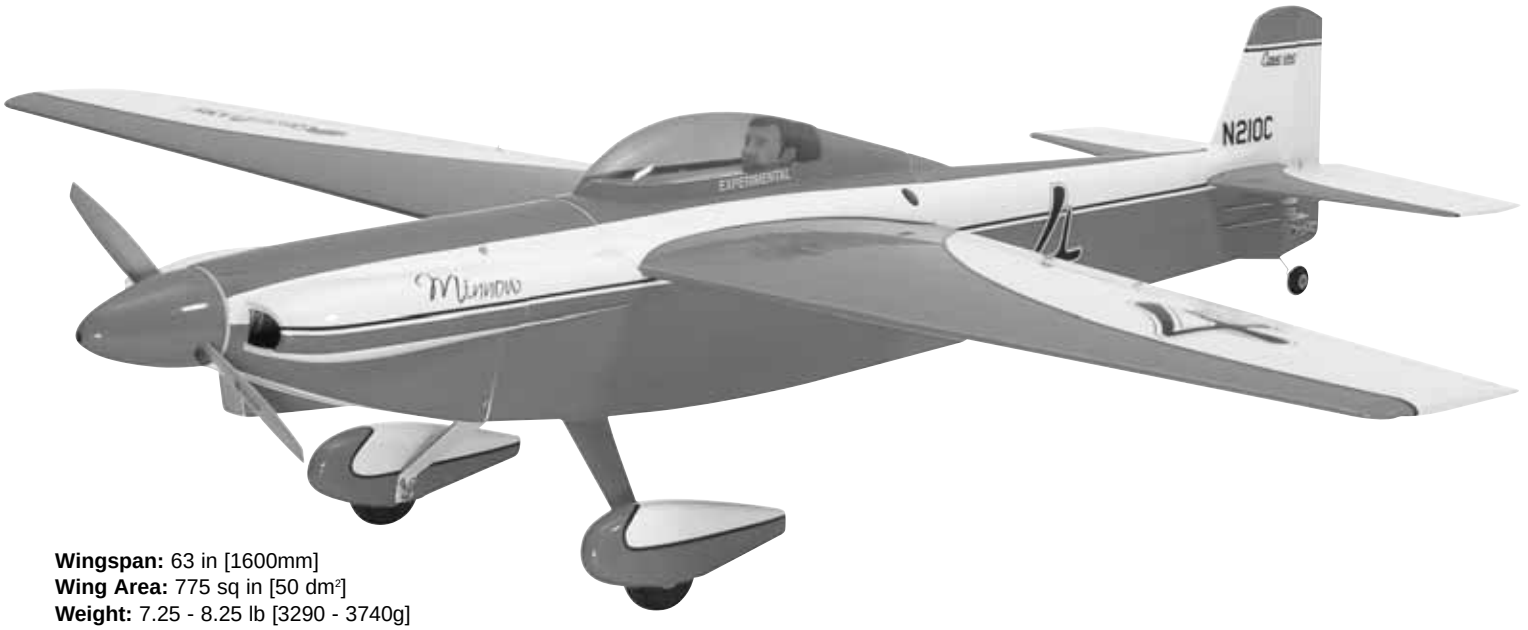
Minnow ARF

INSTRUCTION MANUAL



Wingspan: 63 in [1600mm]
Wing Area: 775 sq in [50 dm²]
Weight: 7.25 - 8.25 lb [3290 - 3740g]
Wing Loading: 22 - 25 oz/sq ft [65 - 75 g/dm²]
Length: 56.5 in [1435mm]
Radio: 4-channel, 5 servos
Engine: .61 cu in [10cc] two-stroke, .91cu in [15cc] four-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.

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

Hobby Services
3002 N. Apollo Dr. Suite 1
Champaign IL 61822 USA

Include a letter stating your name, return shipping address, as much contact information as possible (daytime telephone number, fax number, e-mail address), a detailed description of the problem and a photocopy of the purchase receipt. Upon receipt of the package the problem will be evaluated as quickly as possible.

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

GREAT PLANES® MODEL MANUFACTURING COMPANY
Champaign, Illinois
(217) 398-8970, Ext. 5
airsupport@greatplanes.com

GPMZ0308 for GPMA1321 V1.0

TABLE OF CONTENTS

INTRODUCTION

The Great Planes “Minnow” ARF is a great flying reproduction of the 1940’s racer. Not only does it have the great looks but it is also a pleasure to fly. You will be amazed at how fast it flies.

For the latest technical updates or manual corrections to the Minnow visit the Great Planes web site at:

www.greatplanes.com.

Open the “Airplanes” link, then select the Minnow ARF. If there is new technical information or changes to this model a “tech notice” box will appear in the upper left corner of the page.

IMAA

The Great Planes Minnow is an excellent sport-scale model and is eligible to fly in IMAA events. The IMAA (International Miniature Aircraft Association) is an organization that promotes non-competitive flying of giant-scale models. If you plan to attend an IMAA event, obtain a copy of the **IMAA Safety Code** by contacting the IMAA at the address or telephone number below, or by logging on to their web site at:

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

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

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

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

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

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

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

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

7. If you are not 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.

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

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

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

Radio Equipment

- ❑ Four channel radio
- ❑ Four 54 oz-in servos and one 30 oz-in servo.
- ❑ Two 6" [150mm] servo extension (HCAM2701 for Futaba)
- ❑ Y-harness (HCAM2751 for Futaba)
- ❑ 500 mAh battery or greater
- ❑ Propeller

Engine Recommendations

We have installed both a two and a four stroke engine in our prototypes. The two-stroke engine requires much of the cowl to be cut away while the four-stroke maintains most of the integrity of the cowl. If a more "scale" look is desired, we recommend the four-stroke engine (.91cu. in. [15cc]) option over the two-stroke (.61 cu. in. [10cc]).

ADDITIONAL ITEMS REQUIRED

Hardware and Accessories

The following is the list of hardware and accessories required to finish the Minnow. Order numbers are provided in parentheses.

- ❑ R/C foam rubber (1/4" [6mm],HCAQ1000; or 1/2" [13mm], HCAQ1050)
- ❑ William's Brother's #626 1/4-scale sportsman pilot (WBRQ2626)
- ❑ 1/2 oz. [15g] Thin Pro™ CA (GPMR6001)
- ❑ 1 oz. [30g] Medium Pro CA+ (GPMR6008)
- ❑ Pro 30-minute epoxy (GPMR6047)
- ❑ Pro 6-minute epoxy (GPMR6045)
- ❑ Drill bits: 1/16" [1.6mm], 5/64" [2mm], 3/32" [2.4mm], 1/8" [3.2mm], 3/16" [4.8mm], 9/64" [3.6mm]
- ❑ 8-32 tap and drill set (GPMR8103)
- ❑ #1 Hobby knife (HCAR0105)
- ❑ #11 blades (5-pack, HCAR0211)
- ❑ Medium T-pins (100, HCAR5150)
- ❑ Top Flite® MonoKote® sealing iron (TOPR2100)
- ❑ CA applicator tips (HCAR3780)
- ❑ R/C-56 canopy glue (JOZR5007)
- ❑ Threadlocker threadlocking cement (GPMR6060)
- ❑ Denatured alcohol (for epoxy cleanup)

Optional Supplies and Tools

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

- ❏ 2 oz. [57g] spray CA activator (GPMR6035)
- ❏ CA debonder (GPMR6039)
- ❏ Epoxy brushes (6, GPMR8060)
- ❏ Mixing sticks (50, GPMR8055)
- ❏ Mixing cups (GPMR8056)
- ❏ 36" [900mm] metal ruler (HCAR0475)
- ❏ Curved-tip canopy scissors for trimming plastic parts (HCAR0667)
- ❏ Robart® Super Stand II (ROBP1402)
- ❏ 18" x 24" [460 x 610mm] Builder's Cutting Mat (HCAR0455)
- ❏ Hobbico® Duster™ can of compressed air (HCAR5500)
- ❏ Masking tape (TOPR8018)
- ❏ Switch & Charge Jack Mounting Set (GPMM1000)
- ❏ Rotary tool such as Dremel®
- ❏ Rotary tool reinforced cut-off wheel (GPMR8200)
- ❏ Servo horn drill (HCAR0698)
- ❏ Dead Center™ Engine Mount Hole Locator (GPMR8130)
- ❏ AccuThrow™ Deflection Gauge (GPMR2405)
- ❏ CG Machine™ (GPMR2400)
- ❏ Precision Magnetic Prop Balancer™ (TOPQ5700)
- ❏ Cover Sock (COVR2702)
- ❏ Spinner weight (GPMQ4645 for the 1 oz. weight, or GPMQ4646 for the 2 oz. weight)

IMPORTANT BUILDING NOTES

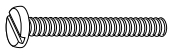
• There are two types of screws used in this kit:

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

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

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

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



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

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

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

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

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

Dark Red	TOPQ0218
Sapphire Blue	TOPQ0226
White	TOPQ0204

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

COMMON ABBREVIATIONS

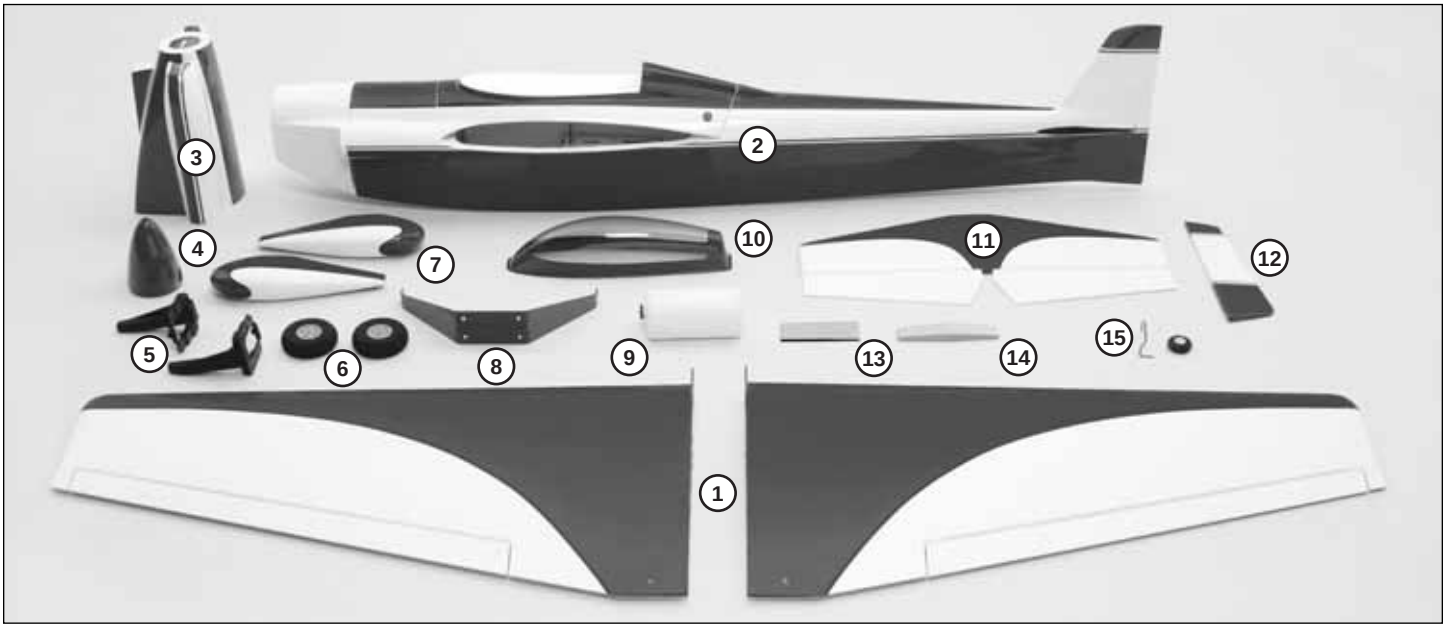
Fuse = Fuselage
Stab = Horizontal Stabilizer
Fin = Vertical Fin
LE = Leading Edge
TE = Trailing Edge
LG = Landing Gear
Ply = Plywood
" = Inches
mm = Millimeters
SHCS = Socket Head Cap Screw

KIT INSPECTION

Before starting to build, take an inventory of this 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 **Product Support**. When reporting defective or missing parts, use the part names exactly as they are written in the Kit Contents list.

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

KIT CONTENTS



Kit Contents (Photographed)

1 Wing	**6** Wheels	**11** Stabilizer with Elevators
2 Fuselage with Canopy Base	**7** Wheel Pants	**12** Rudder
3 Cowl	**8** Main Landing Gear	**13** Wing Bolt Plate
4 Spinner	**9** Fuel Tank	**14** Wing Joiner
5 Adjustable Engine Mount	**10** Canopy	**15** Tail Wheel Assembly

Kit Contents (Not Photographed)

5/32" x 2" Axle (2)	Grey Plastic Outer Pushrod 24" (5)	3/32" Wheel Collar (1)
Brass Body EZ Connector (2)	Silicone Clevis Retainer (5)	5/32" Wheel Collar (6)
4-40 Blind Nuts (4)	2-56 x 5/8" Machine Screw (10)	1-1/4" Tail Wheel (1)
4-40 Nut (1)	6-32 x 1/8" Set Screw (2)	.074" Wire Threaded One End 36" (4)
8-32 Blind Nut (8)	6-32 x 1/4"SHCS (4)	.074" x 6" Pushrod Wire (2)
5/16-24 Lock Nut (2)	4-40 Set Screw (1)	4-40 x 12" Threaded Wire (1)
1/4-20 Blind Nuts (2)	#2 x 3/8" Sheet Metal Screw (12)	#4 Lock Washer (4)
Large Nylon Control Horn (5)	#4 x 3/8" Sheet Metal Screw (4)	#4 Flat Washers (8)
Nylon Torque Rod Bearing (1)	4-40 x 1/2" Machine Screw (4)	#2 Flat Washers (12)
1/4-20 Nylon Wing Bolt (2)	#2 x 3/8" Wood Screw (4)	#8 Lock Washers (8)
Nylon Clevis (5)	8-32 x 1-1/4" SHCS (4)	#8 Flat Washers (8)
Nylon Retainer (2)	8-32 x 1" SHCS (4)	7-3/4" [200mm] Velcro®
2" x 9" Hinge Material (1)	4-40 x 1/8" SHCS (2)	
FasLink™ (4)	8-32 x 3/4" Flat Head Machine Screw (4)	

ORDERING REPLACEMENT PARTS

Replacement parts for the Great Planes Minnow ARF are available using the order numbers in the **Replacement Parts List** that follows. The fastest, most economical service can be provided by your hobby dealer or mail-order company.

