RYAN STA-M

INSTRUCTION MANUAL

A. R. F.

Almost Ready to Fly

Wingspan: 82 in [2080mm]
Wing Area: 1066 sq in [69 dm²]
Weight: 10.25 - 11.5 lbs [4650 - 5220g]
Wing Loading: 22 - 25 oz/sq ft [67 - 76 g/dm²]
Length: 60 in [1525mm]
Radio: 4-5 channel with six servos
Engine: .61 - .91 cu in [10 - 15cc] two-stroke, .91 - 1.20 cu in [15 - 20cc] four-stroke

WARRANTY

Great Planes® Model Manufacturing Co. guarantees this kit to be free from defects in both material and workmanship at the date of purchase. This warranty does not cover any component parts damaged by use or modification. **In no case shall Great Planes' liability exceed the original cost of the purchased kit.** Further, Great Planes reserves the right to change or modify this warranty without notice.

In that Great Planes has no control over the final assembly or material used for final assembly, no liability shall be assumed nor accepted for any damage resulting from the use by the user of the final user-assembled product. By the act of using the user-assembled product, the user accepts all resulting liability.

If the buyer is not prepared to accept the liability associated with the use of this product, the buyer is advised to return this kit immediately in new and unused condition to the place of purchase.

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

GREAT PLANES® MODEL MANUFACTURING COMPANY
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airsupport@greatplanes.com

GPMZ0237 for GPMA1355 V1.0

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INTRODUCTION

Congratulations and thank you for purchasing the Great Planes Ryan STA-M ARF. We at Great Planes R&D were pleased with the appearance and performance of the original red, white and black civilian Ryan STA and are just as pleased with this military “M” version. In fact, a couple of minor improvements make this plane our best ARF yet. Although not intended to be an all-out scale model, the Ryan's classic design and two-cockpit layout make it tempting for enthusiastic modelers to spend a few extra hours adding even more details (such as cockpit controls, flying wires, panel lines, etc.).

When it's time to fly your STA-M, you'll be as pleased with its performance as you are with its appearance. During test flying, it flew so well that we had to actually try to make bad landings! And every time the Ryan went up, local R/C club members stopped what they were doing to watch this model fly. The STA-M's greatest attribute–and what you can expect when you get your model in the air–is its nostalgic gracefulness. Make sure you have plenty of fuel in your field box because when it's time to fly, you'll be needing it.

For the latest technical updates or instruction manual corrections to the Ryan STA-M, visit the web site listed below and select the Great Planes Ryan STA-M 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 Information

The Great Planes Ryan STA-M is an excellent sport-scale model and is eligible to fly in IMAA (International Miniature Aircraft Association) events. The IMAA 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 Great Planes Ryan STA-M is an ARF and may not have the same level of detail as an "all-out" scratch-built 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 from those who fly 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 Ryan STA-M 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 Ryan STA-M 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 Ryan STA-M, if not assembled and operated correctly, could possibly cause injury to yourself or spectators and damage to property.

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

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

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

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

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

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

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

9. 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 to remove fiberglass dust, as the dust will blow back into your eyes. Always wear safety goggles, a particle mask and rubber gloves when grinding, drilling and sanding fiberglass parts. Vacuum the parts and work area thoroughly after working with fiberglass parts.

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

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

If you have not flown a low-wing model before, we recommend that you get the assistance of an experienced pilot in your R/C club for your first flights. If you're not a member of a club, your local hobby shop has information about clubs in your area whose membership includes experienced pilots.

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

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

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

DECISIONS YOU MUST MAKE

Radio Equipment

Though technically the Ryan STA-M is considered a "giant-scale" model, it does not require the same "heavy-duty" equipment as other truly giant planes. The only "heavy-duty" equipment suggested for this model is three servos that have 50 oz.-in. [3.3 kg-cm] or more of torque (one for the rudder and two for the elevators). The ailerons and throttle may be operated by standard servos.

Because the Ryan STA-M 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, the Futaba® SR-10 Synchronized Servo Reverser (FUTM4150) may be used. When both elevator servos are connected to this device, they operate in opposite directions. The Synchronized Servo Reverser is compatible with most popular radio systems.

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

Engine Recommendations

There are several engines that will work well in the Ryan STA-M ARF. The official engine size recommendation range is .61 - .91 cu in [10.0 - 15.0cc] two-stroke or .91 - 1.20 cu in [15.0 - 20.0cc] four-stroke. If an engine in the upper end of the size range is selected, remember that this 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 with a 14 x 6 prop, flew smoothly and most scale-like at about 3/4 throttle. Refer to your engine manufacturer's recommendations for the correct size propeller. **Note:** With the O.S. MAX .91 four-stroke used in this model, the O.S. "in" type exhaust header pipe (OSMG2624) was used to position the muffler so an exhaust hole did not have to be cut in the cowl.

Spinner Adapter Kit

This kit includes a 2-3/4" aluminum spinner with a 10-32 spinner bolt. Due to the variety of engines that may be used on the Ryan, an adapter kit for mounting the spinner is not included with this kit and must be purchased separately. For the O.S. .61 SF, SX and other two-stroke engines with a 5/16"-24 crankshaft thread purchase Spinner Adapter Kit #GPMQ4584. For the O.S. .91 to 1.20 four-strokes and other four-strokes with a 5/16"-24 crankshaft thread purchase Spinner Adapter Kit #GPMQ4588. If neither of these adapter kits will suit your engine, another brand of adapter kit (that includes both the prop nut and the spacer ring for the back plate of the spinner - such as Tru-Turn) must be purchased.

ADDITIONAL ITEMS REQUIRED

Hardware and Accessories

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

- ❏ (2) 24" [610mm] Servo extensions for ailerons (HCAM2200 or HCAM2721 for Futaba®)
- ❏ (1) 6" [150mm] Servo extension for aileron (HCAM2000 or HCAM2701 for Futaba)
- ❏ (1) "Y" connector for ailerons (FUTM4130 for Futaba)
- ❏ Suitable propeller and spare propellers
- ❏ Medium Fuel Tubing (GPMQ4131)
- ❏ Switch & Charge Jack Mounting Set (GPMM1000)
- ❏ Fuel filler valve for glow fuel (GPMQ4160)
- ❏ R/C foam padding (1/4" [6mm] HCAQ1000, or 1/2" [13mm] HCAQ1050)
- ❏ (2) Williams Bros. #62500 1/4-scale Standard pilots (WBRQ2625)
- ❏ Olive Drab paint for cockpit and paint for pilots
- ❏ Model Products #021 Remote glow plug adapter (MODP1221)
- ❏ 1/4" [6mm] Kwik Stripe silver striping tape (GPMQ1244)
- ❏ #64 rubber bands (for mounting fuel tank)

Adhesives and Building Supplies

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

- ❏ 1/2 oz. Thin CA (GPMR6002)
- ❏ 1/2 oz. Medium CA (GPMR6008)
- ❏ CA Applicator Tips (HCAR3780)
- ❏ 30-Minute Epoxy (GPMR6047)
- ❏ Milled Fiberglass (GPMR6165)
- ❏ Threadlocker (GPMR6060)
- ❏ 50" [1270mm] of K&S #801 Kevlar thread (K+SR4575) or non-elastic monofilament line for stab alignment
- ❏ Builders Triangle Set (HCAR0480) (for fin alignment)
- ❏ Masking Tape (TOPR8018)
- ❏ Silver solder (GPMR8070)
- ❏ Small metal file
- ❏ English size drill bits: 1/16", #48 (or 5/64"), 3/32", #36 (or 7/64"), 1/8", #29 (or 9/64"), 5/32", 3/16", 7/32", 17/64" (or

1/4") **-or-** Metric size drill bits: 1.6mm, #48 (or 2mm), 2.4mm, #36 (or 2.8mm), 3.2mm, #29 (or 3.6mm), 4mm, 4.8mm, 5.6mm, 6.7 (or 6.4mm),
- ❑ 6-32 tap (or Great Planes 6-32 tap and drill set with #36 drill - GPMR8102)
- ❑ 8-32 tap (or Great Planes 8-32 tap and drill set with #29 drill - GPMR8103)
- ❑ 3/16" brass tube
- ❑ Coverite™ 21st Century® sealing iron (COVR2700)
- ❑ Coverite™ 21st Century iron cover (COVR2702)
- ❑ Coverite™ 21st Century trim seal iron (COVR2750)
- ❑ Denatured Alcohol (for epoxy clean up)

Optional Supplies and Tools

Here is a list of optional items mentioned in the manual that will help you assemble the Ryan.

- ❑ CA Debonder (GPMR6039)
- ❑ CA Activator (GPMR6034)
- ❑ 6-Minute Epoxy (GPMR6045)
- ❑ Microballoons (TOPR1090)
- ❑ Epoxy Brushes (GPMR8060)
- ❑ Mixing Sticks (GPMR8055)
- ❑ Hobby Knife (HCAR0105), #11 Blades (HCAR0211)
- ❑ Easy-Touch™ Bar Sander (GPMR6170 or similar)
- ❑ Felt-Tip Marker (TOPQ2510)
- ❑ Rotary tool such as a Dremel®
- ❑ Reinforced cut-off wheel (GPMR8020)
- ❑ Curved Tip Canopy Scissors for Trimming Plastic Parts (HCAR0667)
- ❑ Dead Center™ Engine Mount Hole Locator (GPMR8130)
- ❑ Great Planes AccuThrow™ Deflection Gauge (for measuring control throws, GPMR2405)
- ❑ Flat Black MonoKote® film for optional anti-glare panel (6' roll - TOPQ0508)
- ❑ 5/32" brass tube

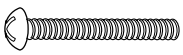
IMPORTANT BUILDING NOTES

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

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

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

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



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

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

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

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

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

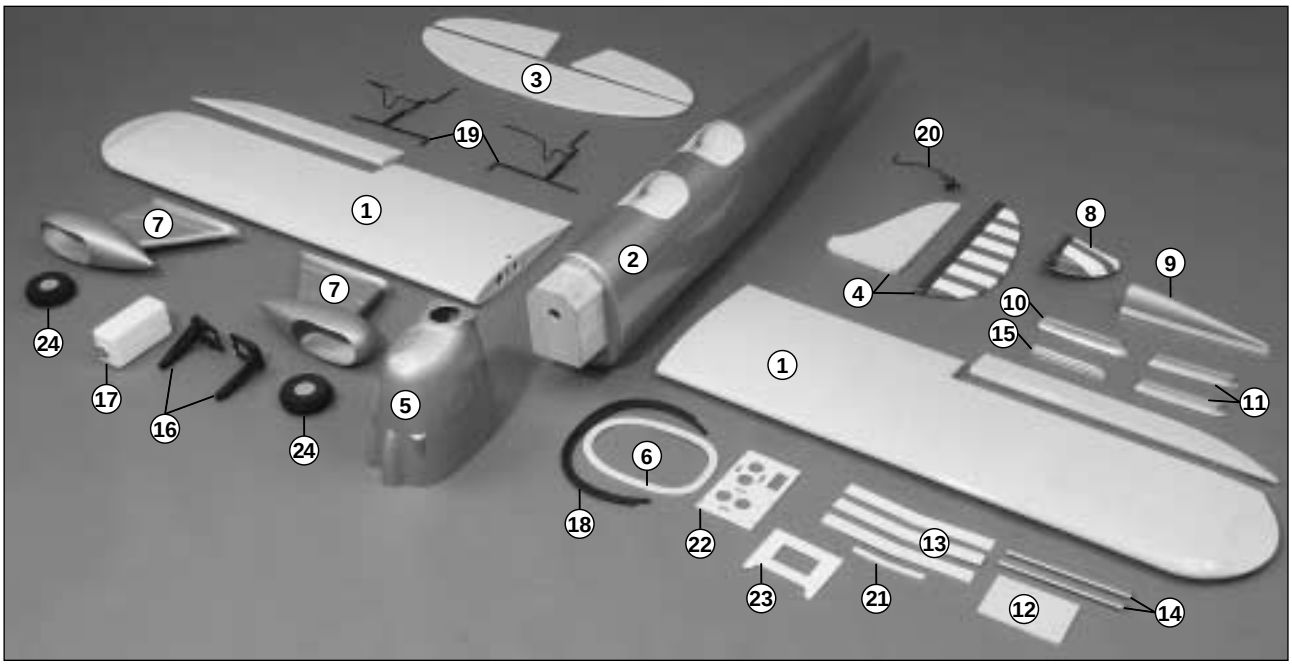
- The Ryan STA-M is factory-covered with Top Flite MonoKote film. Should repairs ever be required, MonoKote can be patched with additional MonoKote purchased separately. MonoKote is packaged in six-foot rolls, but some hobby shops also sell it by the foot. If only a small piece of MonoKote is needed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

Aluminum (TOPQ0205)
Cub Yellow (TOPQ0220)
True Red (TOPQ0227)
Insignia Blue (TOPQ0207)
White (TOPQ0204)

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



Kit Contents (Photographed)

1	Wing with Ailerons	**9**	Turtledeck	**17**	Fuel Tank
2	Fuselage	**10**	Fin Fairing	**18**	Cockpit Coaming
3	Stab with Elevators	**11**	Stab Fairings	**19**	Main Landing Gear
4	Fin with Rudder	**12**	Wing Bolt Plate	**20**	Tailgear
5	Cowl	**13**	Forward Wing Joiners	**21**	Aft Wing Joiner
6	Cowl Ring	**14**	Wing Struts	**22**	Forward Servo Tray
7	Wheel Pants	**15**	Dorsal Fin	**23**	Aft Servo Tray
8	Rudder Fairing	**16**	Engine Mount	**24**	Main Wheels

Kit Contents (Not Photographed)

- (1) 2-3/4" [70mm] spinner
- (2) Decal sheets
- (1) CA hinge strip
- (2) 2-56 x 6" [150mm] pushrods (ailerons)
- (4) Large control horns (ailerons, elevators)
- (38) #2 x 1/2" [13mm] screws
- (2) Nylon Faslinks (ailerons)
- (3) Nylon clevises (ailerons - 2, throttle - 1)
- (7) Silicone clevis retainers (clevises)
- (8) 1/8" [3mm] flat nylon straps (main LG)
- (4) 3 x 6mm socket head cap screws (LG axles)
- (4) 5mm wheel collars (main wheels)
- (4) 3mm set screws for wheel collars
- (2) 4-40 x 36" [910mm] wire pushrods (elevators)
- (4) 2-56 x 3/4" [19mm] screws (elev cntrl horns)
- (2) Large metal solder clevises (elevators)
- (2) 4-40 metal threaded clevises (elevators)
- (2) 4-40 nuts (for clevises)
- (1) 6-32 x 1-1/2" [38mm] threaded rod (rudder)
- (2) 4-40 nylon torque rod horns (rudder)
- (2) 1/8" [3mm] nylon hump straps (tail gear)
- (1) 36" [910mm] gray inner pushrod tube (tail gear, antenna tube)
- (1) 3/16" x 36" [910mm] pshrd tube (tail steering)
- (1) 2-56 x 36" [910mm] wire pshrd (tail steering)
- (2) brass screw-lock connector body
- (2) 4-40 x 1/8" [3mm] screws (for screw-lock)
- (2) nylon retainers (for screw-lock)
- (1) nylon ball link (tail steering)
- (1) 0-80 threaded ball (tail steering)
- (1) 0-80 nut (for threaded ball)
- (2) 1/4-20 blind nuts (factory installed)
- (2) 1/4-20 x 2" [50mm] nylon wing bolts
- (8) #4 x 5/8" [16mm] scrws (cwl mnt, wing struts)
- (4) #4 washers (cowl mounting)
- (4) #4 lock washers (cowl mounting)
- (6) #2 washers (servo tray)
- (1) 2-56 x 18" [460mm] wire pushrod (throttle)
- (1) 3/16" x 12" [21 x 305mm] pushrod tube
- (1) 1/4" x 1/2" x 6" [6 x 13 x 150mm] balsa stick
- (2) 1/4" x 3/8" x 6-1/4" [6 x 10 x 160mm] hardwood sticks
- (2) Axles
- (4) 1/32" x 3/4" [1 x 20mm] plywood discs
- (8) 8-32 x 1" [25mm] socket head cap screws
- (4) #8 washers (engine mount)
- (8) #8 lock washers (eng mnt, eng mounting)
- (4) 8-32 blind nuts (engine mount)
- (4) Cowl mount blocks
- (2) Windscreens
- (2) Wing dowels

