RYAN STA

INSTRUCTION MANUAL

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.

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

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

GREAT PLANES®
MODEL MANUFACTURING COMPANY
P.O. Box 788 Urbana, IL 61803 (217) 398-8970

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INTRODUCTION

Thank you for purchasing the Great Planes Ryan STA ARF. When we assembled the first Ryan prototype in our R & D shop, we could tell right away that this was going to be a popular model. Its classic outline and friendly-looking proportions, not to mention the striking black-and-white checkers with red trim, cannot be resisted by veterans and new modelers alike. Experienced builders will appreciate the quality glasswork and paint job on the cowl and wheel pants, knowing that it takes hours in the shop to duplicate the same result.

When it's time to fly your Great Planes Ryan STA ARF, rest assured. Its flight performance more than lives up to its great looks. This model is definitely one of the most gentle, honest, enjoyable ARFs around! Even in mild crosswinds, you'll find yourself putting on a show while others watch as you shoot touch-and-goes and smooth landings (on pavement or grass!).

Enough talk. Let's start building so you can see for yourself...

PROTECT YOUR MODEL, YOURSELF & OTHERS...FOLLOW THIS IMPORTANT SAFETY PRECAUTION

While the Great Planes Ryan ARF is easy to build and flies well, it is not intended to be a beginner's model. It lacks the self-recovery characteristics of a good basic trainer such as a Great Planes PT™ model. However, if you have learned the basics of R/C flying, the Ryan STA ARF is an excellent choice to try your skills at flying a large-scale model.

Your Ryan STA ARF is not a toy, but rather a sophisticated, working model that functions very much like a full-size airplane. Because of its realistic performance, the Ryan STA ARF, if not assembled and operated correctly, could possibly cause injury to yourself or spectators and damage property.

To make your R/C modeling experience totally enjoyable, if this is your first “giant” R/C model, we recommend that you get the assistance of a pilot who has experience with this type of plane for your first flights. If you're not currently a member of an R/C club, your local hobby shop has information about clubs in your area whose membership includes experienced pilots.

If you're not currently an AMA (Academy of Model Aeronautics) member, we strongly urge you to join. 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 following address or toll-free phone number:

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

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

IMAA INFORMATION

The Great Planes Ryan STA is an excellent sport-scale model. Its size makes it eligible to fly in IMAA events. The IMAA (International Miniature Aircraft Association) is an organization that promotes non-competitive flying of giant scale models. You can contact the IMAA at the address or telephone number below.

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

If you plan to attend an IMAA event, refer to the **IMAA Safety Code** and ***recommendations*** in the back of this manual.

PRECAUTIONS

1. 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.

2. Take time to build straight, true and strong.

3. Use an R/C radio system that is in first-class condition and a correctly sized engine and components (fuel tank, wheels, etc.) throughout your building process.

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

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

Note: We, as the kit manufacturer, provide you with a top quality kit and great instructions, but ultimately the quality 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.

Before starting to build, compare the parts in this kit with the Parts List and note any missing parts. Also inspect all parts to make sure they are of acceptable quality. If any parts are missing, broken or defective, or if you have any questions about building or flying this airplane, please call us at (217) 398-8970, or e-mail us at productsupport@greatplanes.com. If you are contacting us for replacement parts, please be sure to provide the full kit name (Great Planes Ryan ARF) and the part numbers as listed in the Parts List.

You can also check our web site at www.greatplanes.com for the latest Ryan ARF updates.

RADIO SYSTEM REQUIREMENTS

Because the Ryan uses dual elevator servos and because the servos must move in opposite directions (due to the way they are mounted in the fuse), they cannot be connected with a "Y" connector (unless you have a "reverse" servo). Therefore, to fly the Ryan a radio system capable of electronic servo mixing is required, so that one of the elevator servos can be reversed. If you do not have a radio with programmable mixing, there is another solution. MPI (Maxx Products, (847) 438-2233), located in Lake Zurich, Illinois, offers an electronic servo mixing device called the *Miracle Y*. When the elevator servos are connected to the Miracle Y they will operate in opposite directions.

A receiver battery with a capacity of at least 1000 mAh is also recommended for a model of this size.

ENGINE SELECTION

There are several engines that will work well in your Ryan STA ARF. The official engine size recommendation range is .91 to 1.20 two-stroke or four-stroke. If you select an engine in the upper end of the size range, remember that the Ryan is a scale model that is intended be flown in a scale manner at scale speeds, so prudent throttle management must be practiced. Our prototype, powered by an O.S.® MAX .91 FS, flew smoothly and most scale-like at about 3/4 throttle. We also found that a 14 x 8 prop was perfect for this engine and model combination. Other engine sizes may require different size props, so start with the manufacturer's recommendations that came with the engine.

ADDITIONAL ITEMS REQUIRED

Hardware and Accessories

This is the list of hardware and accessories used to assemble the Ryan. Order numbers are provided in parentheses.

- ❏ Five-channel radio (see *Radio System Requirements*)
- ❏ Three servos that have at least 45 oz.-in. or more of torque (1 rudder, 2 elevators)
- ❏ Three standard servos (1 throttle, 2 ailerons)
- ❏ (2) 24" Servo extensions for ailerons (HCAM2200 for Futaba®)
- ❏ 6" Servo extension for aileron (HCAM2000 for Futaba)
- ❏ “Y” connector for ailerons (FUTM4130 for Futaba)
- ❏ Engine (see engine selection)
- ❏ Propeller & spare propellers
- ❏ Medium Fuel Tubing (GPMQ4131)
- ❏ 4" Main wheels (ROBQ1537)
- ❏ 2-3/4" White spinner (GPMQ4525)
- ❏ Switch & Charge Jack Mounting Set (GPMM1000)
- ❏ Fuel filler valve for glow fuel (GPMQ4160)
- ❏ Model Products #021 Remote glow plug adapter (MODP1221)
- ❏ R/C foam padding (1/4" HCAQ1000, or 1/2" HCAQ1050)
- ❏ Williams Bros. #62500 1/4-scale Standard pilot (WBRQ2625)
- ❏ Black fuelproof paint for cockpit
- ❏ Optional: 3/16" x 3/8" x 14" (or a similar size) basswood stick and (6) #2 x 1/2" screws for removable forward servo tray (see step 8 on page 12).

Adhesive and Building Supplies

In addition to common household tools (screw drivers, drill, etc.), this is the list of most important items required to build the Ryan. *We recommend **Great Planes Pro**™ CA and Epoxy glue.*

- ❏ 1/2 oz. Thin CA (GPMR6002)
- ❏ 1/2 oz. Medium CA (GPMR6008)
- ❏ CA Applicator Tips (HCAR3780)
- ❏ 30-Minute Epoxy (GPMR6047)
- ❏ Threadlocker (GPMR6060)
- ❏ Non-elastic monofilament or Kevlar fishing line (for stab alignment)
- ❏ Builders Triangle Set (HCAR0480) (for fin alignment)
- ❏ Masking Tape (TOPR8018)
- ❏ Silver solder (GPMR8070)
- ❏ Small metal file
- ❏ Drill bits: 1/16", #48 (or 5/64"), 3/32", 1/8", #29 (or 9/64"), 3/16", 7/32", 17/64" (or 1/4") drill and 8-32 tap ***or*** Great Planes 8-32 tap and drill set (GPMR8103)
- ❏ Sealing Iron (TOPR2100)
- ❏ Covering sock (TOPR2175)

Optional Supplies & Tools

Here is a list of optional tools mentioned in the manual.

- ❏ CA Debonder (GPMR6039)
- ❏ 6-Minute Epoxy (GPMR6045)
- ❏ Milled Fiberglass (GPMR6165)
- ❏ Microballoons (TOPR1090)
- ❏ R/C-56 Canopy Glue (JOZR5007)
- ❏ Epoxy Brushes (GPMR8060)
- ❏ Mixing Sticks (GPMR8055)
- ❏ Denatured Alcohol (for epoxy clean up)
- ❏ Hobby Knife (HCAR0105), #11 Blades (HCAR0211)
- ❏ Easy-Touch™ Bar Sander (GPMR6170, or similar)
- ❏ Felt-Tip Marker (TOPQ2510)
- ❏ Rotary tool such as Dremel
- ❏ Rotary tool reinforced cut-off wheel (GPMR8020)
- ❏ Curved Tip Canopy Scissors for Trimming Plastic Parts (HCAR0667)
- ❏ Hook and Loop Material (GPMQ4480)
- ❏ Dead Center™ Engine Mount Hole Locator (GPMR8130)
- ❏ 1/4" White Kwik Stripe striping tape (GPMQ1610)
- ❏ 1/8" Chrome Kwik Stripe striping tape (GPMQ10884)
- ❏ Great Planes AccuThrow Deflection Gauge (for measuring control throws, GPMR2405)

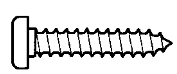
General Inspection

If you haven't done so already, remove all the major components such as the wings, fuselage, tail surfaces, cowl and wheel pants from their bags. Inspect all items closely to check for any damage. If any damage is found, contact the place where your Ryan STA was purchased, or Hobby Services, for a replacement of the damaged items.

Building Notes

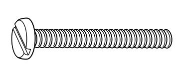
- There are two types of screws used in this kit:

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



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

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



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

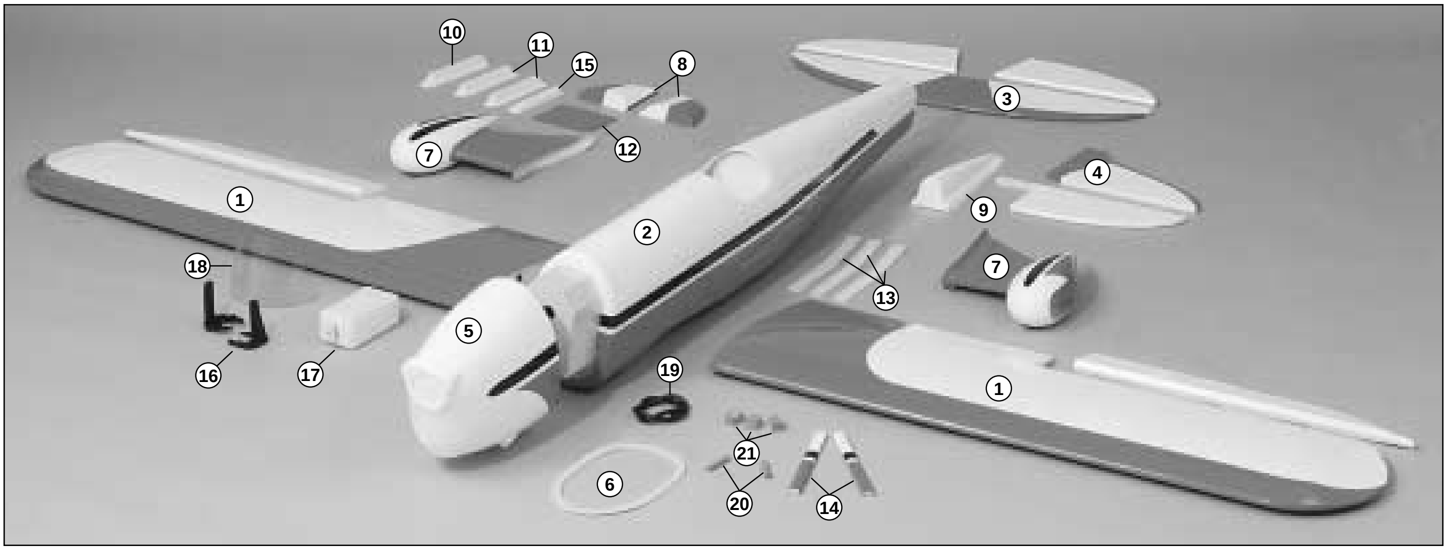
- Whenever the term glue is written you should rely upon your experience to decide what type of glue to use. When a specific type of adhesive works best for that step the instructions will make a recommendation.

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

- When you get to each step, read that step completely through to the end before you begin. Frequently there is important information or a note at the end of the step that you need to know before you start.

- 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.

