EXTRA 300S ARF

1/4 Scale Almost-Ready-to-Fly Radio Control Airplane

INSTRUCTION MANUAL

Wingspan: 78.5 in [1995mm]
Wing Area: 1180 sq in [76 dm²]
Weight: 14.25 – 16.5 lb [6500g – 7500g]
Wing Loading: 27.8 oz/sq ft [85g/dm²]
Length: 70 in [1780mm]
Radio: 4-channel minimum (7 to 8 servos)
Engine: 1.60 to 2.10 cu in [25 to 35cc] 2-stroke,
2.00 to 3.00 cu in [33 to 50cc] 4-stroke,
2.5 to 3.8 cu in [41 to 65cc] Gas

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 INSTRUCTIONS AND WARNINGS CONCERNING THE ASSEMBLY AND USE OF THIS MODEL.

GREAT PLANES® MODEL MANUFACTURING COMPANY
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airsupport@greatplanes.com

GPMZ0216 for GPMA1305 V1.0

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INTRODUCTION

The Great Planes 1/4-Scale Patty Wagstaff Extra 300S ARF is a versatile airplane designed for giant-scale aerobatics. The Extra 300S ARF is capable of wild, 3D aerobatics while still keeping the slow speed and landing performance of a low wing sport model. The Extra 300S ARF is an airplane that will go where you point it without any surprises.

For the latest technical updates or manual corrections to the Extra 300S ARF, visit the web site listed below and select the Extra 300S 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.

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

IMAA

The Extra 300S ARF 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, 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

Scale Competition
Though the Extra 300S is an ARF and may not have the same level of detail as an “all-out” scratch-built competition model, it is a scale model none-the-less and is therefore eligible to compete in the *Fun Scale* class in AMA competition (we receive many favorable reports of Great Planes ARFs in scale competition!) In Fun Scale, the “builder of the model” rule does not apply. To receive the five points for scale documentation, the only proof required that a full-size aircraft of this type in this paint/markings scheme did exist is a single sheet such as a kit box cover from a plastic model, a photo, or a profile painting, etc. If the photo is in black and white, other written documentation of color must be provided. Contact the AMA for a rule book with full details.

If you would like photos of the full-size Patty Wagstaff Extra 300S for scale documentation, or if you would like to study the photos to add more scale details, photo packs are available from:

Bob's Aircraft Documentation
3114 Yukon Ave
Costa Mesa, CA 92626
Telephone: (714) 979-8058
Fax: (714) 979-7279
e-mail: *www.bobsairdoc.com*

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

1. Your Extra 300S 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 Extra 300S ARF, if not assembled and operated correctly, could possibly cause injury to you 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 extreme 3D flying, the modeler is responsible for taking steps to reinforce the high stress points.

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

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

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

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:

AMA
SINCE 1936

Academy of Model Aeronautics
5151 East Memorial Drive
Muncie, IN 47302
Tele: (800) 435-9262
Fax (765) 741-0057
Or via the Internet at:
http://www.modelaircraft.org

DECISIONS YOU MUST MAKE BEFORE BEGINNING TO BUILD

This is a partial list of items required to finish the Extra 300S ARF that may require planning or decision making before starting to build. Stock numbers are provided in parentheses.

Radio Equipment

The Extra 300S ARF can use a simple 4 to 6-channel radio with several "Y" reversing and non-reversing harnesses or it can use a 6 to 10-channel computer radio. Even though the airplane flies fine with a simple radio, we strongly recommend that a computer radio be installed as this will make it easier to obtain the best performance of all flying styles possible with the Extra 300S ARF. Also, all servos used on this airplane should be capable of delivering at least 60 oz-in of torque with the exception of the throttle servo. Digital servos are highly recommended for 3D flying.

Note: Battery selection is also very important. The batteries must be in good condition. To verify this, make sure you cycle them several times before you fly the airplane and that they reach their advertised capacity. If you use 60 oz-in servos on your airplane, the minimum battery size recommended is a 4-cell, 1200mAh battery. If you are using digital servos on your airplane, a 4-cell, 2000mAh battery is the minimum size recommended. Please make sure your batteries are fully charged before each flight, and check and recharge them if needed between flights. A Hobbico® Digital Voltmeter MKIII (HCAP0356) works well for checking your battery voltage. A Hobbico Quick Field Charger™ (HCAM3000) will charge your batteries between flights.

Engine Recommendations

The recommended engine size range for the Extra 300S ARF is 1.60 cu in to 2.10 cu in [25 to 35cc] 2-stroke, 2.00 cu in to 3.00 cu in [33 to 50cc] 4-stroke or 2.5 cu in to 3.8 cu in [41 to 65cc] Gas. Sport style flying will be possible with the lower engine sizes recommended while 3D style flying will require the larger sizes recommended. If an engine in the upper end of the size range is used, throttle management must be practiced. The larger size engines recommended are for 3D style flying which means that the engine is capable of producing several pounds of thrust more than what the model weighs. Full throttle should only be used during straight up maneuvers, never during straight and level flying or while diving as this might over stress the airplane. The airplane has been tested with engines within the recommended range, including the upper end, and it proved to be capable of handling all of them.

The Extra 300S ARF includes the hardware and instructions necessary to install a glow type engine. If you decide to install a gas engine you will need to supply your own fuel tank and hardware necessary to install and run the engine. You may also need to modify the fuel tank supports.

You must not install a larger engine than recommended under any circumstances. Installing a larger engine than recommended will void your warranty and will overstress your airplane to the point where it may break in the air. The airplane is designed and built so that it will fly well with engines within the recommended range.

ADDITIONAL ITEMS REQUIRED

Hardware & Accessories

This is the list of hardware and accessories required to finish the Extra 300S ARF. Stock numbers are provided in parentheses.

- ❑ Engine 1.60 cu in to 2.10 cu in [25 to 35cc] 2-stroke, 2.00 cu in to 3.00 cu in [33 to 50cc] 4-stroke, or 2.7 cu in to 3.8 cu in [44 to 65cc] Gas
- ❑ Suitable propellers *(refer to the engine manufacturer's recommendations)*
- ❑ Switch and charge jack mounting set (Great Planes-GPMM1000) or (Ernst-ERNM3001)
- ❑ R/C foam rubber (1/4"-HCAQ1000, or 1/2" HCAQ1050)

If you plan to use a non-computer radio you will also need:

- ❑ 4-Channel radio with seven servos for a glow engine
- ❑ 5-Channel radio with eight servos for a gas engine
- ❑ (4) 12" Servo extension (ailerons, throttle, elevator, rudder) (HCAM2100 Futaba®)
- ❑ (2) "Y" harness (rudder, aileron) (HCAM2500)
- ❑ (1) "Y" harness with servo reverser (elevator) (FUTM4150)

If you plan to use a computer radio you will also need:

- ❑ 7-Channel Radio with seven servos for a glow engine
- ❑ 8-Channel Radio with eight servos for a gas engine.
- ❑ (3) 12" Servo extension (ailerons, glow throttle) (HCAM2100)
- ❑ (4) 24" Servo extensions (rudder, elevator) (HCAM2200)
- ❑ (4) 6" Servo extensions (elevator, ailerons) (HCAM2200)

If you plan to use a glow engine you will also need:

- ❑ 3' Fuel tubing
- ❑ Great Planes Aluminum Plug (GPMQ4166) or Great Planes Easy Fueler™ Valve for glow (GPMQ4160)
- ❑ Pitts style muffler for your engine

If you plan to use a gas engine such as the Fuji™ BT 50, you will also need:

- ❑ 3' Gas fuel tubing (GPMQ4133)
- ❑ Great Planes Aluminum Plug (GPMQ4166) or Great Planes Easy Fueler Valve for gas (GPMQ4161)
- ❑ Great Planes Ignition Switch Harness (GPMG2150)
- ❑ 36" Plastic pushrod (GPMQ3710)
- ❑ 2-56 x 30" Pushrod (GPMQ3716)
- ❑ 2 Threaded rods for plastic inner rod (GPMQ3831)
- ❑ 2 Plastic clevises (GPMQ3800)
- ❑ (4) 1/4-20 x 2" Bolts
- ❑ (4) 1/4-20 Blind nuts (GPMQ3332)
- ❑ (4) 1/4" Flat washers
- ❑ Gas tank for gasoline

Adhesives & Building Supplies

In addition to common household tools and hobby tools, this is the "short list" of the most important items required to build the Extra 300S ARF. ***Great Planes Pro™*** *CA and Epoxy glue are recommended.*

- ❑ Top Flite® MonoKote® sealing iron (TOPR2100)
- ❑ Top Flite Panel Line Pen (TOPQ2510)
- ❑ 1/2 oz. Thin Pro CA (GPMR6001)
- ❑ 1/2 oz. Medium Pro CA+ (GPMR6007)
- ❑ 30-Minute Epoxy (GPMR6047)
- ❑ 6-Minute Epoxy (GPMR6042)
- ❑ Hobby knife (HCAR0105)
- ❑ #11 Blades (HCAR0211)
- ❑ Small T-pins (HCAR5100)
- ❑ Builder's triangle (HCAR0480)
- ❑ Electric drill and 1/16" [1.6mm], 5/64" [2.0mm], 3/32" [2.4mm], 7/64" [2.8 mm], #28 (0.136") [3.4mm], 3/16" [4.8mm], 1/4" [6.4mm] drill bits.
- ❑ Small Phillips and flat blade screwdrivers (HCAR1040)
- ❑ Pliers with a wire cutter (HCAR0630)
- ❑ 8-32 tap and drill set (GPMR8103) (for glow engine)
- ❑ Great Planes Pro Threadlocker™ (GPMR6060)
- ❑ Heat shrink tubing (GPMM1060)
- ❑ Curved-tip Canopy Scissors for trimming plastic parts (HCAR0667)
- ❑ Masking tape
- ❑ Hobbico® solder iron (HCAR0776)
- ❑ Denatured alcohol
- ❑ Paper towels
- ❑ K & S #801 Kevlar® thread string (K+SR4575)
- ❑ Allen wrenches
- ❑ Rotary tool such as Dremel® Moto-Tool® (for fiberglass cowl and wheel pants)
- ❑ Small clamp

Optional Supplies & Tools

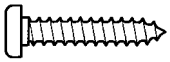
Here is a list of optional tools mentioned in the manual that will help you build the Extra 300S ARF.

- ❑ Top Flite MonoKote heat gun (TOPR2000)
- ❑ Top Flite Trim Seal Tool (TOPR2200)
- ❑ Top Flite Precision Magnetic Prop Balancer™ (TOPQ5700)
- ❑ Top Flite Hot Sock™ iron cover (TOPR2175)
- ❑ Hobbico Hot Knife™ (HACR0770)
- ❑ 3M "75" spray adhesive (MMMR1900)
- ❑ Straightedge with scale (HCAR0475)
- ❑ Cutting mat (HCAR0456)
- ❑ CA Debonder (GPMR6039)
- ❑ CA Applicator Tips (HCAR3780)
- ❑ CA accelerator (GPMR6034)
- ❑ Epoxy Brushes (GPMR8060)
- ❑ Mixing Sticks (GPMR8055)
- ❑ Dead Center™ Engine Mount Hole Locator (GPMR8130)
- ❑ Great Planes AccuThrow™ Deflection Gauge (for measuring control throws, GPMR2405)
- ❑ Hobbico Servo Horn Drill (HCAR0698)
- ❑ Robart Superstand II (ROBP1402)
- ❑ Single-sided foam tape (wing seating tape, GPMQ4422)

IMPORTANT BUILDING NOTES

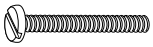
- There are two types of screws used in this kit:

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. **SHCS** is just an abbreviation for "socket head cap screw" and that is a machine screw with a socket head. For example 4-40 x 3/4".



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

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

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

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

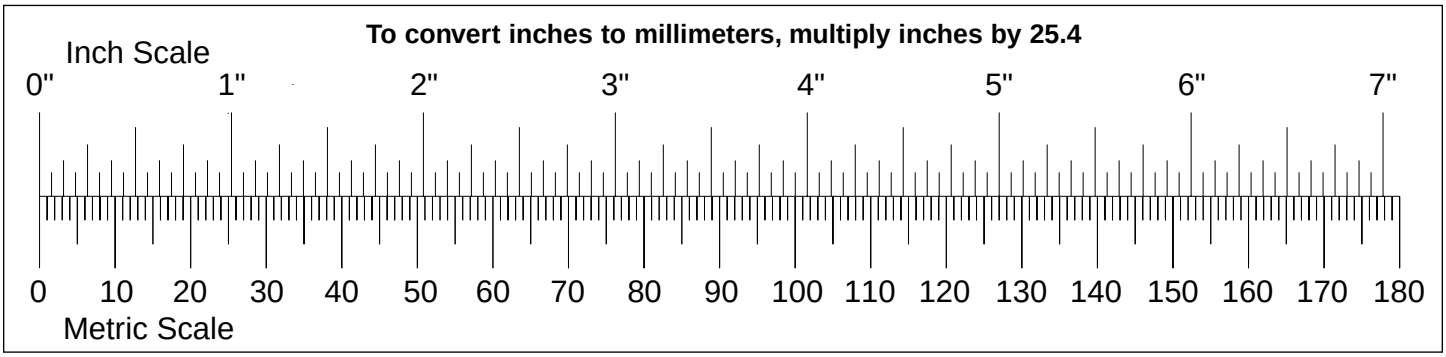
- **Photos** and **sketches** are placed **before** the step they refer to. Frequently you can study photos in following steps to get another view of the same parts.

IMPORTANT: There are many places in this manual where we tell you to reinforce holes made into wood with thin CA. It is important to do this properly to ensure the strongest possible grip of the screw into the wood. The proper procedure is to drill the specified pilot hole first, then run the screw in, remove it, wick thin CA into the hole, allow the CA to cure and reinstall the screw.

• The Extra 300S ARF is 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.

Red–TOPQ0201
Jet White–TOPQ0204
Sapphire Blue–TOPQ0226
Metallic Gold–TOPQ0404



ORDERING REPLACEMENT PARTS

To order replacement parts for the Great Planes Extra 300S 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**.

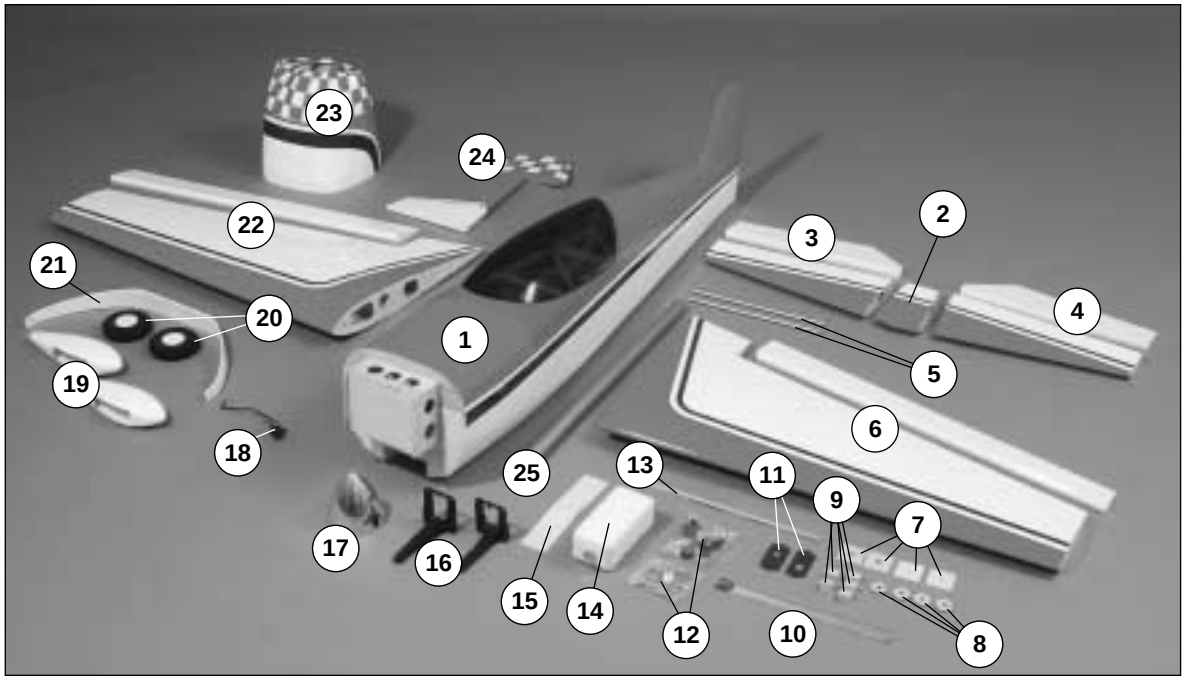
Replacement Parts List

Order Number	Description	How to Purchase
	Missing pieces	Contact Product Support
	Instruction manual	Contact Product Support
	Full-size plans	Not available
GPMA2329	Wing Tube	Contact Your Hobby Supplier to Purchase These Items
GPMA2330	Wing Set	
GPMA2331	Fuselage	
GPMA2332	Stab Set	
GPMA2333	Rudder	
GPMA2334	Landing Gear	
GPMA2335	Wheel Pants Set	
GPMA2336	Canopy	
GPMA2337	Cowl	
GPMA2338	Decal Set	
GPMA2339	Stab Tubes (2)	

KIT CONTENTS

Before starting to build, use the **Kit Contents** list to 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 **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:
Telephone: (217) 398-8970
Fax: (217) 398-7721
E-mail: airsupport@greatplanes.com



Kit Contents (Photographed)

1. Fuselage & Canopy
2. Stab Center Section
3. Right Stab Half and Elevator
4. Left Stab Half and Elevator
5. Aluminum Stab Mounting Tubes
6. Left Wing and Aileron
7. (4) Ply Wheel Pant Mounts
8. (4) Ply Wing Washers
9. (5) Hardwood Cowl Blocks
10. (8) 4-40 x 12" Metal Pushrods
11. (2) Aileron Servo Covers
12. (2) Hardware Bags (contents listed below)
13. Hardwood Stick
14. Fuel Tank
15. CA Hinge Material
16. Engine Mount
17. 4" Aluminum Spinner
18. Tail Wheel Assembly
19. (2) Fiberglass Wheel Pants
20. (2) 4" Wheels
21. Landing Gear
22. Right Wing and Aileron
23. Fiberglass Cowl
24. Rudder
25. Aluminum Wing Tube

Kit Contents (Not Photographed)

(8) 4-40 x 12" Threaded One End Pushrods
(4) 4-40 x 3/4" Bolts
(2) Nylon Tail Wire Straps
(8) 4-40 Threaded Metal Clevises
(7) 4-40 Solder Metal Clevises
(8) 8-32 x 1" Socket Head Cap Screw
(15) Silicone Retainers
(9) 8-32 Blind Nuts
(33) #4 x 5/8" Screws
(13) #8 Flat Washers
(5) 8-32 x 1" Phillips Screw
(2) 1/8" Wheel Collar
(4) 1/4 -20 x 2" Nylon Bolt
(1) 6-32 Torque Rod Horn
(1) Large Quick Connector
(1) Retainer For Quick Connector
(7) #4 Flat Washers
(3) 4-40 x 1/4" Socket Head Cap Screw
(2) 2" x 3/16" Axles
(2) Large Axles Nuts
(2) 3/16" Wheel Collars
(2) 6-32 x 1/8" Socket Head Set Screws
(4) #4 x 3/8" Screws
(4) 1/4-20 Blind Nuts (installed in wing)
(8) #8 Lock Washer
(4) #2 x 3/8" Screw
(4) #2 Washers
(8) 4-40 Hex Nuts
(2) #4 x 3/4" Screw
(4) Nylon Dowels
(6) Giant-Scale Control Horns
(1) #64 Rubber Band
(2) 3mm x 250mm Hardwood Dowel
(1) Landing Gear Cover

BUILDING INSTRUCTIONS

Preparations

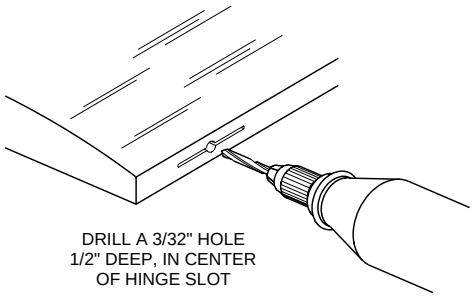
❑ 1. If you have not done so already, remove the major parts of the kit from the box (wings, fuselage, cowl, tail parts, etc.) and inspect them for damage. If any parts are damaged or missing, contact Product Support at the address or telephone number listed in the front cover.