To locate a hobby dealer, visit the Hobbico web site at **www.hobbico.com**. Choose "Where to Buy" at the bottom of the menu on the left side of the page. Follow the instructions provided on the page to locate a U.S., Canadian or International dealer. If a hobby shop is not available, replacement parts may also be ordered from Tower Hobbies at **www.towerhobbies.com**, or by calling toll free (800) 637-6050.

Parts may also be ordered directly from Hobby Services by calling (217) 398-0007, or via facsimile at (217) 398-7721, but full retail prices and shipping and handling charges will apply. Illinois and Nevada residents will also be charged sales tax. If ordering via fax, include a Visa or MasterCard number and expiration date for payment.

Mail parts orders and payments by personal check to:

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

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

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

Replacement Parts List

Order Number	Description	How to Purchase
	Missing pieces	Contact Product Support
	Instruction manual	Contact Product Support
	Full-size plans	Not available
	Kit parts listed below	Hobby Supplier
GPMA2491	Wing Kit	
GPMA2490	Fuse Kit	
GPMA2492	Tail Set	
GPMA2493	Cowl	
GPMA2496	Canopy	
GPMA2494	Landing Gear	
GPMA2495	Wheel Pants	
GPMA2497	Top Wing Cover Only	

IMPORTANT INFORMATION ABOUT WORKING WITH FIBERGLASS

If you have never worked with fiberglass there are a few basic things you should be aware of:

1. When cutting fiberglass, be sure you are cutting the correct place. Unlike wood, you are not able to go back and easily fix a mistake.

2. Whenever you are gluing a part to the inside of fiberglass it is important to roughen the inside surface of the fiberglass with 220-grit sandpaper, then wipe the area with rubbing alcohol. The molding process leaves a waxy residue that can prevent a good bond between the glue and the parts being glued.

3. If you do not have a high-speed motor tool such as a Dremel tool you should consider purchasing one or borrowing one from a fellow modeler. This, combined with a fiberglass cut-off wheel will be extremely helpful in the assembly process.

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

PREPARATIONS

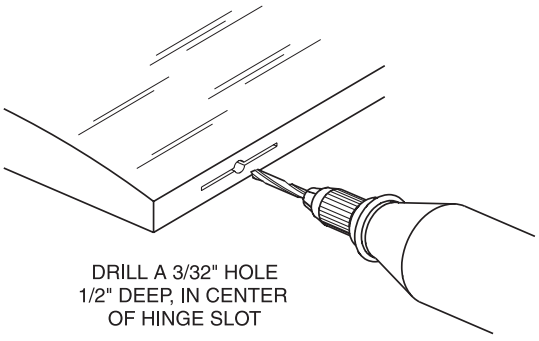
❑ 1. If you have not done so already, remove the major parts of the kit from the box and inspect for damage. If any parts are damaged or missing, contact Product Support at the address or telephone number listed in the “Kit Inspection” section on page 5.

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

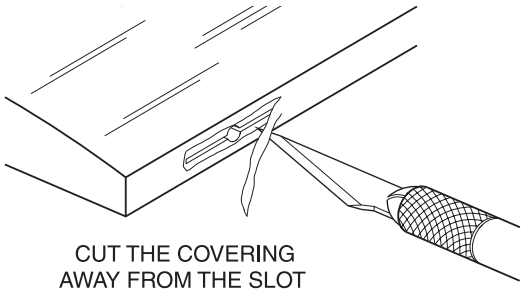
ASSEMBLE THE WING

Install the Ailerons

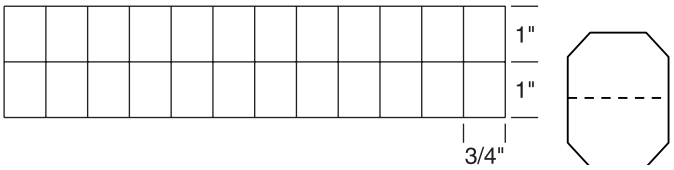
Do the right wing first so your work matches the photos the first time through. You can do one wing at a time, or work on them together.



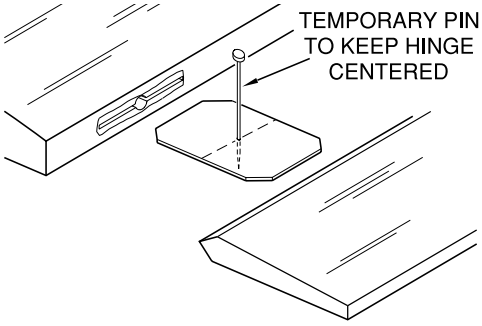
❑ ❑ 1. Drill a 3/32" [2.4mm] hole, 1/2" [13mm] deep in the center of each hinge slot to allow the CA to “wick” in. Follow-up with a #11 blade to clean out the slots. **Hint:** If you have one, use a high-speed rotary tool to drill the holes.



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

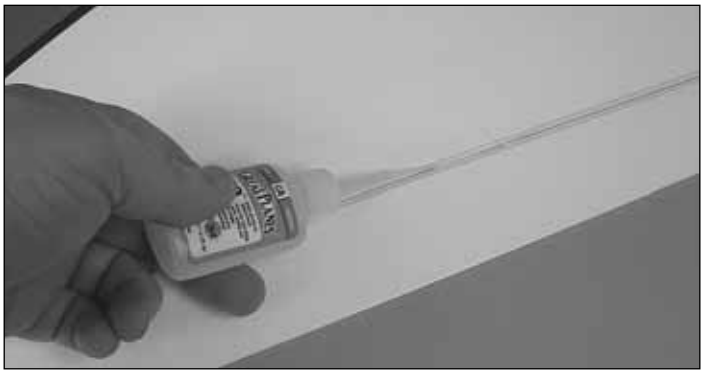


❑ ❑ 3. Cut eight 3/4" x 1" [19 x 25mm] **hinges** from the **CA hinge strip**. Snip off the corners so they are easier to insert.



❑ ❑ 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.

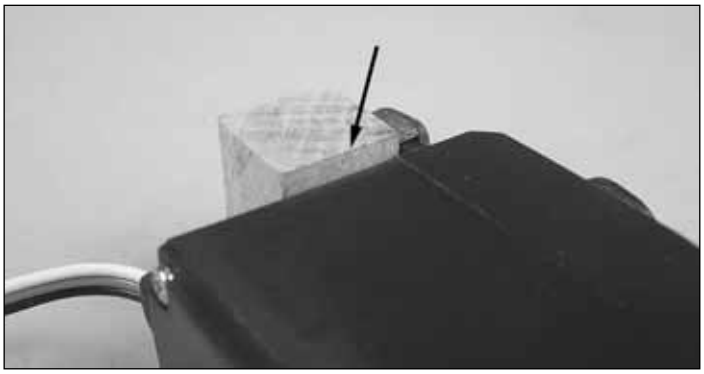


❑ ❑ 6. Apply six drops of thin CA to the top and bottom of each hinge waiting a few seconds between drops to allow the CA to soak in. Do not use CA accelerator. After the CA has fully hardened, test the hinges by pulling on the aileron.

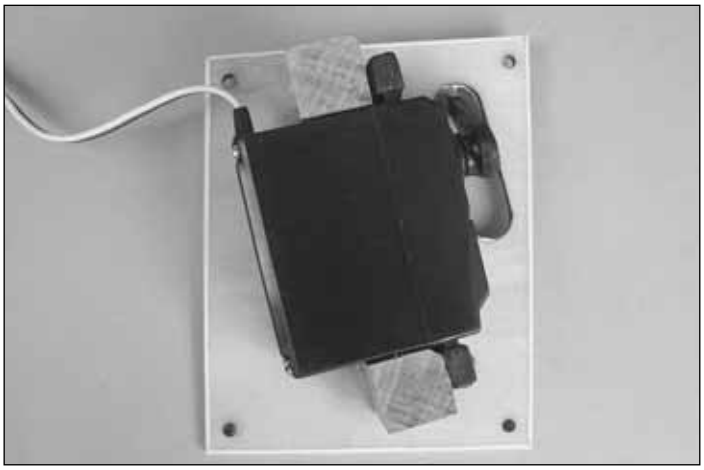
❑ 7. Repeat steps 1- 6 for the left wing panel.

Install the Aileron Servos and Pushrods

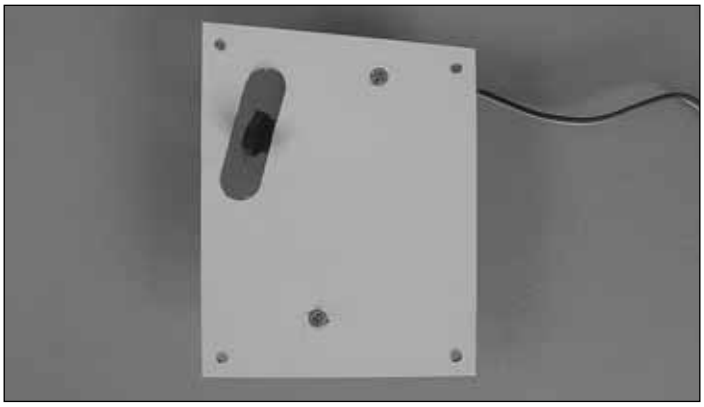
❑ ❑ 1. Installing the servos in the wing will require the use of one 6" [152mm] servo extension for each aileron. One Y-harness connector is required and is used to allow the aileron servos to plug into one slot in your receiver. You may have a computer radio that allows you to plug the servos into separate slots and mix them together through the radio transmitter. If you choose to mix them with the radio rather than the Y-harness, refer to the instructions with your particular brand of radio.



❑ ❑ 2. Remove the tape holding the servo cover to the wing. Locate two 1/2" x 1/2" x 3/4" [12 x 12 x 20mm] hardwood blocks. Place the blocks against the sides of your aileron servo. When positioning the blocks they should be slightly higher than the servo case. Drill a 1/16" [1.6mm] hole through the blocks for the servo screws. Using the hardware included with your radio system screw the servos to the two blocks.



❑ ❑ 3. Apply 6-minute epoxy to each block. Position the blocks so that the servo arm is centered over the opening in the cover. Clamp the blocks to the cover. When the glue has hardened, remove the clamps.



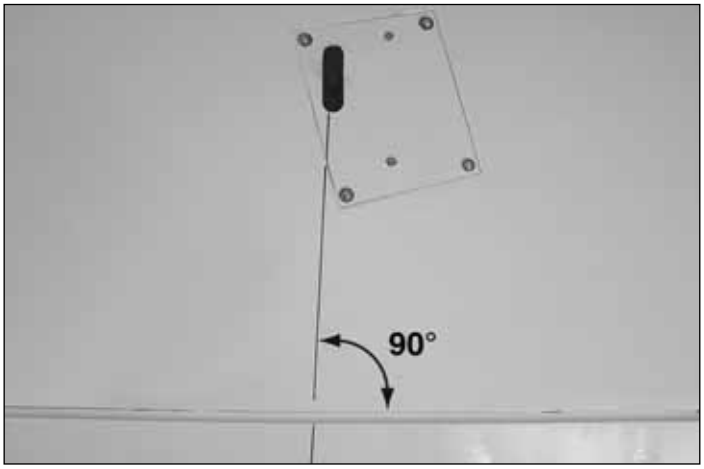
❑ ❑ 4. Mark the center of the hardwood blocks on the cover. Drill a 1/16" [1.6mm] hole through the marks, drilling through the blocks. Install a #2 x 3/8" [9mm] wood screw into each of the holes tightening them against the cover.

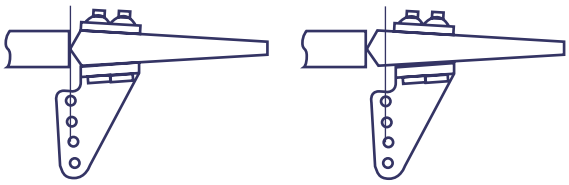
❑ ❑ 5. Attach the servo extension to the aileron servo. Secure the connectors together using a large piece of heat shrink tubing, tape or other method for securing the connectors together.

❑ ❑ 6. Located in the wing in the servo compartment, a string is taped to the wing skin. Tie the string to the end of the servo wire. Pull the servo wire through the wing with the string. Feed the servo wire out the hole in the bottom of the wing center section. Tape the servo wire to the wing to prevent it from falling back into the wing.

