Rapture 40™

INSTRUCTION MANUAL

Wingspan: 60 in [1525mm]
Wing Area: 635 sq in [41 dm²]
Weight: 4.5–5.25 lb [2040–2350 g]
Wing Loading: 16-19 oz/sq ft [50–57 g/dm²]
Length: 46.5 in [1185mm]
Radio: 4-channel, 4 servos
Engine: .40-.50 cu in [6.5–8.0cc] two-stroke,
.40-.52 cu in [6.5–8.5cc] four-stroke

MADE IN USA

WARRANTY

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

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

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

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

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

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

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

GREAT PLANES® MODEL MANUFACTURING COMPANY

Champaign, IL
(217) 398-8970, Ext. 5
airsupport@greatplanes.com

GPMZ0289 for GPMA0220 V1.0

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INTRODUCTION

Thank you for purchasing the Great Planes **Rapture 40**™. The Rapture 40 is a dual-purpose airplane. It's the perfect low-wing trainer for pilots who have already mastered their high-wing trainer. And it's also perfect for modelers who have already mastered flying, but haven't yet built a model from a kit.

For the latest technical updates or manual corrections to the Rapture 40 visit the Great Planes web site at www.greatplanes.com. Open the "Airplanes" link, then select the Rapture 40. 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.

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

1. Your Rapture 40 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 Rapture 40, if not assembled and operated correctly, could possibly cause injury to yourself or spectators and damage to property.

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

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

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

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

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

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

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

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

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

Before starting to build, compare the parts in this kit with the Parts List, and note any missing parts. Also inspect all parts to make sure they are of acceptable quality. If any parts are missing, broken or defective, or if you have any questions about building or flying this airplane, please contact Great Planes at the address or telephone number below. If requesting replacement parts, please provide the full kit name (Rapture 40) and the part numbers as listed in the Parts List.

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

You can also check our web site at *www.greatplanes.com* for the latest Rapture 40 updates.

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

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

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

ADDITIONAL ITEMS REQUIRED

Hardware & Accessories

This is the list of hardware and accessories required to finish the Rapture 40. Order numbers are provided in parentheses.

- ❏ .40-.50 cu in [6.5–8.0cc] Two-stroke or .40-.52 cu in [6.5–8.5cc] four-stroke engine
- ❏ 4-channel Radio control system with four standard servos
- ❏ Suitable propeller and spare propellers
- ❏ 6" [150mm] Servo extension (for aileron servo–HCAM2701 for Futaba®)
- ❏ 1/4" [6mm] R/C foam rubber (HCAQ1000)
- ❏ 8 oz. [240cc] Fuel tank (GPMQ4103)
- ❏ 3' [900mm] Standard silicone fuel tubing (GPMQ4131)
- ❏ 2-1/2" [65mm] Wheels (GPMQ4223)
- ❏ 2-1/2" [65mm] Spinner (white–GPMQ4520, black–GPMQ4521, red–GPMQ4522,)
- ❏ 1" [25mm] Tail wheel (GPMQ4241)
- ❏ William's Brothers #185 1/5-scale sportsman pilot (WBRQ2485)
- ❏ Acrylic paint and paint brushes for painting pilot (found at craft stores)

Adhesives & Building Supplies

In addition to common household tools (screwdrivers, drill, etc.), this is the "short list" of the most important items required to build the Rapture 40. *We recommend **Great Planes Pro**™ CA and Epoxy glue.*

- ❏ 1 oz. [30g] Thin Pro CA (GPMR6002)
- ❏ 1 oz. [30g] Medium Pro CA+ (GPMR6008)
- ❏ Pro 30-minute epoxy (GPMR6047)
- ❏ HobbyLite™ balsa-colored balsa filler (HCAR3401)
- ❏ Plan Protector™ (GPMR6167) or wax paper
- ❏ Drill bits: 1/16" [1.6mm], 3/32" [2.4mm], 1/8" [3.2mm], 9/64" [3.6mm], 5/32" [4mm], #20 (or 5/32" [4mm]), 3/16" [4.8mm], 15/64 [6mm], 1/4" [6.4mm]
- ❏ 1/4-20 Tap and #7 [5mm] or 13/64" [5.2mm] drill, or 1/4-20 tap and drill set (GPMR8105)
- ❏ Tap handle (GPMR8120)
- ❏ Small metal file
- ❏ Stick-on segmented lead weights (GPMQ4485)
- ❏ #1 Hobby knife (HCAR0105)
- ❏ #11 Blades (5-pack, HCAR0211)
- ❏ #11 Blades (100-pack, HCAR0311)
- ❏ Single-edge razor blades (10-pack, HCAR0212)
- ❏ Flat building board (see ***"Important Building Notes"*** on page 4)
- ❏ Medium T-pins (100, HCAR5150)
- ❏ Sanding tools and sandpaper assortment (see ***"Easy-Touch™ Bar Sander"*** section)

Covering & Covering Tools

Two rolls of covering will be required to cover this model. The following colors are those on the model featured on the kit box cover:

White – (TOPQ0204)
True Red – (TOPQ0227)
Cub Yellow – (TOPQ0220)
Medium Purple – (TOPQ0225)

The following tools are also recommended for applying the covering:

- ❑ Top Flite® MonoKote® sealing iron (TOPR2100)
- ❑ Top Flite Hot Sock™ iron cover (TOPR2175)
- ❑ Top Flite MonoKote trim seal iron (TOPR2200)

Optional Supplies & Tools

Here is a list of tools mentioned in the manual that will help you build the Rapture 40.

- ❑ Razor saw and miter box set (HCAR0240)
- ❑ 4-40 Tap and #43 [2.2mm] drill, or 4-40 tap and drill set (GPMR8101)
- ❑ 2 oz. [57g] Spray CA activator (GPMR6035), or 4 oz. [113g] aerosol CA activator (GPMR634)
- ❑ CA applicator tips (HCAR3780)
- ❑ CA debonder (GPMR6039)
- ❑ Epoxy brushes (6, GPMR8060)
- ❑ Mixing sticks (50, GPMR8055)
- ❑ Mixing cups (GPMR8056)
- ❑ Master Airscrew Razor Plane (MASR1510)
- ❑ Builder's Triangle Set (HCAR0480)
- ❑ Great Planes Precision Hinge Marking Tool™ (GPMR4005)
- ❑ Curved-tip canopy scissors for trimming plastic parts (HCAR0667)
- ❑ Robart Super Stand II (ROBP1402)
- ❑ Microballoons (TOPR1090)
- ❑ Threadlocker™ thread locking cement (GPMR6060)
- ❑ Denatured alcohol (for epoxy clean up)
- ❑ K&S brass tubing; 1/8" [3.2mm], 1/4" [6.4mm], 5/16" [8mm]
- ❑ K&S #801 Kevlar® thread (for stab alignment, K+SR4575)
- ❑ Switch & Charge Jack Mounting Set (GPMM1000)
- ❑ Rotary tool such as Dremel® Moto-Tool®
- ❑ Servo horn drill (HCAR0698)
- ❑ Dead Center™ Engine Mount Hole Locator (GPMR8130)
- ❑ AccuThrow™ Deflection Gauge (GPMR2405)
- ❑ Slot Machine™ (110V, GPMR4010)
- ❑ CG Machine™ (GPMR2400)
- ❑ Precision Magnetic Prop Balancer™ (TOPQ5700)