❑ 2. Remove the masking 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 model's covering if necessary. Apply pressure with a Hot Glove over sheeted areas to thoroughly bond the covering to the wood.

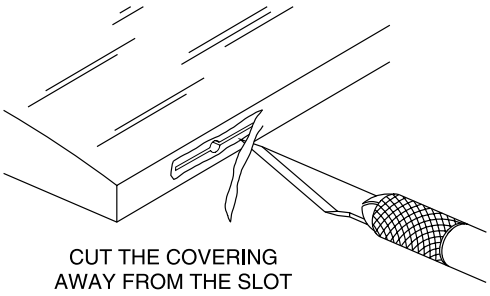
ASSEMBLE THE WING

Hook Up the Ailerons

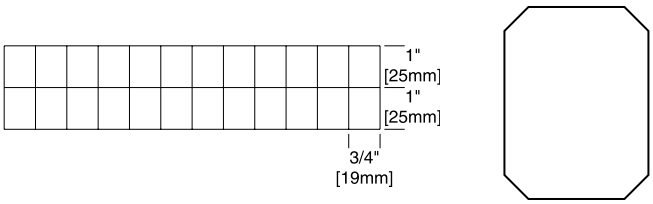
❑ 1. The first steps in the construction of this wing will be the installation of the ailerons and the aileron servos. The process described here will explain how to install the right aileron and the right aileron servo. The process has to be repeated again to install the left aileron and the left aileron servo, or you can work on both at the same time.



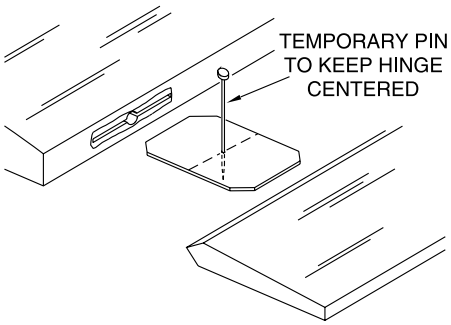
❑ ❑ 2. Locate the pre-cut hinge slots on the wing's trailing edge and the leading edge of the aileron. Drill a 3/32" [2.4mm] hole, 1/2" [12mm] deep in the center of each hinge slot to allow the CA to "wick" in. Follow-up with a #11 blade to clean out the slots. **Hint:** If you have one, use a high-speed rotary tool to drill the holes.



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



❑ ❑ 4. Cut five 3/4" x 1" [19mm x 25mm] hinges from the CA hinge strip. Snip off the corners so they go in easier.

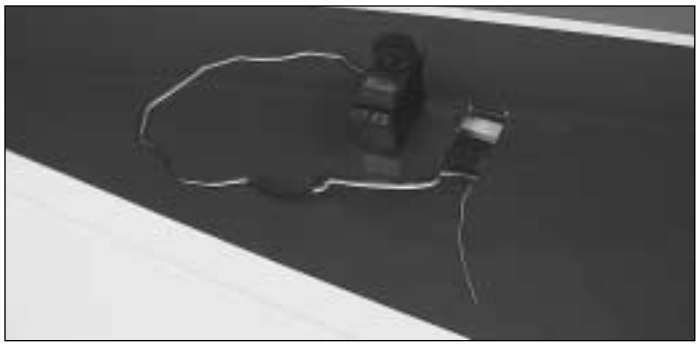


❑ ❑ 5. Test fit the ailerons to the wing with the hinges. If the hinges do not remain centered, stick a pin through the middle of the hinge to hold it in position.

❑ ❑ 6. Remove any pins you may have inserted into the hinges. Adjust the aileron so that 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.

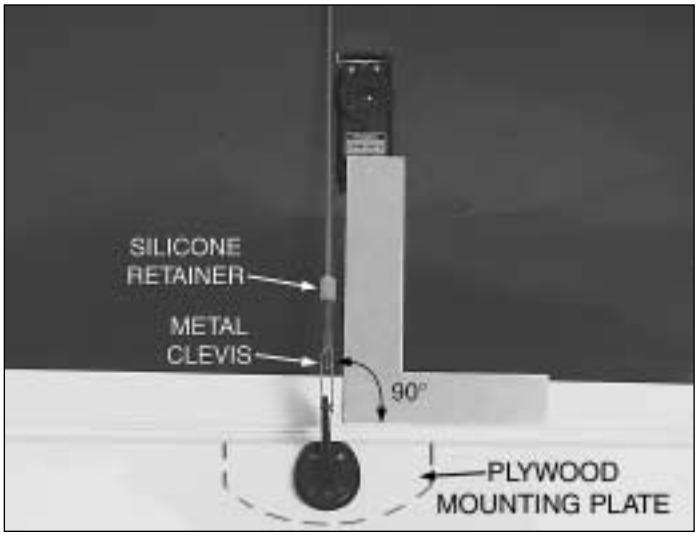
❑ ❑ 7. Apply six drops of thin CA to the top and bottom of each hinge. Do not use CA accelerator. After the CA has fully hardened, test the hinges by pulling on the aileron.

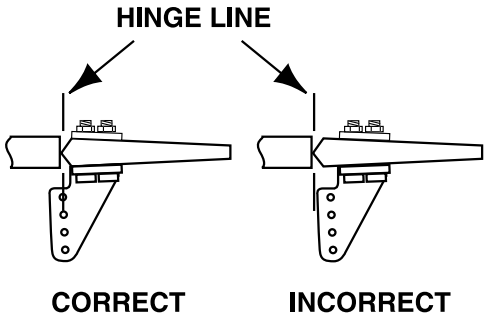
❑ ❑ 8. Feel through the MonoKote covering on the bottom surface of the wing and find the opening for the aileron servo. Cut the covering 1/8" [3.2mm] inside the opening. Use a sealing iron or trim seal tool to seal the covering to the edges of the opening.



❑ ❑ 9. Connect one 12" [305mm] servo lead extension to the aileron servo. Use heat shrink tubing or tape to secure the connection. Tie the string inside the aileron servo opening to the aileron servo lead. Pull the servo lead out of the end of the wing with the string.

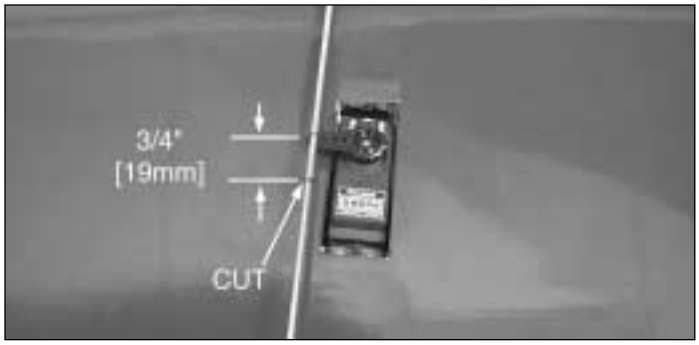
❑ ❑ 10. Test fit the servo in the opening and trim the opening if necessary. Mark the location of the servo mounting screws and drill 1/16" [1.6mm] holes at the marks. Wick some thin CA in the holes you just made and install the aileron servo with the hardware that was supplied with it.

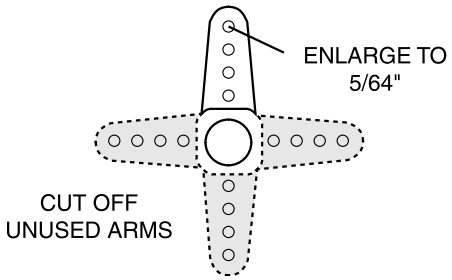




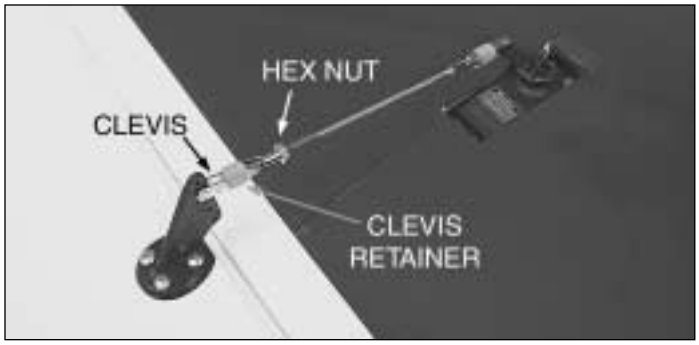
❑ ❑ 11. Install a threaded metal clevis approximately 18 full turns onto one of the 12" [305mm] threaded one end pushrods. Connect the clevis to a large nylon control horn and slip a silicone retainer onto it. Align the pushrod 90 degrees to the aileron's edge as shown above and mark the control horn's holes on the aileron. Make sure that the control horn is positioned on the aileron's plywood mounting plate.

❑ ❑ 12. Use a 1/16" [1.6mm] drill bit to drill the control horn's screw holes. Wrap masking tape 1/4" [6.4mm] from the end of the bit as a guide to keep from drilling the holes too deep. Do not drill through. Wick some thin CA into the holes and mount the control horn using four #4 x 5/8" [16mm] screws. It is important that you use thin CA to strengthen the holes.





❏ ❏ 13. Cut up a servo arm and center it so that the servo arm is 90 degrees to the pushrod. Center the aileron and mark on the pushrod where it meets with the servo arm's hole. Make another mark 3/4" [19mm] closer to the threaded metal clevis. Cut the wire at the second mark.



❏ ❏ 14. Solder an unthreaded metal clevis on the pushrod as shown. Install a 4-40 hex nut on the threaded end of the pushrod. Slip a silicone retainer onto the clevis and install the clevis on the servo arm. Install the servo arm on the servo.

EXPERT TIP

HOW TO SOLDER

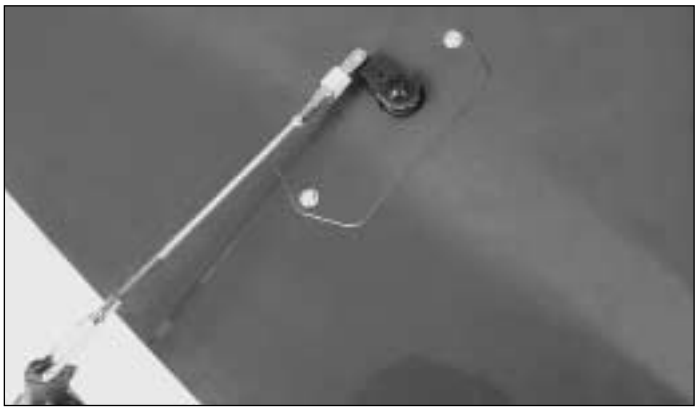
A. Use denatured alcohol or other solvent to remove residual oil from the pushrod.

B. Use coarse sandpaper to thoroughly roughen the end of the pushrod where it is to be soldered.

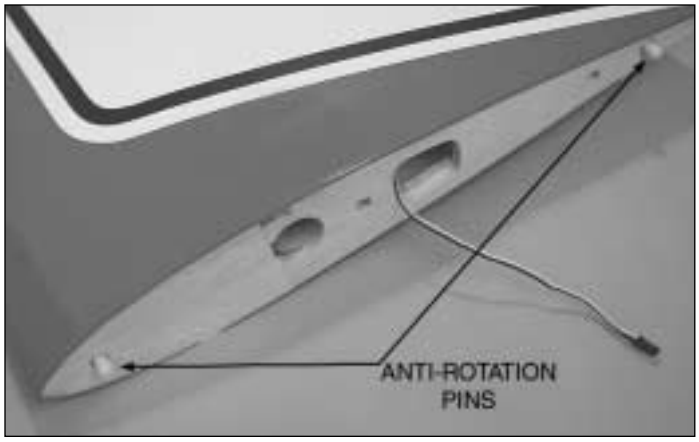
C. Apply a few drops of soldering flux to the end of the pushrod, then use a soldering iron or a torch to heat the end of the pushrod. Coat the end of the pushrod with silver solder (GPMR8070) by touching the solder to the pushrod. The heat of the pushrod should melt the solder–not the flame of the torch or soldering iron–thus allowing the solder to flow. **Note:** Do not use silver solder for electrical soldering.

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

E. After the joint has solidified but while it is still hot, carefully use a cloth to wipe away soldering flux. **Important:** After the joint cools, coat with oil to protect it from corrosion. When finished, the solder joint should appear shiny not dull. If it is dull when it cools, it is a cold joint and not very strong. Simply reheat the cold joint to correct this problem.



❏ ❏ 15. Find the pre-painted **ABS aileron servo cover**. Locate it over the aileron servo and mark the mounting holes on the wing sheeting. Remove the cover and drill 1/16" [1.6mm] holes through the wing sheeting at the marks. Wick thin CA into the holes and install the aileron servo covers in place with two #2 x 1/4" [6.4mm] screws and two #2 washers. Install the aileron pushrod in place. Secure the servo arm in place with the servo screw. Adjust the length of the pushrod and tighten the hex nut against the threaded clevis.



❏ ❏ 16. Find the four white nylon **anti-rotation pins**. Locate the holes in the wings for the pins. Mix a small amount of 30-minute epoxy and glue the anti-rotation pins in place. Once inserted the pins should stick out about 1/2" [13mm]. Clean up any excess epoxy with a paper towel dampened with denatured alcohol.

❏ 17. If you have not done so, go back to step #1 and finish the left wing the same way.

Mount the Wing to the Fuselage

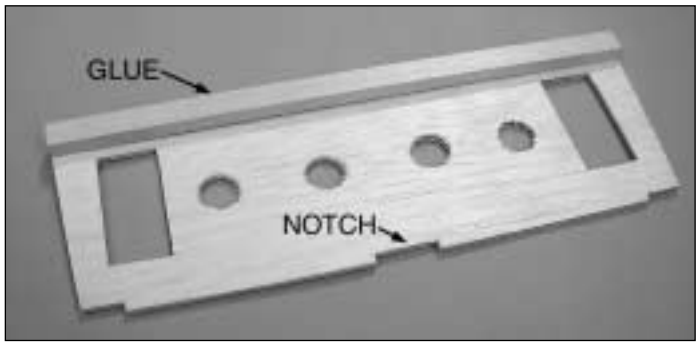
❏ 1. Feel through the MonoKote for the wing mounting holes in the fuselage. There should be a total of six holes on each side of the fuselage: two for the wing hold down bolts, two for the anti-rotation pins, one for the wing tube and one for the servo leads. Cut away the MonoKote and seal the edges with a sealing iron or a trim seal tool. Remember to do this on both sides of the fuselage. **Note:** A little bit of thin CA applied all the way around each hole will protect the wood fuel creep.

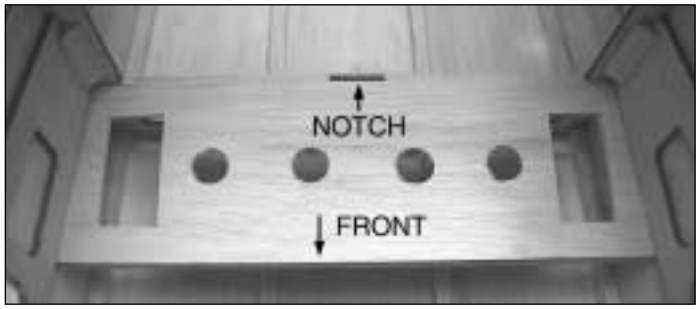
❏ 2. Even though this step belongs in the ***"Install The Tail Surfaces"*** section, it is more convenient to perform it now. Feel through the MonoKote for the stabilizer slot in the aft part of the fuselage. Cut away the MonoKote from the slots on both sides of the fuselage and then seal the edges with a sealing iron or a trim seal tool.

❏ 3. Find the **aluminum wing tube** and install it centered in the **fuselage**. Test fit the wings to the fuse and bolt them in position using two 1/4-20 x 2" [51mm] nylon bolts and two 5/16" [8mm] wood washers for each wing. If necessary, enlarge or adjust the wing bolt holes in the fuselage so the wing bolts will align with the blind nuts in the wing. Also, slightly enlarge the anti-rotation pin holes in the fuselage if necessary. Slightly enlarging the pin holes does not change the wing incidence. Install the two wings this way. Cut 1" [25mm] off the end of all four wing bolts, this will make installing the wing easier. Remove the wings from the fuselage.

