ball link onto the ball on the throttle arm.



❏ 14. Install the throttle servo into the servo opening on the left side of the fuselage with the hardware that came with the servo. Trim three arms from a four-armed servo horn. Enlarge the outer hole in the servo arm with a 5/64" [2mm] drill bit. Center the servo arm and the throttle barrel. Make a mark on the wire where it passes over the hole. Make a 90 degree bend on the mark. Secure the wire with a nylon FasLink and then cut off the excess wire.



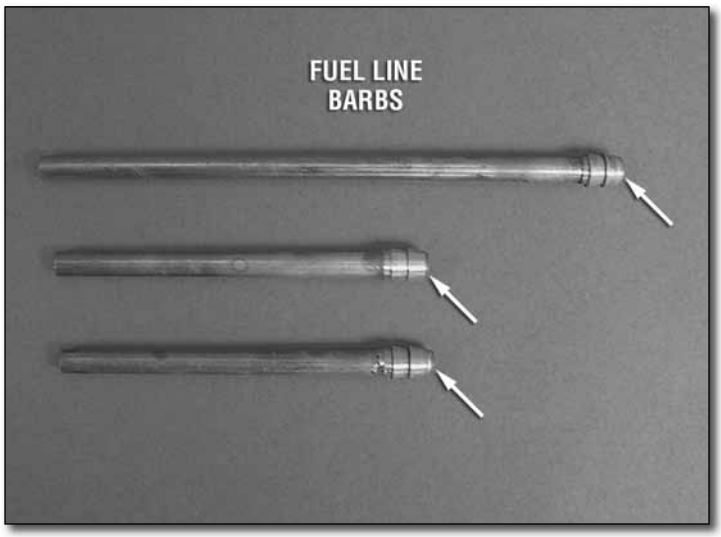
❏ ❏ 15. Cut a piece of 1/4" [6.4mm] foam rubber to fit under the ignition module. Place the module onto the firewall box. On each side of the ignition module drill a 1/16" [1.6mm] hole. Locate a 1/4" x 1/4" x 1/4" [6.4 x 6.4 x 6.4mm] hardwood block and glue it to the firewall box under the hole you drilled. Drill a 1/16" [1.6mm] hole through the hole you drilled and into the block. Screw a hook into each off the holes you just drilled. Secure the ignition module with a couple of #64 rubber bands (not included).

❏ 16. Repeat step 15 for the ignition battery.

❏ 17. You need to decide where you wish to put the switch and charge jack for the ignition module. Though it is a bit tedious we found that there was room at the front of the fuselage. We recommend that you use a heavy-duty switch such as the Futaba heavy-duty charge switch (FUTM4385) and the Ernst charge receptacle (ERNM3001). When determining a location for the switch make sure you keep it as close to the engine as possible to prevent any possible interference with your radio system.

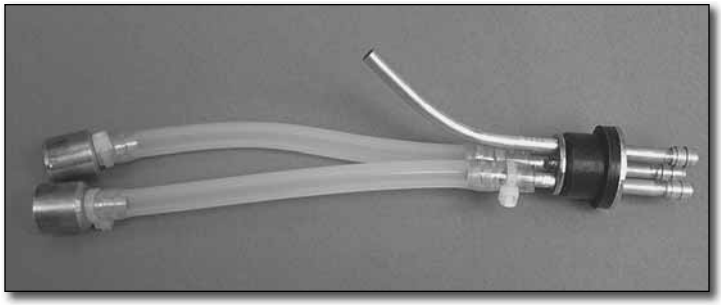
Install the Fuel Tank

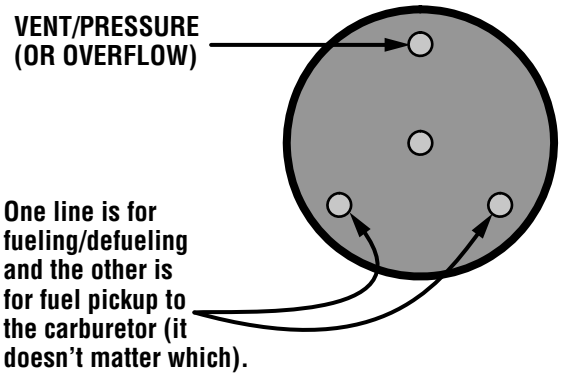
For the installation of the fuel tank you will need approximately 60" [1524mm] of tygon fuel tubing (not included). Be sure you have this before proceeding with the next set of instructions.



❏ 1. Solder a fuel line barb onto one end of each of the three tubes.

❏ 2. Assemble the stopper, tubes and metal plates. Solder another fuel line barb onto the ends of the short tubes. Bend the brass vent/overflow tube upward so it will be at the top of the tank.



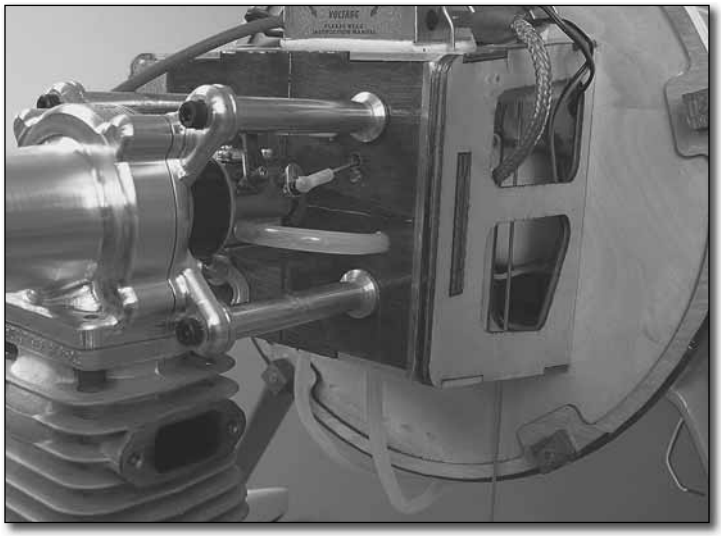


❏ 3. Connect the fuel tubing to the short tubes and the clunks–cut the lines so that the clunks cannot contact the back of the tank–otherwise they could get stuck. Note that one of the lines will be used for fueling and defueling and the other line will be the pickup line that goes to the carburetor. The bent tube will be the vent/overflow line that will be connected to a line that exits the bottom of the fuselage. I***mportant:*** *Secure both ends of both fuel tubes with small nylon ties. This is an important measure that must be taken to be sure the lines remain attached inside the tank.*