EXPERT TIP

EASY-TOUCH BAR SANDER

A flat, durable, easy to handle sanding tool is a necessity for building a well finished model. Great Planes makes a complete range of Easy-Touch Bar Sanders and replaceable Easy-Touch Adhesive-backed Sandpaper. While building the Rapture 40, two 5-1/2" [140mm] Bar Sanders and two 11" [280mm] Bar Sanders equipped with 80-grit and 150-grit Adhesive-backed Sandpaper were used.

5-1/2" [140mm] Bar Sander (GPMR6169)
11" [280mm] Bar Sander (GPMR6170)

12' [3.66m] roll of Adhesive-backed 80-grit sandpaper (GPMR6180)
12' [3.66m] roll of Adhesive-backed 150-grit sandpaper (GPMR6183)
Assortment pack of 5-1/2" [140mm] strips (GPMR6189)

Top Flite 320-grit (TOPR8030, 4 sheets) and 400-grit (TOPR8032, 4 sheets) wet-or-dry sandpaper is also recommended for finish sanding.

IMPORTANT BUILDING NOTES

A flat building board that you can stick T-pins into is required. Most of the building is done by pinning the parts over their location on the plan laid over the building board. The 16" x 36" x 3/4" [410 x 910 x 19mm] Great Planes Pro

Building Board (GPMR6948) is suggested. A piece of 2' x 4' [610 x 1220mm] Celotex® ceiling tile is also suitable. Of course, the building board won't be flat unless the workbench beneath it is flat as well.

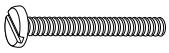
- There are two types of screws used in this kit:

Sheet metal screws are designated by a number and a length.

For example #6 x 3/4" [20mm]

This is a number six screw that is 3/4" [20mm] long.

Machine screws are designated by a number, **threads per inch**, and a length. **SHCS** is just an abbreviation for "socket head cap screw" and that is a machine screw with a socket head.



For example 4-40 x 3/4" [20mm]

This is a number four screw that is 3/4" [20mm] 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.

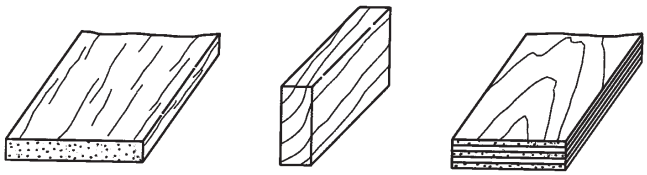
- Whenever the term ***glue*** is written you should rely upon your experience to decide what type of glue to use. When a specific type of adhesive works best for that step, the instructions will make a recommendation.

- 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.

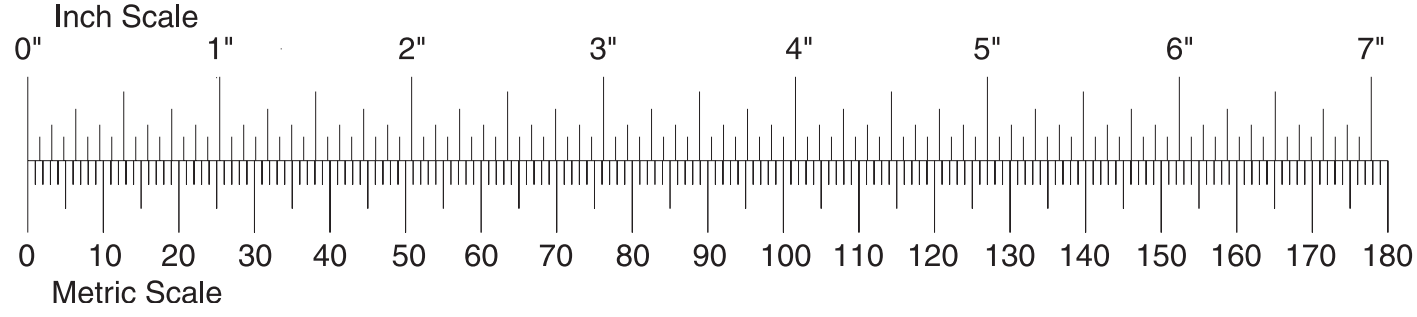
- Not all die-cut parts have a name, or their complete name stamped on them, so refer to the ***"Die-Cut Patterns"*** on page 6 for identification. When it's time to remove the parts from their die sheets, if they are difficult to remove, do not force them out. Instead, use a sharp #11 blade to carefully cut the part from the sheet, then lightly sand the edges to remove any slivers or irregularities. Save some of the larger scraps of wood.

TYPES OF WOOD



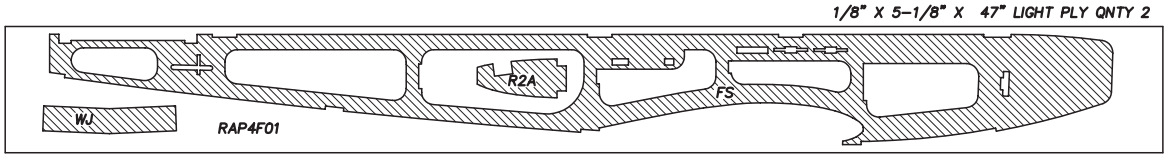
METRIC CONVERSIONS

1/64"	=	.4 mm	3/8"	=	9.5 mm	12"	=	304.8 mm
1/32"	=	.8 mm	1/2"	=	12.7 mm	18"	=	457.2 mm
1/16"	=	1.6 mm	5/8"	=	15.9 mm	21"	=	533.4 mm
3/32"	=	2.4 mm	3/4"	=	19.0 mm	24"	=	609.6 mm
1/8"	=	3.2 mm	1"	=	25.4 mm	30"	=	762.0 mm
5/32"	=	4.0 mm	2"	=	50.8 mm	36"	=	914.4 mm
3/16"	=	4.8 mm	3"	=	76.2 mm			
1/4"	=	6.4 mm	6"	=	152.4 mm			