Rudder pull/pull components:

- (1) Metal cable
- (4) copper swages
- (4) 2mm metal clevises
- (4) 2mm brass couplers
- (4) 2mm nuts
- (4) silicone clevis retainers

ORDERING REPLACEMENT PARTS

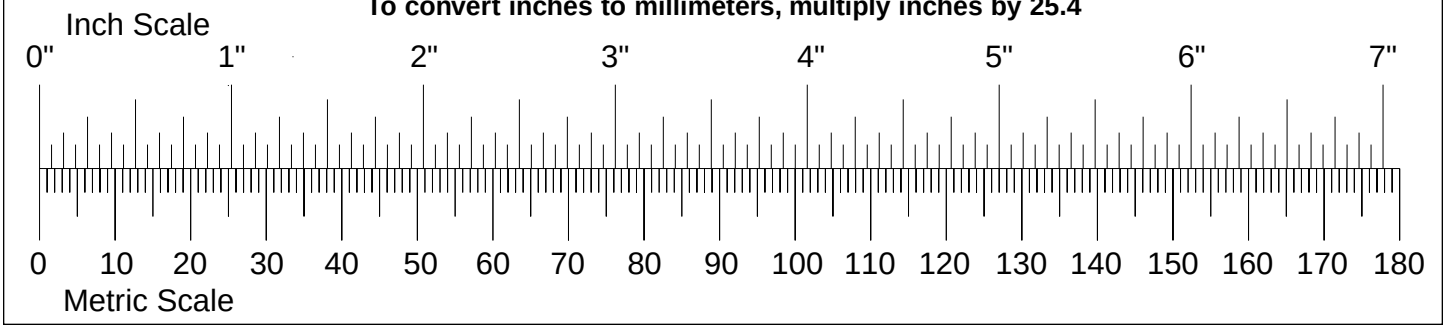
To order replacement parts for the Great Planes Ryan STA-M ARF, use the order numbers in the **Replacement Parts List** that follows. Replacement parts are available only as listed. Not all parts are available separately (an aileron cannot be purchased separately, but is only available with the wing 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
	Kit parts listed below	Hobby Supplier

GPMA2280 .....Wing Kit (R&L wing panels, R&L ailerons, hinge strip, 3 pc. ply forward wing joiner, ply aft wing joiner, (2) wing dowels, wing bolt plate.)
GPMA2281 .....Fuselage Kit (Fuselage, forward and aft servo trays, (4) hardwood cowl mounting blocks, (2) cockpit coaming, (2) 1/4" x 3/8" x 6-3/8" [7 x 10 x 165mm] hardwood forward servo mount rails, 1/4" x 1/2" x 6" [6 x 13 x 150mm] balsa rudder pushrod tube support, (2) hardwood wing strut mounting blocks.)
GPMA2282 .....Tail Set (Fin & rudder, stab & elevators, hinge strip.)
GPMA2283 .....Cowl (Fiberglass cowl, plywood cowl ring, (4) ply cowl discs.)
GPMA2284 .....Windscreen Set (2)
GPMA2205 .....Main Landing Gear Set (L&R)
GPMA2286 .....Wheel Pants (L&R)
GPMA2287 .....Wing Strut Set (2)
GPMA2288 .....Axle Set ((2) axles, (4) wheel collars, screws, wrenches)
GPMA2289 .....Rudder Pull-Pull Set (Braided rudder cable, (4) threaded brass couplers, (4) metal clevises, (4) 2mm nuts, (4) copper swages.)
GPMA2290 .....Decal Sheet Set (2 sheets)
GPMA2291 .....Plastic Parts Set (Turtledeck, stab & fin fairings, R&L rudder fairing.)
GPMA2292 .....Tailgear Set w/Wheel

To convert inches to millimeters, multiply inches by 25.4



TIGHTEN THE COVERING

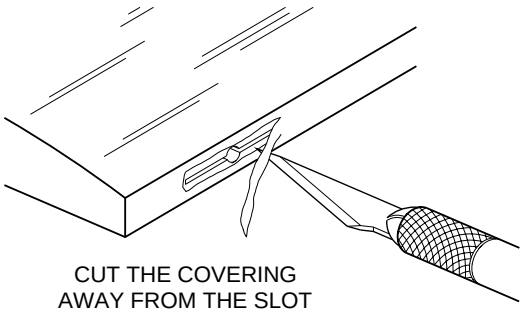
1. If you have not done so already, remove the major parts of the kit from the box (wings, fuse, wheel pants, cowl, tail parts, etc.) and inspect them for damage. If any parts are damaged or missing, contact Product Support at the address or telephone number listed on page 6.

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

ASSEMBLE THE WING

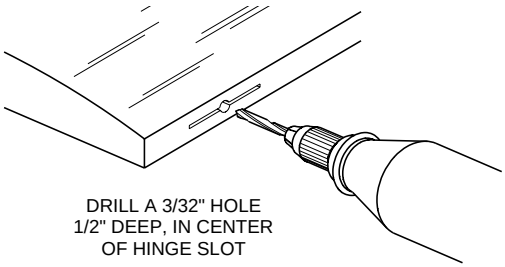
Hinge the Ailerons

Do the right aileron first.



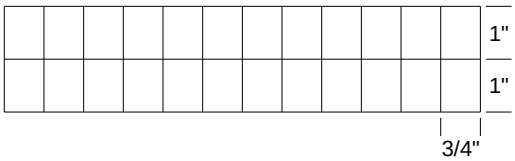
CUT THE COVERING
AWAY FROM THE SLOT

❏ ❏ 1. Locate the hinge slots in the right wing and the right aileron. Cut a small strip of covering from each slot.



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

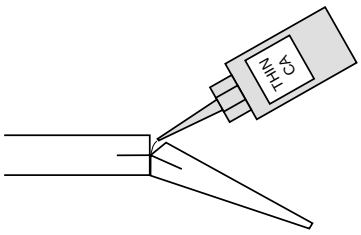
❏ ❏ 2. Drill a 3/32" [2.4mm] hole 1/2" [13mm] deep in the center of the slots. For the best result, use a high-speed tool such as a Dremel. Insert a #11 knife blade into the slots, working it back and forth a few times to clean the slots out.



❏ ❏ 3. Cut four 3/4" x 1" [19 x 25mm] hinges 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 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 aileron 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. Wait a few seconds between drops to allow the hinge slots to fully absorb the CA.

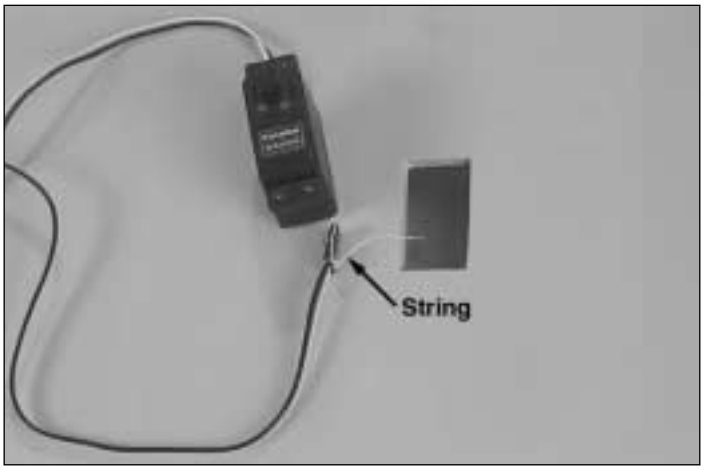
❏ 7. Join the left aileron to the left wing panel the same way.

Hook Up the Ailerons

Start with the right aileron.

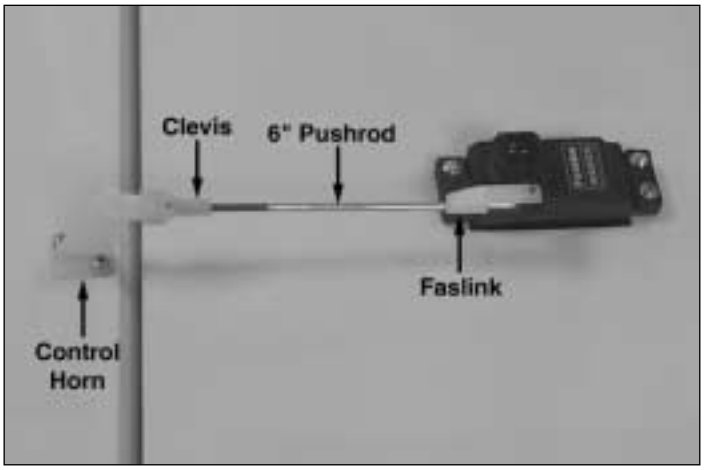
❑ ❑ 1. Cut the covering from the right aileron servo mount in the bottom of the wing. **Hint:** Cut the covering 1/8" [3mm] inside the edges, then use a trim iron to seal the covering to the edges.

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

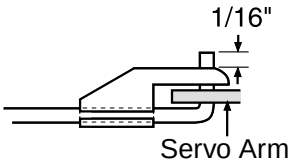


❑ ❑ 3. Tie the end of the string that is taped inside the wing to the end of the servo wire. Pull the wire through. **Note:** If something happens to the string such as it breaks or it cannot be located, don't worry. Tie another piece of string to the servo wire and tie a weight (such as a wheel collar) to the other end of the string. Place the wing on end and drop the weight down through the holes in the ribs. Pull the end of the string out of the hole in the middle of the wing.

Refer to this photo for the following two steps.



❑ ❑ 4. Drill 1/16" [1.6mm] holes in the wing for mounting the aileron servo. Add a few drops of thin CA to the holes and allow to harden. 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 is toward the trailing edge. The left aileron servo is mounted in a "mirror" image (with the servo arm pointing toward the middle of the wing and the output shaft toward the trailing edge).

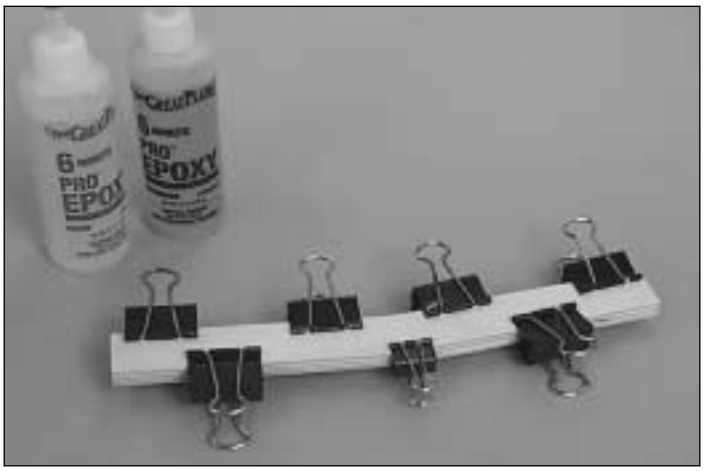


❑ ❑ 5. Thread a nylon clevis twenty full turns onto a 6" [150mm] threaded pushrod. Connect the clevis to a control horn with a silicone retainer over the clevis. Place the control horn on the aileron so the pushrod is in alignment with the servo arm. Use a felt-tip pen to mark the pushrod over the holes in the servo arm. Bend the pushrod at the mark, then fit a nylon Faslink (shown in the sketch above) to the pushrod. Cut the pushrod so 1/16" [2mm] protrudes from the Faslink. If necessary, enlarge the holes in the servo arm with a #48 (or 5/64" [2mm]) drill. Connect the pushrod to the servo arm with the Faslink.

❑ ❑ 6. Drill 1/16" holes into the aileron for mounting the control horn with two #2 x 1/2" [13mm] screws. Add a few drops of thin CA to the holes and allow to fully harden. Mount the control horn to the aileron with two #2 x 1/2" [13mm] screws. Be **certain** the screws are secure and get a good "bite" into the wood. If necessary, remove the screws, add a few more drops of thin CA to the holes and allow to harden. Remount the control horn.

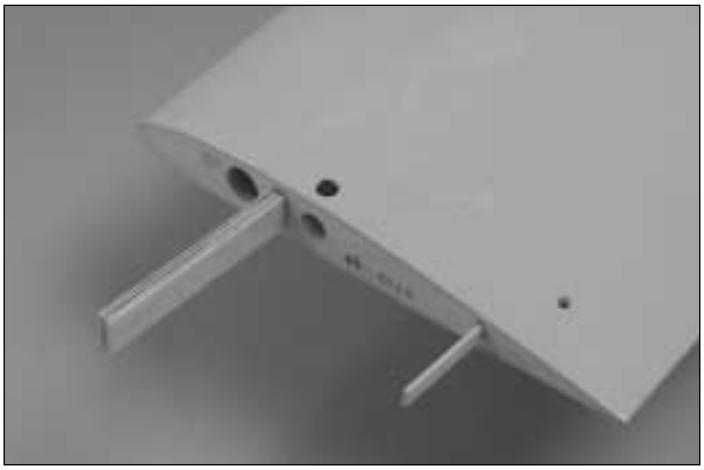
❑ 7. Mount the left aileron servo and make the pushrod the same way. Install the screws that hold the servo arms to the servos.

Join the Wing



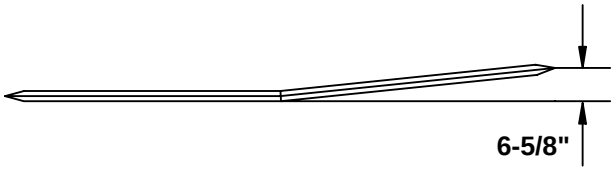
❑ 1. Use epoxy to glue the three plywood **forward wing joiners** together. Wipe away excess epoxy before it hardens.

Refer to this photo for the following two steps.



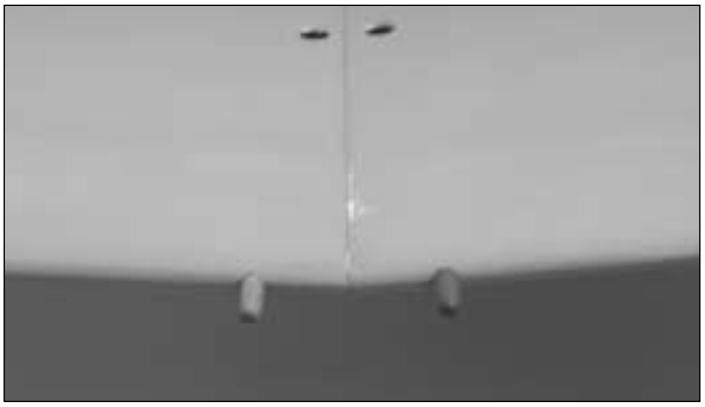
❑ 2. Cut the covering from the pre-drilled holes in both wing halves for the servo wires, the wing dowels and the wing bolts. Guide the end of the servo wires through the holes in the top of both wing halves.

❑ 3. Test fit the forward wing joiner and the plywood **aft wing joiner** in both wing halves. Make adjustments where necessary for a good fit.

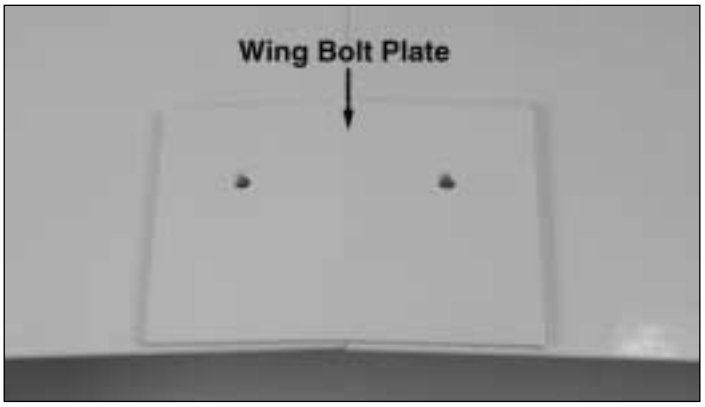


❑ 4. Test fit the wing halves together. There should be no gap. When one wing is lying flat on the workbench, the tip of the other wing should be approximately 6-5/8" [168mm] from the workbench. Make adjustments where necessary.

❑ 5. 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 the wings 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.



