Shoestring

INSTRUCTION MANUAL

A. R. F.

Almost Ready to Fly

Wingspan: 61.5" [1,560mm]
Wing area: 712.5" [46 sq dm]
Weight: 7 lbs [3,630g]
Wing loading: 25.9 oz/sq ft [79 g/sq cm]
Length: 53" [1,345mm]
Radio: 4-ch (five servos)
Engine: .61 two-stroke, .91 four-stroke [10cc 2-stroke, 15cc 4-stroke]

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.

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TABLE OF CONTENTS

INTRODUCTION 2
IMPORTANT SAFETY PRECAUTIONS 2
ADDITIONAL ITEMS REQUIRED 3
Muffler 3
Hardware and Accessories 4
Adhesives and Building Supplies 4
Optional Supplies and Tools 4
IMPORTANT BUILDING NOTES 4
ORDERING REPLACEMENT PARTS 4
KIT CONTENTS 5
PREPARATIONS 6
BUILD THE WING 6
Hook up the Ailerons 6
Join the Wing 7
BUILD THE FUSELAGE 8
Mount the Wing 8
Mount the Stab and Fin 9
Mount the Wheel Pants and Landing Gear 12
Finish the Cockpit 13
Mount the Engine 15
Mount the Cowl 15
FINAL ASSEMBLY 17
Install the Radio 17
Finishing Touches 19
GET THE MODEL READY TO FLY 19
Check the Control Directions 19
Set the Control Throws 19
Balance the Model (C.G.) 20
Balance the Model Laterally 21
PREFLIGHT 21
Identify Your Model 21
Charge the Batteries 21
Balance Propellers 21
Ground Check 21
Range Check 21
ENGINE SAFETY PRECAUTIONS 21
AMA SAFETY CODE 22
CHECK LIST 22
FLYING 23
Takeoff 23
Flight ..... Back Cover
Landing ..... Back Cover

INTRODUCTION

Thank you for purchasing the Great Planes Shoestring ARF. Those who know the full-size Shoestring and are familiar with its history are likely to be racers who may have resisted the idea of building an ARF. On the other hand, such a beautiful plane can't be resisted no matter how it is constructed! The Shoestring is nostalgic and modern at the same time. While the Shoestring made its name as a pylon racer in 1949 and into the fifties, even today the Shoestring looks just as “mean” as any other modern-day racer. Though it is an ARF, the Shoestring can still be “scaled-out” if one wishes to go the extra mile by adding home-made details such as landing gear fairings and an air scoop. **Note:** The Shoestring is covered in TopFlite Red (TOPQ0201, 6’ roll) and Cub Yellow (TOPQ0220, 6’ roll) MonoKote film.

The full-size Shoestring has a wingspan of 19' (228"). This model has a wingspan of 61.5". That makes it slightly larger than quarter-scale (1:3.7 to be exact) and eligible to participate in IMAA events.

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

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

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

1. The Shoestring ARF should not be considered a toy, but rather a sophisticated, working model that functions very much like a full-size airplane. Because of its performance capabilities, the Shoestring, 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 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.

8. While this kit has been flight tested to exceed normal use, if the plane will be used for extremely high stress flying, such as racing, the modeler is responsible for taking steps to reinforce the high stress points.

Note: 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 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 AMA 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*

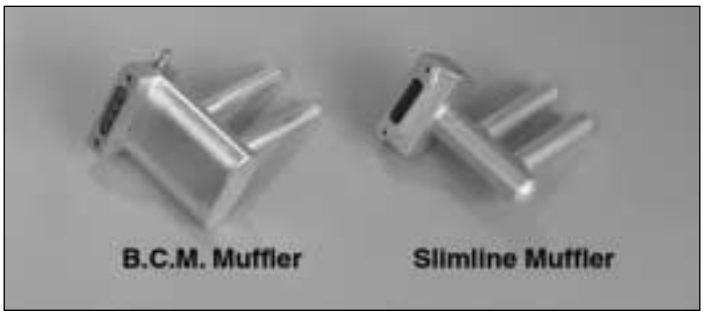
IMAA Information

The Great Planes Shoestring ARF is an excellent sport-scale model. Though it isn't particularly large, it is larger than quarter-scale making it eligible to fly in IMAA events. The IMAA (International Miniature Aircraft Association) is an organization that promotes non-competitive flying of giant-scale models. If you plan to attend an IMAA event, contact the IMAA for a copy of the **IMAA Safety Code** at the address or telephone number below.

IMAA
205 S. Hilldale Road
Salina, KS 67401
(913) 823-5569

ADDITIONAL ITEMS REQUIRED

Muffler



Conveniently, the O.S.® MAX .61FX engine fits inside the cowl. Engines with similar proportions will fit as well. However, the cowl will have to be trimmed to fit the exhaust system. On our prototype, we used the B.C.M. (Bisson Custom Mufflers) #04061 Pitts muffler for the O.S. .61 FX (BISG4061). Another muffler that will work is the Slimline #3217 (SLIG2217) Pitts Style (for O.S. .61 SF, FP, FX). To use these mufflers, a portion of the included Great Planes 60-120 engine mount will have to be trimmed to accommodate the muffler. See page 17 for details.

Hardware and Accessories

This is the list of hardware and accessories required to finish the Shoestring ARF. Order numbers are provided in parentheses for your convenience.

- ❑ Four-channel radio with five servos (two aileron servos)
- ❑ .61 two-stroke to .91 four-stroke engine
- ❑ Muffler
- ❑ Suitable propellers (refer to the engine manufacturer's recommendations)
- ❑ 3' Medium fuel tubing (GPMQ4131)
- ❑ Y-harness for dual aileron servos (HCAM2500 for Futaba® J)
- ❑ 1/4-scale pilot (optional, WBRQ2626)
- ❑ R/C foam rubber (1/4" - HCAQ1000, or 1/2" - HCAQ1050)
- ❑ Easy Fueler fuel filler valve for glow fuel (GPMQ4160)
- ❑ Switch and charge jack mounting set (GPMM1000)
- ❑ 1/4" yellow Kwik Stripe striping tape (for canopy trim, GPMQ1450)

Adhesives and 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 Shoestring. Great Planes Pro™ CA and Epoxy glue are recommended.

- ❑ 1/2 oz. Thin Pro CA (GPMR6001)
- ❑ 1/2 oz. Medium Pro CA (GPMR6007)
- ❑ 30-Minute Epoxy (GPMR6047)
- ❑ Drill bits, 1/16", 5/64", 3/32", 1/8", #29 (or 9/64") and 8-32 tap (or Great Planes 8-32 tap and drill set, GPMR8103), 3/16", #11 (or 13/64"), 7/64" (or 1/4"), 7/32"

Optional Supplies and Tools

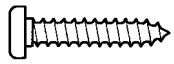
Here is a list of additional optional items we used to assemble the Shoestring ARF.

- ❑ 21ST Century® sealing iron (COVR2700)
- ❑ 21ST Century iron cover (COVQ2702)
- ❑ Milled Fiberglass (GPMR6165)
- ❑ Microballoons (TOPR1090)
- ❑ Builders Triangle Set (HCAR0480)
- ❑ Dead Center™ Engine Mount Hole Locator (GPMR8130)
- ❑ Threadlocker (GPMR6060)
- ❑ K & S #801 Kevlar thread (for stab alignment K+SR4575)
- ❑ Denatured Alcohol (for epoxy clean up)
- ❑ Curved Tip Scissors for Trimming Canopy (HCAR0667)
- ❑ R/C-56 Canopy Glue (JOZR5007)
- ❑ Great Planes CG Machine™ (GPMR2400)
- ❑ Great Planes AccuThrow™ Deflection Gauge (for measuring control throws, GPMR2405)
- ❑ Top Flite Precision Magnetic Prop Balancer™ (TOPQ5700)

IMPORTANT BUILDING NOTES

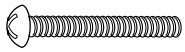
- There are two types of screws used in this kit:

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



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.

- 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 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.

ORDERING REPLACEMENT PARTS

To order replacement parts for the Great Planes Shoestring 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**.

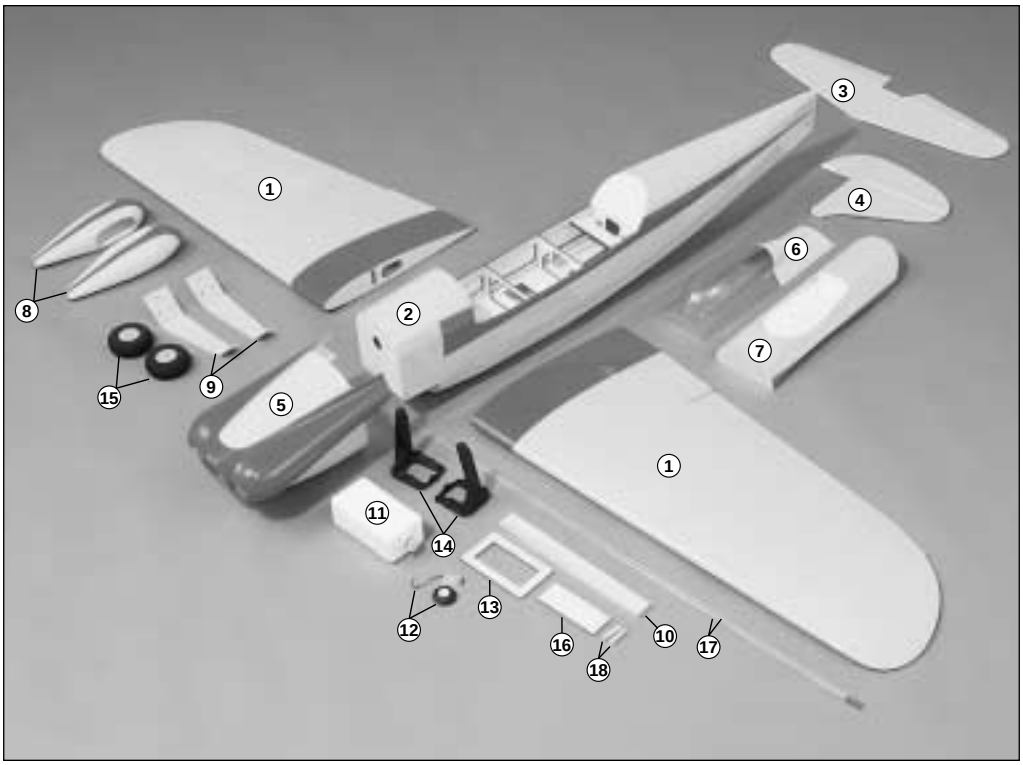
Replacement Parts List

Order Number	Description	How to Purchase
	Missing pieces	Contact Product Support
	Instruction manual	Contact Product Support
	Full-size plans	Not available
GPMA2210	Wing Kit	Contact Your Hobby Supplier to Purchase These Items
GPMA2211	Fuse Kit	
GPMA2212	Tail Set	
GPMA2213	Cowl	
GPMA2214	Canopy	
GPMA2215	Landing Gear	
GPMA2216	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



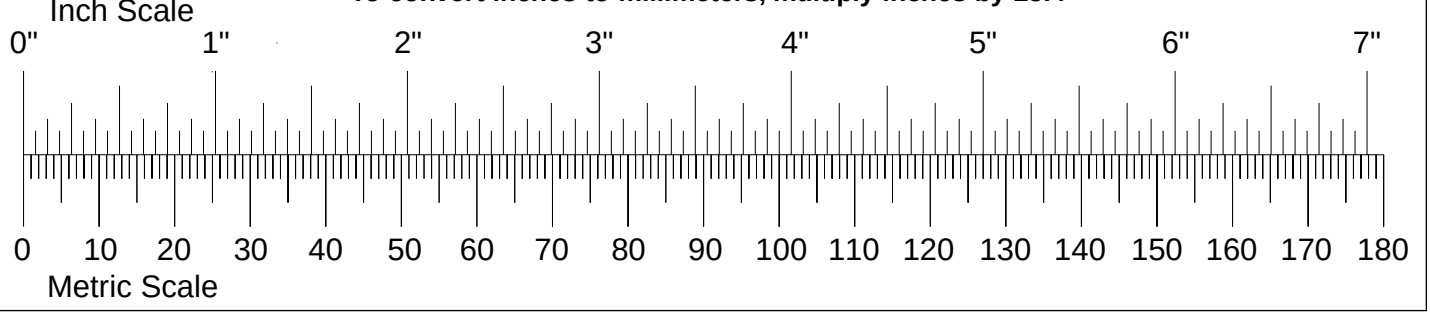
Kit Contents (Photographed)