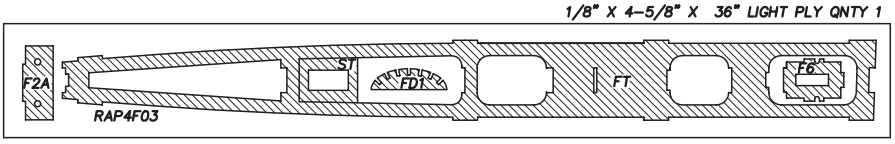


DIE-CUT PATTERNS

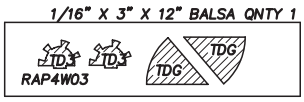
1/8" X 5-1/8" X 47" LIGHT PLY QNTY 2



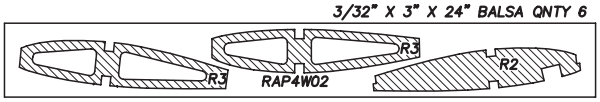
1/8" X 4-5/8" X 36" LIGHT PLY QNTY 1



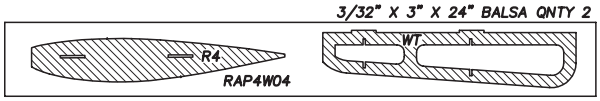
1/16" X 3" X 12" BALSA QNTY 1



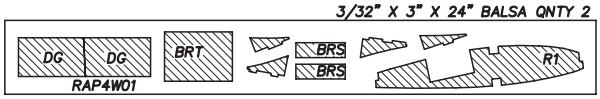
3/32" X 3" X 24" BALSA QNTY 6



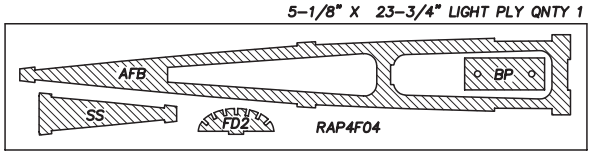
3/32" X 3" X 24" BALSA QNTY 2



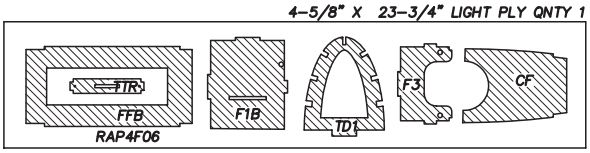
3/32" X 3" X 24" BALSA QNTY 2



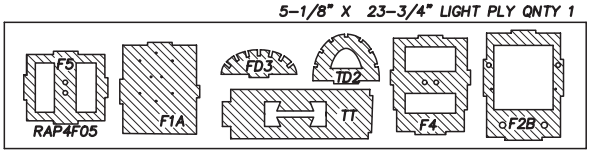
5-1/8" X 23-3/4" LIGHT PLY QNTY 1



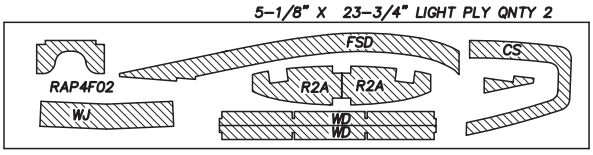
4-5/8" X 23-3/4" LIGHT PLY QNTY 1



5-1/8" X 23-3/4" LIGHT PLY QNTY 1



5-1/8" X 23-3/4" LIGHT PLY QNTY 2

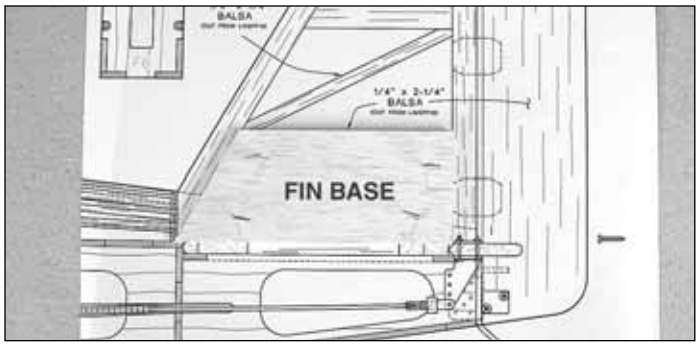


BUILD THE TAIL SURFACES

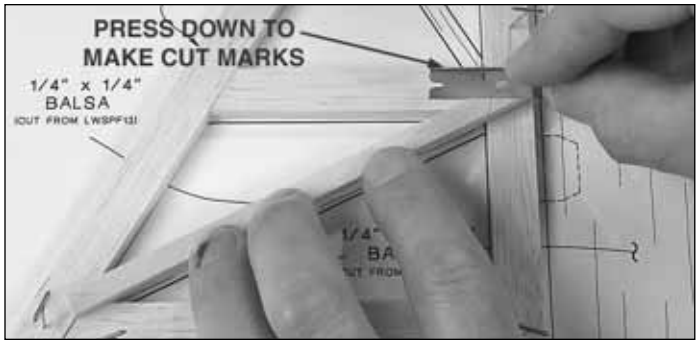
Build the Fin & Rudder

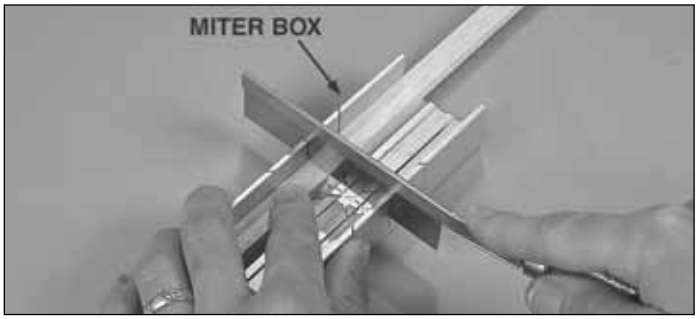
❏ 1. Unroll the full-size plan sheet and reroll it inside out to help it lay flat. Cut the **fin plan** from the rest of the plan, or position the plan so the fin is over your building board. Cover the fin plan with Great Planes Plan Protector or wax paper so glue will not adhere to the paper.

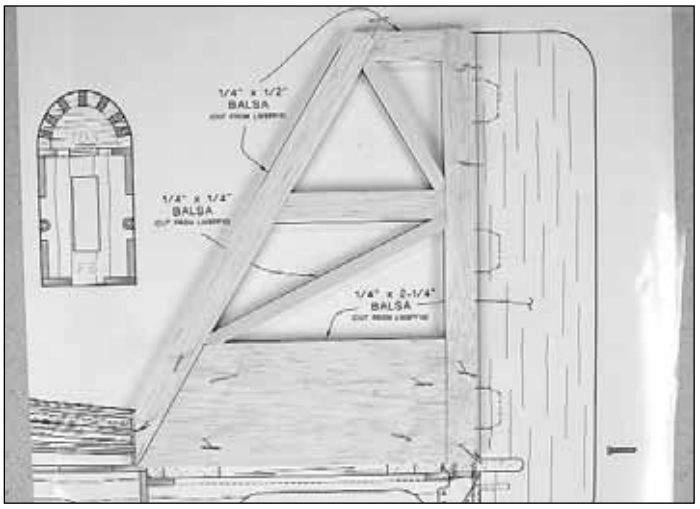
❏ 2. Use the pattern on the plan to cut the **fin base** from the 1/4" x 2-1/4" x 24" [6.4 x 57 x 610mm] balsa sheet. Repositionable spray adhesive may be used to temporarily stick the pattern to the balsa sheet, or the pattern can simply be traced onto the sheet. Use a straightedge and a hobby knife to cut out the part.