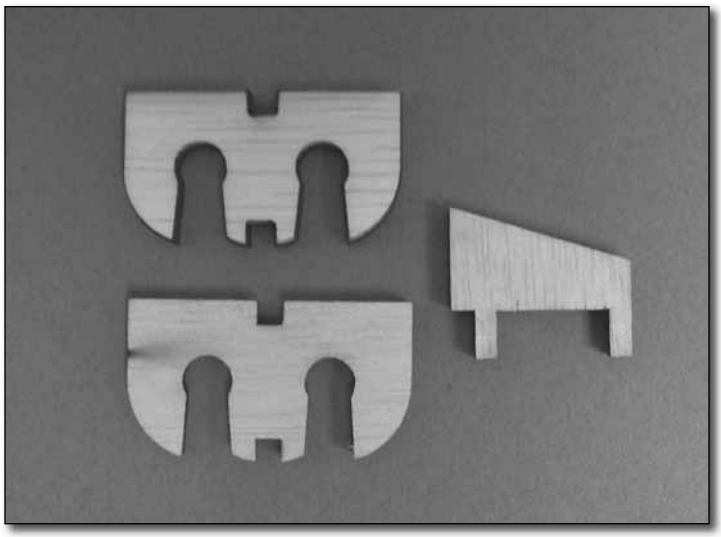
❏ 4. Write "TOP" on the back of the tank so you will know which way to install it after inserting the stopper assembly. Insert the stopper so the vent tube will be at the top of the tank. Then tighten the screw to squish the stopper and seal the tank. Shake the tank to make sure the clunks can move around and the fuel lines are not too long.

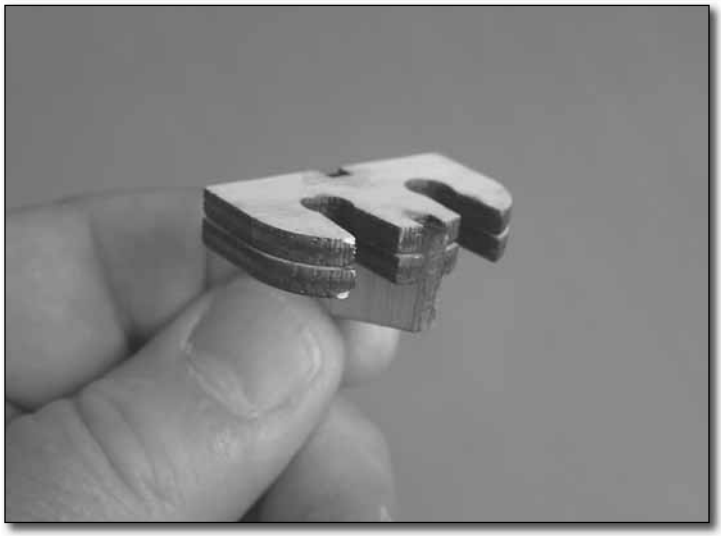
❏ 5. Install 13" [330mm] of fuel tubing onto each of the lines coming from the fuel tank. Be sure to put a tie wrap on each of them.

❏ 6. Inside of the fuselage you will find two slots on both sides of the fuel tank tray. Install a long tie wrap through the slots and then put the tank in position on the tray. (If you wish to put foam under the tank do this now). Pull the tie wraps around the tank, making sure that the tie wrap falls into the recesses in the tank. Pull the tie wraps tight and then cut off the excess tie wrap material.

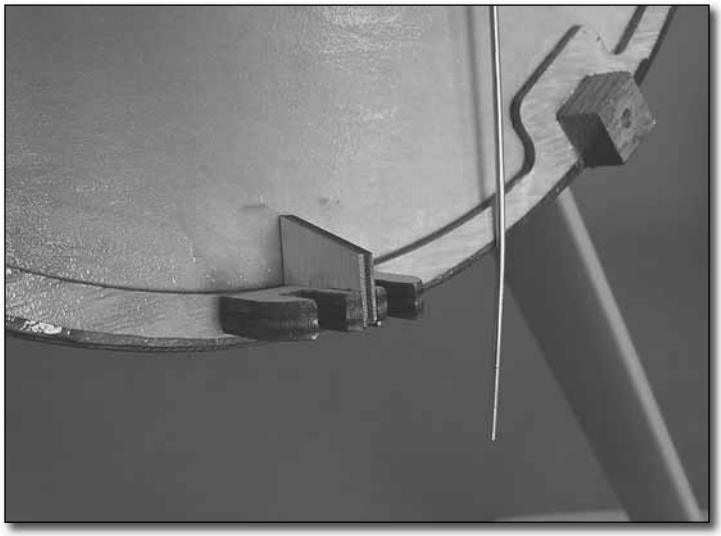


❏ 7. Determine the location for the fuel line to come through the firewall and then drill a hole appropriate to the size of your fuel line. Install the fuel line to the carburetor and route the remaining fuel line out the bottom of the mounting box.

