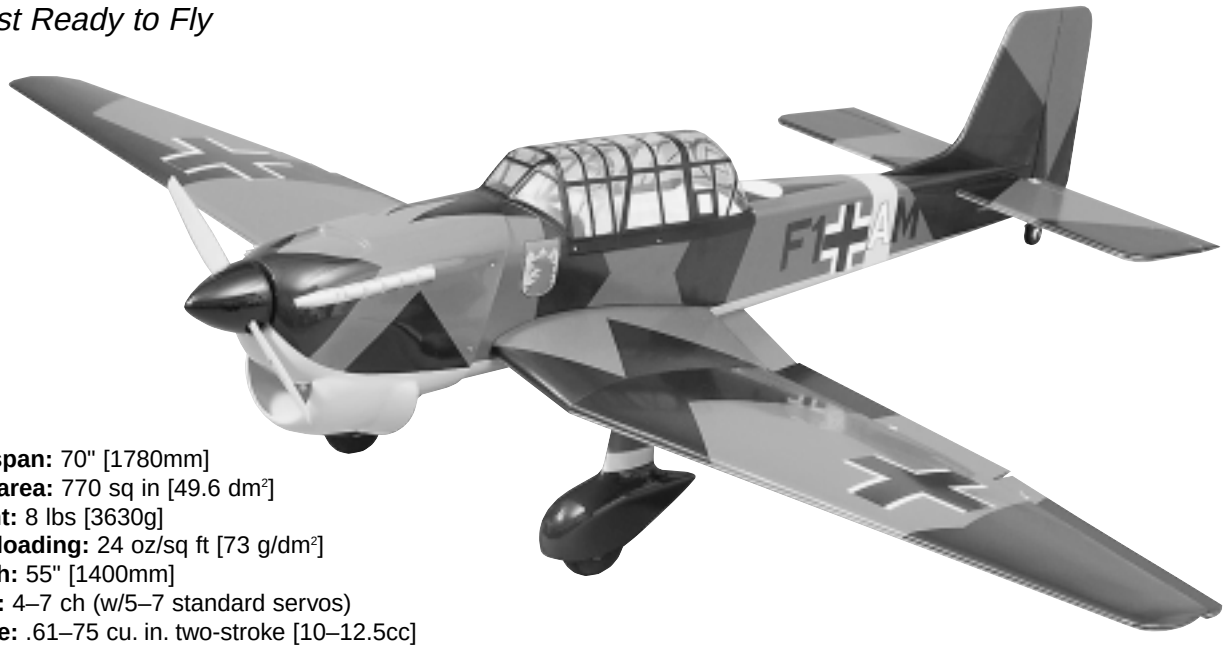
Ju-87 Stuka

INSTRUCTION MANUAL

A. R. F.

Almost Ready to Fly



Wingspan: 70" [1780mm]
Wing area: 770 sq in [49.6 dm^2]
Weight: 8 lbs [3630g]
Wing loading: 24 oz/sq ft [73 g/dm^2]
Length: 55" [1400mm]
Radio: 4–7 ch (w/5–7 standard servos)
Engine: .61–75 cu. in. two-stroke [10–12.5cc]
.91 cu. in. four-stroke [15cc]

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.

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

GREAT PLANES® MODEL MANUFACTURING COMPANY
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(217) 398-8970, Ext 2
airsupport@greatplanes.com

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INTRODUCTION

For the latest technical updates or manual corrections for the Stuka, visit the web site listed below and select the Great Planes Stuka ARF. A “tech notice” box will appear in the upper left corner of the page if there is new technical information or changes to this kit.

http://www.greatplanes.com/airplanes/index.html

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

1. Your Stuka 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 Stuka, if not assembled and operated correctly, could possibly cause injury to yourself or spectators and damage property.

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

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

4. You must use an R/C radio system that is in first-class condition, and a correctly sized engine and components (fuel tank, wheels, etc.) throughout the building process.

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

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

7. If you are not already an experienced R/C pilot, you should fly the model only with the help of a competent, experienced R/C pilot.

We, as the kit manufacturer, provide you with a top quality 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.

If you 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.

In addition to joining an R/C club, we strongly recommend you join the AMA (Academy of Model Aeronautics). AMA membership is required to fly at AMA sanctioned clubs. There are over 2,500 AMA chartered clubs across the country. Among other benefits, the AMA provides insurance to its members who fly at sanctioned sites and events. Additionally, training programs and instructors are available at AMA club sites to help you get started the right way. Contact the AMA at the address or toll-free phone number below:

Academy of Model Aeronautics
5151 East Memorial Drive
Muncie, IN 47302-9252
Tele. (800) 435-9262
Fax (765) 741-0057

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

DECISIONS YOU MUST MAKE

This is a partial list of items required to finish the Stuka that may require planning or decision-making before starting to build.

Radio Equipment
The Stuka will require a good 4–7 channel radio system or greater with 7 servos. The servos need to have a minimum of 40 oz. of torque. In addition you will need two 12" aileron extensions and two 6" aileron extensions and two "Y" connectors.

Engine Recommendations
The recommended engine size range for the Stuka is a .61–.75 two-stroke or a .91 four-stroke. If an engine in the upper end of the size range is used, remember that this is a scale model that is intended to fly at scale-like speeds, so throttle management should be practiced.

ADDITIONAL ITEMS REQUIRED

Hardware and Accessories

In addition to the items listed in the **"Decisions You Must Make"** section, following is the list of hardware and accessories required to finish the Stuka. Order numbers are provided in parentheses.

- ❑ **Engine** – O.S.® 61 FX (OSMG0561), SuperTigre® G-61 (SUPG0181), O.S. 91 II Surpass™ (OSMG0896) or the SuperTigre G-75 (SUPG0205)
- ❑ **Radio** – Futaba® 6XAS (FUTK30**)
- ❑ **Propellers** – Follow engine manufacturer's recommendation
- ❑ **Fuel line** – 12" medium silicone fuel line
- ❑ Easy Fueler™ fuel filling valve for glow fuel (GPMQ4160)

Adhesives & Building Supplies

In addition to common household tools and hobby tools, this is the "short list" of the most important items required to build the Stuka. ***Great Planes Pro***™ *CA and Epoxy glue are recommended.*

- ❑ 1/2 oz. Thin Pro CA (GPMR6001)
- ❑ 1/2 oz. Medium Pro CA+ (GPMR6007)
- ❑ 6-Minute Epoxy (GPMR6045)
- ❑ 30-Minute Epoxy (GPMR6047)
- ❑ Hobby knife (HCAR0105)
- ❑ #11 blades (HCAR0211)
- ❑ Small T-pins (HCAR5100)
- ❑ Builder's triangle (HCAR0480)
- ❑ Electric drill
- ❑ Small phillips and flat blade screwdrivers (HCAR1040)
- ❑ Pliers with wire cutter (HCAR0630)
- ❑ Silicone sealant

Optional Supplies & Tools

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

- ❑ Great Planes CG Machine™ (GPMR2400)
- ❑ Top Flite® Precision Magnetic Prop Balancer™ (TOPQ5700)
- ❑ Straightedge with scale (HCAR0475)
- ❑ Masking tape (TOPR8018)
- ❑ CA Applicator tips (GPMR6033)
- ❑ CA Debonder (GPMR6039)
- ❑ CA Accelerator (GPMR6034)
- ❑ Epoxy brushes (GPMR8060)
- ❑ Mixing sticks (GPMR8055)
- ❑ Threadlocker (GPMR6060)
- ❑ Rubbing alcohol (for epoxy clean up)
- ❑ Builder's Triangle Set (HCAR0480) (for fin alignment)
- ❑ Felt-Tip marker (TOPQ2510)
- ❑ Drill bits used: 1/16", 17/64" (or 1/4"), #48 (or 5/64"), #29 (or 9/64") drill and 6-32 tap
- ❑ Great Planes 8-32 tap and drill set (GPMR8103)
- ❑ Curved Tip Canopy Scissors for trimming plastic parts (HCAR0667)
- ❑ Dead Center™ Engine Mount Hole Locator (GPMR8130)
- ❑ Great Planes AccuThrow™ Deflection Gauge (for measuring control throws, GPMR2405)

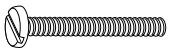
IMPORTANT BUILDING NOTES

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

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

This is a number six screw that is 3/4" long.

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



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

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

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

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

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

COMMON ABBREVIATIONS

Fuse = Fuselage
Stab = Stabilizer
Fin = Vertical Fin
LE = Leading Edge
TE = Trailing Edge
LG = Landing Gear
Ply = Plywood
" = Inches

ORDERING REPLACEMENT PARTS

To order replacement parts for the Great Planes Stuka ARF, use the order numbers in the **Replacement Parts List** that follows. Replacement parts are available only as listed. Not all parts are available separately (an aileron cannot be purchased separately, but is only available with the wing kit). Replacement parts are not available from Product Support, but can be purchased from hobby shops or mail order/Internet order firms. Hardware items (screws, nuts, bolts) are also available from these outlets. If you need assistance locating a dealer to purchase parts, visit **www.greatplanes.com** and click on "Where to Buy." If this kit is missing parts, contact **Great Planes Product Support**.

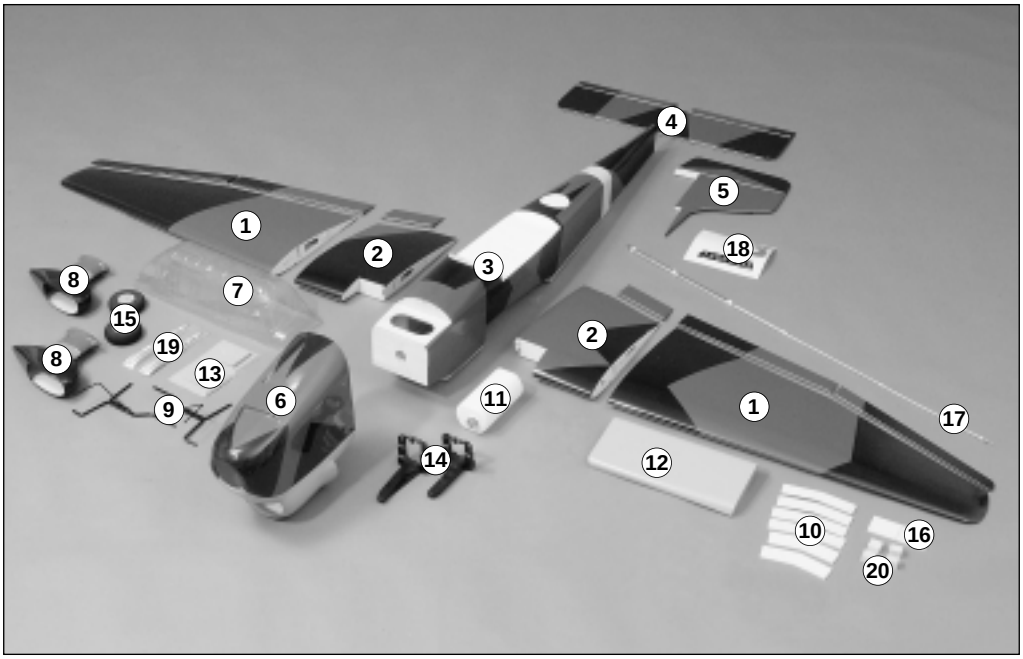
Replacement Parts List

Order Number	Description	How to Purchase
	Missing pieces	Contact Product Support
	Instruction manual	Contact Product Support
	Full-size plans	Not available
GPMA2220	Wing Kit	Contact Your Hobby Supplier to Purchase These Items
GPMA2221	Fuse Kit	
GPMA2222	Tail Set	
GPMA2223	Cowl	
GPMA2224	Canopy	
GPMA2225	Landing Gear	
GPMA2226	Wheel Pants	

KIT CONTENTS

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

Great Planes Product Support:
Phone: (217) 398-8970
Fax: (217) 398-7721
E-mail: airsupport@greatplanes.com



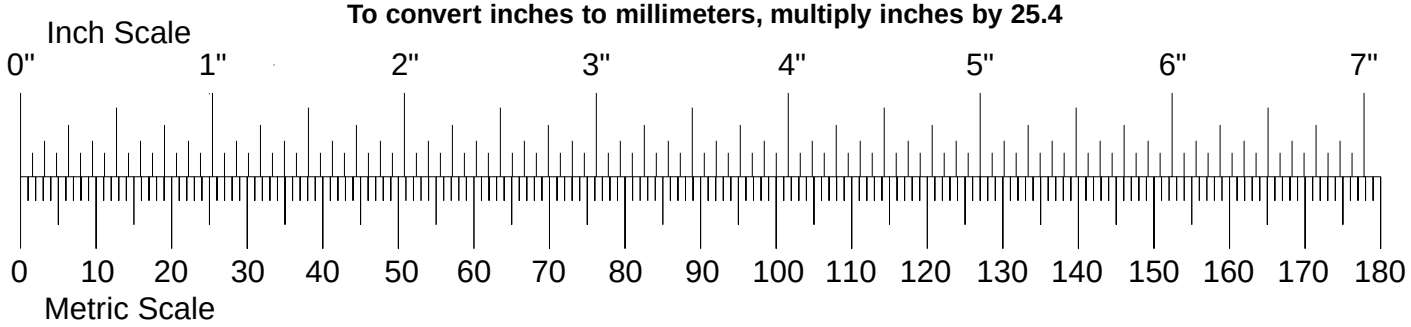
Kit Contents (Photographed)

1 L&R Wing with Ailerons & Flap
2 Inner Wing with Flaps
3 Fuselage
4 Stab with Elevators
5 Fin with Rudder
6 Painted Cowl
7 Canopy
8 Painted Wheel Pants (2)
9 Painted Aluminum Landing Gear (2)
10 Wing Joiners
11 Fuel Tank with Hardware
12 Wing Fairing
13 Aileron Servo Covers
14 Engine Mount
15 3" Wheel (2)
16 Wing Bolt Plate
17 Pushrods
18 Decals
19 Exhaust Stacks
20 Aileron Mounting Blocks (4)

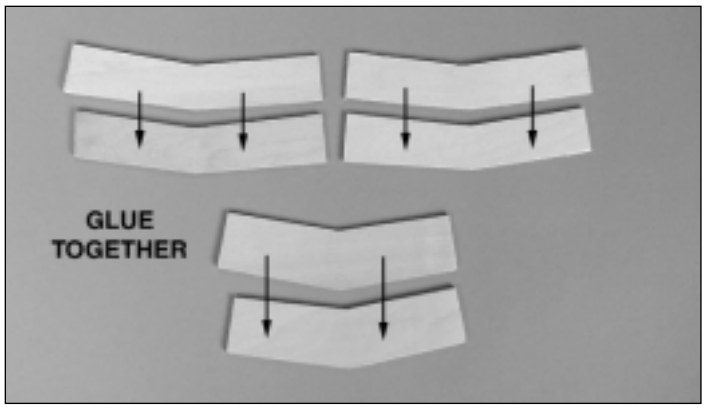
Kit Contents (Not Photographed)

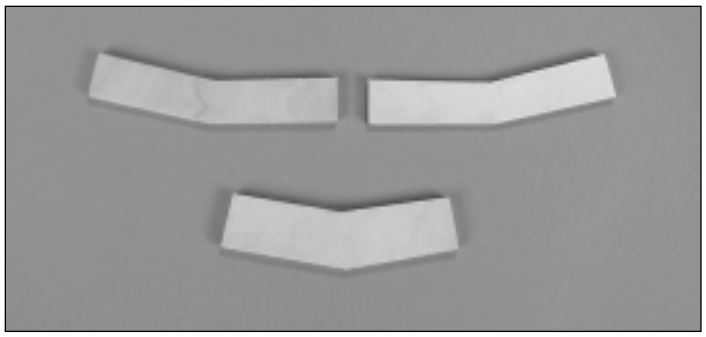
(1) 3" Black spinner
(2) Bolt-on axles
(4) 2.5mm ID brass tube x 15mm (flap mechanism)
(2) 2.5mm Steel pin x 25mm (flap mechanism)
(16) Nylon flap/aileron hinges
(1) 1-1/4" Tail wheel
(3) Large control horn
(4) Small control horn
(2) Nylon 1/4-20 bolt
(8) Nylon clevis
(8) Nylon landing gear straps
(1) 2" x 9" Hinge strip
(7) Faslinks
(8) Silicone clevis retainer
(56) #2 x 3/8" Sheet metal screw (landing gear straps, aileron covers, canopy, flap/aileron hinges)
(8) #2 x 1/2" Sheet metal screw (wheel pants)
(16) #2 Washers
(4) 5/32" Wheel collar
(6) 6-32 x 1/4" Socket head cap screw (for wheel collars and axles)
(1) 3/32" Wheel collar (for tail wheel)
(1) 4-40 Set screw (for tail wheel collar)
(6) #4 x 3/8" Sheet metal screw (mounting the cowl)
(6) #4 Washers (mounting the cowl)
(1) Wire tail wheel
(4) 1" x 1" Servo mounting tape (for mounting the aileron servos)
(3) 2-56 x 36" Pushrod
(1) 2-56 x 17-1/2" Pushrod
(4) 2-56 x 6" Pushrod
(4) 8-32 x 1" Socket head cap screw (engine mount)
(4) 8-32 x 3/4" Socket head cap screw (mounting the engine)
(8) #8 Washers