1 Wing with Ailerons
2 Fuselage
3 Stab with Elevators
4 Fin with Rudder
5 Painted Cowl
6 Painted Canopy
7 Cockpit
8 Painted Wheel Pants (2)
9 Painted Aluminum Landing Gear (2)
10 1/4" x 1-1/8" x 10-3/4" Wing Joiner
11 Fuel Tank with Hardware
12 Tail Gear with Wheel
13 Plywood Servo Tray
14 Engine Mount
15 3" Wheel (2)
16 1/8" Plywood Wing Bolt Plate
17 .074" x 36" Elevator and Rudder Pushrods
18 Wing Dowels

Kit Contents (Not Photographed)

1/8" x 7/8" x 6" Ply strip (wheel pant mounts)
(4) 1/2" x 1/2" x 5/8" Maple blocks (cowl mnts)
1/4" x 3/4" x 5" Balsa stick (fuel tank support)
3" Spinner
(2) 2" x 3/16" Bolt-on axles
(4) 3/16" Wheel collars
(4) 6-32 Set screws for wheel collars
(2) 5/16" -24 Lock nuts (for axles)
(2) 1/4-20 x 2" Nylon wing bolts
(4) Large control horns
(6) 6-32 Blind nuts (preinstalled)
(2) 1/4-20 Blind nuts (preinstalled)
(8) 8-32 x 1" SHCS (socket-head cap screws) (4-engine mnt to firewall, 4-engine to mnt)
(4) Faslinks
(5) Nylon clevis
(1) 2" x 9" CA hinge strip
(4) 8-32 Blind nuts (engine mount)
(6) 6-32 x 3/4" Screws (landing gear)
(4) 2-56 x 5/8" Screws (elev, rudd control horns)
(4) #2 x 1/2" Screws (aileron control horns)
(4) #2 x 3/8" Screws (wheel pants)
(5) Silicone retainers (clevises)
(4) #8 Flat washers (engine mount)
(1) 3/32" Wheel collar (tail wheel)
(1) 4-40 Set screw (tail wheel)
(1) Brass body screw-lock conn. (throttle servo)
(1) Nylon retainer (screw-lock connector)
(1) 4-40 x 1/4" SHCS (screw-lock connector)
(2) .074" x 6" Pushrod (ailerons)
(1) 3/16" x 12" Guide tube (throttle)
(1) .074" x 18" Pushrod (throttle)
(8) #8 Lock washers (engine, engine mount)
(1) Elevator joiner wire
(4) #4 x 3/8" Screws (cowl)
(4) #4 Washers (cowl)

To convert inches to millimeters, multiply inches by 25.4



PREPARATIONS

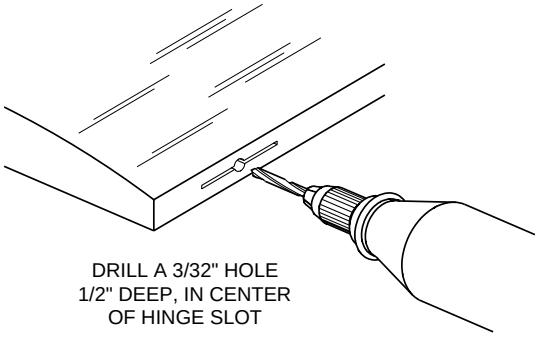
❏ 1. If you have not done so already, remove the major parts of the kit from the box (wings, fuse, wheel pants, cowl, tail parts, etc.) and inspect them for damage. If any parts are damaged or missing, contact Product Support at the address or telephone number listed on the front cover.

❏ 2. Remove the masking tape and separate the ailerons from the wing, the rudder from the fin and the elevators from the stab. Use a covering iron with a covering sock on high heat to tighten the covering. Apply pressure over sheeted areas to **thoroughly** bond the covering to the wood. **Hint:** Poke three or four pin holes in the covering between the "ribs" in the tail surfaces and ailerons. This will allow air to escape while tightening the covering.

BUILD THE WING

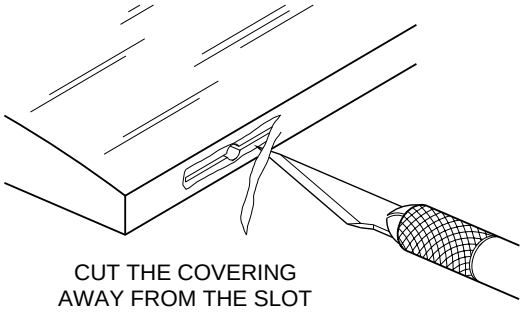
Hook Up the Ailerons

Do the right wing first so yours matches the photos the first time through. You can do one wing at a time, or work on them together.



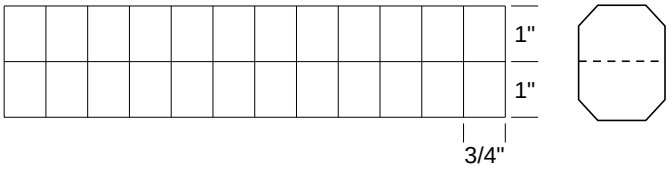
DRILL A 3/32" HOLE
1/2" DEEP, IN CENTER
OF HINGE SLOT

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

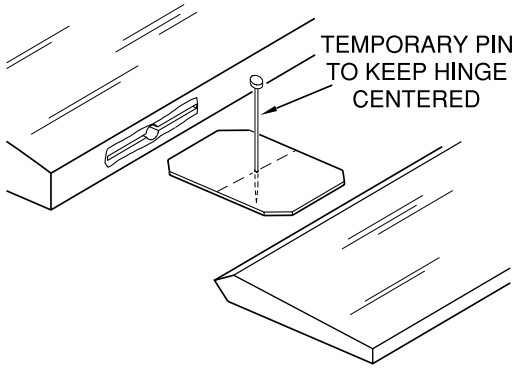


CUT THE COVERING
AWAY FROM THE SLOT

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

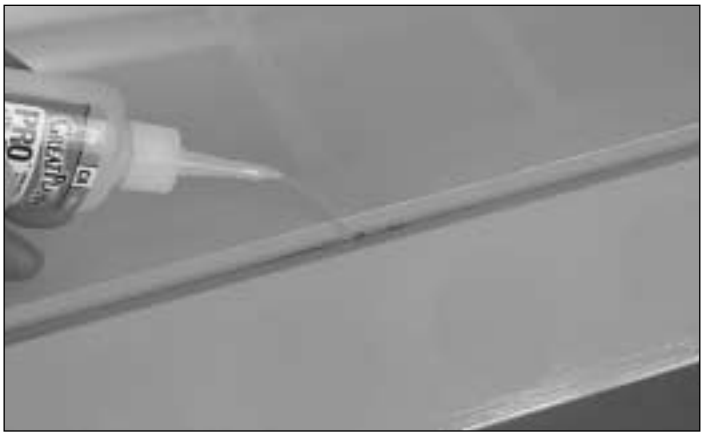


❏ ❏ 3. Cut three 3/4" x 1" **hinges** from the **CA hinge strip**. Snip off the corners so they go in easier.



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

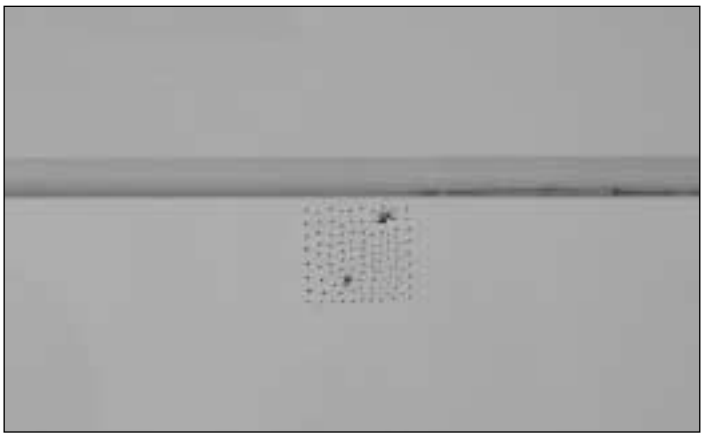
❏ ❏ 5. Remove any pins you may have inserted into the hinges. Adjust the aileron so there is a small gap between the LE of the aileron and the wing. The gap should be small—just enough to see light through or to slip a piece of paper through.



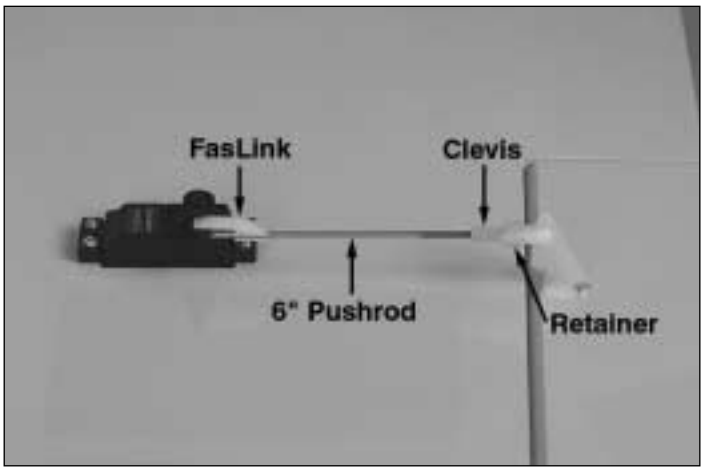
❑ ❑ 6. Apply six drops of thin CA to the top and bottom of each hinge. Do not use CA accelerator. After the CA has fully hardened, test the hinges by pulling on the aileron.

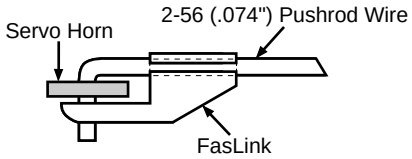
❑ ❑ 7. Cut the covering 1/8" inside the opening in the wing for the aileron servo. Use a trim iron to seal the covering to the edges of the opening. Cut the covering from the hole in the bottom of the wing for the aileron servo wire.

❑ ❑ 8. Tie the string inside the wing to the aileron servo wire. Pull the servo wire out of the end of the wing with the string. Drill 1/16" holes in the wing for the servo mounting screws, then mount the aileron servo using the screws that came with it.



❑ ❑ 9. Drill 1/16" holes into the bottom of the aileron for mounting the nylon control horn. Before mounting the horn, use a pin to poke several holes through the covering in the mounting location. Saturate the holes with thin CA, wipe away residual CA and allow to fully harden. Mount the aileron control horn to the aileron with two #2 x 1/2" screws.





❑ ❑ 10. Enlarge the hole in the servo arm with a Hobbico Servo Horn Drill (or a #48 or 5/64" drill bit). Connect the aileron to the servo with a 6" pushrod, a FasLink, a clevis and a silicone retainer.

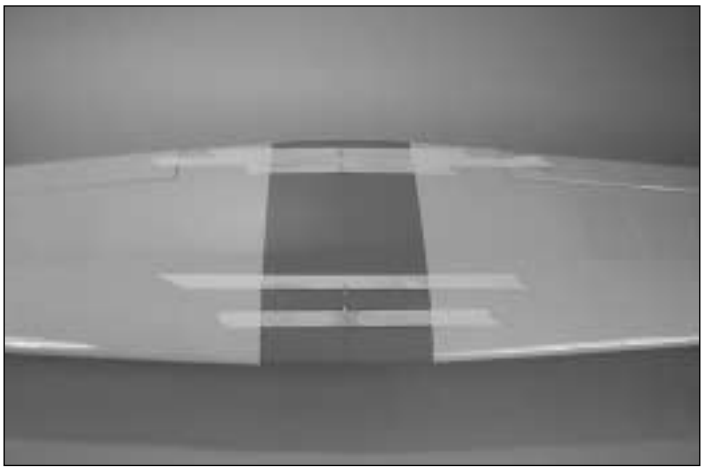
❑ 11. If you haven't yet done so, go back to step 1 and assemble the other wing the same way.