❑ ❑ 7. Center the servo. Trial fit the servo cover into the wing. Depending on the size and mounting position of your particular servo you may need to trim away some of the wood edge the cover rests on. Trim as needed to allow the servo cover to be positioned properly on the wing.

❑ ❑ 8. Place the cover on the wing. Drill a 1/16" [1.6mm] hole through each of the pre-drilled mounting holes. Remove the cover from the wing. Install and remove a #2 x 3/8" [9mm] sheet metal screw into each of the four holes. Insert a drop of thin CA into the holes to harden the wood. After the glue has hardened, install the cover with four #2 x 3/8" [9mm] sheet metal screws and four #2 flat washers.



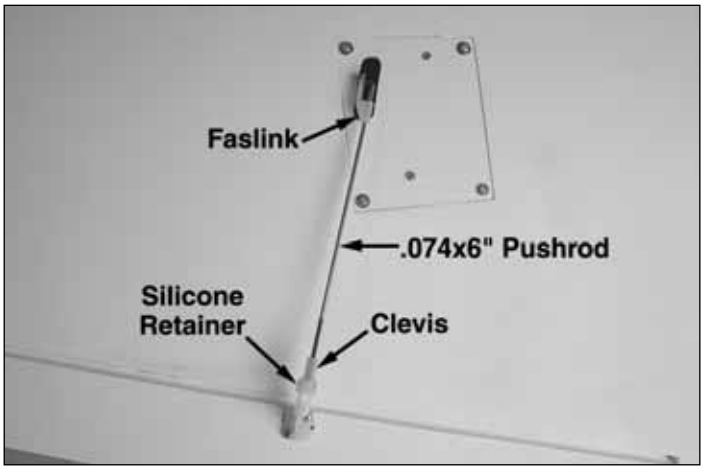


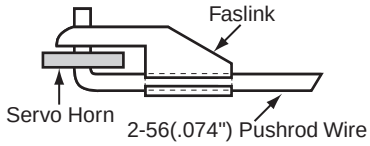
Correct Incorrect

❑ ❑ 9. Position a nylon control horn on the aileron, positioning it as shown in the sketch and aligning it with the servo arm. Mark the location for the screw holes. Drill through the marks you made with a 1/16" [1.6mm] drill bit, drilling through the aileron. Secure the control horn to the aileron with two 2-56 x 5/8" [16mm] machine screws and the nylon mounting plate.

❑ ❑ 10. Locate a .074" x 6" [.074" x 152mm] pushrod wire threaded on one end. Screw a nylon clevis onto the threaded end of the wire 20 full turns. Install a silicone clevis keeper onto the clevis, then install the clevis in the second hole from the end of the aileron control horn.

❑ ❑ 11. Be sure the aileron servo is centered. Enlarge the first hole in the servo arm with a Hobbico Servo Horn Drill (or a #48 or 5/64" [2mm] drill bit). Center the aileron and align the wire pushrod with the hole in the end of the servo arm. Using a marker, mark the location where the wire aligns with the hole in the servo arm. On that mark make a 90 degree bend. From the bend measure an additional 3/16" [4.8mm] then cut off the excess pushrod wire.

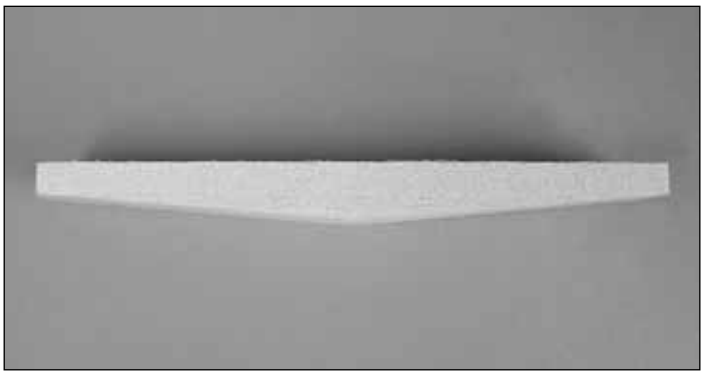


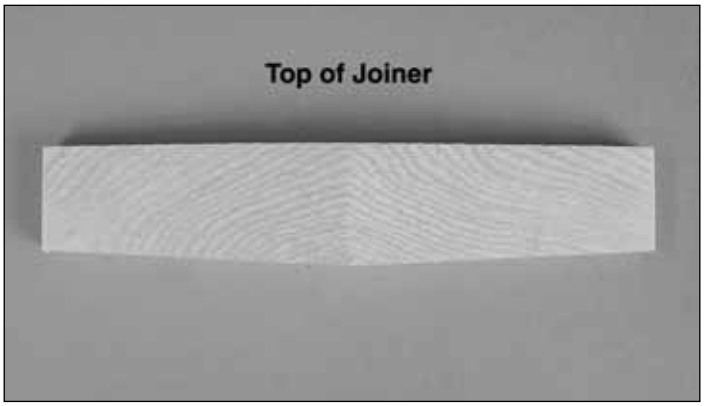


❑ ❑ 12. Install the wire into the hole in the servo arm using a nylon FasLink as shown in the sketch.

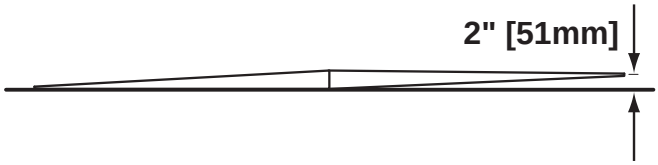
❑ 13. Repeat steps 1-12 for the left wing panel

Join the Wings



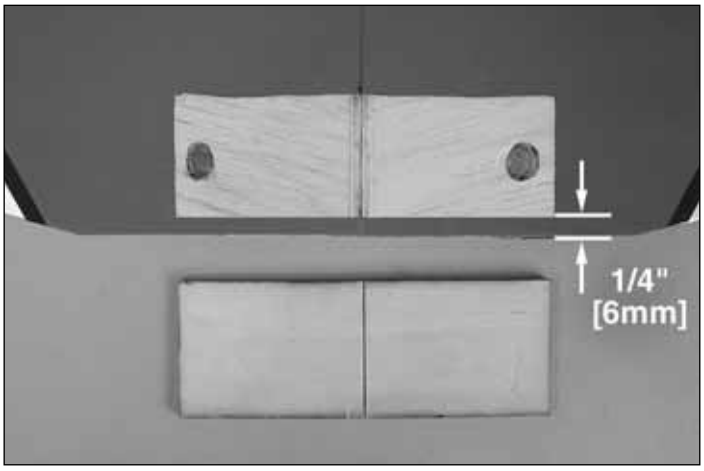


❑ 1. Locate the hardwood **wing joiner**. Notice that the joiner is cut with a double taper. Test fit the joiner into both wing halves to see exactly how it fits into the wing, making sure that it is not too tight. Sand the joiner as needed to get a good fit.



❑ 2. Apply 30-minute epoxy to all sides of the wing joiner, the joiner pocket in both wing panels and the root rib of each wing panel. Push the wing panels together and hold them in place with masking tape. Before the glue hardens, set the wing flat on your bench and measure the dihedral. The distance from the top of the bench to the center of the wing as measured at the wing tip should be approximately 2" [51mm]. Block the wingtip up while the glue hardens. ***Note:*** *Due to production techniques there may be some variance in the actual dihedral of each model. Our prototypes flew well with the dihedral anywhere between 1-1/2" and 2-1/2" [38mm and 64mm].*

❑ 3. Set the wing aside allowing the glue to harden.



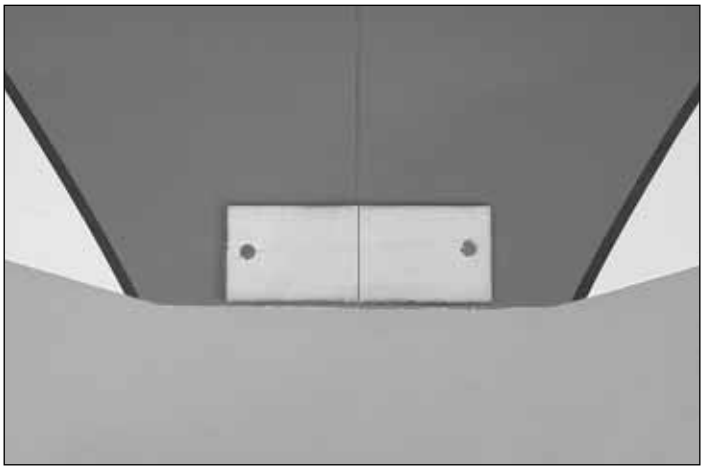
❑ 4. Place the plywood **wing bolt mounting plate** in position on the top of the wing, over the wing bolt holes and 1/4" [6mm] from the trailing edge of the wing. Using a fine point-felt tip marker, trace the outline of the plate onto the wing. Use a sharp #11 hobby knife or use the **Expert Tip** that follows to cut the covering from the wing along the lines you have 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 4).

❑ 5. Glue the plywood wing bolt plate to the wing.

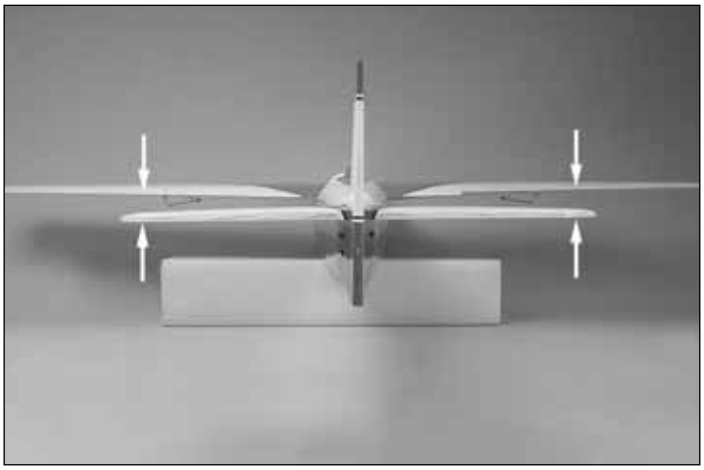


❑ 6. From the bottom of the wing, drill through the wing bolt holes and through the plywood plate with a 1/4" [6mm] drill bit.

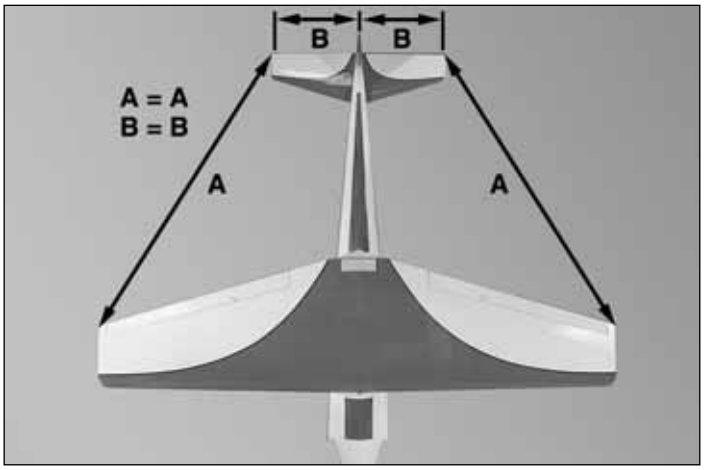
❑ 7. Fit the wing to the fuselage with two 1/4-20 x 2" [51mm] nylon wing bolts.

ASSEMBLE THE FUSELAGE

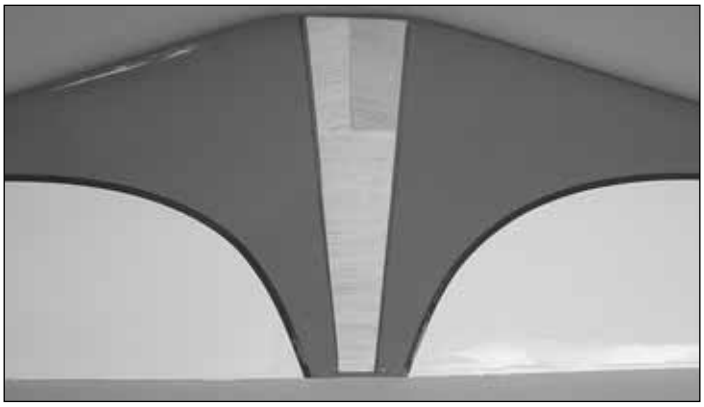
Install the Stab, Elevators and Rudder



❑ 1. Test fit the stab into the opening in the back of the fuselage. Stand back and look at the stab in relation to the wing. The stab should be parallel with the wing. If not, sand the stab saddle until the stab and wing are aligned.

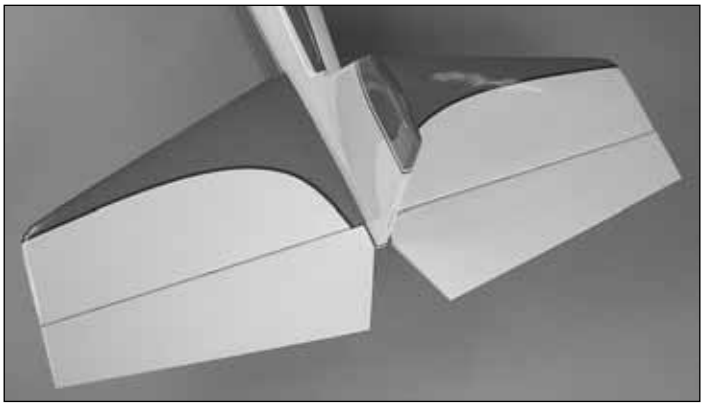


❑ 2. Measure the distance from the tip of the stab to the tip of each wing. Adjust the position of the stab until both are equal.