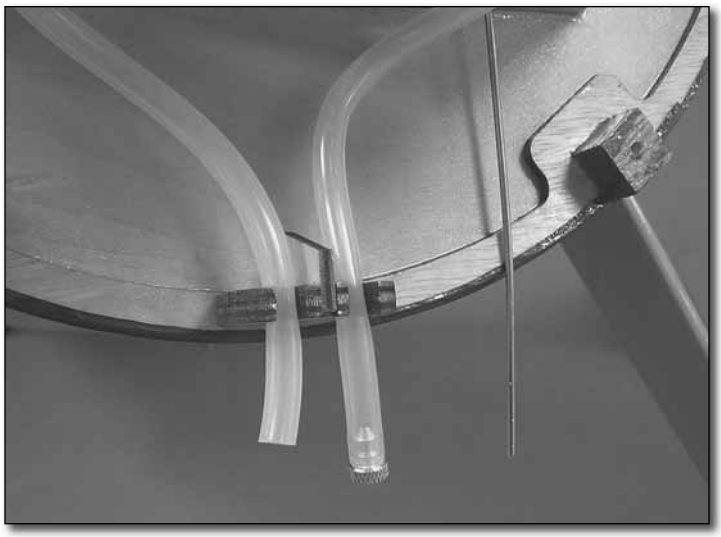




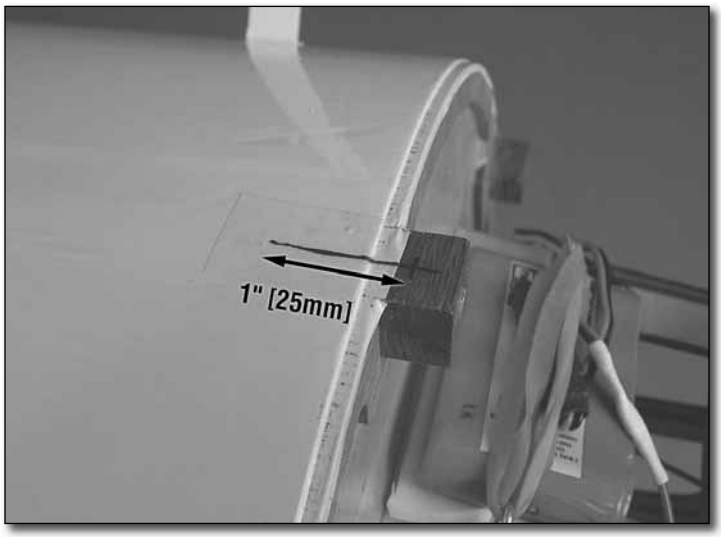
❏ 8. Locate the 3mm plywood components that make up the fuel line holder. Glue the two matching parts to each other. Then slide the remaining part into the slots, gluing it to the other part.



❏ 9. Glue the fuel line holder to the bottom of the firewall.



❏ 10. Install an aluminum fuel plug into the fill line and then push the lines onto the holder.

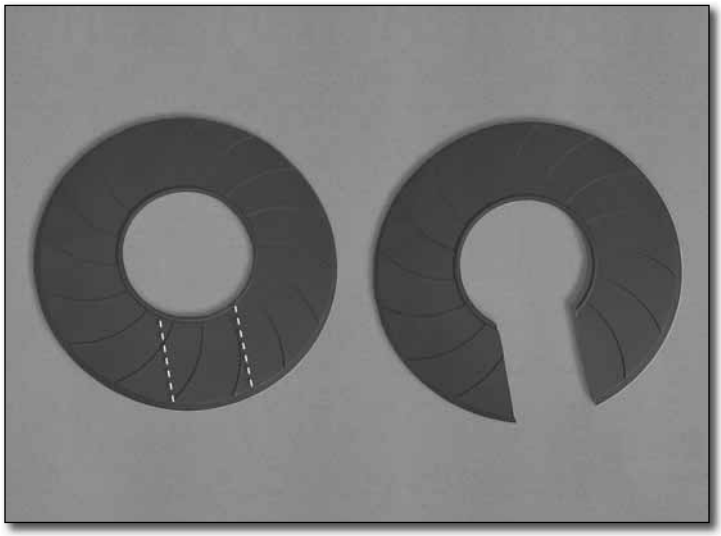


❏ 11. Place a piece of masking tape on the fuselage in line with each of the wood cowl mounting blocks. Measure back 1" [25.4mm] from the center of each block. Mark a line onto the tape.

❏ 12. Place the cowl onto the fuselage, aligning the stripes on the cowl with the fuselage. Make a mark on the cowl where the throttle choke wire contacts the cowl and then cut away the cowl as needed to provide clearance for the wire. Tape the cowl in place on the front of the fuselage.

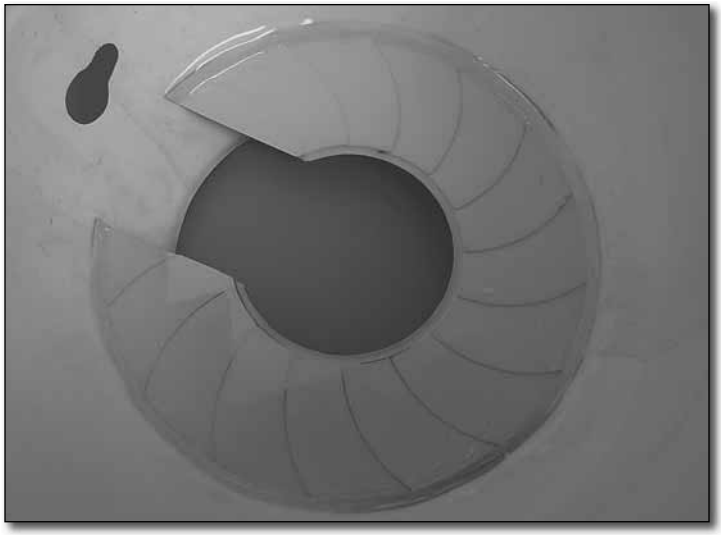
❏ 13. Using the line on the tape as your reference, measure forward from the end of the line 1" [25.4mm]. Make a mark on the cowl and do this for each of the lines you made. On the mark you made drill a 3/32" [2.3mm] hole through the cowl and into the cowl blocks. Temporarily install the cowl to the fuselage with #4 x 1/2" [12.7mm] screws. (Don't worry about washers for now. You will be removing the cowl several times for final adjustments to the cowl).

❏ 14. Make cut outs in the cowl for any parts of the engine that might be interfering with the cowl (spark plug boot, muffler, etc.)

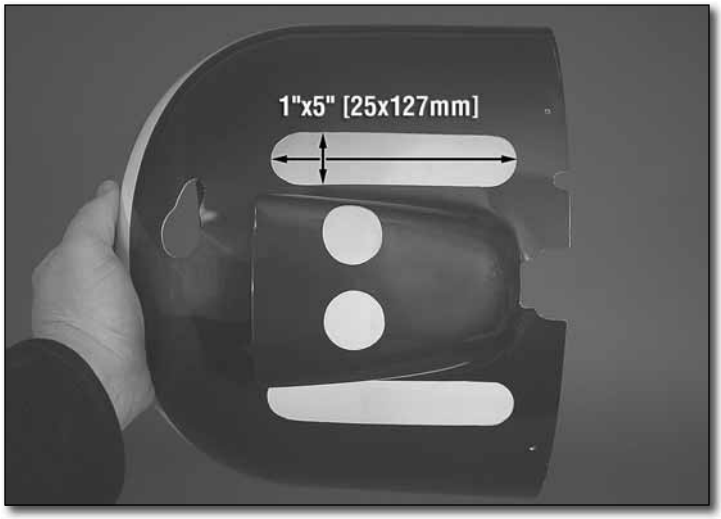


❏ 15. Locate the ABS plastic engine baffle. Place it in front of the cowl and mark the location of the cylinder head. Cut this area from the baffle. This opening will allow air to pass over the cylinder allowing the engine to be cooled.