To convert inches to millimeters, multiply inches by 25.4

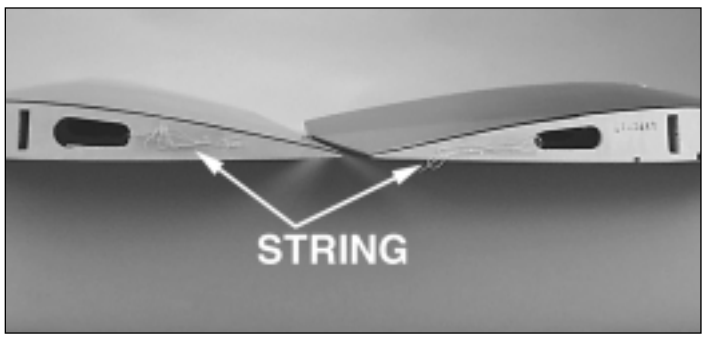


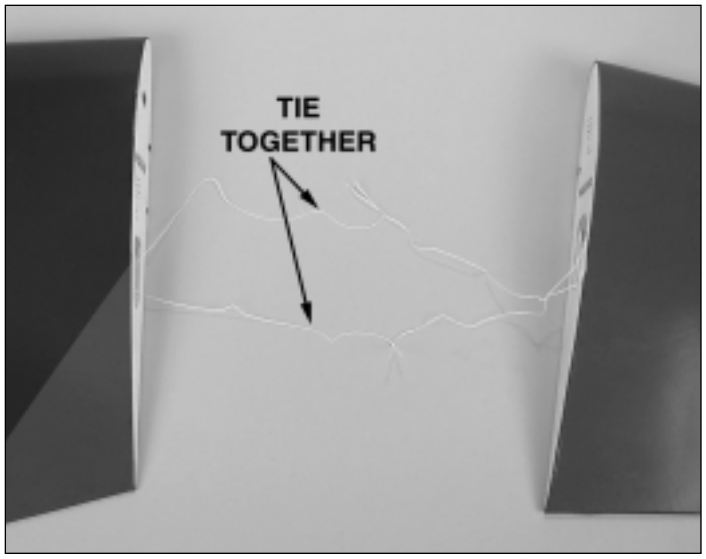
WING ASSEMBLY



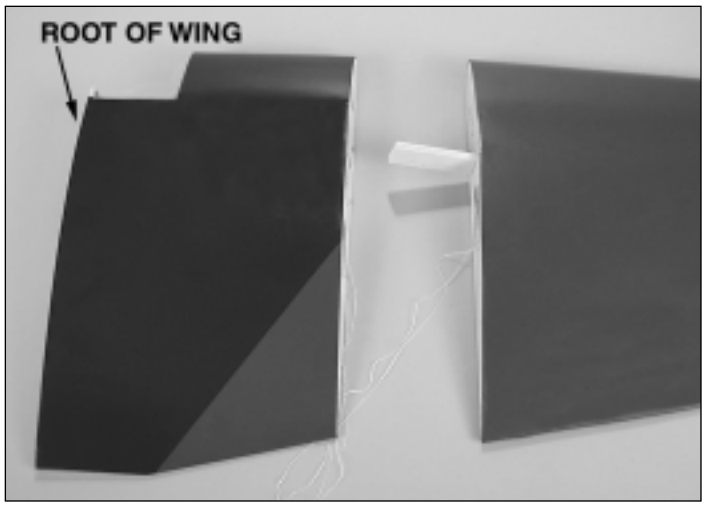


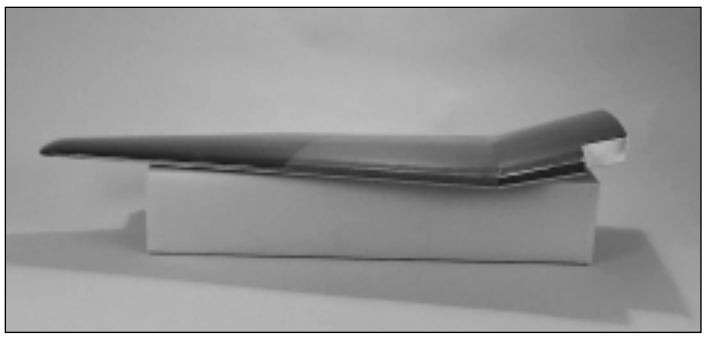
❏ 1. Locate the two plywood **center wing joiners** and four plywood **outer wing joiners.** Using 6-minute epoxy, glue two plywood center wing joiners together forming one 1/4" [6mm] center wing joiner. Do the same to the outer wing joiners, making two 1/4" [6mm] outer wing joiners.





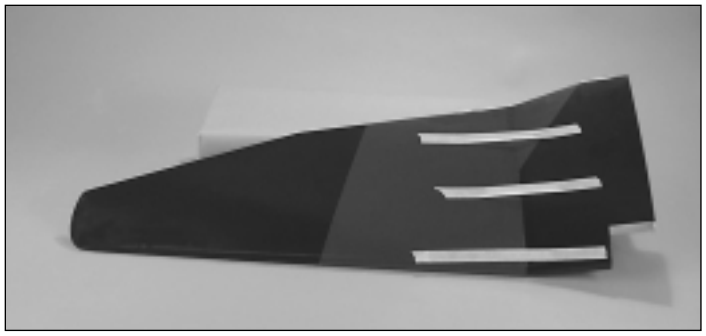
❏ ❏ 2. Locate the **right wing panel** and the **right inner wing panel.** At the root of each wing panel where the two panels join are two strings. Tie the strings together. The strings will be used for pulling the servo wires through the wing when the radio installation takes place.



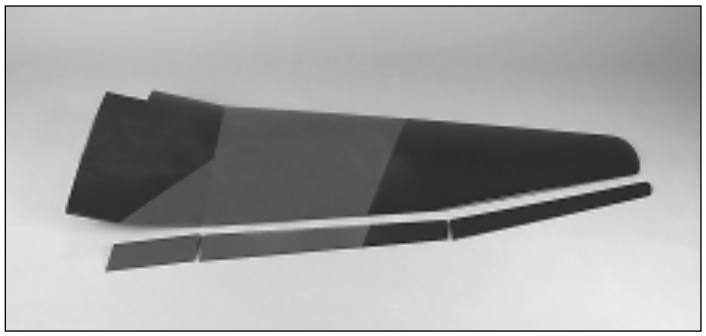


❏ ❏ 3. Test fit the outer wing joiner to the wing panel and the inner wing panel. Be sure the wing panel is assembled to the correct end of the inner wing panel. The end of the inner wing panel without the cut-out is the end of the panel that is glued to the wing panel. Be sure when fitting the joiner that the bend in the wing is going the proper direction (see photo). When you are satisfied that everything fits properly, use 30-minute epoxy to join the two wing sections and glue the joiner into the wing box in the wings (Be sure to use

ample glue to coat the wing box where the joiner goes into it) and apply epoxy to both wing ribs.

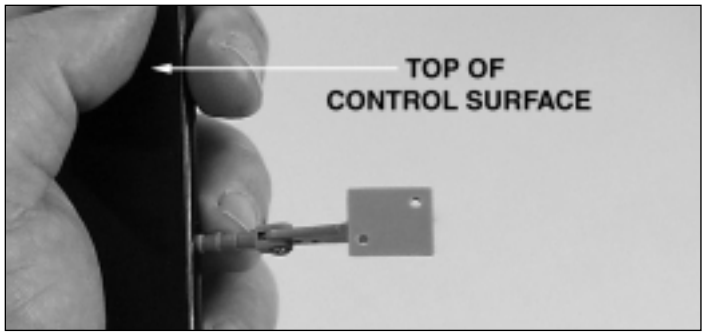


❏ ❏ 4. Hold the wing panel and the inner wing panel together with masking tape until the glue fully cures. Any excess epoxy that squeezes out of the wing joint can be cleaned away with rubbing alcohol as long as the glue has not cured.



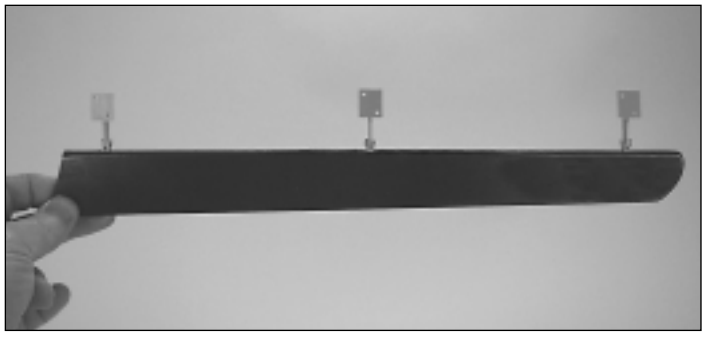
❏ ❏ 5. Locate the **right aileron, flap and inner flap.** It is easy to determine the right control surfaces from the left by matching the covering on the top of the wing with the covering on the top of the control surfaces.

❏ ❏ 6. On the leading edge of the aileron, flap and inner flap are pre-drilled holes for the hinges. Cut the covering away over the three holes in the leading edge of the aileron, three holes in the leading edge of the flap and two holes in the leading edge of the inner flap.

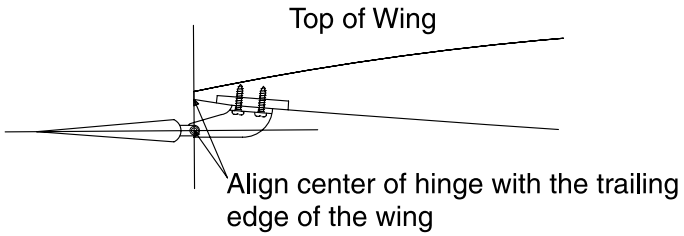


❏ ❏ 7. Test fit the **hinges** into each of the holes. Make note that when the hinges are properly installed the bottom of the hinge plate will face the top of the control surface.

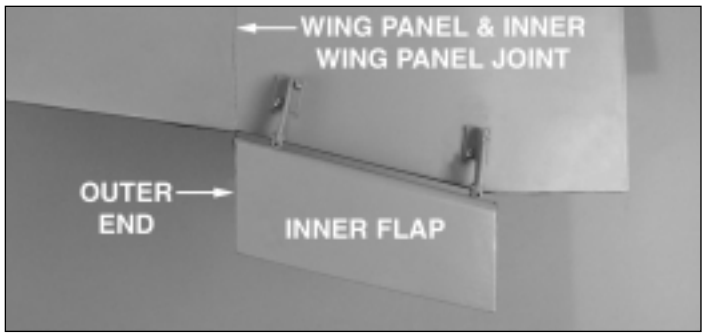
❏ ❏ 8. Apply a small drop of oil or a dab of petroleum jelly onto each of the hinge joints. This will prevent the glue from getting into the hinge joint when installing the hinges.



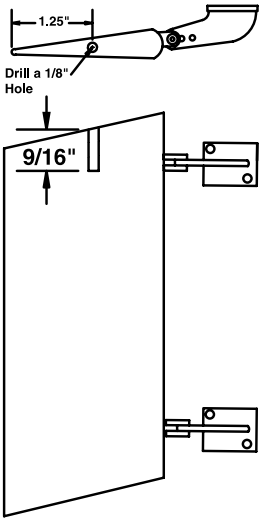
❏ ❏ 9. After each hinge has been lubricated, glue each hinge into the pre-drilled holes in the aileron and both flaps with 6-minute epoxy. Be sure that each hinge has the plate facing the top of the control surface as shown in the above photograph of the aileron.



❏ ❏ 10. Before mounting the control surfaces to the surface of the wing it is important to understand the positioning of the hinges to the wing. When mounted properly the aileron and flap are below the trailing edge of the wing and the hinge line should be even with the trailing edge of the wing. Study the illustration to be sure you understand exactly how they will be mounted.

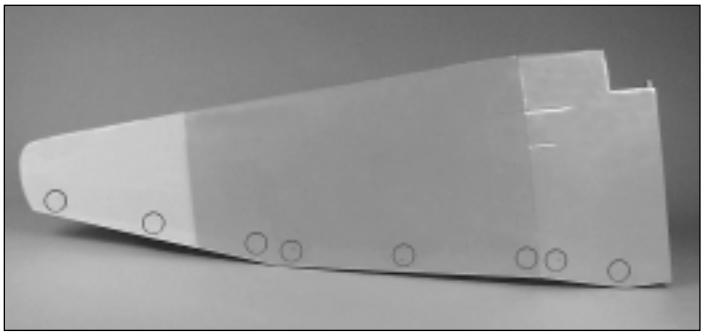


❏ ❏ 11. Begin the installation of the control surface with the inner flap. When it is installed it will be positioned as shown in the photograph. Do not install the inner flap yet. Reference the photograph to determine which end of your inner flap is the outboard end.

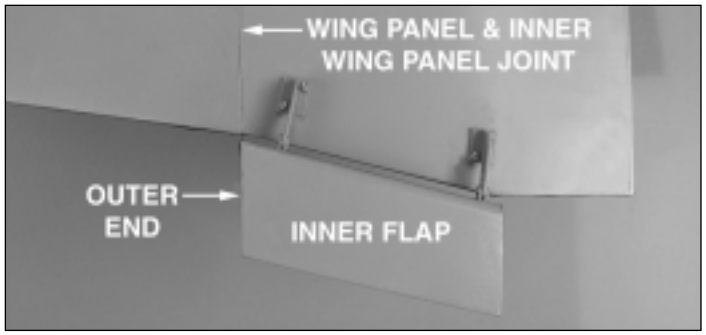


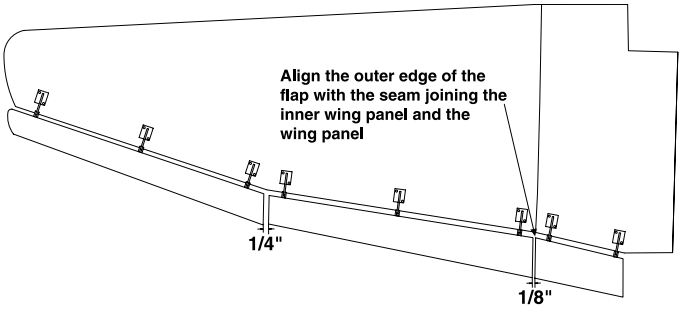
❏ ❏ 12. On the outboard end of the inner flap draw a line 1-1/4" [31mm] from the trailing edge of the inner flap. On this line mark the center of the flap and carefully drill a 1/8" [3mm] hole on this mark into the flap 9/16" [14.3mm], making sure you are centered in the flap and that the hole is drilled parallel to the leading edge of the flap.

❏ ❏ 13. Locate one of the 3/32" x 9/16" [2.5mm x 15mm] **brass tubes.** Insert it half way into the hole you drilled in the end of the inner flap. Place a small drop of medium CA glue onto the ***outside*** of the tube. Then press the tube all the way into the inner flap. *Be sure that CA glue does not get into the inside of the brass tube.*

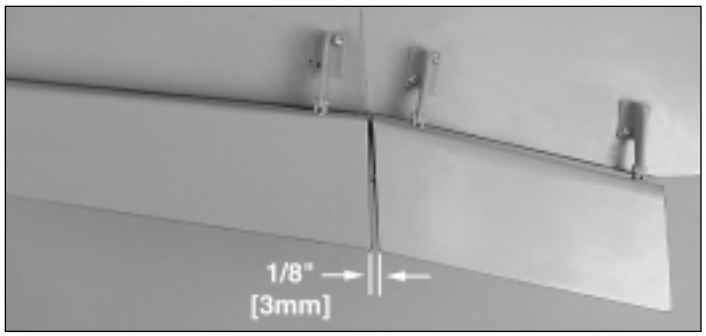


❏ ❏ 14. You are now going to proceed with installation of the flap and ailerons. Before installing the hinges you need to take a close look at the bottom of the wing. If you hold the wing and look across the face of the bottom of the wing at the trailing edge, you should be able to see the outline of eight circular wooden mounts. Refer to the above photograph. (For easy reference we have drawn the circles onto the covering. This should help you locate each of the mounts.) These mounts are what you will be screwing the hinge plates to as we proceed with installing the aileron and flaps. As you work through the installation of the flap and aileron be sure that you are screwing into these wood blocks.