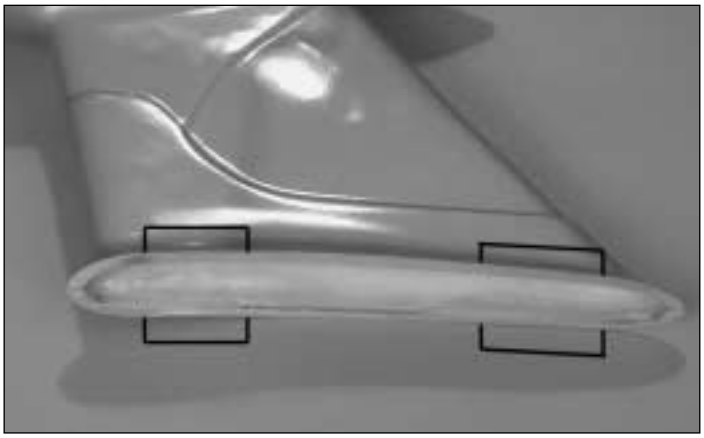
❑ 6. Round one end of both hardwood **wing dowels**. Use epoxy to glue the dowels in the wing with the rounded ends forward. Be certain approximately 1/2" [13mm] of the dowels protrudes from the wing. While you've got some epoxy mixed up, **lightly** coat the dowels to fuelproof them.



❑ 7. Use a sharp, new #11 blade to trim the covering from the bottom of the wing for the 1/8" [3mm] 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" [6.7mm] (or 1/4" [6.4mm]) holes through the wing bolt plate.

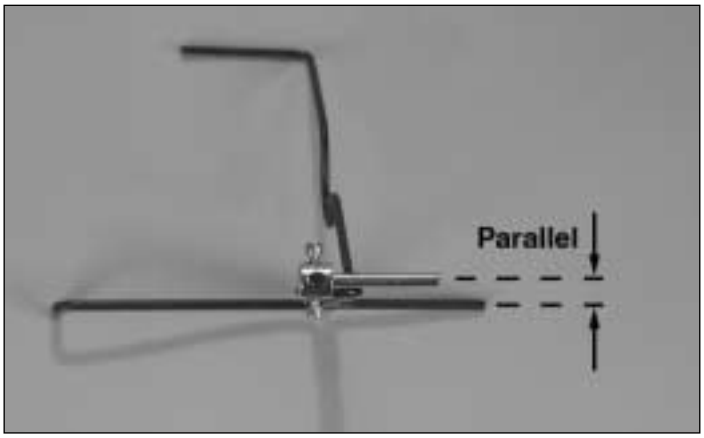
Mount the Landing Gear

❑ 1. Use coarse sandpaper to roughen the inside of the *rim* near the front and back of both wheel pants. The areas specified are indicated by the brackets in the following photo.

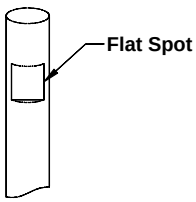


❏ 2. Apply a fillet of epoxy mixed with milled fiberglass inside the pants where shown between the brackets in the photo. If milled fiberglass is not available, microballoons is a suitable substitute.

Start with the right gear first so the photos will match your progress the first time through.

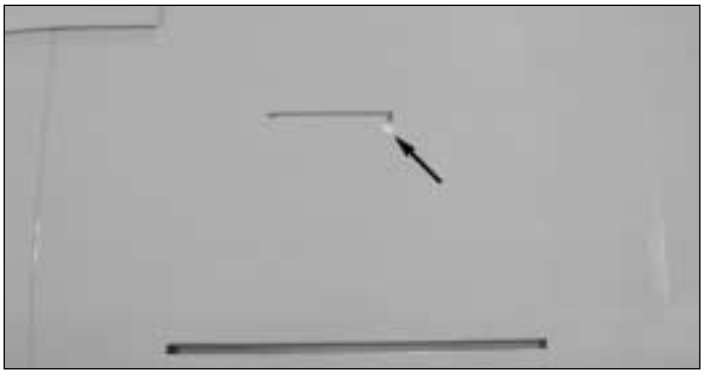


❏ ❏ 3. Mount an axle onto the right landing gear wire with two 3 x 6mm SHCS (socket-head cap screws). The axle should be positioned so that it is parallel with the bottom horizontal wires. Tighten and loosen the screws a few times to mark the wire.

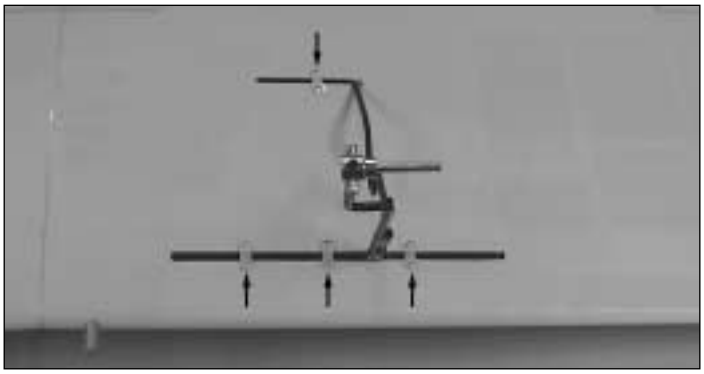


❏ ❏ 4. Remove the axle from the landing gear. File flat spots on the gear where the screws made their marks.

❏ ❏ 5. Reposition the axle on the gear. Tighten the screws. Be certain that the screws have “landed” on the flat spots and that the axle has remained parallel with the bottom wires. If necessary, remove the axle and adjust the flat spots until you can get the axle positioned correctly. *(Taking your time here and doing the job correctly will eliminate having the axles loosen at the flying field.)*

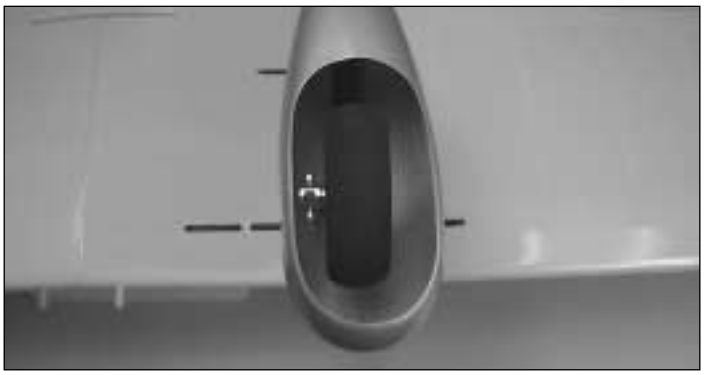


❏ ❏ 6. Cut the covering from the grooves in the landing gear rails in the bottom of the right wing panel. Trim the rail and the wing sheeting (where indicated by the arrow) to accommodate the aft strut where it “angles up” toward the main strut. Also trim the edge of the hole in the forward rail to accommodate the bend in the main strut.

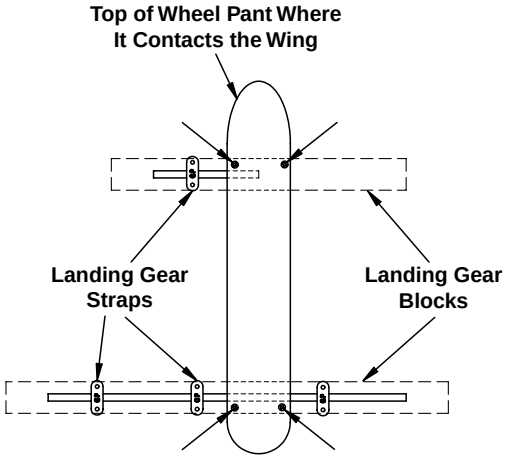


❏ ❏ 7. Fit the landing gear into the wing. Drill 1/16" [1.6mm] holes for the screws for four landing gear straps where shown, then mount the gear to the wing with the straps and #2 x 1/2" [13mm] screws. **Note:** Make certain the straps are no closer than 1" [25mm] to the forward strut.

❏ ❏ 8. Fit 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 wheel and another wheel collar onto the axle (if necessary, temporarily remove the axle to install the wheel).



❏ ❏ 9. Center the wheel pant and the wheel laterally on the gear. Also position the pant, fore and aft, where it best fits the wing. **Note:** If the landing gear wire protrudes below the bottom surface of the wing and interferes with the fit of the wheel pant, trim the wheel pant as necessary to accommodate the wire.



❑ ❑ 10. Drill a 1/16" [1.6mm] hole through the wheel pant into the landing gear block as shown in the photo and where indicated in the sketch. Enlarge the hole **in the wheel pant only** with a 3/32" [2.4mm] drill, then mount the wheel pant to the wing with a #2 x 1/2" [13mm] screw.

❑ ❑ 11. One at a time, drill the remaining three holes and mount the wheel pant to the wing with three more #2 x 1/2" [13mm] screws.

❑ ❑ 12. Remove the wheel from the axle. File a flat spot on the axle for the set screw in the outer wheel collar. Add a few drops of oil to the axle. Using a drop of thread locking compound on the 3mm set screws, mount the wheel to the axle with the wheel collars.

❑ ❑ 13. Temporarily remove the screws that hold the axle to the landing gear wire, add a drop of threadlocker to the threads, then reinstall the screws and tighten them securely.

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

ASSEMBLE THE FUSELAGE

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

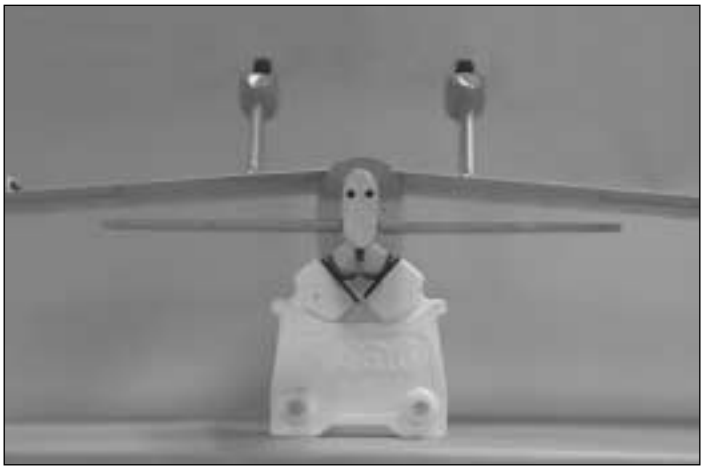
Mount the Stabilizer and Fin

❑ 1. The same as was done for the ailerons and the wing, prepare the elevator, stab, rudder and fin for hinging by cutting a strip of covering from the hinge slots and drilling holes. Do not glue in the hinges until instructed to do so.

❑ 2. Trim the covering from the fuselage over the slots for the stab and fin and over the holes for the rudder control cables. Also trim the covering from the openings in the elevator pushrod tubes (one on each side of the fuselage, indicated by the arrow in the photo).

❑ 3. Temporarily install the stab in the fuse.

❑ 4. Bolt the wing to the fuselage with two 1/4-20 x 2" [50mm] nylon wing bolts.

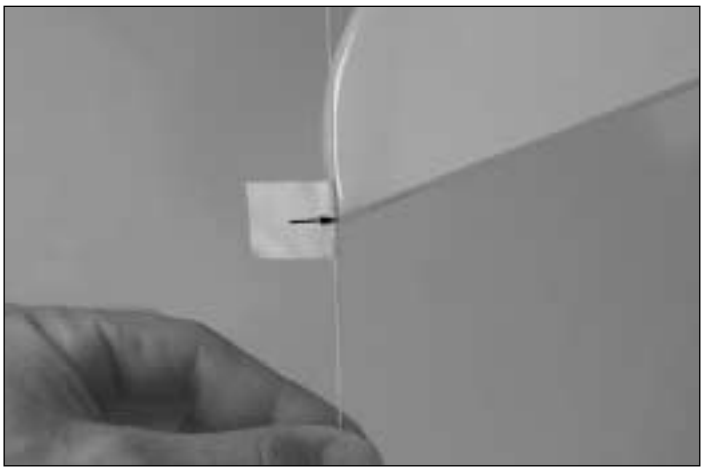


❑ 5. Stand approximately ten feet behind the model and view the stab and wing. If the stab and wing align with each other proceed to the next step. If the stab and wing do not align but are close, place a small weight on the “high side” of the stab to see if you can bring it into alignment. If weight is

not enough, remove the stab from the fuselage. Lightly sand the slots in the fuselage as necessary to get the stab to align with the wing. Reinsert the stab and check the alignment.

❏ 6. Remove the wing from the fuse. Center the trailing edge of the stab in the fuse by taking accurate measurements from both tips to the sides of the fuse.

❏ 7. 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" [1270mm] piece of non-elastic string such as monofilament or Kevlar line (K+SR4575). Slip the loop in the string over the T-pin.



❏ 8. 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 from side-to-side, adjust the stab and slide the tape along the string until the arrow aligns with both ends of the stab. Be certain the stab remains centered, side-to-side, during this process.

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

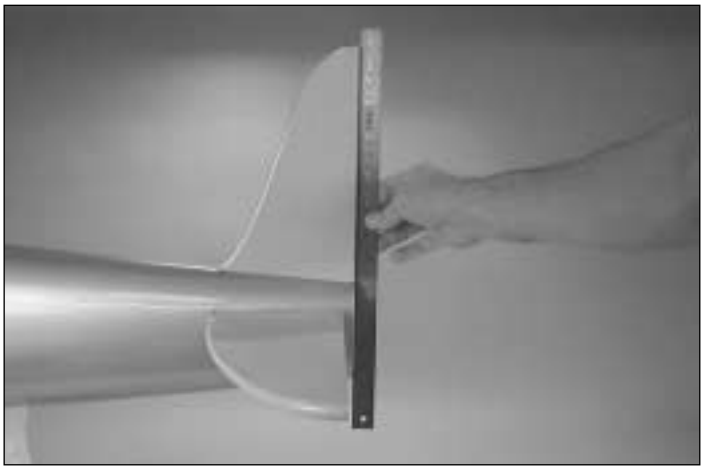
❏ 10. Remove the stab from the fuse. Use a sharp #11 hobby knife or follow the **Expert Tip** below to cut the covering from the stab along the lines. Use care to cut only into the covering and **not** into the wood. Cutting into the balsa will weaken the structure.

How to cut covering from balsa.

To avoid cutting into the balsa, use a soldering iron instead of a hobby knife to cut the covering. 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 move to melt a fine cut.

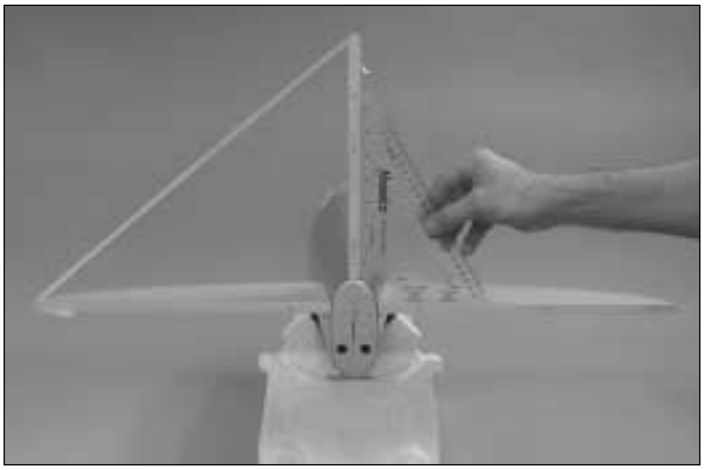
❑ 11. Peel the covering from the stab. Remove any ink with a piece of a tissue dampened with denatured alcohol.

❑ 12. Thoroughly coat all joining areas of the stab and fuse with 30-minute epoxy. Slide the stab into the fuse. Wipe off epoxy deposited on the stab with several tissues 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.



❑ 13. 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. Use a straightedge to make certain the trailing edge is vertical.

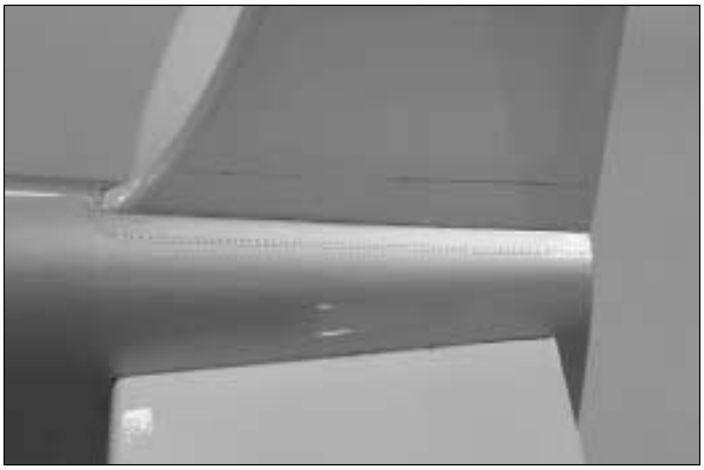
❑ 14. The same as you did the stab, draw a line around the fin where it meets the fuse. Remove the fin and carefully cut, then remove the covering.