❏ 16. Slide the engine baffle into the front of the cowl. Install a tip extension onto a bottle of medium CA glue. Now, center the baffle in the front of the cowl and while holding the engine baffle in place, tack glue the baffle to the cowl with the CA glue. Use a CA glue accelerator to harden the glue quickly. Tack the baffle in place in three or four spots. When you have the baffle centered and secured, remove the cowl.



❏ 17. Where the baffle contacts the cowl, wipe that area with a paper towel dampened with alcohol. Let the alcohol dry and then mix an ounce [30mL] of 5-minute epoxy and micro balloons. Apply a fillet of the epoxy mixture around the baffle where it contacts the cowl to permanently secure the baffle. Allow the glue to harden.

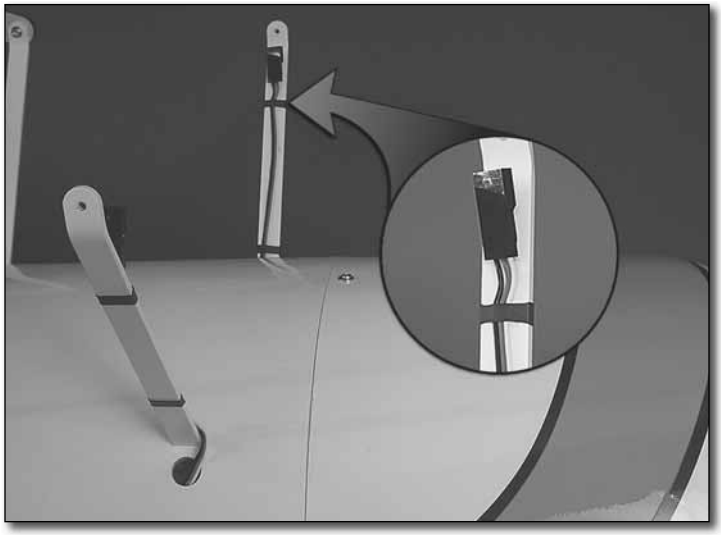


❏ 18. To allow for proper engine cooling you must have an area to allow the air to escape the cowl. Cut two openings as shown. Each of the openings should measure approximately 1" x 5" [25.4mm x 127mm].

❏ 19. Re-install the cowl to the fuselage with the screws and #4 flat washers. Install the propeller and spinner. The spinner is available as an accessory item from Great Planes (GPMA4020). This is a high-quality, turned aluminum spinner that has a scale shape and matching color to the airplane.

Completing the Radio Installation

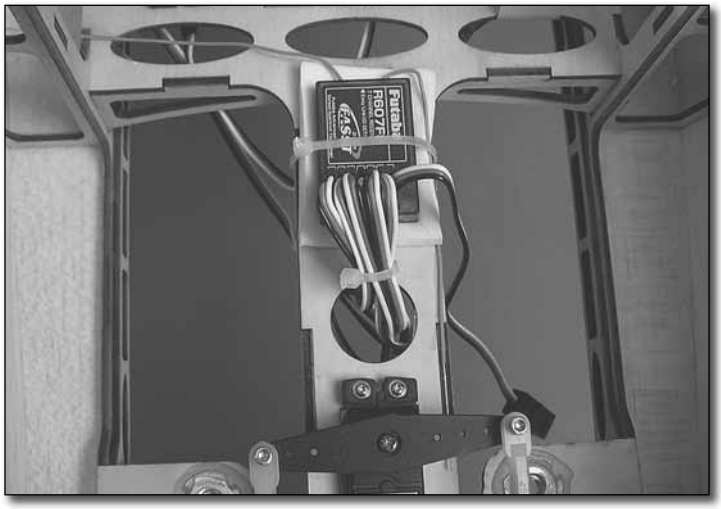
At this point you should have all of the servos installed. All that remains is installing the receiver, battery, switch harness and two aileron extensions.



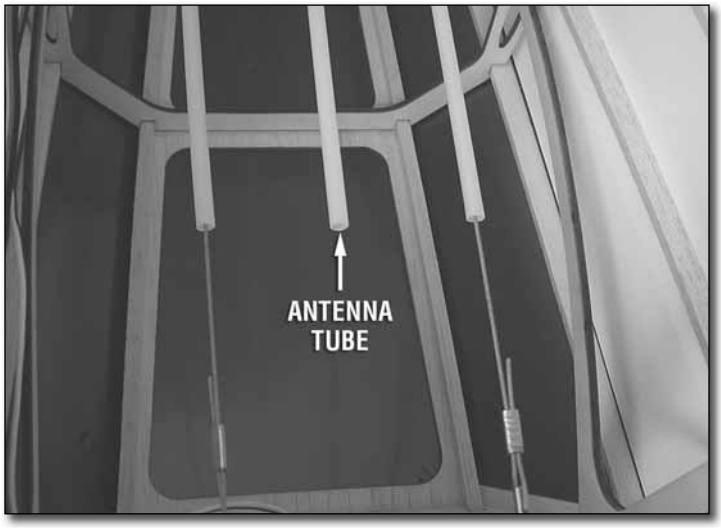
❏ 1. There is a hole located where the forward cabane comes through the surface of the fuselage. Insert a 24" [610mm] servo extension into each hole and guide it toward the radio compartment in the fuselage. These extensions are for the ailerons in the upper wing. There are a number of ways that you can secure the extensions. We cut 1/4" [6.4mm] bands of heat shrink tubing, slipped them over the extension and the cabane and then shrunk the bands with a heat gun. You can secure the extensions with tape or even use hot glue. Secure both wires to the cabane.

❏ 2. Cut the 24" [610 mm] Velcro strap to fit your particular battery. Use the Velcro to secure the battery pack as shown.