Join the Wing

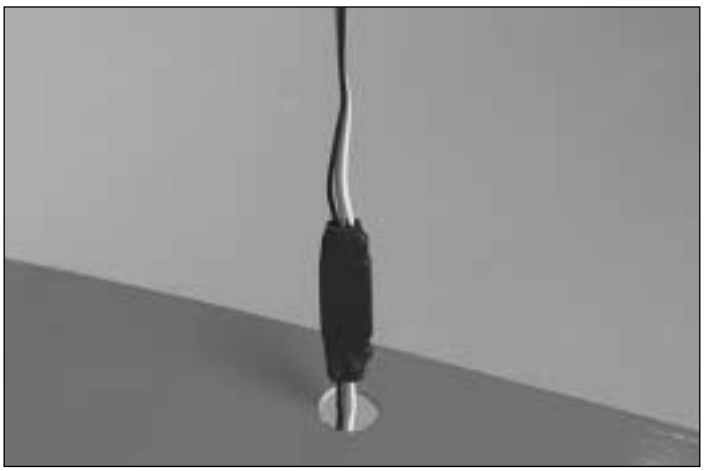
❑ 1. Trim the covering from the ribs on the end of both wings. This is easily done with a sanding block and medium-grit sandpaper as shown.

❑ 2. Test fit the wing halves with the hardwood joiner. Be certain the joiner is installed upright (the bottom of the joiner has an angle for wing dihedral).

❑ 3. Prepare 1/2 oz. of 30-minute epoxy. Add 1/2 oz. of microballoons. Working quickly, thoroughly coat the inside of both wing halves where the joiner fits and one half of the joiner with the epoxy and microballoons mixture. Making certain the joiner is upright, insert the coated end into one of the wing halves. Coat the other end of the joiner with the remainder of the epoxy and microballoons mixture. Proceed **immediately** to the next step.



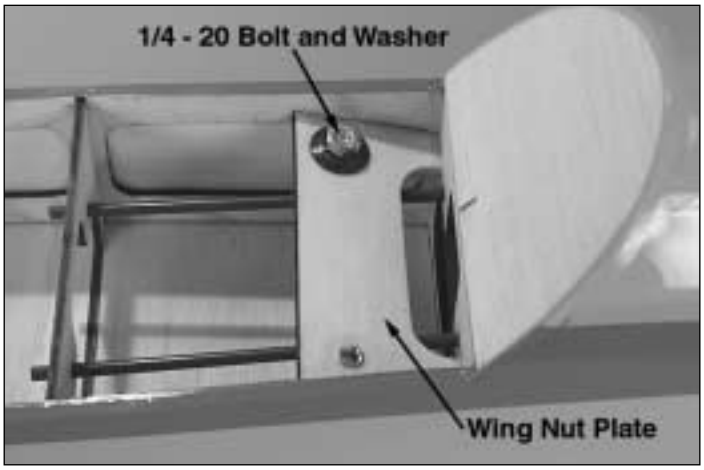
❑ 4. Prepare an additional 1/4 oz. of 30-minute epoxy only (no microballoons). Coat the ribs on both ends of the wing with the epoxy. Join the wing halves tightly, holding them together. Use a paper towel to wipe away excess epoxy that comes out of the wing. Tightly hold the wing together with masking tape, making certain both halves are in full contact and that the leading edges and trailing edges align. Wipe away excess epoxy and do not disturb the wing until the epoxy has fully hardened.



❑ 5. Connect the servo wires to a Y-harness (HCAM2500 for Futaba). Secure the connection between the servo wire and the Y-harness with heat shrink tubing, tape or clips suitable for that purpose.

BUILD THE FUSELAGE

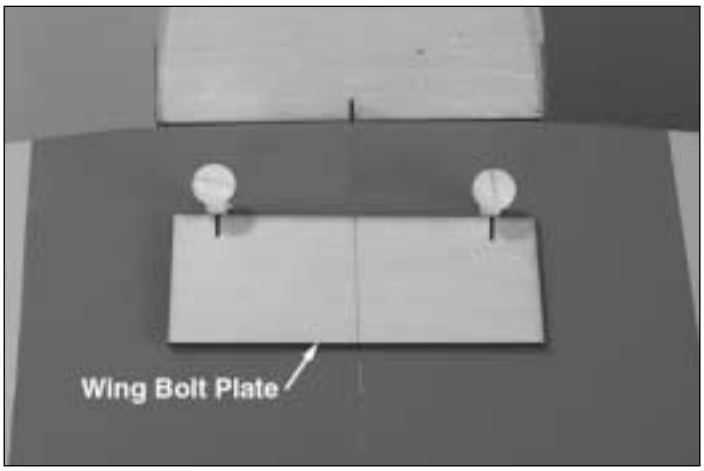
Mount the Wing



❑ 1. Inspect the blind nuts that are pressed into the bottom of the wing nut plate inside the fuselage. If the nuts are not securely pressed into the plate, remove them. Apply a dab of 30-minute epoxy to the flange around the blind nuts, then reinsert them into the plate. Use a metal 1/4-20 bolt and a large washer to draw the blind nuts all the way up into the wood by tightening the bolt to the top of the plate.

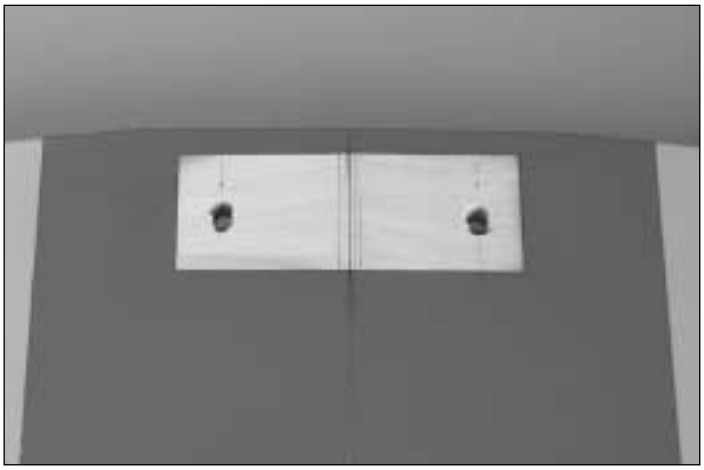
❑ 2. Cut the covering from the holes in the leading edge of the wing for the dowels and near the trailing edge for the wing bolts. Temporarily fit the 1/4" **wing dowels** into the leading edge of the wing.

❑ 3. Test fit the wing to the fuse and bolt it into position with the 1/4-20 nylon wing bolts. If necessary, enlarge or adjust the wing bolt holes in the wing so the wing bolts will align with the blind nuts.



❑ 4. Unscrew the wing bolts about 1/2". Place the 1/8" plywood **wing bolt plate** on the wing centered on the wing bolts. Mark the location of the wing bolts on the plate.

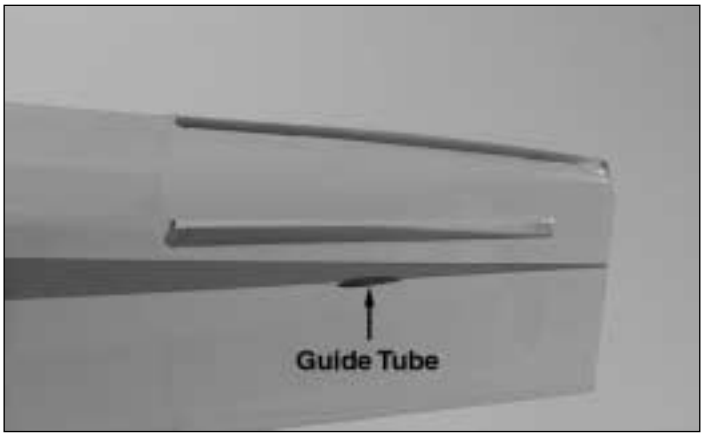
❑ 5. Drill 17/64" (or 1/4") holes through the center of the wing bolt plate at the marks (see the photo at step 7).



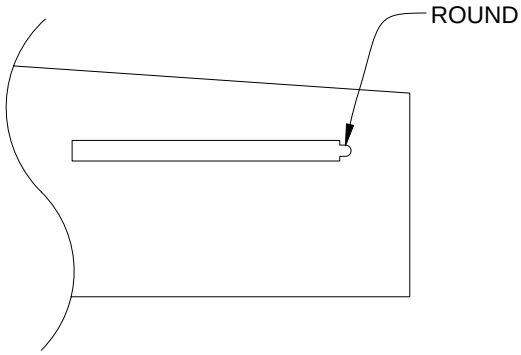
❑ 6. Use a hobby knife with a sharp #11 blade to cut the covering from the wing where the wing bolt plate will fit. Be certain to cut only through the covering, not into the wood.

❑ 7. Remove the covering and use epoxy to glue the wing bolt plate to the wing. **Hint:** Use the wing bolts themselves as clamps to hold the wing bolt plate into position until the epoxy hardens. Be certain you do not epoxy the wing to the fuse or the bolts to the wing!

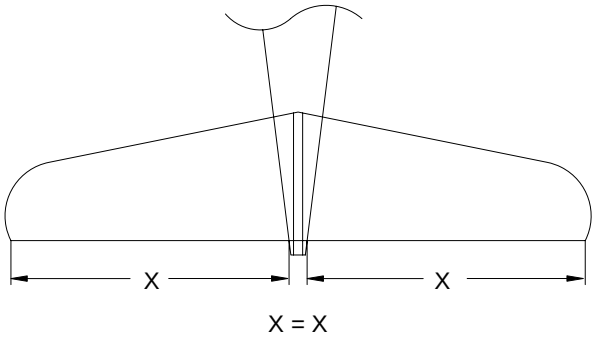
Mount the Stab and Fin



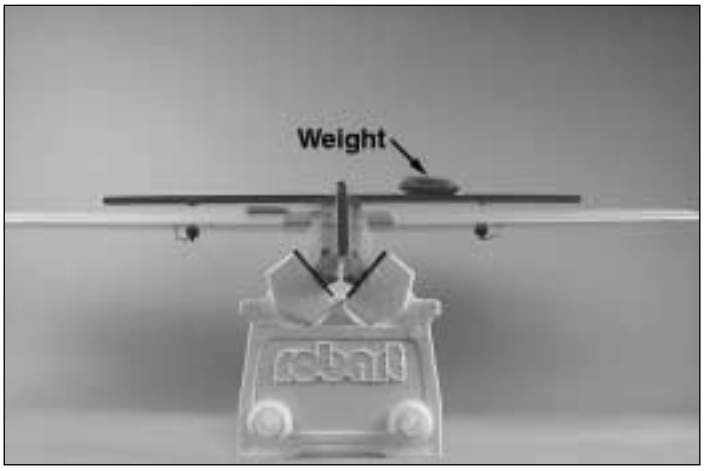
❑ 1. Cut the covering from the slots in the fuse for the stab and fin and from the guide tubes for the pushrods. **Hint:** Cut the covering from the slots for the stab and fin 3/32" from the edge, thus leaving a *flap* that can be ironed to the stab and fin after gluing them into position.



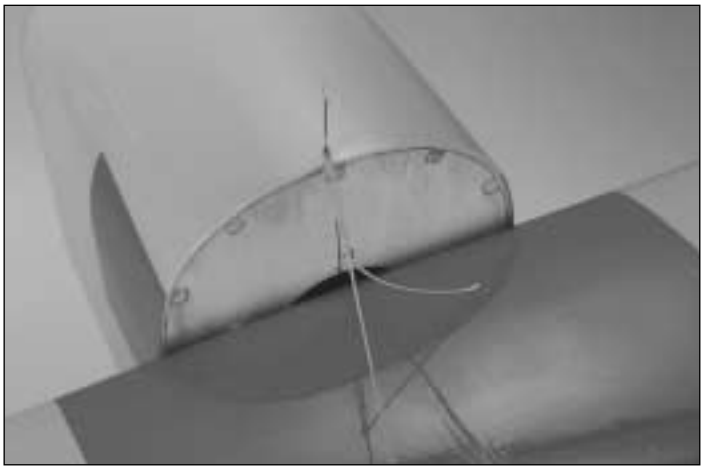
❑ 2. Cut a round groove or a notch in the fuse at the TE of the stab to accommodate the elevator joiner wire.