❑ 15. Use 30-minute epoxy to glue the fin to the fuse. Before the epoxy hardens, use a Hobbico® Builder's Triangle (HCAR0480) to see 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.”

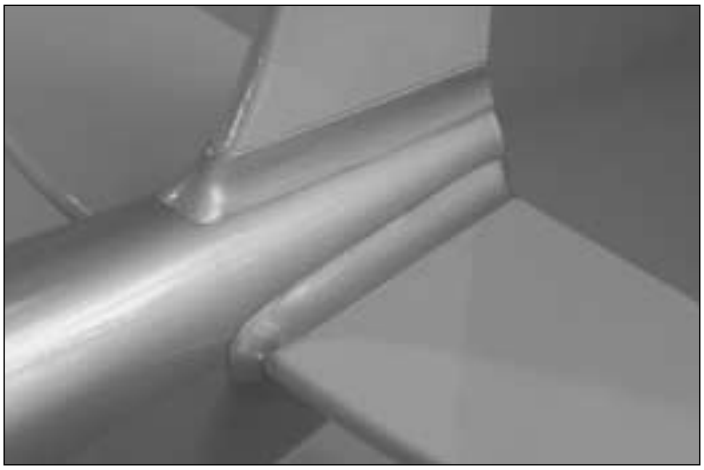
❑ 16. Carefully cut out the molded plastic fin fairing. The best results will be achieved if you start with curved-tip scissors, then use a rotary tool with a small sanding drum, followed by a thin sanding block to straighten the edges. Note that most of the small “rim” around the outer edges has also been trimmed away.

❑ 17. Test fit the fin fairing to the fin, cutting and trimming the fairing where necessary for a good fit. The aft end of the fairing will be trimmed even with the trailing edge of the fin after it is glued into position.



❏ 18. Holding the fin fairing in position, use a fine-point ballpoint pen to draw a line around the fairing onto the covering. Remove the fairing and poke several pin holes just inside the lines.

❏ 19. Use a tissue dampened with denatured alcohol to wipe away the ink line, then position the fairing and **carefully** glue it into position with thin CA. Refrain from using CA activator. If activator must be used, apply **small** drops with a T-pin or a small wire.



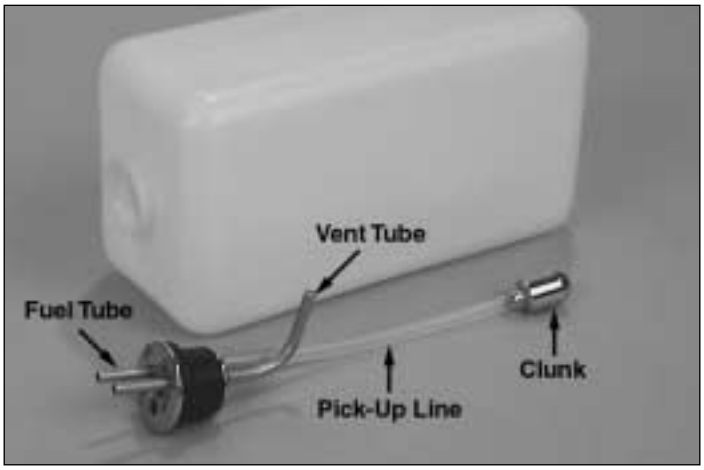
❏ 20. Cut and fit, then glue the stab fairings into position the same way. Note that the stab fairings go around the trailing edge of the stab.

Mount the Servos

Before the servo trays can be mounted, the blind nuts for the engine mount and the fuel tank must first be installed.

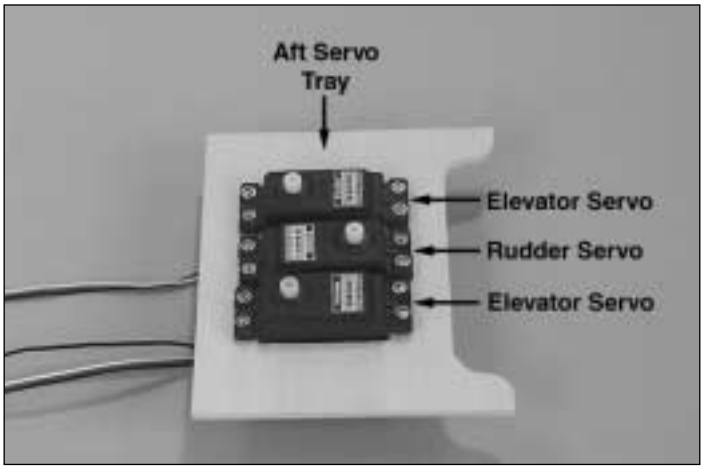
❏ 1. If using the included Great Planes adjustable .60 - 1.20 engine mount, cut out or photocopy the engine mount bolt pattern template provided on the back cover of this manual. Use spray adhesive or tape to hold the template to the firewall aligning the lines on the template with the lines on the firewall (if necessary, extend the lines on the firewall with a straightedge and a pen). Mark the center of the holes on the firewall through the template with a sharpened piece of wire or something similar. Remove the template, then drill 7/32" [5.6mm] holes through the firewall at the marks.

❏ 2. Install the 8-32 blind nuts in the back of the firewall using an 8-32 x 1-1/4" [32mm] socket head cap screw and #8 washers to pull the blind nuts **all the way** in.



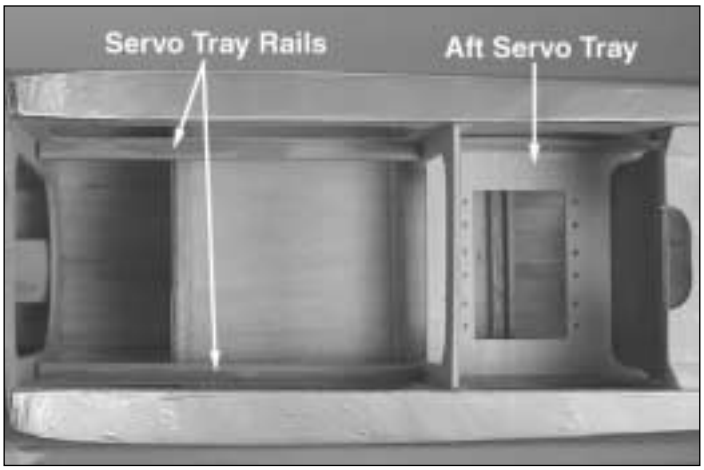
❏ 3. Assemble the fuel tank. Arrange the stopper and tubes as shown in the photo, then fit them into in the tank. Tighten the screw to expand the stopper, thus sealing the tank. Be certain the fuel line weight (clunk) at the end of the fuel line inside the tank does not contact the rear of the tank. 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 a couple of #64 rubber bands (not included) to hold the tank to the tank floor. **Note:** There may be a little resistance installing the tank at the point when it is at an angle pointing toward the top of the fuselage, but with a little “persuasion” it will slide into position.



❏ 5. Test fit the rudder servo and both elevator servos in the 1/8" [3mm] plywood aft servo tray. If necessary, enlarge the opening to accommodate the 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. Don't mount the servos into the tray until instructed to do so.

Refer to this photo for the following four steps.



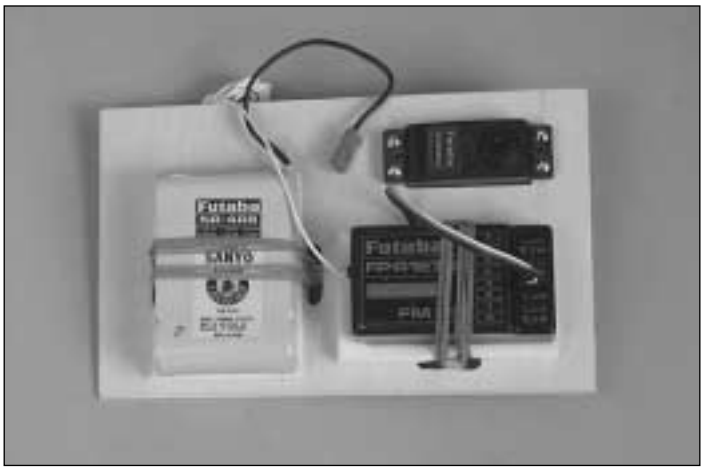
❏ 6. Use epoxy to securely glue the aft servo tray to the top edges of the crutches inside the fuselage. For additional strength, add milled fiberglass (GPMR6165) to the epoxy. Use clamps to hold the aft servo tray in position until the epoxy hardens.

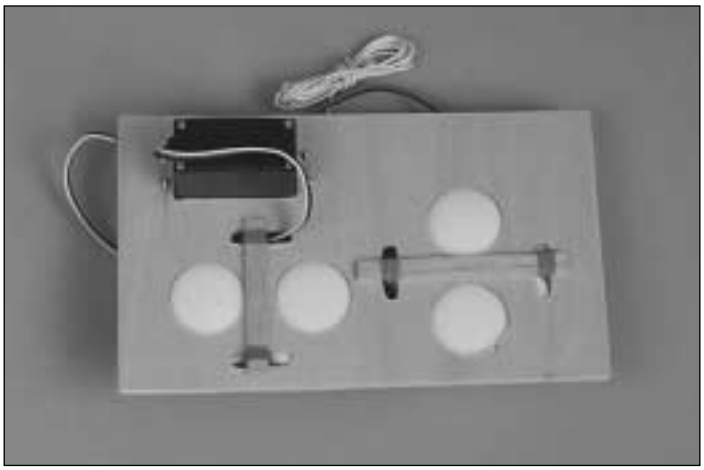
❏ 7. Determine which way you will be mounting the 1/8" [3mm] plywood **forward servo tray**. Position the tray to provide the best alignment of the throttle servo with the carburetor arm on the engine. As can be seen in the photo at step 6 on page 21 the forward servo tray in this model was mounted with the throttle servo nearest the rear of the fuselage on the left side.

❏ 8. Securely glue both 1/4" x 3/8" x 6-1/4" [6 x 10 x 160mm] hardwood **forward servo tray rails** to the plywood inner fuse sides. The bottom edge of the rails must be even with the top edge of the opening in the 1/16" ply inner fuse sides.

❏ 9. Trim both sides of the forward servo tray to get it to fit between the inner fuse sides on the rails. Drill three evenly spaced 1/16" [1.6mm] holes through both sides of the tray and the rails (see step 6 on page 21). Add a few drops of thin CA to each hole and allow to fully harden.

❏ 10. Remove the servo tray. Enlarge the holes in the tray with a 3/32" [2.4mm] drill. Mount the tray to the rails with six #2 x 1/2" [13mm] screws and #2 washers.

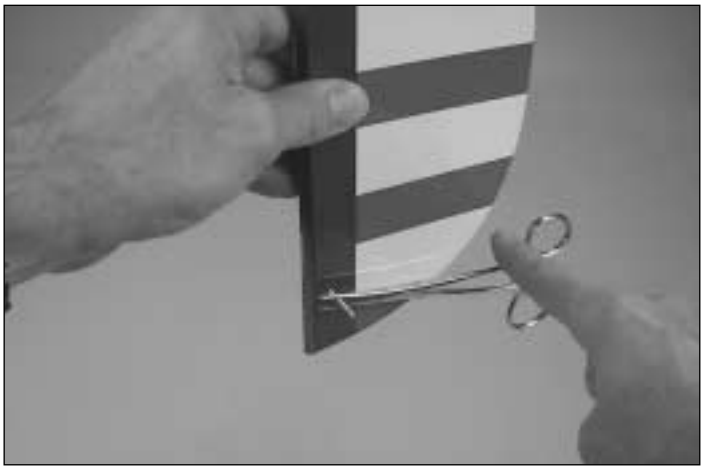




❏ 11. Mount the throttle servo, receiver and battery pack to the tray. Use hard balsa sticks (not included) and rubber bands to secure the receiver and battery pack. Place 1/4" [6mm] or 1/2" [13mm] R/C foam rubber under the receiver and battery.

❏ 12. Mount the forward servo tray in the fuselage and mount the rudder and elevator servos to the aft servo tray. If necessary, cut the front of the elevator pushrod tubes (factory installed in the fuselage) a few inches short of the elevator servos.

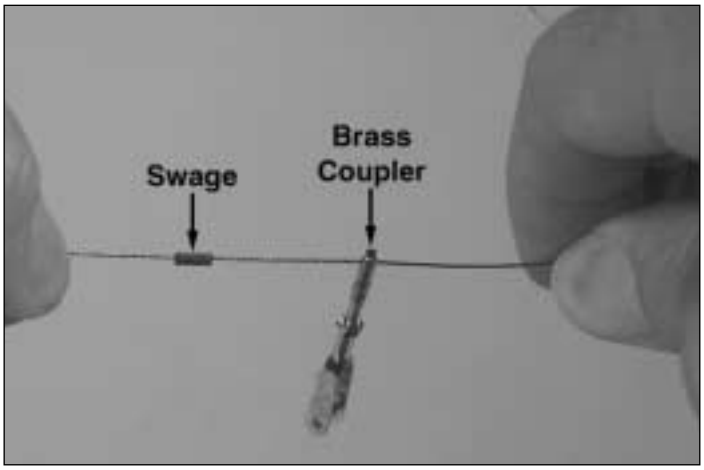
Hook Up the Rudder



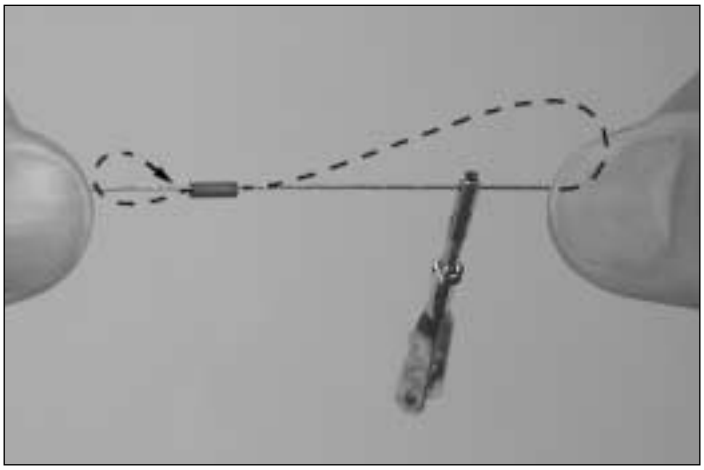
❑ 1. Cut the covering from the hole in both sides of the rudder for the 6-32 x 1-1/2" [38mm] threaded control rod. Temporarily thread the rod into the rudder until it is centered. (A hemostat was used to thread the control rod into the rudder.)

❑ 2. Use a #36 (or 7/64" [2.8mm]) drill to enlarge the hole in both nylon torque rod horns. Use a 6-32 tap to make threads in the horns. Screw the horns onto the threaded rod on the rudder until the top of the horns are even with the ends of the rod. (The horns can be seen in photos on page 18.)

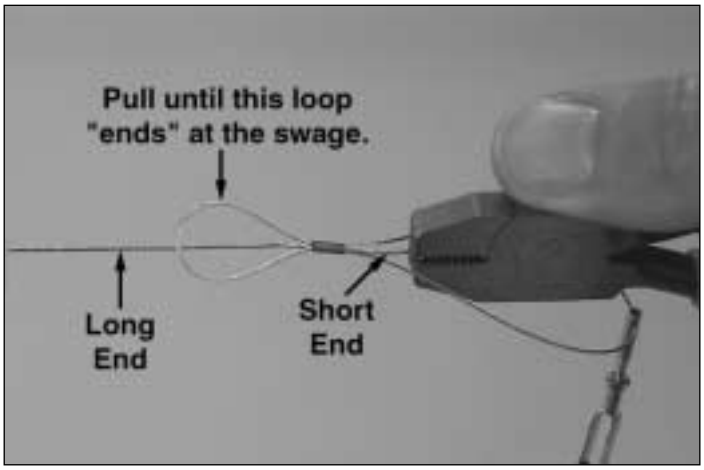
❑ 3. Test fit the rudder to the fin with the hinges. If necessary, enlarge the holes in the back of the fuselage so the torque rod horns will not contact the edges when the rudder is moved back and forth.