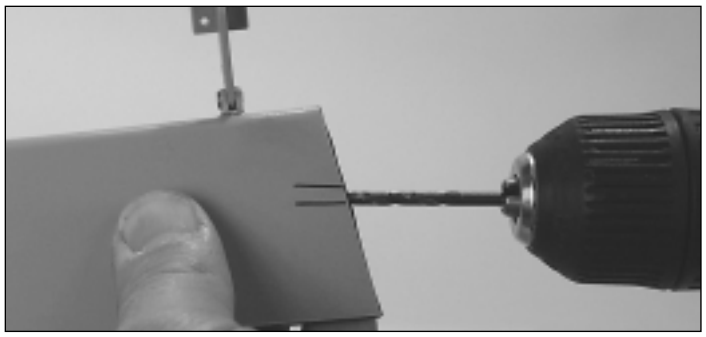


❏ ❏ 15. Position the inner flap onto the wing. When doing this the inner flap must line up with the joint where the inner wing panel and the wing are joined. The center of the hinge must also be in line with the trailing edge of the wing as shown in the sketch at step 10. Once you are satisfied with the position of the inner flap, mark the location for the mounting screws with a felt-tip marker onto the wing. Drill a 1/16" [1.5mm] hole through each of these marks into the wing. **BE CAREFUL NOT TO DRILL THROUGH THE TOP OF THE WING!** Once you have the holes drilled, install the inner flap with four #2 x 3/8" [9.5mm] screws.



❏ ❏ 16. Temporarily mount the main flap to the wing with a #2 x 3/8" [9.5mm] screw in the inboard and outboard hinge. The inside end of the flap must be located 1/8" [3mm] from the outer end of the inner flap. **(Refer to the sketch in step 15).**

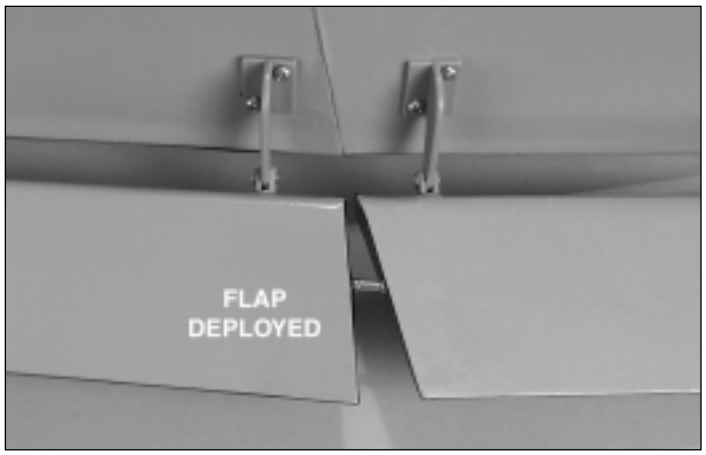
❏ ❏ 17. Insert the 2.5 x 25mm **steel pin** into the brass tube you installed in the inner flap. Position the inner flap with the steel pin so that the steel pin is resting on top of the flap. Draw a line on each side of the steel pin onto the flap.



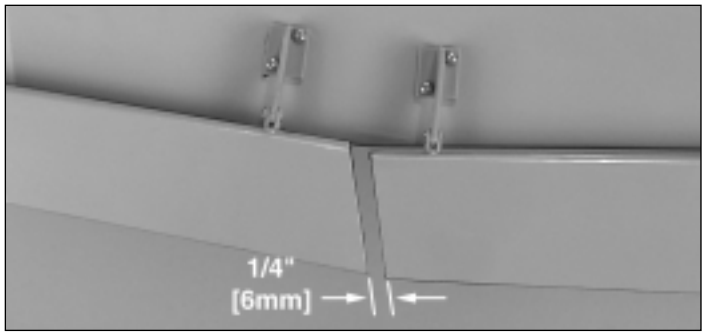
❏ ❏ 18. Drill a 1/8" [3mm] hole into the center of the end of the flap as you did for the inner flap. Be sure as you drill the hole that it is parallel to and centered between the lines you have drawn on the flap.

❏ ❏ 19. Locate another 2.5mm x 15mm brass tube. Insert it half way into the hole you drilled in the end of the flap. Place a small drop of medium CA glue onto the ***outside*** of the tube. Then press the tube all the way into the inner flap. *Be sure that CA glue does not get into the inside of the brass tube.*

❏ ❏ 20. Install the steel pin into the brass tube in the inner flap. Then slide the flap onto the steel pin extending from the inner flap. Mark the location for the mounting screws with a felt-tip marker onto the wing. Drill a 1/16" [1.5mm] hole through each of these marks into the wing. **BE CAREFUL NOT TO DRILL THROUGH THE TOP OF THE WING!** Once you have the holes drilled, install the flap with six #2 x 3/8" [9.5mm] screws.

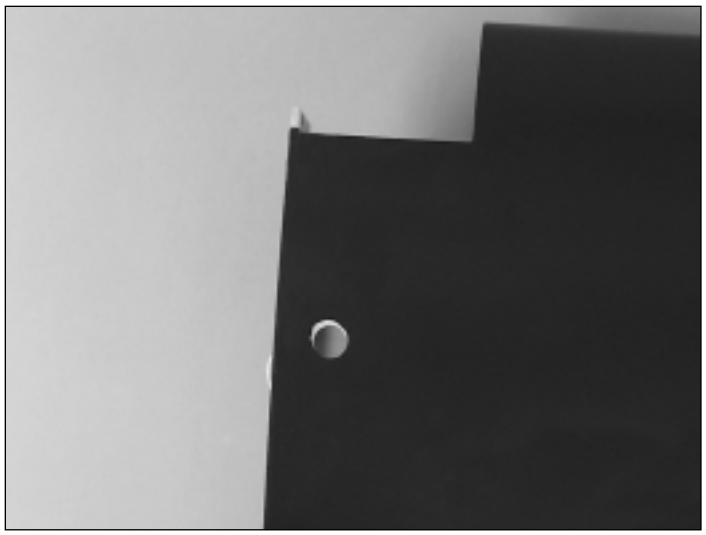


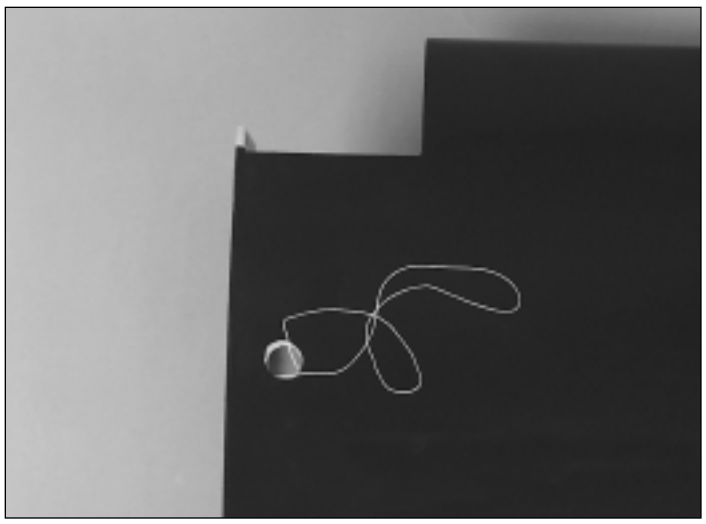
❏ ❏ 21. With the flap and inner flap mounted to the wing you can now see how the flap and inner flap are tied together by the steel pin and how they will move together when the flaps are deployed. (If there is any binding between the inner flap and the flap, you may be able to get a smoother operation if you put a slight bend in the steel pin. This should only be necessary if you do not get the hole for the brass tube in perfect alignment.)



❏ ❏ 22. Position the inner end of the aileron 1/4" [6mm] from the outer end of the flap (refer to the sketch in step 15). Install the aileron by marking the location for the mounting screws with a felt-tip marker onto the wing. Drill a 1/16" [1.5mm] hole through each of these marks into the wing. **BE CAREFUL NOT TO DRILL THROUGH THE TOP OF THE WING!** Once you have the holes drilled, install the aileron with six #2 x 3/8" [9.5mm] screws.

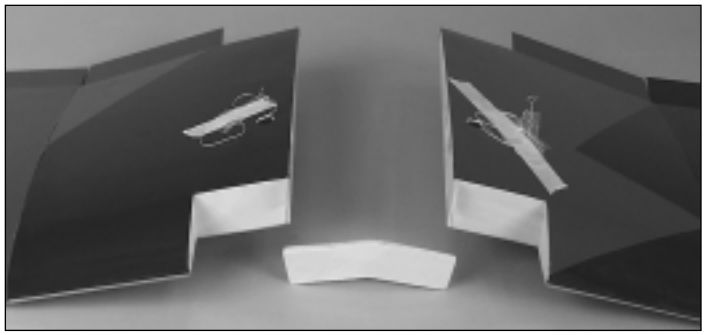
❏ ❏ 23. On the bottom of the wing, cut away the covering from the two servo bays and the landing gear mounting rails.

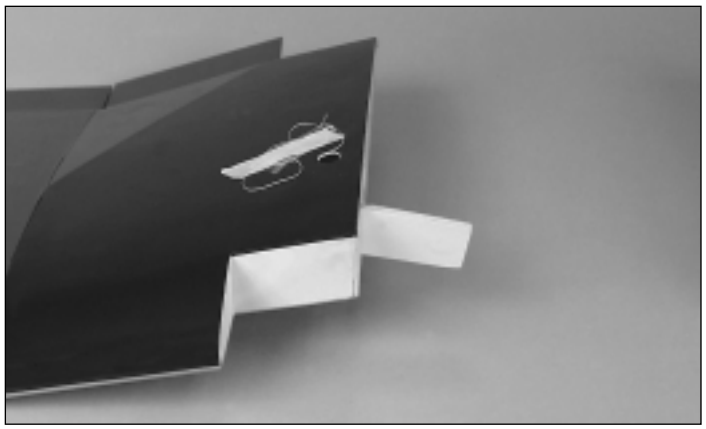




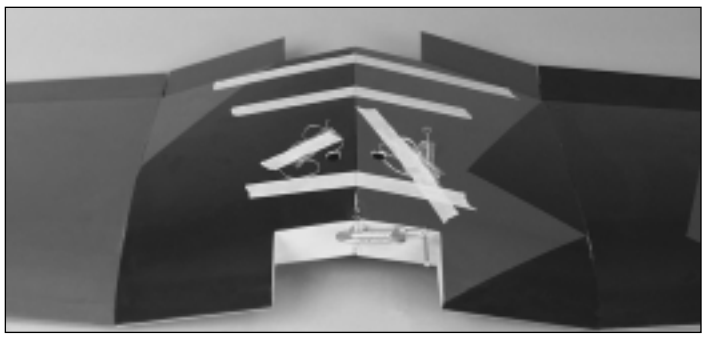
❏ ❏ 24. Cut away the covering in the top of the wing to reveal the holes that the servo leads come through. After cutting the hole, feed the string from inside of the wing through the hole. This will allow you to pull the servo leads through the wing after the two wing halves are joined.

❏ 25. Repeat steps 2 to 24 for the left wing panel.



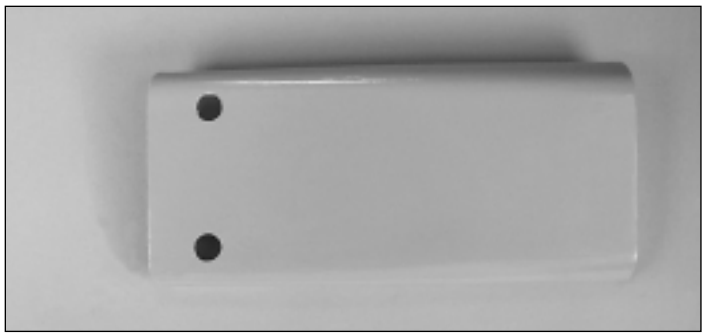


❏ 26. Locate the plywood center wing joiner. Test fit it into the right and left wing halves. When fitting it into the wing, make sure that the joiner angles downward.

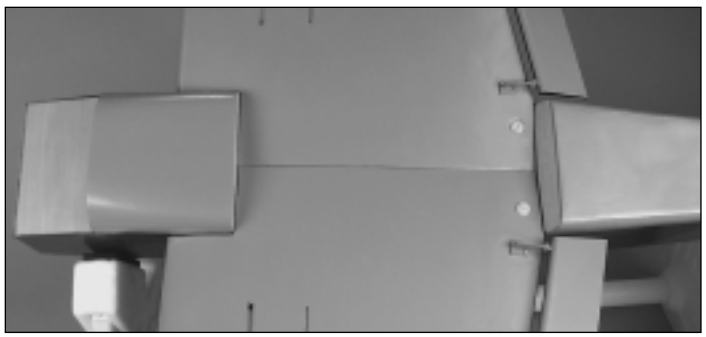


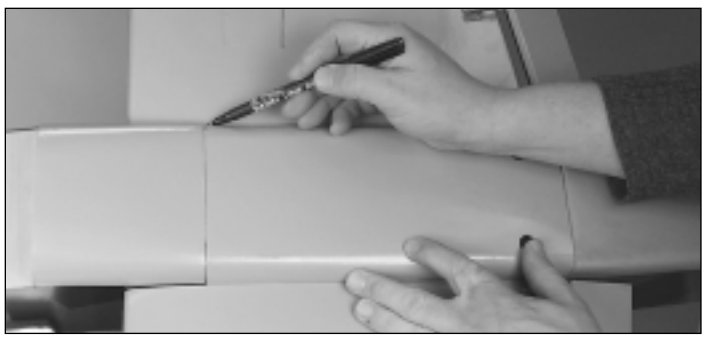
❏ 27. When you are satisfied that the two wing halves fit well together, apply a liberal amount of 30-minute epoxy to the joiner, the joiner box and the wing root ribs. Insert the wing joiner into one of the wings and then install the opposite wing onto the other end of the wing joiner. Put a clamp onto the tab that extends forward from the center of the wing and use masking tape to hold the wings together while the glue is curing.

❏ 28. After the glue has cured, cut away the covering on the top and bottom of the wing at the trailing edge of the wing to expose the two holes for the nylon wing bolts to pass through.

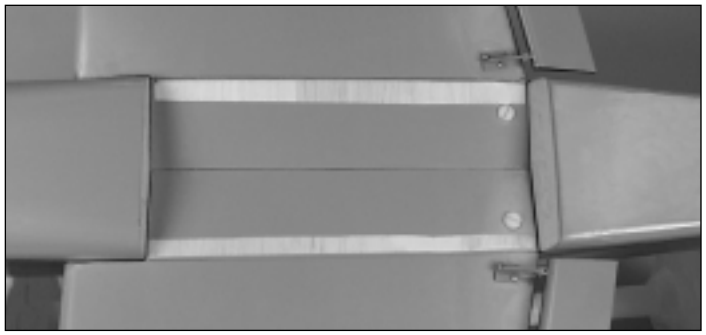


❏ 29. Locate the **wing fairing.** Cut away the covering to expose the two holes for the wing bolts.

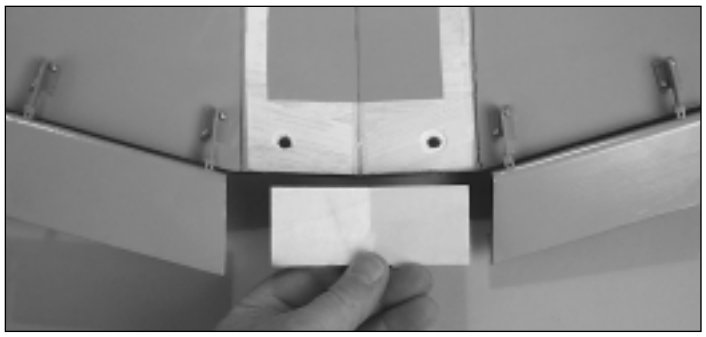


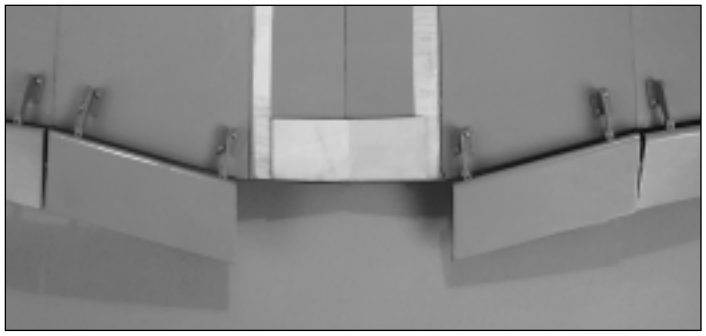


❏ 30. Mount the wing onto the fuselage with the nylon **wing bolts**. Set the wing fairing onto the wing in line with the fuselage. Draw a line on each side of fairing. Then remove the fairing and the wing.