❑ 3. Mark the sides of the fuselage onto the top and bottom of the stab with a fine point felt-tip marker. Cut the covering away from the center of the stab using the same method used on the wing. Reinsert the stab into the fuselage, double checking the alignment with the wing.

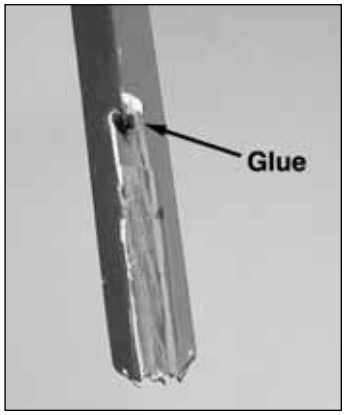
❑ 4. When satisfied with the fit of the stab, use thin CA with a CA applicator tip to wick glue into the stab saddle. Apply the glue to the top, bottom and both sides of the fuselage. Allow the glue to fully harden before moving. After the glue has hardened remove the wing from the fuselage. **Hint:** Do not use any accelerator. This will most likely cause the glue to get a white haze on the fuselage and stab. Allow the plane to sit for approximately 5 minutes until the glue is completely hardened.

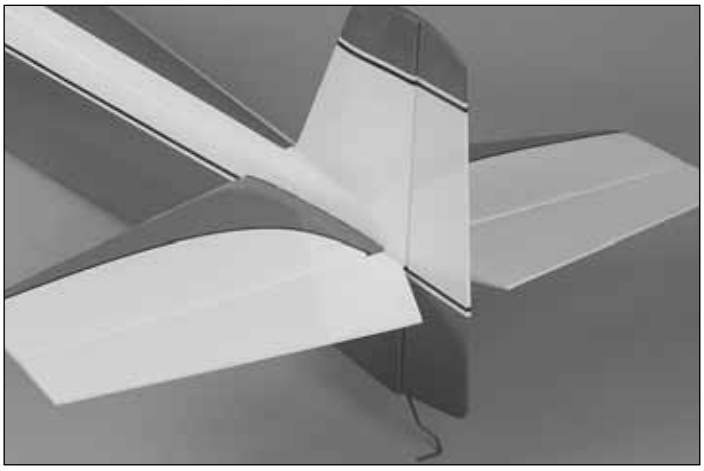


❑ 5. Cut six hinges from the hinge material. Install the two elevator halves using the same method used for the ailerons. Once you are satisfied with the positioning of the elevators, glue them in place with thin CA the same as was done on the ailerons.

❏ 6. Locate the **tail wheel wire**. Test fit the nylon bushing into the slot at the bottom of the rudder post. Make any needed adjustments to the slot to get a good fit. Temporarily install the rudder onto the tail wheel wire. Be sure the positioning of the tail wheel wire allows the rudder to align with the fin. Once you are satisfied with the fit and position of the tail wheel wire, apply a couple of drops of oil to the wire where it passes through the nylon bushing to prevent glue from getting into the bushing. Apply epoxy to both sides of the nylon bushing and insert it into the slot. Allow the glue to harden.

❏ 7. Cut three more hinges and insert them into the rudder using the same technique you used on the elevators. Before joining the rudder to the fin, apply a small amount of epoxy into the hole that is drilled in the bottom of the rudder. Quickly move to the next step.

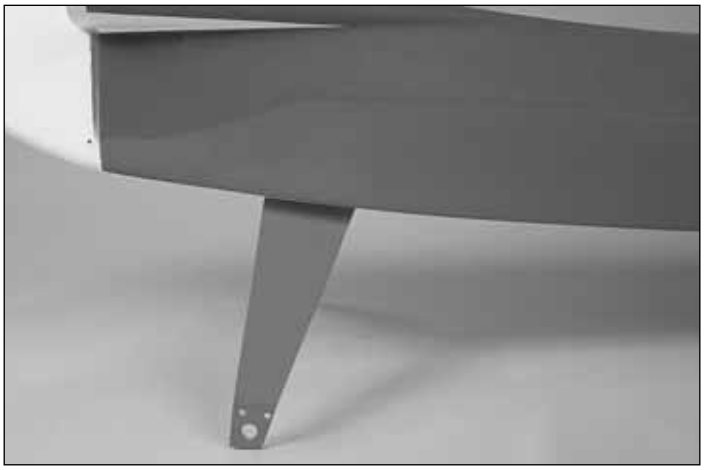




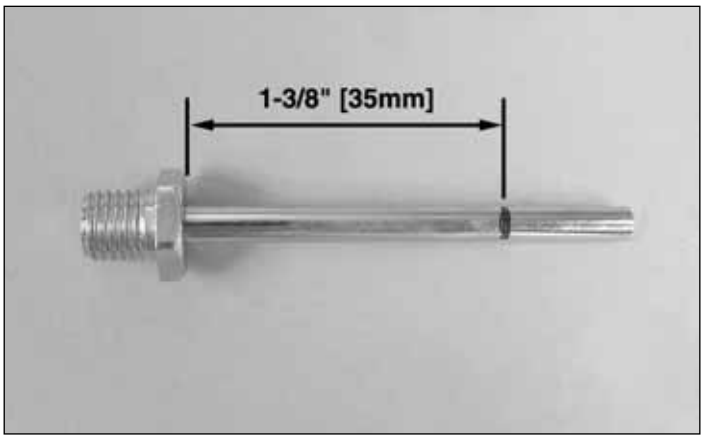
❏ 8. Insert the rudder onto the fin, installing the hinges into the fin and inserting the tail wheel wire into the hole you applied the epoxy in. Position the rudder, then apply thin CA onto the hinges.

This completes the installation of the tail surfaces. You will finish the installation of the control horns and pushrods when you do the radio installation.

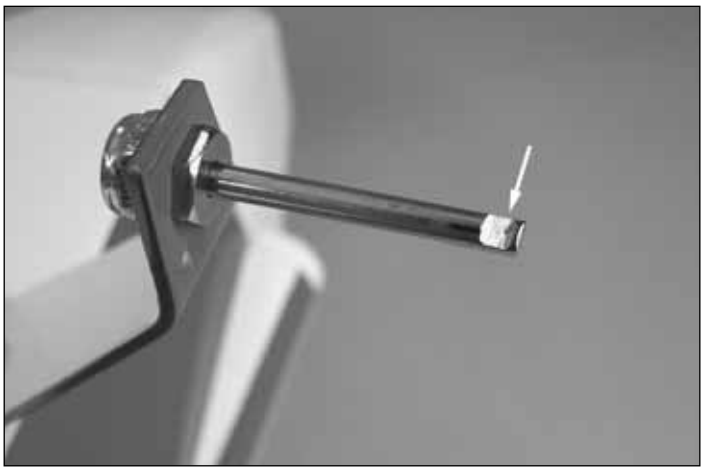
Install the Landing Gear and Wheel Pants



❏ 1. Bolt the landing gear to the fuselage with four 8-32 x 3/4" [19mm] flat head machine screws. Apply a drop of thread locker to the threads before screwing them into the fuselage. When installing the gear, the taper should be to the back of the fuselage.

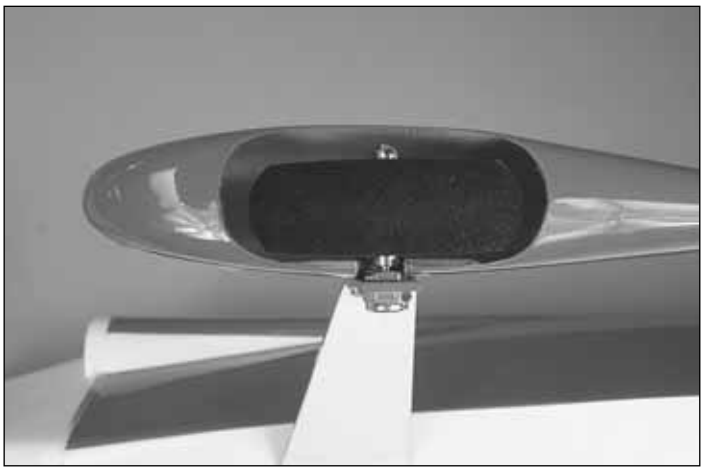


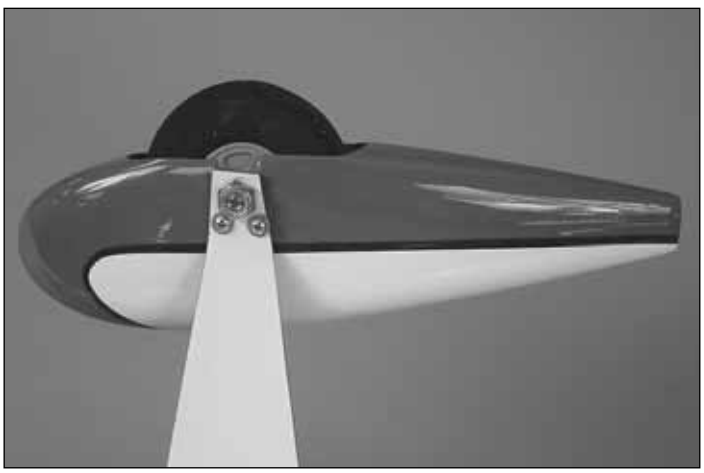
❏ ❏ 2. Cut both axles to a length of 1-3/8" [35mm]. A high-speed rotary tool with a cut-off wheel works well for this application. Bolt the axle to the landing gear, securing it with a 5/16-24 lock nut.



❏ ❏ 3. File a flat spot on the end of the axle. A high-speed rotary tool works well for this also.

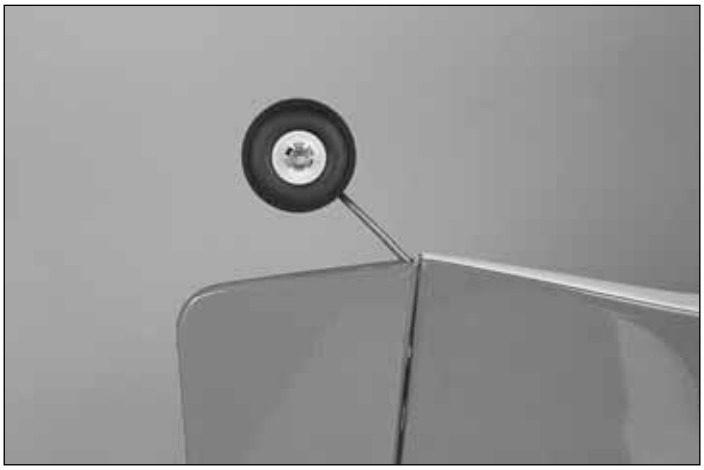
❏ ❏ 4. Insert a 6-32 set screw into a 5/32" [4mm] wheel collar. Slide it onto the axle. Slide the wheel onto the axle and then slide another 5/32" wheel collar. Screw a 6-32 x1/4" [6mm] socket head cap screw into the wheel collar with a drop of threadlocker. Center the wheel, then tighten the set screws on the wheel collars.





❏ ❏ 5. Slide the **wheel pant** over the wheel. Attach the wheel pant to the landing gear with two 4-40 x 1/2" [13mm] machine screws, a drop of threadlocker, #4 flat washers and #4 lock washers.

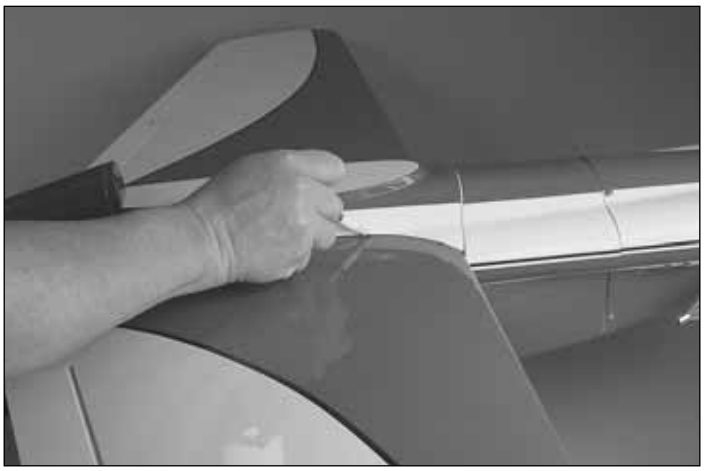
❏ 6. Repeat steps 3-5 for the other wheel pant.



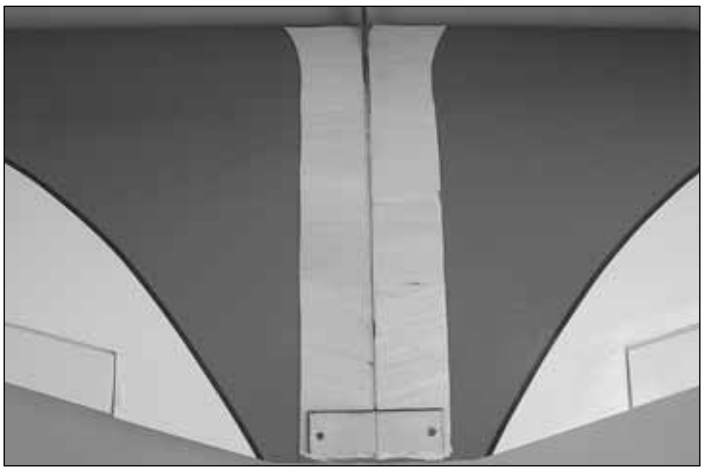
❏ 7. Install the tail wheel onto the tail wheel wire. Lock it in place with a 3/32" [2.4mm] wheel collar and a 4-40 set screw with a drop of threadlocker.