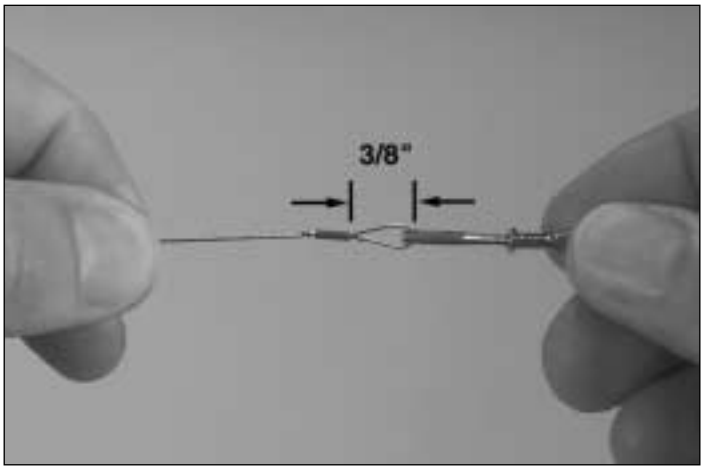
❑ 4. Slip a small copper tube (also called a “swage”)and a threaded brass coupler with a clevis about 6" [150mm] onto one end of the braided steel rudder pull/pull cable.



❑ 5. Insert the end of the cable back down through the swage, then loop it around and thread it back up through the swage (as indicated by the dashed line in the photo).



❑ 6. Pull the short end of the cable tight through the swage until the loop “ends” at the swage.



❑ 7. Pull the long end of the cable through the swage, decreasing the loop around the threaded brass coupler until it is approximately 3/8" [9mm] long. Use pliers to tightly squish the swage, then cut the excess cable at the end of the swage.

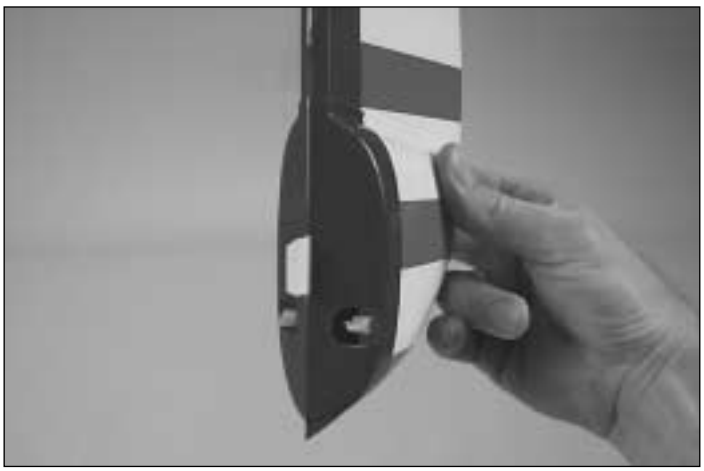
❑ 8. Connect another threaded brass coupler to the other end of the cable the same way, then cut the cable into two equal lengths.

❑ 9. Hold the fuselage vertically with the nose pointing upward. Guide the end of one of the cables with the clevis attached down through the fuse out one of the holes for the rudder. Connect the clevis to the torque rod horn on the rudder, then temporarily fit the rudder to the fin with a the hinges.

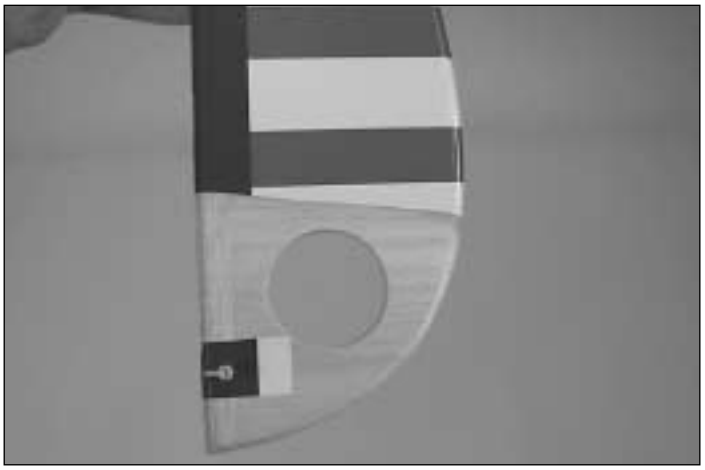
❑ 10. Use masking tape to securely hold the rudder centered. Determine the correct length of the cable so it may be connected to the rudder servo arm with another brass coupler and metal clevis. The tension on the cable should be about the same as a slightly loose guitar string–neither slack nor taut. Connect the cable to the coupler the same as before using a swage. Connect the clevis to the rudder servo arm. On our model, the clevis was connected to the second-from-the-innermost hole of a Futaba four-arm servo arm.

❑ 11. Connect the other rudder cable to the rudder and the other side of the rudder servo arm the same way. Adjust the clevises on the threaded couplers so the tension on the cables is as desired and the rudder is centered when the servo arm is centered.

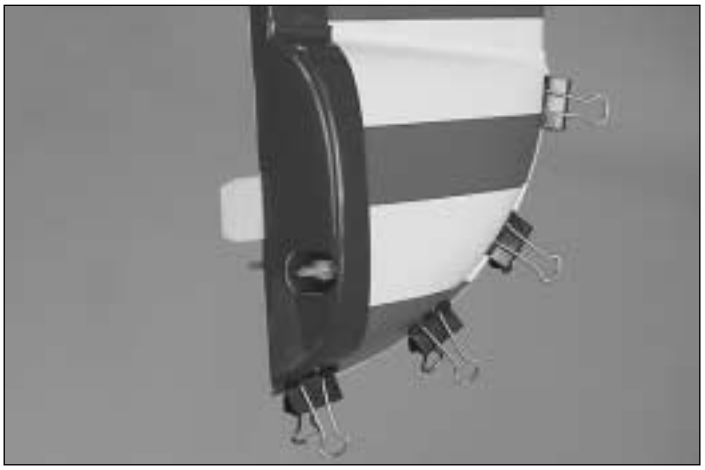
❑ 12. Now that the rudder hookup is completed, remove the servo arm from the rudder servo while leaving the pull/pull clevises connected to it. Pull the rudder from the fin and disconnect the clevises from the torque rod horns, but leave the cables inside the fuselage.



❑ 13. Cut holes in both halves of the molded plastic rudder fairing to accommodate the torque rod horns on the rudder. This is best done with a rotary tool and a cutting bit. Also cut a slot in both fairings for the bottom rudder hinge.



❑ 14. The same as was done for the fin and stab, place the fairings on the rudder and use a felt-tip pen to mark the top of the fairing onto the rudder. Cut the covering from the rudder 1/16" [1.6mm] below the line, but leave part of the covering around the threaded rod.



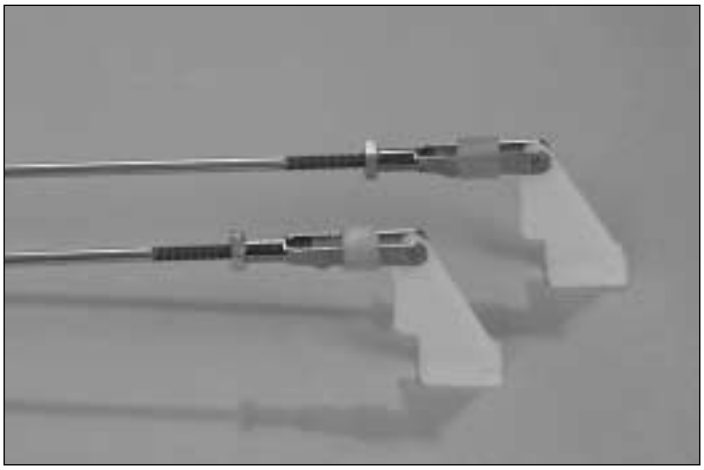
❑ 15. Use tape or small clamps to hold both halves of the rudder fairing to the rudder. Be certain the fairing fits well. Test fit the rudder to the fin with the fairing. Use thin and medium CA to carefully glue the fairing to the rudder. **Note:** Use great care with the CA and use it sparingly so it does not flow out of the fairing onto the outside of the rudder!

❑ 16. Reconnect the clevises on the aft end of the rudder cables to the torque rod horns on the rudder. Tighten the nuts on the threaded couplers against the clevises. Join the rudder to the fin with the hinges. Be certain the hinges remain centered. If necessary, use pins to keep the hinges centered, then securely glue in the hinges with thin CA.

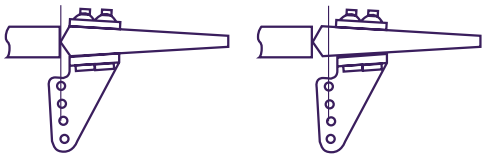
❑ 17. Attach the servo arm with the cables to the rudder servo. If necessary, adjust the length and tension of the rudder cables to get the rudder centered when the servo arm is centered.

Hook Up the Elevators

❑ 1. Permanently join both elevators to the stab by gluing in the hinges with thin CA.



❑ 2. Make an elevator pushrod by threading a 4-40 nut and a 4-40 clevis with a silicone retainer onto a 4-40 x 36" [910mm] pushrod. Connect the clevis to the outer hole of a large nylon control horn. Prepare another pushrod the same way. Insert the pushrods into the guide tubes from the rear of the fuselage.



Correct Incorrect

❑ 3. Position the pushrods so the holes in the control horns are over the hinge gap between the elevators and stab.

❑ 4. Use a felt-tip pen to mark the front of the pushrods where they are to be cut for connecting to the elevator servo arms with metal solder-on clevises.

❑ 5. Remove the pushrods from the fuselage, cut them to the correct length, then read the following **Expert Tip** and solder the clevises to the ends of both pushrods.

How to Solder

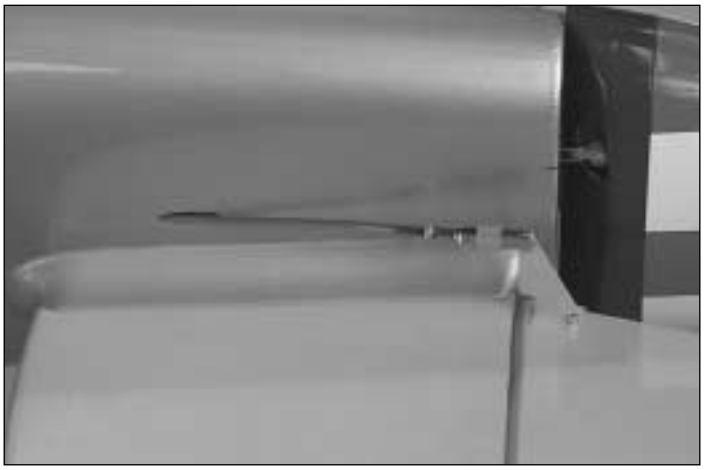
A. Use denatured alcohol or other solvent to remove residual oil from the pushrod.

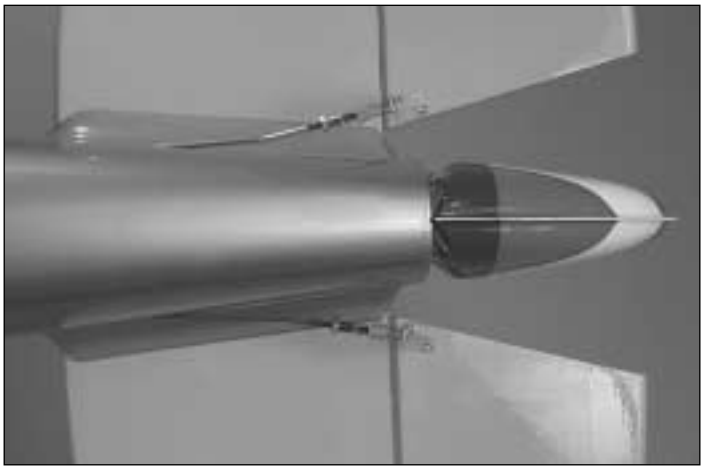
B. Use coarse sandpaper to thoroughly roughen the end of the pushrod where it is to be soldered.

C. Apply a few drops of soldering flux to the end of the pushrod, then use a soldering iron or a torch to heat it. Coat the end of the pushrod with silver solder (GPMR8070) by touching the solder to it. 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.

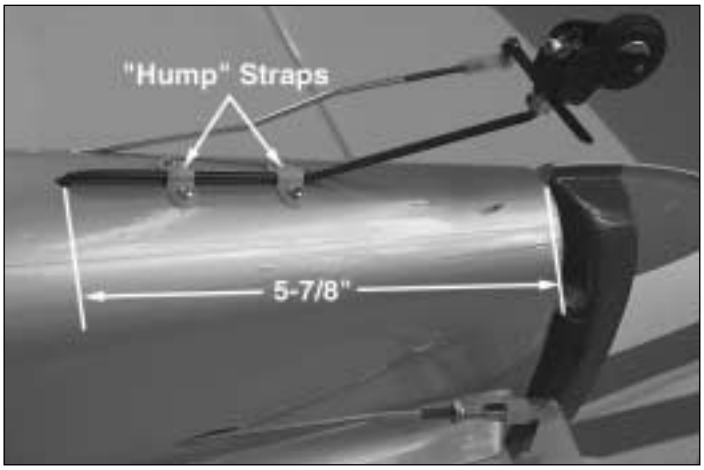




❑ 6. Remove the threaded clevises from the aft end of the pushrods. Guide the pushrods through the front of the pushrod tubes from inside the fuselage and thread the clevises back onto the pushrods. Connect the front of the pushrods to the elevator servo arms. Make slight bends in the aft end of the pushrods as necessary, then drill 3/32" [2.4mm] holes through the elevators and mount the horns with 2-56 x 3/4" [19mm] screws and the nylon plate that came with the control horns.

Mount the Tailgear

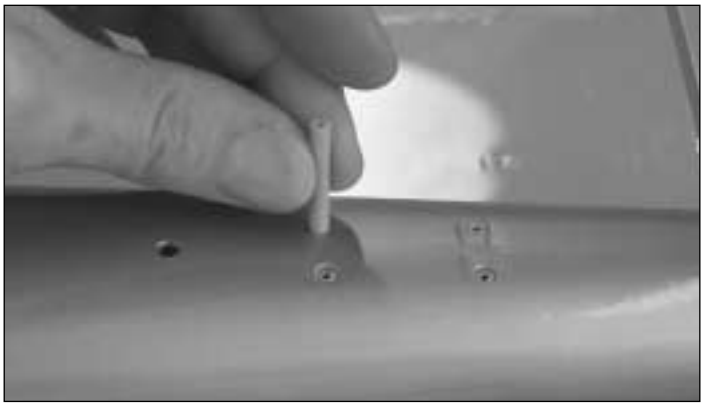
Refer to this photo while mounting the tail gear.



❑ 1. Drill a 1/8" [3.2mm] hole through the middle of the bottom of the fuse for the tail gear wire 5-7/8" [150mm] from the aft end. **Optional:** Use a 5/32" brass tube sharpened at one end to drill the hole. Cut 1" [25mm] from the end of the brass tube and glue it into the hole. This will provide a bearing for the tail gear wire.

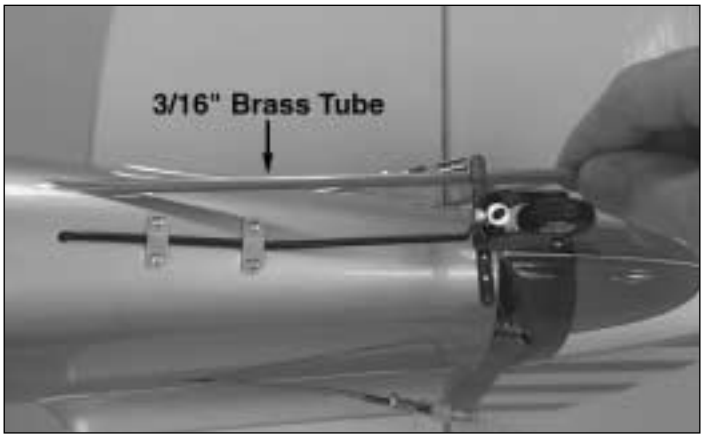
❑ 2. Insert the tail gear wire into the hole (or brass tube). Place two nylon hump-straps on the wire where shown in the photo. Accurately mark the center of the holes in the straps onto the bottom of the fuse.