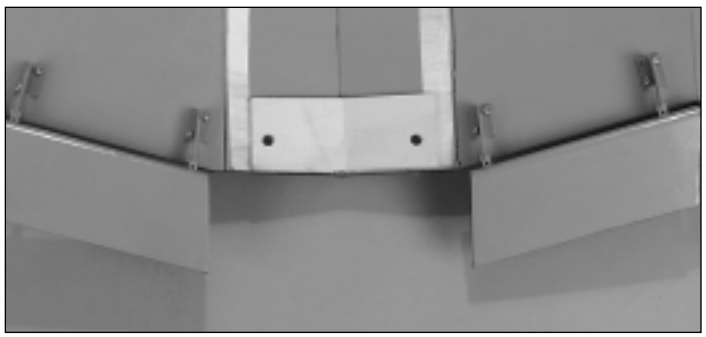


❏ 31. Cut away a 1/2" [13mm] strip of covering inside each of the lines you have drawn. Be careful not to cut into the surface of the wing sheeting. This could weaken the structure of the wing.

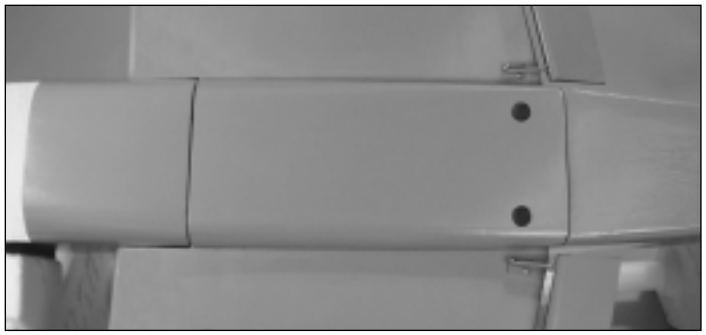




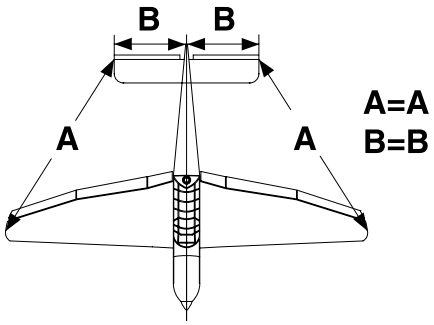
❏ 32. Locate the plywood **wing bolt plate.** Flex it to fit it to the trailing edge of the wing. Draw a line on the covering to mark the location of the wing bolt plate. Then cut the covering away and glue the wing bolt plate to the wing with 6-minute epoxy.



❏ 33. After the glue has cured, turn the wing over. Use a 17/64" [6.7mm] drill bit to drill through the holes from the top of the wing, drilling through the wing bolt plate.

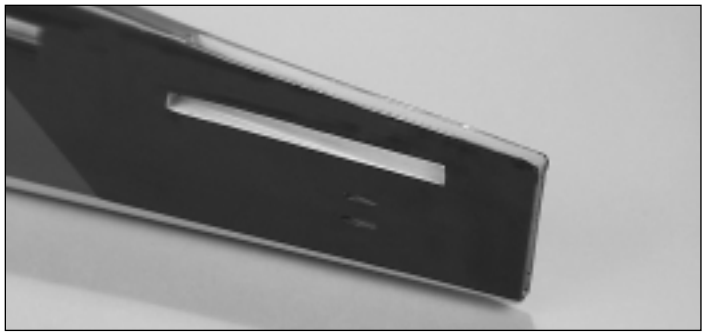


❏ 34. Glue the wing fairing in place on the wing with 6-minute epoxy.



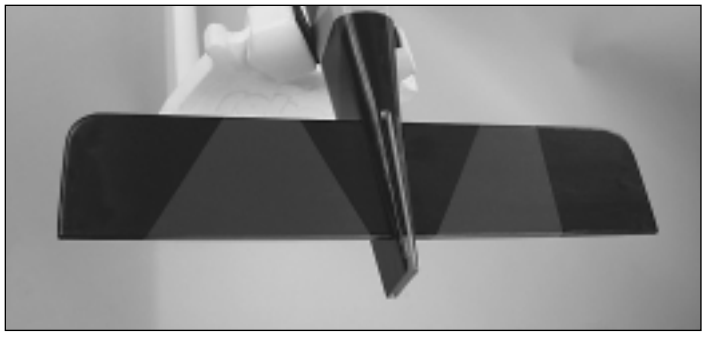
❏ 4. Measure from the end of the stab to each wing tip and from the center of the fuselage out to the end of the stab as shown in the sketch.

FUSELAGE ASSEMBLY



❏ 1. Cut away the covering from the rear of the fuselage to reveal the slots for the fin, stab and the holes for the pushrods. There are two holes for the pushrods on the left side of the fuselage and one hole on the right side.

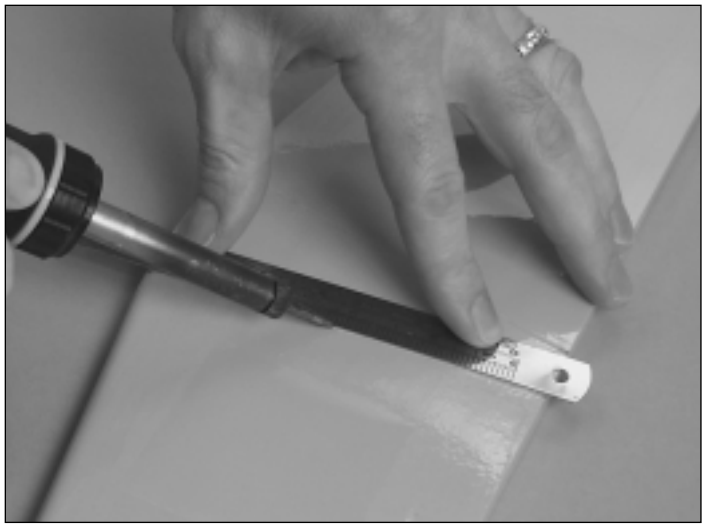
❏ 2. Bolt the wing onto the fuselage.



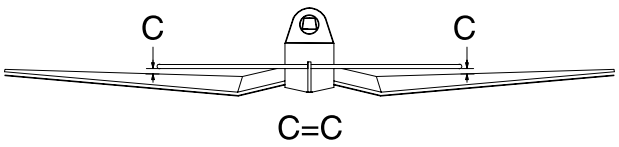
❏ 3. Slide the horizontal stabilizer into the slot in the fuselage.

❏ 5. Once you have the stab properly positioned, mark the outline of the fuselage on the top and bottom of the stab. Remove the stab from the fuse. Use a sharp #11 hobby knife or use the **Expert Tip** that follows to cut the covering from the stab along the lines you marked. Use care to cut **only into the covering** and **not** into the wood.

EXPERT TIP

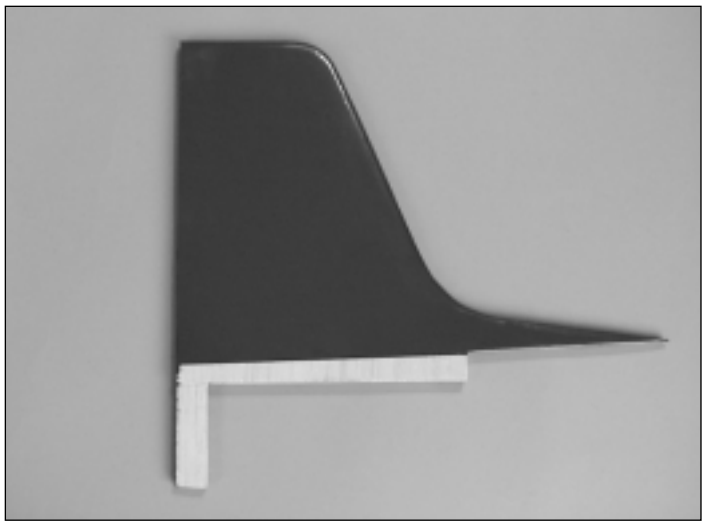


How to cut covering from balsa.
Use a soldering iron to cut the covering from the stab. The tip of the soldering iron doesn't have to be sharp, but a fine tip does work best. Allow the iron to heat fully. Use a straightedge to guide the soldering iron at a rate that will just melt the covering and not burn into the wood. The hotter the soldering iron, the faster it must travel to melt a fine cut. Peel off the covering (see the photo at step 11).

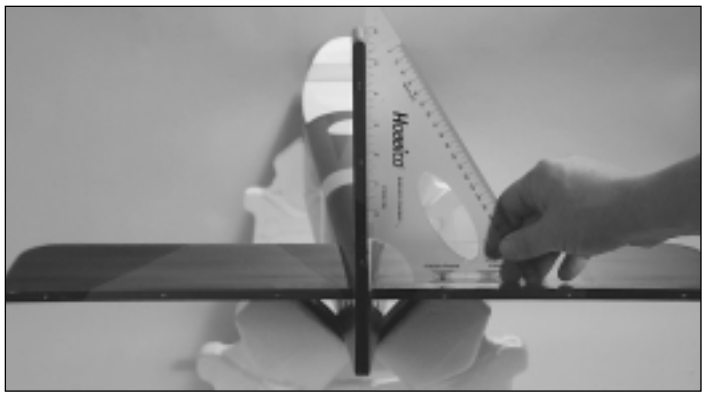


❏ 6. Place the stab back into the fuselage. Stand back approximately 10' [3m] and view your plane from the rear. Be sure the stab is straight in relation to the wing as shown in the sketch. If it is not straight, sand a bit of the wood away in the stab saddle on the side that is high until the stab is straight.

❏ 7. Glue the stab in place with 6-minute epoxy, checking to be sure that it is properly positioned before the glue has cured.

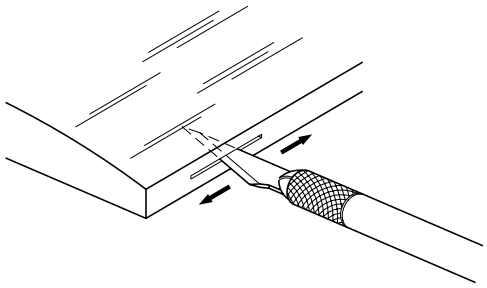


❏ 8. Position the fin in the slot at the rear of the fuselage. Mark the outline of the fuselage onto the fin. Then cut the covering away using the same technique used for the stab.

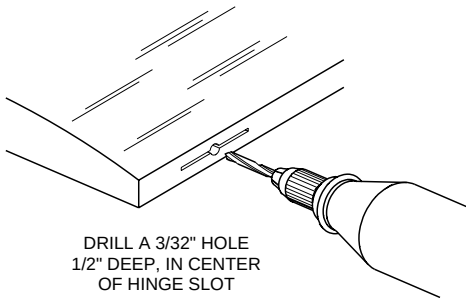


❏ 9. Test fit the fin into the slot. Use a builders triangle to be sure that the fin is 90 degrees to the stab. When you are satisfied with the fit, glue the fin in place with 6-minute epoxy.

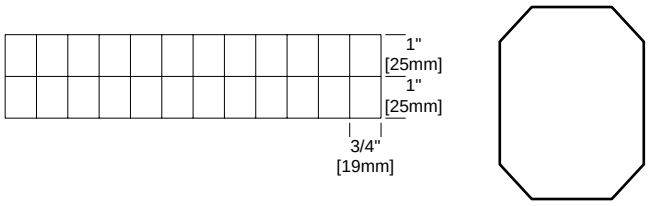
INSTALL THE HINGES



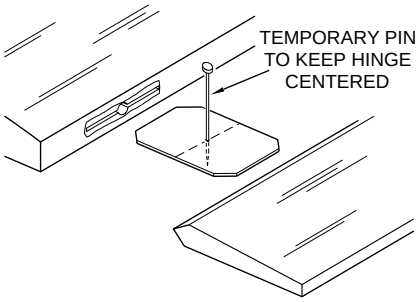
❏ 1. The hinge slots for the elevators and the rudder are pre-cut in the trailing edge of the stab and fin as well as the leading edge of the elevator and rudder. Using a #11 hobby knife, run the blade in each of the three hinge slots in each control surface.

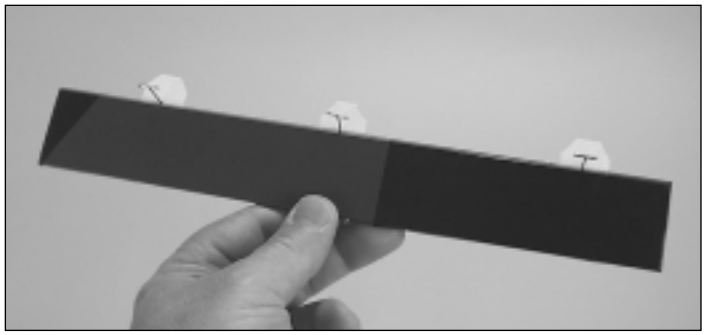


❏ 2. Drill a 3/32" [2.4mm] hole in the center of the hinge slot. This will allow the glue to fully wick into the hinge.

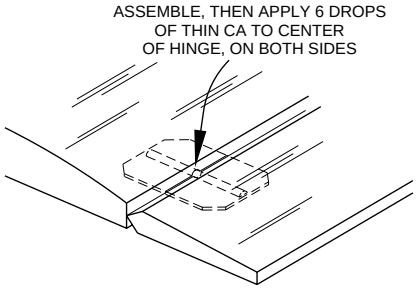


❏ 3. Cut 9 hinges 3/4" x 1" [19 x 25mm] from the hinge material. Cut the material as shown. Cut the corners of each hinge as shown in the second illustration. This will make it easier when installing the hinges.





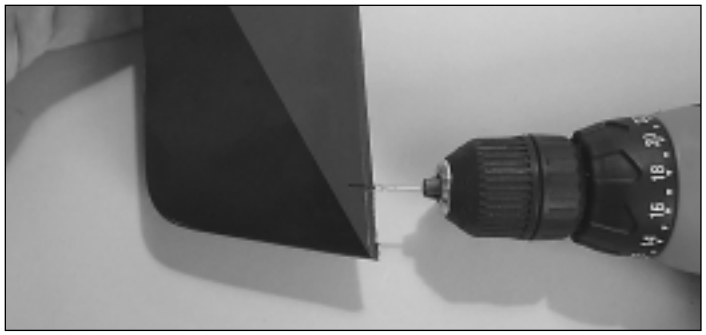
❏ 4. Install a pin into the center of three hinges, then install one hinge in each of the slots in one of the **elevator** halves. Install the hinge until the pin is touching the leading edge of the elevator. Install the opposite end of the hinges into the trailing edge of the stab.



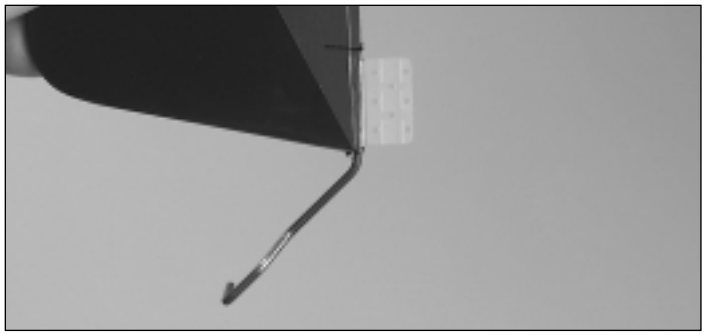
❏ 5. Remove the pins. Then apply 6 drops of thin CA to the center of the hinge on both sides of the hinge.

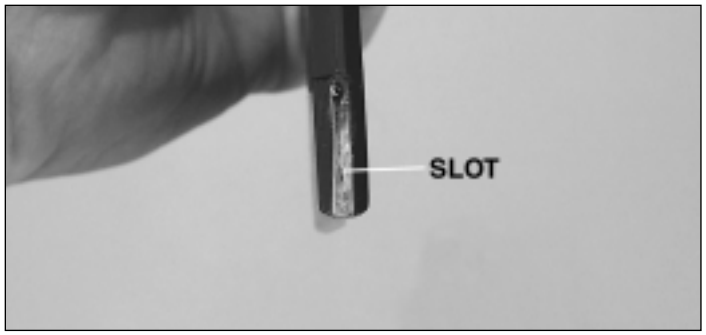
❏ 6. Repeat the procedure for the other elevator half.

❏ 7. From the bottom of the rudder measure up 1" [25mm] and make a mark.

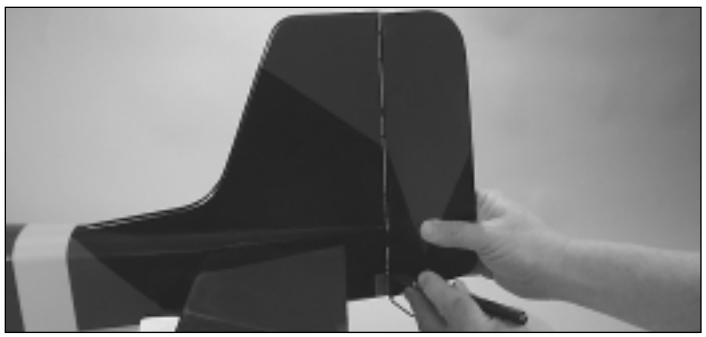


❏ 8. Drill a 5/32" [4mm] hole in the leading edge of the elevator 1/2" [13mm] deep at the 1" [25mm] mark.