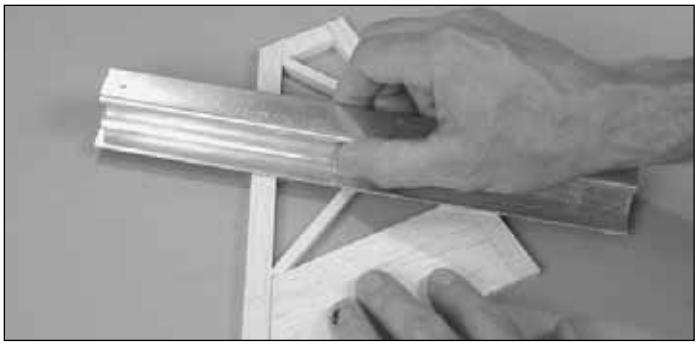
❏ 3. Pin the fin base to the building board over its location on the plan.

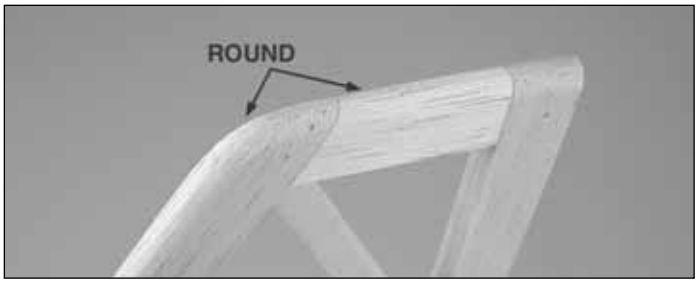




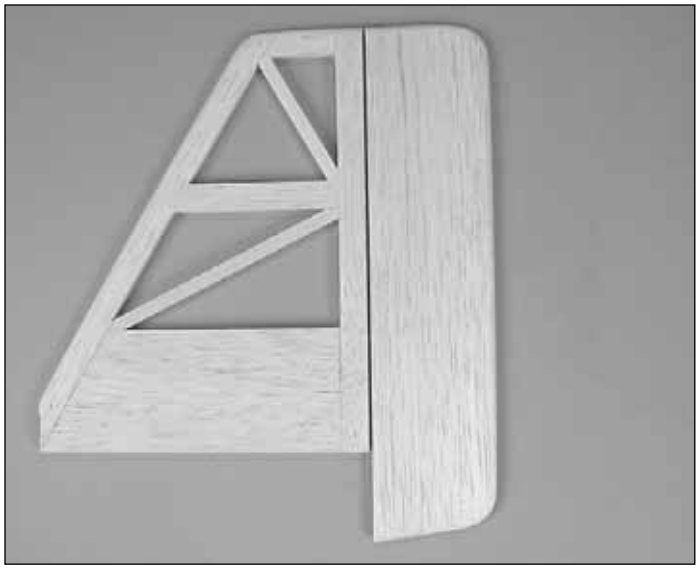


❏ 4. Build the rest of the fin framework from a 1/4" x 1/2" x 36" [6.4 x 13 x 914mm] balsa stick and a 1/4" x 1/4" x 36" [6.4 x 6.4 x 914mm] balsa stick. Use medium CA to glue the parts together and use T-pins to hold them down as you go. **Hint:** The easiest, most accurate way to cut the small sticks is to place the stick over the structure; use a single-edge razor blade to make cut marks, then cut the rest of the way through the stick over your workbench. A miter box is also helpful for cutting 90° angles on some of the larger balsa sticks.





❏ 5. Remove the fin from the plan. Use a bar sander with 80-grit sandpaper to sand both sides flat and round the tip and leading edge. Follow with 220-grit sandpaper. Final sanding will be done later.



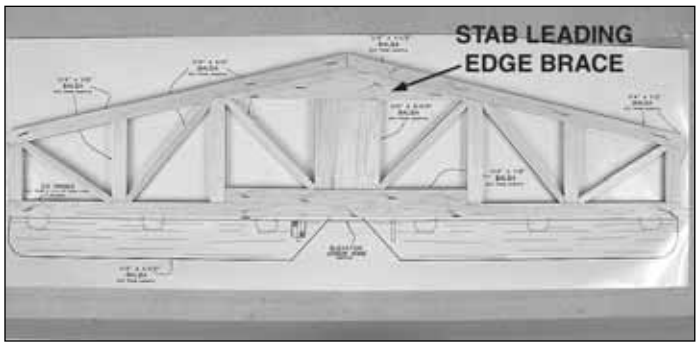
❏ 6. Make the **rudder** as shown on the plan from the remainder of the 1/4" x 2-1/4" x 24" [6.4 x 57 x 610mm] balsa sheet used to make the fin base. Do not cut the “V” in the leading edge until instructed to do so.

Set the fin and rudder aside for now.

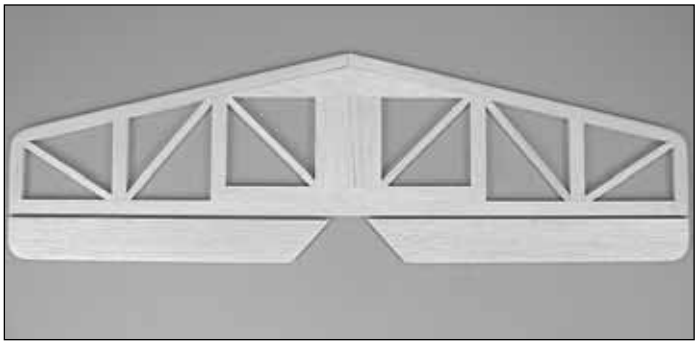
Build the Stab & Elevators

❏ 1. Cut out the stab plan or position the plan so it is over your flat building board. Cover with Great Planes Plan Protector or wax paper.

❏ 2. The same way you cut the fin base for the fin, use the **stab leading edge brace template** on the plan to cut the **stab leading edge brace** from the 1/4" x 1-1/2" x 36" [6.4 x 38 x 914mm] balsa stick. Pin the brace to the plan.