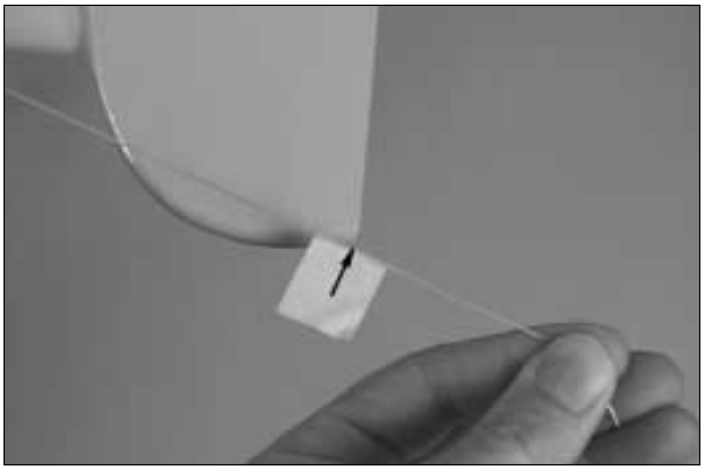
❑ 3. Fit the stab into the fuse. Center the trailing edge by taking accurate measurements as shown in “X” = “X” in the sketch.



❑ 4. Bolt the wing to the fuse. Place the model in a building stand (such as a Robart Super Stand II, ROBP1402). Stand five to ten feet behind the model and view the stab and wing. If the stab and wing align with each other, proceed to the next step. If the stab and wing do not align, place a weight on the “high” side of the stab to bring it into alignment. If much weight is required, remove the stab and sand the “high side” of the slot in the fuse where the stab fits until the stab aligns with the wing.



❑ 5. Stick a pin into the top of the fuse centered in the middle stringer at the front of the wing. Tie a small loop in one end of a 42" piece of non-elastic string such as K & S #801 Kevlar thread (K+SR4575). Slip the loop in the string over the T-pin.



❑ 6. Fold a piece of masking tape over the other end of the string and draw an arrow on it. Slide the tape along the string and align the arrow with one end of the stab as shown in the photo. Swing the string over to the same position on the other end of the stab. While keeping the stab centered from side-to-side, adjust the stab and slide the tape along the string until the arrow aligns with both sides. Be certain the stab remains centered from side-to-side during this process.

❑ 7. Use a fine-point felt-tip pen such as a Top Flite Panel Line Pen (TOPQ2510) to mark the outline of the fuse onto the top and bottom of the stab. *(Disregard the elevators, fin and rudder in the photo - they should not be mounted to the model yet.)*

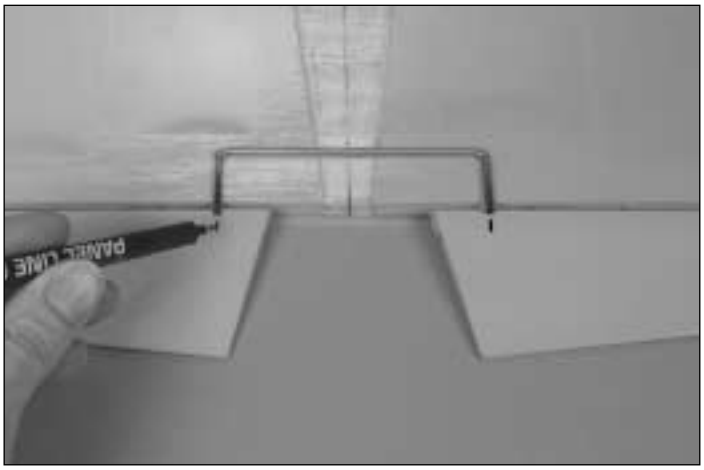
❑ 8. Remove the stab from the fuse. Use a sharp #11 hobby knife or use the **Expert Tip** that follows to cut the covering from the stab along the lines you marked. Use care to cut **only into the covering** and **not** into the wood.

How to cut covering from balsa.

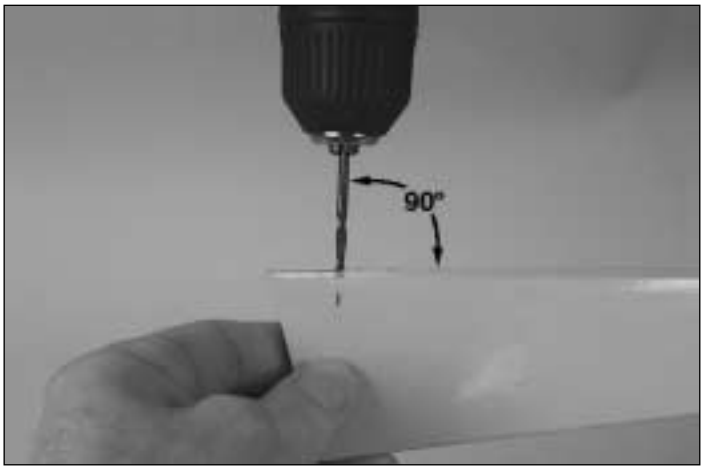
Use a soldering iron to cut the covering from the stab. The tip of the soldering iron doesn't have to be sharp, but a fine tip does work best. Allow the iron to heat fully. Use a straightedge to guide the soldering iron at a rate that will just melt the covering and not burn into the wood. The hotter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

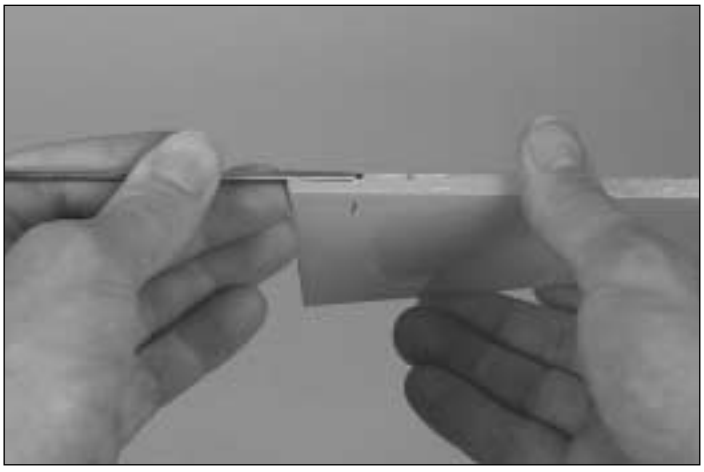
❑ 9. The same as you did for the wing and fuse, cut the covering from the hinge slots in the stab and elevators and the fin and rudder. There should be three hinge slots in the rudder and in both elevators and two hinge slots in the fin. There should also be a hinge slot in the fuse that aligns with the bottom hinge slot in the rudder. Drill 3/32" holes through the middle of the slots.

❑ 10. Cut nine more CA hinges from the CA hinge strip. Temporarily join the elevators to the stab with the hinges.



❑ 11. Position the **elevator joiner wire**, evenly spaced, over both elevators as shown in the photo. Mark the ends of the joiner wire onto the elevators.

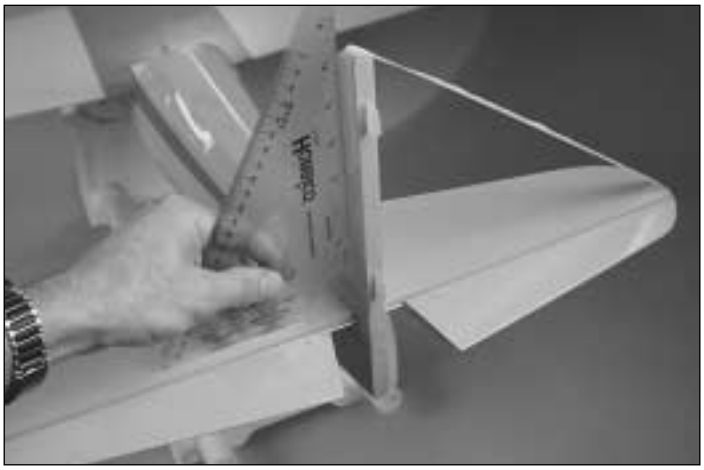




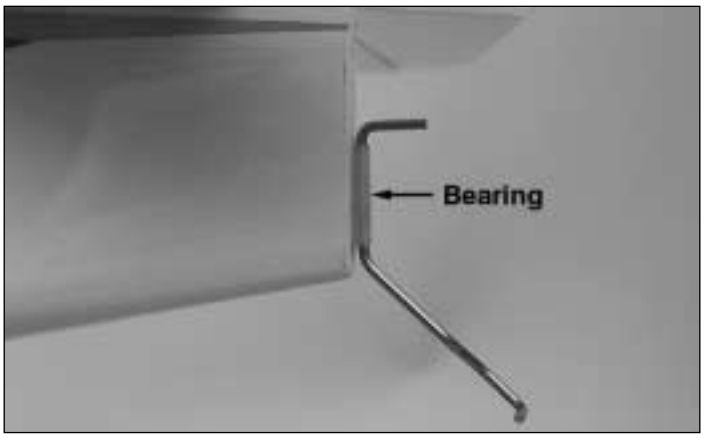
❑ 12. Drill a 1/8" hole through the LE of both elevators at the marks you made. Use a Great Planes Groove Tube (GPMR8140) or a 1/8" brass tube sharpened on the end to cut a groove in the LE of the elevators to accommodate the joiner wire. Test fit elevators to stab with joiner wire. "Tweak" the joiner wire if necessary to get both elevators even.

❑ 13. Use 30-minute epoxy to glue the stab into the fuse. For the most strength, apply epoxy to both sides of the stab **and** inside the fuse where the stab fits. Slide the stab **and the elevator joiner wire** into position. Wipe away residual epoxy with a tissue dampened with alcohol. If the stab required a weight on one side or the other to align it with the fuse, position the weight. Use the pin and string to confirm stab alignment. If you've cut the covering as suggested over the slots in the fuse for the stab (leaving a 3/32" *flap* that can be ironed to the stab), use a trim iron to iron the covering to the stab before the epoxy hardens. Do not disturb the model until the epoxy has fully hardened.

❑ 14. **Thoroughly** coat the insides of the holes in the elevators for the joiner wire with 30-minute epoxy. Also coat the ends of the joiner wire that go into the elevators. Join the elevators to the stab and the joiner wire with the hinges. Wipe away excess epoxy before it hardens. The same as you did the ailerons, permanently join the elevators to the stab by gluing in the hinges with thin CA.



❑ 15. Fit the fin into the fuse. Just the same as you did the stab, mark the outline of the fuse onto the fin, then use the soldering iron technique to remove the covering. Glue the fin into position with 30-minute epoxy using a builder's square to make certain the fin is vertical. If necessary, pull the fin to one side or the other with masking tape until the fin is perpendicular to the stab.

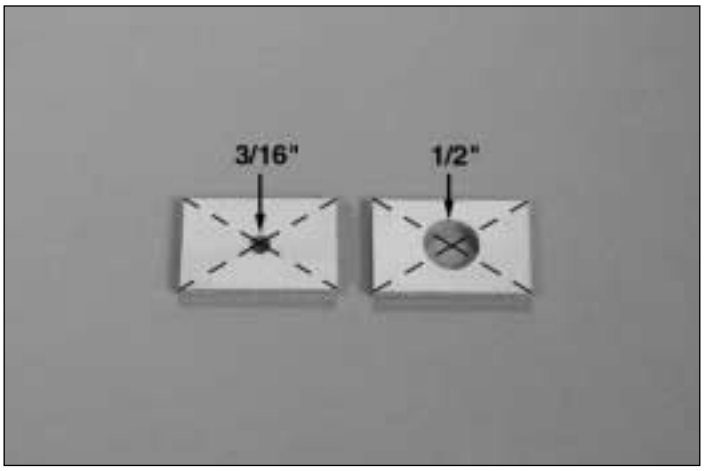


❑ 16. Use a #11 blade or a small razor saw to cut a slot in the aft end of the fuse for the nylon bearing on the tail gear wire. Test fit the tail gear wire into the fuse as shown.

❏ 17. The same as the elevators, drill a 3/32" hole in the rudder for the tail gear wire and cut a groove to accommodate the bearing.

❏ 18. Apply petroleum jelly to the tail wheel bearing where the wire passes through. This will prevent the wire from being glued to the bearing. Permanently join the rudder to the fin using 30-minute epoxy to glue the “arm” portion of the tail gear wire into the rudder. Use thin CA to glue in the hinges.