❑ 3. Drill 5/32" [4mm] holes (or use the 5/32" brass tube to make the holes) all the way through the bottom of the fuse at the marks.



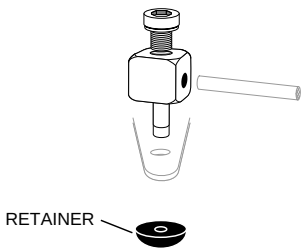
❑ 4. Cut four 1" [25mm] pieces from the 36" [910mm] plastic tube (the one with the ridges). Use thick CA or epoxy to glue a tube in each of the four holes. **Note:** If using thick CA, work quickly. If necessary, use a small mallet or a wood block to tap the tubes down into the holes before the CA takes hold.

❑ 5. Mount the tail gear to the fuse with the straps and four #2 x 1/2" [13mm] screws.



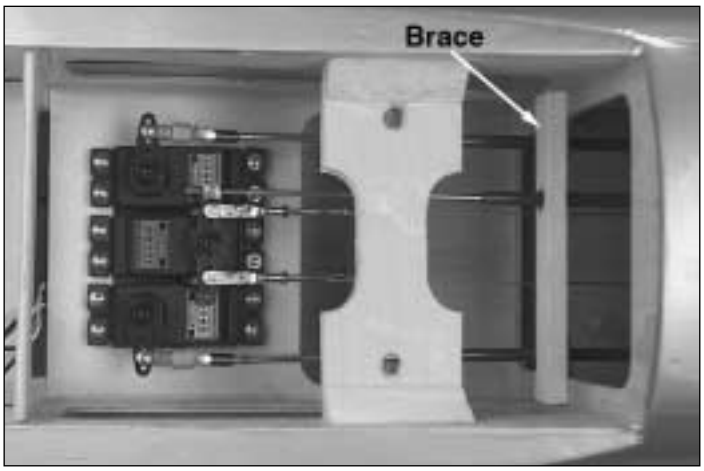
❑ 6. Use a 3/16" [4.8mm] brass tube sharpened on one end to cut a hole through the bottom of the fuse in alignment with the arm on the right side of the tail gear. The angle of the hole does not have to be precise because when installed, the pushrod will be bent as necessary to align with the steering arm.

❑ 7. Roughen one end of the 3/16" x 36" [4.8 x 910mm] pushrod tube. Guide the tube through the fuse, so the roughened end is in the hole, then cut the front of the tube approximately 2" [50mm] short of the rudder servo arm. Glue the tube in the hole and trim it even with the bottom of the fuse.



❑ 8. Mount the 0-80 threaded ball to the outer hole of the tail wheel steering arm with an 0-80 nut and a small drop of threadlocker. Make the tail wheel pushrod from a 2-56 x 36" [910mm] pushrod with a nylon ball link on the aft end. Install

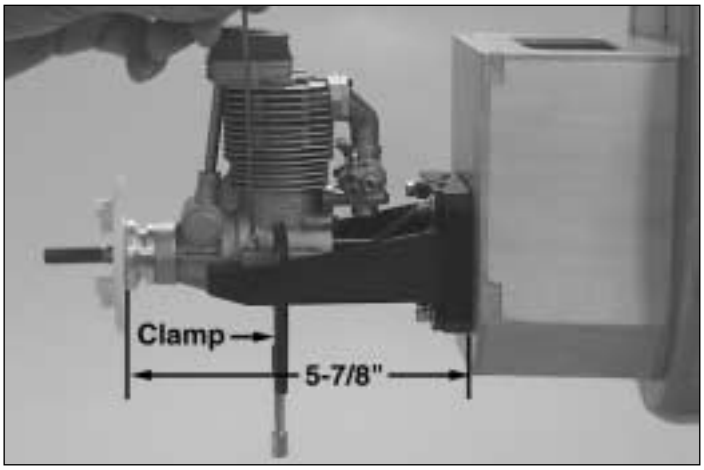
the pushrod into the pushrod tube, then bend it as necessary to connect to the steering arm. Mount a screw-lock connector to the rudder servo arm with a nylon retainer. Temporarily fit the pushrod into the connector.



❏ 9. Make a **brace** for the front of the tail wheel pushrod tube from the 1/4" x 1/2" x 6" [6 x 13 x 150mm] balsa stick. Drill a 3/16" [4.8mm] hole through the brace, then slip the brace over the tail steering pushrod tube. Glue the brace in the fuse so the pushrod aligns with the screw-lock connector on the rudder servo. Glue the pushrod tube to the brace. Center the tail wheel, then secure the pushrod to the screw-lock connector with a 4-40 x 1/8" [3.2mm] screw.

Mount the Engine

❏ 1. Mount the engine mount to the firewall with four 8-32 x 1" [25mm] SHCS, #8 lock washers and #8 flat washers, but do not tighten the screws. Adjust the mount to fit your engine and tighten the screws.

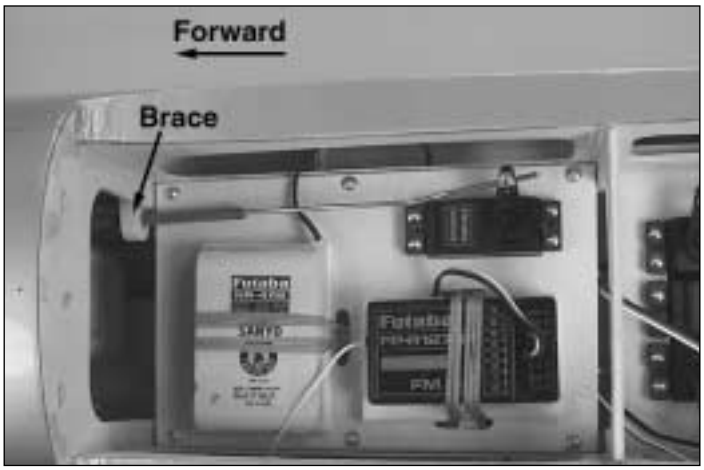


❏ 2. Mount the back plate of the spinner to the engine. Position the engine on the mount so the back plate will be 5-7/8" [150mm] from the firewall. Temporarily hold the engine to the mount with a small “C”-clamp. Use a Great Planes Dead Center™ Hole Locator (GPMR8130-shown in the photo) or another method to mark the locations of the holes for mounting the engine.

❏ 3. Remove the engine mount from the firewall. Drill #29 (or 9/64" [3.6mm]) holes through the mount at the marks. Tap 8-32 threads into the holes. Mount the engine mount to the fuse, then mount the engine to the mount with 8-32 x 1" [25mm] screws and #8 lock washers. Center the mount on the vertical line on the firewall, then tighten the bolts that hold the mount.

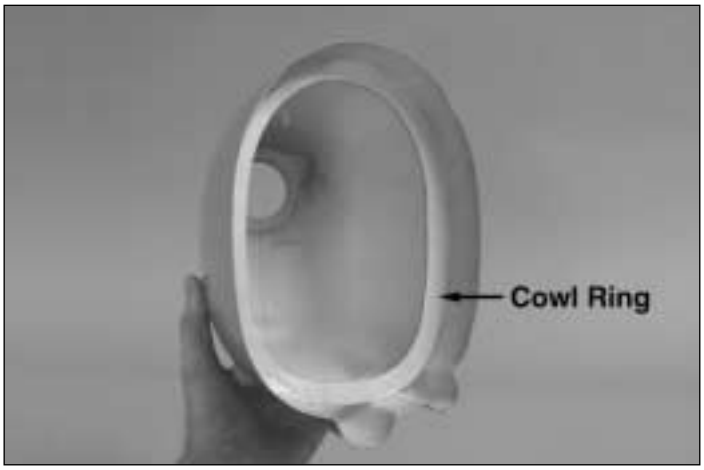
❏ 4. Drill a 3/16" [4.8mm] hole through the firewall for the throttle pushrod in alignment with the carburetor arm.

❏ 5. Cut the 3/16" x 12" [4.8 x 300mm] pushrod tube to the correct length, then roughen one end and guide it through the hole you drilled. Thread a nylon clevis twenty full turns onto the 2-56 x 18" [460mm] pushrod. Bend the front of the pushrod as necessary, then connect the clevis on the pushrod to the carb arm.



❏ 6. Cut the other end of the pushrod to the correct length, then bend it as necessary to connect to a screw lock connector on the throttle servo arm. Similar to the brace used for the tail wheel steering pushrod tube, make a brace for the throttle pushrod tube from the piece of leftover 1/4" x 1/2" [6 x 13mm] balsa stick and glue it into position.

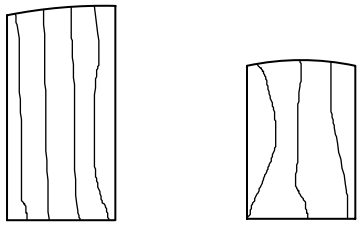
Mount the Cowl



❑ 1. Use 30-minute epoxy mixed with lightweight Top Flite Microballoons Filler to glue the 1/8" [3mm] plywood **cowl ring** inside the cowl an **equal distance** from the aft edge all the way around. The distance should be approximately 1" [25mm] to 1-3/8" [35mm]–wherever it fits best. Set the cowl aside and allow the epoxy to harden.

❑ 2. Cut the holes in the front of the cowl for the engine crank shaft and for the air inlets where shown. (Though not marked on the cowl, for scale effect, an additional round hole was cut to match the hole on the full-size STA-M.) A Dremel with a carbide cutter, followed by a drum sander, works best for cutting the holes. Use protective goggles and a particle mask when cutting fiberglass. Finish by sanding the openings by hand with 400-grit sandpaper to smooth the edges.

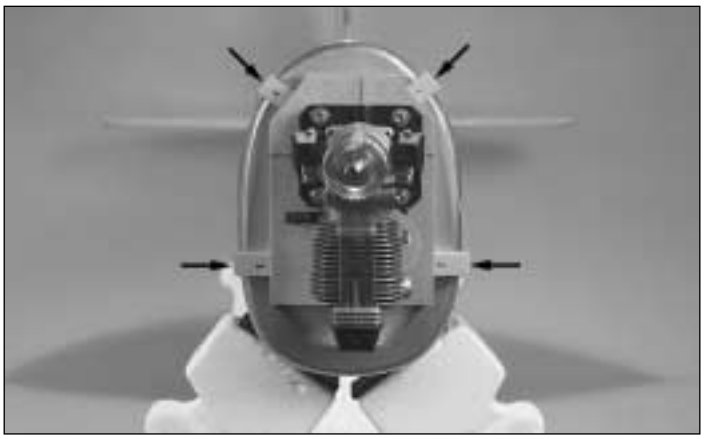
❑ 3. Determine your engine exhaust configuration. With the O.S.® MAX .91 Surpass™ II used on this model, an O.S. "in" type exhaust header pipe (OSMG2624) was used to position the muffler near the bottom of the cowl. (This requires removing a portion of the bottom of the plywood cowl ring to accommodate the muffler.)



Lower Cowl Mount

Upper Cowl Mount

❑ 4. Make two **upper cowl mount blocks** and two **lower cowl mount blocks** to fit the full-size drawings above from the 9/16" x 9/16" x 1-3/16" [14.3 x 14.3 x 30mm] hardwood blocks.

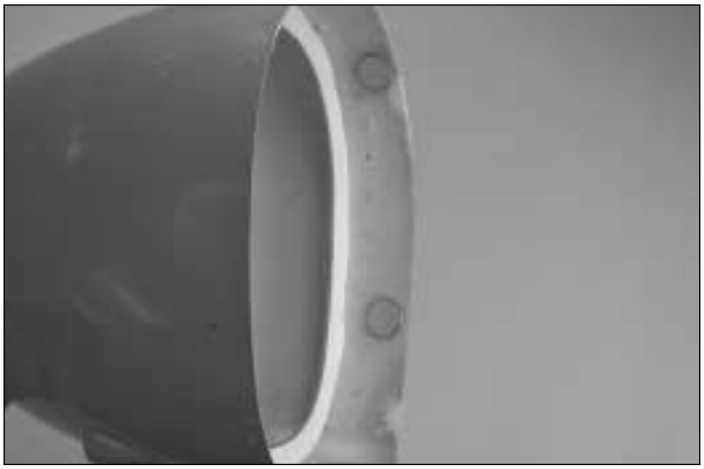


❑ 5. Use coarse sandpaper to roughen the fuelproof coating where the cowl mount blocks will be glued (indicated by the arrows) so the epoxy will adhere. Temporarily hold the cowl mount blocks in position with a rubber band.

❑ 6. Test fit the cowl. The cowl should not fit tightly over the blocks. There should be approximately 1/32" [.8mm] between the cowl and the mounting blocks. If necessary, trim the cowl mount blocks to get the cowl to fit correctly.

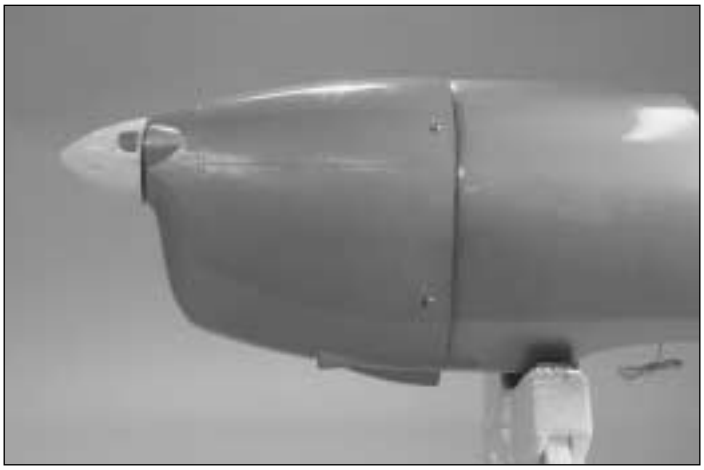
❏ 7. Use 30-minute epoxy to glue the cowl mount blocks into position.

❏ 8. After the epoxy has hardened, place the cowl on the fuse. Place the back plate of the spinner on the engine. If necessary, have an assistant hold the cowl in position. Use a felt-tip pen to mark the center of the cowl mount blocks on the cowl.

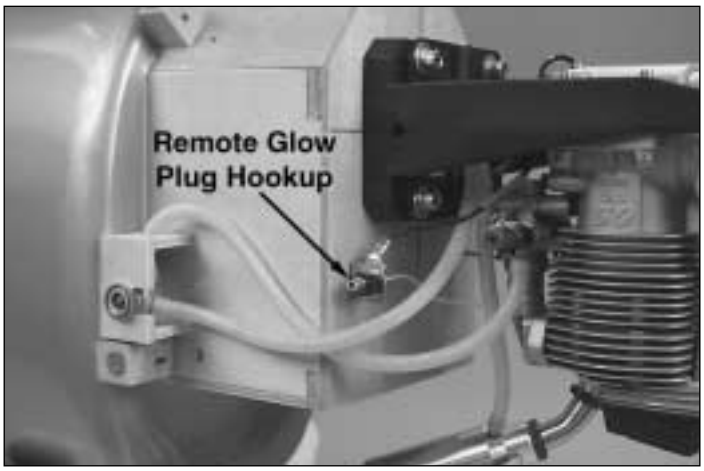


❏ 9. Remove the cowl from the fuselage. Use 30-minute epoxy to glue the four 1/32" [.8mm] plywood discs to the inside of the cowl centered on the marks.