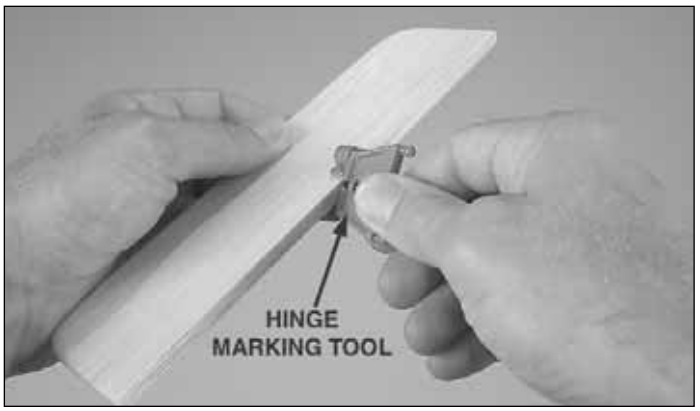
❏ 3. Finish building the stab from the remainder of the 1/4" x 1/4" x 36" [6.4 x 6.4 x 914mm] balsa stick and the remainder of the 1/4" x 2-1/4" x 24" [6.4 x 57 x 610mm] balsa sheet used to build the fin, an additional 1/4" x 1/4" x 36" [6.4 x 6.4 x 914mm] balsa stick and two more 1/4" x 1/2" x 36" [6.4 x 13 x 914mm] balsa sticks.

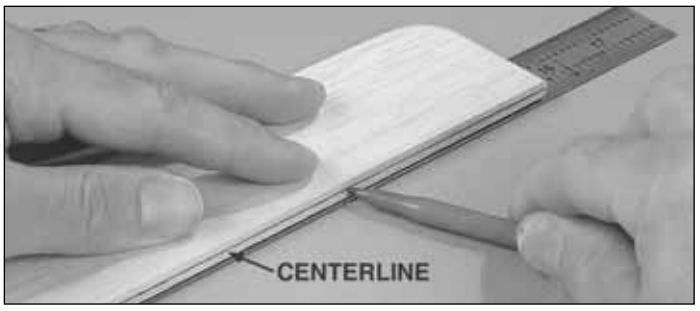


❏ 4. Make both **elevators** from the remainder of the 1/4" x 1-1/2" x 36" [6.4 x 38 x 914mm] balsa sheet used to make the stab leading edge brace. Do not cut the “V” on the leading edge until instructed to do so.

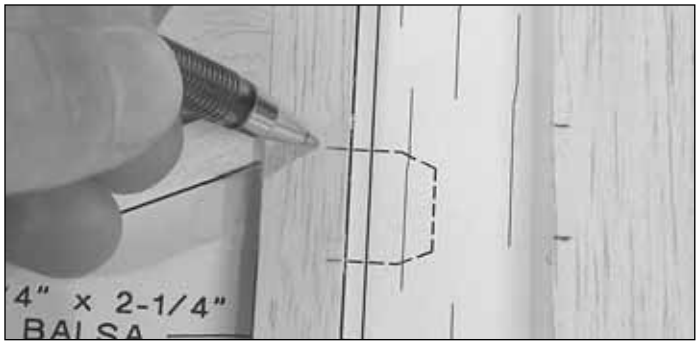
Hinge the Elevators & Rudder

NOTES ABOUT CA HINGES
This kit is supplied with CA hinge material consisting of a 3-layer lamination of Mylar and polyester specially made for hinging model airplanes. When properly installed, this type of CA hinge provides the best combination of strength, durability and easy installation. We use these hinges on all our models, but it is essential to install them correctly. Follow the hinging instructions in this manual for the best result. The techniques shown have been developed to ensure thorough and secure gluing.

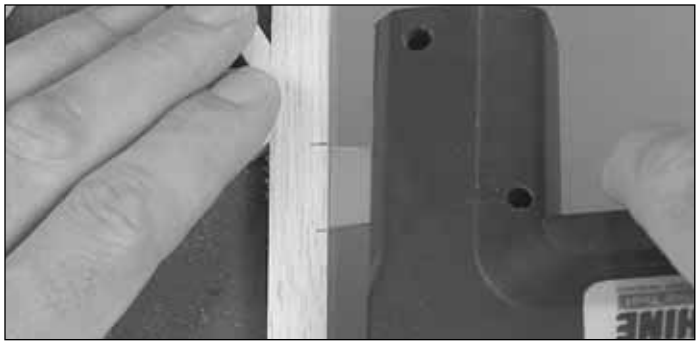


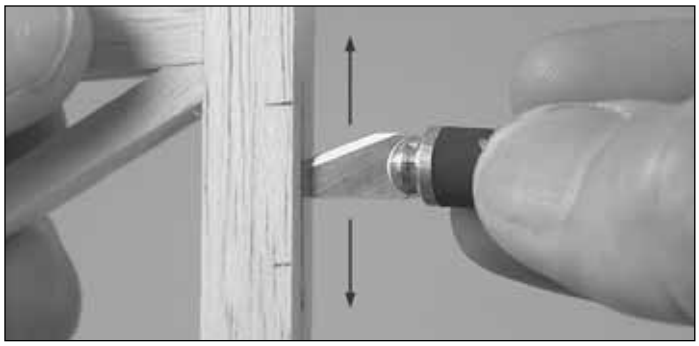


❏ 1. Use a Great Planes Precision Hinge Marking Tool (GPMR4005) to mark the centerline all the way down the leading edge of the rudder. If you don’t have a Hinge Marking Tool, use a fine-point ballpoint pen to mark the centerline as shown. The pen or the rudder may have to be raised from the workbench so the line will be on center.

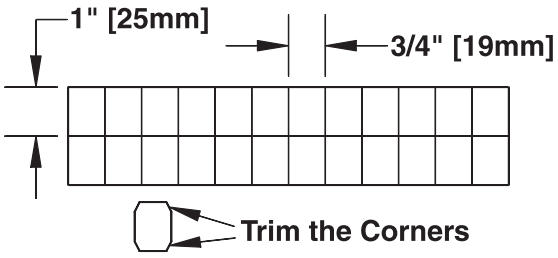


❏ 2. Mark the locations of the hinge slots on the fin and rudder where shown on the plan.