Mount the Wheel Pants & Landing Gear

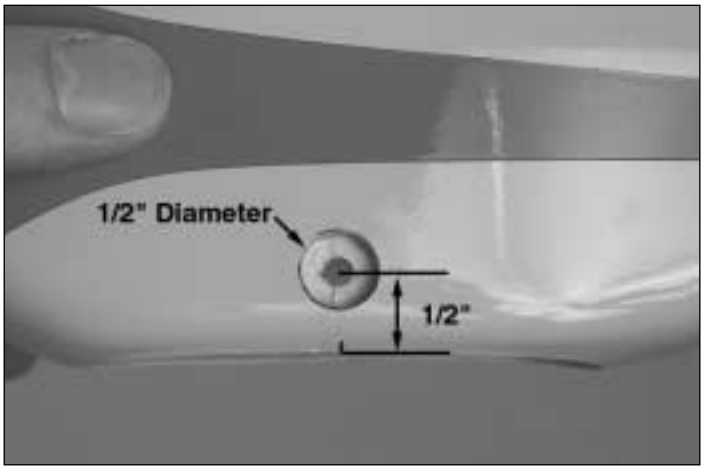


❏ ❏ 1. Cut two 1-3/8"-long **wheel pant mounts** from the 1/8" x 7/8" x 6" plywood strip. Stack one mount on top of the other, then drill a 3/16" hole through the **center** of both mounts at the same time. Enlarge the hole in one of the mounts to 1/2". **Note:** Drawing diagonal lines, from corner to corner as shown, will help locate the center of the wheel pant mounts.

❏ ❏ 2. Glue the mounts together with the holes centered over each other.

❏ ❏ 3. Holding one of the **wheel pants** as shown in the photo (with the front of the pant toward the left), insert a wheel into the pant and center it in the opening. Use a felt-tip pen to mark the side of the pant over the hole in the wheel.

Refer to these photos for the following two steps.

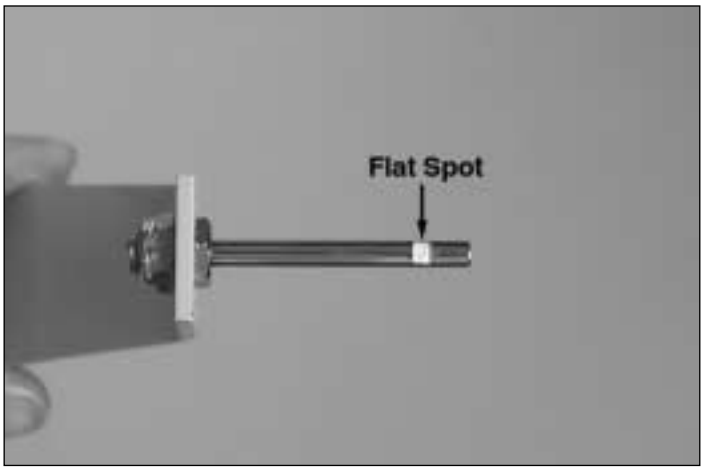


❏ ❏ 4. Use a high-speed rotary tool with a cutting bit or a hobby knife to cut a 1/2" hole **centered** over the mark 1/2" from the bottom of the pant. This is now the **right** wheel pant.

❏ ❏ 5. Round the bottom edge of the wheel pant mount so it fits in the pant when the 1/2" hole in the mount is centered over the hole in the pant. Glue the mount to the pant with 30-minute epoxy. **Hint:** For the most secure bond, add microballoons (TOPR1090) or milled glass fibers (GPMR6165) to the epoxy.

❏ ❏ 6. Drill 3/32" holes through the **right landing gear** on both sides of the large hole for the axle.

❏ ❏ 7. Use a metal saw or a high-speed rotary tool with a reinforced cut-off wheel to cut 5/16" from one of the bolt-on axles. Mount the axle to the landing gear with a nut.

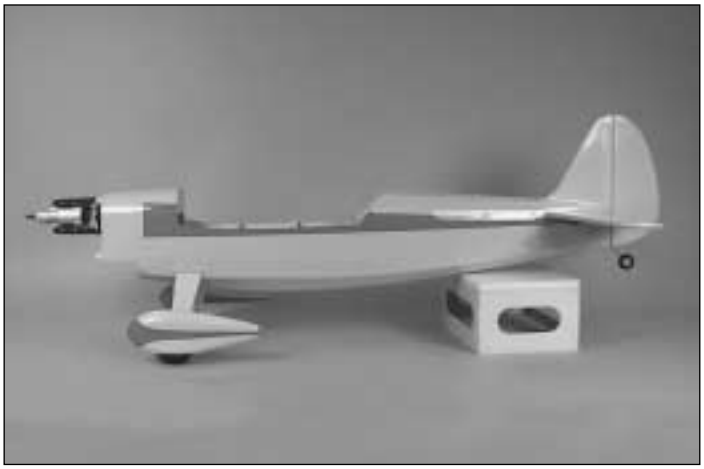


❏ ❏ 8. Use a #11 (or 13/64") drill to enlarge the hole in the wheel.Temporarily slide the wheel pant, a wheel collar and a wheel onto the axle. Determine where the set screw for the second wheel collar that holds on the wheel will be positioned on the axle. Remove the wheel and pant, then file a flat spot on the axle for the set screw in the wheel collar.

❏ ❏ 9. Mount the wheel and pant to the axle with a wheel collar on both sides of the wheel. Temporarily tighten the set screws in the wheel collars.

❏ 10. Return to step 1 and mount the other wheel and pant to the left landing gear the same way. Be certain to make a **left** wheel pant.

❏ 11. Mount the landing gear to the fuse with six 6-32 x 3/4" screws. Mount the tail wheel to the tail gear wire with the wheel collar and set screw.



❏ 12. Place the model on its gear on the workbench. Prop-up the tail until the fuse is level. Adjust both wheel pants so they are level with the workbench.

❏ 13. Without moving the wheel pants, mark the locations of the holes in the landing gear onto the wheel pants.

❏ 14. Drill 1/16" holes through the pants and the wheel pant mounts at the marks you made (it may be easier to remove the landing gear from the fuselage for this).

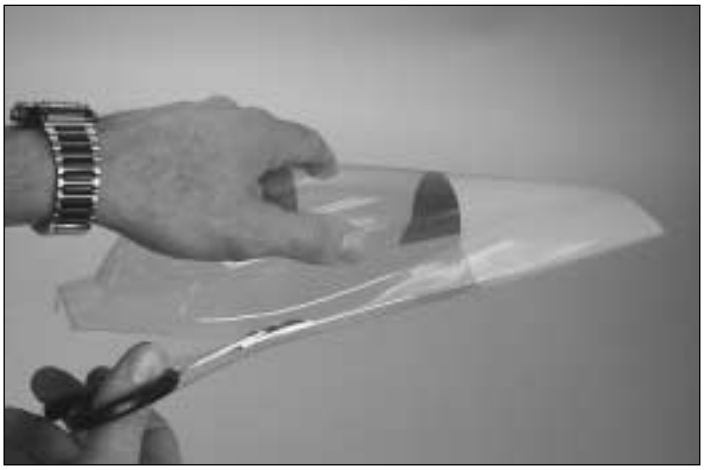
❏ 15. Fasten the wheel pants to the landing gear with #2 x 3/8" screws. Remove the set screws in the wheel collars, and add a drop of oil to the axles and the wheels. Add a drop of threadlocker to the set screws, install them into the wheel collars and securely tighten.

Finish the Cockpit

Refer to this photo while finishing the cockpit and gluing in the pilot.

❏ 1. Paint the inside of the cockpit black. **Caution:** Most types of paint will soak through the balsa and show through the covering. To avoid this, first clear-coat the inside of the cockpit before painting it black.

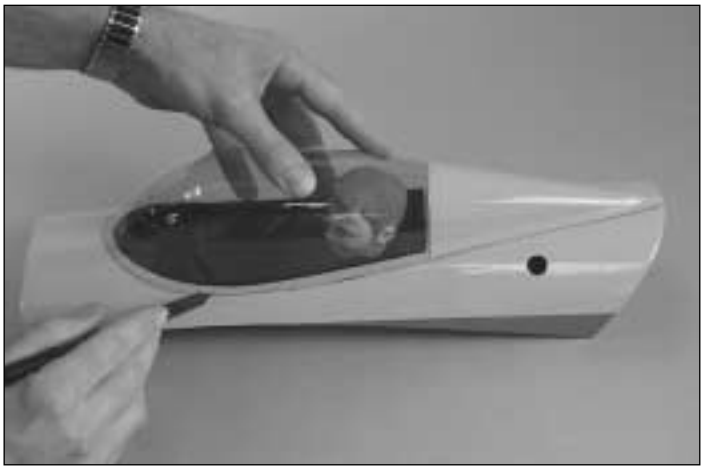
❏ 2. After the black paint inside the cockpit fully dries, apply the instrument panel decal.



❑ 3. Use curved-tip scissors to cut out the canopy. Be certain to leave approximately a 1/4" rim all the way around the canopy for a gluing surface to the cockpit. True the edges by sanding with medium-grit sandpaper.

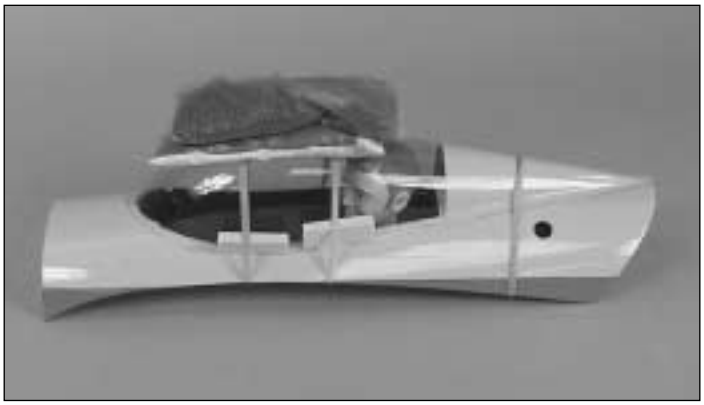
❑ 4. Test fit the pilot but **do not** yet glue him into position. We used a Williams Brothers' 1/4-scale pilot (WBRQ2626). Unless a portion of the cockpit floor is removed, there is room for only his head, not his bust. On the prototype shown in this manual, we simply cut a round hole in the cockpit floor for his neck. Position the canopy on the cockpit to be certain the pilot does not contact the canopy. Make adjustments where necessary.

❑ 5. Paint the pilot and securely glue him into position.



❑ 6. Place the canopy on the cockpit. Use a fine-point felt-tip pen to lightly trace the outline of the canopy onto the cockpit.

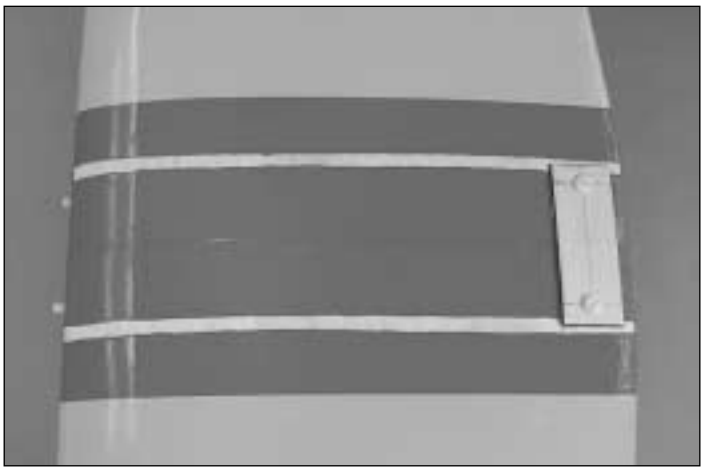
❑ 7. Remove the canopy. Use a pin to poke several holes through the covering all the way around the cockpit 3/32" inside the line you marked. These holes will help the glue adhere to the cockpit when it's time to glue the canopy on. Use a tissue dampened with alcohol to wipe away the ink line.



❑ 8. Wash the canopy in warm, soapy water. Glue the canopy to the cockpit with R/C-56 Canopy Glue (JOZR5007). CA could be used, but great care must be taken not to fog the canopy or use too much CA which could run onto the canopy or the covering. Canopy glue provides working time and can be wiped away with a damp tissue before it dries. Use rubber bands, weights or whatever method appropriate to hold the canopy to the cockpit until the glue dries.