Parts List



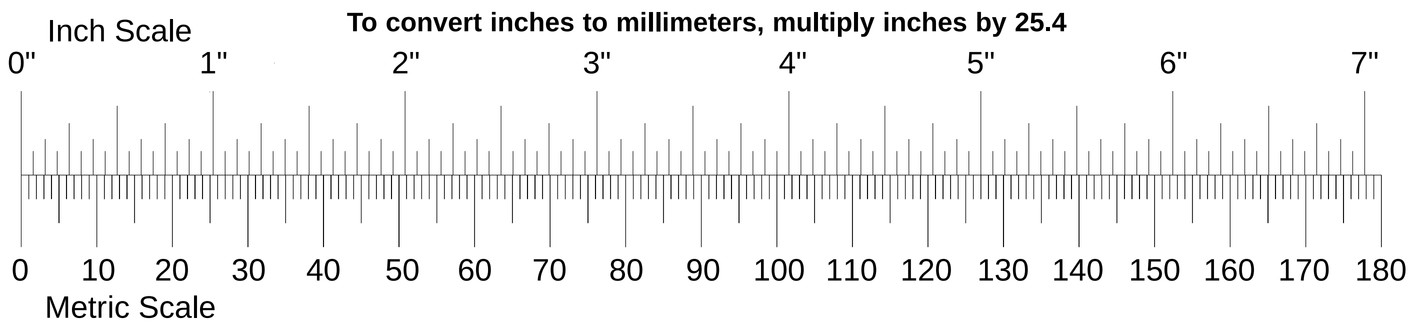
Parts List

1	Wing and Ailerons	**Not Pictured:**
2	Fuselage	Main Landing Gear
3	Stab and Elevators	Tail Gear with Tailwheel
4	Fin and Rudder	Aft Wing Joiner
5	Cowl	Forward Servo Tray
6	Cowl Ring	Aft Servo Tray
7	Wheel Pants	Instrument Panel Decal
8	Rudder Fairing	Hardware Bag
9	Turtledeck	
10	Fin Fairing	
11	Stab Fairings	
12	Wing Bolt Plate	**Replacement Parts:**
13	Forward Wing Joiner	GPMA2200 Wing Set
14	Wing Struts	GPMA2201 Fuse Set
15	Dorsal Fin	GPMA2202 Tail Set
16	Engine Mount	GPMA2203 Cowl Set
17	Fuel Tank	GPMA2204 Windscreen
18	Windscreen	GPMA2205 Landing Gear Set
19	Cockpit Coaming	GPMA2206 Wheel Pants
20	Wing Dowels	GPMA2207 Wing Struts
21	Cowl Mount Blocks	GPMA2208 Rudder Fairing

Hardware

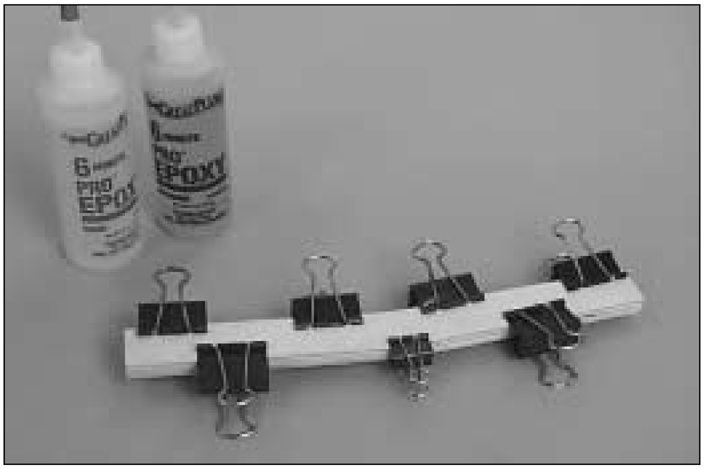
(1) 60-120 Engine mount	(7) #4 x 5/8" screws
(2) Metal solder-on clevis	(1) 0-80 threaded ball
(2) Brass body for screw-lock pushrod connector	(4) 2-56 x 3/4" cap screws
(4) Large nylon control horns	(4) 8-32 x 1-1/4" cap screws
(2) 1/4-20 x 2" nylon wing bolts	(4) 8-32 x 1" cap screws
(3) Nylon clevis	(2) 4-40 x 1/8" cap screws
(2) Hump strap for 1/8" wire	(36)#2 x 1/2" screws
(2) Trees of 4 flat nylon LG straps	(4) 3/16" wheel collars
(1) Ball link	(1) 2-56 x 12" threaded pushrod
(2) Nylon retainers for screw-lock	(1) 2-56 x 36" threaded pushrod
(1) CA hinge strip	(2) 2-56 x 6" threaded pushrods
(2) Nylon faslinks	(2) 4-40 x 36" threaded pushrods
(2) 6-32 torque rod horn	(1) 6-32 x 1-1/2" threaded rod
(2) 4-40 hex nuts	(3) #4 flat washer
(4) 8-32 blind nuts	(8) #8 lock washer
(1) 0-80 hex nut	(4) #8 flat washer
(1) 3/16" x 36" guide tube	(2) Axles
(7) Silicone retainers	
(2) 6-32 set screws	
(2) 6-32 x 1/4" cap screws	

To convert inches to millimeters, multiply inches by 25.4

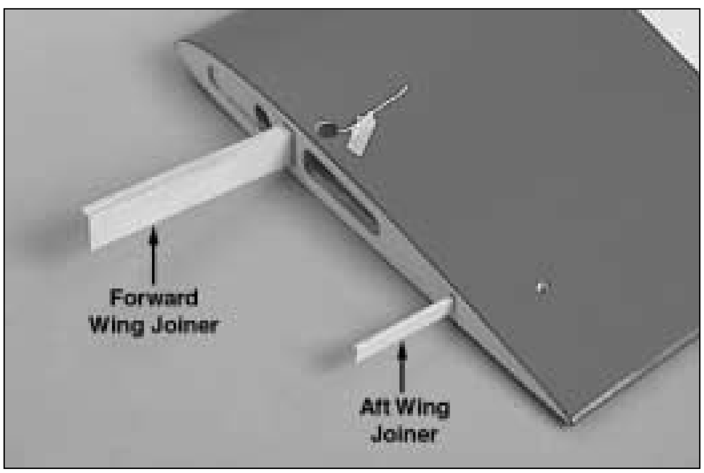


BUILD THE WING

Join the Wing Halves

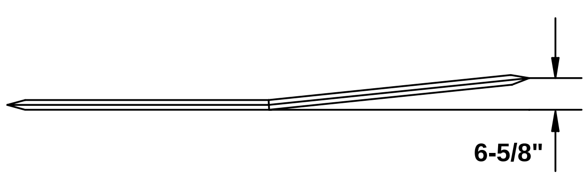


❑ 1. Use epoxy to glue the three plywood **forward wing joiners** together. Wipe away excess epoxy before it hardens.

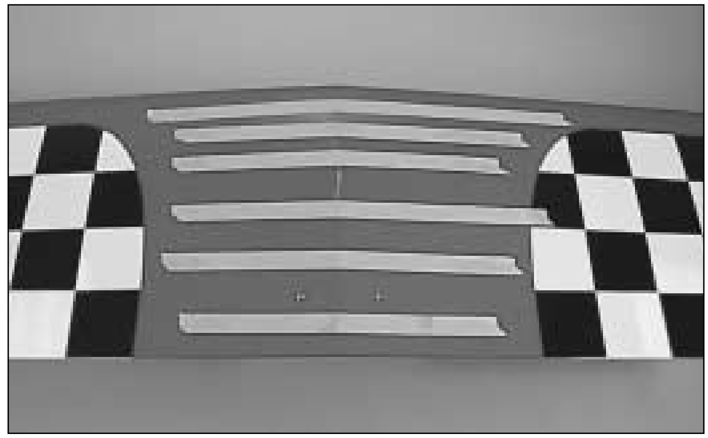


Refer to this photo for the following two steps.

❑ 2. Cut the covering from the pre-drilled holes in both wing halves for the servo cords, the wing dowels and the wing bolts. Route the end of the string through the servo wire hole in the top of both wing halves and tape the end of the string to the top of the wing.

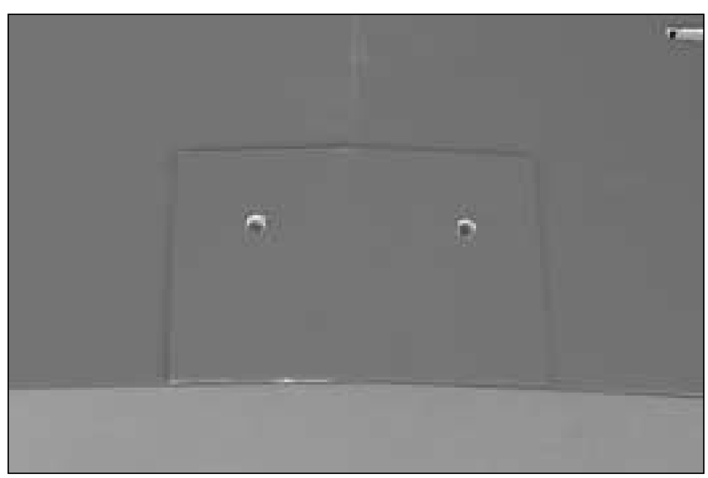


❑ 3. Test join the wing halves using the forward wing joiner you glued together in the first step and an additional plywood **aft wing joiner** that fits in the slot near the trailing edge. Make adjustments where necessary for a good fit. There should be no gap between the wing halves. When one wing half is lying flat on the workbench the tip of the other half should be approximately 6-5/8" from the workbench.



❑ 4. Separate the wings and remove the joiners. **Thoroughly** coat all mating surfaces, including the **inside** of the wings where the joiners fit, with 30-minute epoxy, then glue the wings together. Use masking tape to tightly hold them together until the epoxy has hardened. Excess epoxy that gets on the covering can be easily removed before it hardens with a tissue dampened with denatured alcohol or other suitable solvent.

❑ 5. Round one end of both hardwood **wing dowels**. Use epoxy to glue the dowels into the wing with the rounded ends forward. Be certain approximately 1/2" of the dowels protrudes from the wing. While you've got some epoxy mixed up, lightly coat the dowels to fuelproof them.

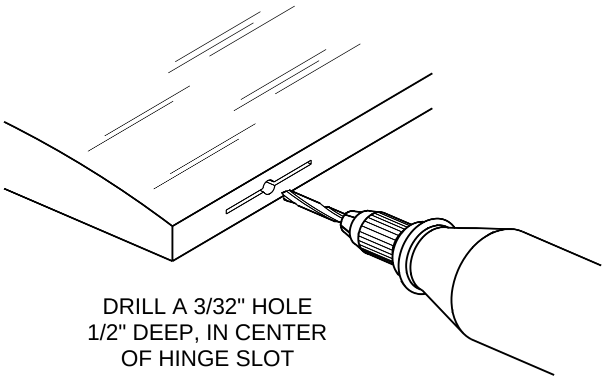


❑ 6. Use a sharp, new #11 blade to trim the covering from the bottom of the wing for the 1/8" plywood **wing bolt plate**.

Use care to cut **just through the covering**, while not cutting into the wood. Glue the wing bolt plate into position. After the glue hardens, use the holes in the top of the wing as a guide to drill 17/64" (or 1/4") holes through the wing bolt plate.

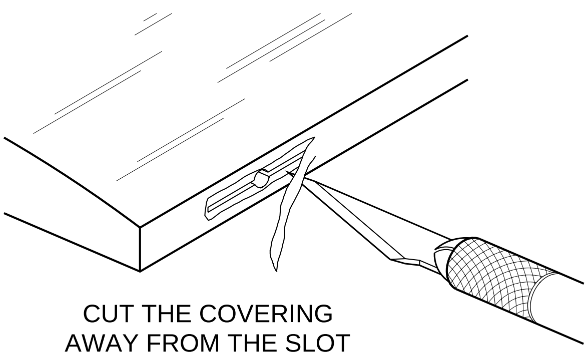
Hinge the Ailerons

Do the right aileron first.



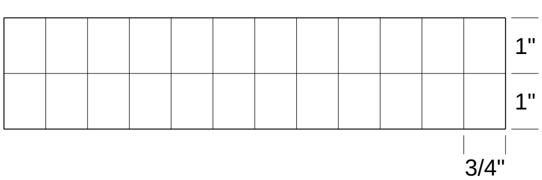
DRILL A 3/32" HOLE
1/2" DEEP, IN CENTER
OF HINGE SLOT

❑ ❑ 1. Drill a 3/32" hole 1/2" deep in the center of the hinge slots in the right wing panel and right aileron. A drill does the job okay, but a high-speed tool like a Dremel works better. Insert a #11 knife blade into the slots, working it back and forth a few times to clean them out.



CUT THE COVERING
AWAY FROM THE SLOT

❑ ❑ 2. Cut the covering from the hinge slots.



❑ ❑ 3. Cut four 3/4" x 1" hinges as shown in the sketch from the supplied CA hinge strip.

❑ ❑ 4. Test fit the aileron to the wing with the hinges. If the hinge slots are too tight, remove the hinges and use a #11 blade to **slightly** open the slots. If necessary, insert a small pin through the center of the hinges so they remain centered when joining the aileron to the wing.

❑ ❑ 5. With the aileron joined to the wing, remove any pins used to center the hinges. Be certain there is a **small** gap between the leading edge of the ailerons and the wing—just enough to slip a piece of paper through or to see light through.

❑ ❑ 6. Apply six drops of thin CA to **both sides** of all the hinges. Allow a few seconds between drops to allow the hinge slots to fully absorb the CA.

❑ 7. Join the left aileron to the wing the same way.

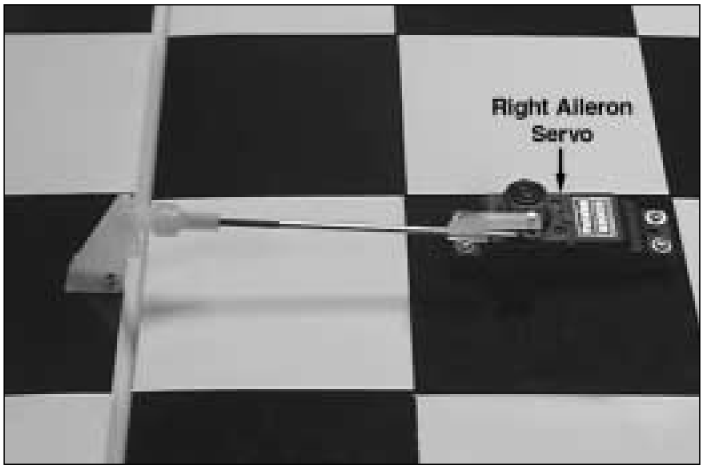
Hook Up the Ailerons

Do the right aileron first.