Mount the Canopy to the Wing

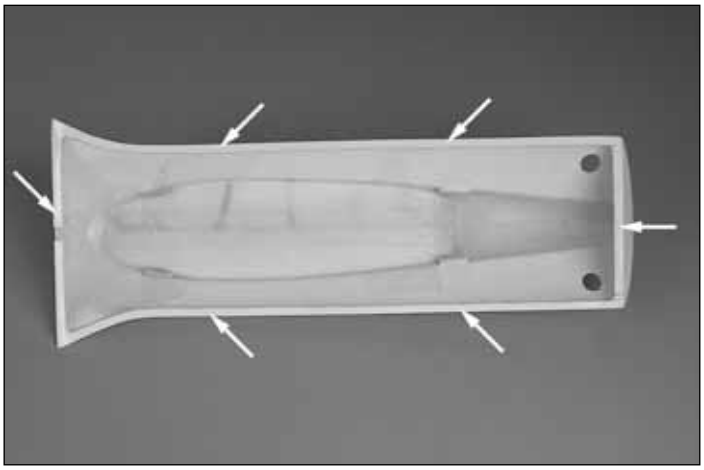
❏ 1. Mount the wing to the fuselage with the 1/4-20 nylon bolts.



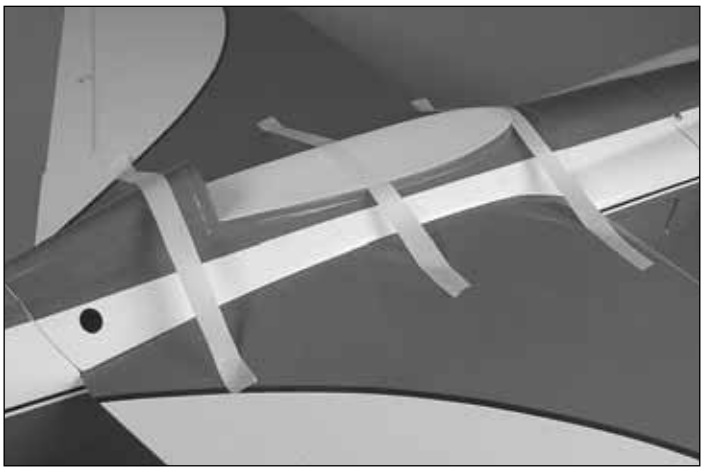
❏ 2. Place the canopy base on top of the wing aligning it to the fuselage. Trace the outline of the canopy base to the wing.



❏ 3. Carefully cut away the covering inside the lines you have drawn.



❑ 4. Roughen up the underside of the canopy base with 120-grit sandpaper.

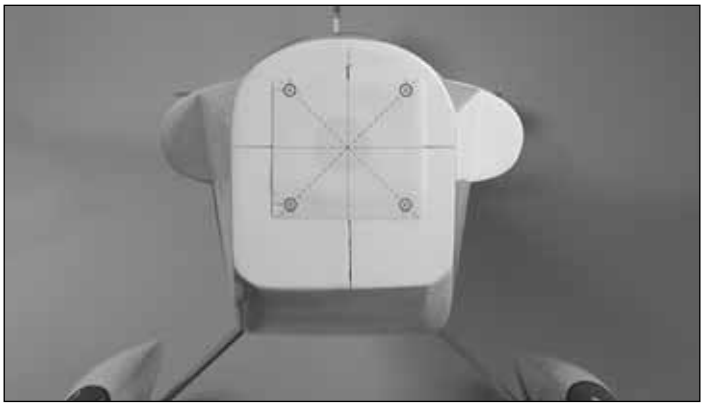


❑ 5. Apply epoxy to the bottom of the canopy base. Place the canopy base in position on the fuselage holding it in place with masking tape until the epoxy hardens.

❑ 6. *If you plan on installing a pilot you may wish to wait before installing the canopy to the canopy base. See the "FINAL TOUCHES" section of the manual for tips on the pilot installation.* Trim the canopy on the cut lines then glue the canopy to the canopy base with R/C-56 canopy glue.

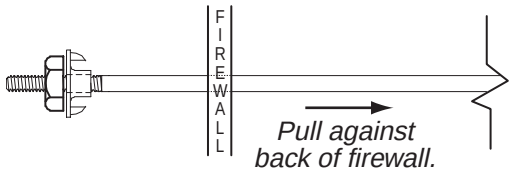
When you have completed your work with the canopy, remove the wing.

Install Engine, Fuel Tank & Throttle Servo

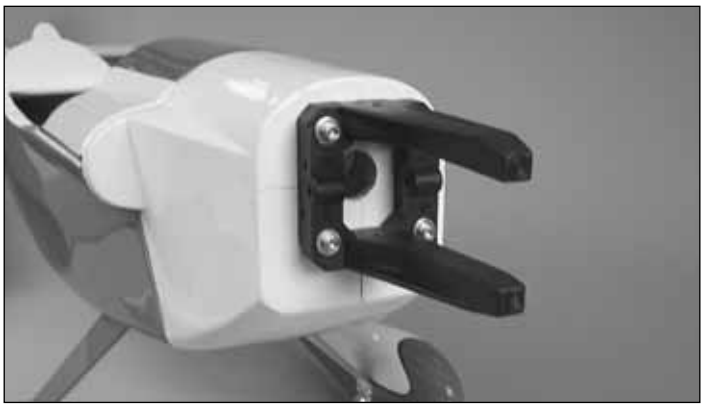


❑ 1. Cut out the engine mount template on page 25 of this manual. Tape it on the firewall aligning the lines on the pattern with the lines on the firewall.

❑ 2. Use a 3/16" [4.8mm] bit to drill through the firewall at the marks on the engine mounting pattern.

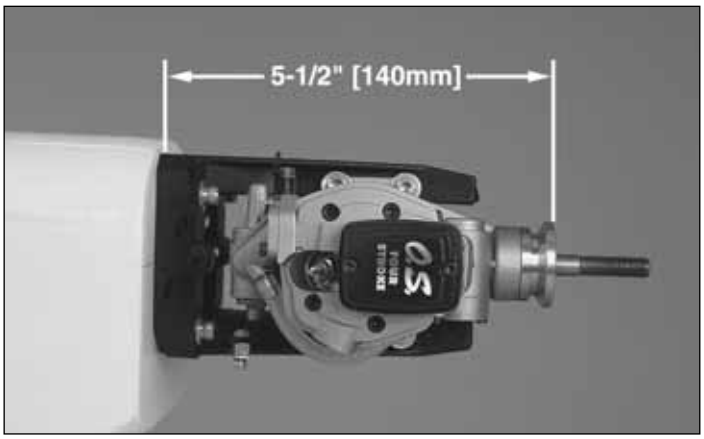


❑ 3. Install four 8-32 blind nuts into the back of the firewall. We have included a 4-40 x 12" [305mm] rod threaded on one end to assist you with this process. Screw a 4-40 nut onto the threaded end of the rod. Slide a blind nut (flat side of the blind nut toward the nut) onto the rod. Insert the wire through the inside of the fuselage, through one of the holes you drilled in the firewall. Pull on the wire until the blind nut pulls into the firewall. Remove the wire. Carefully screw an 8-32 x 1" [25mm] socket head cap screw with a #8 flat washer into the blind nut. Tighten the bolt and washer against the firewall until the blind nut is pulled firmly against the firewall. Remove the socket head cap screw. Repeat this procedure for the remaining three blind nuts.



❑ 4. Install the engine mount to the firewall using four each, 8-32 x 1-1/4" [32mm] socket head cap screws, #8 flat washers and #8 lock washers. When installing the mount, use your engine to determine the spacing needed for the mounting rails.

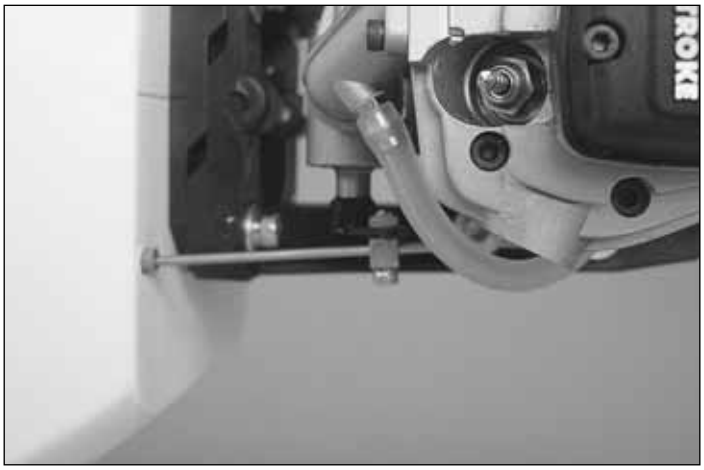
The following engine mounting instructions apply to both the two-stroke and four-stroke engines. As mentioned earlier in the instructions, the four-stroke engine leaves much more of the cowl intact than will the two-stroke. Should you have to cut a portion of the fuselage/ firewall to clear your muffler, you may need to insert an additional hardwood block (not included) inside the fuselage for mounting the cowl. You may also wish to build a box inside of the fuselage to prevent fuel residue from getting inside the fuselage.

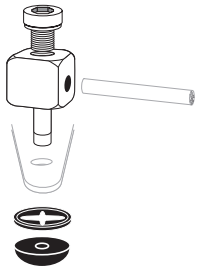


❑ 5. Position the engine on the mount so the distance from the front of the firewall to the front of the thrust washer measures 5-1/2" [140mm]. Mark the location of the engine on the mount. The Great Planes® Dead Center Hole Locator (GPMR8130) works well for this. Drill through the marks you have made on the engine mount with a #29 or 9/64" [3.6mm] drill bit. Tap each of the holes with an 8-32 tap.

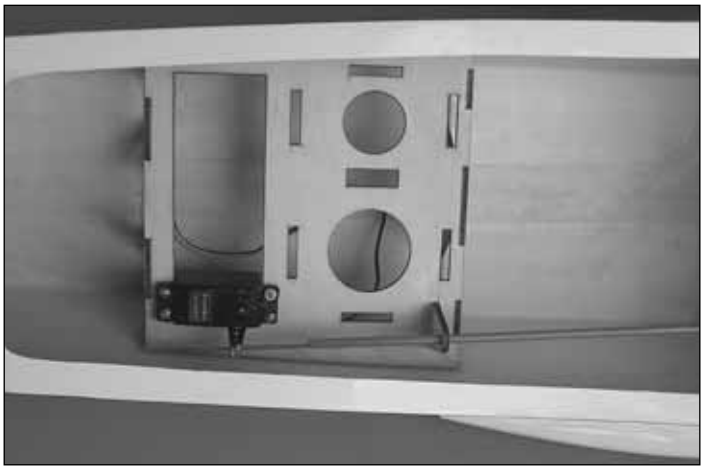
❑ 6. Install the engine onto the mount with four each, 8-32 x 1" [25mm] socket head cap screws, #8 flat washers and # 8 lock washers.

❑ 7. Mark the location on the firewall where the throttle pushrod will pass through. Drill a 3/16" hole on that mark. Locate the 24" [610mm] gray plastic pushrod tube. Cut it to a length of 20" [508mm]. Roughen one end of the tube with 220-grit sandpaper. Install the un-sanded end of the pushrod tube into the front of the firewall through the hole you drilled in the firewall and through the hole inside the fuselage, in the fuselage former. Apply CA to the roughened end of the plastic tube gluing it into the firewall.



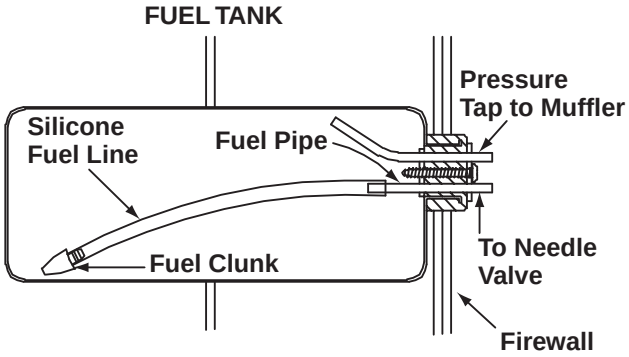


❑ 8. Locate a .074 x 36" [914mm] pushrod wire. Cut it to a length of 24" [610mm] cutting off the threaded end of the wire. Insert this wire into the plastic tube you installed for the throttle. Install a brass screw-lock connector into the throttle arm, locking it to the arm with the nylon retainer. Insert this wire into the screw lock connector and the plastic tube you installed for the throttle. Lock the wire to the connector with a 4-40 x 1/4" [6mm] socket head cap screw.