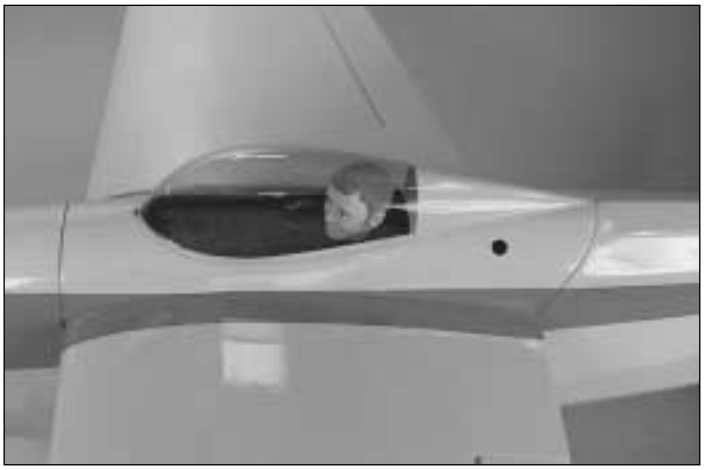
❑ 9. Use epoxy to glue the wing dowels into the wing with 1/4" protruding from the LE.

❑ 10. Mount the wing to the fuse. Position the cockpit on the wing. Accurately align the cockpit with the fuselage. Use a felt-tip pen to mark the outline of the cockpit onto the wing.



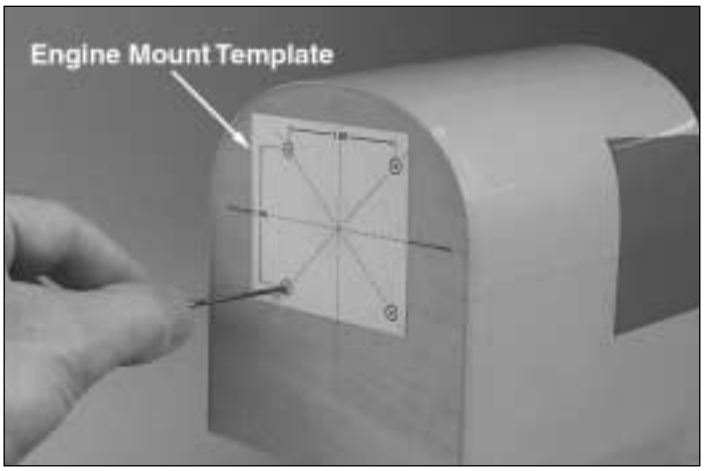
❑ 11. Remove the cockpit and the wing from the fuse. Use the “soldering iron and straightedge” technique to cut the

covering 1/16" inside the lines you marked. Make an additional cut 1/2" inside of the cuts already made. Peel the covering from the wing to expose the balsa wing sheeting.



12. Mount the wing to the fuse. Use epoxy to glue the cockpit to the wing.

Mount the Engine

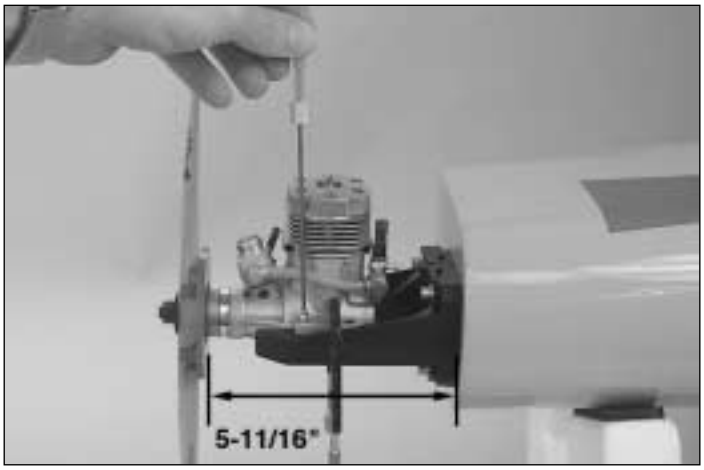


❏ 1. Turn to page 23 and cut the **engine mount template** from the manual. Use spray adhesive or tape to temporarily attach the template to the firewall with the vertical and horizontal lines on the template aligned with the lines on the firewall.

❏ 2. Use a small punch or a wire sharpened on one end to transfer the engine mount bolt holes to the firewall by making dimples in the wood. Remove the template.

❏ 3. Drill 7/32" holes through the firewall at the marks. Install four 8-32 blind nuts into the holes on the back of the firewall.

Refer to this photo for the following two steps.

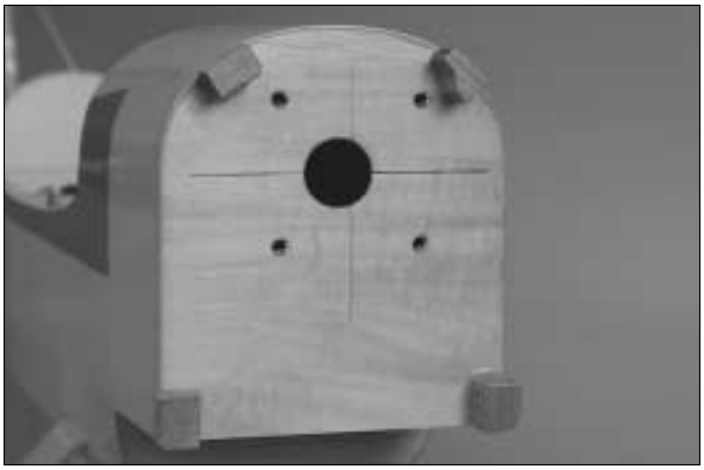


❏ 4. Mount the engine mount to the firewall with four 8-32 x 1" SHCS (socket-head cap screws), #8 lock washers and #8 flat washers, but do not fully tighten the bolts. Place the back plate of the spinner on the engine. Adjust the width of the mount to fit the engine. Center the molded-in “tick” marks on the engine mount over the horizontal line on the firewall. Tighten the mounting bolts.

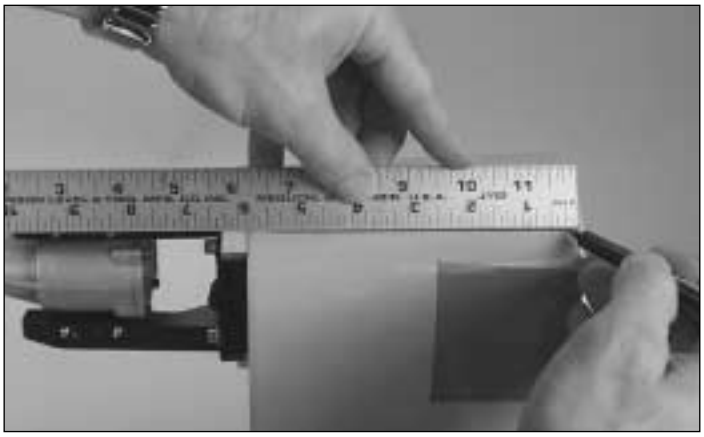
❏ 5. Use small clamps or another method to temporarily secure the engine to the mount with the back plate of the spinner 5-11/16" from the firewall. Use a Great Planes Dead Center™ Engine Mount Hole Locator (GPMR8130) or another method to mark the engine mount holes onto the engine mount.

❏ 6. Remove the engine from the mount. Drill #29 holes through the mount at the marks you made. Tap 8-32 threads into the mount. Mount the engine to the mount with four 8-32 x 1" socket head cap screws and #8 lock washers.

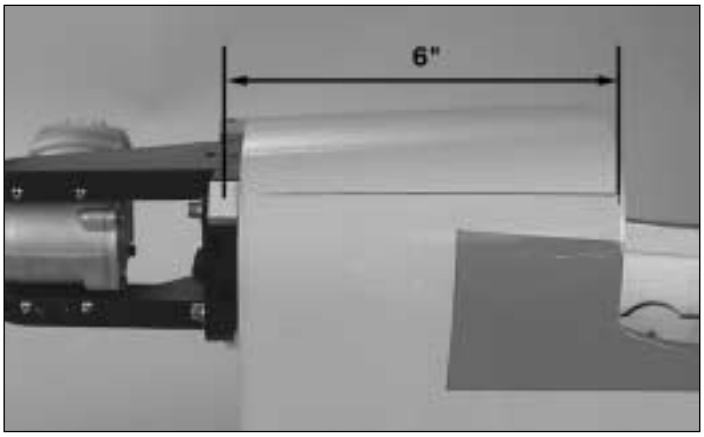
Mount the Cowl



❏ 1. Use epoxy to glue the four 1/2" x 1/2" x 5/8" maple **cowl mounting blocks** to the firewall where shown. Before gluing the top two blocks, sand them to a curved shape to match the top of the fuse. Also note that the top left block will have to be trimmed to accommodate the engine mount.



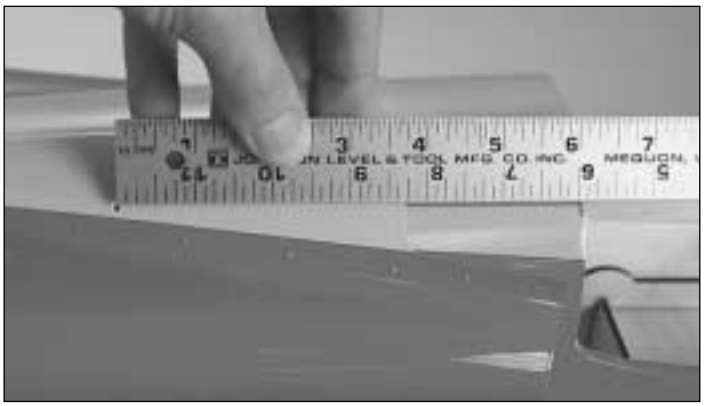
❑ 2. Hold a ruler to the fuse centered on one of the cowl mounting blocks. Use a felt-tip pen to draw a line directly onto the fuse along the straightedge.



❑ 3. Mark a **reference point** on the end of the line exactly 6" from the center of the cowl mounting block.

❑ 4. Mark the location of the remaining three cowl mounting blocks the same way.

❑ 5. Place the cowl on the fuse. Mount the spinner and prop to the engine. Position the cowl on the fuse so it is in alignment with the spinner. Be certain there is at least a 3/32" gap between the front of the cowl and the back plate of the spinner. It may be helpful to have an assistant hold the cowl for you.

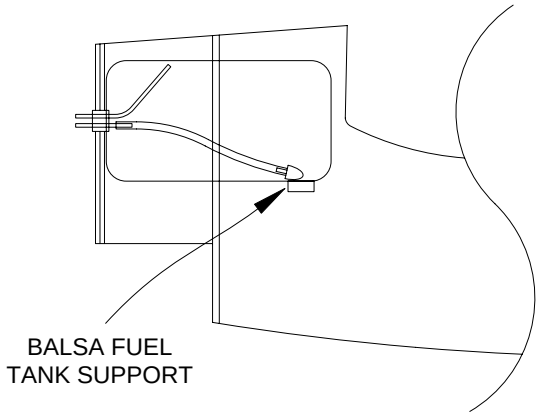


❑ 6. Align the ruler with the line on the fuselage. Mark the center of the cowl mounting block on the cowl 6" from the reference point. Drill a 3/32" hole through cowl and the mounting block at the mark. Enlarge the hole **in the cowl only** with a 1/8" drill. Mount the cowl to the block with a #4 x 3/8" screw and #4 washer.

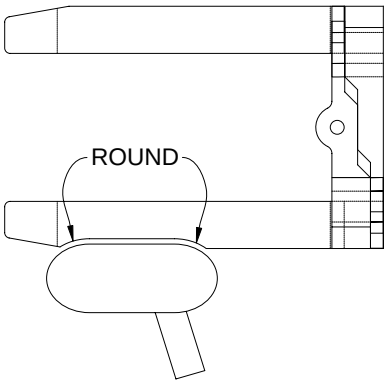
❑ 7. With your assistant holding the cowl in position, mark, drill and mount the cowl to the remaining three cowl mounting blocks the same way.

Before finishing the cowl, now is a good time to install the fuel tank...

❑ 8. Arrange the stopper and tubes as shown in the photo, then insert them into in the tank. Tighten the screw to expand the stopper, thus sealing the tank. Be certain the fuel line weight (clunk) at the end of the fuel line inside the tank does not contact the rear of the tank. Otherwise, the line may become stuck above the fuel level and discontinue fuel flow. Remember (or use a felt-tip pen to mark) which tube is the fuel pick-up tube and which tube is the vent (that will be connected to the pressure fitting on the engine muffler).



❑ 9. Install the tank in the fuse. Fit the neck through the hole in the firewall. Be certain the vent tube inside the tank is pointing upward. Cut the 1/4" x 3/4" x 5" balsa stick to the correct length to fit between the fuselage sides under the aft end of the tank (the approximate length will be 4-11/16"). Position the “fuel tank support” in the fuse, then glue it into position. If necessary, the support may be broken free to remove the tank when maintenance is required.