ASSEMBLE THE FUSELAGE

Install the Servo Tray

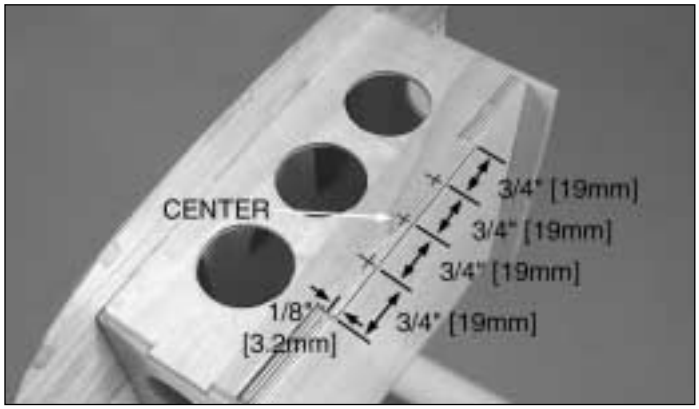




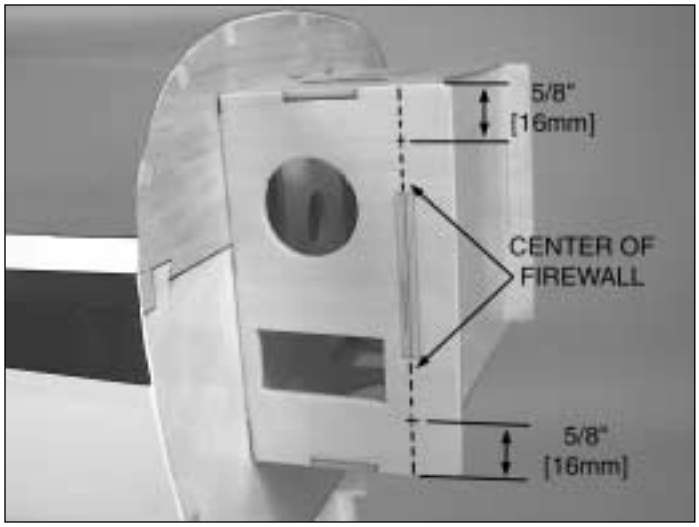
❏ 1. Glue a 1/2" x 1/4" x 8-1/4" [13mm x 6.4mm x 210mm] hardwood stick to the **servo tray** as shown with 6-minute epoxy.

Once the glue has cured, install the servo tray in place as shown using 6-minute epoxy. The notched side fits against the former.

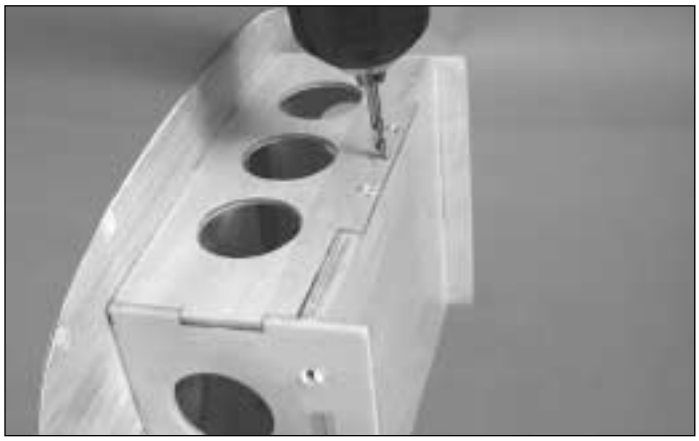
Engine Mounting Preparations



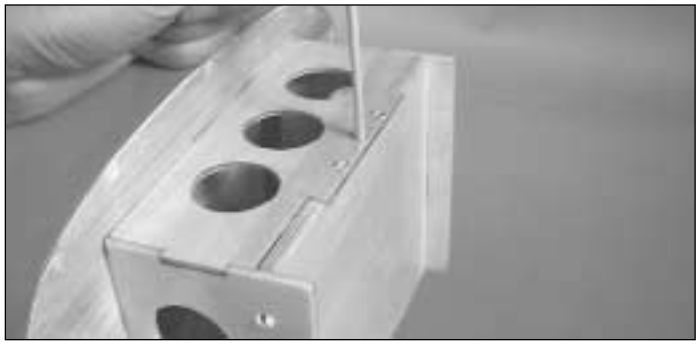
❑ 1. **Top and bottom firewall support:** Make marks 1/8" [3.2mm] away from the edge of the firewall at the center of the firewall support lip and 3/4" [19mm] to either side.



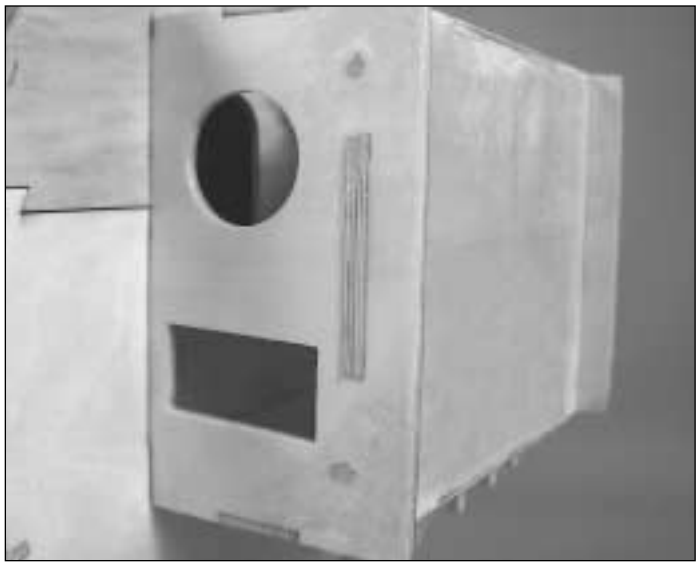
❑ 2. **Firewall side supports:** Make marks 5/8" [16mm] away from the edge of the firewall side supports' flanges as shown in the photo above.



❑ 3. Drill 1/8" [3.2mm] holes 1" [25mm] deep at all the marks.



❑ 4. Mix some 30-minute epoxy. Wick some epoxy inside the holes drilled in the previous step. Insert a 1/8" [3.2mm] dowel inside a hole and slide it in and out several times to make sure that it is coated in epoxy. Push the dowel all the way in and cut it so that about 1/8" [3.2mm] of it protrudes. Repeat this step for all the holes. Clean up any excess glue with a paper towel dampened with denatured alcohol. Repeat this procedure for the bottom firewall.



❑ 5. Once the epoxy has cured, sand the dowels flush with the firewall supports.

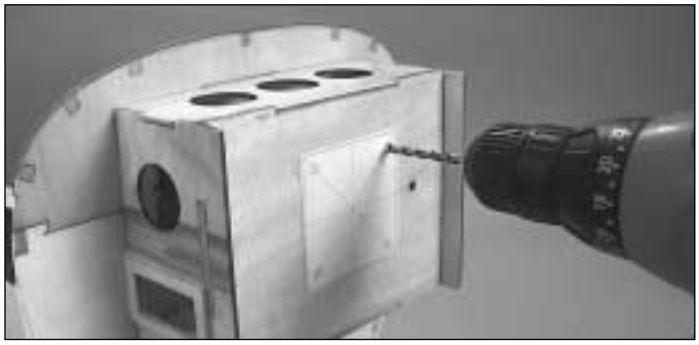
❑ 6. Fuelproof the inside of the firewall and the sanded areas with epoxy mixed with alcohol. Let the epoxy cure.

Install the Engine

Both gas and glow engines can be installed on this airplane so two installations will be shown in this instruction book. The first installation shown will be of an O.S.® 1.60 FX (OSMG0661) glow engine. The second installation shown will be of a Fuji BT-50SA (FJIG0050) gas engine. Both engine installations are typical of engines of their respective size and type. Follow this instruction manual step by step if you are installing either of these engines. Use this instruction manual as a guide if you are installing other similar engines.

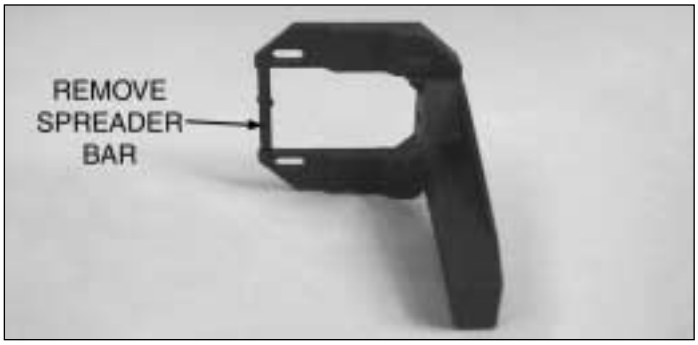
If you are installing a gas engine, skip the ***"Install a Glow Engine"*** section and go to page 15, ***"Install a Gas Engine."***

Install a Glow Engine



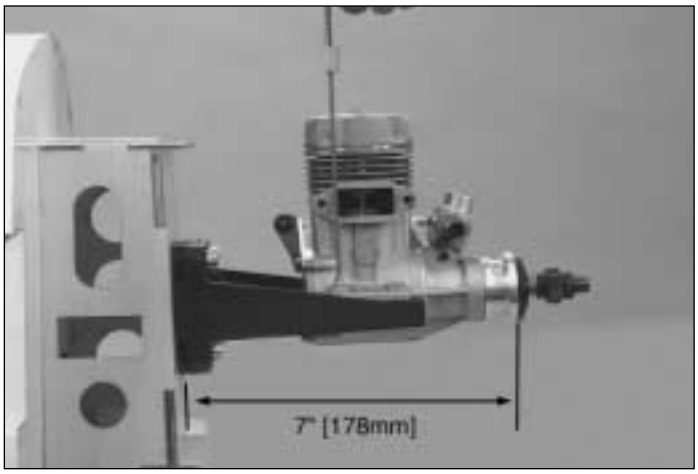
❏ 1. Cut the **engine mount template** from page 39. Use spray adhesive or tape to temporarily attach the template to the firewall. Align the template using the vertical and horizontal lines stamped into the firewall. Drill 3/16" [4.8mm] holes through the firewall at the marks.

❏ 2. Remove the engine mount template. Install four 8-32 blind nuts on the back of the firewall using one 8-32 x 1" [25mm] SHCS and a #8 flat washer as shown. Use a small amount of epoxy on the blind nuts to keep them in place. Do not get epoxy in the threads.



❏ 3. Find the left and right **engine mounts** and cut off the spreader bar on both of them.

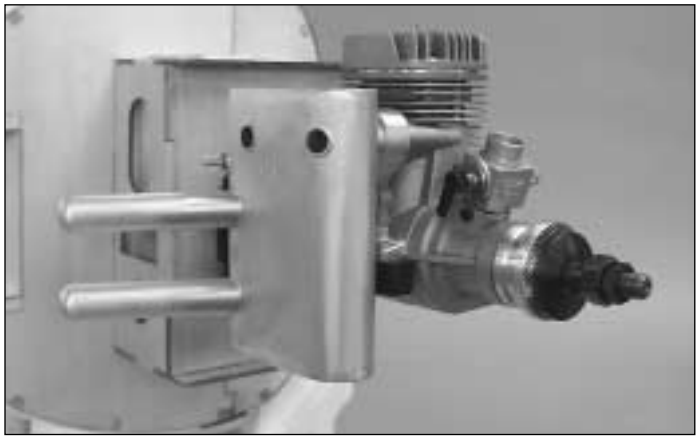
❏ 4. Mount the engine mount to the firewall with four 8-32 x 1" [25mm] SHCS, four #8 lock washers, and four #8 flat washers into the four 8-32 blind nuts, but do not fully tighten the bolts. Place the engine on the mount and adjust the width of the mount to fit the engine. Center the molded-in "tick" marks on both the top and bottom of the engine mount with the marks on the firewall and tighten the mounting bolts. It would be a good idea to use some Great Planes Pro Threadlocker™ on the engine mount bolts.



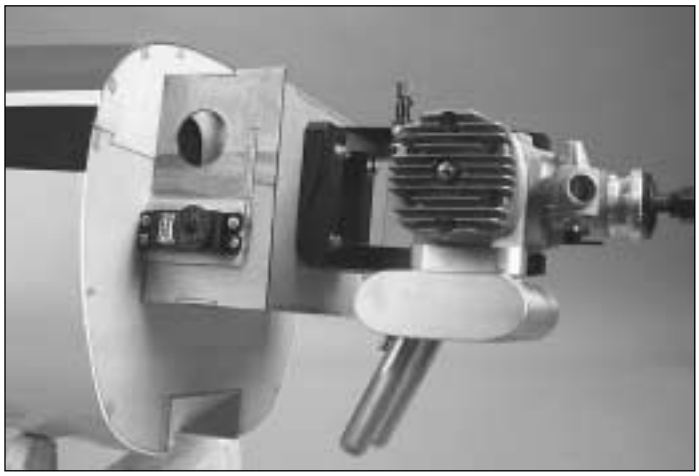
❏ 5. Position the engine so that the face of the drive washer is 7" [178 mm] from the firewall. Use a small clamp to hold the engine at that position. A Great Planes Dead Center™ Engine Mount Hole Locator (or your own method) works well to mark the engine mount holes onto the engine mount. Drill the engine mount at the marks with a #28 (0.136"

[3.4mm]) drill bit. Tap the four holes with an 8-32 tap for the engine bolts.

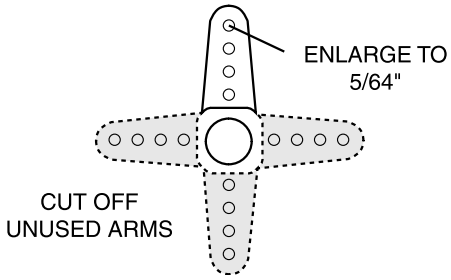
❑ 6. Install the engine using four 8-32 x 1" [25mm] SHCS, four #8 lock washers, and four #8 flat washers.



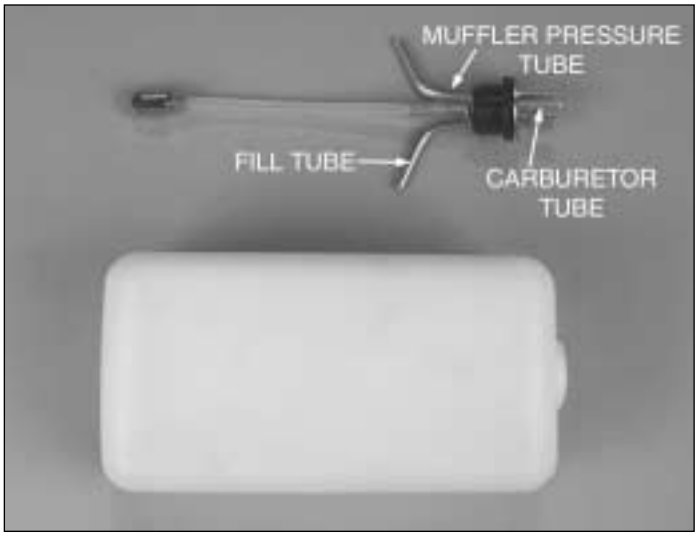
❑ 7. Install the muffler for your engine. A Pitts-style Bisson Custom Muffler (BISG4116) is being used on our prototype.



❑ 8. Connect a 12" [25mm] servo extension to the throttle servo and secure it with shrink tubing. Route the servo wire to the center-section of the fuselage. Install the throttle servo on its tray on the right side of the firewall box as shown using the hardware supplied with the servo. Make sure you wick thin CA into the servo screw holes of the servo tray.

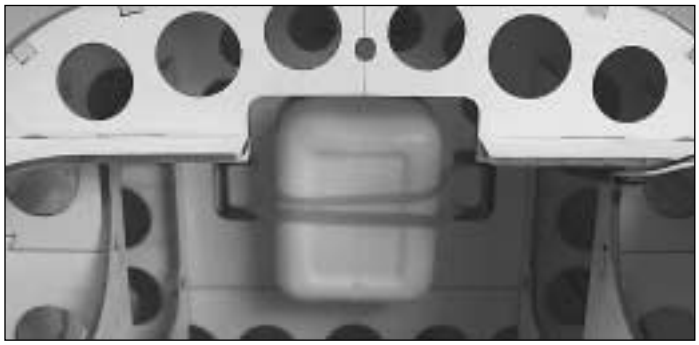


❑ 9. Cut a large servo arm as shown above, and install it on the throttle servo. Install a 4-40 hex nut and a threaded metal clevis on the threaded end of the 4-40 x 12" [305mm] threaded one end pushrod. Connect the clevis to the throttle servo arm. Slip a clevis retainer onto the pushrod. Install a large Screw-Lock pushrod connector onto the carburetor arm as shown. Bend the pushrod as necessary to clear the engine head and muffler. The metal pushrod should not touch the engine at any throttle setting. Connect the pushrod to the carburetor arm with the Screw-Lock pushrod connector. Use Great Planes Pro Threadlocker on the 4-40 x 1/4" [6.4mm] SHCS for the Screw-Lock pushrod connector and tighten it. Reinstall the servo arm screw and tighten the hex nut against the threaded clevis.

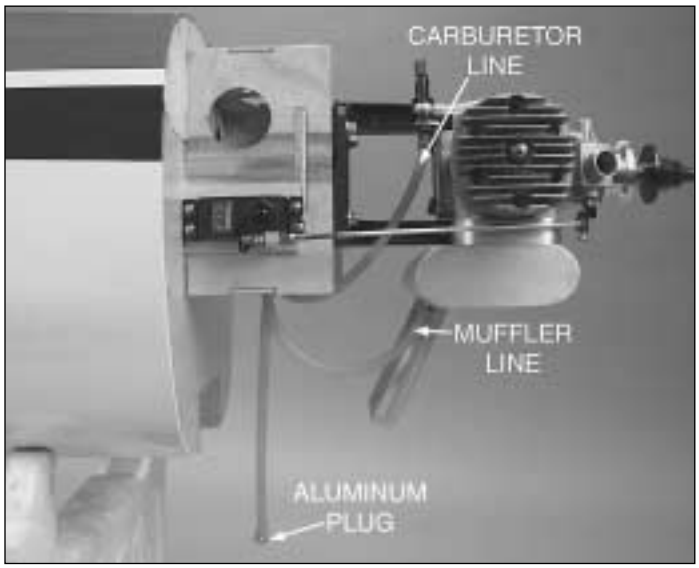


❑ 10. Find the **fuel tank**. Assemble the stopper and tubes as shown in the photo, and then insert them into the tank. Do not tighten the screw to expand the stopper; you will do that in the next step. Be certain the fuel line weight (clunk) at the end of the fuel line inside the tank does not contact the rear of the tank. Otherwise, the line may become stuck

above the fuel level and stop the fuel flow. Remember which is the fuel pick-up, vent and fill tubes. You can mark the tubes with a Top Flite Panel Line Pen if you wish.



❏ 11. Cut the fuel line (not included), in three 9" [228mm] length sections. Install the three sections of fuel line on the three fuel tank tubes. Mark the fuel lines so that you know what each one is for. Install the fuel tank in place. Use a #64 rubber band to hold it in place. Make sure the fuel tubes exit freely through one of the access holes in the front of the fuselage.