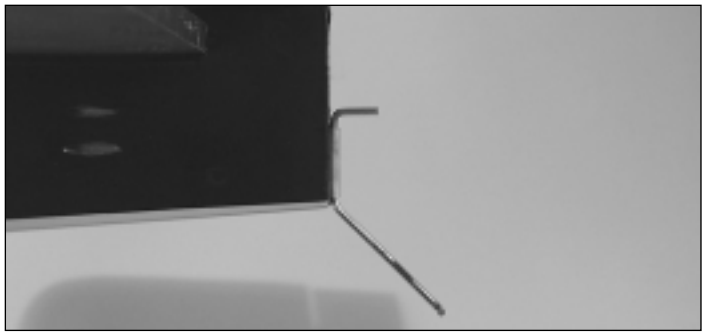




❏ 9. Locate the **tail wheel wire** and install it into the hole you just drilled. On the leading edge of the rudder, cut a slot the width of the nylon bearing. Remove the tail wheel wire and cut the slot to a depth that allows the bearing to rest in the leading edge of the rudder. Fuelproof the slot with a thin coat of 6-minute epoxy. After the epoxy cures, re-install the tail wheel wire into the rudder.



❏ 10. Hold the rudder up to the fin. Mark the location of the nylon bearing from the tail wheel wire.

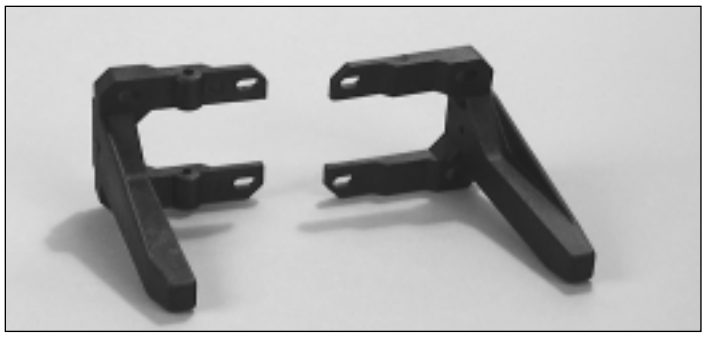


❏ 11. Cut a slot in the end of the fuselage from the mark you made to the bottom of the fuselage. Insert the nylon bearing into the slot. When you are satisfied with the fit, glue the nylon bearing to the fuselage with 6-minute epoxy. Apply a light coat of petroleum jelly to the wire and the nylon bearing to prevent glue from getting into the nylon bearing.

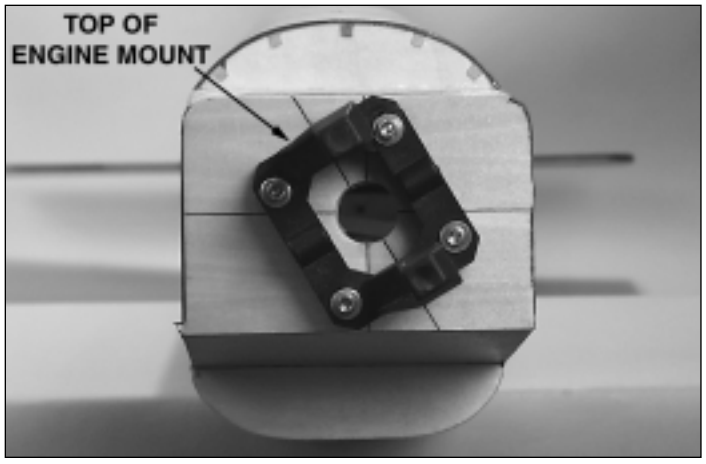
❏ 12. Install the hinges into the rudder using the same procedure used for the elevator. Slide the hinges into the fin, making sure that the tail wheel wire is inserted into the hole you drilled in the leading edge of the rudder. When you are satisfied with the fit of the rudder to the fin, apply 6 drops of thin CA glue to each of the hinges.

❏ 13. Install the tail wheel onto the tail wheel wire. Hold it in place with the 3/32" wheel collar and the 4-40 set screw.

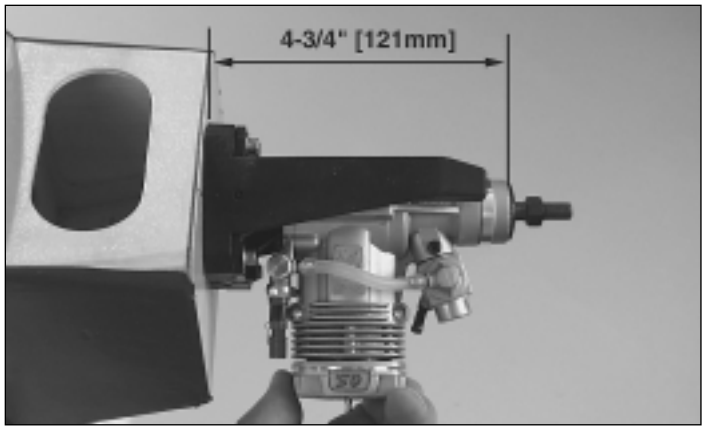
INSTALL THE ENGINE



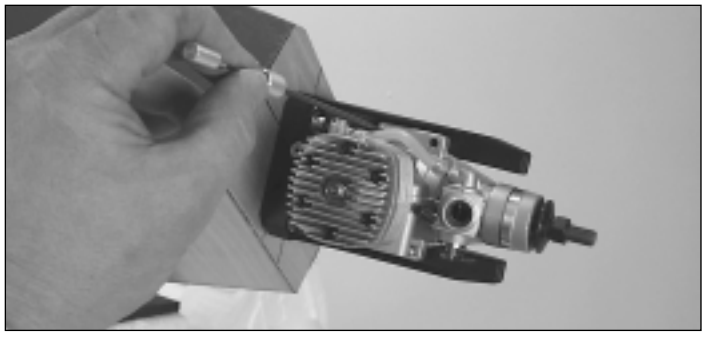
❏ 1. Locate the left and right halves of the **engine mount.** Cut off the “spreader bar” from each half of the engine mount.



❏ 2. Install the engine mount to the firewall. Screw four 8-32 x 1" socket head cap screws and four #8 washers through the engine mount into the pre-installed 8-32 blind nuts in the firewall.

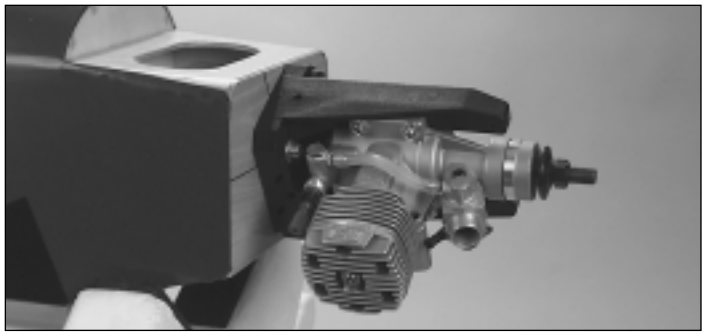


❏ 3. Adjust the width of the engine mount for your engine. Then position the engine onto the engine mount so that the distance from the firewall to the front of the thrust washer is 4-3/4" [121mm].



❏ 4. Once you have the engine properly positioned on the engine mount, mark the location of the engine mounting holes on the rails of the engine mount. A great tool for doing this is the Great Planes Dead Center™ Tool (GPMR8130). It’s fast, easy and accurate!

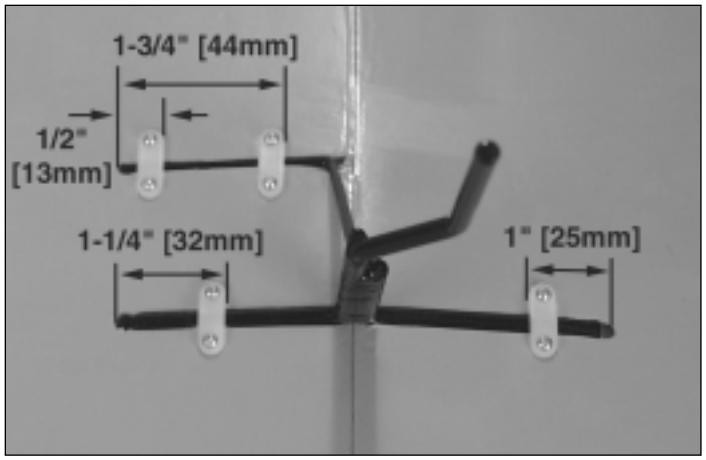
❏ 5. Once you have the locations for the mounting holes marked on the engine mount, drill a 7/64" [2.8mm] hole into each of the four marks. After drilling the holes tap each of them with a 6-32 tap.



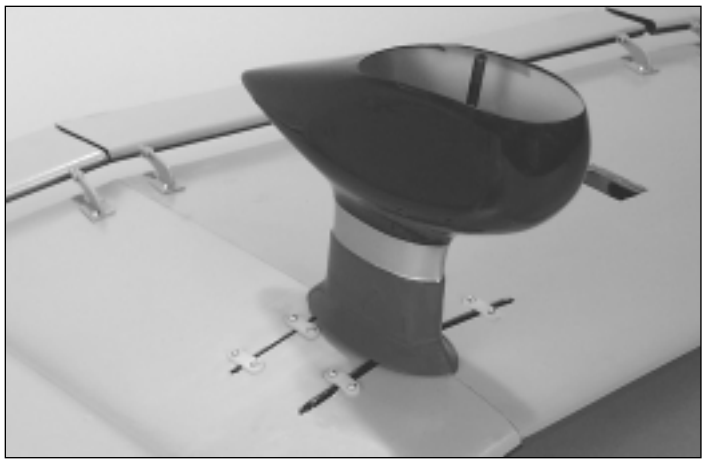
❏ 6. Mount the engine to the engine mount with four 6-32 x 3/4" socket head cap screws and four #6 washers.

INSTALL THE LANDING GEAR

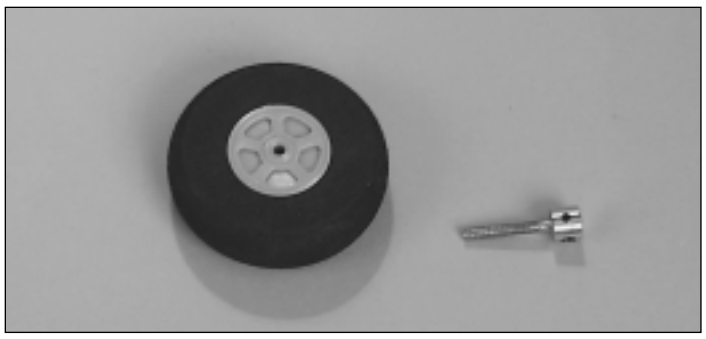
❏ ❏ 1. Locate the **left** and **right landing gear.** Test fit the right landing gear wire into the slots in the right wing.



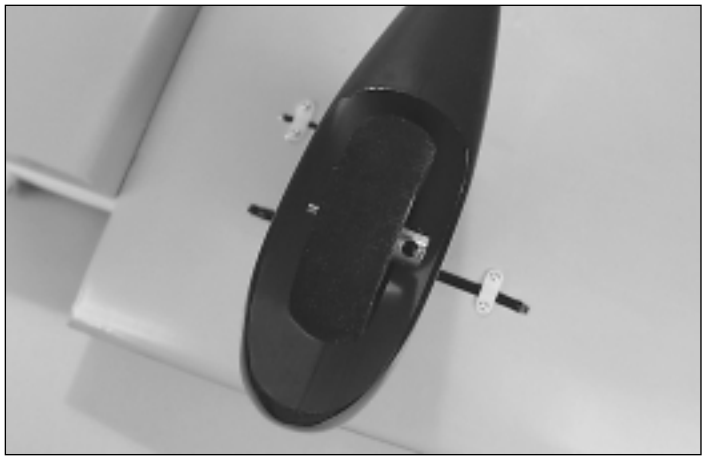
❏ ❏ 2. Install four nylon **landing gear straps** to hold the landing gear wire to the wing. Position the nylon straps using the dimensions shown in the photograph. Once positioned, drill a 1/16" [1.5mm] pilot hole through the strap and into the hardwood mounting block in the wing. Install the straps with eight #2 x 3/8" [9.5mm] sheet metal screws.



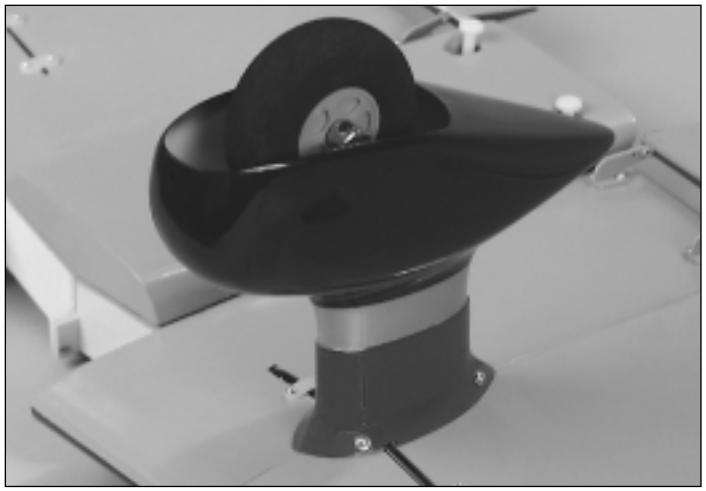
❏ ❏ 3. Position a wheel pant over the landing gear wire on the wing. Do not attach it yet.



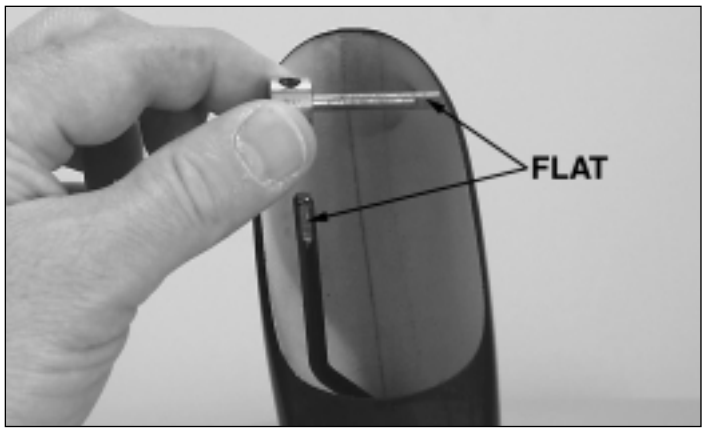
❏ ❏ 4. Locate a wheel, axle and 4-40 socket head cap screw. Install the socket head cap screw into the axle.



❏ ❏ 5. Slide the wheel and axle onto the landing gear wire. Position the axle and wheel as shown. Position the wheel pant so that the wheel is centered in the pant. Mark the location of the wheel pant on the wing with a felt-tip marker.



❏ ❏ 6. Mark a location onto the wheel pant for two screws on each side. These marks will be the drilling location so make these marks over the hardwood blocks that the nylon landing gear straps are screwed into. Once you are satisfied with the location, drill a 1/16" hole through the mark and into the wing. Screw the pant in place with four #2 x 1/2" [13mm] machine screws and four #2 washers.

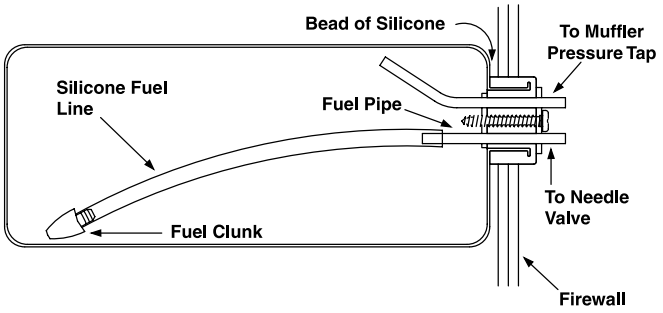


❏ ❏ 7. When you are satisfied with the position of the axle on the landing gear wire, file a flat spot on the landing gear

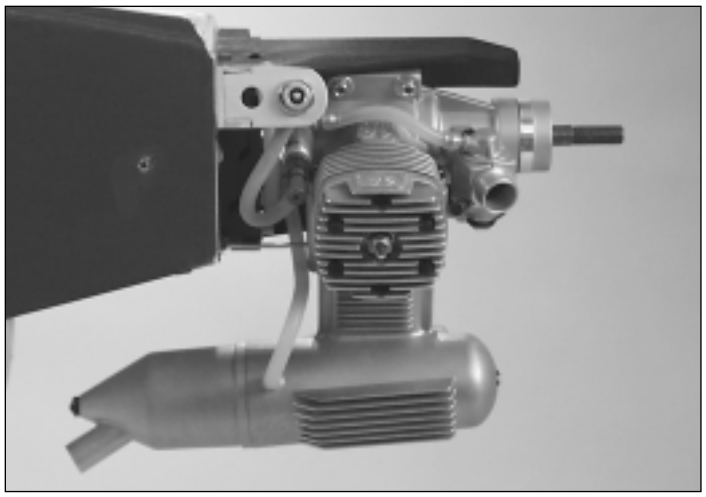
wire for the set screw to tighten onto. This flat spot will also prevent the axle from slipping on the landing gear wire. File a flat spot on the axle for the wheel collar too. Install the wheel and one 5/32" [4mm] **wheel collar** onto the axle and insert the axle onto the landing gear wire. Then tighten the set screws to the axle and wheel collar.