❑ 10. Mount the muffler to the engine. A Bisson Custom Mufflers #04061 Pitts muffler (BISG4061) was selected for the O.S. .61 FX used on the model shown in this manual (the muffler can be seen in the following photo). The muffler supplied with the engine could be used, but this would require trimming a significant amount of material from the cowl, detracting from its appearance. **Note:** Approximately 1/16" of the engine mount must be ground away to accommodate the Bisson muffler. This poses no problem as long as the corners are round as illustrated in the sketch.

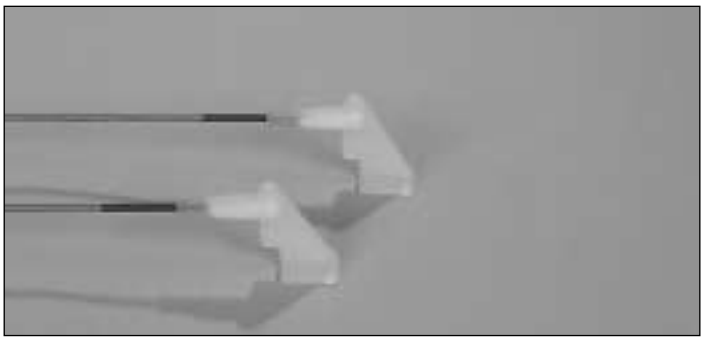
❑ 11. Use the **filler valve mount** from a Great Planes Handy Mounts set (GPMQ6000), or fashion a mount from 1/8" plywood (not included) for the fuel filler valve. A Great Planes Easy-Fueler for glow fuel was used on this model (GPMQ4160, not included with this kit). Use epoxy to securely glue the filler valve mount to the firewall in a location where the filler valve will be accessible outside the cowl when it's time to fuel the engine.

❑ 12. Use epoxy or fuelproof paint to coat the cowl mounting blocks and the fuel filler mount.

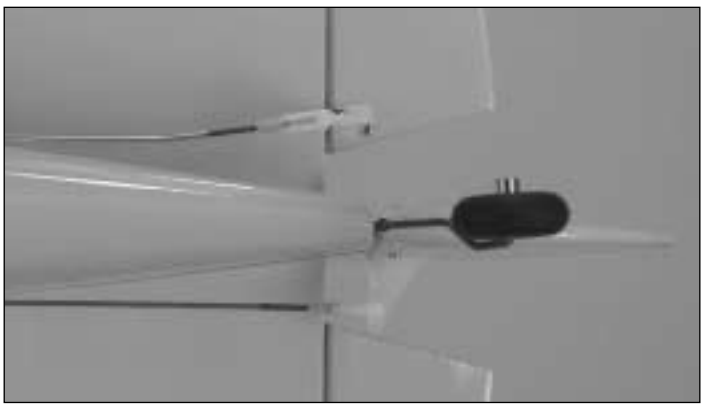
❑ 13. Cut holes in the cowl where necessary for the engine exhaust, needle valve, glow plug igniter (or remote glow plug hook up if used) and fuel filler valve.

FINAL ASSEMBLY

Install the Radio

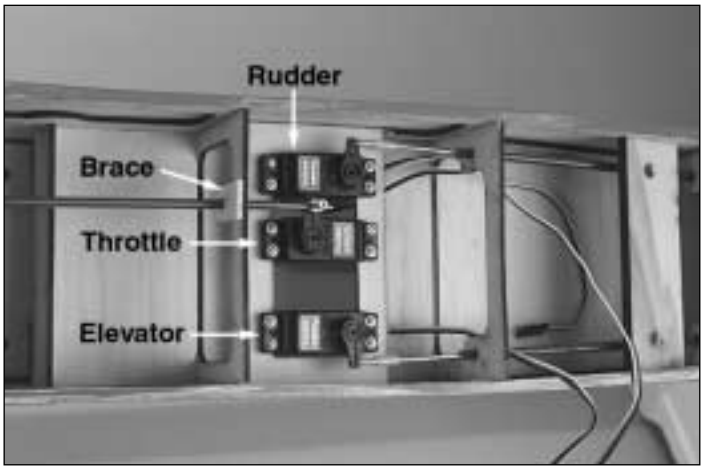


❑ 1. Make the **elevator** and **rudder pushrods** by threading two nylon clevises approximately 20 full turns onto the end of two 36" pushrods. Connect each clevis to a large nylon control horn.

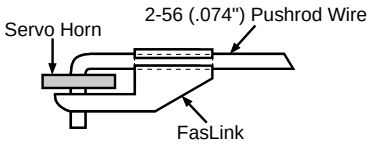


❑ 2. Slide the pushrods into the guide tubes through the aft end of the fuse. Bend the pushrods as necessary so the control horns will fit on the rudder and elevator. Drill 3/32" holes through the rudder and elevator and mount the horns with 2-56 x 5/8" screws and the nylon mounting plates on the other side of the control horn.

Refer to this photo while mounting the servos.



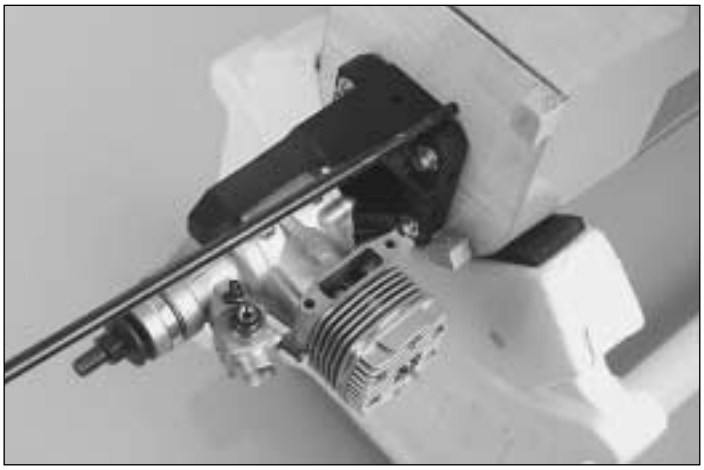
❏ 3. Test fit the rudder, elevator and throttle servos in the 1/8" plywood **servo tray**. Make modifications to the tray if necessary to fit the servos. Use epoxy to glue the servo tray into the fuse.



❏ 4. Place the servos in the tray. Center the elevator and rudder. If necessary, bend the elevator and rudder pushrods to align with the holes in the servo arms, then cut the pushrods so they can be connected to the servos with a nylon FasLink as shown in the sketch.

❏ 5. Connect the pushrods to the servos. Drill 1/16" holes through the servo tray for mounting the elevator and rudder servos. Add a drop of thin CA to each hole and allow to harden. Mount the servos to the servo tray with the screws that came with the servos.

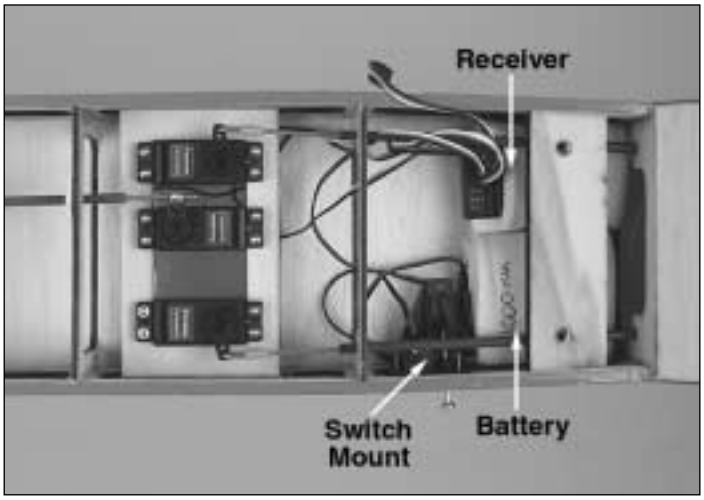
Hook up the throttle...



❏ 6. Drill a 3/16" hole through the firewall for the throttle pushrod guide tube. **Be certain to not drill into the tank!** It may be helpful to remove the engine for this step, so it does not interfere with drilling the hole (or use an extended drill bit).

❏ 7. Insert the 3/16" x 12" throttle pushrod guide tube through the hole in the firewall. Bend the 17" throttle pushrod as necessary, then connect it to the carb arm on the engine with a nylon clevis and connect it to the throttle servo with a screw-lock pushrod connecter. Make a **brace** for the aft end of the guide tube from 1/8" leftover balsa or plywood (not supplied with this kit) and glue it to the former as shown in the previous photo. Mount the throttle servo to the servo tray.

❏ 8. Glue the guide tube to the brace and the firewall.



❏ 9. Wrap the battery pack and receiver in at least 1/4" of R/C foam rubber and install them in the fuselage. On our model with an O.S. MAX .61 FX, the battery and receiver were mounted where shown in the photo to minimize the amount of tail weight required to balance the model at the correct C.G. (with a 2-stroke engine, a small amount of tail weight **may** be required). Securely hold the battery pack and receiver in position with a balsa stick glued between the fuse sides. Simply stuffing the receiver and battery pack in place with additional foam rubber is not a secure method of holding them down. **Note:** Be certain that the wing bolts do not dislodge the balsa stick that holds the battery and receiver in the fuse. The wing bolts may be shortened if necessary.

❏ 10. Mount the receiver on/off switch. A Great Planes Switch & Charge Jack Mounting Set (GPMM1000, not included) was used on this model. Be certain it is in a location away from engine exhaust.

❏ 11. Make certain all the servo arms are secured to the servos with the screws that came with them and that all the clevises have retainers on them.

❑ 12. Extend the receiver antenna and guide it out of the fuselage and connect it to the fin. Be certain there is a strain relief on the antenna to keep stress off the solder joint inside the receiver. On our prototype we drilled a 3/32" hole through the top stringer aft of the cockpit and routed the antenna through the hole. The end of the antenna was connected to a hook made from a cut-off servo arm connected to a small rubber band and a T-pin inserted into the top of the fin.

Finishing Touches

❑ 1. If you prefer, paint the spinner with LustreKote® Missile Red (TOPR7201) to accurately match the paint and covering on the plane. **Note:** The paint on spinners usually does not hold up well to electric starters, so painted spinners are best for display only.

❑ 2. Apply the decals. 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 tablespoon 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.

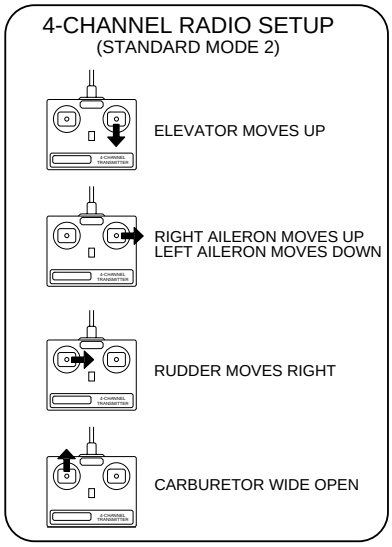
❑ 3. Apply 1/4" yellow striping tape (GPMQ1450) around the base of the canopy.

GET THE MODEL READY TO FLY

Check the Control Directions

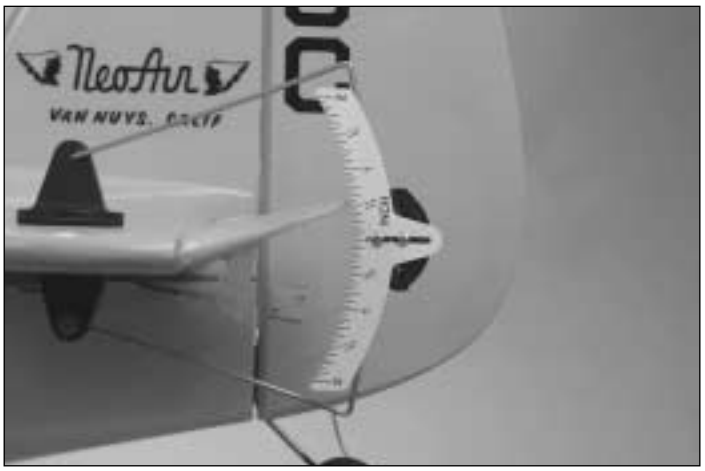
❑ 1. Turn on the transmitter and receiver and center the trims. If necessary, remove the servo arms from the servos and reposition them so they are centered. Reinstall the screws that hold on the servo arms.