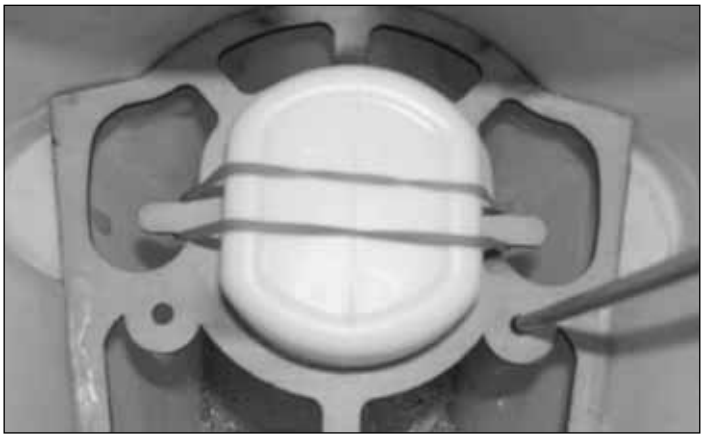


❑ 9. Install the throttle servo into the tray in the fuselage. Drill a 1/16" [1.6mm] hole through each of the mounting holes in the servo. Install and then remove a servo mounting screw into each of the holes you have drilled. Apply a couple of drops of thin CA into the holes to harden the threads. After the glue has hardened install your servo.

❑ 10. Install a brass-screw lock connector and nylon retainer to the servo arm. Slide it onto the pushrod wire, center the servo, install the servo arm onto the servo then install the servo screw into the servo and a 4-40 x 1/4" [6mm] socket head cap screw into the screw-lock connector.

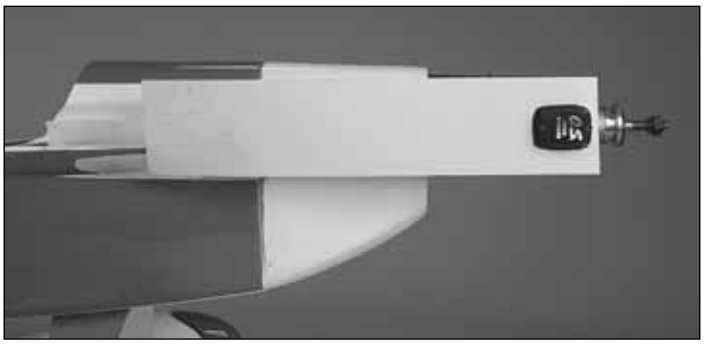


❏ 11. Assemble the **fuel tank** as shown. Included with the fuel tank hardware is a 24" [610mm] length of fuel tubing. This will be used for attaching the tank to the carburetor and muffler pressure tap. If you will be using a fuel valve (not included) for filling the tank rather than filling the tank by removing the line from the carburetor, install it in the fuel line following the instructions included with the valve.



❏ 12. Install the fuel line included with the kit onto the tubes extending from the fuel tank. Insert the lines and the fuel tank into the fuselage. Hold the tank in place with a couple of #64 rubber bands. Attach the carburetor line to the carburetor. The vent line can be attached later when the muffler is permanently installed.

Install the Cowl

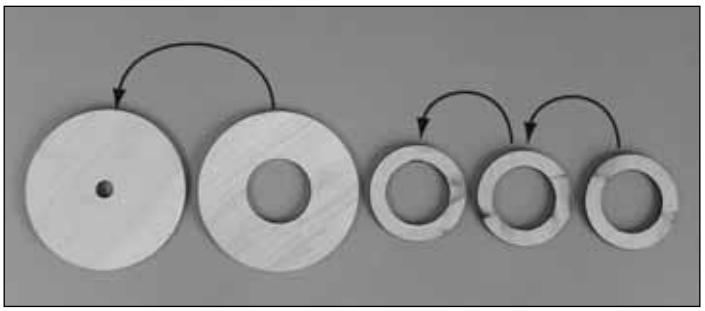


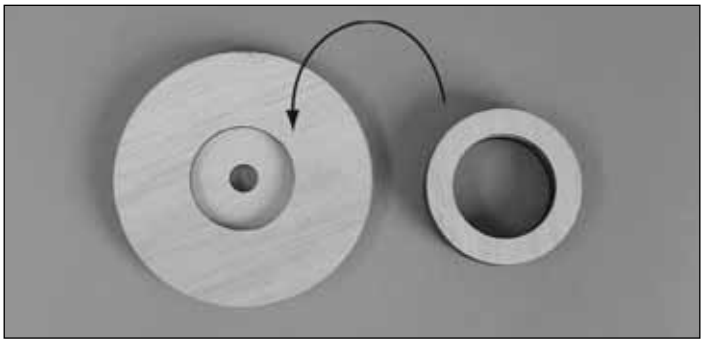
❏ 1. Use card stock as a template for making the cut out in the cowl. Tape the card stock to the fuselage behind where the cowl will be mounted. Mark the card stock where the engine extends outside of the cowl. Cut that area out of the card stock.

❏ 2. Remove the engine from the mount; slide the cowl onto the fuselage. (If you are installing the O.S. .91 four-stroke engine, you can remove the rocker arm cover and the cowl will fit over the engine without removing it.) Tape the cowl to the fuselage. Trace the pattern from the card stock onto the cowling.

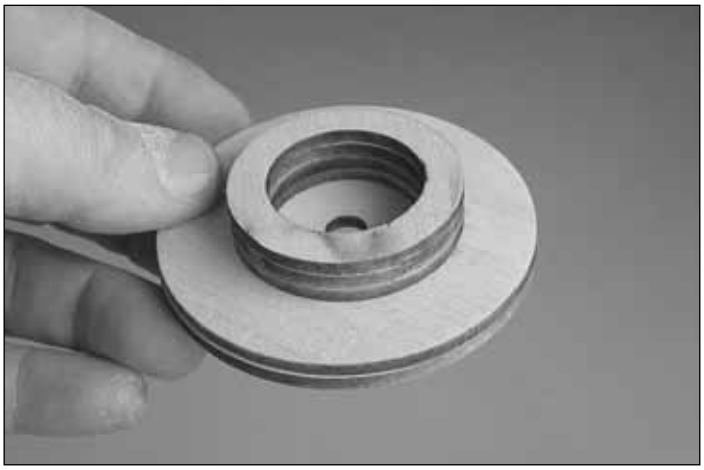
❏ 3. Remove the cowl from the fuselage. Cut out the area you have marked. A high speed rotary tool works well for this. Try to cut as closely to the area outlined as you can. You will be making adjustments to the cut out as you continue with the installation of the cowl. The goal now is to just be able to slip the cowl over the engine and onto the fuselage.

❏ 4. Reinstall the engine onto the engine mount. Slide the cowl over the engine and onto the fuselage.

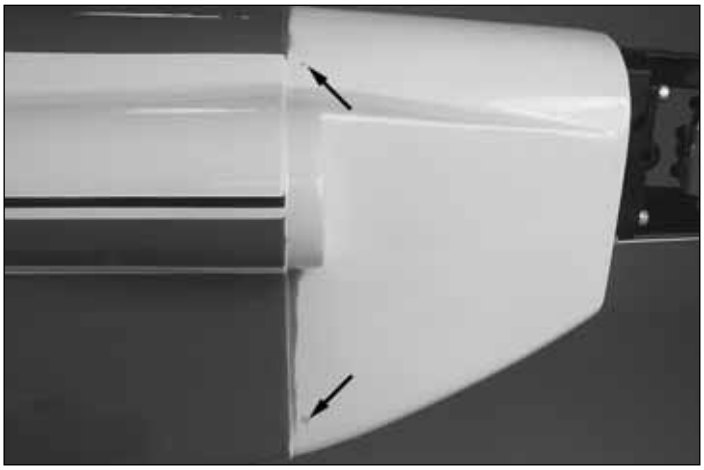




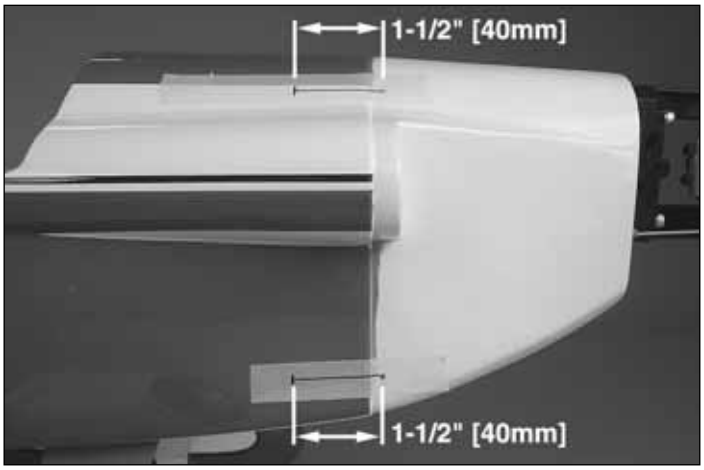
❏ 5. Locate the five 1/8" [3mm] balsa disks shown. Glue the three smaller disks to each other forming a 3/8" [9mm] thick disk. The inside diameter of these disks is designed to fit over the thrust washer of the O. S. .91 two-stroke engine and the O.S. .91 four-stroke engine. Depending on the engine you are installing you may have to slightly enlarge the inside diameter of the disks. If necessary, enlarge the disks just enough to fit snugly over the engine thrust washer. Once the disk fits, glue the 3/8" [9mm] disk onto the large disk inside the location marks on the disk.



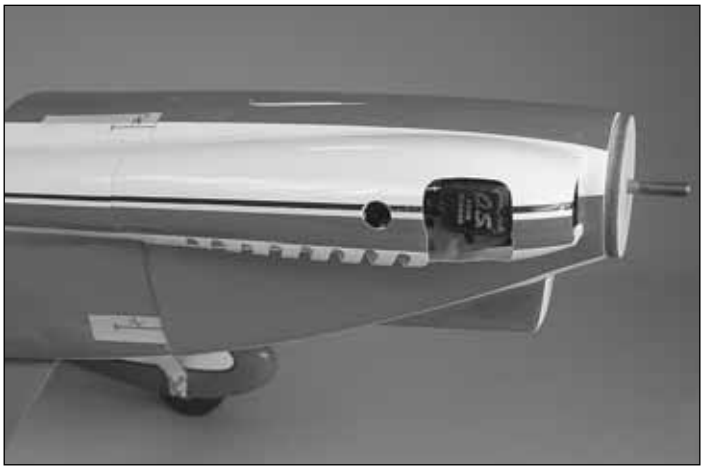
❑ 6. Glue the remaining disk on the bottom of the large disk as shown. This will become a handy aid in helping you to properly center the cowl and the engine. In the future this will be referred to as the **cowl tool**.



❑ 7. Look at the front of the fuselage and you will see two dimples on each side of the fuselage. The cowl mounting blocks are located under each of the dimples.



❑ 8. Place masking tape on the fuselage extending over the location of the blocks. Draw a 1-1/2" [40mm] line extending from the center of the block. Do this at all four blocks.

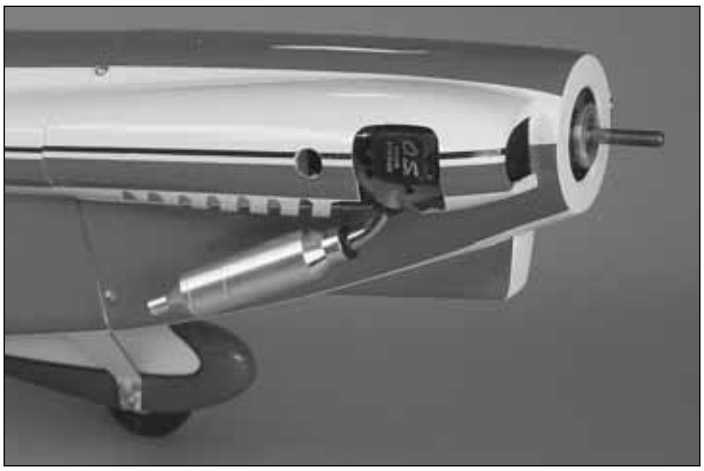


❑ 9. Install the cowl onto the front of the fuselage. Slide the cowl tool in place over the crankshaft of the engine and into the opening in the front of the cowl. Hold it tight against the engine by tightening the prop nut and washer against the cowl tool.

❑ 10. Make any adjustment needed to align the paint lines on the cowl with the fuselage. At each of the reference lines you have drawn on the fuselage, measure from the fuselage forward to the cowl 1-1/2" [38mm]. Mark that location on the cowl.

❑ 11. Drill a 3/32" [2.4mm] hole through the cowl and fuselage mounting blocks at one of the four locations. Temporarily screw a #4 x 3/8" [9mm] sheet metal screw and a #4 flat washer into the cowl and fuselage. Drill a hole at another location, install another screw and washer. Do this for all four mounting blocks.

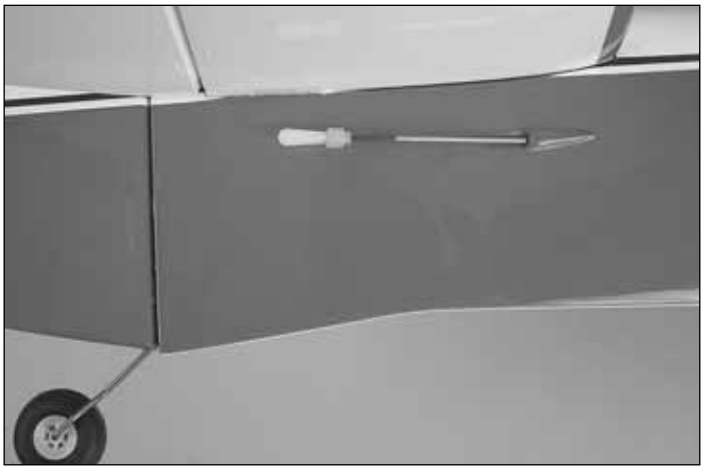
❑ 12. Remove the cowl. Apply a couple of drops of thin CA to the holes to harden the threads. After the glue has hardened, install the cowl with the #4 x 3/8" [9mm] sheet metal screws and #4 flat washers.