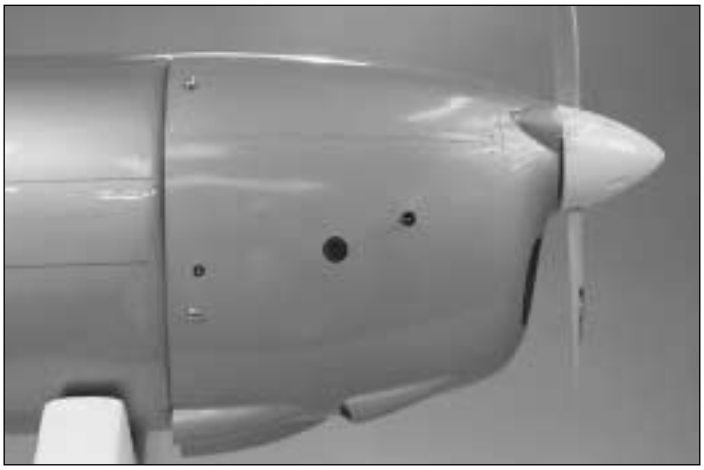
❏ 10. Reposition the cowl on the fuse. Place the back plate of the spinner on the engine. Be certain to allow adequate clearance between the spinner and the cowl–3/32" to 1/8" [2 to 3mm] is suitable. Holding the cowl in position, drill 3/32" [2.4mm] holes through the cowl and the center of the cowl mount blocks. Remove the cowl. Enlarge the holes in the cowl with a 1/8" [3.2mm] drill.



❏ 11. Run the screws in and out of the cowl mount blocks several times to “cut” threads into the blocks. Add a few drops of thin CA to the holes to harden the “threads.” Be certain the CA has **fully** hardened, then mount the cowl to the fuse with four #4 x 5/8" [16mm] screws, #4 lock washers and flat washers. Mount the spinner to see how it all fits.



❏ 12. If using a fuel filler valve, make a mount from 1/8" [3mm] plywood (not included). Glue the mount into position. For cowl installation, it is easiest to position the fuel filler valve aft of the cowl ring. Also mount a remote glow plug hookup if using one.

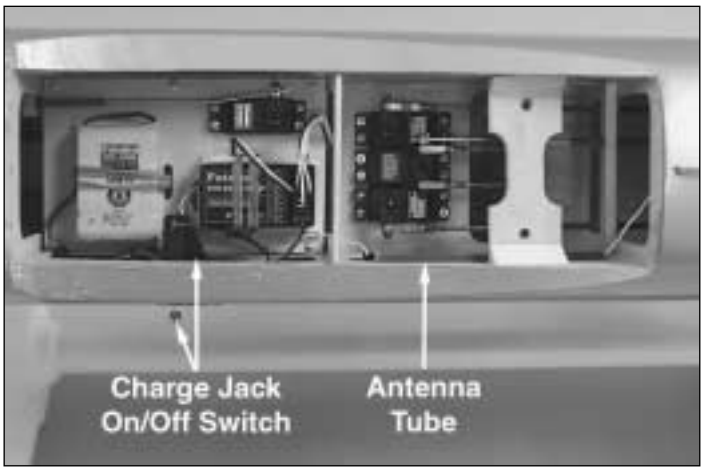


❏ 13. Cut holes in the cowl where required for the fuel filler valve, the remote glow plug hookup and the needle valve.

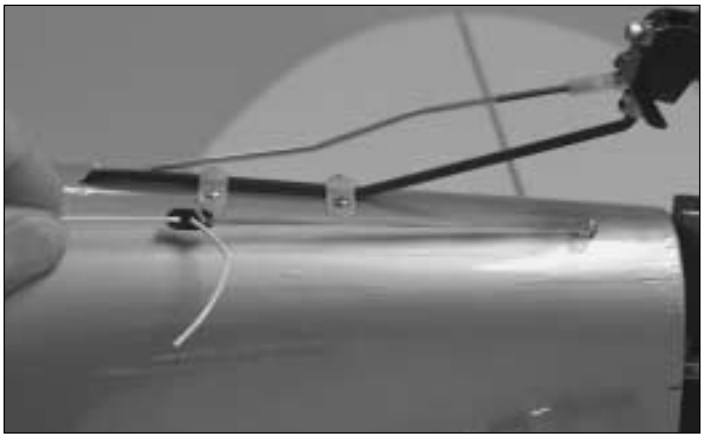
❏ 14. Use epoxy or fuelproof paint to coat any bare wood such as the cowl ring, the cowl mounting blocks and the mount for the fuel filler valve.

❏ 15. If you feel it necessary for the engine you are using, cut additional holes in the cowl for cooling. With the O.S.® MAX .91 FS no additional holes were required.

Finish the Radio Installation



❏ 1. Mount the on/off switch in a convenient location on the side of the fuselage opposite the engine exhaust. The switch on the model shown was mounted with a Great Planes Switch and Charge Jack (GPMM1000). This setup provides access to the battery charging cord from outside the model for quick field charging and battery monitoring. If you have not yet already done so, mount the battery and receiver. The final location of the battery pack could be determined while balancing the model (to minimize or eliminate the requirement for additional ballast), but the model shown in this manual required no tail weight with the components mounted where shown. Be certain the receiver and battery are cushioned with 1/4" or 1/2" [6mm or 13mm] R/C foam rubber to protect them from vibration. Connect all the wires to the receiver and hook up the battery and switch.



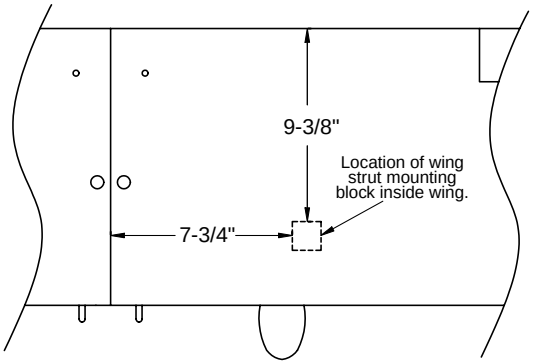
❏ 2. Glue the piece of leftover throttle pushrod tube inside the fuselage to keep the receiver antenna away from the servos and pushrods. Make a *strain relief* from a cut-off servo arm and slip it onto the antenna, then route the antenna through the tube and out of the fuselage. On the model shown in the manual the antenna was routed out the bottom of the fuselage through a small piece of tubing, then connected to a hook fashioned from another leftover servo arm which was connected to a rubber band and a wire hook inserted into the bottom of the fuse.

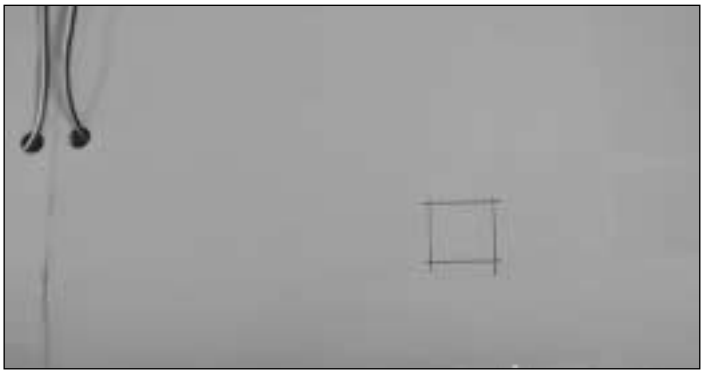
❏ 3. Make certain all the servo arms are secured to the servos with the screws that came with them and that all the clevises have retainers on them.

SCALE DETAILS

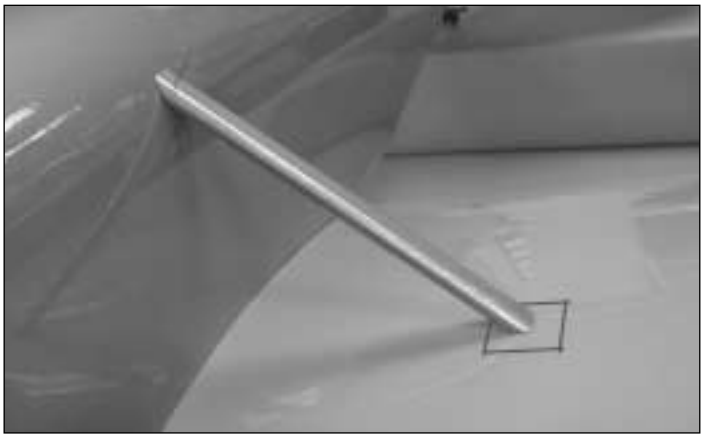
Mount the Wing Struts

Do the left wing strut first.

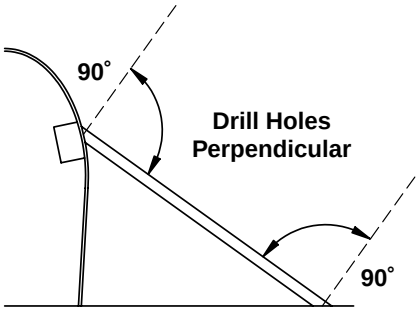




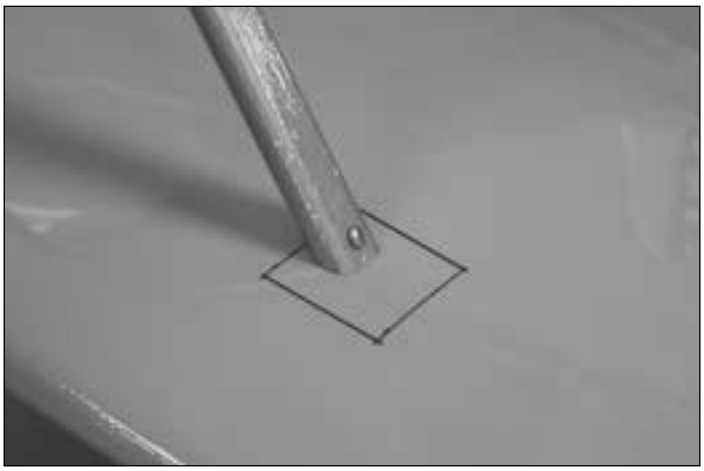
❑ ❑ 1. Use a fine-point felt-tip pen (such as a Top Flite Panel Line Pen, TOPQ2510) to mark the location of the **wing strut mounting block** directly on the wing (later, denatured alcohol will be used to wipe the marks off–if uncertain, test on an inconspicuous part of the model). The wing strut mounting block is located 7-3/4" [197mm] from the middle of the wing, and 9-3/8" [238mm] from the trailing edge of the wing. The block is 1-1/4" x 1-1/4" [32 x 32mm].



❑ ❑ 2. Mount the wing to the fuselage with both 1/4-20 x 2" [50mm] nylon wing bolts. Bevel both ends of one of the balsa **wing struts** to fit the wing and fuse over the strut mounting blocks (the strut mounting block in the fuselage can be visually located). Note that the top of the strut will be angled slightly more than the bottom of the strut. Temporarily hold the strut in position with a couple of T-pins.



❑ ❑ 3. Remove the T-pin and drill a 3/32" [2.4mm] hole through the **bottom** of the strut into the hardwood block in the wing.



❑ ❑ 4. Remove the strut and enlarge the hole **in the strut only** with a 1/8" [3.2mm] drill. Mount the bottom of the strut to the wing with a #4 x 5/8" [16mm] screw.

❑ ❑ 5. Mount the top of the strut to the fuselage the same way.

❑ ❑ 6. Remove the strut. Add a few drops of thin CA to both ends of the strut to harden the holes and to fuelproof the exposed balsa. Remove any ink lines marked on the wing with a tissue dampened with alcohol.

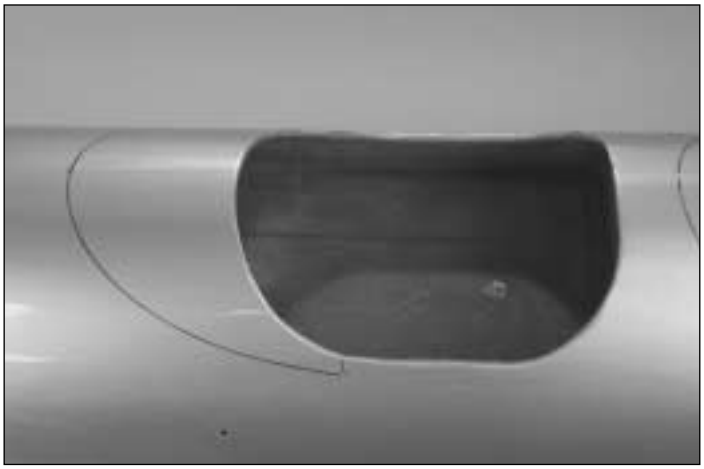
❑ 8. Mount the other strut to the right side of the fuse the same way. Mark the struts in an inconspicuous location as **right** and **left**.

Finish the Cockpits

❑ 1. Paint the inside of the cockpits. The cockpits in the full-size Ryan this kit was modeled after are olive drab. For the best appearance, apply two coats of paint, sanding between coats (it's a hassle, but worth it!). **Note:** Some paints with strong solvents will soak through the balsa and "bleed" onto the back of the MonoKote, making marks that can be seen from the outside. To avoid this, paint the cockpits with an airbrush or apply light coats and allow to fully dry between coats.

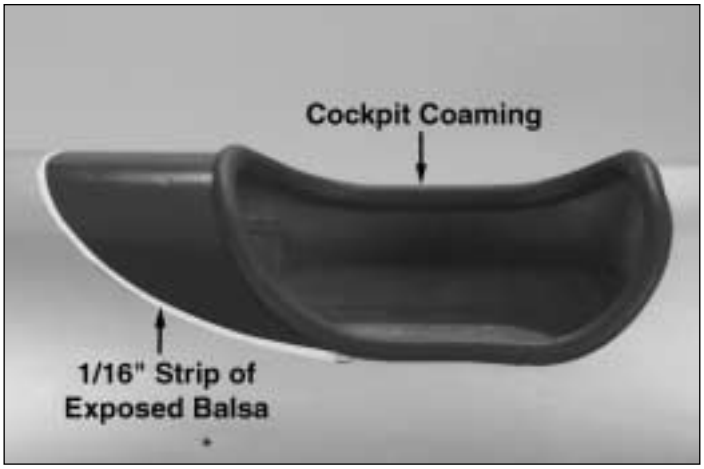
❑ 2. Cut out the front and rear instrument panel stickers and place them in the model (the front instrument panel will have to be trimmed to accommodate the wing strut blocks).

❑ 3. Use the **windshield pattern** in the back of the manual to cut out the windshields from the supplied clear plastic sheets. Start with curved-tip plastic cutting scissors, then true the edges with progressively finer grits of sandpaper.



❑ 4. Have an assistant hold one of the windscreens in position on the fuse. Use a fine-point felt-tip pen to draw a line on the fuse around the edge of the windscreen.

Use this photo for the next three steps.



❑ 5. Use a hobby knife with a new #11 blade to cut through the covering along the line you marked. If adding a flat black anti-glare panel, remove the aluminum covering behind the line. Use the covering as a template to cut another piece from flat black MonoKote film (or use fine sandpaper to scuff a piece of regular black MonoKote film). Iron the “anti-glare” panel covering into position, with a 1/16" [2mm] gap between the black and the aluminum. If not making an anti-glare panel, make another cut in the covering 1/16" [2mm] in front of the first cut. Remove the strip of covering from the fuse, leaving a 1/16" [2mm] strip of exposed balsa where the windscreen will be glued.

❑ 6. Use a #11 blade to split both pieces of black rubber tubing for the **cockpit coaming**. Fit the coaming around the cockpit openings with the ends joining at the rear, but don't glue them into position yet.

❑ 7. Prepare the other cockpit the same way.

❑ 8. Trim the molded plastic turtledeck to fit the fuse, then temporarily fit it into position. Trim the rear cockpit coaming to accommodate the turtledeck.

❑ 9. The same way a line was drawn around the windshields, draw a line around the turtledeck onto the covering. Remove the turtledeck, then cut the covering 1/16" [2mm] inside the line you marked and peel off the covering.

❑ 10. Wipe away the ink with a tissue dampened with denatured alcohol. Position the turtledeck, then carefully glue it into position with thin CA. Avoid using CA activator, but if necessary, activator may be applied in **small amounts** by spraying the CA on a T-pin, then using the T-pin to transfer small drops where necessary. If rapidly curing CA fogs the covering or forms small white bubbles, it may be cleaned up with CA debonder. Use care, because debonder will also remove the paint from the turtledeck.