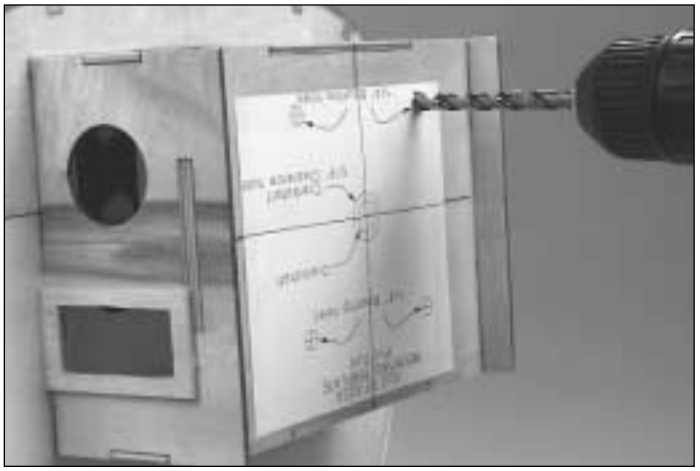


❏ 12. Connect the carburetor line to the fuel nipple at the engine's needle valve. Connect the muffler line to the pressure fitting on the muffler. Use a Great Planes Aluminum Fuel Line Plug (GPMQ4166) to plug the fill fuel line. If you wish, you could install a Great Planes Easy Fueler Valve for glow engines (GPMQ4160) instead of the third (fill) line in the tank.

Install a Gas Engine

Note: The hardware necessary for the installation of the gas engine is not supplied in this kit. Please refer to the front of the manual for a list of required parts.

Note: The gas engine you use needs to be installed in a way so that the drive washer is located 7" [178mm] from the firewall box, just like the glow engine. Use spacers if you need to in order to achieve this. The Fuji engine shown here does not need any spacers.



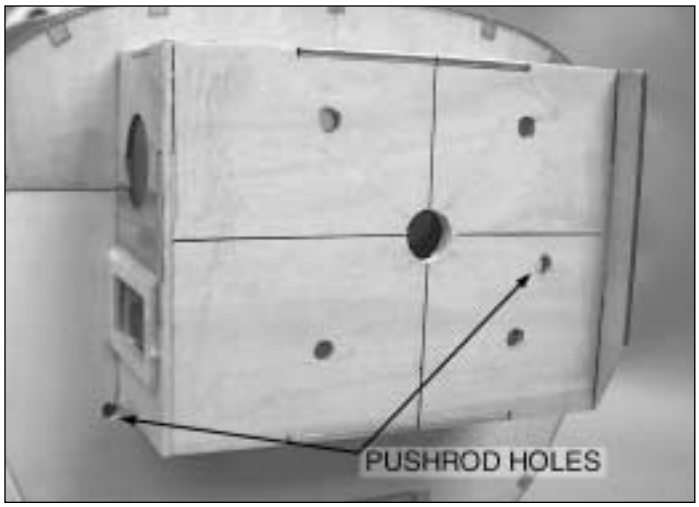
❏ 1. Find the **engine mount template** provided with your engine. Use spray adhesive or tape to temporarily attach the template to the firewall. Align the template using the vertical and horizontal lines of the firewall. Drill 1/4" [6.4mm] holes through the firewall at the marks.

❏ 2. Make sure you make any clearance holes needed in the firewall for the engine you use. Remove the engine template and fuelproof the holes with thinned down epoxy.

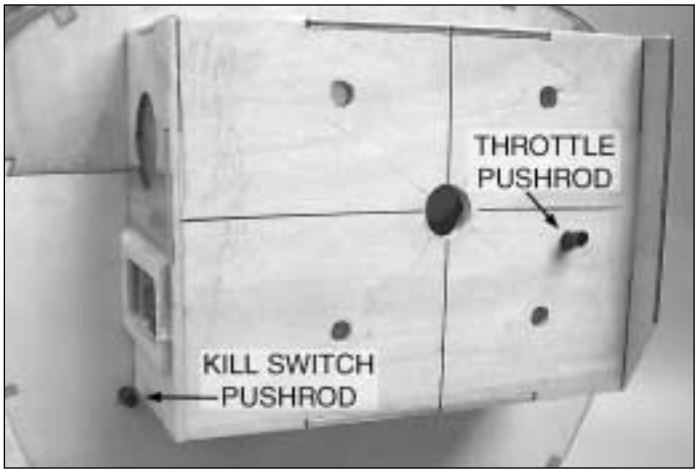
❏ 3. Install the throttle linkage from the carburetor arm to the 90° nylon bellcrank. Use #8 flat washers as spacers to separate the bellcrank from the engine. Make sure the linkage can rotate freely and that it does not bind.

❏ 4. Install the engine in place with the hardware recommended by the manufacturer. For the Fuji BT-50SA you should use 1/4-20 x 1" [25mm] bolts with 1/4-20 blind nuts and 1/4" [6.4mm] flat washers. **Note:** Depending on the gas engine you use, you may need to trim the firewall. For the Fuji BT-50SA the sides of the firewall needed to be trimmed for the muffler and for the carburetor's fuel line.

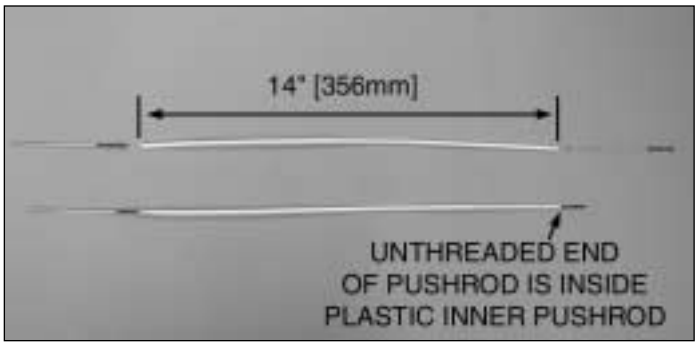
Warning: All R/C equipment (receiver, batteries, servos and switches) must be kept at least 12" [305mm] away from a running gas engine. For this reason, the throttle servo and the engine kill servo must be installed inside the fuselage. A manual kill switch should also be installed.



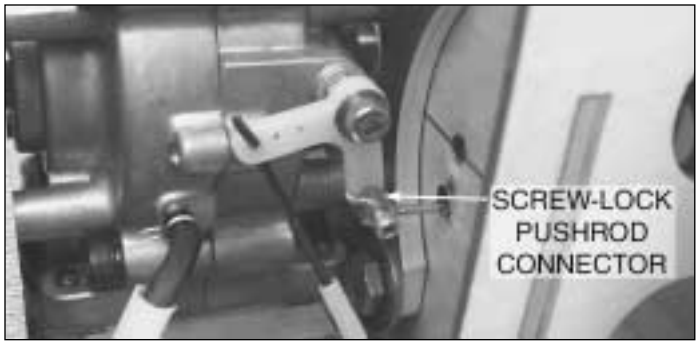
❏ 5. Mark the location of the throttle pushrod and of the kill switch pushrod on the firewall. Remove the engine from the firewall. Drill two 3/16" [4.8mm] holes through the firewall as shown. Use a long drill bit to drill through the fuselage formers. Make sure that you make the holes so that the pushrods clear the wing tube and that they do not block the wing mounting screws. Also, make sure you leave enough space for the fuel tank. **Note:** The position of your throttle pushrod and kill switch pushrod will vary depending on the gas engine you use.



❏ 6. Cut a 36" [914mm] plastic outer pushrod (not included) so that you have one 19" [482mm] and one 17" [432mm] long pieces. Roughen the ends of the outer pushrods and use thin CA to glue them in place as shown in the above image. Leave about 1/4" [6.4mm] of the engine kill pushrod protruding, but cut the throttle pushrod flush with the firewall. **Note:** If the throttle configuration on your Fuji BT-50SA does not match the one you see in the previous image, you may have to make changes to the throttle pushrod location.



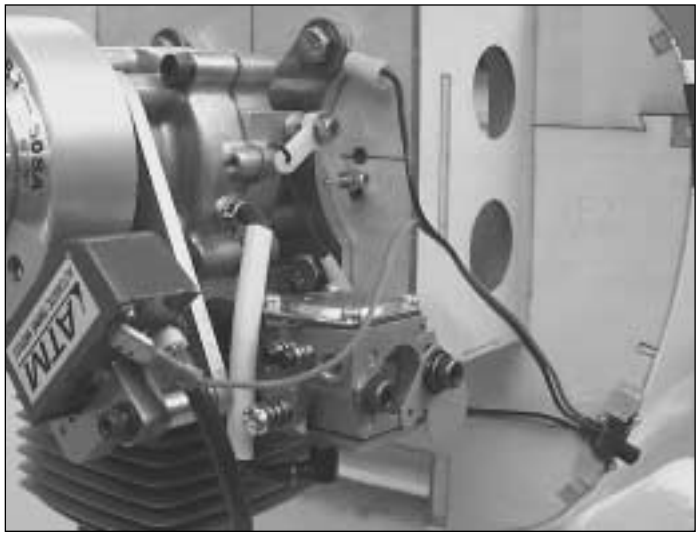
❏ 7. To make the throttle pushrod you will need a 14" [356mm] plastic inner pushrod, two 6" [152mm] threaded one end pushrods a clevis, a clevis retainer and quick connector. Thread a 6" [152mm] pushrod into each end of the plastic inner pushrod as shown in the above image. Note that the threaded pushrods are inserted in different directions on each end. Make two of these pushrods, one for the throttle and one for the kill switch.



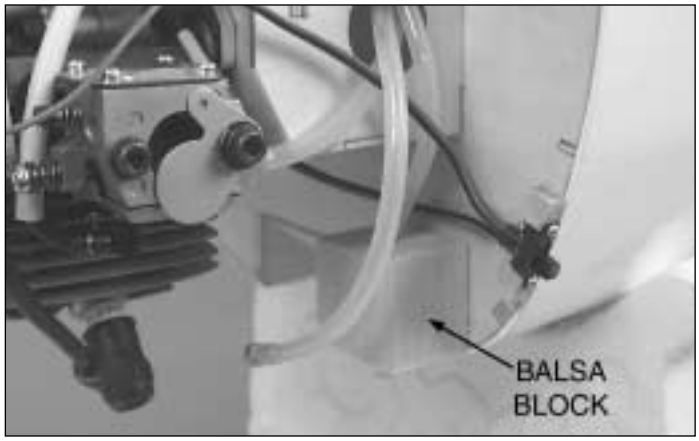
❏ 8. Reinstall the engine. Install the throttle servo in the servo tray as shown using the hardware supplied by the manufacturer. Wick thin CA into the servo screw holes. Install the throttle pushrod using a clevis and a clevis retainer on the servo arm and a Screw-Lock pushrod connector on the throttle bellcrank side.

❏ 9. Install a **Great Planes Ignition Switch Harness** (GPMG2150) as shown in the above image. The lever switch is held in place using two #4 x 5/8" [16mm] screws. Glue two small hardwood blocks for the slide switch on the firewall and install the switch using two #2 x 3/8" [9.5mm] screws.

❏ 10. Install a small hardwood block or hardwood dowel at the end of the threaded rod of the second pushrod made in step 6. This block will push the lever kill switch. Insert the plastic inner pushrod into the plastic outer pushrod. Use a Screw-Lock pushrod connector to attach the inner pushrod to the servo arm. Make sure the setup works freely, with no binding. It is a safety device and must be operable at all times.



❏ 11. Connect the engine kill switch wires to the magneto module and to the engine's metallic body. You may need to change some of the connectors depending on the engine you use. Follow the instructions included with the ignition switch harness.

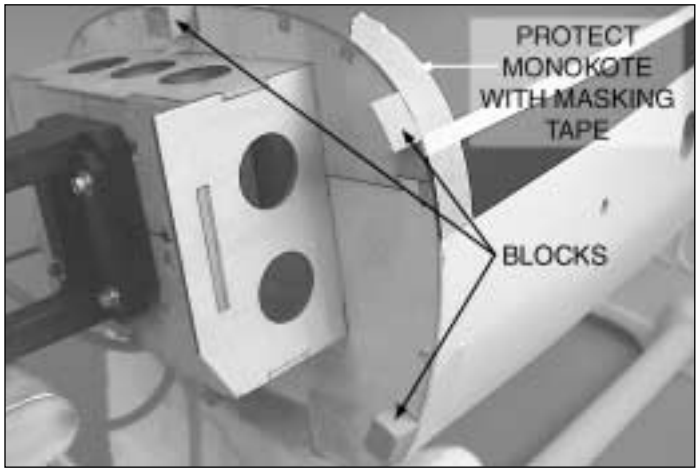


❏ 12. Install the **gas fuel tank** of your choice in the fuselage. You will either need a three-line fuel system or a two line fuel system with a Great Planes Easy Fueler Valve. If you use

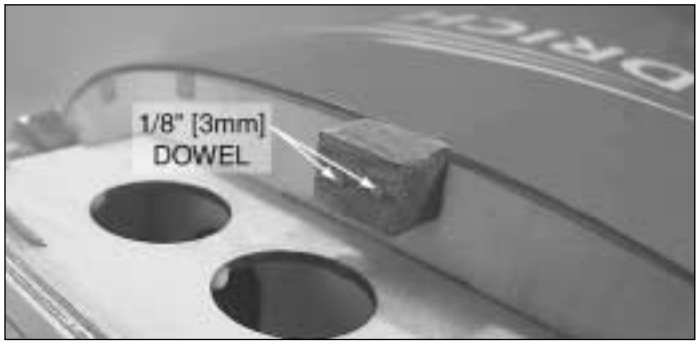
the three line system, you will need to route the carburetor line to the carburetor fuel nipple and the vent and fill lines to the front of the firewall. Glue a block of balsa to the firewall and make a hole through it of the size of the vent tube. Slide the vent tube through the balsa block. Plug the fill tube with an Aluminum Plug. Make sure the fill tube is long enough so that it can be pulled out of the cowl to fill the tank. If you use the two tube system with the Easy Fueler Valve, the valve needs to be installed between the carburetor and the tank in the carburetor line.

Install the Cowl

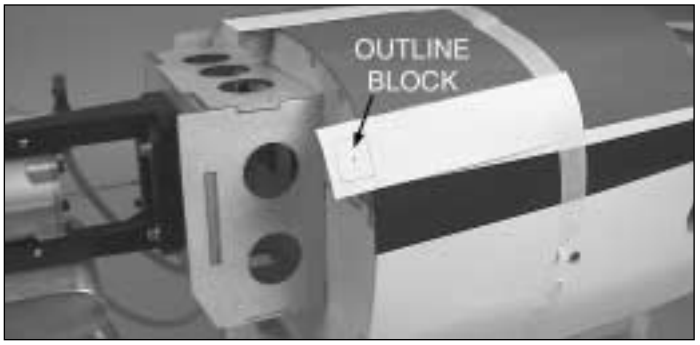
Note: The **cowl** installation is similar for both the gas engine and the glow engines option. This instruction book will explain how to install the cowl with a glow engine installed on the airplane. The only difference between the two installations is the location of the holes for the carburetor needle valves and clearance holes for the muffler tubes.



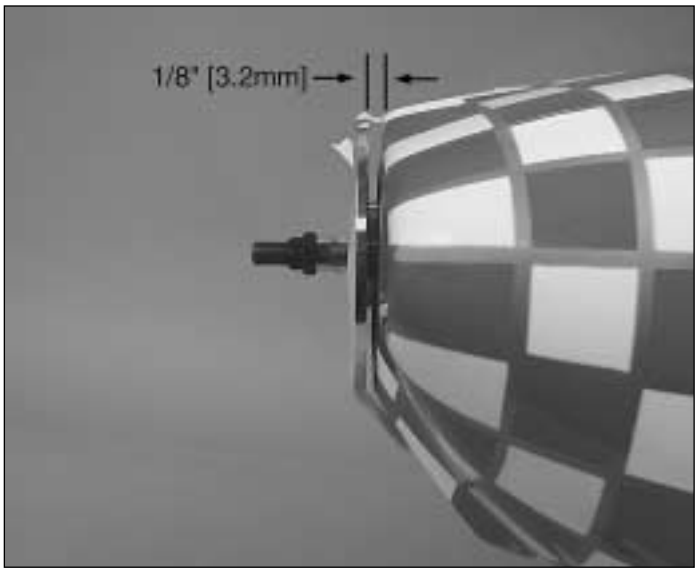
❑ 1. Find the five 5/8" x 5/8" x 7/8" [15mm x 15mm x 20mm] **hardwood blocks**. Glue them on the firewall as in the positions shown with 6-minute epoxy. Carefully sand them to the contour of the fuselage. Use masking tape on the MonoKote to protect it from being scratched while you are sanding. Also sand away the fuelproofing on the firewall to glue the blocks to the bare wood.



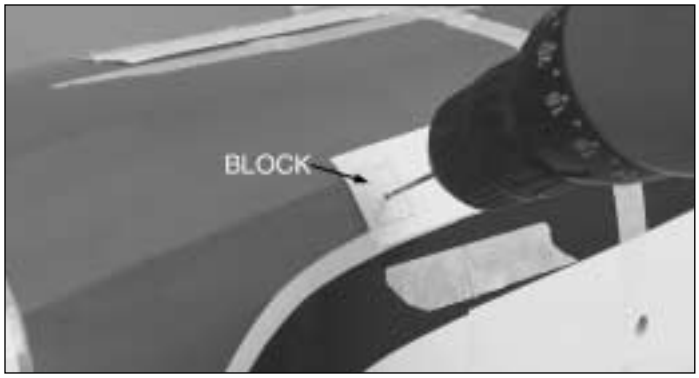
❑ 2. Find the remaining 1/8" x 10" [3mm x 254mm] **hardwood dowel** and cut it in 1" [25mm] lengths. Drill two 1/8" [3.2mm] holes on each cowl block into the firewall. Glue the dowels in the holes with epoxy. This will improve the blocks ability to withstand engine vibrations.



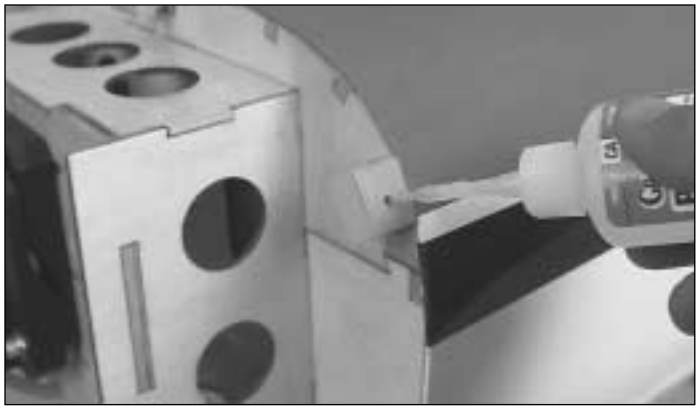
❑ 3. Use long paper strips as shown to mark the location of the hardwood blocks. Tape the paper strips to the fuselage so that they do not move during the following steps.



❑ 4. Place the cowl over the engine and push it back onto the fuselage until the cowl ring is 1/8" [3.2mm] behind the face of the prop washer. Install the spinner back plate and the propeller nut. Center the cowl ring using the spinner back plate as a reference. Tape the cowl in place.