❏ 3. Install the switch and charge jack for your radio system. We recommend that you use a heavy-duty switch such as the Futaba heavy-duty charge switch (FUTM4385) and the Ernst charge receptacle (ERNM3001).



❏ 4. Install the receiver to the fuselage. Follow the instructions for antenna installation that came with your brand of receiver. Be sure to place it on a cushion of 1/4" [6.4mm] foam. Secure it with tie wraps or Velcro.

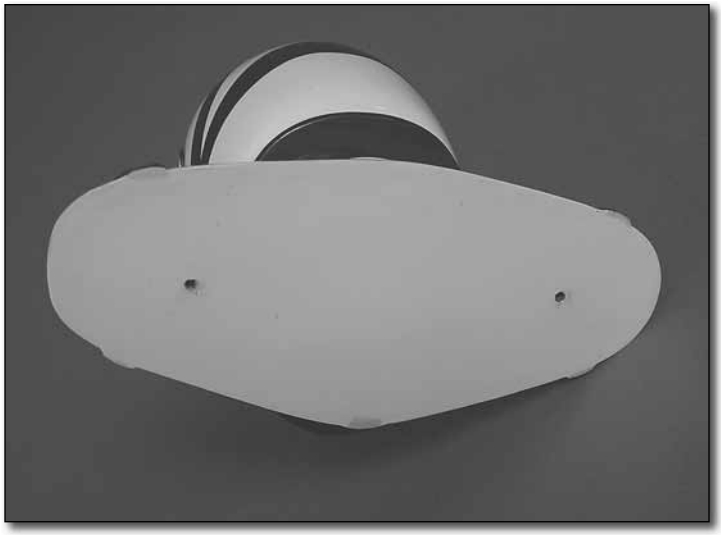


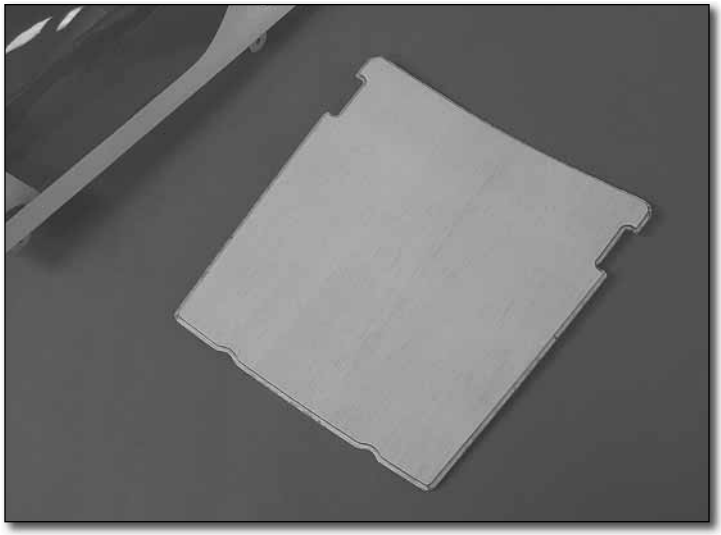
❏ 5. We used a 2.4GHz radio system. If you are going to use a 72MHz receiver, we have installed a tube for the antenna. Route the antenna into the tube.

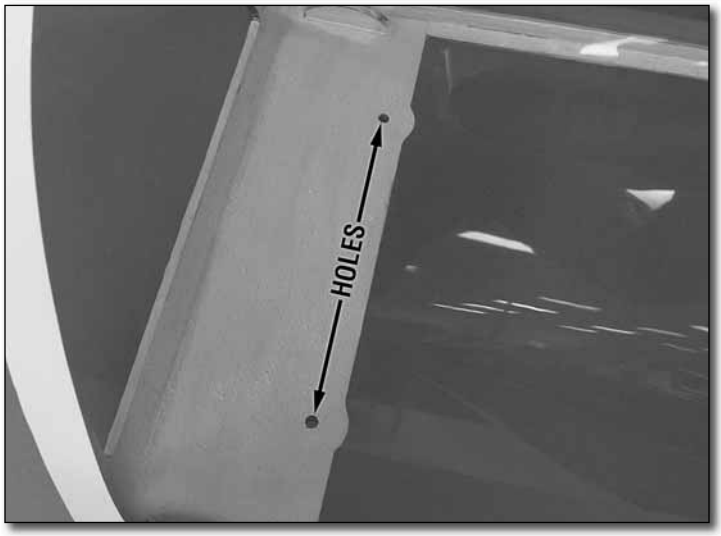
❏ 6. Plug all of the servo leads into the appropriate channels in the receiver. Depending on your transmitter you may wish to use separate channels for each of the four ailerons. For our set up we used “Y” connectors to have the ailerons in two channels. You can also use “Y” connectors to have all four servos work in one channel. Refer to your radio manual for the best use of the radio channels.

Install the Cockpit and Pilot

❏ 1. The pilot comes in two parts. Using 220-grit sandpaper, scuff the finish on the top of the neck and the bottom of the head. Glue the head to the body with epoxy.







❏ 2. On the bottom of the pilot are two holes and inside the pilot there are blind nuts to secure the pilot. Align the holes on the bottom of the pilot with the holes located at the back of the cockpit. Secure the pilot to the cockpit with 4-40 x 1/2" [12.7mm] machine screws, #4 flat washers and #4 lock washers.

❏ 3. Included in the kit is a cockpit floor. To keep some of the weight down you might choose not to install it. Installation is completely optional. If you wish to install the floor, glue it in place on the bottom of the cockpit canopy.

❏ 4. Install the canopy to the fuselage. Secure the canopy with four 4-40 x 3/4" [19.1mm] and four #4 flat washers. Be sure to use threadlocker on the screw.