❑ 1. Cut the covering from the right aileron hatch in the bottom of the wing.

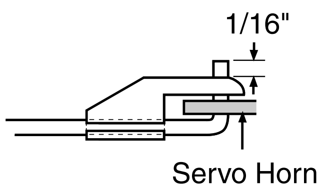
❑ 2. Connect a servo extension cord to your aileron servo wire. Secure the connection with vinyl tape, heat shrink tubing, or special clips intended for that purpose.

❑ 3. Tie the end of the string that is taped inside the wing to the end of the servo wire. Pull the wire through the ribs and out of the hole in the middle of the wing.



Refer to this photo for the following two steps.

❑ 4. Drill 1/16" holes in the wing for mounting the aileron servo. Add a few drops of thin CA to the holes and allow to harden, then mount the servo to the wing. Note that, for the right aileron servo shown in the photo, the servo arm points towards the **middle** of the wing and the output shaft on the servo is toward the **trailing edge** of the wing. When instructed to mount the left aileron servo, it should “mirror” the right servo with the servo arm pointing toward the middle of the wing and the output shaft toward the trailing edge.

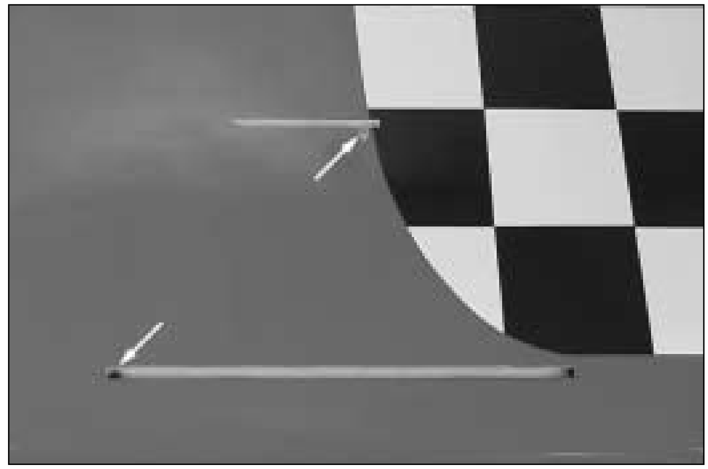


❑ 5. Make the aileron pushrod as shown in the photo using a 2-56 x 6" threaded one-end pushrod, a nylon clevis, a large nylon control horn, two #2 x 1/2" screws, a nylon Faslink and a silicone retainer. After drilling 1/16" holes in the aileron for the #2 x 1/2" screws, harden the holes by adding a few drops of thin CA and allowing it to harden before mounting the control horn. After you make the “L” bend in the pushrod wire for the nylon Faslink, trim the end of the wire so that approximately 1/16" protrudes from the Faslink as shown in the sketch. If necessary, enlarge the holes in the servo arm with a #48 (or 5/64") drill.

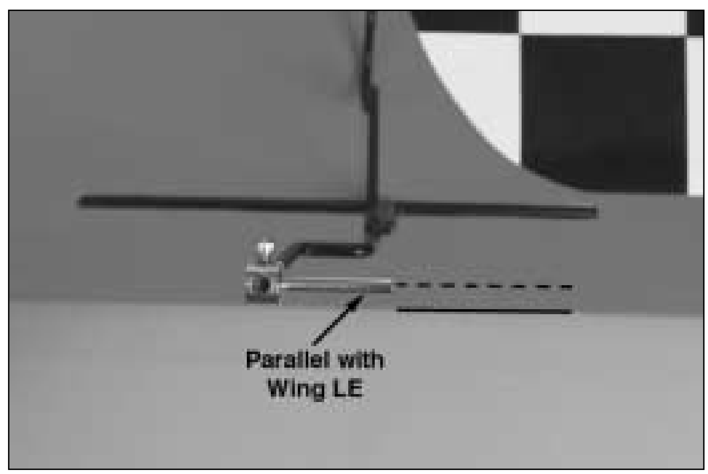
❑ 6. Mount the left aileron servo and connect it to the left aileron the same way. Be certain you've installed the screws that hold the servo arms to the servos when you're done hooking up the ailerons!

Mount the Landing Gear

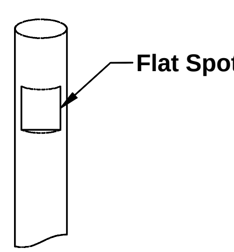
Do the right one first so yours looks like the photos.



❑ ❑ 1. Cut the covering from the grooves in the landing gear rails in the bottom of the right wing panel. Trim the aft rail (as indicated by the arrow in the photo) to accommodate the aft strut where it “angles up” toward the main strut. Trim the edge of the hole in the forward rail (as indicated by the arrow in the photo) to accommodate the bend in the main strut. Test fit the right landing gear into the wing.

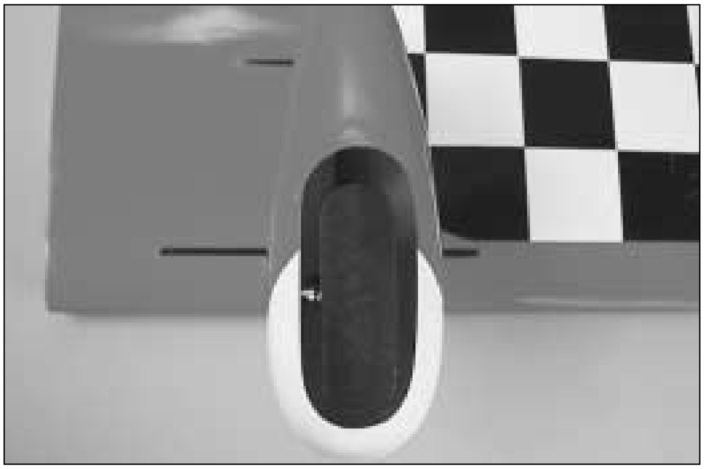


❑ ❑ 2. Place an axle on the landing gear so it is parallel with the leading edge of the wing. Temporarily tighten a 6-32 x 1/4" cap screw that holds the axle on.

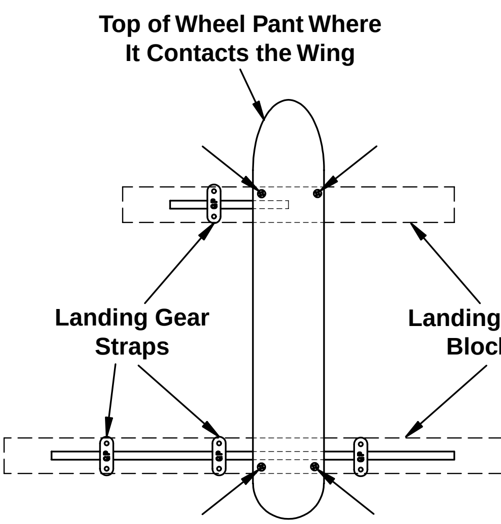


❑ ❑ 3. Loosen the screw and remove the axle from the landing gear. Remove the landing gear from the wing. File a flat spot on the landing gear where the screw made its mark.

❑ ❑ 4. Reposition the axle onto the gear and tighten the screw. Be certain that the screw has "landed" on the flat spot and that the axle has remained parallel with the leading edge of the wing. If not, remove the axle and adjust the flat spot as necessary. Securely mount the axle to the landing gear with the 6-32 x 1/4" cap screw and a drop of threadlocker on the screw.



❑ ❑ 5. Fit of the right wheel pant over the gear. (The right wheel pant is the one that fits the right wing best when fit over the landing gear.) Slip a wheel collar followed by a 4" wheel and another wheel collar onto the axle. Adjust the position of the wheel collars until the wheel is centered in the opening in the wheel pant. Temporarily tighten the outer wheel collar to the axle with a 6-32 set screw.



Refer to this sketch for the following two steps.

❑ ❑ 6. With the wheel pant positioned on the wing so the wheel is centered in the opening, drill 1/16" holes through the wheel pant into the landing gear blocks where indicated by the arrows in the sketch. Enlarge the holes in the wheel pants **only** with a 3/32" drill, then mount the pants to the wing with four #2 x 1/2" screws.

❑ ❑ 7. Drill 1/16" holes into the wing over the landing gear rails for the landing gear straps. Secure the landing gear to the wing with four nylon landing gear straps and eight #2 x 1/2" screws.

❑ ❑ 8. Now that the final position of the wheel pant, wheel and wheel collars has been determined, remove the wheel pant and the wheel from the landing gear. File a flat spot on the axle for the set screw in the wheel collar that holds on the wheel. Reassemble all the parts using a drop of threadlocker on the set screw in the wheel collar.

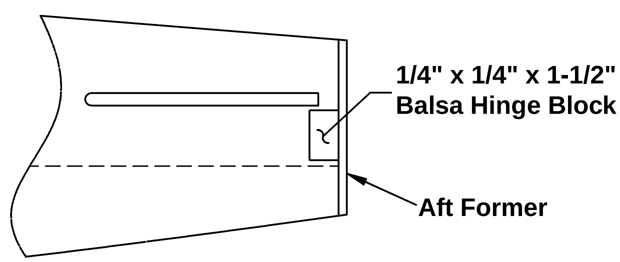
❑ 8. Return to step 1 and mount the left landing gear and wheel pant to the wing the same way.

JOIN THE TAIL SURFACES TO THE FUSE

While working on the fuse, it helps to have a stand or a cradle. We use a Robart Super Stand II (ROBP1402).

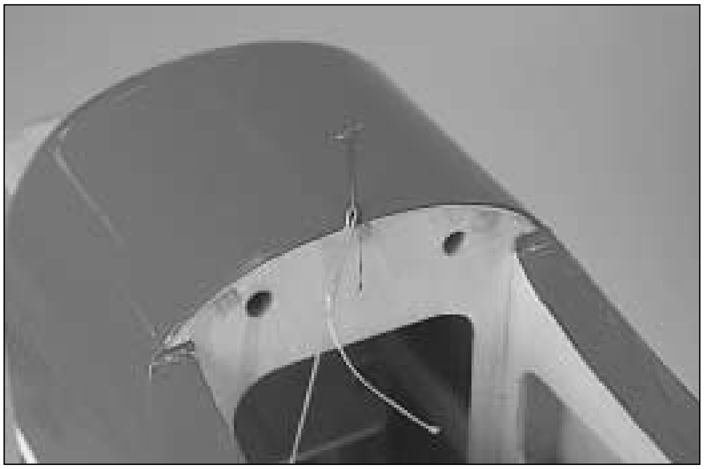
Install the Stab

❑ 1. Trim the covering from the fuse over the slots for the stab and fin and over the holes for the rudder control cables.

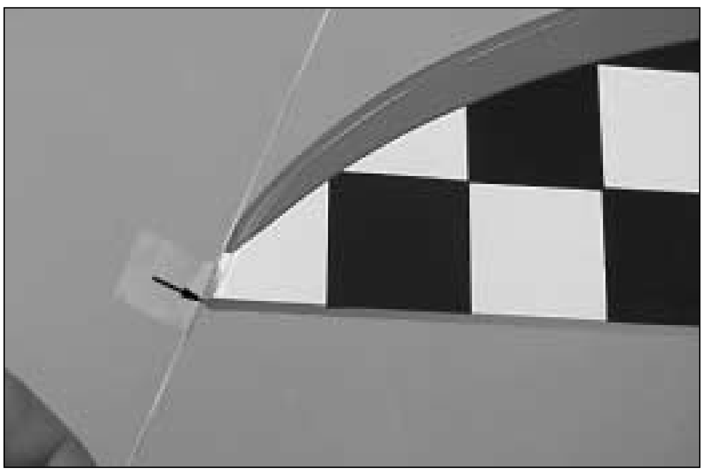


❑ 2. View the aft former through the slot for the rudder. Check to see if there is a balsa **hinge block** glued to the former for the bottom rudder hinge. If there isn't one, make a 1/4" x 1/4" x 1-1/2" (or a similar size) hinge block from a balsa stick and glue it into position as shown in the sketch.

❑ 3. Temporarily install the stab in the fuse. At the trailing edge, measure the distance between the tips and the fuse. Position the stab until both measurements are equal and the trailing edge of the stab is centered.



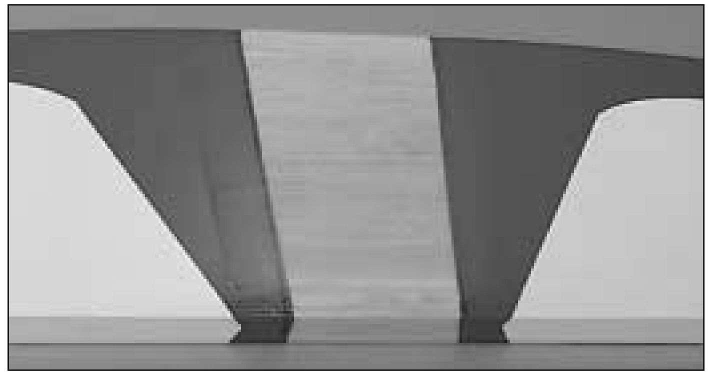
❑ 4. Turn the fuse upside-down. Stick a T-pin through the bottom of the fuse centered over the middle stringer. Tie a small loop in one end of a 50" piece of non-elastic string such as monofilament or Kevlar fishing line. Slip the loop in the string over the T-pin.