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



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

Set the Control Throws



Use a Great Planes AccuThrow (or a ruler) to accurately measure and set the control throw of each control surface as

indicated in the chart that follows. If your radio does not have dual rates, we recommend setting the throws ***between*** the high and low rate settings.

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

These are the recommend control surface throws:

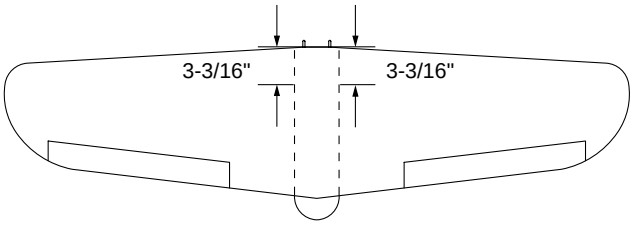
	High Rate	**Low Rate**
ELEVATOR:	3/4" [19mm] up 3/4" [19mm] down	1/2" [13mm] up 1/2" [13mm] down
RUDDER:	1-1/4" [32mm] right 1-1/4" [32mm] left	3/4" [19mm] right 3/4" [19mm] left
AILERONS:	9/16" [14mm] up 9/16" [14mm] down	3/8" [9mm] up 3/8" [9mm] down

IMPORTANT: The Shoestring ARF 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 Shoestring flies, you would like to change the throws to suit your taste, that is fine. However, too much control throw could make the model difficult to control, so remember, "more is not always better."

Balance the Model (C.G.)

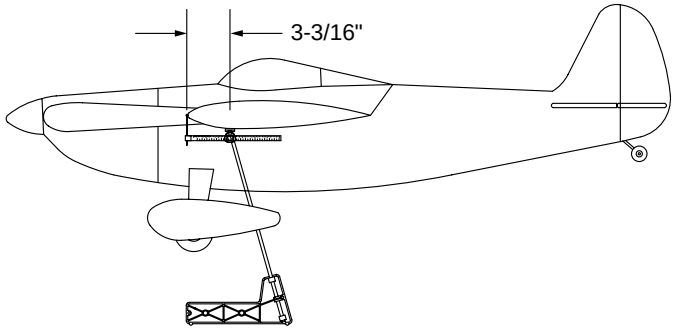
More than any other factor, the C.G. (center of gravity or balance point) can have the **greatest** effect on how a model flies and may determine whether or not your first flight will be successful. If you value this model and wish to enjoy it for many flights, **DO NOT OVERLOOK THIS IMPORTANT PROCEDURE.** 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 installed including the engine, landing gear, covering and paint and the radio system. The fuel tank should be empty.



BOTTOM OF WING

❑ 1. Use a felt-tip pen or 1/8"-wide tape to accurately mark the C.G. on the bottom of the wing on both sides of the fuselage. **The C.G. is located 3-3/16" [81mm] back from the leading edge of the wing where it meets the fuselage.** This is where your model should balance for your first flights. Later, you may wish to experiment by shifting the C.G. up to 7/16" [11mm] forward or 7/16" [11mm] back to change the flying characteristics. 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 difficult to control. In any case, start at the recommended location and do not at any time balance the 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 on a Great Planes CG Machine, or lift it at the balance point you marked.

❑ 3. When the model is lifted at the recommended balance point it is likely that the nose will drop, thus indicating that the model is nose-heavy and will require tail weight to balance. However, if the tail drops, the model is tail heavy and the model will require nose weight. If you haven't already done so, move the battery pack and receiver to a location that will minimize or eliminate any additional ballast required. If additional weight is required to balance the model, 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 lead to the nose is to the firewall (don't attach weight to the cowl—it is not intended to support weight). If tail weight is required (as will most likely be the case), it may be temporarily attached to the bottom of the stab or fuse. When the amount of tail weight is finalized after test flying, the tail block may be cut open and weight permanently glued 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 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

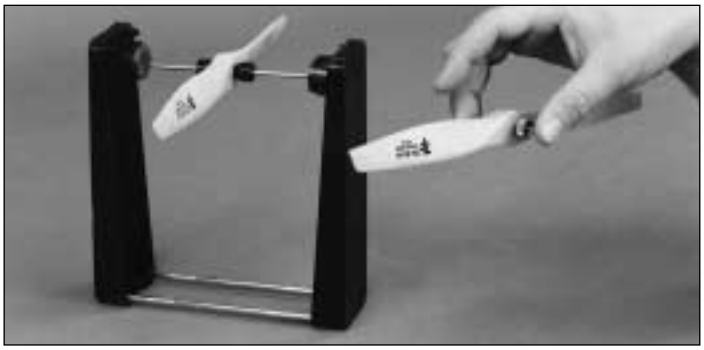
No matter if you fly at an AMA sanctioned R/C club site or if you fly somewhere on your own, you should always have your name, address, telephone number and AMA number on or inside your model. It is **required** at all AMA R/C club flying sites and AMA sanctioned flying events. Fill out the identification tag on page 23 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 taken out of another model, or a new battery pack, 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 Propeller



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. To stop a gasoline powered engine an on/off switch should be connected to the engine coil. 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 checklist is provided to make sure these important areas are not overlooked. Many are covered in the instruction manual, so where appropriate, refer to the manual for complete instructions. Be sure to check the items off they are completed (that's why it's called a *check list!*).

❏ 1. Fuelproof all areas exposed to fuel or exhaust residue such as the cowl mounting blocks, fuel filler mount, the wing saddle area, etc.
❏ 2. Check the C.G. according to the measurements provided in the manual.
❏ 3. Be certain the battery and receiver are securely mounted in the fuse. Simply stuffing them into place with foam rubber is not sufficient.
❏ 4. Extend the 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 the model *laterally* as explained in the instructions.
❏ 6. Use threadlocking compound to secure critical fasteners such as the set screw in the wheel collar that holds the tail wheel on, screws that hold the carburetor arm (if applicable), screw-lock pushrod connectors, etc.
❏ 7. Add a drop of oil to the axles so the wheels will turn freely.
❏ 8. Make sure all hinges are **securely** glued in place.
❏ 9. “Harden” 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.

❑ 12. Secure connections between servo wires and Y-connectors or servo extensions and the connection between the battery pack and the on/off switch with tape, heat shrink tubing or special clips suitable for that purpose.
❑ 13. Make sure servo wires do not interfere with other systems (servo arms, pushrods, etc.).
❑ 14. Secure the pressure tap (if used) to the muffler with high temp RTV silicone, thread locking compound or J.B. Weld.
❑ 15. Make sure the fuel lines are connected and are not kinked.
❑ 16. Use an incidence meter to check the wing for twists and attempt to correct before flying.
❑ 17. Balance the propeller (and spare propellers).
❑ 18. Tighten the propeller nut and spinner.
❑ 19. Place your name, address, AMA number and telephone number on or inside the model.
❑ 20. Cycle the receiver battery pack (if necessary) and make sure it is fully charged.
❑ 21. If you wish to photograph the model, do so before your first flight.
❑ 22. Range check the radio when you get to the flying field.

FLYING

The Shoestring ARF is a great-flying model that flies smoothly and predictably. The Shoestring 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

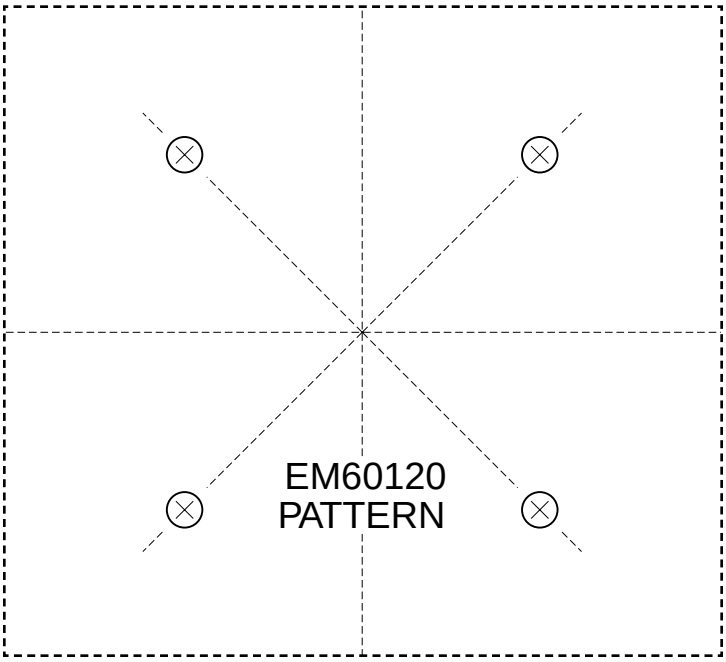
A fully cowled engine may run at a higher temperature than an un-cowled engine. For this reason, the fuel mixture should be richened so the engine runs at about 200 rpm below peak speed. By running the engine slightly rich, you will help prevent dead-stick landings caused by overheating.

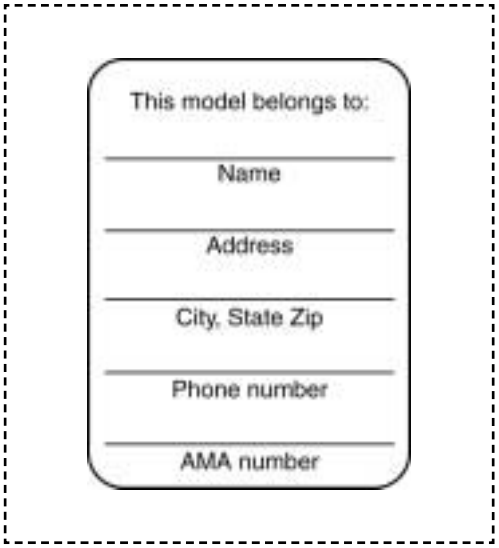
CAUTION: (THIS APPLIES TO ALL R/C AIRPLANES): If, while flying, you notice any unusual sounds, such as a low-pitched "buzz," this may indicate control surface *flutter*. Because flutter can quickly destroy components of your airplane, any time you detect flutter you must **immediately** cut the throttle 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 taking off, see how the model handles on the ground by doing a few practice runs at **low speeds** on the runway. Hold "up" elevator to keep the tail wheel on the ground. If necessary, adjust the steering by using pliers to bend the tail gear wire so the model will roll straight down the runway (when the rudder is centered). 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.

Takeoff into the wind. When ready, point the model straight down the runway, hold a bit of up elevator to keep the tail on the ground to maintain tail wheel steering, then **gradually** advance the throttle. As the model gains speed, decrease up elevator allowing the tail to come off the ground. One of





the most important things to remember with a tail dragger is to always be ready to apply **right** rudder to counteract engine torque. Smoothly applying power will decrease the amount of right rudder required. Gain as much speed as the runway and flying site will practically allow before gently applying up elevator and lifting the model into the air. Be smooth on the elevator, allowing the model to establish a **gentle** climb to a safe altitude before turning into the traffic pattern established at the field you are using.

Flight

For reassurance and safety, have an assistant on the flight line with you. Tell him or her to remind you to throttle back once the plane gets to a comfortable altitude. The Shoestring is smooth and predictable at full throttle, but flying at reduced speeds for the first flight will calm your nerves and give you time to think and react.

Take it easy with the Shoestring 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 the Shoestring before landing.

Landing

The Shoestring is a “clean” model, so it doesn't slow as rapidly as other models and may require a longer landing approach. To initiate an approach, lower the throttle while on the downwind leg. Allow the nose of the model to pitch downward to gradually decrease altitude. Continue to lose altitude, but maintain airspeed by keeping the nose down as you turn onto the crosswind leg. Make the final turn toward the runway (into the wind) keeping the nose down to maintain airspeed and control. Level the attitude when the model reaches the runway threshold, modulating the throttle as necessary to maintain the glide path and airspeed. If you are going to overshoot, **smoothly** advance the throttle and climb out to make another attempt. When you are ready to make a landing flare and the model is a foot or so off the deck, smoothly increase up elevator until it gently touches down. Three-point landings (on the main gear and tail gear) are recommended, but require a slower landing speed to flare. If the mains touch-down too hard, the model has a tendency to bounce. Once the model is on the runway and has lost flying speed, apply up elevator to hold the tail on the ground.

One final note about flying the Shoestring (or any 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 flight 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 planning a loop, check your altitude, note 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 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!