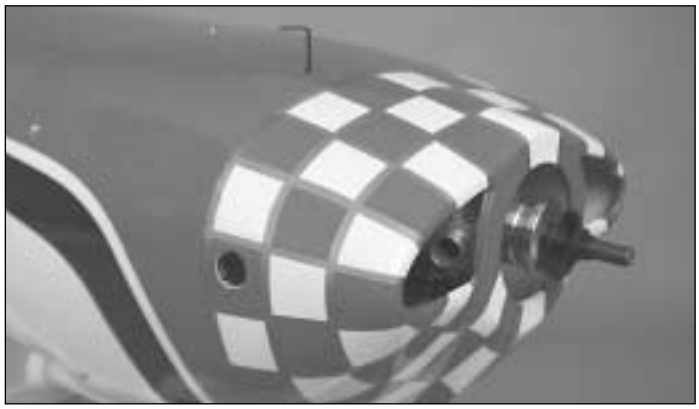


❏ 5. Use the paper strips over the cowl to find the location of the hardwood blocks and drill at the center of the block, through the cowl into the hardwood blocks with a 5/64" [2mm] drill bit. Remember to drill all five cowl holes at the same time without moving the cowl.



❏ 6. Remove the cowl and enlarge the holes in the cowl with a 7/64" [2.8mm] drill bit. Use thin CA on the inside of the cowl to strengthen the edges of the holes. Install a #4 x 5/8" [16mm] screw into each one of the hardwood block holes. Remove the screws and apply some thin CA into the holes to strengthen the threads.

❏ 7. Install an extension on the needle valve. Use the same technique you used before with the paper strips to mark the location of the needle valve, muffler clearance holes, fill line hole, glow starter, etc. on the cowl. After the holes are marked on the cowl, remove the cowl from the airplane. **Note:** If you are installing the cowl over a gas engine, you will need to make holes for the slider kill switch, the gas fill line, the carburetor choke, and the muffler.

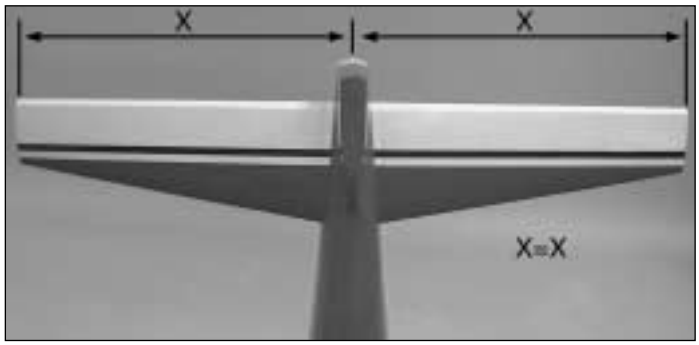


❏ 8. Drill the needed holes on the cowl with a 5/64" [2mm] drill bit and then enlarge them to the adequate size with a High Speed Rotary Tool. Use thin CA to strengthen the cut edges. Once all the holes are cut, reinstall the cowl with five #4 x 5/8" [16mm] screws and five #4 washers.

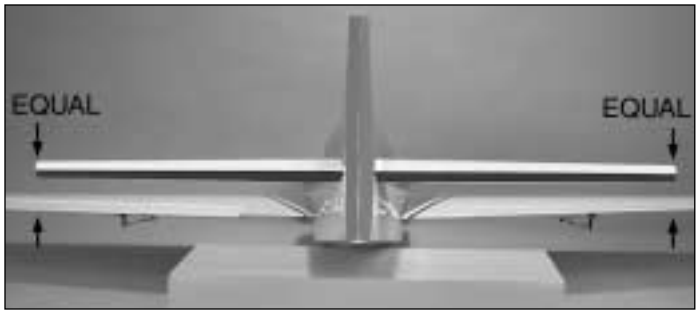
The cowl installation is now complete.

Install the Tail Surfaces

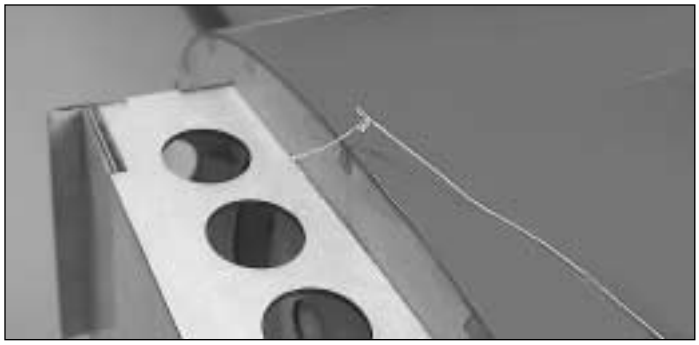
Note: The Extra 300S ARF has a **plug-in stabilizer**. The stabilizer is comprised of three built up parts, the **stab center-section**, and the **left** and **right stab panels**. To separate the outer panels you need to remove the four 4-40 x 3/4" [19mm] screws that secure the **mounting tubes** to the outer panels at the bottom of the stab. Make sure you tighten them before flying.



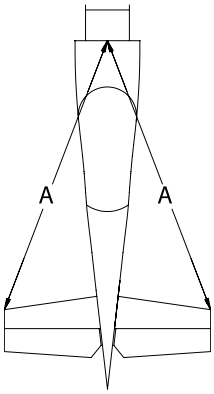
❏ 1. Find the plug-in stabilizer and insert it in the stabilizer slot in the aft fuselage. Center the trailing edge by taking accurate measurements as shown in “X”=”X” in the photo. Mark the location of the stab at the stab’s trailing edge.



❏ 2. Mount the wing. Stand five to ten feet behind the model and view the stab and the wing. The wing and stab should line up. If they do not line up, place a small 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.

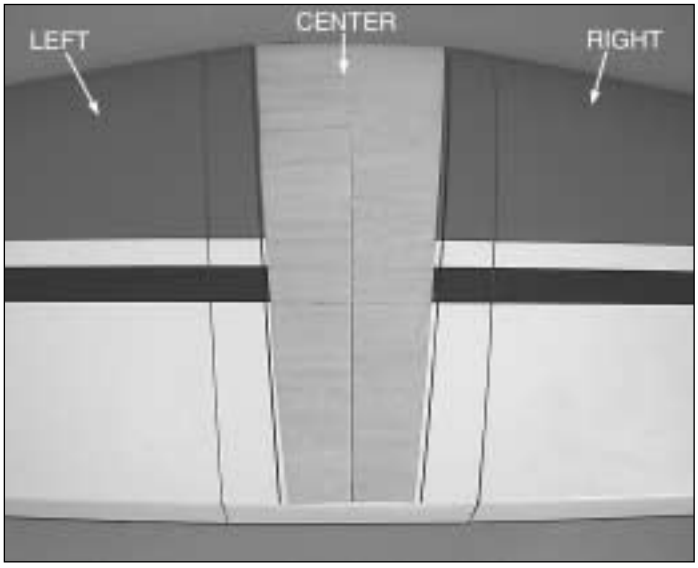


❏ 3. Stick a pin into the center of the fuselage on top of the firewall. Tie a small loop on one end of a 60" [1520 mm] piece of non-elastic string such as a K & S #801 Kevlar thread (K+SR4575). Slip the loop in the string over the T-pin.



❏ 4. Fold a piece of masking tape over the end of the string and draw an arrow on it. Slide the tape along the string and align the arrow with one corner of the stab as shown in the photo. Swing the string over to the same position on the other corner of the stab. Rotate 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.

❏ 5. Use a Top Flite Panel Line Pen to mark the outline of the fuse onto the top and bottom of the stab.



❏ 6. Remove the stab from the fuse. Use a sharp #11 hobby knife or use the following **Expert Tip** to cut the covering 1/16" [1.6 mm] inside of the lines you marked. Use care to cut **only into the covering** and **not into the wood**.

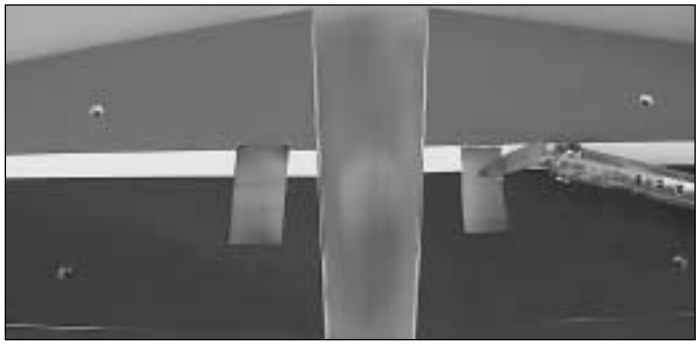
EXPERT TIP

HOW TO CUT COVERING FROM BALSA

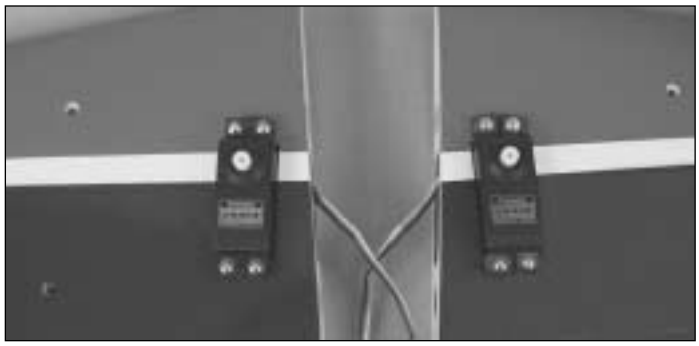
Use a soldering iron to cut the covering from the wing. The tip of the soldering iron doesn't have to be sharp, but a fine tip does work best. Allow the iron to heat fully. Use a straightedge to guide the soldering iron at a rate that will just melt the covering and not burn into the wood. The hotter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

❏ 7. 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 into position. Wipe away residual epoxy with a paper towel and alcohol. Use the pin and string to confirm the stab is aligned. Stand behind the model to check the stab's alignment with the wing. Do not disturb the model until the epoxy has fully hardened.

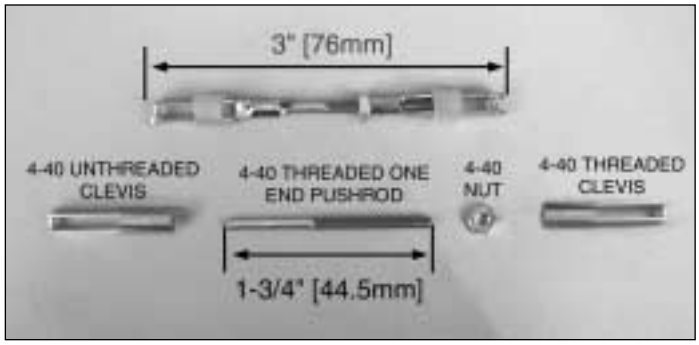
❏ 8. Cut ten CA hinges for the **elevators** and **rudder** just as it was done for the ailerons. Install the CA hinges on the elevators and the rudder just as it was done for the ailerons on page 8. Apply six drops of thin CA on each side of each CA hinge.



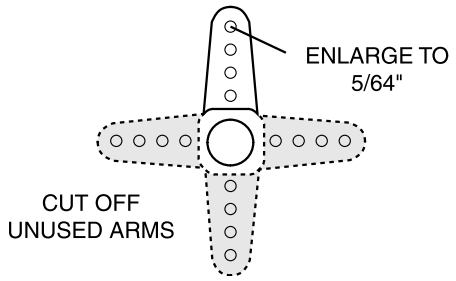
❏ 9. Remove the stabilizer outer panels from the fuselage. Feel through the MonoKote on the bottom surface of the stabilizer and find the openings for the elevator servos. Cut the covering 1/8" [3.2 mm] inside the opening. Use a sealing iron or trim seal tool to seal the covering to the edges of the opening.

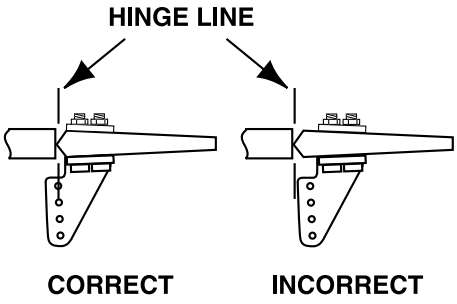


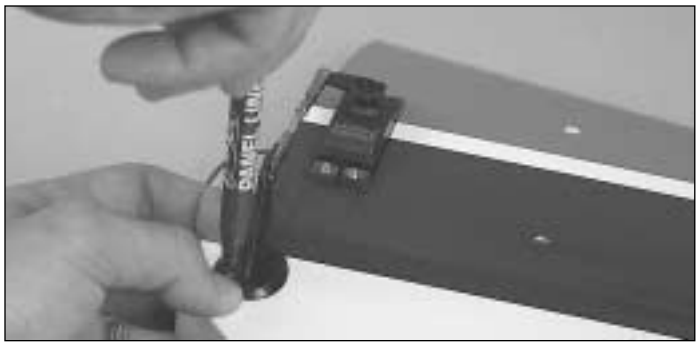
❏ 10. Install the two elevator servos on the two stabilizers with the hardware provided by the manufacturer. Make sure you wick thin CA into the servo tray screw holes to strengthen them.



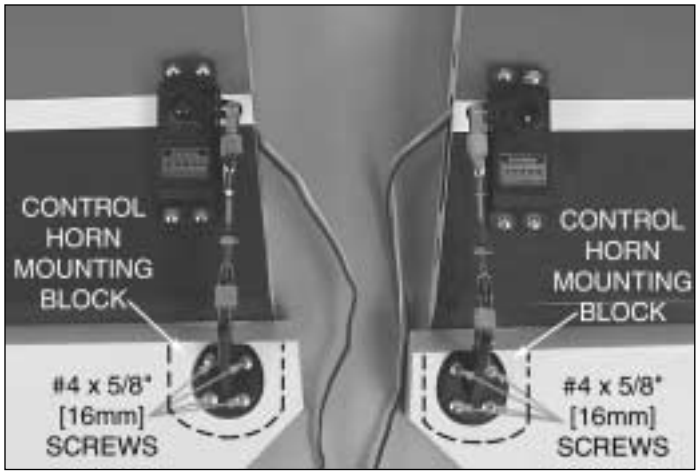
❏ 11. Find two 4-40 x 12" [305mm] threaded one end metal pushrods, two threaded 4-40 metal clevises, two 4-40 unthreaded clevises, two hex nuts and four silicone retainers. Cut the 4-40 threaded one end metal pushrod 1-3/4" [44.5mm] from the threaded end. Solder the non-threaded 4-40 metal clevis onto the non-threaded end of the pushrod. Use the soldering **Expert Tip** on page 10 as a reference. Install a hex nut and the threaded clevis on the threaded end of the pushrod until the pushrod is 3" [76mm] long. Do this twice so that you end up with a pushrod for each elevator. Remember to slip two silicone retainers on each pushrod.



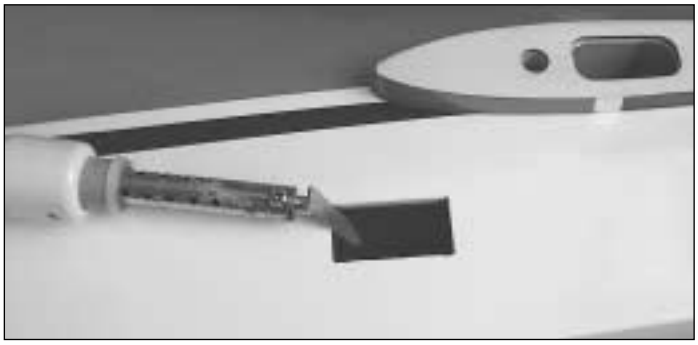




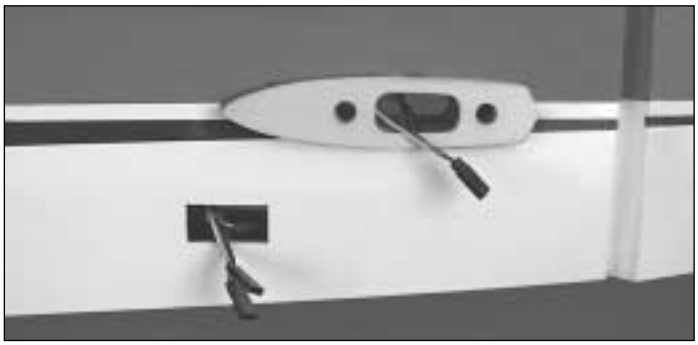
❑ 12. Cut up two large servo arms as shown. Find two large control horns and eight #4 x 5/8" [16mm] screws. Connect the unthreaded clevis to the servo arm and the threaded clevis to the control horn. Install the servo arm on the servo and position the control horn on the elevator's control horn mounting block, so that the pushrod is 90 degrees to the hinge line and the control horn is right at the edge of the elevator bevel. Mark the holes for the base of the control horns with a Top Flite Panel Line Pen. Please note the orientation of the servo arms and pushrods in the above image.



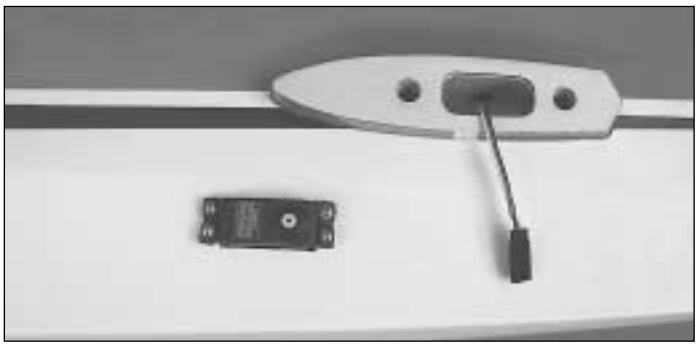
❑ 13. Remove the control horn and drill a 1/16" [1.6mm] pilot hole 1/2" [13mm] deep at the marks. Make sure you do not drill through the other side of the elevator. Wick some thin CA into the holes and re-install the control horn using four #4 x 5/8" [16mm] screws. Tighten the hex nut against the threaded clevis. Repeat this procedure for the other elevator.



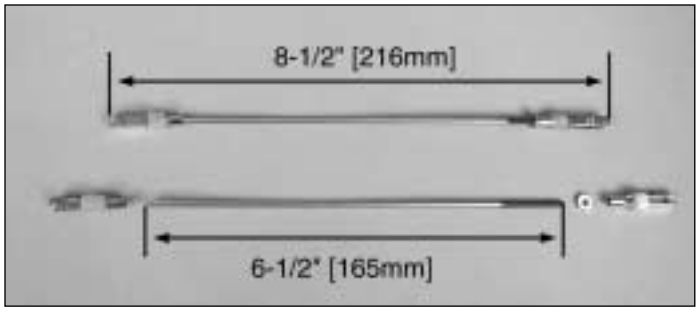
❑ 14. Feel through the MonoKote for the rudder servo cut outs in the aft fuselage. There should be one on each side of the aft fuselage. Cut the covering 1/8" [3.2mm] inside the opening. Use a sealing iron or trim seal tool to seal the covering to the edges of the openings.