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

❑ 6. Use a fine-point felt-tip pen such as a Top Flite® Panel Line Pen (TOPQ2510) to mark the outline of the fuse onto the top and bottom of the stab.

❑ 7. Remove the stab. Use a sharp, new #11 blade to trim the covering from the stab along the lines you marked. The same as when you cut the covering from the wing, use care to cut **just through the covering**, thereby not cutting into the wood. **Important:** Cutting into the balsa will weaken the stab which could cause it to break during flight. Using a sharp blade reduces the pressure required to cut the covering, thereby reducing the chance of cutting into the balsa.



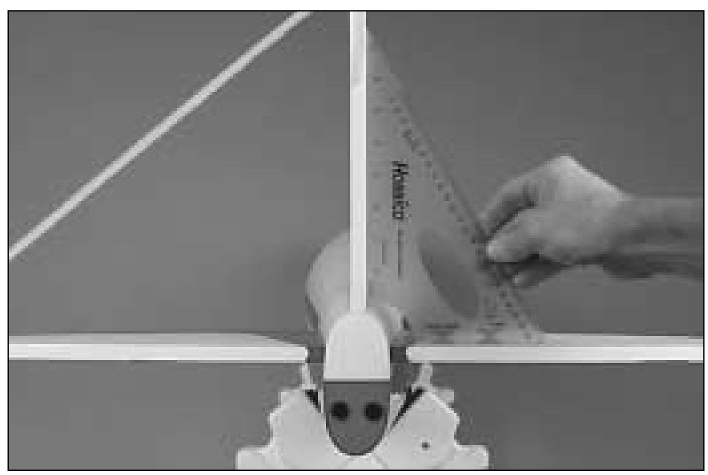
❑ 8. Peel the covering from the stab. Remove any ink with a piece of a tissue dampened with denatured alcohol.

❑ 9. Thoroughly coat all joining areas of the stab and fuse with 30-minute epoxy. Reinsert the stab into the fuse. Wipe away excess epoxy using tissue dampened with denatured alcohol. Center the stab the same way you did before (measuring the distance from side to side and using the pin-and-string). Do not disturb the fuse until the epoxy has fully hardened.

Install the Fin

❑ 1. Test fit the fin into the fuse. Be certain the trailing edge is even with the aft end of the fuse. If the fin cannot be positioned far enough aft to achieve this, trim the bottom of the trailing edge of the fin.

❑ 2. The same as you did the stab, draw a line around the fin where it meets the fuse. Remove the fin and carefully cut, then remove the covering.



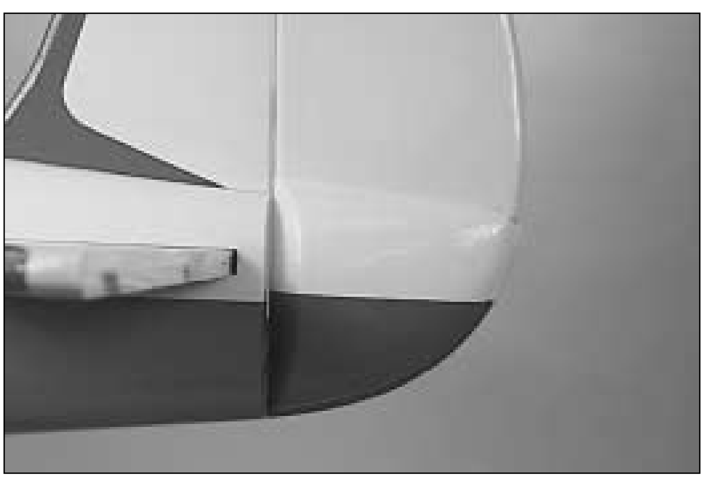
❑ 3. Use 30-minute epoxy to glue the fin to the fuse. Before the epoxy hardens, use a Hobbico® Builder's Triangle (HCAR0480) to check if the fin is perpendicular to the stab. If necessary, use masking tape to pull the tip of the fin to one side or the other until it is "square."

❑ 4. The same as you did when hinging the ailerons, drill a 3/32" hole, 1/2" deep in the center of the hinge slots in the stab, fin, elevators and rudder. Cut the covering from the hinge slots, then cut nine hinges from the remainder of the CA hinge strip.

❑ 5. There should be **four** hinge slots for the rudder—three in the fin and one in the fuse. If there isn't one in the fuse, cut a hinge slot about 1/2" from the bottom. Cut a corresponding hinge slot in the rudder.

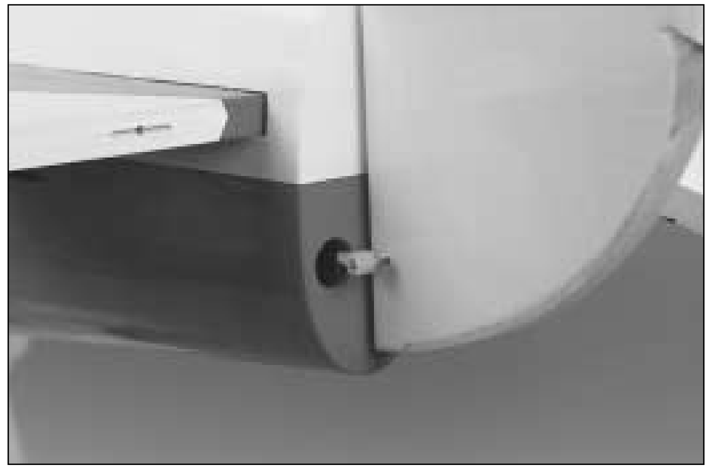
❑ 6. Use coarse sandpaper to roughen the joining edges of both halves of the molded plastic **rudder fairing**. Use small clamps to hold the fairing together, then drip a small amount of thin CA along the seams on the inside. Allow to harden.

❑ 7. Test fit the rudder fairing to the rudder. If necessary, trim the rudder to accommodate the fairing so it will go on all the way.



❑ 8. Test fit the rudder and fairing to the fin with the hinges. Cut a slot in the front of the fairing to accommodate the bottom rudder hinge.

Now that we've fit the rudder fairing, let's set it aside and hook up the rudder. The rudder fairing will be permanently mounted after the controls are hooked up.



❑ 9. Cut the covering from the hole in both sides of the rudder. Thread the 6-32 x 1-1/2" threaded rod into the rudder until it is centered. Thread a 6-32 nylon torque rod connector onto both ends of the rod until the top of the connectors are even with the ends of the rod. Once again temporarily fit the rudder to the fin. If the connectors do not align with the holes in the back of the fuse, enlarge the holes as necessary.

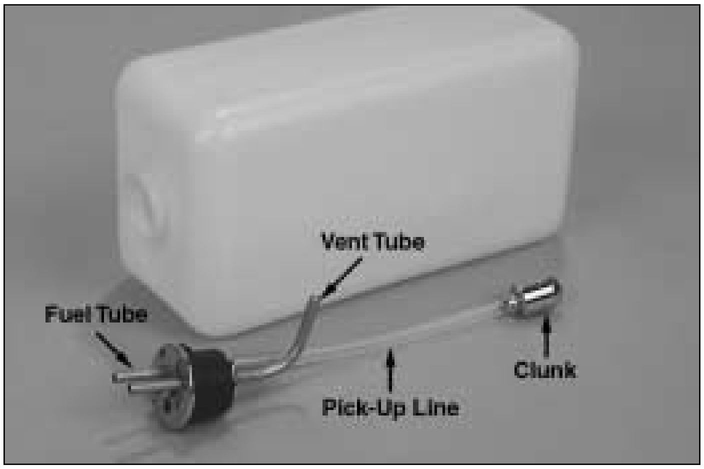
HOOK UP THE CONTROLS

Connect the Pushrods

Before the forward and aft servo trays can be mounted, first the fuel tank has to be installed. But before that can be done, the blind nuts for the engine mount should be installed in the back of the firewall.

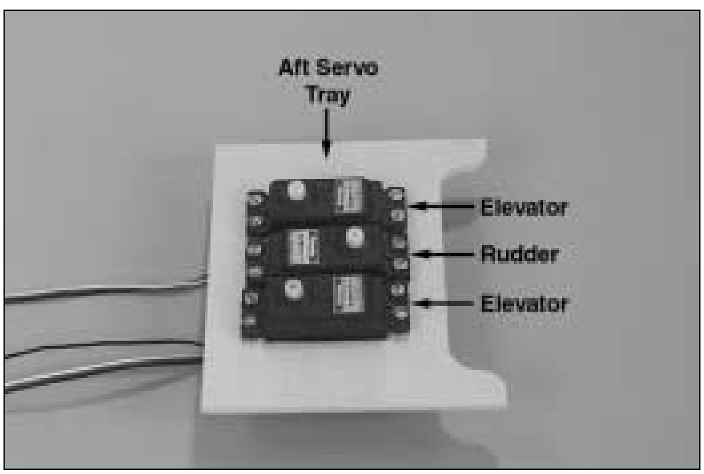
❑ 1. Cut out the **engine mount bolt pattern template** provided on page 27. Align the lines on the template with the lines scribed into the firewall. Drill 7/32" holes through the firewall for the 8-32 blind nuts.

❑ 2. Install the 8-32 blind nuts in the back of the firewall using an 8-32 x 1-1/4" socket head cap screw (SHCS) and #8 washers to pull the blind nuts all the way in.



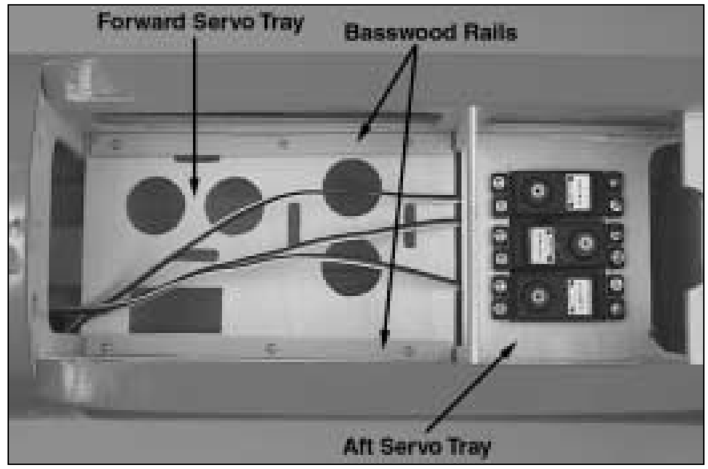
❑ 3. Assemble the fuel tank. Arrange the stopper and tubes as shown in the photo, then fit them into in the tank. Tighten the screw to expand the stopper, thus sealing the tank. Be certain the fuel line weight (clunk) at the end of the fuel line inside the tank does not contact the rear of the tank.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

❑ 4. Install the fuel tank so the neck fits through the hole in the firewall. Be certain that you have installed the tank so the vent tube inside the tank is pointing upward. Use #64 rubber bands (not included) to hold the tank to the tank floor.



❑ 5. Test fit the rudder servo and both elevator servos in the 1/8" plywood **aft servo tray**. Make adjustments if necessary to the tray to accommodate your servos. Drill 1/16" holes in the tray for mounting the servos, then add a few drops of thin CA to the holes and allow to harden. Mount your servos.

❑ 6. Before installing the 1/8" plywood **forward servo tray**, use a pin to poke a hole through the fuselage sheeting at the **middle** of the **bottom edge** of the hardwood wing strut mounting blocks on both sides of the fuse. The hole will be a future reference for mounting the wing struts later on.



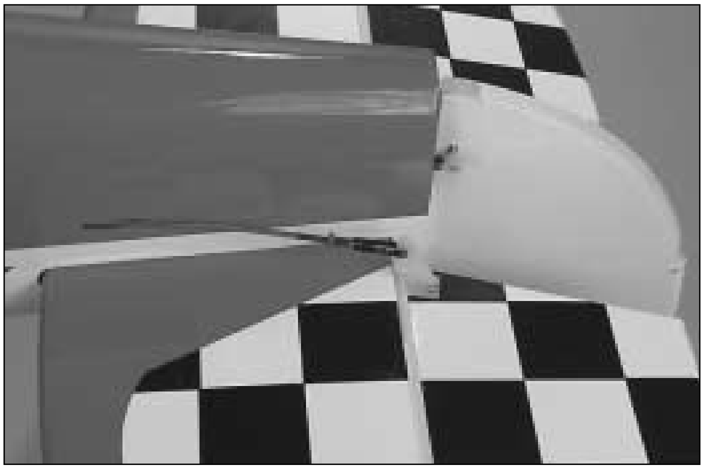
Refer to this photo for the following two steps.

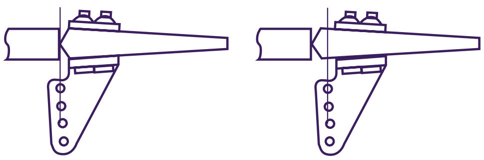
❑ 7. Securely glue the aft servo tray to the crutches using epoxy (it may be easier to do this without the servos in the tray). For additional strength, mix Great Planes Pro Milled Fiberglass (GPMR6165) into the epoxy. Use clamps to hold the aft servo tray in position until the epoxy hardens.