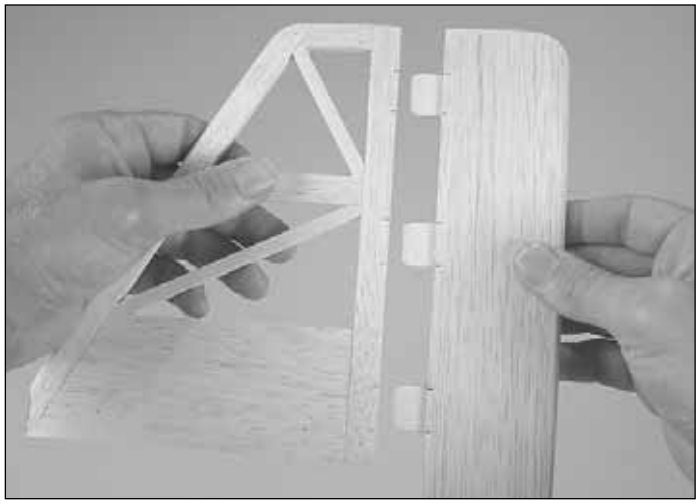


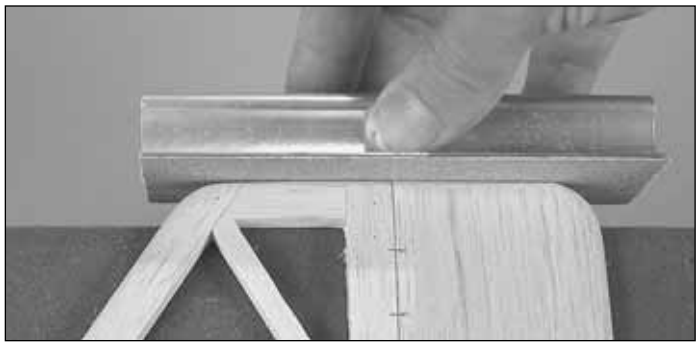


❏ 3. Use a Great Planes Slot Machine to cut hinge slots on the centerlines at the marks. If you do not have a Slot Machine, use a #11 hobby blade to cut the hinge slots. Start by making a small slit. Then, working in small increments, go a little deeper moving the blade back and forth. Note that it's the back of the blade that does the work.

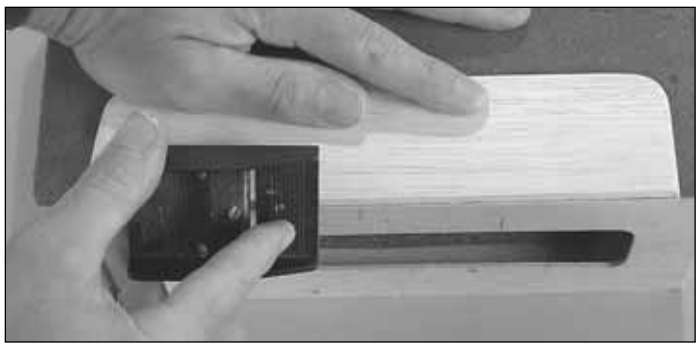


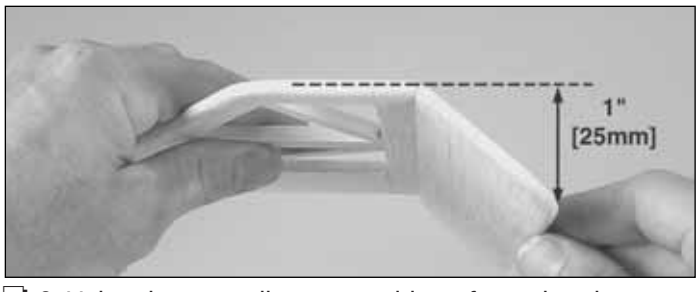
❏ 4. Cut three 3/4" x 1" [19 x 25mm] CA hinges from the supplied 2" x 9" [50 x 230mm] CA hinge strip. Snip off the corners so they go in easier.





❏ 5. Test fit the rudder to the fin with the hinges. Make adjustments where necessary for a good fit. **Hint:** Now that the rudder and fin are together (temporarily), this would be the perfect opportunity to align the tip of the fin and rudder by sanding them to match each other.



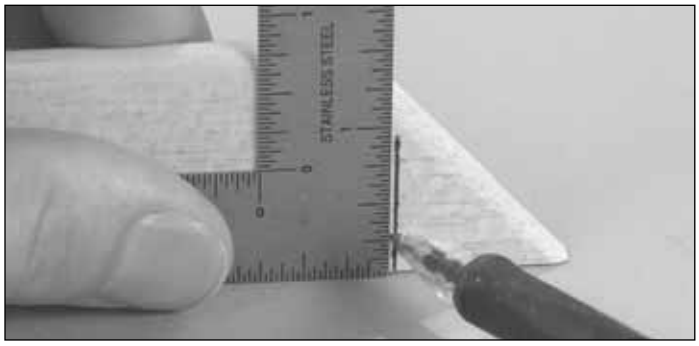


❏ 6. Using the centerline as a guide, refer to the plan to get the correct angle, then shape the leading edge of the rudder to a "V." The best tool for this is the Master Airscrew razor plane (MASR1510). If you don't have a razor plane a bar sander with 80-grit sandpaper can be used instead. The "V" doesn't have to be sharp, but make certain you can get 1" [25mm] of both **right** and **left** rudder throw.

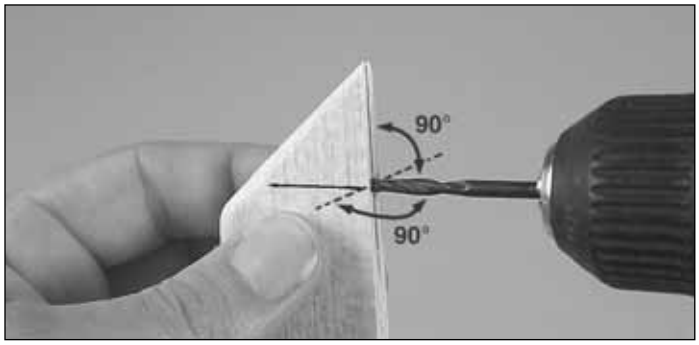
❑ 7. Set the fin and rudder aside. Mark the centerlines and hinge locations and cut the hinge slots on both elevators and the stab the same way, but don't cut the "V" until instructed to do so.

❑ 8. With the elevators temporarily connected to the stabilizer with the hinges, determine which side looks best. Write "bottom" on the other side of the center of the stab.

❑ 9. Place the **joiner wire** on the bottom of the stab as shown. Use a ballpoint pen to mark the location of the ends of the joiner wire where it will go into the elevators.



❑ 10. Extend the lines across the bottom of the elevator using a small square.

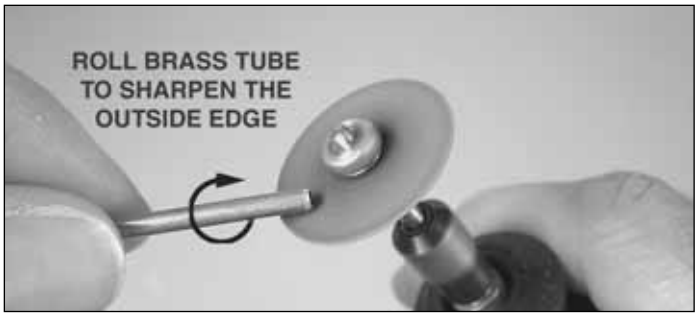


❑ 11. Drill a 9/64" [3.6mm] (or 1/8" [3.2mm]) hole 1" [25mm] deep into both the elevators centered on the lines.