❏ 8. Repeat this procedure for the left landing gear.

INSTALL THE FUEL TANK



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



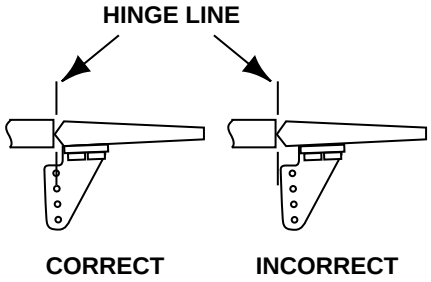
❏ 2. Install silicone fuel tubing (not included in the kit) onto the aluminum tubes from the fuel tank. The line with the fuel clunk will feed to the fuel inlet at the needle valve and the other will attach to the pressure tap on the muffler. For our installation we chose to use an external fill valve. If you choose to do this as well, follow the instructions with the fuel valve. Should you choose not to install a fuel filler valve, you can fill the fuel tank by removing the fuel line to the carburetor and filling through it. However, depending on how you cut out the cowling to accommodate the engine, the cowling may make it difficult to access the carburetor. You can also install a third line to the tank and use it for filling the tank. The method you use is your choice, but make your decision before moving onto the installation of the fuel tank.

❏ 3. Install the fuel tank into the fuselage. Apply silicone sealant to the front of the tank to hold it to the firewall. Feed the silicone fuel lines through the opening in the firewall. The silicone sealant will hold the tank in place.

❏ 4. Attach the fuel line to the carburetor and the pressure line to the muffler.

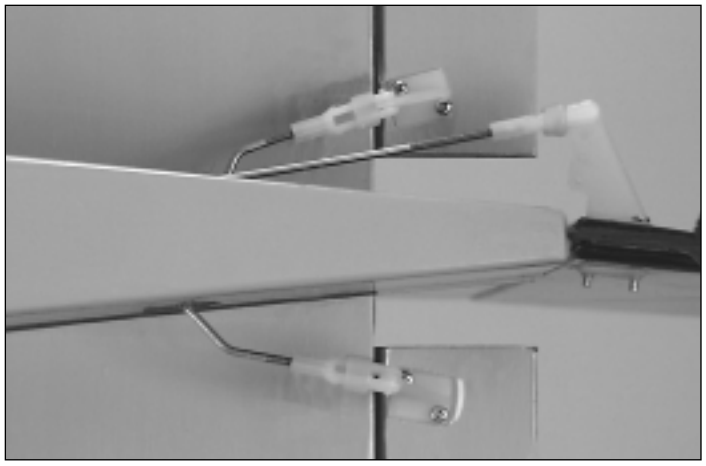
INSTALL THE RADIO, PUSHRODS & CONTROL HORNS

❏ 1. Locate one of the 2-56 x 36" wire **pushrods,** threaded on one end. Locate a nylon clevis and silicone clevis retainer. Turn the clevis onto the threaded end of the pushrod approximately 25 turns. Slide the clevis retainer onto the bottom of the clevis. Once completed, slide the wire into the lower pushrod hole on the left side of the fuselage.



❏ 2. Install the control horn to the rudder. Place the control horn as shown in the sketch. Once positioned, drill a 1/16" [1.5mm] hole through the holes in the mounting flange and through the rudder. Harden the holes with a drop of thin CA. Attach the control horn in place with two 2-56 x 5/8" [15.9mm] machine screws. The screws attach to the control horn plate on the opposite side of the rudder.

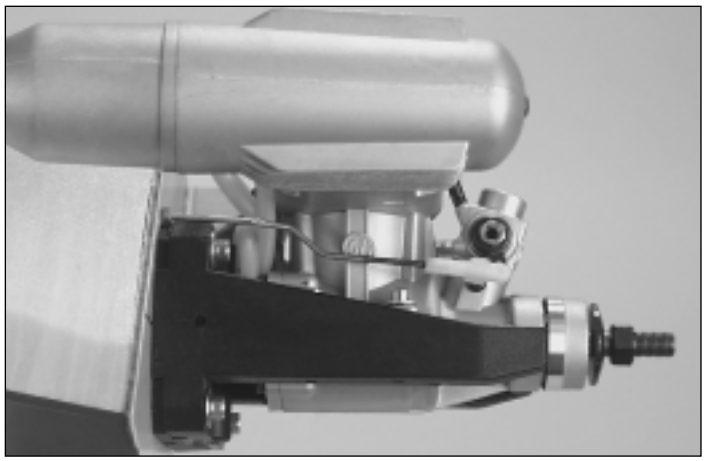
❏ 3. Attach the clevis to the control horn and slide the clevis retainer onto the clevis.



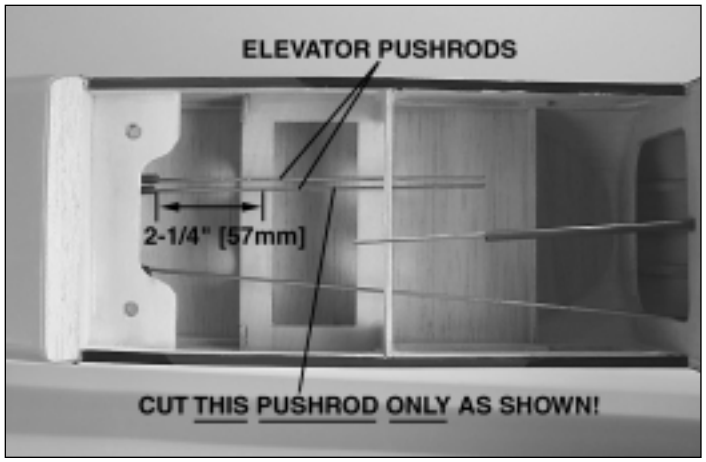
❏ 5. Repeat step 4 for the other half of the elevator.

❏ 6. Drill a 3/16" [5mm] hole in firewall. This hole should be in close alignment to the carburetor. Locate the 12" [305mm] long gray plastic **outer pushrod.** Roughen one end of it with 200-grit sandpaper, then install it into the fuselage through the hole you drilled. Apply 6-minute epoxy to the roughened end of the tube and insert it flush with the firewall.

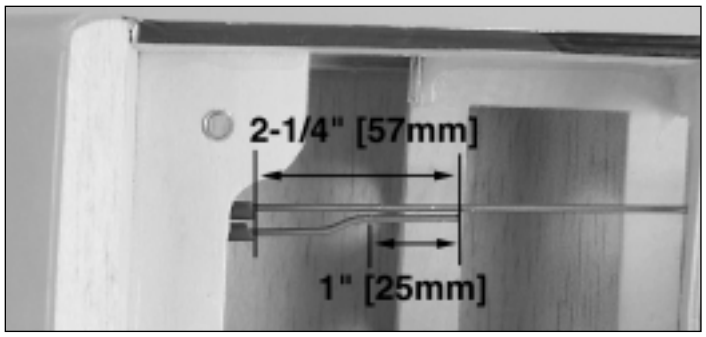
❏ ❏ 4. Install the clevis and clevis retainer onto the 36" [914mm] wire pushrod. Turn the clevis onto the threaded end of the pushrod approximately 25 turns. Mount the control horn in line with the pushrod as previously done with the rudder, ***except,*** **mount the horn at a slight angle as shown.** After mounting the control horn, slide the threaded wire into the pushrod opening. You will see that the pushrod does not exit the fuselage and line up exactly with the control horn. Make two angled bends to bring the pushrod in alignment with the control horn as shown in the photograph. Do not make either bend at 90 degrees and **do not bend** the threaded part of the pushrod. Make both bends on the solid wire.



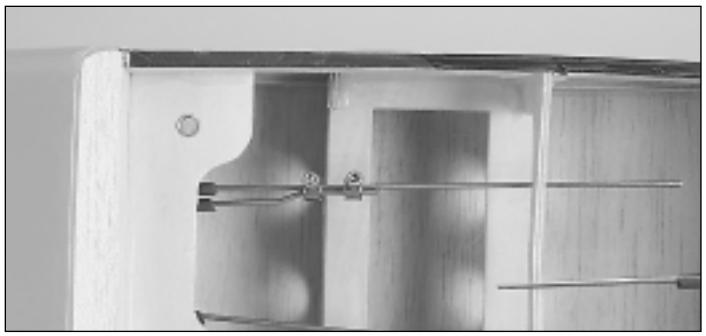
❏ 7. Locate a 2-56 x 17-1/2" wire pushrod. Install a nylon clevis and clevis retainer onto the pushrod approximately 25 turns. Slide the wire pushrod into the plastic outer pushrod tube on the firewall. Attach the clevis to the throttle arm and slide the clevis retainer onto the end of the clevis. ***Note:*** *For our installation it was necessary to make a bend in the wire to get it to align with the carburetor throttle arm. Adjust your wire as needed to get smooth operation of the throttle arm.*



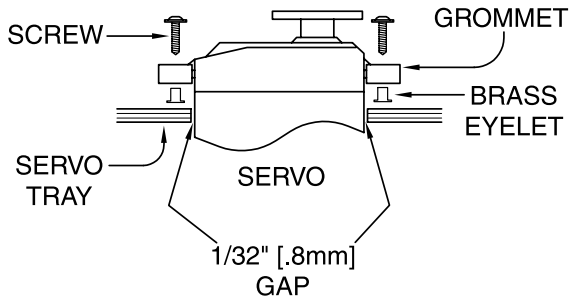
❏ 8. Inside the fuselage locate the two elevator pushrods. The pushrod closest to the center of the fuselage needs to be cut. Cut the pushrod wire 2-1/4" [57mm] from the end of the plastic outer pushrod tube.

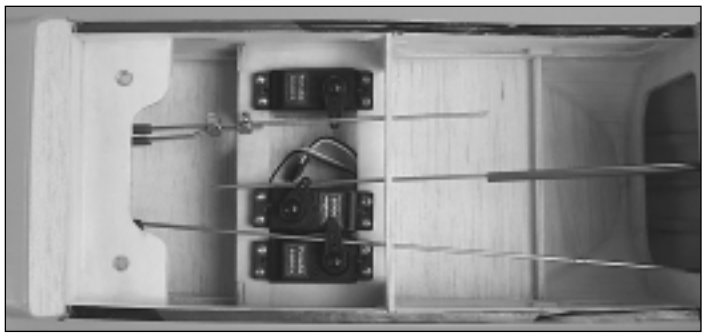


❏ 9. Bend the inside elevator pushrod wire as shown so that both wires are parallel to one another. Be sure there is at least 1" [25mm] at the end of the pushrod wire that is parallel to the other pushrod.

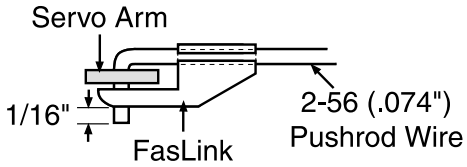


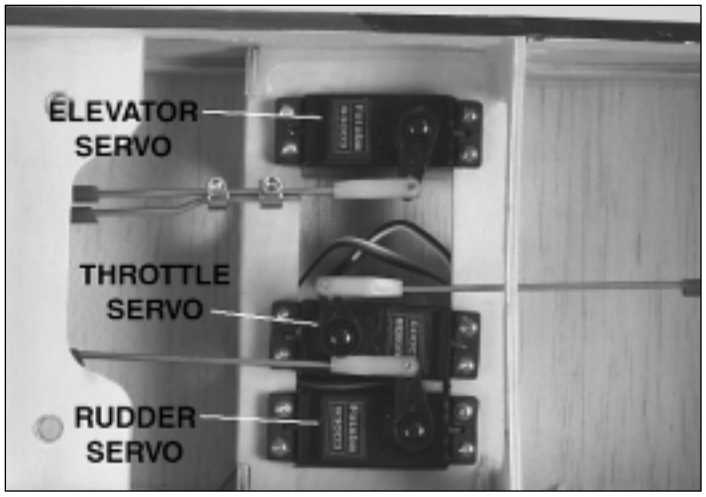
❏ 10. Locate two 5/32" [4mm] wheel collars and two 6-32 x 1/4" [12mm] socket head cap screws. Install a screw into each of the wheel collars. Slide both wheel collars over the two elevator pushrod wires. Position the elevators the same and then tighten the wheel collar screws onto the two wires.





❏ 11. Following the manufacturer's instructions for your radio system, install the rubber grommets and eyelets onto three servos. Place the servos for the elevators, throttle and rudder onto the servo mount in the fuselage. Position each servo in line with the pushrod as shown. Once properly positioned drill a 1/16" [1.5mm] pilot hole through each of the servo mounting holes and into the servo mount. After drilling the holes, harden the holes with a drop of thin CA. Screw each of the servos in place with the hardware provided by the radio manufacturer.





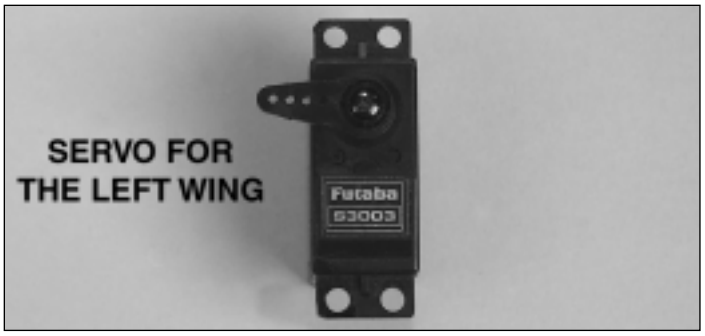
❏ 12. Position each of the servo arms as shown in the photograph. Make a mark on the elevator pushrod wire over the outboard hole of the servo arm. On this mark make a 90°

bend upward in the wire. Cut the excess wire off 1/2" [13mm] above the bend. Insert the wire through the hole in the servo arm and secure it with a nylon FasLink. Do this for the throttle and the rudder as well.

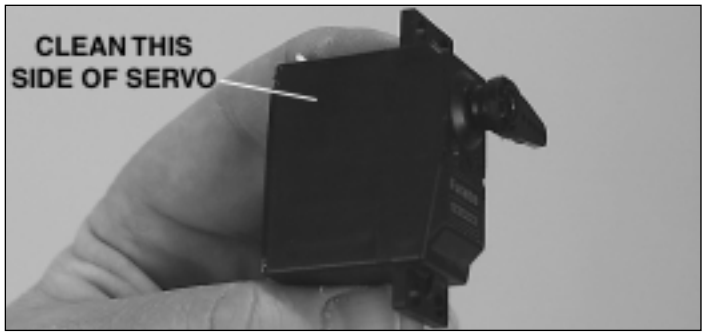
INSTALL THE FLAP & AILERON SERVOS

❏ 1. Temporarily plug a servo into the aileron port on your receiver. Turn the receiver and transmitter on and with the aileron trim centered, allow the servo to center itself. Install a long servo arm onto your servo in the direction shown in the photograph. This servo will be used in the right wing panel.

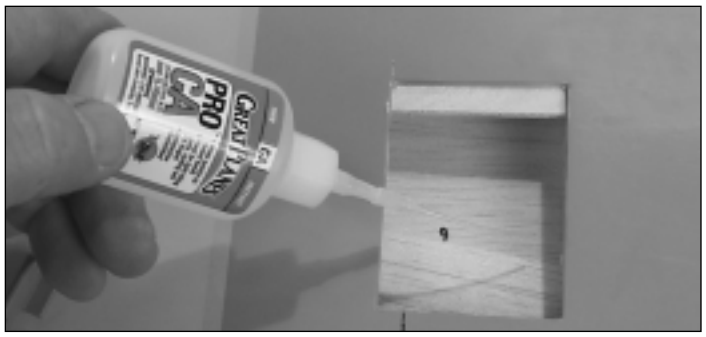
Proceed to step 3 for installation of the servo in the right wing!



❏ ❏ 2. Temporarily plug a servo into the aileron port on your receiver. Turn the receiver and transmitter on and with the aileron trim centered, allow the servo to center itself. Install a long servo arm onto your servo in the direction shown in the photograph. With the servo horn installed as shown, this servo will be used in the left wing panel.