Apply the Decals

1. The decals are all pre-cut. Simply remove the decal from the sheet.

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

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

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

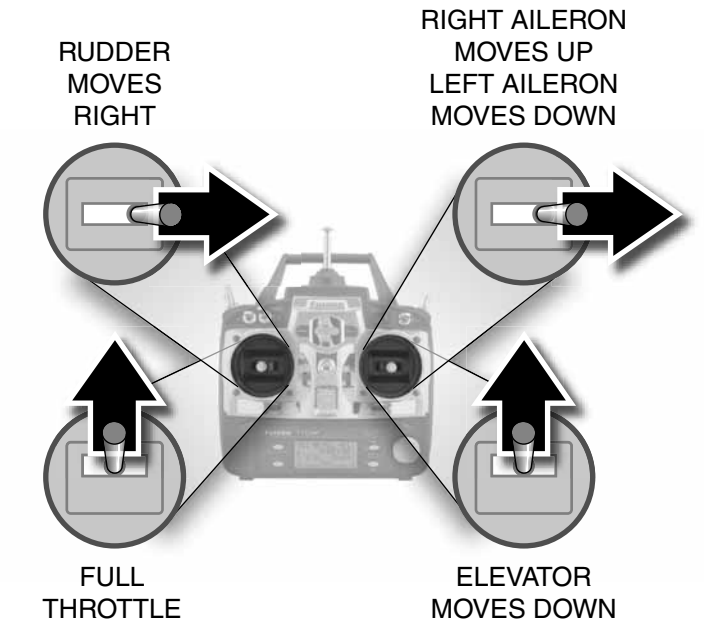
GET THE MODEL READY TO FLY

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.

4-CHANNEL RADIO SET UP (STANDARD MODE 2)



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

Set the Control Throws

To ensure a successful first flight, set up your Pitts M-12s according to the control throws specified in this manual. The throws have been determined through actual flight testing and accurate record-keeping, allowing the model to perform in the manner in which it was intended. If, after you have become accustomed to the way the Pitts M-12s flies, you would like to change the throws to suit your taste, that is fine. However, too much control throw could make the model too responsive and difficult to control, so remember, "more is not always better."

❏ 1. Use a box or something similar to prop up the bottom of the fuselage so the horizontal stabilizer and wing will be level.

*Measure the **high rate** elevator throw first…*

❏ 2. Hold a ruler vertically on your workbench against the widest part (front to back) of the trailing edge of the elevator. Note the measurement on the ruler.

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

❏ 4. Referring to the ***Proper Pushrod Hookup*** illustrations on the opposite page, adjust the location of the pushrod on the servo arm or on the elevator horn and program the ATVs in your transmitter to increase or decrease the throw according to the measurements in the control throws chart.

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

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

These are the recommended control surface throws:

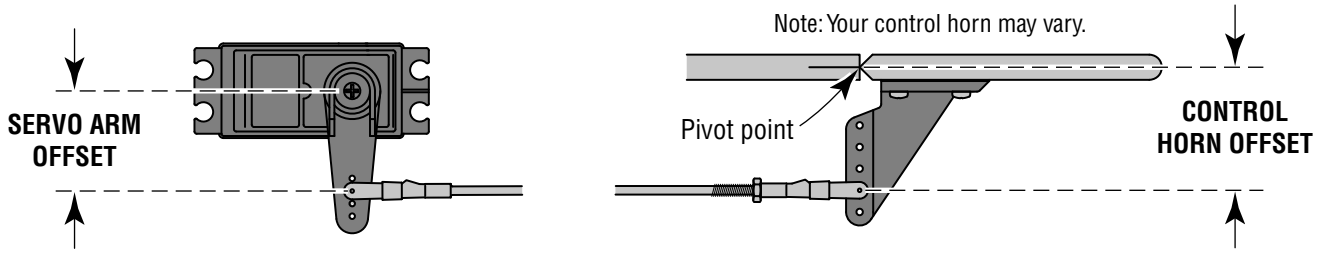
	3D RATE		HIGH RATE		LOW RATE	
ELEVATOR	**Up**	**Down**	**Up**	**Down**	**Up**	**Down**
	2-7/8" [73mm] 29°	2-7/8" [73mm] 29°	1-1/4" [32mm] 12°	1-1/4" [32mm] 12°	1" [25mm] 10°	1" [25mm] 10°
RUDDER	**Right**	**Left**	**Right**	**Left**	**Right**	**Left**
	6" [152mm] 30°	6" [152mm] 30°	3" [76mm] 14°	3" [76mm] 14°	2" [51mm] 10°	2" [51mm] 10°
AILERONS	**Up**	**Down**	**Up**	**Down**	**Up**	**Down**
	2" [51mm] 33°	2" [51mm] 33°	1" [25mm] 16°	1" [25mm] 16°	3/4" [19mm] 12°	3/4" [19mm] 12°

Note: *The use of exponential will make the plane less sensitive at the center of the control gimbals on the radio. We programmed -40% exponential on our Futaba radios. Check your manufacturer's instructions for exponential settings. You may need to program positive exponential instead of negative exponential as is done for Futaba radios.*

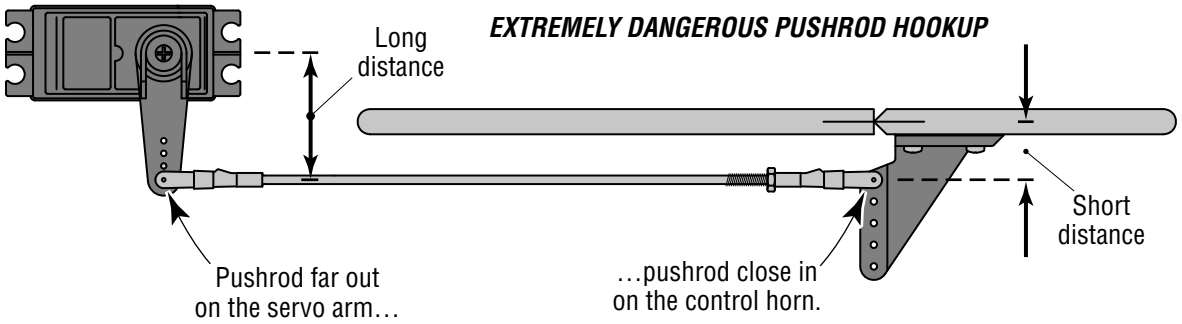
In addition to exponential we found a 13% rudder to aileron mix helped to minimize roll coupling in knife edge flight.

The following are general guidelines for hooking up pushrods to the control surface and the servo. The installation method used throughout this manual provided safe, effective control and allows you to achieve all of the required control throws. If for some reason you have decided to hook up the controls differently than we outlined, please review the following to assure you have a safe set up.