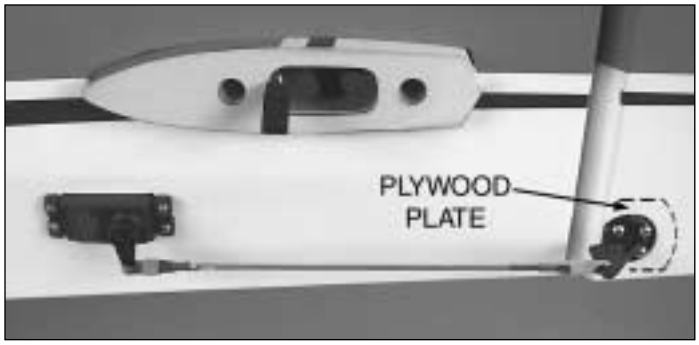
❑ 15. Connect the servo extensions and/or "Y" harnesses you need for your radio setup through the fuselage and into the rudder servo openings and through the stab center hole. **Remember:** If you are using a computer radio, you will only use 24" [610mm] extensions in this step. If you are using a non-computer radio, you will need two 12" [305mm] extensions, a "Y" harness for the rudder and a reversing "Y" harness for the elevator.



❑ 16. Connect the rudder servo leads to the rudder extensions and use either tape or heat shrink tubing to secure them. Install the rudder servos on the fuselage using the hardware supplied by the manufacturer. Remember, there is a servo on each side of the fuse.

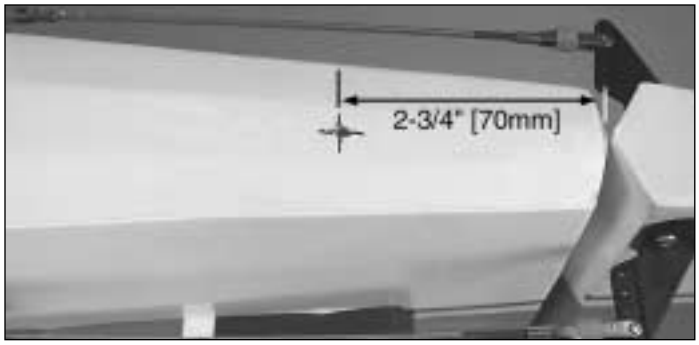


❏ 17. Use the same procedure described on steps 11, 12, and 13 of the elevator pushrod setup to make the rudder pushrods except that the rudder pushrods need to be 6-1/2" [165mm] long when cut and 8-1/2" [216mm] after they are assembled and ready to be installed onto the servo arm. Remember to install the hex nuts and clevis retainers. Make two pushrods.



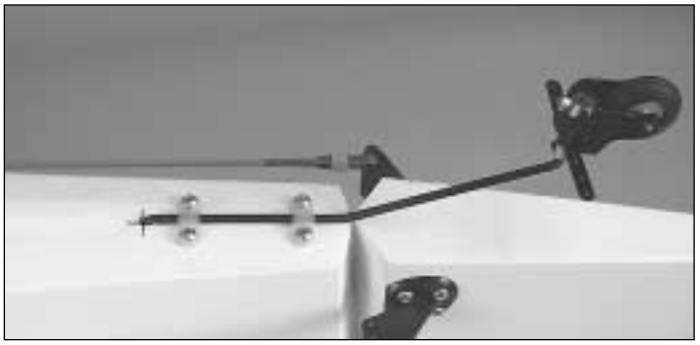
❏ 18. Repeat the same procedure described for the installation of the elevator control horns to install the rudder control horns. Remember that there is a rudder servo on each side of the fuselage and so two control horns (one on each side of the rudder) need to be installed. Make sure that you install them on the plywood plates located at the bottom of the rudder for that purpose. Use the remaining two control horns and eight #4 x 5/8" [16mm] sheet metal screws for this step. Also, remember to slip two silicone retainers on each pushrod and to tighten the hex nuts against the threaded clevises. Wick thin CA in the control horn screw holes and servo screw holes.

Install the Landing Gear

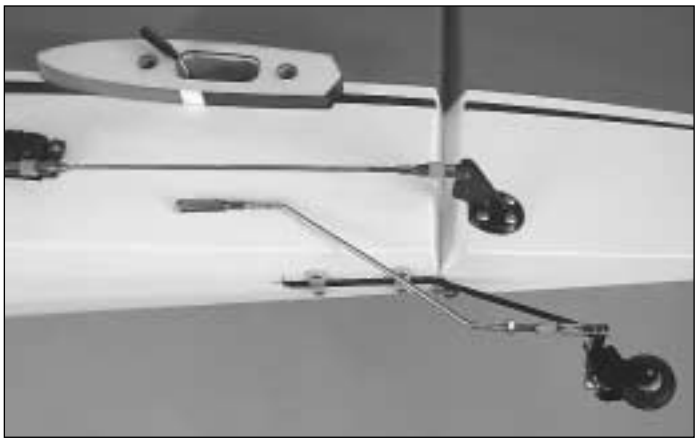


❏ 1. Make a mark at the center of the bottom of the fuselage 2-3/4" [70mm] away from the end of the fuselage. Drill a 7/64" [2.8mm] hole 1" [25mm] deep at the mark. Wick thin CA into this hole.

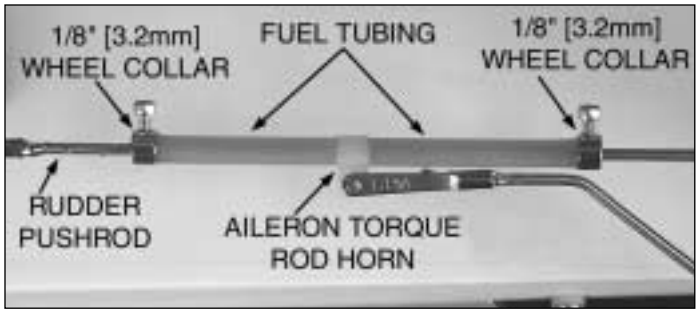
❏ 2. Insert the tail wheel wire into the hole. Find two “U” shaped nylon straps and place them over the wire as shown. Mark the location for the landing gear straps’ holes. Remove the straps and the landing gear.



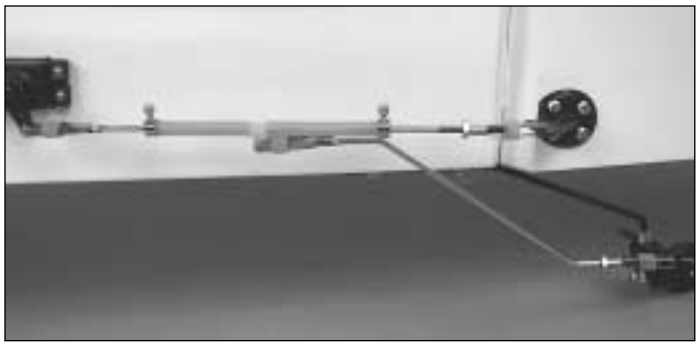
❏ 3. Use a 1/16" [1.6mm] drill bit to drill 1/2" [13mm] deep pilot holes for the nylon strap screws. Wick thin CA into the 4 holes. Install the tail wheel in place using four #4 x 5/8" [16mm] screws.



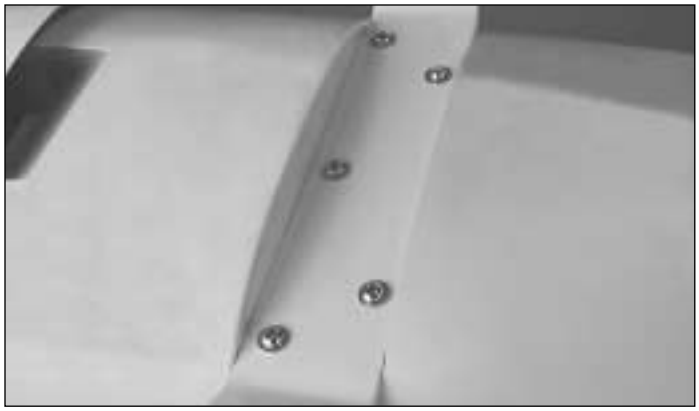
❏ 4. Bend and cut a 4-40 x 12" [305mm] threaded one end pushrod as indicated in the photo above and using the tail wheel pushrod pattern shown on page 39. Install a hex nut and a threaded clevis on one end and solder an unthreaded clevis on the other end. Install the threaded clevis on the tail wheel horn.



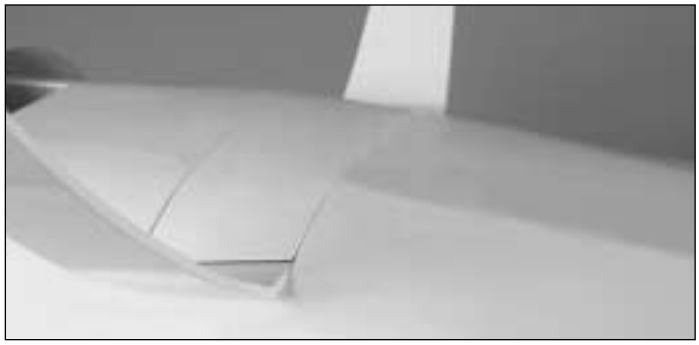
❏ 5. Cut two 1-1/2" [38mm] lengths of silicone tubing. Remove the threaded clevis from the rudder pushrod that is on the same side where the tail wheel pushrod is installed (you may choose to install the tail wheel pushrod on either side of the rudder). Slip a 1/8" [3.2mm] wheel collar, a 1-1/2" [38mm] piece of silicone fuel tubing, an aileron torque rod horn, another silicone fuel tubing piece and another 1/8" [3.2mm] wheel collar over the pushrod. Reinstall the threaded clevis for the rudder and its retainer and install it back onto the rudder control horn.



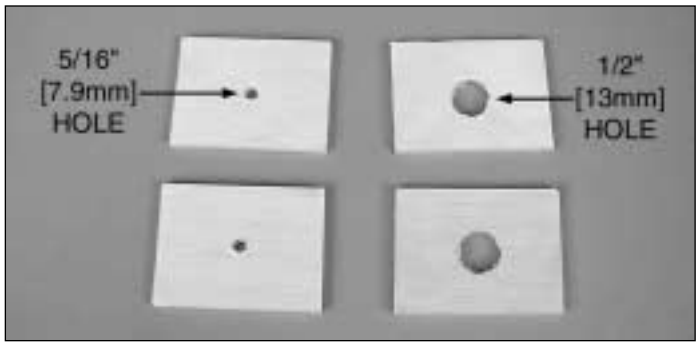
❏ 6. Connect the tail wheel pushrod to the aileron torque rod horn. Straighten the rudder and adjust the positioning of the tail wheel pushrod by sliding the swivel along the length of the rudder pushrod. When the rudder and the tail wheel are straight, push the silicone tubing and the wheel collars against the swivel and use a 4-40 x 1/4" [6.4mm] SHCS to tighten the wheel collars. Use Great Planes Pro Threadlocker on the SHCS. Slip a silicone retainer onto both tail wheel pushrod clevises.

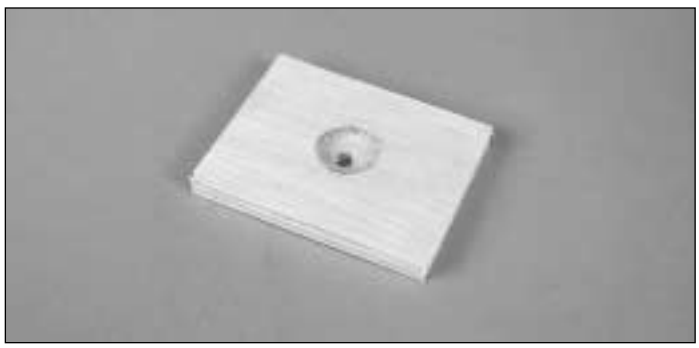


❏ 7. Locate the **main aluminum landing gear**, five 8-32 x 1" [25mm] Phillips head machine screws and five #5 flat washers. Install the landing gear using the Phillips head machine screws into the pre-installed blind nuts on the airplane as shown.

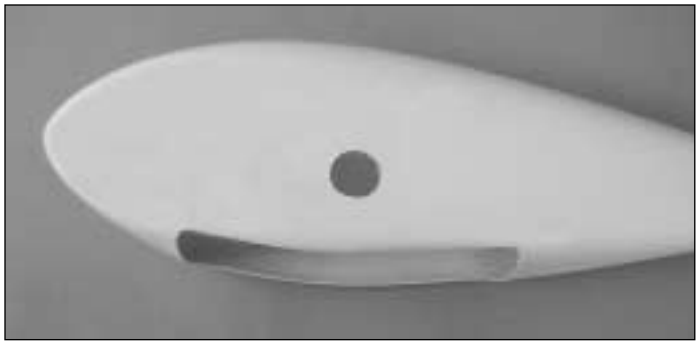


❏ 8. Find the landing gear cover and fit it in place. Push the balsa block down until the heads of the landing gear screws leave a mark on the block. Remove the block and drill clearance holes where the screws left a mark until the block fits flush with the bottom of the fuselage. Glue the block in place with CA.





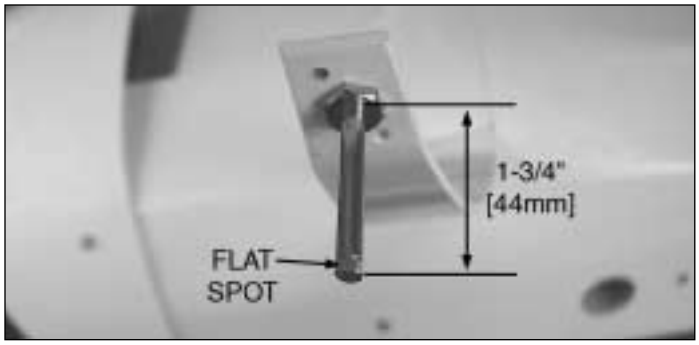
❏ 9. Locate the four ply **wheel pant mounts**. Glue one of the mounts with the 5/16" [7.9mm] hole to one of the mounts with the 1/2" [13mm] hole as shown. Repeat the procedure for the other mount.



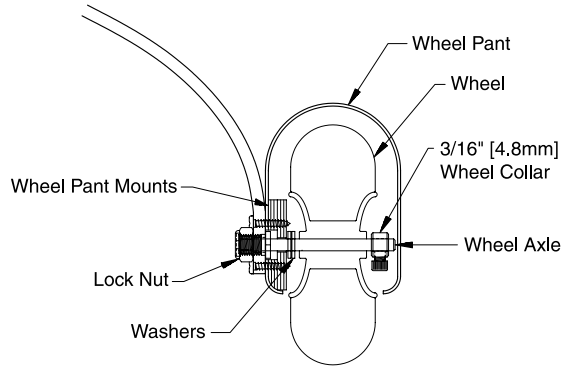
❏ 10. Look carefully at the **wheel pants**. Locate a dimple that indicates the wheel axle location on the side of the wheel pant. Use a high speed rotary tool to drill a 1/2" [13mm] hole at the mark. Make sure you make a right wheel pant and a left wheel pant.

❏ 11. Round the bottom edge of the wheel pant mount so it fits in the pant when the 1/2" [13mm] hole in the mount is centered over the hole in the pant. Roughen the area inside the wheel pant with sandpaper where the wheel pant mount will be glued. Glue the mount to the pant with 30-minute epoxy. **Hint:** For the most secure bond, add micro balloons (TOPR1090) or milled glass fibers (GPMR6165) to the epoxy.

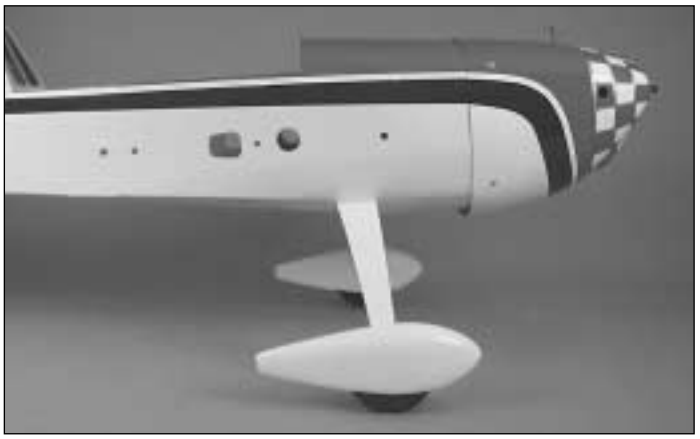
❏ 12. Use a metal saw or a high-speed rotary tool with a reinforced cut-off wheel to cut the wheel axle to 1-3/4" [44mm] length. Mount the axle to the landing gear with a self-locking nut.



❏ 13. Temporarily slide the wheel pant, two #8 washers and a 3/16" [4.8mm] wheel onto the axle. Determine where the wheel collar that retains the wheel will be positioned on the axle. Remove the wheel and wheel pant, then file a flat spot on the axle for the set screw in the outer wheel collar. Do this for both wheel pants.



❏ 14. Mount the wheel and wheel pant to the axle with two #8 washers, and a wheel collar. Temporarily tighten the set screw in the wheel collar. Do this for both wheel pants.

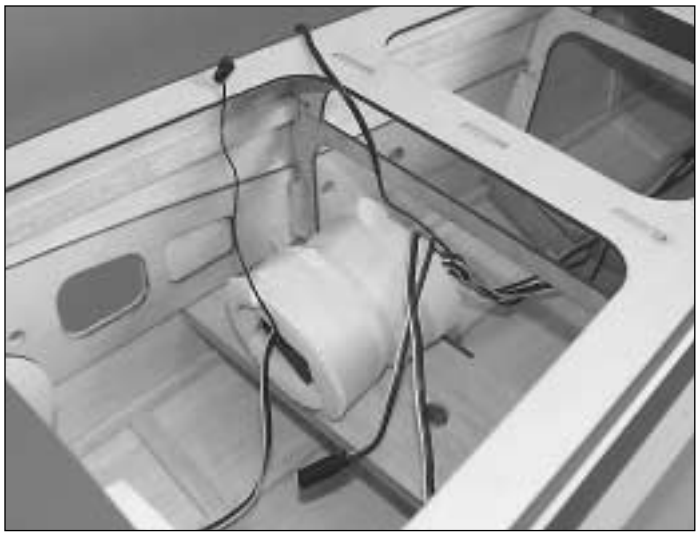


❏ 15. Place the model on its gear on the workbench. Prop up the tail until the fuse is level. Adjust both wheel pants so that they are level with the fuse.