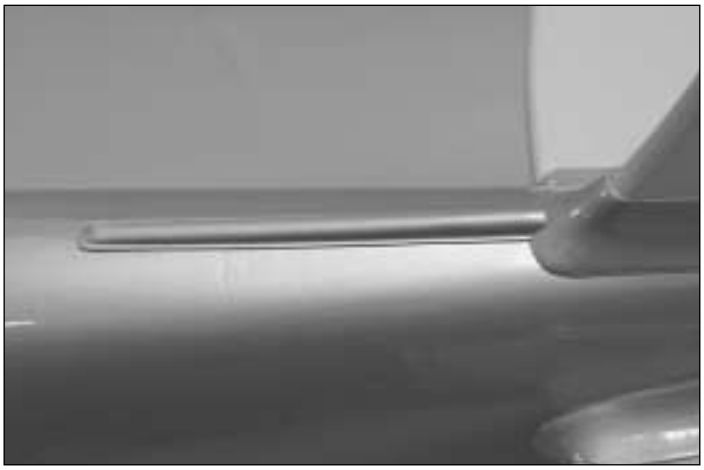
❑ 11. Use thin CA sparingly to glue the coaming to the fuse.

❑ 12. Glue the windscreens to the fuse. This was done on our prototype models using thin and medium CA as necessary, but great care must be used not to smear the windshields by using too much CA. The same as the turtledeck, CA activator may be applied sparingly with a T-pin.

❑ 13. Use CA debonder where necessary to remove CA that has “fogged” the covering or windshields. This is best done with a few drops applied to a cotton swab. **Note:** For added scale effect, a flat black anti-glare panel was applied to the front of the fuselage after the front windshield was glued into position.

❑ 14. Assemble your pilots, then paint them with suitable paint. Acrylic paint (found at craft stores) is recommended. Securely glue the pilots into the cockpits.

❏ 15. Apply 1/4" [6mm] Kwik Stripe silver striping tape (GPMQ1244) around the windscreens where they meet the fuse.



❏ 16. Cut out the molded dorsal fin, then use thin or medium CA to glue it into position as shown.

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 and water allows accurate positioning and reduces air bubbles underneath.

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

4. Use a piece of soft balsa or something similar to squeegee remaining water from under the decal. Apply the rest of the decals the same way. It is best to allow the decals to “set” overnight before flying the model.

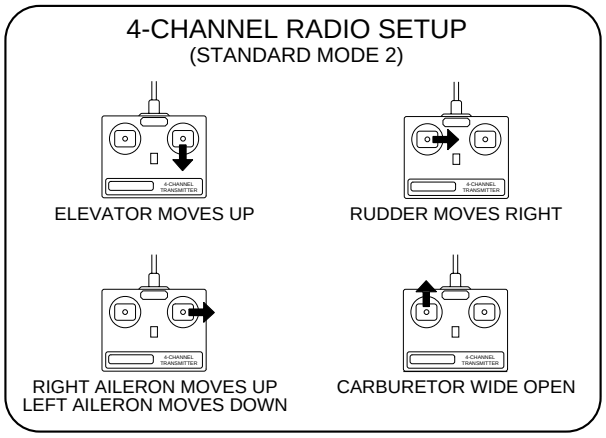
PREPARE THE MODEL FOR FLYING

Set the Control Throws

❏ 1. Connect the aileron servo wires with a “Y” connector. For the following steps the aileron servos need to be connected to the receiver, but it's easier to operate with the wing off the fuselage. Place the wing on a stand next to the fuselage, then connect the “Y” connector from the ailerons to a servo extension cord and connect the cord to the receiver.

❏ 2. Turn on the transmitter and receiver and center the trims. Remove any servo arms that aren't centered and reposition them so they are centered. Reinstall the screw that holds on the servo arm.

❏ 3. If necessary, adjust the clevises on the pushrods so the control surfaces are centered. Be certain to tighten the nuts on the metal clevises on the elevator and rudder.



❏ 4. Make certain the control surfaces and the carburetor respond in the correct direction as shown in the diagram. If any of the controls respond in the opposite direction, change their direction by using the servo reversing feature in your transmitter.

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

NOTE: The control throws are measured at the widest part of the elevators, rudder and ailerons. It is likely that the recommended rudder control throws will not be achieved by adjusting the linkages mechanically (by changing the position of the clevises on the servo arm). Instead, the transmitter ATV will probably have to be used for this. The ATV in the transmitter used to fly the prototypes was set to 70% to achieve the correct rudder throw.

We recommend the following control surface throws:

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

NOTE: This procedure is not to be confused with balancing the model (checking the C.G.). That important step will be covered after this procedure.

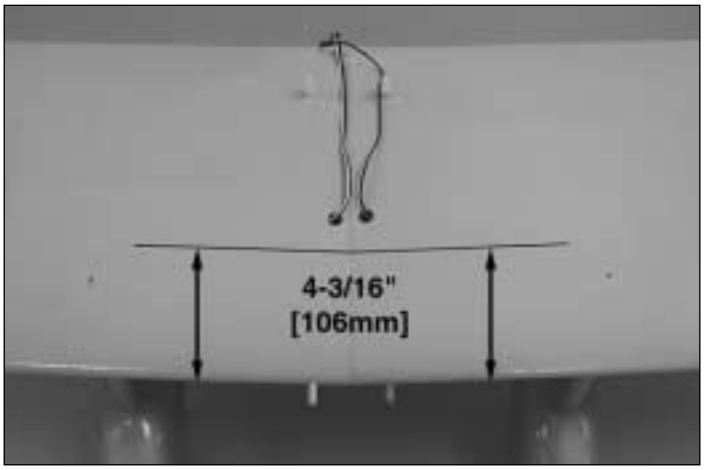
❏ 1. With the wing level, have an assistant help you lift the model by the engine propeller shaft and the bottom of the fuse under the trailing edge of the fin. Do this several times.

❏ 2. If one wing always drops when the model is lifted, 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.**

Balance the Model (C.G.)

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

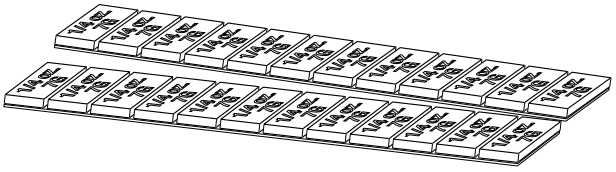
At this stage the model should be in ready-to-fly condition with all of the systems installed including the engine, landing gear, propeller and spinner and the radio system. The fuel tank should be empty.



❏ 1. If using a Great Planes C.G. Machine™ to balance the model, set the rulers on the C.G. Machine to 4-3/16" [106mm]. If you do not have a Great Planes C.G. Machine, use a felt-tip pen or 1/16" to 1/8" [1.5 to 3mm] tape to accurately mark the C.G. 4-3/16" [106mm] from the leading edge next to both sides of the fuselage on the top of the wing.

This is where the model should balance for the first flights. Later, you may wish to experiment by shifting the C.G. up to 1/4" [6mm] forward or 1/4" [6mm] back to change the flying characteristics. Moving the C.G. forward will increase stability, but will decrease the model's aerobatic capabilities by decreasing maneuverability. Moving the C.G. aft will have the opposite effect. In any case, as long as the model is balanced **within the recommended range** it will not display any bad tendencies. Do not at any time balance the model outside the recommended range.

❏ 2. Mount the wing to the fuselage. If using a C.G. Machine, place the model on the machine. If not using a C.G. Machine, lift the model upside-down at the balance point marked on top of both sides of the wing using the tip of your middle finger on both hands.



❑ 3. If the nose drops the model is nose-heavy and will require weight on the tail to balance. If the tail drops, however, the model is tail heavy and will require weight on the nose to balance. If possible, mount the battery pack and receiver in a location that will 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. [29g] weight, or GPMQ4646 for the 2 oz. [57g] weight). Great Planes (GPMQ4485) "stick-on" lead weight is also suitable. A good place to add stick-on lead to the nose is to the firewall. If tail weight is required it may be temporarily attached to the side of the fuse (opposite the engine exhaust) under the stab. After test flying and confirming the amount of weight required, the bottom of the fuse may be cut open and the weight permanently glued inside.

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

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

Identify Your Model

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

Charge the Batteries

Follow the battery charging procedures in your radio instruction manual. The batteries should always be charged the night before flying and at other times as recommended by the radio manufacturer.

NOTE: Checking the condition of the 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, it 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. A Hobbico® Accu-Cycle Plus™ is recommended (HCAP0270).

Balance Propellers

Carefully balance the propeller before flying. Balance a few spare propellers as well. 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.

CHECK LIST

During the last few moments of preparation your mind may be elsewhere anticipating the excitement of the first flight. Because of this, you may be more likely to overlook certain checks and procedures that should be performed before the model is flown. To help avoid this, a checklist is provided to make sure these important areas are not overlooked. Many are covered in the instruction manual, so where appropriate, refer to the manual for complete instructions. Be sure to check the items off as they are completed (that's why it's called a *check list!*).

❑ 1. Fuelproof all areas exposed to fuel or exhaust residue such as the cowl ring, cowl mounting blocks, the fuselage former that the front of the wing dowels go into, the rest of the wing saddle area, etc.
❑ 2. Check the C.G. according to the measurements provided in the manual.
❑ 3. Balance the model laterally as explained in the instructions.
❑ 4. Extend the receiver antenna and make sure it has a strain relief inside the fuselage to keep tension off the solder joint inside the receiver.
❑ 5. Be certain the battery and receiver are securely mounted in the fuse. Simply stuffing them into place with foam rubber is not sufficient.
❑ 6. Use threadlocking compound to secure critical fasteners such as the set screws that hold the axles to the landing gear wires and that hold the wheel collars to the axles, 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 system.

❏ 12. Secure connections between servo wires and Y-connectors or servo extensions and the connection between the battery pack and the on/off switch with vinyl tape, heat shrink tubing or special clips suitable for that purpose.
❏ 13. Make sure servo wires do not interfere with other systems (servo arms, pushrods, etc.).
❏ 14. Make sure the fuel lines are connected and are not kinked.
❏ 15. Balance the propeller (and spare propellers).
❏ 16. Tighten the propeller nut and spinner.
❏ 17. Place your name, address, AMA number and telephone number on or inside the model.
❏ 18. Cycle the receiver battery pack (if necessary) and make sure it is fully charged.
❏ 19. If you wish to photograph the model, do so before the first flight.
❏ 20. Range check the radio when you get to the flying field.

FINAL PREPARATIONS

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.

End of AMA Safety Code

FLYING

The Ryan STA-M 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.

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

Note: Fully cowled engines may run at higher temperatures than an un-cowled engines. 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

If not yet confident in your flight skills with a low-wing model, have an experienced modeler standing by (or at the controls) who can provide assistance or take over if necessary. Tell him to remind you to throttle back once the plane gets to a comfortable altitude. While full throttle may be desirable for takeoff, throttling back a bit once in the air isn't a bad idea to make things happen slower, giving you more time to react.

Before taking off, see how the model handles on the ground by doing a few practice runs at **low speeds** on the runway. Hold "up" elevator to push the tail down and keep the tail wheel on the ground. If the rudder is centered but the model does not roll straight down the runway, adjust the tail wheel steering by turning the nylon ball link on the end of the tail gear pushrod in or out. After making ground handling adjustments and getting used to how the model handles, return to the pits, shut off the engine and top off the fuel. Check all fasteners and control linkages to be certain they are secure.

When ready, place the model on the runway facing 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. As the model gains speed decrease up elevator, allowing the tail to come off the ground. Be ready to apply **right** rudder to counteract engine torque. Gain as much speed as the runway and flying site will practically allow before applying up elevator and lifting the model into the air. Be smooth on the elevator stick, allowing the model to establish a **gentle** climb to a safe altitude before turning into the traffic pattern established at the field you are using. It should be noted that the prototype Ryan STA-M powered by an O.S. MAX .91 FS usually required only about 3/4 throttle for takeoff. If flown in a smooth, scale-like manner, full power may not always be required–even on takeoff!

Flight

Take it easy with the Ryan 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 it 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 the fuel level, but use this first flight to become familiar with the Ryan model before landing.

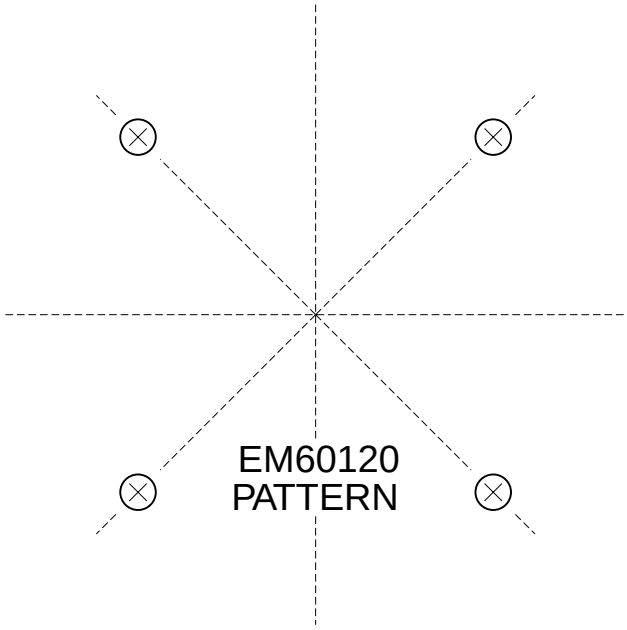
Landing

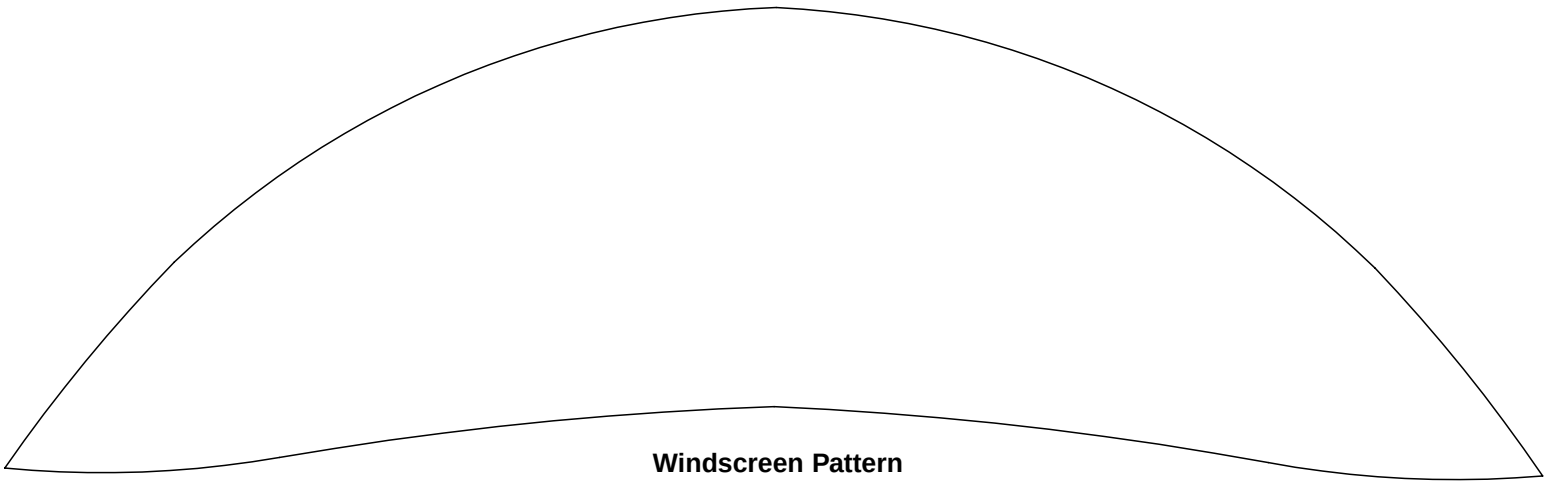
To initiate a landing approach, lower the throttle while on the downwind leg. Allow the nose of the model to pitch downward to gradually bleed off altitude. Continue to lose altitude, but maintain airspeed by keeping the nose down as you turn onto the crosswind leg. Make the final turn toward the runway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

One final note about flying the Ryan (or any model). Have a goal or flight plan in mind for **every** flight. This can be learning a new maneuver(s), improving a maneuver(s) you already know, or learning how the model behaves in certain conditions (such as on high or low rates). This is not necessarily to improve flight skills (*though it is never a bad idea!*), but more importantly so you do not surprise yourself by impulsively attempting a maneuver and suddenly finding that you've run out of time, altitude or airspeed. Every maneuver should be deliberate, not impulsive. For example, if planning a loop, check your altitude, 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 and impulsive moves. **Remember to think.**

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

GOOD LUCK AND GREAT FLYING!





Windscreen Pattern