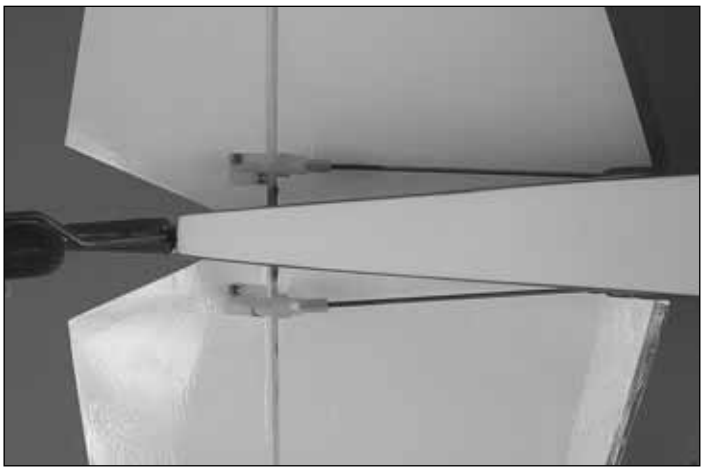
❑ 13. Using a technique similar to the way you located and cut the cowl for the engine cylinder head, make any additional cut outs needed in the cowl for the needle valve, muffler, glow plug, etc.

Install the Radio System

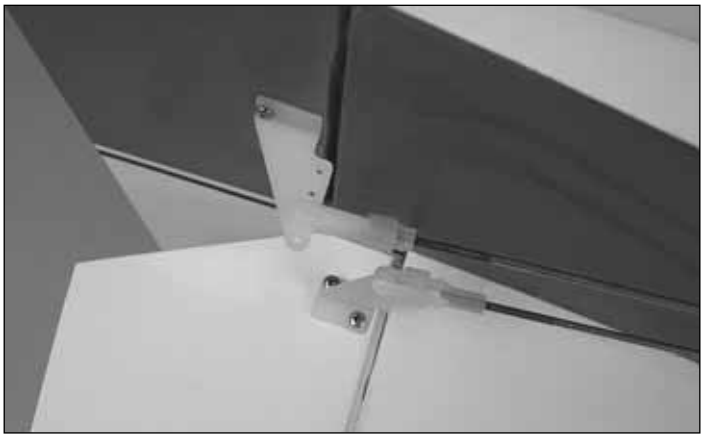
❏ 1. Locate three .074" x 36" [914mm] pushrod wires threaded on one end. Screw a nylon clevis onto the threaded end of the wires 20 full turns. Install a silicone clevis keeper onto the clevises.



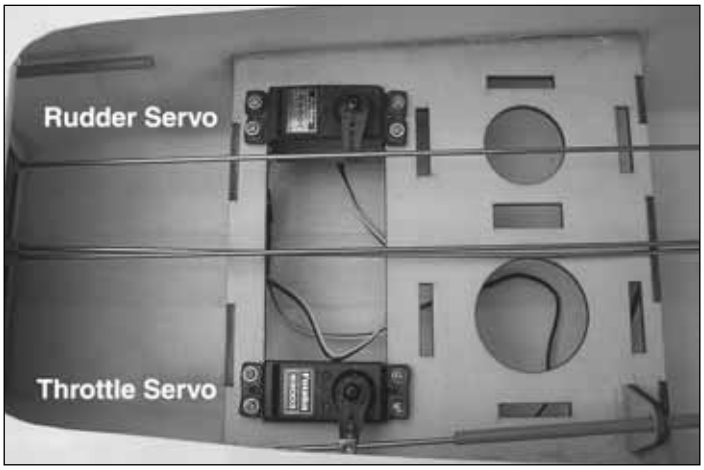
❏ 2. Slide two of the pushrods with clevises attached into the openings closest to the bottom of the elevator on both sides of the fuselage.



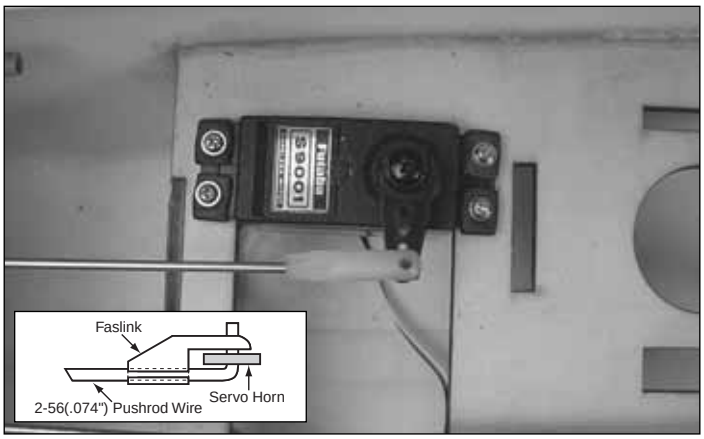
❏ 3. Connect a nylon control horn onto each of the two clevises. Position the control horns on the elevators, positioning them the same way as you did with the ailerons. Mark the location for the screw holes. Drill through the marks you made with a 1/16" [1.6mm] drill bit, drilling through the elevator. Secure the control horn to the aileron with two 2-56 x 5/8" [16mm] machine screws and the nylon mounting plate.



❏ 4. Connect the third pushrod into the remaining opening in the fuselage. Connect the control horn to the clevis and attach the control horn to the rudder in the same way you installed them to the elevators.

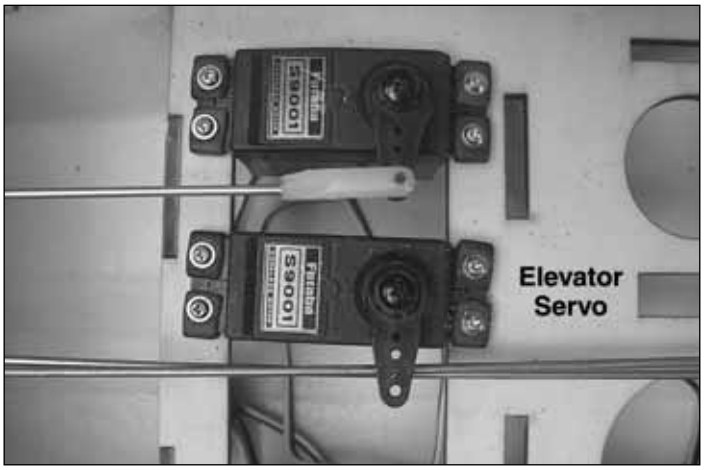


❏ 5. Install the rudder servo into the servo tray at the position shown. Mark the location for the servo mounting screws. Drill a 1/16" [1.6mm] hole through the marks, drilling through the plywood tray. Insert and then remove one of the servo mounting screws supplied with your radio into each of the four holes you have drilled. Apply a couple of drops of thin CA to each of the holes to harden the threads. After the glue has hardened mount the servo.

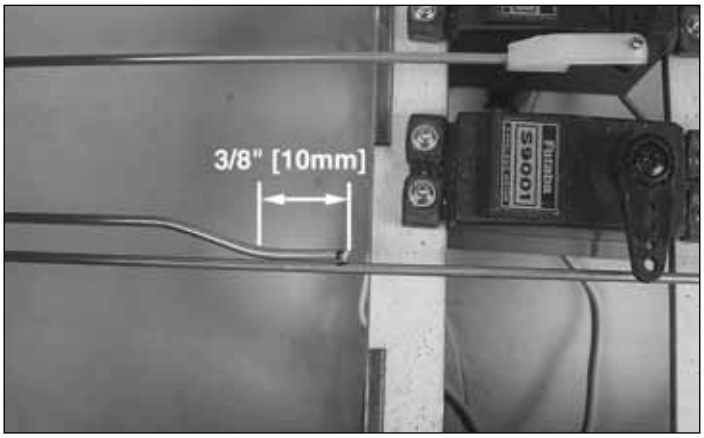


❏ 6. Be sure the rudder servo is centered. Enlarge the first hole in the servo arm with a Hobbico Servo Horn Drill (or a #48 or 5/64" [2mm] drill bit). Center the rudder and align the

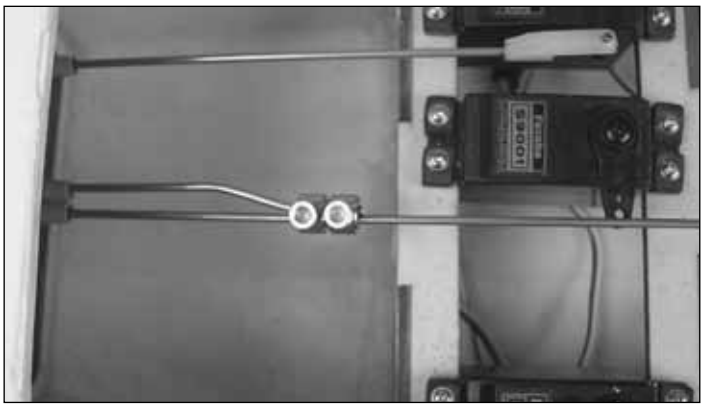
wire pushrod with the hole in the end of the servo arm. Use a fine-point felt-tip pen to mark the wire where it crosses the holes in the servo arm. On that mark make a 90 degree bend. From the bend measure an additional 3/16" [4.8mm] then cut off the excess pushrod wire. Install a nylon Faslink to the wire and servo arm.



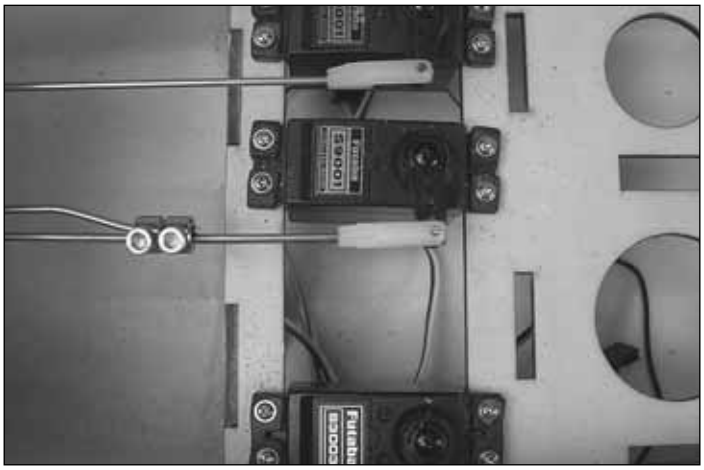
❑ 7. Install the elevator servo into the servo tray. Position it in line with the elevator pushrods. Mount the servo using the same procedure used for the rudder servo.



❑ 8. Make a bend in one of the elevator pushrod wires as shown. Cut the excess wire 3/8" [10mm] from the bend.

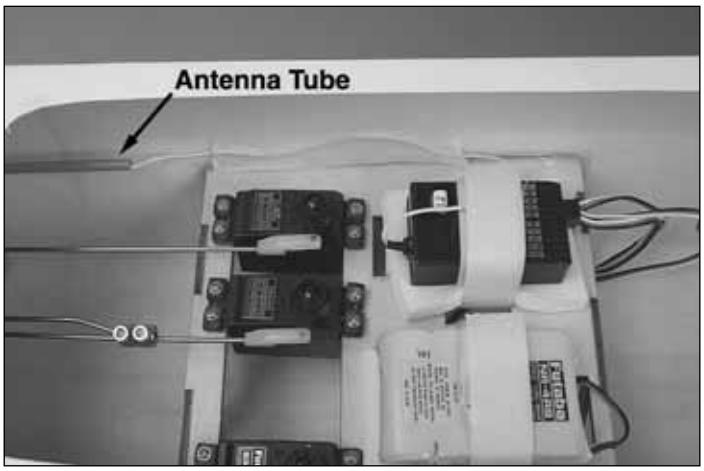


❑ 9. Screw a 6-32 x 1/4" [6mm] socket head cap screw with a small amount of threadlocker into two 5/32" [4mm] wheel collars. Slide the wheel collars onto the wires. Align the elevators. Tighten the set screws against the wires.



❑ 10. Be sure the elevator servo is centered. Enlarge the first hole in the servo arm with a Hobbico Servo Horn Drill (or a #48 or 5/64" [2mm] drill bit). Center the elevators and align the wire pushrod with the hole in the end of the servo arm. Using a marker, mark the location where the wire aligns with the hole in the servo arm. On that mark make a 90 degree bend. From the bend measure an additional 3/16" [4.8mm] then cut off the excess pushrod wire. Install a nylon Faslink to the wire and servo arm.

❑ 11. Install a switch harness and charge jack in the fuselage. Connect the switch to the battery. Be sure to use heat shrink or tape to be sure the battery to switch connection is secure.



❑ 12. Install the battery and receiver as shown. Place 1/4" [6mm] thick foam under the receiver and battery, holding it in place with the Velcro material (included with the kit). Insert the receiver antenna into the antenna tube.

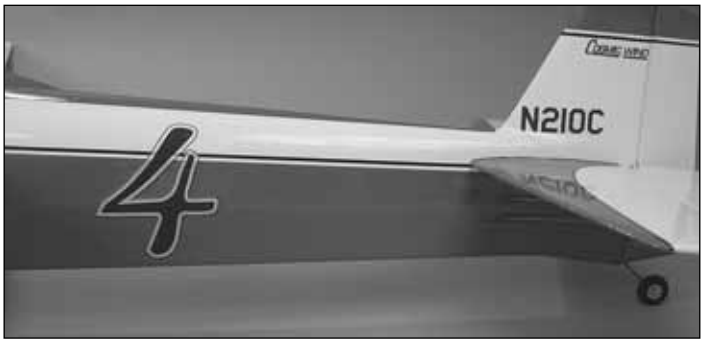
FINAL TOUCHES

Install the Canopy

❏ 1. We installed a 1/4-scale Williams Brothers “Sportsman” pilot (WBRQ2626). Because the Minnow was such a small racer, the head of the pilot is all that is required. To fit the head you will have to sand a small portion of the chin from the pilot figure.