❑ 8. Removal of the fuel tank will not be possible after the forward servo tray is glued into position. If you would like to be able to remove the fuel tank after the forward servo tray is installed (for future maintenance to the tank), make the forward servo tray removable. This can be done by using epoxy to glue 3/16" x 3/8" x 6-3/8" (or a similar size) basswood rails (not supplied) to the fuse crutches. Drill three 3/32" holes through both rails before gluing them into position. Use #2 x 1/2" screws (not supplied) to secure the tray to the rails. If you prefer not to make the forward servo tray removable, use epoxy to glue it into position the same way you did the aft servo tray.

❑ 9. Connect the rudder servo to the rudder using the pull-pull cable system.

❑ 10. Cut the covering from the elevator guide tube exits in both sides of the fuse. Make two **elevator pushrods** by threading a 4-40 nut and a 4-40 clevis onto two 4-40 x 36" threaded one-end pushrods. Insert the pushrods into the guide tubes with the clevises on the aft end.





Correct Incorrect

❑ 11. Connect the clevis on the end of both pushrods to the outer hole of a large control horn. Bend the pushrods as necessary—but as little as possible—to position the control horns on the elevator as shown in the sketch. Drill 3/32" holes through the elevators, then mount the horns with 2-56 x 3/4" SHCS and the nylon plate that came with the control horn.

❑ 12. Cut the front end of the pushrods to the correct length, then read the following Expert Tip and solder a clevis to the end of both pushrods. Connect the pushrods to the elevator servos. If you prefer to solder the clevises to the pushrods out of the model, you will have to slightly straighten the bends you made before reinserting the pushrods through the guide tubes.

EXPERT TIP

How to solder.

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

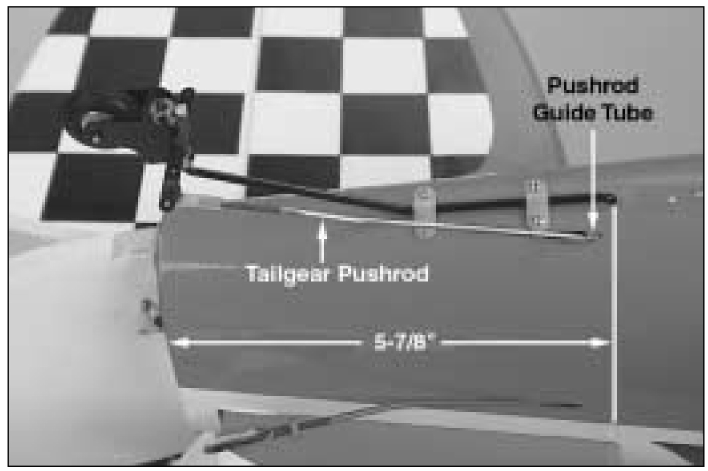
B. Use coarse sandpaper to thoroughly roughen the end of the pushrod where it is to be soldered.

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 rusting.

Mount the Tailgear



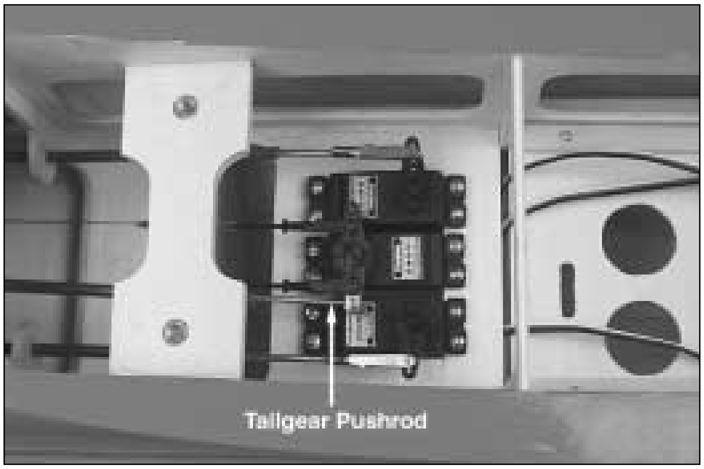
Refer to this photo while mounting the tail gear.

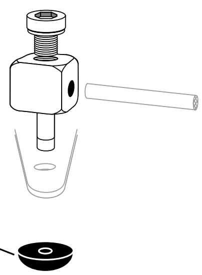
❑ 1. Drill a 1/8" hole through the center of the bottom of the fuse for the tail gear wire 5-7/8" from the aft end. **Optional:** Use a 5/32" brass tube sharpened at one end to drill the hole. Cut 1" from the end of the brass tube and glue it into the hole. This will provide a bearing for the tail gear wire.

❑ 2. Insert the tail gear wire into the hole (or brass tube). Keeping the tail gear wire centered, place two nylon hump-straps on the wire where shown in the photo. Drill 1/16" holes for the screws that will hold the straps into position. Add a few drops of thin CA to the holes and allow to harden. Mount the straps to the fuse with four #2 x 1/2" screws.

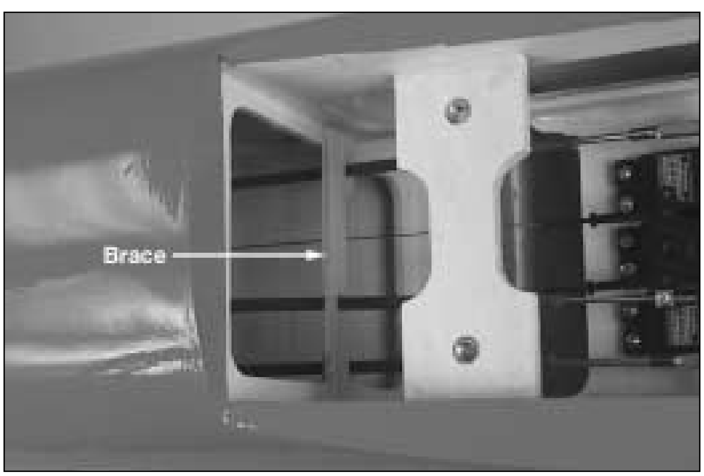
❑ 3. Drill a 3/16" hole (or use a 3/16" brass tube sharpened at the end) through the bottom of the fuse in alignment with the arm on the right side of the tail gear. Roughen one end of the 3/16" x 36" **pushrod guide tube**. Guide the tube through the fuse, so the roughened end is in the hole you cut. Glue the tube into position. Trim the end of the tube so it is even with the bottom of the fuse.

❑ 4. Cut the front of the guide tube about 1-1/2" short of the rudder servo arm. Save the piece you just cut off for the throttle. Make the **tail gear pushrod** from the 2-56 x 36" wire by bending the threaded end to join the steering arm on the right side of the tail gear. Connect the pushrod to the tail gear with a nylon ball link, a 0-80 threaded ball and a 0-80 nut and a small drop of threadlocker.



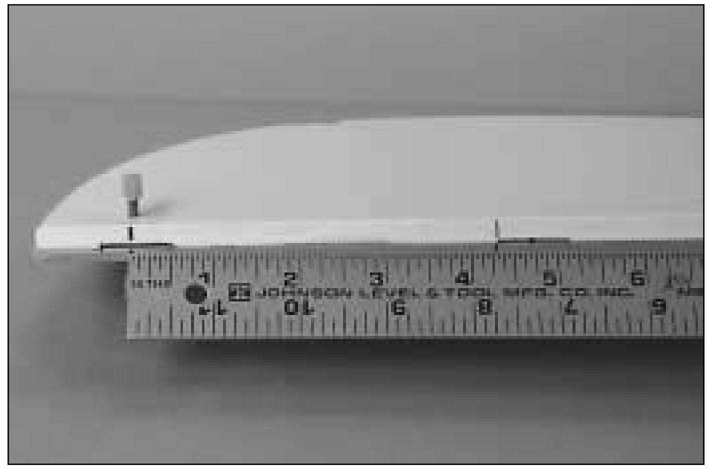


❑ 5. Cut the other end of the wire to the correct length and connect it to the rudder servo arm as shown in the sketch with a brass Quick Connector body, a nylon retainer and a 4-40 x 1/8" screw.



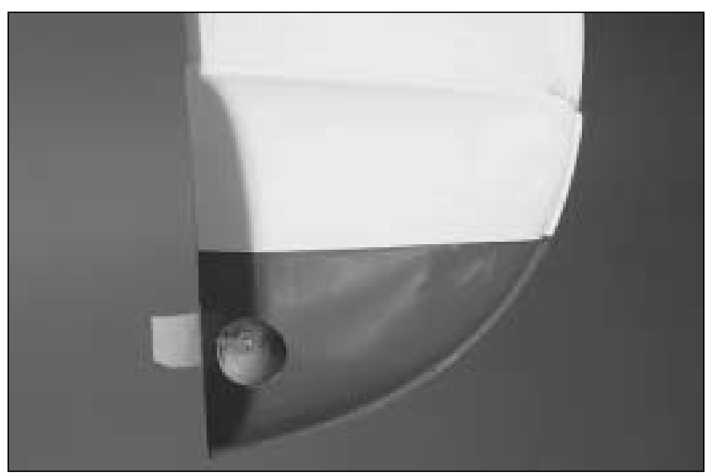
❑ 6. Make a balsa or plywood brace for the front end of the tail gear guide tube. Temporarily disconnect the pushrod from the servo and slide the brace over the guide tube. Connect the pushrod, then glue the brace into position as shown in the photo.

Join the Tail Fairings

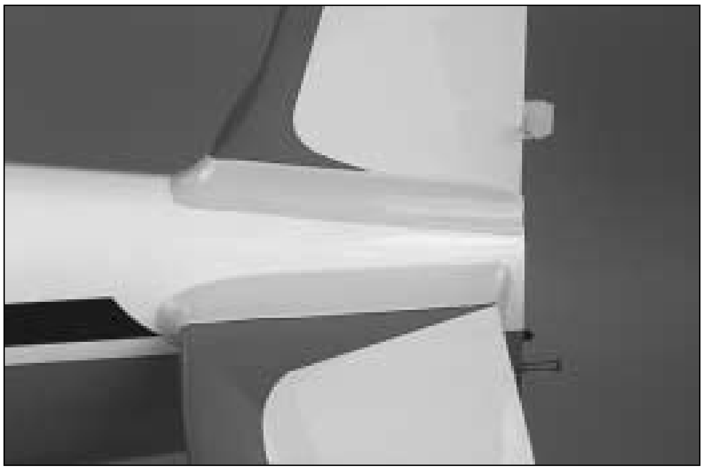


❑ 1. Disconnect the clevises from the rudder and remove the rudder from the fin. Measure the distance from the bottom of the third hinge slot to the threaded rod that goes through the rudder. As you can see in the rudder in the photo, the distance is about 4-1/4".

❑ 2. Remove a torque rod horn and the threaded rod from the rudder. Temporarily fit the rudder fairing over the rudder. Using the measurement taken in the previous step, trim the rudder fairing as necessary to accommodate the threaded rod, torque rod horns and the clevises.



❑ 3. Making certain the leading edge of the rudder fairing is parallel with the leading edge of the rudder, glue the rudder fairing into position. Install the threaded rod. Add a few drops of thin CA and allow to harden. Thread on the torque rod horns.

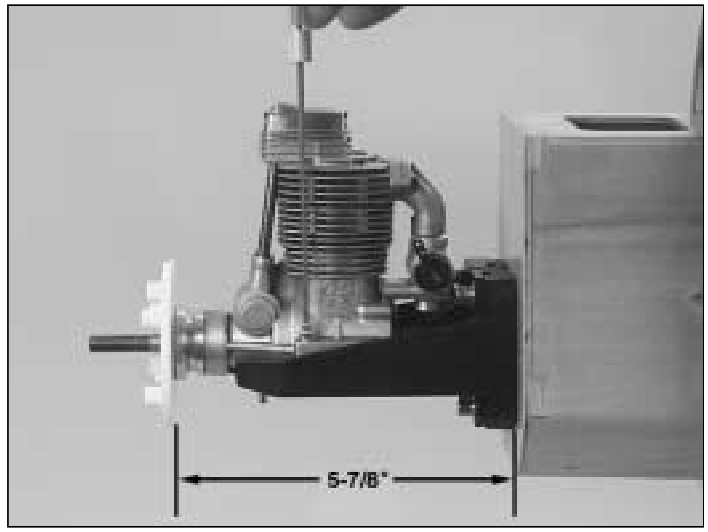


❑ 4. Use curved-tip scissors or a hobby knife to carefully trim the molded **fin** and **stab fairings**. Note that the longer fairing is the one for the fin. Trim the fairings as necessary for a good fit, then carefully glue them to the fuse using thin CA sparingly.

❑ 5. Join the rudder to the fin and the elevators to the stab with the hinges. The same way you did the ailerons, use thin CA to glue in the hinges. Connect the rudder cables to the rudder and connect the elevator pushrods to the elevators.