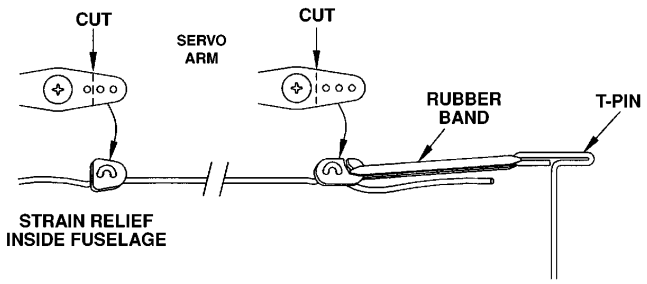
❏ 16. Without moving the wheel pants, drill 1/16" [1.6mm] holes through the holes in the landing gear into the wheel pants and mounts as shown above. Make sure you do not drill into the wheels.

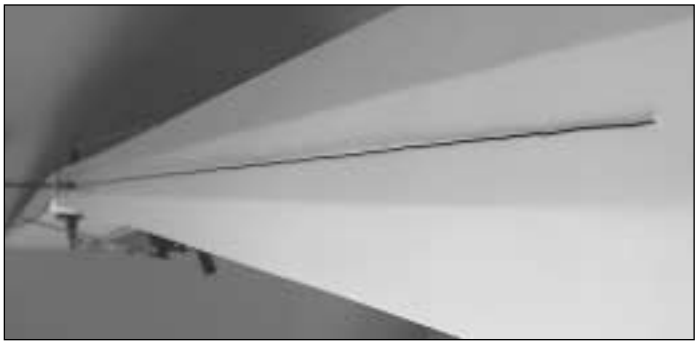
❏ 17. Remove the wheel pants from the axle and wick some thin CA into the holes you just drilled. Permanently install the wheel pants and wheels in place using two #4 x 3/8" [9.5mm] sheet metal screws for the wheel pants and the previously mentioned two #8 washers and one 3/16" [4.8mm] wheel collars for each wheel.

Finish the Radio Installation



❏ 1. Connect all servos and servo extensions to your receiver. Also, connect the on/off switch to the receiver. Wrap the receiver in 1/4" [6.4mm] RC foam. Use a nylon tie strap to hold the receiver in place as shown.



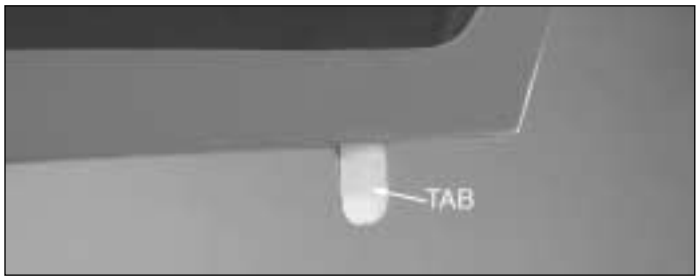


❏ 2. Drill a small hole at the bottom of the fuselage and route the receiver antenna to the rear of the airplane. Use a rubber band to keep it stretched. Make sure you use a strain relief inside the fuselage.

❏ 3. Wrap your receiver battery with foam and use another nylon tie strap to secure it to the servo tray.

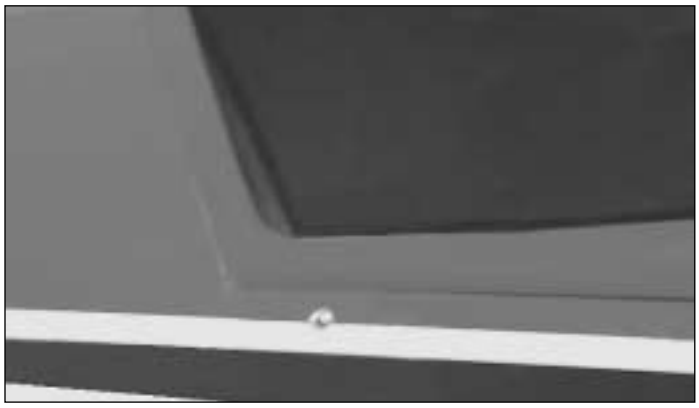
❏ 4. Install the receiver switch on the side of the airplane. Make sure you do not install it in a place where it will interfere with the wing. If you choose to install a rechargeable jack, now is the time to do so. Make sure you use heat shrink tubing or tape to secure all connections.

Finish the Cockpit



❏ 1. Round the corners of the canopy mounting tabs.

❏ 2. There are 1/16" [1.6mm] holes pre-drilled in the canopy mounting blocks on the fuselage side. Install the **canopy** and push down on it to fully seat it. If you wish, you can tape the canopy down so that it does not move while you drill. Drill through the canopy mounting blocks into the canopy mounting tabs using a 1/16" [1.6mm] drill bit.



❏ 3. Remove the canopy from the airplane. Use a #4 x 3/4" [19mm] sheet metal screw and a washers on each side of the fuse to hold the canopy in place. It is important that the screws screw into the mounting block. **Do not overtighten.** Wick some thin CA into the mounting block, on the mounting tab and mounting holes. Let the glue cure.

Note: If you want to install a scale pilot, now is the time to do so. A 1/4-scale pilot can be fit in the canopy through the opening at the bottom of the canopy. Secure the pilot in place with glue or with a mounting screw, through the bottom of the canopy.

Note: If your canopy does not sit tight against the fuselage, apply some wing seating tape (GPMQ4422) to the fuselage.

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 the decals on the model as seen on the box cover. Holding the decal down, use a paper towel to wipe most of the water away.

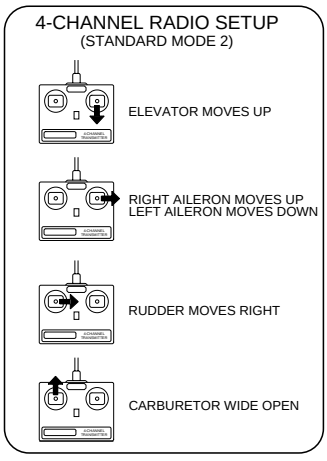
4. Working from the middle to the outside, use a piece of soft balsa or something similar to squeegee remaining water from under the decal. Apply the rest of the decals the same way.

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 secure 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. After the pushrods are adjusted, remember to tighten the hex nuts against the threaded clevises.



❏ 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 somewhere between the low rate and the high rate setting.

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

These are the recommended control surface throws:

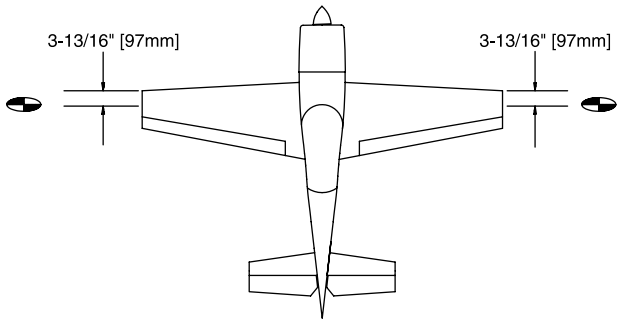
	High Rate	Low Rate
ELEVATOR:	3/4" [19mm] up	9/16" [14mm] up
	3/4" [19mm] down	9/16" [14mm] down
RUDDER:	4-1/2" [114mm] right	3" [76m] right
	4-1/2" [114mm] left	3" [76mm] left
AILERONS:	1-1/4" [32mm] up	3/4" [19mm] up
	1-1/4" [32mm] down	3/4" [19mm] down

IMPORTANT: The Extra 300S 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 Extra 300S ARF flies, you would like to change the throws to suit your taste, that is fine. However, too much control throw could make the model difficult to control, so remember, "more is not always better."

Balance the Model (C.G.)

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

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



❑ 1. Use a felt-tip pen or 1/8"-wide tape to accurately mark the C.G. on the top of both wing tips. The recommended C.G. is located 3-13/16" [97mm] back from the leading edge of the **wing tip**.

This is where your model should balance for your first flights. Later, you may wish to experiment by shifting the C.G. up to 1-3/16" [30mm] forward or 3/8" [9.5mm] 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 the airplane more difficult to slow for landing. Moving the C.G. aft makes the model more maneuverable, but could also cause it to become too difficult for you to control. In any case, start at the location we recommend and do not at any time balance your model outside the recommended range.

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

❑ 3. If the tail drops, the model is "tail heavy" and the battery pack and/or receiver must be shifted forward or weight must be added to the nose to balance. If the nose drops, the model is "nose heavy" and the battery pack and/or receiver must be shifted aft or weight must be added to the tail to balance. If possible, relocate the battery pack and receiver to minimize or eliminate any additional ballast required. If additional weight is required, nose weight may be easily added by using a "spinner weight" (GPMQ4645 for

the 1 oz. weight, or GPMQ4646 for the 2 oz. weight). If spinner weight is not practical or is not enough, use Great Planes (GPMQ4485) “stick-on” lead. A good place to add stick-on nose weight is to the firewall (don’t attach weight to the cowl–it is not intended to support weight). Begin by placing incrementally increasing amounts of weight on the bottom of the fuse over the firewall until the model balances. Once you have determined the amount of weight required, it can be permanently attached. If required, tail weight may be added by cutting open the bottom of the fuse and gluing it permanently inside.

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

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

Balance the Model Laterally

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

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

PREFLIGHT

Identify Your Model

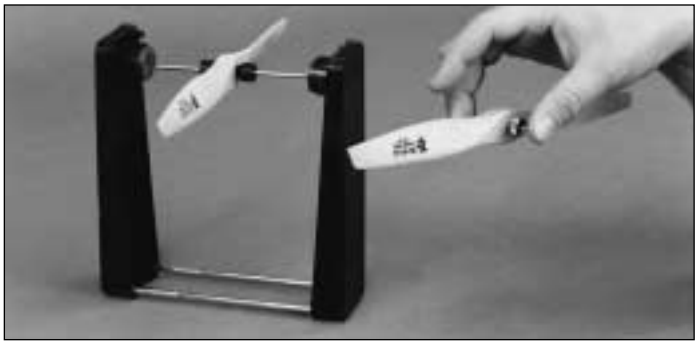
No matter if you fly at an AMA sanctioned R/C club site or if you fly somewhere on your own, you should always have your name, address, telephone number and AMA number on or inside your model. It is **required** at all AMA R/C club flying sites and AMA sanctioned flying events. Fill out the identification tag in page 35 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 the Propellers



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

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

Ground Check

I**f 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, scarves, 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.

IMAA SAFETY CODE (excerpt)

Since the Extra 300S ARF qualifies as a “giant-scale” model and is therefore eligible to fly in IMAA events, we’ve printed excerpts from the IMAA Safety Code which follows:

Definition:

For the purpose of the following IMAA Safety Code, the term Giant-Scale shall refer to radio controlled model aircraft, either scale or non-scale, which have a wingspan of 80 inches or more for monoplanes and 60 inches or more for

multi-winged model aircraft and have a ramp weight (fueled and ready to fly) of 55 lbs. or less.

Section 1.0: SAFETY STANDARD

1.1 – Adherence to Code: This safety code is to be strictly followed.

1.2 The most current AMA Safety Code in effect is to be observed. However, the competition sections of the code may be disregarded.

Section 3.0: Safety Check

3.4 – Flight Testing: All Giant-Scale R/C aircraft are to have been flight tested and flight trimmed with a minimum of six flights before the model is allowed to fly at an IMAA Sanctioned event.

3.5 – Proof of Flight: The completing and signing of the Declaration section of the Safety Inspection form by the pilot (or owner) shall document as fact that each aircraft has been successfully flight-tested and proven airworthy prior to an IMAA event.

Section 5.0: EMERGENCY ENGINE SHUT OFF (kill switch)

5.1 All magneto spark ignition engines must have a coil grounding switch on the aircraft to stop the engine. This will also prevent accidental starting of the engine. This switch shall be readily available to both pilot and helper. This switch is to be operated manually and without the use of the radio system.

5.2 Engines with battery power ignition systems must have a switch to turn off the power from the battery pack to disable the engine from firing. This will also prevent accidental starting of the engine. This switch shall be readily available to both pilot and helper. This switch shall be operated manually and without the use of the Radio System.

5.3 There must also be a means to stop the engine from the transmitter. The most common method is to close the carburetor throat completely using throttle trim. However, other methods are acceptable. This requirement applies to all glow/gas ignition engines regardless of size.

Section 6.0: RADIO REQUIREMENTS

6.1 All transmitters must be FCC type certified.

6.2 FCC Technician or higher-class license required for 6 meter band operation only.

Additional IMAA General Recommendations

The following recommendations are included in the Safety Code not to police such items, but rather to offer basic suggestions for enhanced safety.

Servos need to be of a rating capable to handle the loads that the control surfaces impose upon the servos. Standard servos are not recommended for control surfaces. Servos should be rated heavy-duty. For flight-critical control functions a minimum of 45 inch/ounces of torque should be considered. This should be considered a minimum for smaller aircraft and higher torque servos are strongly encouraged for larger aircraft. The use of one servo for each aileron and one for each elevator half is strongly recommended. Use of dual servos is also recommended for larger aircraft.

On-board batteries shall be 1000 mAh up to 20 lbs., 1200 mAh to 30 lbs., 1800 mAh to 40 lbs., and 2000 mAh over 40 lbs. flying weight. The number and size of servos, size and loads on control surfaces, and added features should be considered as an increase to these minimums. Batteries should be able to sustain power to the onboard radio components for a minimum of one hour total flying time before recharging.

Redundant and fail-safe battery systems are recommended.

The use of anti-glitch devices for long leads are recommended.

There is no maximum engine displacement limit, as it is the position of this body that an underpowered aircraft presents a greater danger than an overpowered aircraft. However, the selection of engine size relative to airframe strength and power loading mandates good discretionary judgment by the designer and builder. Current AMA maximums for engine displacement are 6.0 cu. in. for two-stroke and 9.6 cu. in. for four-stroke engines. These maximums apply only to AMA Sanctions concerning competition events (such as 511, 512, 515 and 520) and, as such, the maximums apply. All IMAA (non competition) events should be sanctioned as Class “C” events, in which these engine size maximums do not apply.

Generally, it is recommended that no attempt should be made to fly a radio controlled model aircraft with a gasoline engine in which the model aircraft weight would exceed twelve (12) pounds (underpowered) per cubic inch of engine displacement, or be less than five (5) pounds (overpowered) per cubic inch of engine displacement. Example: Using a 3 cu. in. engine, a model would likely be underpowered at an aircraft weight greater than 36 pounds. With the same engine, an aircraft weighing less than 15 pounds would likely be overpowered.

Servo arms and wheels should be rated heavy-duty. Glass-filled servo arms and control horns are highly recommended.

Control surfaces linkages are listed in order of preference:

1. Cable system (pull-pull). A tiller bar is highly recommended along with necessary bracing.

2. Arrow Shaft, fiberglass or aluminum, 1/4" or 5/16" O.D. bracing every six (6) to ten (10) inches is highly recommended.

3. Tube-in-tube (nyrod). Bracing every few inches is highly recommended. Inner tube should be totally enclosed in outer tube.

4. Hardwood dowel, 3/8" O.D. bracing every six (6) to ten (10) inches is highly recommended.

Hinges should be rated heavy-duty and manufactured for Giant-Scale use primarily. Homemade and original design hinges are acceptable if determined to be adequate for the intended use.

Clevis (steel, excluding heavy-duty ball links) and attachment hardware should be heavy-duty 4-40 threaded rod type. 2-56 threaded size rod is acceptable for some applications (e.g. throttle). Clevis is to have lock nuts and sleeve or spring keepers.

Propeller tips should be painted or colored in a visible and contrasting manner so as to increase the visibility of the propeller tip arc.

CHECK LIST

During the last few moments of preparation your mind may be elsewhere anticipating the excitement of the first flight. Because of this, you may be more likely to overlook certain checks and procedures that should be performed before the model is flown. To help avoid this, a check list is provided to make sure these important areas are not overlooked. Many are covered in the instruction manual, so where appropriate, and refer to the manual for complete instructions. Be sure to check the items off as 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 wing saddle area or the engine spacer if needed.
- ❑ 2. Check the C.G. according to the measurements provided in the manual.
- ❑ 3. Be certain the battery and receiver are securely mounted in the fuse. Simply stuffing them into place with foam rubber is not sufficient.
- ❑ 4 Extend your receiver antenna and make sure it has a strain relief inside the fuselage to keep tension off the solder joint inside the receiver.
- ❑ 5. Balance your model *laterally* as explained in the instructions.
- ❑ 6. Use thread locking compound to secure critical fasteners such as the 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 the 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. Make sure the fuel lines are connected and are not kinked.
- ❑ 15 Balance your propeller (and spare propellers).
- ❑ 16. Tighten the propeller nut and spinner.
- ❑ 17. Place your name, address, AMA number and telephone number on or inside your model.
- ❑ 18. Cycle your receiver battery pack (if necessary) and make sure it is fully charged.
- ❑ 19. If you wish to photograph your model, do so before your first flight.
- ❑ 20. Range check your radio when you get to the flying field.

FLYING

The Extra 300S ARF is a great-flying model that flies smoothly and predictably. The Extra 300S ARF does not, however, possess the self-recovery characteristics of a primary R/C trainer and should be flown only be experienced R/C pilots.

Fuel Mixture Adjustments

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

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

Takeoff

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

Remember to takeoff into the wind. When you're ready, point the model straight down the runway, hold a bit of up elevator to keep the tail on the ground to maintain tail wheel steering, and then gradually advance the throttle. As the model gains speed, decrease up elevator allowing the tail to come off the ground. One of the most important things to remember with a tail dragger is to always be ready to apply **right** rudder to counteract engine torque. Gain as much speed as your runway and flying site will practically allow before gently applying up elevator, lifting the model into the air. At this moment it is likely that you will need to apply more right rudder to counteract engine torque. Be smooth on the elevator stick, allowing the model to establish a **gentle** climb to a safe altitude before turning into the traffic pattern.

Flight

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

Take it easy with the Extra 300S ARF 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.**

Performance Settings for the Extra 300S ARF

The Extra 300S ARF will perform 3-D aerobatics easily if you use the larger engines recommended within the engine range. If you setup your airplane to do 3D maneuvers, you

will need to be throttle conscious; that is, never apply full throttle on straight and level flying or in dives to prevent flutter.

3D Control Throws

ELEVATOR:	3-1/4" [83mm] Up 3-1/4" [83mm] Down
RUDDER:	6-1/2" [165mm] Right 6-1/2" [165mm] Left
AILERONS:	1-3/4" [45mm] Up 1-3/4" [45mm] Down

3D Servo Arms

Larger than stock servo arms are highly recommended for getting the 3D throws for the Extra 300S ARF. Do not move the pushrods in on the control horns to get the increased throw, as doing that intensifies any play in the system. Dubro Super Strength Arms sets (DUBM6670) were used on the test models.