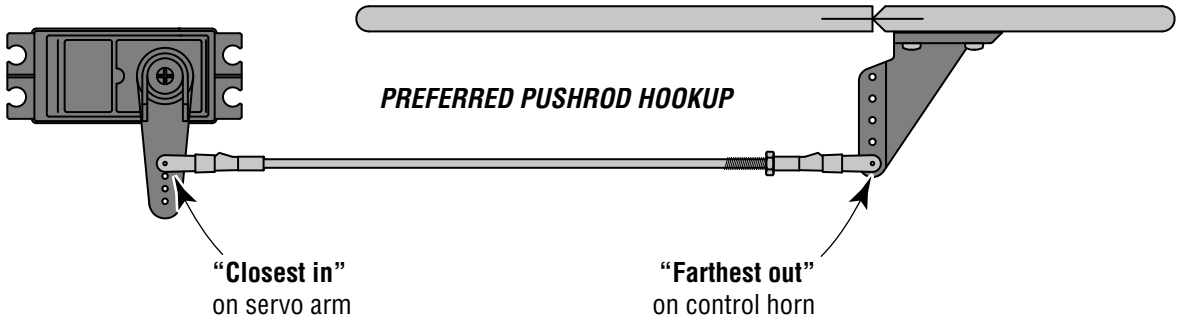
Proper Pushrod Hookup; Avoiding Flutter, Maximizing Servo Output Torque



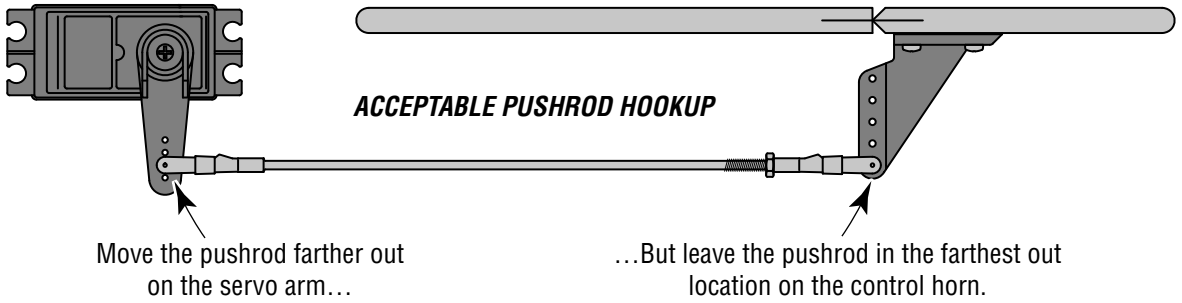
When connecting pushrods and setting up your control throws, it is **critically important** to use proper pushrod geometry—that is the distance from the pushrod on the servo arm to the center of the output shaft (**servo arm offset**) compared to the distance from the pushrod on the control horn to the pivot point (**control horn offset**).



One particularly dangerous situation arises when the pushrod on the servo arm is too "far out" and the pushrod on the control horn is too "close in." This setup is usually chosen by pilots who are trying to achieve maximum, "monster" control throws for 3D flight. But with your pushrods set up this way, any free play (slop) in the linkages or servo will be greatly magnified, possibly causing destructive control surface flutter. Additionally, if you have to turn your ATVs way down for "normal" throw, the result will be poor resolution and poor servo holding/centering capabilities. More importantly, too much force may be transmitted back to the servo, possibly causing control surface blowback, stripped servo gears or stripped servo arms—the latter two likely causing a crash.



Here is an optimum pushrod setup—the pushrod is "close in" on the servo arm and "far out" on the control horn. This situation gives the greatest mechanical advantage of the servo over the control surface which will increase the servo's centering capabilities and output torque, minimize any free play in the system and allow high ATV settings for optimum servo resolution and positive control "feel." **Note:** When the pushrod is "close in" on the servo arm, make certain the servo arm can travel through its full range of movement without the pushrod (or clevis or other type of connector) interfering with the servo arm, output shaft or servo case.

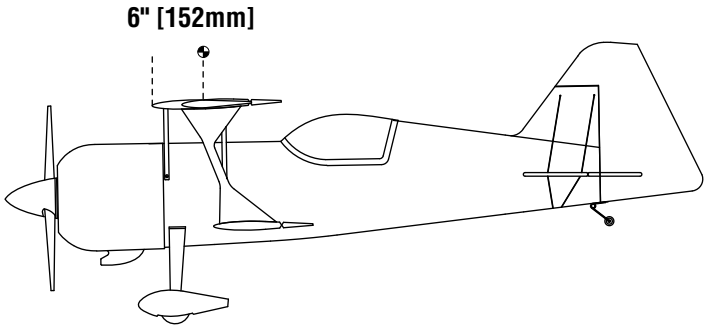


If the optimum situation doesn't provide enough control throw, the pushrod may be moved inward on the control horn, but it's better to go **farther out** on the servo arm because this will introduce less free play than the alternative. Only after moving the pushrod all the way out on the servo arm, if you still can't get the throw required, you'll have to resort to moving the pushrod closer in on the control horn. **Note:** If you have a computer radio, it is always desirable to set your ATVs to 100% (or as near 100% as possible to achieve the control throw required). If setting up a model that requires extraordinary control surface throw (for 3D flying for example), start by "maxing-out" your ATVs (typically 130% -- 140%). Then, the dual rates in your "normal" flight mode will still be acceptably high (70% -- 80%) for good servo resolution.

Balance the Model (C.G.)

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

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



❏ 1. Use a fine-point felt tip pen to mark lines on the bottom of the top wing 6" [152mm] back from the leading edge of the center section of the top wing. Apply narrow (1/16" [1.6mm]) strips of tape over the lines so you will be able to feel them when lifting the model with your fingers.

This is where your model should balance for the first flights. Later, you may experiment by shifting the C.G. 1/4" [6.4mm] forward or 1/2" [12.7mm] back to change the flying characteristics. Moving the C.G. forward will improve the smoothness and stability, but the model will then be less aerobatic (which may be fine for less-experienced pilots). Moving the C.G. aft makes the model more maneuverable and aerobatic for experienced pilots. In any case, **start at the recommended balance point** and do not at any time balance the model outside the specified range.

❏ 2. With the wing attached to the fuselage, all parts of the model installed (ready to fly) and an empty fuel tank, lift it at the balance point you marked.