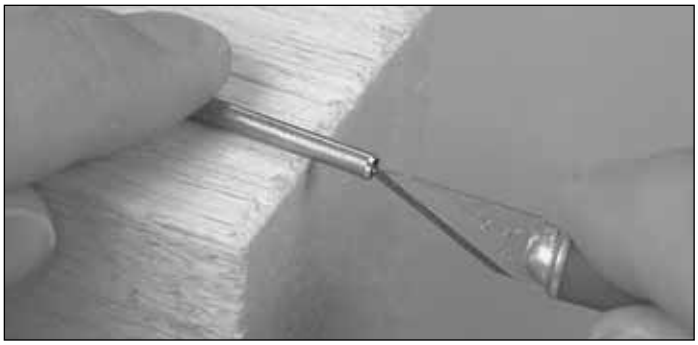
EXPERT TIP

HOW TO SHARPEN A BRASS TUBE FOR CUTTING BALSA

Often, using a brass tube sharpened on the end to cut holes (or grooves) in balsa provides a much cleaner, more accurate hole than would a regular drill bit. The sharpening procedure below works on any size of hobby tubing (available from K&S at hobby shops, craft stores and hardware stores).

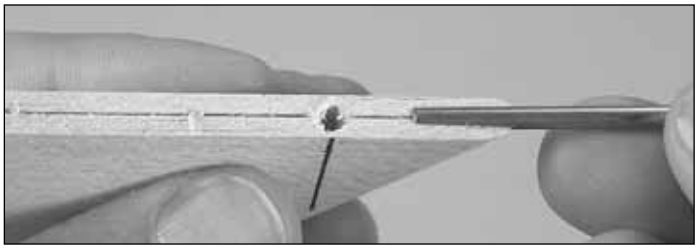


*Sharpen the outside of the tube using a fiber reinforced cut-off wheel or a metal file. If using a cut-off wheel, be certain to use the **reinforced** variety and **always** wear safety glasses.*



Use a hobby knife with a #11 blade to sharpen the inside of the tube by rolling it on a wood block.

The tube can be turned either by hand or by an electric drill. After the hole has been cut the material will usually stick inside the tube. The balsa "plug" can be removed with a wire or the next size smaller tube.



❑ 12. Use a 1/8" [3.2mm] brass tube sharpened on the end or a hobby knife to cut a groove in both elevators to accommodate the joiner wire.

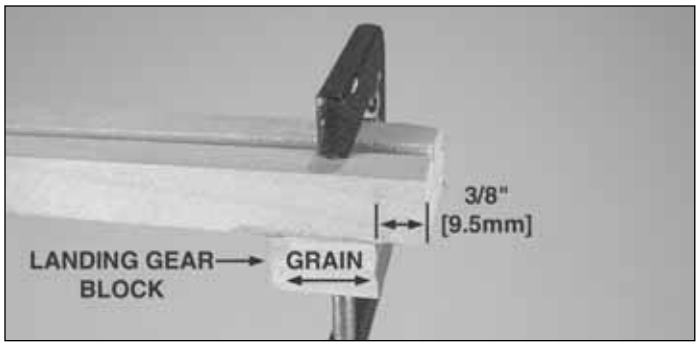
❑ 13. Test fit the elevators to the stabilizer with the joiner wire. Make any adjustments necessary for a good fit.

❑ 14. The same as was done for the rudder, bevel the leading edge of both elevators. Make sure you can get 1/2" [13mm] of both **up** and **down** elevator throw.

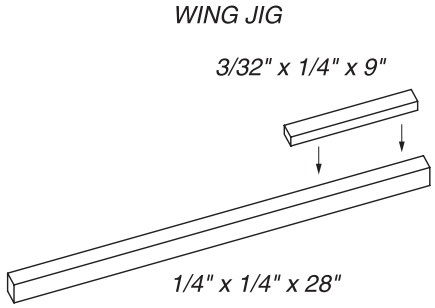
Set the elevators and rudder aside while building the wing.

BUILD THE WING

Build the Wing Panels



❑ 1. Use 30-minute epoxy to glue a 1/2" x 3/4" x 3/4" [13 x 19 x 19mm] maple **landing gear block** to the top of a 1/2" x 3/4" x 6-1/4" [13 x 19 x 160mm] **landing gear rail**. The block should be 3/8" [10mm] from one end of the rail and the wood grain on the block should run the same direction as the rail. Make another assembly the same way. Set the assemblies aside and get to work on the rest of the wing while the epoxy hardens.



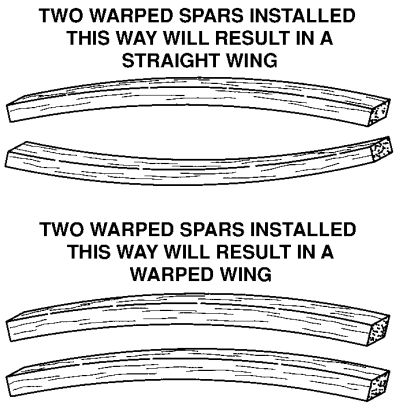
❑ 2. Cut 9" [230mm] from a 3/32" x 1/4" x 24" [2.4 x 6.4 x 610mm] balsa stick. Cut 2" [50mm] from a 1/4" x 1/4" x 30" [6.4 x 6.4 x 760mm] balsa stick. Glue the 9" [230mm] stick on top of one end of the 28" [710mm] stick to make the **wing jig**.

Start with the left panel so yours looks like the photos the first time through.

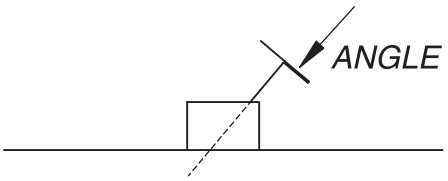
❑ ❑ 3. Position the left wing panel plan over your flat building board and cover it with Plan Protector or wax paper.

Refer to this photo for the following three steps.