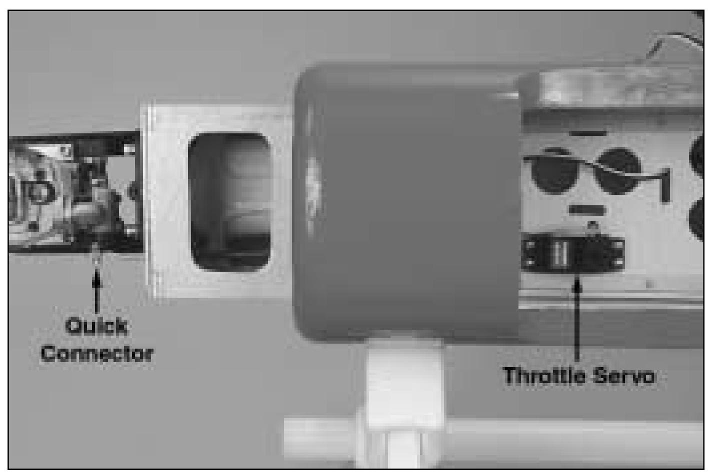
Mount the Engine

❑ 1. Use four 8-32 x 1-1/4" SHCS, #8 lock washers and #8 flat washers to mount the Great Planes 60-120 Adjustable Engine Mount to the firewall, simultaneously adjusting the mount to fit your engine. Be certain the mount is centered on the vertical line on the firewall. Tighten the screws and make certain they do not contact the fuel tank. If they do, move the tank slightly aft, or add additional washers to the screws.



❑ 2. Mount the back plate of the spinner to the engine. Position the engine on the mount, so the back plate will be 5-7/8" from the firewall. This will provide the correct clearance between the spinner and the cowl. Temporarily hold the engine to the mount with clamps. Use a Great Planes Dead Center™ Hole Locator (GPMR8130—shown in the photo) or another suitable method to mark the locations of the holes for mounting the engine to the engine mount.

❑ 3. Drill #29 (or 9/64") holes through the engine mount at the marks you made, then tap 8-32 threads into the holes. Mount the engine to the mount with four 8-32 x 1" SHCS screws and #8 lock washers.



Refer to this photo while hooking up the throttle.

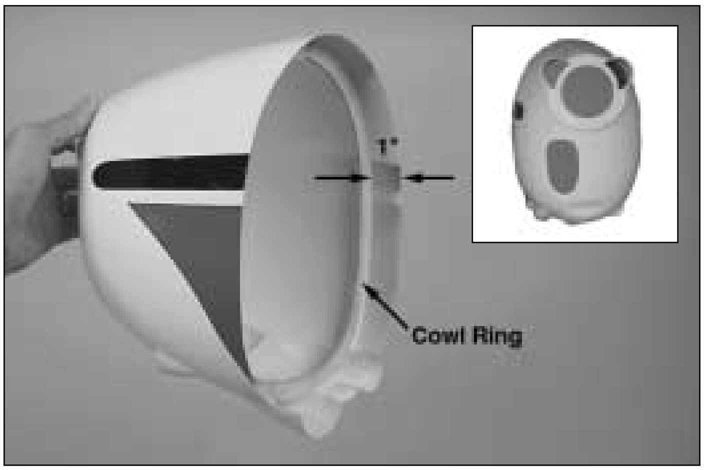
❑ 4. Mount the throttle servo in the servo tray the same way you mounted the rudder and elevator servos (drill 1/16" holes, harden the holes with thin CA).

❑ 5. Place a brass Quick Connector body on the carb arm of your engine and secure it with a nylon retainer. Drill a 3/16" hole through the firewall in alignment with the Quick Connector. Cut the remainder of the tail wheel guide tube you saved to the correct length for the throttle pushrod guide tube. Use coarse sandpaper to roughen the tube so glue will adhere. Guide the tube through the hole you drilled in the firewall for the throttle and glue it to the firewall.

❑ 6. Make the **throttle pushrod** from a 2-56 x 12" threaded one-end pushrod and connect it to the throttle servo with a nylon clevis. Cut the other end to the correct length and fasten it to the Quick Connector body with a 4-40 x 1/8" SHCS.

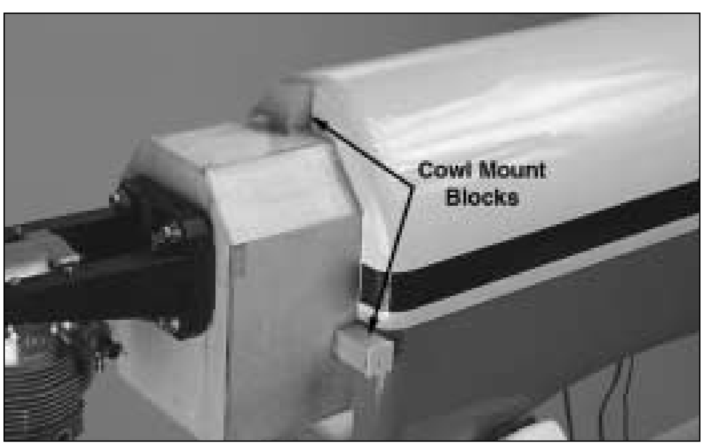
Mount the Cowl

❑ 1. Cut the holes in the front of the cowl for the engine crank shaft and for the main air inlet. A Dremel with a carbide cutter, followed by a drum sander, works the best. Use protective goggles and a particle mask when cutting fiberglass. Follow-up by sanding the openings to remove sharp edges.



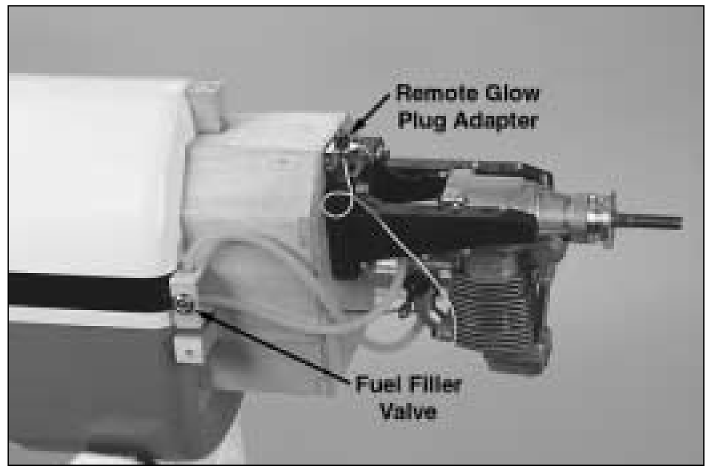
❑ 2. Use 30-minute epoxy mixed with lightweight Top Flite Microballoons Filler (optional, TOPR1090) to glue the 1/8" plywood **cowl ring** inside the cowl 1" from the aft edge.

❑ 3. Refer to the following photo, then use 30-minute epoxy to glue the three 9/16" x 9/16" x 1" **cowl mount blocks** to the fuselage as shown. **Note:** The end-grain of the wood blocks readily absorbs epoxy, so first coat one end of each block with epoxy and let them sit for a few minutes. Apply a second, then a third coat of epoxy before positioning the blocks on the fuse and clamping them into position.



❑ 4. Position the cowl over the cowl mount blocks on the fuse. If necessary, trim the blocks to accurately fit the cowl. As you can see in the photo, 1/8" leftover plywood glued to the ends of the two side cowl mount blocks was required.

Refer to the following photos while mounting the cowl.



❑ 5. Position the cowl on the fuse and mount the spinner. Align the front of the cowl with the spinner and the back of the cowl with the fuse. With the cowl in alignment, drill 3/32" holes through the cowl into the cowl mount blocks. Remove the cowl and enlarge the holes **in the cowl only** with a 1/8" drill.

❑ 6. Screw a #4 x 5/8" screw into each cowl mount block, then remove. Add a few drops of thin CA to the holes and allow to harden. Test fit the cowl to the fuse with three #4 x 5/8" screws and #4 washers.

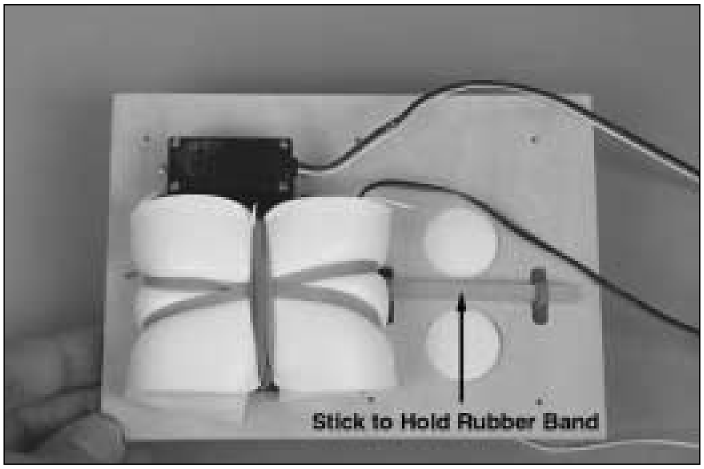
❑ 7. Fashion a mount for a fuel filler valve, should you decide to use one, from 1/8" plywood (not included). As shown in the photo, we used a Great Planes Easy-Fueler™ for glow fuel (not included with this kit, GPMQ4160). We also used a Model Products #021 Remote Single Lock remote glow plug adapter (MODP1221). Note that the filler valve is positioned behind the ply cowl ring and the front of the fuse to allow easy installation of the cowl.

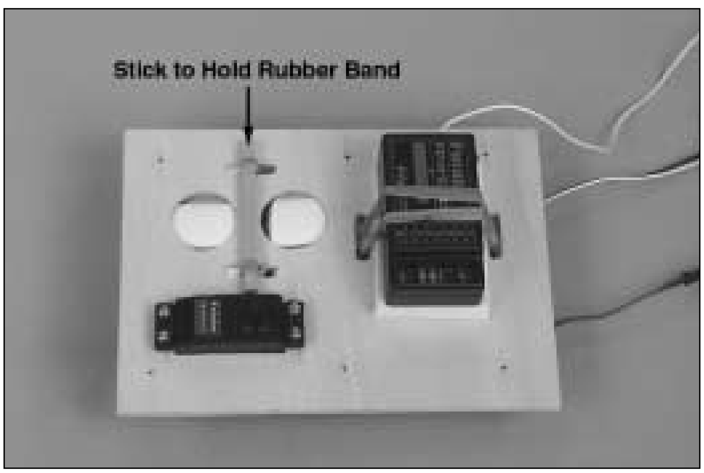
❑ 8. Cut holes in the cowl where necessary for the engine exhaust/muffler, needle valve, glow plug igniter (or remote glow plug hook up) and fuel filler.

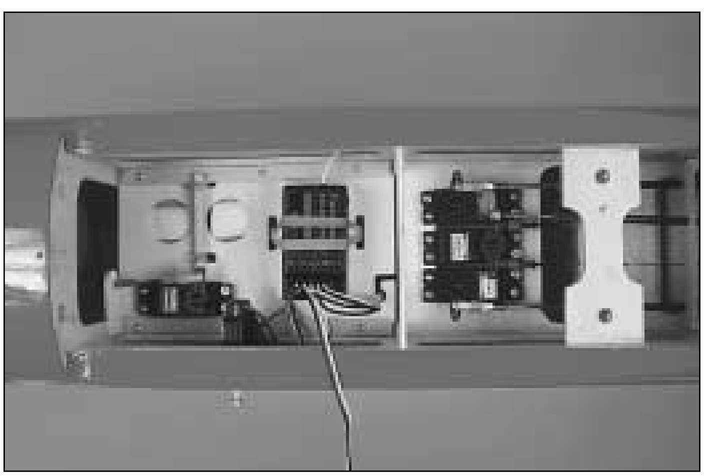
❑ 9. Use epoxy or fuelproof paint to coat bare wood such as the cowl ring, the cowl mounting blocks and the mount for the fuel filler valve.

❑ 10. Consider the amount of air entering and exiting the cowl for engine cooling. If you feel it necessary, cut additional holes in the cowl for cooling. Our prototype, with the O.S.® MAX .91 FS, required no additional holes in the cowl for cooling, but other engines may have different requirements. Cowled-in engines should operate at ***slightly*** rich needle valve settings to be certain there is an adequate fuel/oil supply which aids in engine cooling and reliability.

Finish Radio Installation



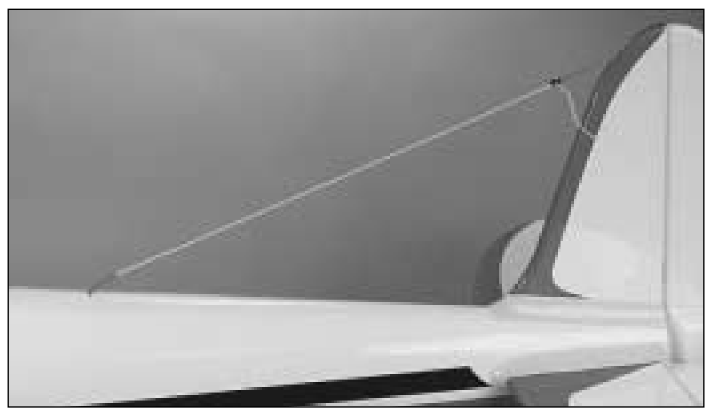


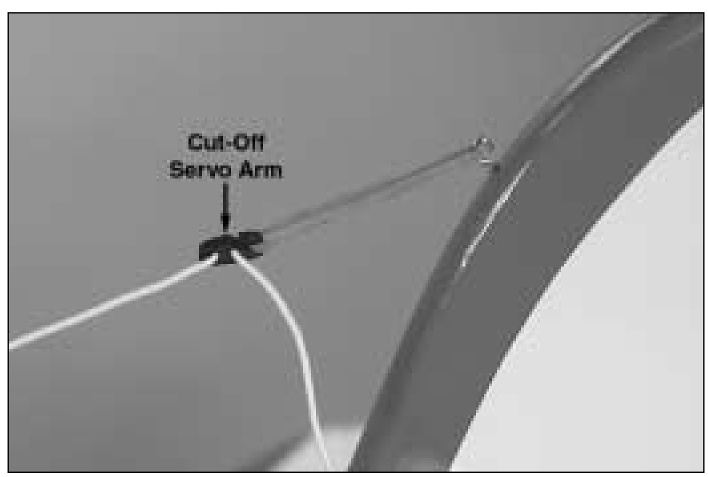


❑ 1. Connect the servos, aileron extension cord and on/off switch to the receiver. Wrap the receiver and battery pack in at least 1/4" of R/C foam rubber and securely mount them in the fuse using Velcro® Hook & Loop straps (GPMQ4480), rubber bands or another suitable, yet secure method. Simply stuffing them into place with additional foam is not sufficient. As you can see in the photos, we removed the forward servo tray and used #64 rubber bands strapped to hardwood sticks to hold the battery pack and receiver. The battery pack was mounted to the top of the tray, so it would not interfere with the throttle servo. **Note:** With the battery pack and receiver mounted where shown, our prototype Ryan with an O.S. MAX .91 FS balanced within the recommended C.G. range shown on page 20 without additional ballast. If, upon checking the C.G., you find that the model is nose-heavy or tail-heavy, you could relocate the battery pack to minimize or eliminate any additional ballast required.