❏ ❏ 3. The servos for the ailerons are installed with servo tape. To insure the strongest installation **do not skip the next couple of steps!** Clean the side of the servo opposite the servo arm with rubbing alcohol. Be sure all grease and oil is removed from the side of the case.

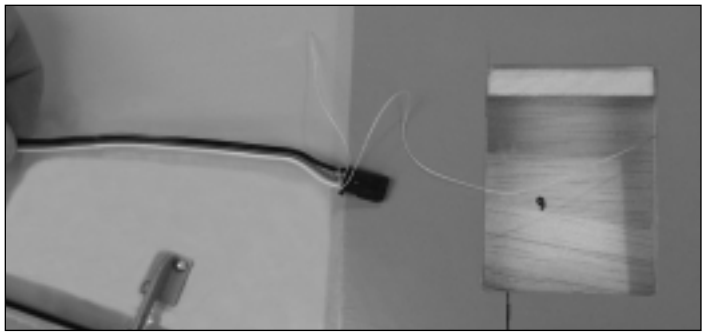


❏ ❏ 4. Move the string in the servo bay. Next, saturate the balsa in the servo bay with thin CA. Apply the thin CA, allowing it to saturate the wood for a few minutes. If there is any puddling of the glue after it has soaked in for a couple of minutes, wipe away the excess and allow it to cure for a few minutes. You ***do not*** want to apply the glue and then apply accelerator to it, causing it to cure too fast. If there are any puddles when you do this the surface will become uneven, giving a rough surface for mounting the servo.

❏ ❏ 5. Set the servo into the servo bay on its side as shown. With a felt-tip marker draw a line from the servo arm

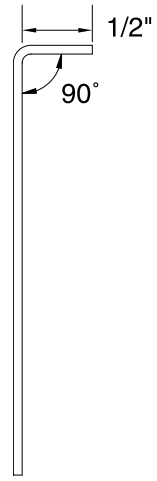
to the aileron. This line must be parallel to the top of the servo.

❏ ❏ 6. Install a small nylon control horn onto the aileron. The horn must be aligned with the line you have drawn. Install the control horn the same way you installed the other control horns.

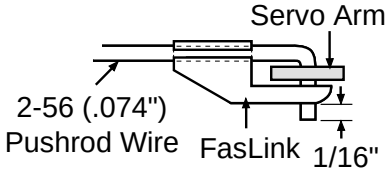


❏ ❏ 7. Attach a 12" servo extension to the aileron servo. Apply tape or a piece of heat shrink tubing to the connection to be sure that the extension cannot come unplugged from the servo wire. Remove the tape from the string inside of the servo bay. Tie the string to the end of the servo extension. Then pull the servo through the wing from the end of the string at the center-section in the top of the wing. Leave the string attached to the servo lead until you have completed the servo installation instructions.

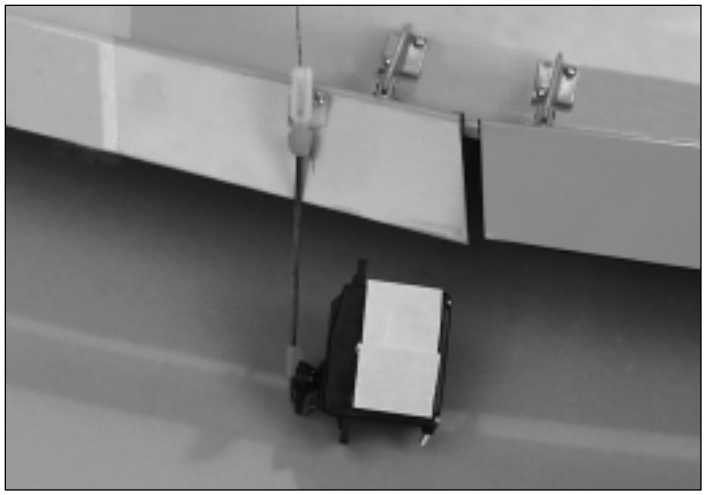
❏ ❏ 8. Locate one of the 2-56 x 6" [152mm] wire pushrods. Install a nylon clevis and clevis retainer onto the threaded end of the wire. The clevis should be screwed onto the wire approximately 25 turns. Snap the clevis onto the control horn. Be sure the aileron is in the neutral position. Then make a mark on the pushrod wire at the point that it is over the hole in the servo horn. ***Important:*** *Be sure that the servo has remained centered as you have handled the servo. If it has moved, repeat the centering procedure before marking the wire.*



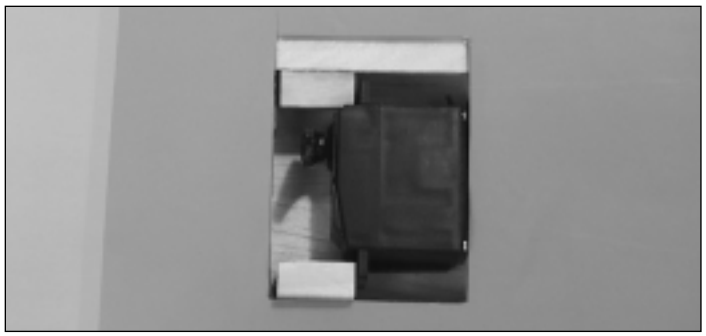
❏ ❏ 9. At the mark on the wire make a 90° bend. Cut the excess wire off 1/2" [13mm] above the bend.



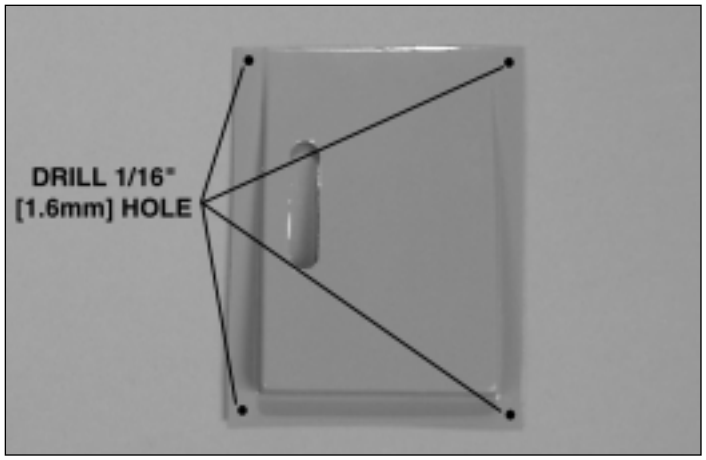
❏ ❏ 10. Enlarge the hole in the servo arm to 1/8", slide the wire into the hole and attach a nylon FasLink.



❏ ❏ 11. **(Important: Before starting step 11, be sure the servo is properly centered. If you have any doubt, re-center the Servo.)** Leave the pushrod wire attached to the servo horn and the control horn. Remove the servo from the servo bay. Apply two 1" [25mm] squares of double faced servo tape (included in kit) to the servo. Then place the servo back into the servo bay, making sure the bottom of the servo is resting against the side of the servo bay as shown in step 12. (Be sure to pull the string that is attached to the servo lead, pulling the lead through the wing as you mount the servo.) Apply pressure to the servo so that the servo tape gets good adhesion to the servo bay.



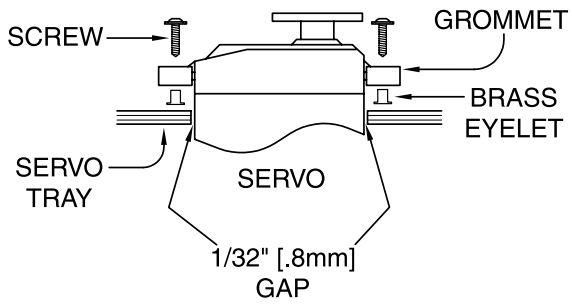
❏ ❏ 12. Remove the nylon FasLink and the pushrod wire from the servo horn. Locate two 3/8" x 3/4" x 3/4" [9.5 x 19 x 19mm] hardwood blocks. Place them against the servo mounting tabs so that they act as a wedge forcing the servo against the side of the servo bay. Using 6-minute epoxy, glue them in the servo bay but do not glue them to the servo.



❏ ❏ 13. Cut out the ABS servo cover as shown. Drill a 1/16" [1.5mm] hole in each corner of the cover.

❏ ❏ 14. Place the cover in position over the servo bay. Drill a 1/16" [1.5mm] hole into the wing through each of the holes in the corner of the servo cover. Put a drop of thin CA into the holes in the wing. This will strengthen the holes. Allow the glue to cure and then screw the cover to the wing with four #2 x 3/8" [9.5mm] machine screws. After the cover is installed, re-attach the pushrod clevis retainer and nylon FasLink.

❏ 15. Repeat steps 2 to 14 for installing the servo in the left wing.

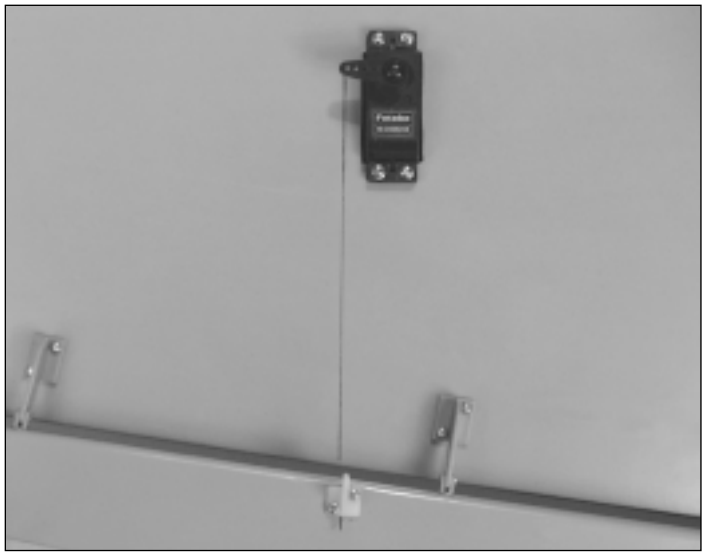


❏ ❏ 16. Following the manufacturer's instructions for your radio system, install the rubber grommets and eyelets onto a flap servo.

❏ ❏ 17. Attach a 6" servo extension to the flap servo. Apply tape or a piece of heat shrink tubing to the connection to be sure that the extension cannot come unplugged from the servo wire. Remove the tape from the string inside of the flap servo bay. Tie the string to the end of the flap servo extension. Then pull the servo lead through the wing from the end of the string at the top of the wing center-section. Leave the string attached to the servo lead until you have completed the servo installation instructions.

❏ ❏ 18. Place the flap servo onto the servo mount in the wing. Drill a 1/16" [1.5mm] pilot hole through each of the servo mounting holes and into the wing. After drilling the holes, screw the servo in place with the hardware provided by the radio manufacturer.

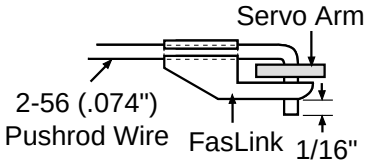
❏ ❏ 19. Center the servo and then install a servo arm onto the servo. Use a felt-tip marker to draw a reference line from the servo arm to the flap.



❏ ❏ 20. Install a small nylon control horn to the flap the same way you installed the aileron control horns.

❏ ❏ 21. Locate one of the 2-56 x 6" [152mm] wire pushrods. Install a nylon clevis and clevis retainer onto the threaded end of the wire. The clevis should be screwed onto the wire approximately 25 turns. Snap the clevis onto the control horn. Be sure the flap is in the neutral position. Then make a mark on the pushrod wire at the point that it is over the hole in the servo horn. ***Important:*** *Be sure that the servo has remained centered as you have handled the servo. If it has moved, repeat the centering procedure before marking the wire.*

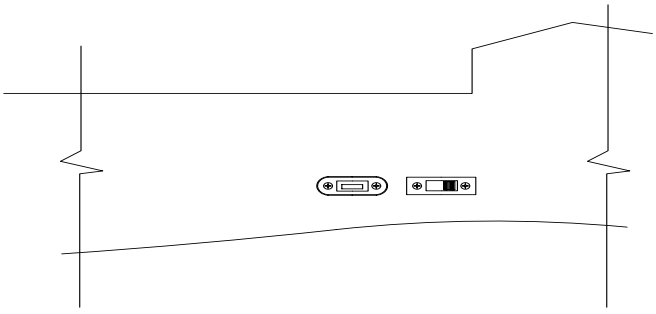
❏ ❏ 22. On the mark on the wire make a 90° bend. Cut the excess wire off 1/2" [13mm] above the bend.



❏ ❏ 23. Enlarge the hole in the servo arm to 1/8", slide the wire into the hole and attach a nylon FasLink.

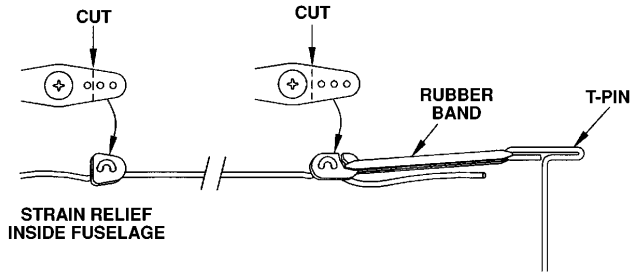
❏ 24. Repeat steps 16 to 23 for the flap in the left wing.

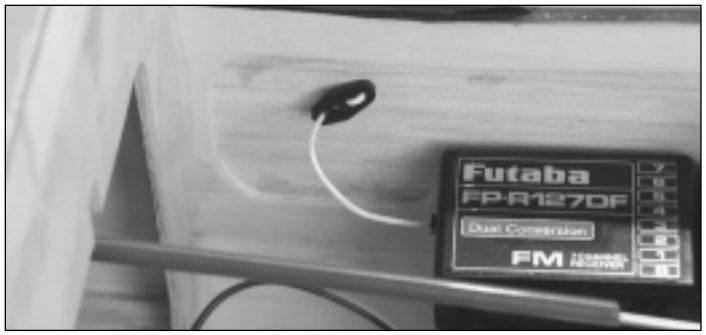
INSTALL THE RADIO SYSTEM

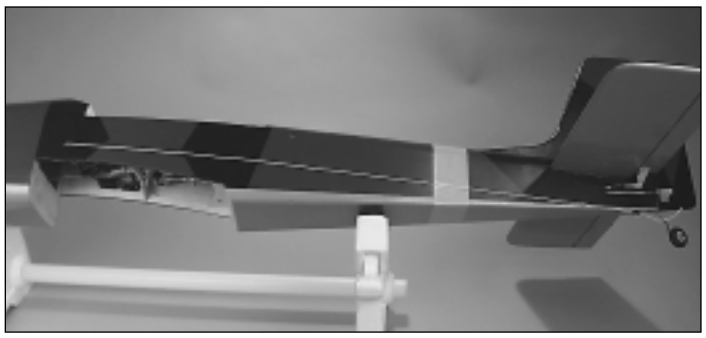


❏ 1. Following your radio manufacturer's instructions, install a radio on/off switch and charging jack.

❏ 2. Lay a piece of foam rubber in the bottom of the fuselage just ahead of the servo tray. Install the receiver and battery on the foam.







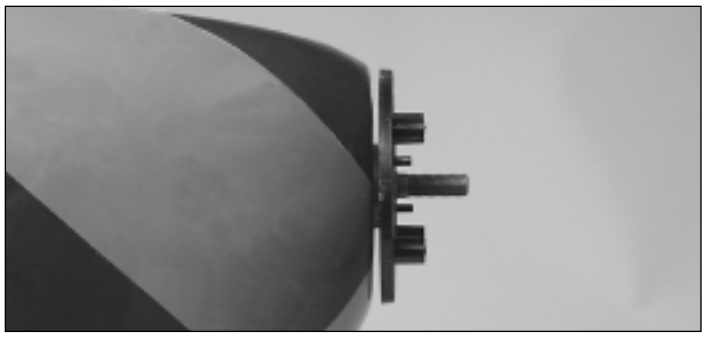
❏ 3. Drill a 1/16" [1.5mm] hole in the side of the fuselage for the antenna. Assemble a simple antenna strain relief from left over servo arms as shown in the sketch. Attach the rubber band at the end of the antenna wire to the tail wheel assembly.

❏ 4. At the center of the wing you should have the servo leads for the flaps and the aileron. Plug the two flap leads into a "Y" connector and plug the two aileron servo leads into an additional "Y" harness. Depending on your radio system you may have the ability to plug each of the servo leads directly into the receiver. Refer to your particular radio manufacturer's instructions to determine the best way to connect the flaps and ailerons.