Servos

The large control throws require servos with great centering. The digital servos are second to none in this department. Digital servos such as the Futaba S9250 (FUTM0220) should be used on all control surfaces of this airplane for optimum performance. The test models were also flown successfully in 3D mode with analog Futaba S9304 (FUTM0095) servos.

COMPUTER RADIOS

As you prepare to fly the Extra 300S ARF for the first time, there are a few features on computer radios we'd like to mention. There are many others, of course, but these are commonly used features on most computer radios. If you are using a non-computerized radio, this information may still be of interest to you for future installations.

ATV or Travel Volume: ATV is a wonderful feature of computer radios which allows you to make minor adjustments to how far a servo travels at its extremes. For example, you install the throttle pushrod, and it's almost perfect, except you have some binding at wide open. Instead of struggling with the clevises to try to keep full throttle but not have the binding, you can turn down the ATV slightly until the binding is gone.

Why only adjust ATV slightly? Control linkages are really just a lesson in leverage. The less distance the servo is moving for a given throw at the surface, the less leverage you have given the servo to do the job. Thus the lower you set the ATV the less power you are leaving for the servo to apply to the surface. Additionally, a servo has only so many points within its range of motion. By cutting its range in half, you've also diminished the precision of the servo by 50%. Because of both of these issues, we strongly recommend setting the high rates as close as possible to 100% on the ATV.

Dual Rates: Setting dual rates helps make your model easier to fly in a variety of situations. For example, an expert pilot who wants to do torque rolls will need a large amount of control throw. However, he does not want that same huge volume of throw when he is trying to do smooth loops or slow rolls. Low rates give your model a soft feel, with aggressive responsiveness just a flip of a switch away.

Exponential, the best of both rates: Exponential is a feature which modelers tend to either love or hate. The benefits of exponential are that they make the elevator, for example, feel like it is on low rates when you are moving the stick near center; however, when you get farther from center the model gets progressively more responsive. The reason this is helpful is that it allows you to make soft, minor adjustments when small corrections are needed, but still allows you sufficient throw to make major changes at full stick. For example, you can smoothly level the wings while flying along straight and level without over-controlling, yet still have enough aileron throw at full stick to complete a one-second roll.

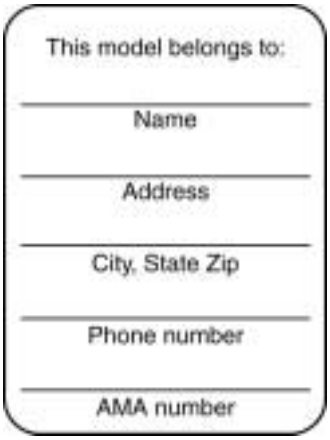
Idle Down and Throttle Kill: Idle down allows you to have a switch set for a high idle, ideal for most aerobatics where you have little or no risk of dead sticking, as well as a lower idle setting for, say, landings, taxiing, and minimum throttle maneuvers such as spins. The throttle kill setting on most computer radios will idle your engine down whatever percent you set it so that your engine will shut off when the switch is thrown and the throttle stick is in the idle position. This is an excellent safety feature to shut off your engine in emergency situations.

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

GOOD LUCK AND GREAT FLYING!

GREAT PLANES® MODEL MANUFACTURING COMPANY

Make a copy of the identification tag shown below and place it on or inside the model.



APPENDIX

Flight Trimming

Note: *The following article has been reprinted in part for future reference and also as a guide for your flight instructor or experienced flying partner to help you with trimming your model. If further information is required, please contact your local hobby dealer, local flying club or call Great Planes at (217) 398-8970*

A model is not a static object. Unlike a car, which you can only hunt left or right on the road (technically, a car does yaw in corners, and pitches when the brakes are applied), a plane moves through that fluid we call air in all directions simultaneously. The plane may look like it's going forward, but it could also be yawing slightly, slipping a little and simultaneously climbing or diving a bit! The controls interact. Yaw can be a rudder problem, a lateral balance problem or an aileron rigging problem. We must make many flights, with minor changes between each, to isolate and finally correct the problem.

The chart accompanying this article is intended to serve as a handy field reference when trimming your model. Laminate it in plastic and keep it in your flight box. You just might have need to consult it at the next contest! The chart is somewhat self-explanatory, but we will briefly run through the salient points.

First, we are assuming that the model has been C.G. balanced according to the manufacturer's directions. There's nothing sacred about that spot — frankly, it only reflects the balance point where a prototype model handled the way the guy who designed it thought it should. If your model's wing has a degree more or less of incidence, then the whole balance formula is incorrect for you. But, it's a good ballpark place to start.

The second assumption is that the model has been balanced laterally. Wrap a strong string or monofilament around the prop shaft behind the spinner, then tie the other end to the tail wheel or to a screw driven into the bottom of the aft fuse. Make the string into a bridle harness and suspend the entire model inverted (yes, with the wing on!). If the right wing always drops, sink some screws or lead into the left wing tip, etc. You may be surprised to find out how much lead is needed.

At this point the model is statically trimmed. It's only a starting point, so don't be surprised if you wind up changing it all. One other critical feature is that the ailerons must have their hinge gap sealed. If shoving some Scotch tape or MonoKote into the hinge gap to prevent the air from slipping from the top of the wing to the bottom, and vice-versa, bothers you, then don't do it.

To achieve the maximum lateral trim on the model, the hinge gap on the ailerons should be sealed. The easiest way to do this is to disconnect the aileron linkages, and fold the ailerons as far over the top of the wing as possible (assuming they are top or center hinged). Apply a strip of clear tape along the joint line. When the aileron is returned to neutral, the tape will be invisible, and the gap will be effectively sealed. Depending on how big the ailerons are, and how large a gaping gap you normally leave when you install hinges, you could experience a 20 percent increase in aileron control response just by this simple measure.

Your first flights should be to ascertain control centering and control feel. Does the elevator always come back to neutral after a 180° turn or Split-S? Do the ailerons tend to hunt a little after a rolling maneuver? Put the plane through its paces. Control centering is either a mechanical thing (binding servos, stiff linkages, etc.), an electronic thing (bad servo resolution or dead band in the radio system), or C.G. (aft Center of Gravity will make the plane wander a bit). The last possibility will be obvious, but don't continue the testing until you have isolated the problem and corrected it.

Let's get down to the task of trimming the model. Use the tachometer every time you start the engine, to insure consistent results. These trim flights must be done in calm weather. Any wind will only make the model weather vane. Each "maneuver" on the list assumes that you will enter it dead straight-and-level. The wings must be perfectly flat, or else the maneuver will not be correct and you'll get a wrong interpretation. That's where your observer comes in. Instruct him to be especially watchful of the wings as you enter the maneuvers.

Do all maneuvers at full throttle. The only deviation from this is if the plane will routinely be flown through maneuvers at a different power setting.

Let's commence with the "engine thrust angle" on the chart. Note that the observations you make can also be caused by the C.G., so be prepared to change both to see which gives the desired result. Set up a straight-and-level pass. The model should be almost hands-off. Without touching any other control on the transmitter, suddenly chop the throttle. Did the nose drop? When you add power again, did the nose pitch up a bit? If so, you need some down thrust, or nose weight. When the thrust is correct, the model should continue along the same flight path for at least a dozen plane lengths before gravity starts to naturally bring it down.

Do each maneuver several times, to make sure that you are getting a proper diagnosis. Often, a gust, an accidental nudge on the controls, or just a poor maneuver entry can mislead you. The thrust adjustments are a real pain to make. On most models, it means taking the engine out, adding shims, then reassembling the whole thing. Don't take shortcuts.

Don't try to proceed with the other adjustments until you have the thrust line and/or C.G. correct. They are the basis upon which all other trim settings are made.

Also, while you have landed, take the time to crank the clevises until the transmitter trims are at neutral. Don't leave the airplane so that the transmitter has some odd-ball combination of trim settings. One bump of the transmitter and you have lost everything. The trim must be repeatable, and the only sure way to do this is to always start with the transmitter control trims at the middle.

The next maneuver is somewhat more tricky than it looks. To verify C.G., we roll the model up to a 45° bank, then take our hands

off the controls. The model should go a reasonable distance with the fuse at an even keel. If the nose pitches down, remove some nose weight, and the opposite if the nose pitches up. The trick is to use only the ailerons to get the model up at a 45° bank. We almost automatically start feeding in elevator, but that's a no-no. Do the bank in both directions, just to make sure that you are getting an accurate reading of the longitudinal balance.

We now want to test the correct alignment of both sides of the elevator (even if they aren't split, like a Pattern ship's, they can still be warped or twisted). Yaw and lateral balance will also come into play here, so be patient and eliminate the variables, one-by-one. The maneuver is a simple loop, but it must be entered with the wings perfectly level. Position the maneuver so that your assistant can observe it end-on. Always loop into the wind. Do several loops, and see if the same symptom persists. Note if the model loses heading on the front or back side of the loop. If you lose it on the way up, it's probably an aileron problem, while a loss of heading on the way back down is most likely a rudder situation.

Note that the Yaw test is the same looping sequences. Here, however, we are altering rudder and ailerons, instead of the elevator halves. We must repeat that many airplanes just will not achieve adequate lateral trim without sealing the hinge gaps shut. The larger you make the loops (to a point), the more discernable the errors will be.

The Lateral Balance test has us pulling those loops very tightly. Pull straight up into a vertical and watch which wing drops. A true vertical is hard to do, so make sure that your assistant is observing from another vantage point. Note that the engine torque will affect the vertical fall off, as will rudder errors. Even though we balance the wing statically before leaving for the field, we are now trimming it dynamically.

The Aileron Coupling (or rigging) is also tested by doing Hammerhead Stalls. This time, however, we want to observe the side view of the model. Does the plane want to tuck under a bit? If so, then try trimming the ailerons down a small bit, so that they will act as flaps. If the model tends to want to go over into a loop, then rig both ailerons up a few turns on the clevises. Note that drooping the ailerons will tend to cancel any washout you have in the wing. On some models, the lack of washout can lead to some nasty characteristics at low speeds.

Again, we reiterate that all of these controls are interactive. When you change the wing incidence, it will influence the way the elevator trim is at a given C.G. Re-trimming the wing will also change the rigging on the ailerons, in effect, and they may have to be readjusted accordingly.

The whole process isn't hard. As a matter of fact it's rather fun — but very time consuming. It's amazing what you will learn about why a plane flies the way it does, and you'll be a better pilot for it. One thing we almost guarantee, is that your planes will be more reliable and predictable when they are properly trimmed out. They will fly more efficiently, and be less prone to doing radical and surprising things. Your contest scores should improve, too.

We wish to acknowledge the Orlando, Florida, club newsletter, from which the basics of the chart presented here were gleaned.

Reprinted in part by Great Planes Model Manufacturing Company, courtesy of Scale R/C Modeler magazine, Pat Potega, Editor, August 1983 issue.

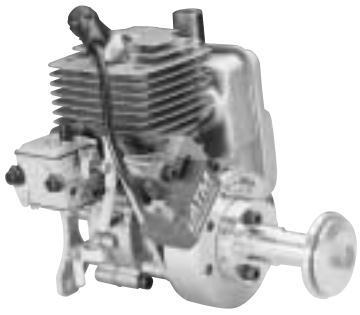
See the Flight Trimming Chart on Page 38

Great Planes Ryan STA-M 1.20 ARF
The Ryan STA-M was the Army Air Corps' first monoplane trainer. Now, you can have your own R/C version flight-ready in just 12-15 hours! The interlocking wood airframe is factory-covered in glowing MonoKote. Cowl and wheel pants are fiberglass and painted. It's gentle with smaller engines, aerobatic with larger engines, and equipped with dual ailerons for absolute control. Requires a 4-5 channel radio w/6 servos and a 2-stroke .61-.91 or 4-stroke .91-1.20 engine. Pilot figures shown not included with kit. **GPMA1355**

Great Planes C.G. Precision Aircraft Balancer™
Accurate balancing makes trainers more stable, low-wings more agile, and pylon planes move at maximum speed. The innovative C.G. Machine helps you achieve optimum balance easily, without measuring or marking–and without the errors that fingertip balancing can cause. You'll quickly pinpoint your plane's exact center of gravity. Then you'll know at a glance whether weight should be added, removed or relocated. The C.G. Machine works with kits and ARF models of any size and wingspan. Its slanted wire balancing posts support models weighing up to 40 pounds. **GPMR2400**

Great Planes Accu-Throw™
Control Surface Deflection Meter
One leading cause of crashes is flying an airplane with its control throws set differently from those recommended in the instructions. The Great Planes AccuThrow lets you quickly and easily measure actual throws first, so you can make necessary corrections before you fly. Large, no-slip rubber feet provide a firm grip on covered surfaces without denting or marring the finish. Spring tension holds Accu-Throw's plastic ruler steady by each control surface. Curved to match control motions, the ruler provides exact readings in both standard or metric measurements. **GPMR2405**

Futaba® 9CAP 9-Channel Radio Systems
Want to experiment with *triple* rates? Find, open, set and close functions with amazing ease? Be able to look at an LCD and see how far each servo will travel in operation – and reset the limits of any servo you choose? You can do it all and more, with the 9CAP. Easy Dial N' Key programming, eight-character naming, and a "full functionality" trainer system are just a few of its extraordinary features. Learn more on the Futaba website at *www.futaba-rc.com.* Includes R149DP receiver, four S3001 servos, 600mAh Tx and Rx NiCds. **FUTJ87****

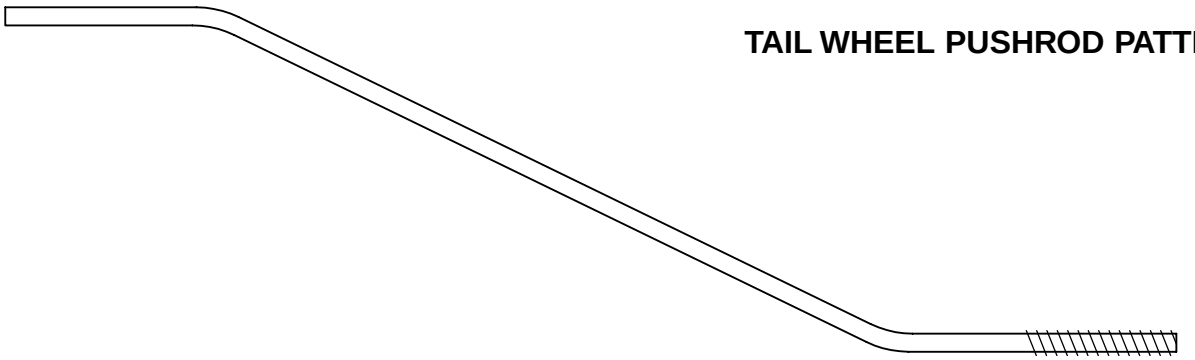


Fuji™ BT-50SA Gasoline Engines
The 46.5cc BT-50SA features a true chrome cylinder, regulating pump, and high-performance Walbro carb. The dynamically balanced flywheel, prop hub and crankshaft substantially decrease vibration, wear – even electrical "noise." With Fuji's ATM (Automatic Timing Module), starts are easier and backfire-free, idle is smoother, and timing advances automatically with rpm to produce optimum power. Comes with muffler, mount and Champion RCJ6Y spark plug. **FJIG0050**

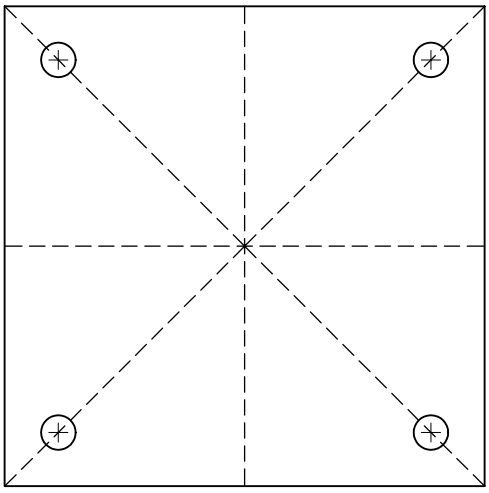
TRIM FEATURE	MANEUVERS	OBSERVATIONS	CORRECTIONS
CONTROL CENTERING	Fly general circles and random maneuvers.	Try for hands off straight and level flight.	Readjust linkages so that Tx trims are centered.
CONTROL THROWS	Random maneuvers	A. Too sensitive, jerky controls. B. Not sufficient control.	If A, change linkages to reduce throws. If B, increase throws.
ENGINE THRUST ANGLE[1]	From straight flight, chop throttle quickly.	A. Aircraft continues level path for short distance. B. Plane pitches nose up. C. Plane pitches nose down.	If A, trim is okay. If B, decrease downthrust. If C, increase downthrust.
CENTER OF GRAVITY LONGITUDINAL BALANCE	From level flight roll to 45° bank and neutralize controls.	A. Continues in bank for moderate distance. B. Nose pitches up. C. Nose drops.	If A, trim is good. If B, add nose weight. If C, remove nose weight.
YAW[2]	Into wind, do open loops, using only elevator. Repeat tests doing outside loops from inverted entry.	A. Wings are level throughout. B. Yaws to right in both inside and outside loops. C. Yaws to left in both inside and outside loops. D. Yaws right on insides, and left on outside loops. E. Yaws left in insides, and right on outside loops.	If A, trim is correct. If B, add left rudder trim. If C, add right rudder trim. If D, add left aileron trim. If E, add right aileron trim.
LATERAL BALANCE	Into wind, do tight inside loops.	A. Wings are level and plane falls to either side randomly. B. Falls off to left in loops. Worsens as loops tighten. C. Falls off to right in loops. Worsens as loops tighten.	If A, trim is correct. If B, add weight to right wing tip. If C, add weight to left wing tip.
AILERON RIGGING	With wings level, pull to vertical climb and neutralize controls.	A. Climb continues along same path. B. Nose tends to go to inside loop. C. Nose tends to go to outside loop.	If A, trim is correct. If B, raise both ailerons very slightly. If C, lower both ailerons very slightly.

1. Engine thrust angle and C.G. interact. Check both.
2. Yaw and lateral balance produce similar symptoms. Note that fin may be crooked. Right and left references are from the plane's vantage point.

BUILDING NOTES	
Kit Purchased Date: _____	Date Construction Finished: _____
Where Purchased:_____	Finished Weight: _____
Date Construction Started: _____	Date of First Flight: _____
FLIGHT LOG	



TAIL WHEEL PUSHROD PATTERN



ENGINE MOUNT TEMPLATE

EM218 BOLT PATTERN
USE 10-32 BOLTS AND BLIND NUTS IN A TYPICAL INSTALLATION