❑ 2. Mount the on/off switch and an external charge jack, should you decide to use one, on the side of the fuselage opposite the engine exhaust. As shown in the photo we use a Great Planes Switch & Charge Jack Mounting Set (GPMM1000). The external charge jack allows us to monitor the voltage of the receiver battery pack before each flight without removing the wing.

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





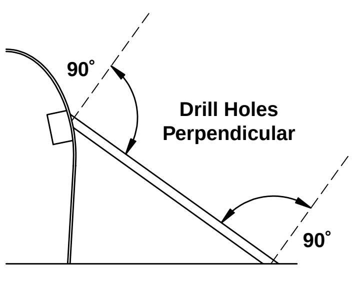
❑ 4. Extend the receiver antenna and guide it out of the fuselage and connect it to the fin. Be certain there is a strain relief on the antenna to keep stress off the solder joint inside the receiver. On our prototype we drilled a 1/8" hole through the top stringer aft of the cockpit and routed the antenna through a piece of tubing exiting the fuse. The other end of the antenna was connected to a hook made from a cut-off servo arm connected to a small rubber band and a T-pin inserted into the leading edge of the fin.

FINAL SCALE DETAILS

Mount the Wing Struts

Refer to this photo while mounting the wing struts.

❏ 1. Bolt the wing to the fuselage with the 1/4" x 2" nylon wing bolts. Bevel both ends of one of the balsa **wing struts** to match the left side of the fuse and the wing. Note that the top of the strut should be positioned so that when a hole is drilled through it and the fuse, the hole will go through the strut block inside (remember you made a small hole through the fuse with a pin indicating the location of the block).



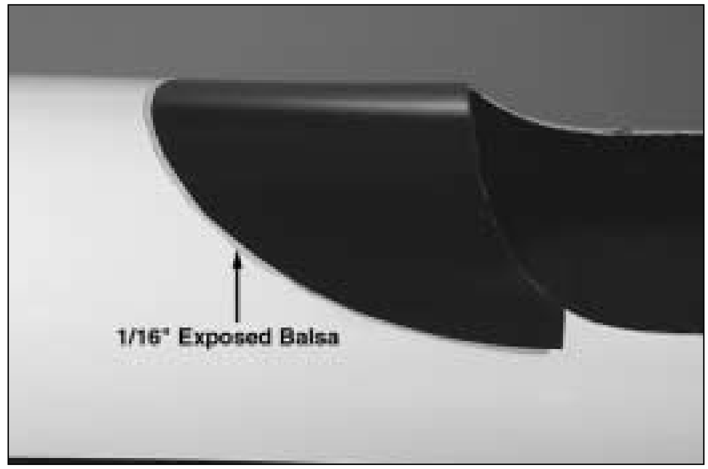
❏ 2. Hold the strut in position, then drill 3/32" holes through both ends of the strut into the mounting blocks in the wing and the fuse. The holes should be perpendicular to the top of the strut. Enlarge the holes in the strut only with a 1/8" drill.

❏ 3. Add a few drops of thin CA to both ends of the strut to harden the holes and to fuelproof the exposed balsa. Mount the strut to the fuse and wing with two #4 x 5/8" screws.

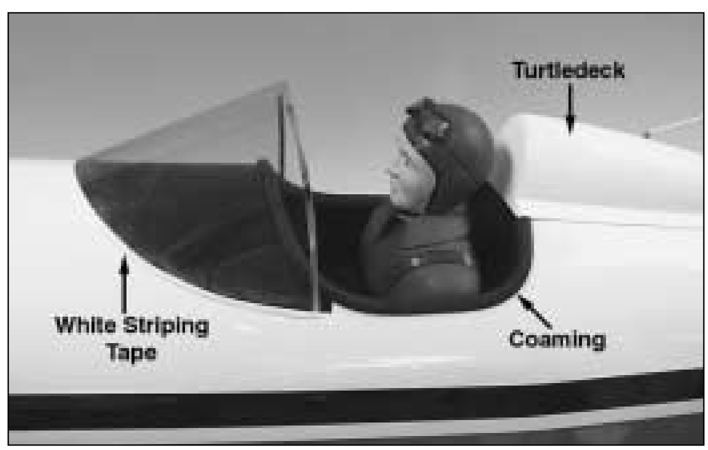
❏ 4. Mount the other strut to the right side of the fuse the same way. Mark the struts as *right* and *left* in an inconspicuous location, so you will know how to put them back on when you get to the flying field.

Finish the Cockpit

❏ 1. Use black, fuelproof paint to coat the inside of the cockpit. After the paint dries, place the instrument panel sticker on the instrument panel.



❏ 2. Have a helper hold the clear plastic **windscreen** in position on the fuse. Use a fine-point felt-tip marker to draw a line on the fuse around the front edge of the windscreen. Use a hobby knife with a new #11 blade to cut through the covering along the line you marked. If you wish to make a flat black anti-glare panel (as shown in the photo), remove the portion of covering behind the line you cut. Use the piece of covering as a template to cut another piece of covering from flat black MonoKote® film (or use fine sandpaper to scuff a piece of regular black MonoKote film). Iron the "anti-glare" panel you cut from the black MonoKote film into position, leaving a 1/16" gap of exposed balsa between the black and the white. If you are not going to make a black anti-glare panel, simply cut the covering 1/16" in front of the line you already cut. Remove the 1/16" strip of covering from the fuse, thereby leaving a 1/16" strip of exposed balsa that the windscreen can be glued to.



Refer to this photo while you are finishing the cockpit.

❏ 3. Use a #11 blade to split the rubber tubing used for the **cockpit coaming**. Fit the coaming around the cockpit with the ends joining at the rear but don't glue it into position. It isn't necessary for the ends of the coaming to meet up, because it will be trimmed to accommodate the turtledeck.

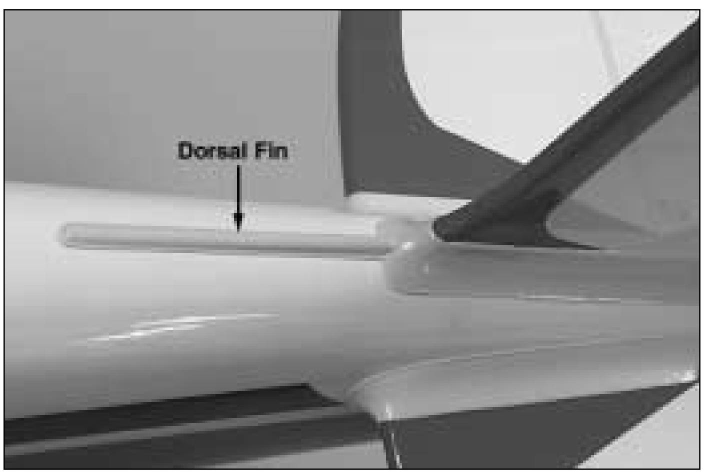
❑ 4. Trim the molded plastic **turtledeck** to fit the fuse, then temporarily fit it into position. Trim the cockpit coaming to accommodate the turtledeck. If you plan to route the receiver antenna through the top of the fuse, cut a hole in the turtledeck to pass the antenna. Glue the turtledeck to the fuse with thin CA.

❑ 5. If you prefer, you can glue the coaming to the fuse with thin CA, but the coaming stays put by itself, so it isn't really necessary to glue it.

❑ 6. Glue the windscreen to the fuse. If **great** care is used and it is applied **sparingly**, thin CA can be used for this. If too much thin CA is used, fogging of the canopy and covering will be the result. Another type of adhesive recommended is J & Z Products Z R/C 56 canopy glue (JOZR5007), but it dries in a few hours, so the canopy will have to be taped into position while the glue is drying.

❑ 7. Apply Great Planes 1/4" white Kwik Stripe (GPMQ1610) striping tape around the base of the windscreen where it meets the fuse. For an added touch, apply 1/8" chrome striping tape (GPMQ10884) around the aft edge of the windscreen.

❑ 8. Assemble, paint, then glue a pilot in the cockpit. We used a Williams Bros. #62500 1/4-scale Standard pilot (WBRQ2625) with 1/4" balsa sticks glued between the base of the pilot and the cockpit floor to raise him 1/4".



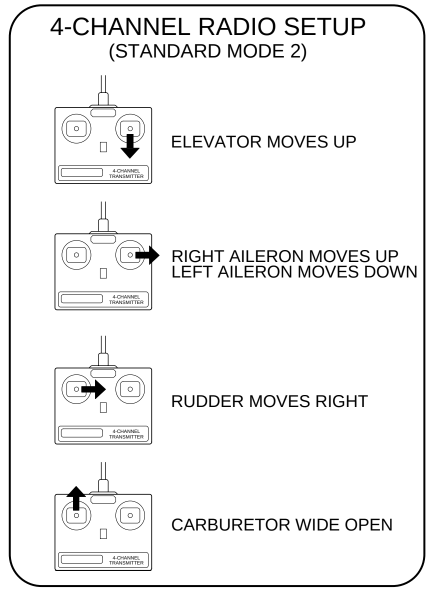
❑ 9. Cut out the molded **dorsal fin**, then glue it into position with thin CA as shown in the photo.

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.

❑ 2. If necessary, adjust the clevises on the pushrods so the control surfaces are centered.



❑ 3. Make certain that the control surfaces and the carburetor respond in the correct direction as shown in the diagram above. If any of the controls respond in the opposite direction, change their direction by using the servo reversing feature in your transmitter. **Note:** Due to the fact that the elevator pushrods are connected to opposite sides of the elevator servos, the servos must be mixed electronically (not with a “Y” connector).

Set the Control Throws

Use a Great Planes AccuThrow™ (or a ruler) to accurately measure and set the control throw of each control surface as indicated in the chart that follows. If your radio does not have dual rates, we recommend setting the throws at the low rate setting.

NOTE: Throws are measured at the **widest part** of the elevators, rudder and ailerons. You will probably not be able to achieve the recommended rudder control throws mechanically (by changing the mounting locations of the cables on the servo arm and rudder). You will have to use the ATV in your transmitter. In our transmitter, we found it necessary to turn the rudder ATV down to about 70% to arrive at the correct throw.

We recommend the following control surface throws:

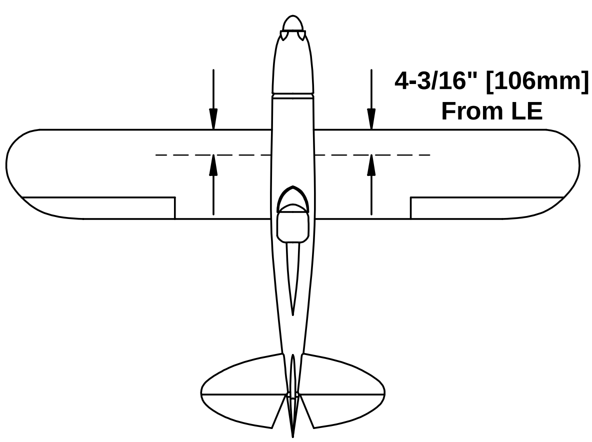
	High Rate	Low Rate
ELEVATOR:	1" [25mm] up	3/4" [19mm] up
	1" [25mm] down	3/4" [19mm] down
RUDDER:	1-9/16" [40mm] right	1-3/8" [35mm] right
	1-9/16" [40mm] left	1-3/8" [35mm] left
AILERONS:	3/4" [19mm] up	1/2" [13mm] up
	3/4" [19mm] down	1/2" [13mm] down

IMPORTANT: The balance point and control surface throws listed in this manual are the ones at which the Ryan flies best. Set up your aircraft to those specifications. If, after a few flights, you would like to adjust the throws or C.G. to suit your tastes, that is fine. Too much control surface throw can make your model difficult to control or force it into a stall, so remember "more is not always better."