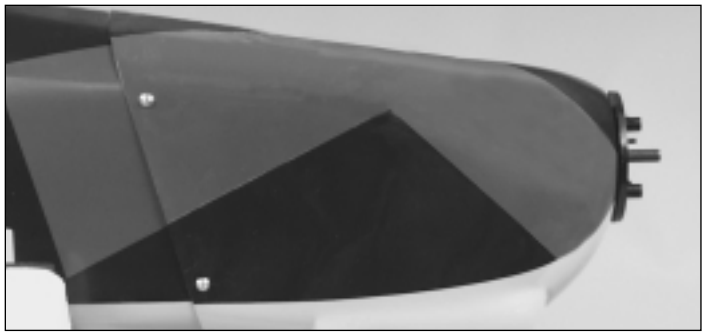
❏ 5. Following the radio manufacturer's instructions, connect the servos, battery and switch to the radio receiver.

❏ 6. Place another piece of foam rubber on top of the receiver and battery after you have plugged in all of the servos. Hold the foam, receiver and battery in place with some balsa sticks *(not included in the kit),* by gluing the balsa sticks to the sides of the fuselage.

INSTALL THE COWL

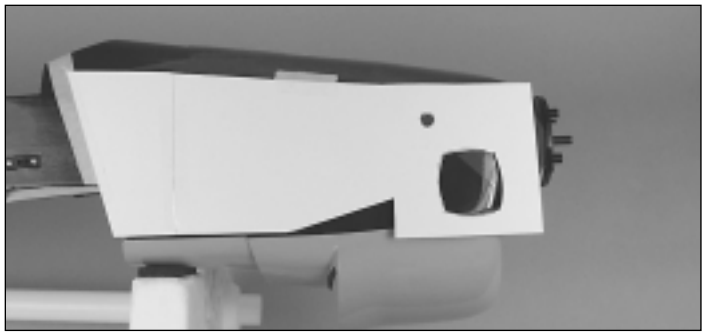


❏ 1. Position the **cowl** on the front of the fuselage so that there is a 1/8" [3mm] gap between the front of the cowl and the spinner backplate. (**Note:** With our O.S. .61 bolted to the engine mount and without the muffler mounted to the engine, the cowling could not be slid over the engine and onto the fuselage. By removing the head it would fit over the engine. If the cowling cannot slip over your engine you will have to make reference marks on the fuselage and then measure the distance from your reference mark to the front of the engine. Then, mount the cowl.)



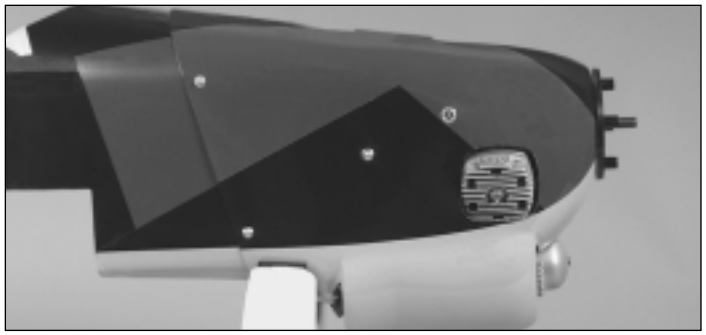
❏ 2. Drill four 3/32" [2.4mm] hole through the cowl and the fuselage. Enlarge the holes **in the cowl only** with a 1/8" [3mm] drill. Harden the holes in the fuselage with a few drops of thin CA. Mount the cowl to the front of the fuselage with four (two per side) #4 x 3/8" [9.5mm] machine screws and #4 washers.

❏ 3. Remove the cowling from the fuselage. You are now going to make a paper pattern for cutting the openings in the cowl for the engine and fuel fill valve (if you installed one). Use a piece of poster board approximately 15" [381mm] long. Tape the poster board onto the fuselage. Mark the location of the engine and fill valve on it and then cut out the openings. Keep cutting until you have the exact opening required for them.



❏ 4. Leave the pattern taped to the fuselage. Re-install the cowl onto the fuselage. Transfer the openings from the pattern onto the cowling. Then cut out the openings in the cowl. **Hint:** A Dremel® Moto-tool™ is handy for this task.

❏ 5. Install the muffler onto the engine and re-fit the cowl. Make additional cutouts in the cowl to accommodate your muffler.



❏ 6. Finish the final installation of the cowl by adding one additional #4 x 3/8" [9.5mm] machine screw in the middle of the cowl on each side. Drill the holes using the same procedure used in step 2.

FINISH & INSTALL THE CANOPY

❏ 1. Cut out the instrument panel decal and install it in the front of the cockpit.

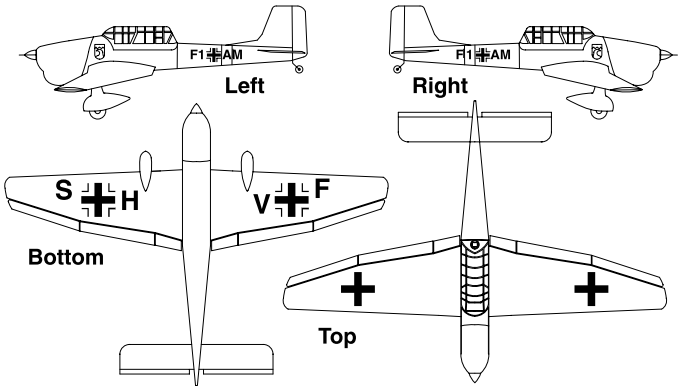
❏ 2. If you are installing a pilot, now is the time to paint it and install it in the fuselage. We used a 1/5 scale pilot bust. This size fits well. After painting the pilot, remove the MonKote® under the pilot. Then glue it to the floor of the cockpit.

❏ 3. The canopy of the Stuka has a lot of panels of glass. This looks great but requires a bit of patience when you finish the canopy. We chose to paint our canopy. Should you decide to paint the canopy you will find that Hobbico® Master Mask™ (HCAR3410) makes this job much easier. Brush Master Mask onto the inside of the canopy and allow it to dry overnight. After it dries, cut the mask with a #11 hobby knife around each of the panels. Remove the masking film from the canopy frames but leave it on each window panel.

❏ 4. Paint the canopy frames from the inside of the canopy with black paint. We recommend this be done with paints like Pactra Formula U, or any of the many varieties of acrylic paints available.

❏ 5. Once the paint has dried, position the canopy on the fuselage. Drill four 1/16" [1.5mm] holes in the bottom of the canopy on both sides of the canopy. Apply a drop of thin CA to each of the holes drilled in the fuselage. Mount the canopy with eight (four per side) #2 x 3/8" machine screws and eight #2 washers.

APPLY THE DECALS



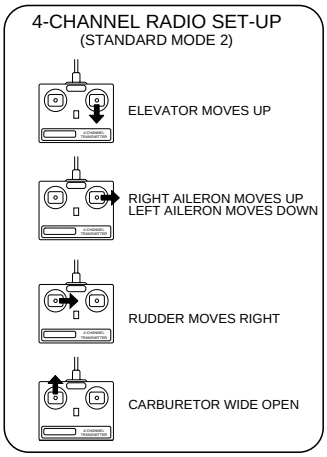
❏ 1. Use the above sketches and box cover to position the decals on your model. Even though these decals are self adhesive, the easiest and most accurate way to position the decals is to first cut them from the sheet. When ready to apply one of the decals, submerge it in a tub of warm water mixed with liquid dish soap (about a teaspoon of soap per gallon of water) and peel the decal from the backing. Lay the decal on the model and position it exactly where you want it. Use a paper towel to wipe away most of the water. Then use a soft balsa sheet or something similar to squeegee the rest of the water from under the decal. Allow to dry overnight before flying the model.

GET THE MODEL READY TO FLY

Check the Control Directions

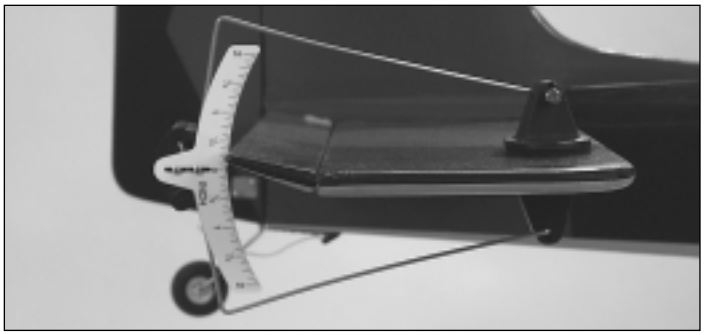
❏ 1. Turn on the transmitter and receiver and center the trims. If necessary, remove the servo arms from the servos and reposition them so they are centered. Reinstall the screws that hold on the servo arms.

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



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

Set the Control Throws



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

These are the recommend control surface throws:

	High Rate	Low Rate
ELEVATOR:	5/16" [7.9mm] up	3/16" [5mm] up
	5/16" [7.9mm] down	3/16" [5mm] down
RUDDER:	1-1/8" [28mm] right	3/4" [19mm] right
	1-1/8" [28mm] left	3/4" [19mm] left
AILERONS:	1-1/16" [27mm] up	3/4" [19mm] up
	1-1/16" [27mm] down	3/4" [19mm] down
FLAPS:	1-1/2" [38mm] down	1" [25mm] down

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

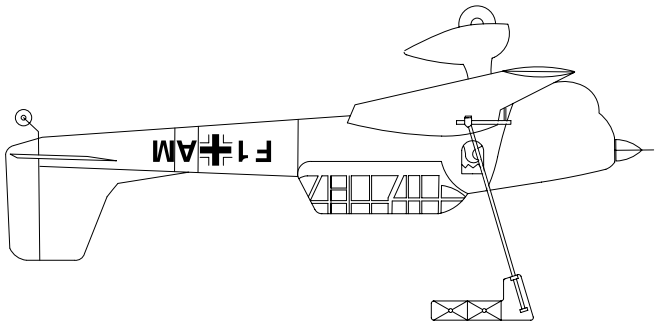
Balance the Model (G.G.)

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

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

❏ 1. Use a felt-tip pen or 1/8" wide tape to accurately mark the C.G. on the top of the wing on both sides of the fuselage. The C.G. is located 4" [102mm] back from the leading edge of the wing along the side of the fuselage.

This is where your model should balance for your first flights. Later, you may wish to experiment by shifting the C.G. back from the leading edge of the wing, up to 4-7/16" [113mm] to change the flying characteristics. The forward C.G. for this model is 3-3/4" [95mm] back from the leading edge of the wing and the rearward C.G. is 4-7/16" [113mm]. Moving the C.G. forward may improve the smoothness and stability, but it may then require more speed for takeoff and make it more difficult to slow for landing. Moving the C.G. aft makes the model more maneuverable, but could also cause it to become too difficult for you to control. In any case, start at the location we recommend and do not at any time balance your model outside the recommended range.



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

❏ 3. If the tail drops, the model is "tail heavy" and the battery pack and/or receiver must be shifted forward or weight must be added to the nose to balance. If the nose drops, the model is "nose heavy" and the battery pack and/or receiver must be shifted aft or weight must be added to the tail to balance. If possible, relocate the battery pack and receiver to minimize or eliminate any additional ballast required. If additional weight is required, nose weight may be easily added by using a "spinner weight" (GPMQ4645 for the 1 oz. weight, or GPMQ4646 for the 2 oz. weight). If spinner weight is not practical or is not enough, use Great Planes (GPMQ4485) "stick-on" lead. A good place to add stick-on nose weight is to the firewall (don't attach weight to the cowl–it is not intended to support weight). Begin by placing incrementally increasing amounts of weight on the bottom of the fuse at the base of the firewall until the model balances. Once you have determined the amount of weight required, it can be permanently attached. If required, tail weight may be added by cutting open the bottom of the fuse and gluing it permanently inside.

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

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

Balance the Model Laterally

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

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

PREFLIGHT

Identify Your Model

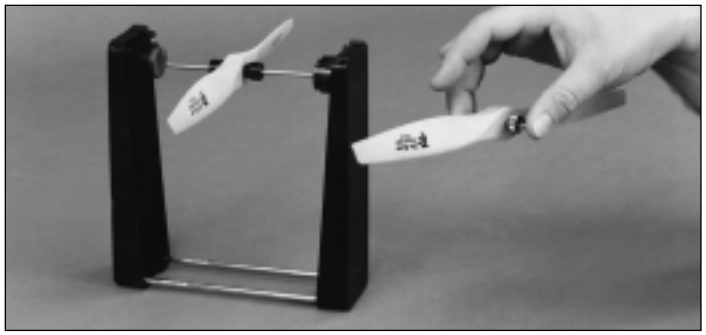
No matter if you fly at an AMA sanctioned R/C club site or if you fly somewhere on your own, you should always have your name, address, telephone number and AMA number on or inside your model. It is **required** at all AMA R/C club flying sites and AMA sanctioned flying events. Fill out the identification tag on page 32 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.

Note: Checking the condition of your receiver battery pack is **highly recommended.** All battery packs, whether it's a trusty pack you've just taken out of another model, or a new battery pack you just purchased, should be cycled, noting the discharge capacity. Oftentimes, a weak battery pack can be identified (and a valuable model saved!) by comparing its actual capacity to its rated capacity. Refer to the instructions and recommendations that come with your cycler. If you don't own a battery cycler, perhaps you can have a friend cycle your pack and note the capacity for you.

Balance the Propellers



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

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

Ground Check

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

Range Check

Ground check the operational range of your radio before the first flight of the day. With the transmitter antenna collapsed and the receiver and transmitter on, you should be able to walk at least 100 feet away from the model and still have control. Have an assistant stand by your model and, while you work the controls, tell you what the control surfaces are doing. Repeat this test **with the engine running** at various speeds with an assistant holding the model, using hand signals to show you what is happening. If the control surfaces do not respond correctly, **do not fly!** Find and correct the problem first. Look for loose servo connections or broken wires, corroded wires on old servo connectors, poor solder joints in your battery pack or a defective cell, or a damaged receiver crystal from a previous crash.

ENGINE SAFETY PRECAUTIONS

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

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

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

Use safety glasses when starting or running engines.

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

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

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

Use a “chicken stick” or electric starter to start the engine. Do not use your fingers to flip the propeller. Make certain the glow plug clip or connector is secure so that it will not pop off or otherwise get into the running propeller.

Make all engine adjustments from behind the rotating propeller.

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

To stop a glow engine, cut off the fuel supply by closing off the fuel line or following the engine manufacturer’s recommendations. Do not use hands, fingers or any other body part to try to stop the engine. Do not throw anything into the propeller of a running engine.

AMA SAFETY CODE (excerpt)

Read and abide by the following Academy of Model Aeronautics Official Safety Code:

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 to, and avoid flying in the proximity of full-scale aircraft. Where necessary an observer shall be used 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.

7. I will not fly my model unless it is identified with my name and address or AMA number, on or in the model.

9. 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. I will perform my initial turn after takeoff away from the pit or spectator areas, and I will not thereafter fly over pit or spectator areas, unless beyond my control.

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

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 as off they are completed (that’s why it’s called a *check list!*)

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

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

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

❏ 4. 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 thread locking 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 or two 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 properly and are not kinked.

❏ 16. Use an incidence meter to check the wing for twists and attempt to correct before flying.

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

❏ 18. Tighten the propeller nut and spinner.

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

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

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

❏ 22. Always range check your radio when you get to the flying field.

FLYING

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

Fuel Mixture Adjustments

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

CAUTION (THIS APPLIES TO ALL R/C AIRPLANES): If, while flying, you notice any unusual sounds, such as a low-pitched "buzz," this may indicate control surface *flutter*. Because flutter can quickly destroy components of your airplane, any time you detect flutter you must **immediately** cut the throttle and land the airplane! Check all servo grommets for deterioration (this may indicate which surface fluttered), and make sure all pushrod linkages are secure and free of play. If the control surface fluttered once, it probably will flutter again under similar circumstances unless you can eliminate the free-play or flexing in the linkages. Here are some things which can cause flutter: Excessive hinge gap; Not mounting control horns solidly; Poor fit of clevis pin in horn; Side-play of pushrod in guide tube caused by tight bends; Poor fit of Z-bend in servo arm; Insufficient glue used when gluing in the elevator joiner wire; Excessive *play* or *backlash* in servo gears; and insecure servo mounting.

Takeoff

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

Remember to takeoff into the wind. When you're ready, point the model straight down the runway, hold a bit of up elevator to keep the tail on the ground to maintain tail wheel steering, then gradually advance the throttle. As the model gains speed, decrease up elevator allowing the tail to come off the ground. One of the most important things to remember with a taildragger 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 Stuka 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 lose 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 descent 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.

The Stuka lands quite well without the flaps as described above but it really shines when you lower the flaps. Your approach is the same as just described except once you deploy the flaps you may need to add a bit more throttle to maintain flying speed. Watch the plane as the flaps are dropped. As the airspeed drops add power as needed to keep flying. It is a good idea to practice an approach at about 50 feet of altitude to get familiar with what the flaps will do before attempting a flaps down landing.

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

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

GOOD LUCK AND GREAT FLYING!

IDENTIFICATION TAG

This model belongs to:

Name

Address

City, State Zip

Phone number

AMA number

Fill out the tag and place it inside your model.

GREAT PLANES®
MODEL MANUFACTURING COMPANY