❏ 2. Trim the canopy on the molded cut lines. Glue the canopy in place using R/C-56 canopy glue.

Apply the Decals



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

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

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

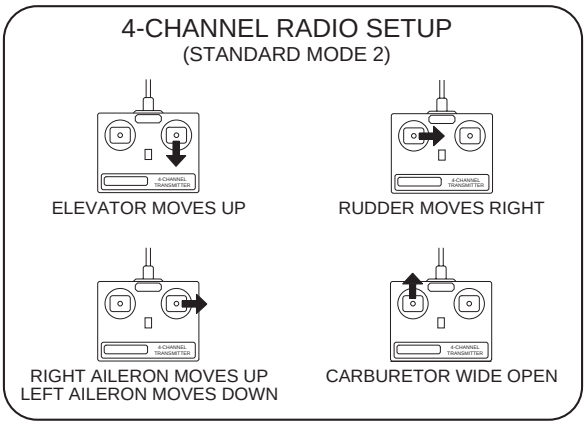
4. Use a piece of soft balsa or something similar to squeegee remaining water from under the decal. Apply the rest of the decals the same way.

GET THE MODEL READY TO FLY

Check the Control Directions

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

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



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

Set the Control Throws

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

These are the recommended control surface throws:

	High Rate	Low Rate
ELEVATOR:	3/4" [19mm] up 3/4" [19mm] down	1/2" [13mm] up 1/2" [13mm] down
RUDDER:	1-1/8" [28mm] right 1-1/8" [28mm] left	3/4" [19mm] right 3/4" [19mm] left
AILERONS:	3/8" [10mm] up 3/8" [10mm] down	1/4" [6mm] up 1/4" [6mm] down

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

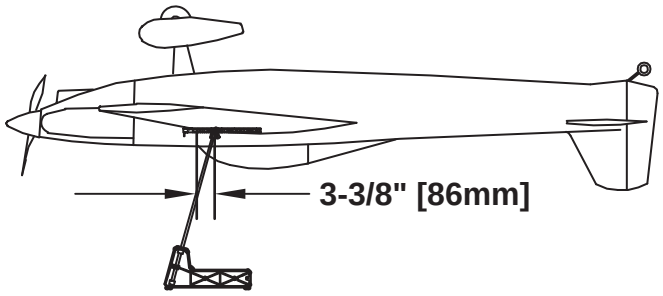
Balance the Model (C.G.)

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

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

❑ 1. Use a felt-tip pen or 1/8" [3mm] wide tape to accurately mark the C.G. on the top of the wing on both sides of the fuselage. **The C.G. is located 3-3/8" [86mm] back from the leading edge of the wing, measured at the fuselage sides.**

This is where your model should balance for the first flights. Later, you may wish to experiment by shifting the C.G. up to 1/2" [13mm] forward or 1/2" [13mm] back to change the flying characteristics. Moving the C.G. forward may improve the smoothness and stability, but the model may then require more speed for takeoff and make it more difficult to slow for landing. Moving the C.G. aft makes the model more maneuverable, but could also cause it to become too difficult to control. In any case, **start at the recommended balance point** and do not at any time balance the model outside the specified range.



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

❏ 3. If the tail drops, the model is "tail heavy" weight must be added to the nose to balance. If the nose drops, the model is "nose heavy" weight must be added to the tail to balance. 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 over the firewall until the model balances. Once you have determined the amount of weight required, it can be permanently attached.

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

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

Balance the Model Laterally

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

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

PREFLIGHT

Identify Your Model

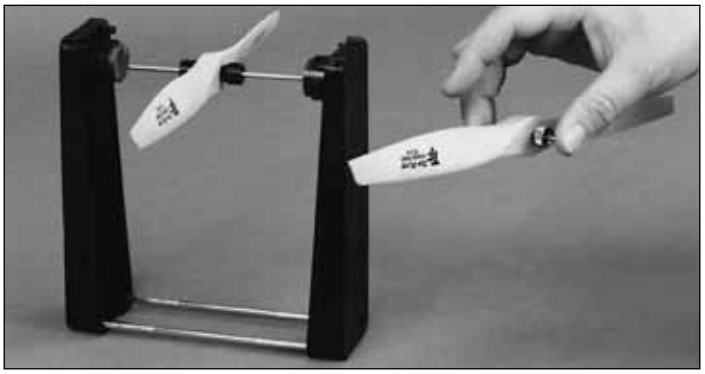
No matter if you fly at an AMA sanctioned R/C club site or if you fly somewhere on your own, you should always have your name, address, telephone number and AMA number on or inside your model. It is **required** at all AMA R/C club flying sites and AMA sanctioned flying events. Fill out the identification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

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 as they are completed.

- ❏ 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 threadlocking compound to secure critical fasteners such as the set screws that hold the wheel collars, screws that hold the carburetor arm (if applicable), screw-lock pushrod connectors, etc.
- ❏ 7. Add a drop of oil to the axles so the wheels will turn freely.
- ❏ 8. Make sure all hinges are **securely** glued in place.
- ❏ 9. Reinforce holes for wood screws with thin CA where appropriate (servo mounting screws, cowl mounting screws, etc.).
- ❏ 10. Confirm that all controls operate in the correct direction and the throws are set up according to the manual.
- ❏ 11. Make sure there are silicone retainers on all the clevises and that all servo arms are secured to the servos with the screws included with your radio.
- ❏ 12. Secure connections between servo wires and Y-connectors or servo extensions, and the connection between your battery pack and the on/off switch with vinyl tape, heat shrink tubing or special clips suitable for that purpose.
- ❏ 13. Make sure any servo extension cords you may have used do not interfere with other systems (servo arms, pushrods, etc.).
- ❏ 14. Secure the pressure tap (if used) to the muffler with high temp RTV silicone, thread locking compound or J.B. Weld.
- ❏ 15. Make sure the fuel lines are connected and are not kinked.
- ❏ 16. Balance your propeller (and spare propellers).
- ❏ 17. Tighten the propeller nut and spinner.
- ❏ 18. Place your name, address, AMA number and telephone number on or inside your model.
- ❏ 19. Cycle your receiver battery pack (if necessary) and make sure it is fully charged.
- ❏ 20. If you wish to photograph your model, do so before your first flight.
- ❏ 21. Range check your radio when you get to the flying field.

FLYING

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

Fuel Mixture Adjustments

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

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

Takeoff

Before you get ready to takeoff, see how the model handles on the ground by doing a few practice runs at **low speeds** on the runway. 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 tail dragger is to always be ready to apply **right** rudder to counteract engine torque. Gain as much speed as your runway and flying site will practically allow before gently applying up elevator, lifting the model into the air. At this moment it is likely that you will need to apply more right rudder to counteract engine torque. Be smooth on the elevator stick, allowing the model to establish a **gentle** climb to a safe altitude before turning into the traffic pattern.

Flight

For reassurance and to keep an eye on other traffic, it is a good idea to have an assistant on the flight line with you. Tell him to remind you to throttle back once the plane gets to a comfortable altitude. While full throttle is usually desirable for takeoff, most models fly more smoothly at reduced speeds.

Take it easy with the Minnow for the first few flights, gradually getting acquainted with it as you gain confidence. Adjust the trims to maintain straight and level flight. After flying around for a while, and while still at a safe altitude with plenty of fuel, practice slow flight and execute practice landing approaches by reducing the throttle to see how the model handles at slower speeds. Add power to see how she climbs as well. Continue to fly around, executing various maneuvers and making mental notes (or having your assistant write them down) of what trim or C.G. changes may be required to fine tune the model so it flies the way you like. Mind your fuel level, but use this first flight to become familiar with your model before landing.

Landing

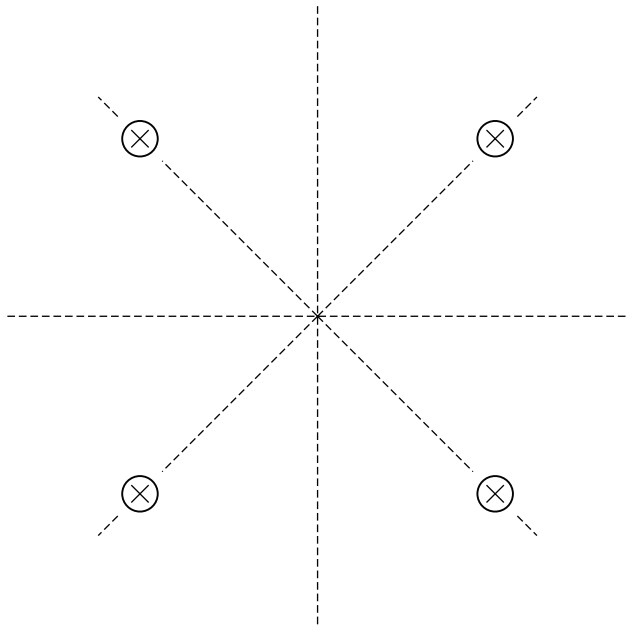
To initiate a landing approach, lower the throttle while on the downwind leg. Allow the nose of the model to pitch downward to gradually bleed off altitude. Continue to lose altitude, but maintain airspeed by keeping the nose down as you turn onto the crosswind leg. Make your final turn toward the runway (into the wind) keeping the nose down to maintain airspeed and control. Level the attitude when the model reaches the runway threshold, modulating the throttle as necessary to maintain your glide path and airspeed. If you are going to overshoot, smoothly advance the throttle (always ready on the right rudder to counteract torque) and climb out to make another attempt. When you're ready to make your landing flare and the model is a foot or so off the deck, smoothly increase up elevator until it gently touches down. Once the model is on the runway and has lost flying speed, hold up elevator to place the tail on the ground, regaining tail wheel control.

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

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

GOOD LUCK AND GREAT FLYING!

ENGINE MOUNT TEMPLATE



ALSO AVAILABLE FROM GREAT PLANES

Futaba® 7C 7-Channel PCM Computer Radio

For virtually the same price as some 6-channel radios, you can enjoy 7-channel versatility and the ease of Dial-N-Key programming. Toggle switches are accessible without taking your thumbs off the sticks, or your eyes off of your model...and can be assigned to operate almost any function. Contrast on the big 72x32 LCD adjusts for maximum visibility, and programming includes both Basic and Advanced menus for airplanes and helis. Includes an R138DP receiver, 600mAh Tx and Rx NiCds, dual output charger and four digital S3151 servos. 72MHz only. **FUTJ71****

Displacement: 0.92 cu in
Bore: 1.09 in
Stroke: 0.98 in
RPM Range: 2,000-12,000
Output: 1.6 bhp @ 11,000 rpm
Weight w/o Muffler: 22.6 oz
Weight w/Muffler: 24.5 oz
Includes: Gow Plug, Muffler, Header, 60P Carb

O.S.(R) FS-91 Surpass™ II

The first impression most modelers have of the ringed FS-91 II is raw power. But the most lasting impression it leaves is for its durability. CAD-assisted engineering and CNC-machined parts ensure the fit and finish; a permanently lubricated, rubber-sealed rear bearing and corrosion-resistant plating on the crankshaft, camshaft and piston help minimize wear and maximize performance. Bolt in an FS-91 II, and a large-scale plane can go from a short roll-out to rocketing vertical to out-of-sight in the span of a few seconds. The power to impress is always there — and along with it, improved fuel economy and a mellower, more scale-like sound. The needle valve and mixture control screw are on the same side of a reversible carb to offer maximum installation and access ease. **OSMG0896**

ALSO AVAILABLE FROM GREAT PLANES

A fierce competitor for decades, the Little Toni is the inspiration for this exciting ARF model. The wing halves and tail surfaces are balsa-sheeted, built-up — and factory-covered in genuine MonoKote. The fiberglass fuselage, cowl, wheel pants and aluminum landing gear arrive painted to match. A clear canopy, scale shaped aluminum spinner, decals and Great Planes hardware are also supplied. In as little as 12-15 hours, the Little Toni can be turning heads at the field. And she flies as well as she looks — tracking solidly, turning quickly, and slowing gently for smooth, easy landings. Capable of most all aerobatic maneuvers, a .91-equipped Little Toni is most at home rocketing around pylons at breathtaking speeds! Spans an IMAA-legal 63", requires a 2-stroke .61 or 4-stroke .91 cu in engine and a 4-channel radio w/5 servos. **GPMA1320**

It's a great first scale model -- it's an aerobatic blast to fly -- the 61.5" span Shoestring is both, with kit quality and easy ARF assembly as added bonuses. All-wood parts makes it light and lively; dual aileron servos and a symmetrical wing supply the speed and might for exciting stunts and new moves. Factory-applied MonoKote® and factory-painted fiberglass parts add vibrant color and durability. Requires a 2-stroke .61 or 4-stroke .91 engine and 4-channel radio w/5 servos. Pilot figure not included. **GPMA1325**

BUILDING NOTES

Kit Purchased Date: _____

Where Purchased: _____

Date Construction Started: _____

Date Construction Finished: _____

Finished Weight: _____

Date of First Flight: _____

FLIGHT LOG