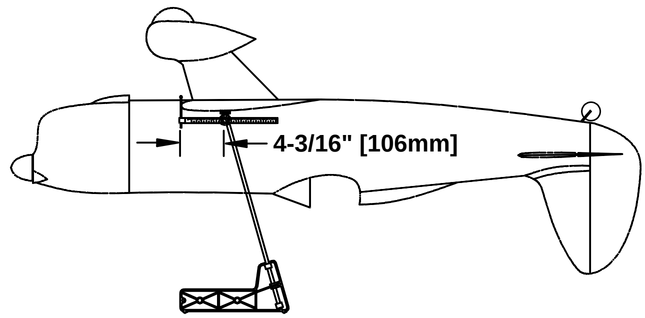
Balance the Model

NOTE: This section is VERY important and must NOT be omitted! A model that is not properly balanced will be unstable and possibly unflyable.

At this stage your 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. Accurately mark the C.G. on the top of the wing on both sides of the fuselage. **The C.G. is located 4-3/16" [106mm] back from the leading edge of the wing.** This is where your model should balance for your first flights. Later, you may wish to experiment by shifting the C.G. up to 1/4" [6.4mm] forward or back to change the flying characteristics. Moving the C.G. forward may improve the smoothness and arrow-like tracking, but it may then require more speed for takeoff and make it more difficult to slow down for landing. Moving the C.G. aft makes the model more agile with a lighter and snappier feel. In any case, start at the location we recommend and do not at any time balance your model outside the recommended range.



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

❑ 3. If the tail drops, the model is "tail heavy" and weight must be added to the nose to balance. If the nose drops, the model is "nose heavy" and weight must be added to the tail to balance. 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 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

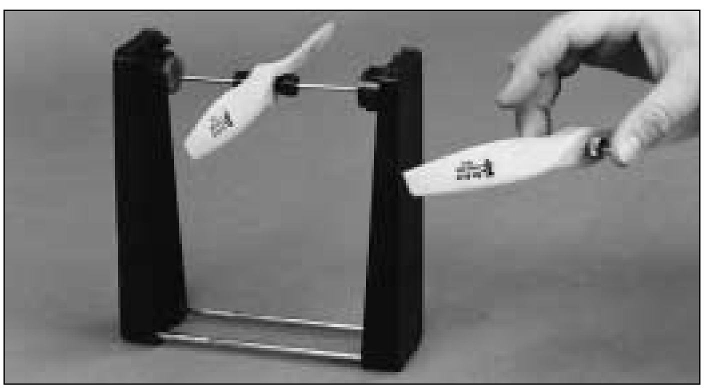
No matter if you fly at an AMA sanctioned R/C club site or if you fly somewhere on your own, you should always have your name, address, telephone number and AMA number on or inside your model. It is **required** at all AMA R/C club flying sites and AMA sanctioned flying events. Fill out the identification tag on page 27 and place it on or inside your model.

Charge the Batteries

Follow the battery charging procedures in your radio instruction manual. You should always charge your transmitter and receiver batteries the night before you go flying and at other times as recommended by the radio manufacturer.

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

Balance Propellers



Carefully balance your propellers before you fly. An unbalanced prop is 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

Follow the engine manufacturer's instructions to break-in your engine. After you run the engine on your model, inspect your model closely to make sure all screws remain tight and your pushrods and connectors are secure.

Range Check

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

ENGINE SAFETY PRECAUTIONS

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

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

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

Use safety glasses when starting or running engines.

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

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

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

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

Make all engine adjustments from behind the rotating propeller.

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

To stop a glow engine, cut off the fuel supply by closing off the fuel line or following the engine manufacturer's recommendations. Do not use hands, fingers or any other body part to try to stop the engine. To stop a gasoline powered engine, an on/off switch should be connected to the engine coil. Do not throw anything into the propeller of a running engine.

AMA SAFETY CODE (Excerpt)

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

General

1. I will not fly my model aircraft in sanctioned events, air shows, or model flying demonstrations until it has been proven to be airworthy by having been previously successfully flight tested.

2. I will not fly my model aircraft higher than approximately 400 feet within 3 miles of an airport without notifying the airport operator. I will give right of way to and avoid flying in the proximity of full scale aircraft. Where necessary an observer shall be used to supervise flying to avoid having models fly in the proximity of full scale aircraft.

3. Where established, I will abide by the safety rules for the flying site I use and I will not willfully and deliberately fly my models in a careless, reckless and/or dangerous manner.

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

9. I will not operate models with pyrotechnics (any device that explodes, burns, or propels a projectile of any kind).

Radio Control

1. I will have completed a successful radio equipment ground check before the first flight of a new or repaired model.

2. I will not fly my model aircraft in the presence of spectators until I become a qualified flier, unless assisted by an experienced helper.

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

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

IMAA SAFETY CODE (Excerpt)

Since the Great Planes Ryan STA 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 judgement 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 your first flight. Because of this, you may be more likely to overlook certain checks and procedures that should be performed after your model is built. To help avoid this, we've provided a checklist to make sure you don't overlook these important areas. Many are covered in the instruction manual, so where appropriate, refer to the manual for complete instructions. Be sure to check the items off as you complete them (that's why we call it a *check list*!).

❑ 1. Fuelproof all areas exposed to fuel or exhaust residue such as the cowl ring, cowl mounting blocks, wing saddle area, etc.

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

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

❑ 4. Extend your receiver antenna and make sure it has a strain relief inside the fuselage to keep tension off the solder joint inside the receiver.

❑ 5. Balance your model laterally as explained in the instructions.

❑ 6. Use threadlocking compound to secure critical fasteners such as the set screws that hold the wheel axles to the struts, screws that hold the carburetor arm (if applicable), screw-lock pushrod connectors, etc.

❑ 7. Add a drop of oil to the axles so the wheels will turn freely.
❑ 8. Make sure all hinges are **securely** glued in place.

❑ 9. Reinforce holes for wood screws with thin CA where appropriate (servo mounting screws, cowl mounting screws, etc.).

❑ 10. Confirm that all controls operate in the correct direction and the throws are set up according to the manual.

❑ 11. Make sure there are silicone retainers on all the clevises and that all servo arms are secured to the servos with the screws included with your radio.

❑ 12. Secure connections between servo wires and Y-connectors or servo extensions and the connection between your battery pack and the on/off switch with vinyl tape, heat shrink tubing or special clips suitable for that purpose.

❑ 13. Make sure any servo extension cords you may have used do not interfere with other systems (servo arms, pushrods, etc.).

❑ 14. Secure the pressure tap (if used) to the muffler with high temp RTV silicone, thread locking compound or J.B. Weld.

❑ 15. Make sure the fuel lines are connected and are not kinked.

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

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

❑ 18. Tighten the propeller nut and spinner.

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

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

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

❑ 22. Range check your radio when you get to the flying field.

FLYING

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.

The Ryan STA is a great flying sport airplane that flies smoothly and predictably, yet does not have the self-recovery characteristics of a primary trainer. Therefore, you must either have mastered the basics of R/C flying or seek the assistance of a competent R/C pilot to help you with your first flights.

Fuel Mixture Adjustment

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. By running the engine slightly rich, you will help prevent dead stick landings caused by overheating.

Takeoff

Before you 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 until the model rolls 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. Check all fasteners and control linkages, then top off the fuel.

When you're ready for takeoff, point the model straight down the runway and into the wind. Hold a bit of up elevator to keep the tail on the ground to maintain tail wheel steering, then gradually advance the throttle. Initially, quite a bit of right rudder may be required to counteract engine torque. 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 the torque of the engine, keeping the model heading straight. Gain as much speed as your runway and flying site will safely 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. It should be noted that with our prototype powered by an O.S. MAX .91 FS, much of the time we found ourselves taking off at only about 3/4 throttle. This isn't to say that the model jumped into the air prematurely, but if you fly your Ryan in a smooth, scale-like manner, full power may not always be required—even on takeoff!

For reassurance and to keep an eye on other traffic, 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 may be desirable for takeoff, most scale models fly well at reduced speeds.

Flight

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

When landing in a crosswind, add about five to seven "clicks" of throttle and touch-down a little faster to keep the air speed up, so the rudder will remain effective to counter the crosswind.

One final note about flying. Have a goal or flight plan in mind **every time** you put the model into the air. This can be learning a new maneuver, improving a maneuver 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 this 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. Maneuvers 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 just because of poor planning. **Remember to think.**

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

GOOD LUCK AND GREAT FLYING!

BUILDING NOTES

Kit Purchased Date: ______________________

Where Purchased: ______________________

Date Construction Started: ______________________

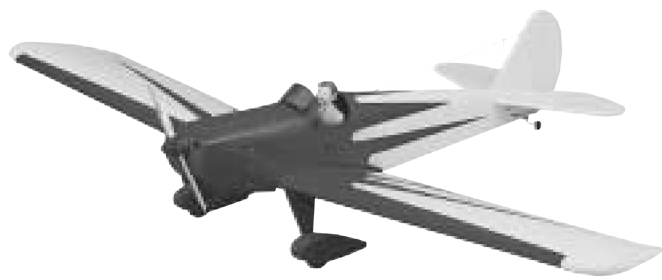
Date Construction Finished: ______________________

Finished Weight: ______________________

Date of First Flight: ______________________

FLIGHT LOG

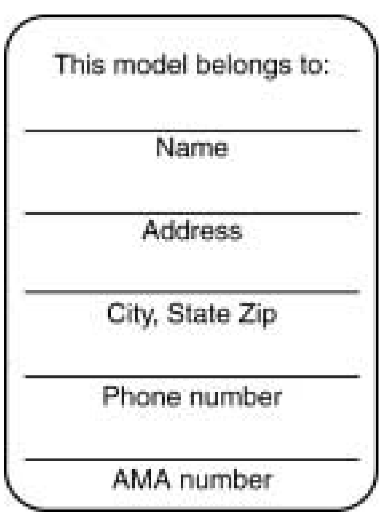
OTHER ITEMS AVAILABLE FROM GREAT PLANES



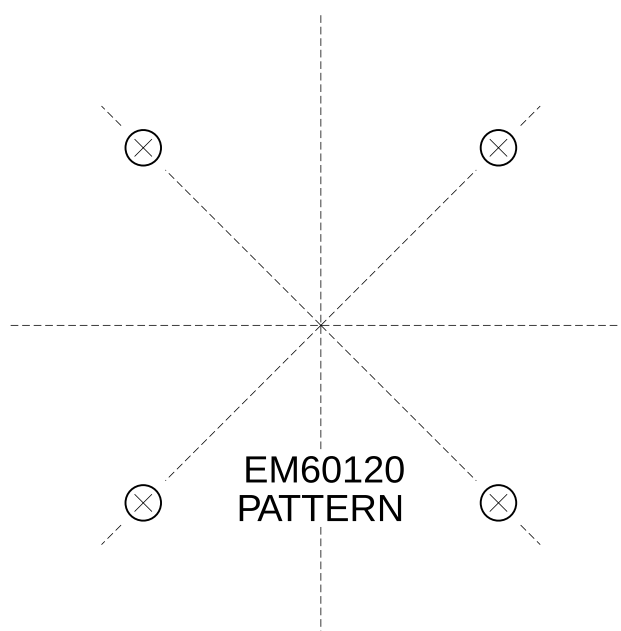
SpaceWalker ARF GPMA1300
Based on Jesse Anglin's '86 tribute to '30s homebuilts, the SpaceWalker takes only a few hours to assemble. It has a strong, wood frame; welded, steel landing gear; side plates; ABS wheel pants; windshield; and a cowl color-matched to the MonoKote covering. Smooth in flight, it blends the muscle of dual aileron servos with the aerobatic potential of a symmetrical airfoil. **Note:** Pilot figure not included.

Piper J-3 Cub ARF GPMA1310
This sport-scale model is all-wood, impressively detailed and flight-ready in as little as 15-20 hours! Surrounding the CAD-engineered framework is real woven Coverite™ 21st Century® fabric. With its dual aileron servos the Cub maneuvers well. It also lands gently and includes a prepainted fiberglass cowl, replica cylinder heads, adjustable engine mount and Great Planes-brand hardware. **Note:** Pilot figure not included.

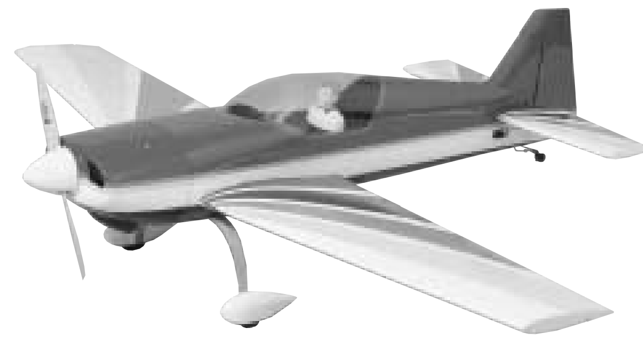
Model Identification Tag



Engine Mount Bolt Pattern Template



AT-6 Texan ARF GPMA1245
Enjoy smooth flight and easy aerobatics with this kit-quality ARF. Precision-molded, painted parts include a glass-reinforced cowl. Plus, the AT-6 offers the strength of wood...the dependability of Great Planes hardware...and the fine finish of Top Flite MonoKote film. Fixed landing gear is supplied, though wheel wells and mounting rails are built-in for retracts. **Note:** Pilot figure not included.



Giles G-202 GPMA1315
Designed to convince “kitters” that ARFs can be outstanding! Parts interlock for strength and are all-wood except for fiberglass parts factory-painted to match the preapplied MonoKote covering. Competition mounted servos (2 each for ailerons and elevators, 1 for the rudder) plus double-beveled rudder and elevator control surfaces open the way for wild, 3D stunts. **Note:** Pilot figure not included.

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