❏ 3. If the tail drops, the model is "tail heavy." If possible, move the battery pack and/or receiver forward to get the model to balance. If the nose drops, the model is "nose heavy." If possible, move the battery pack and/or receiver aft. If the receiver and/or battery cannot be moved, or if additional weight is still required, nose weight or tail weight may be added. Use Great Planes "stick-on" lead (GPMQ4485). To find out how much weight is required, place incrementally increasing amounts of weight on the top of the fuselage over the location where it would be mounted inside until the model balances. A good place to add stick-on nose weight is to the firewall. Do not attach weight to the cowl—this will cause the mounting screws to open up the holes in the cowl. 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: If mounting weight where it may be exposed to fuel or exhaust, do not rely upon the adhesive on the back to permanently hold it in place. Over time, fuel and exhaust residue may soften the adhesive and cause the weight to fall off. Instead, permanently attach the weight with glue or screws.

❏ 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

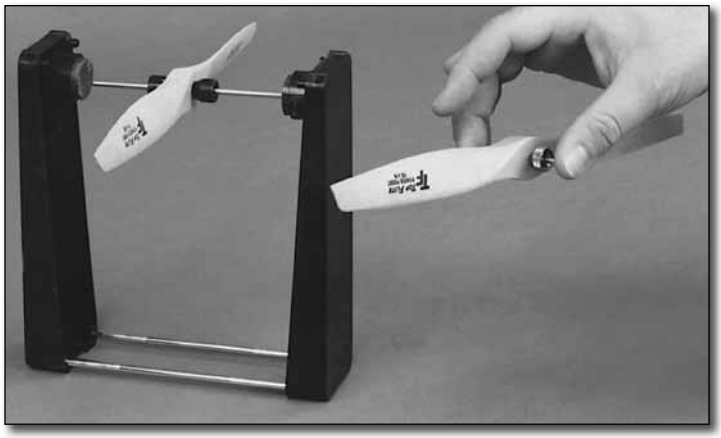
No matter if you fly at an AMA sanctioned R/C club site or if you fly somewhere on your own, you should always have your name, address, telephone number and AMA number on or inside your model. It is **required** at all AMA R/C club flying sites and AMA sanctioned flying events. Fill out the identification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

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

ENGINE SAFETY PRECAUTIONS

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

- Keep all engine fuel in a safe place, away from high heat, sparks or flames, as fuel is very flammable. Do not smoke near the engine or fuel; and remember that engine exhaust gives off a great deal of deadly carbon monoxide. Therefore **do not run the engine in a closed room or garage**.
- Get help from an experienced pilot when learning to operate engines.
- Use safety glasses when starting or running engines.
- 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 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.

This model belongs to:

Name

Address

City, State, Zip

Phone Number

AMA Number

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.**

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 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

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. 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 Pitts M-12s 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. 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. Continue to lose altitude, but maintain airspeed by keeping the nose down as you turn onto the crosswind leg. Make your final turn toward the runway (into the wind) keeping the nose down to maintain airspeed and control. Level the attitude when the model reaches the runway threshold, modulating the throttle as necessary to maintain your glide path and airspeed. If you are going to overshoot, smoothly advance the throttle (always ready on the right rudder to counteract torque) and climb out to make another attempt. When you're ready to make your landing flare and the model is a foot or so off the deck, smoothly increase up elevator until it gently touches down. 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.

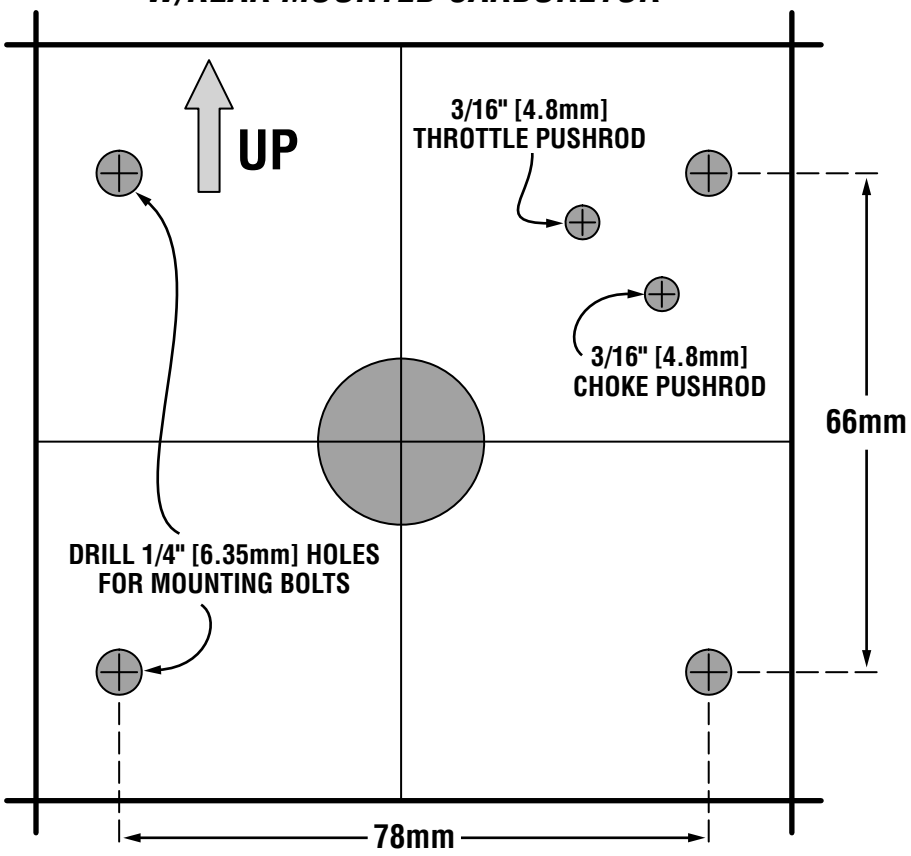
One final note about flying your model. Have a goal or flight plan in mind for **every** flight. This can be learning a new maneuver(s), improving a maneuver(s) you already know, or learning how the model behaves in certain conditions (such as on high or low rates). This is not necessarily to improve 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!

DA-50-R 50cc GASOLINE ENGINE W/REAR MOUNTED CARBURETOR



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