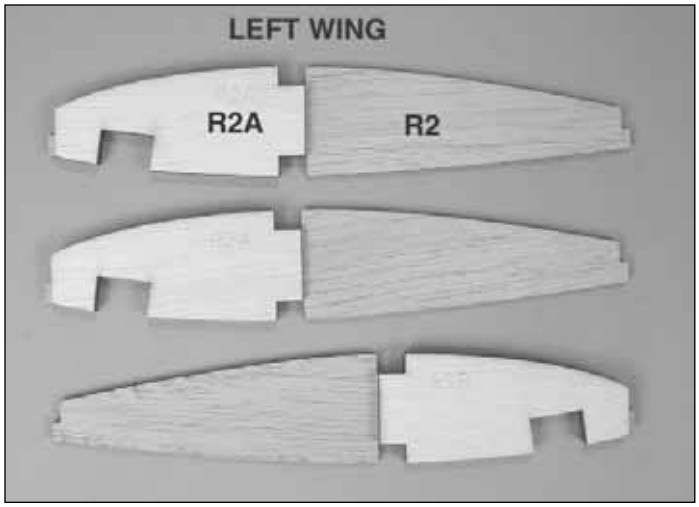
❑ ❑ 4. Pin the wing jig over its location on the plan with the ends protruding beyond the root and tip ribs. The end with the 9" [230mm] piece goes toward the root end of the wing panel.

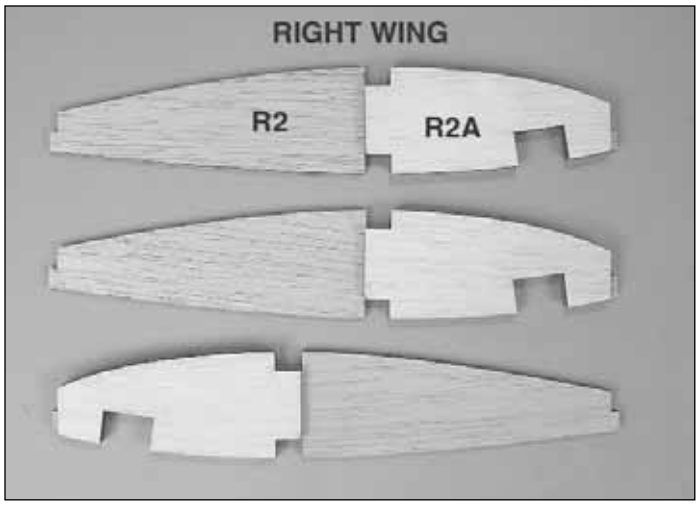


❑ ❑ 5. Inspect the four 3/8" x 3/8" x 30" [9.5 x 9.5 x 760mm] balsa **wing spars** included with this kit. Note any warps that may be present. If any of the spars are warped, pair them up as shown in the sketch at the top to cancel out any warps.

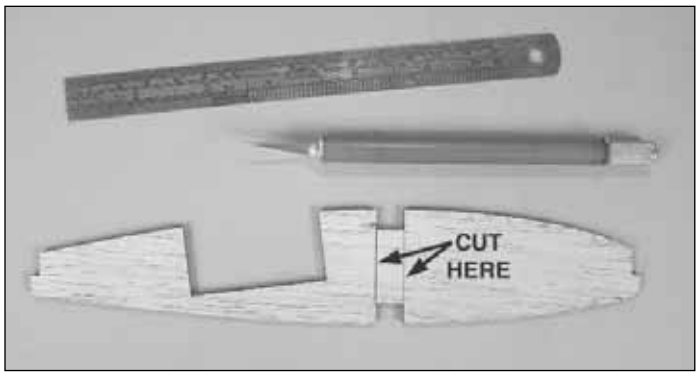


❑ ❑ 6. Pin one of the wing spars over its location on the plan being certain, if necessary, to place it so any warp will be cancelled out by the top spar. Note that the pins should be inserted at an angle so they do not interfere with the top spar when it is added later on. Also note that the tip of the spar should “end” at the outer edge of rib R3 but the root end of the spar may extend beyond the root rib.

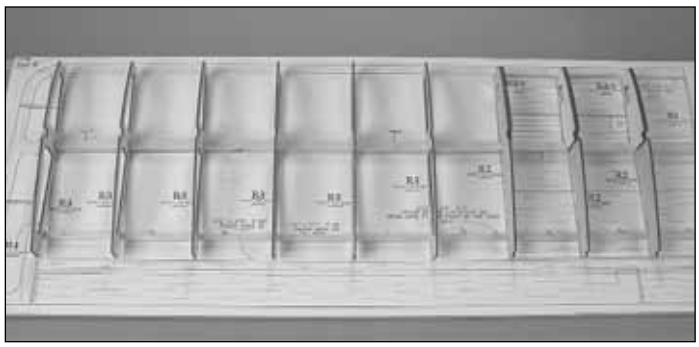




❑ ❑ 7. Use medium CA or epoxy to glue the die-cut 1/8" [3.2mm] plywood **R2A rib doublers** to the correct side of three die-cut 3/32" [2.4mm] balsa **R2 ribs** as shown in the photo for the wing panel you are working on.

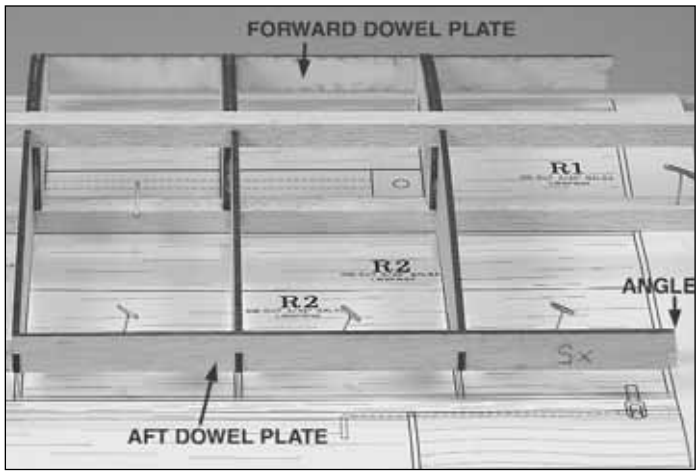


❑ ❑ 8. Use a straightedge and a hobby knife to cut **partway** through the **outside** of rib R1 between the spar notches as shown.



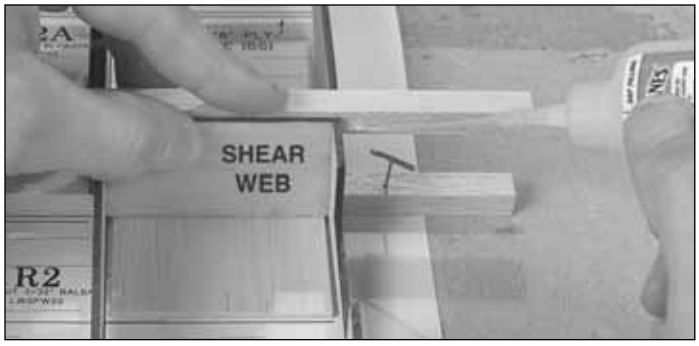
❑ ❑ 9. Using a small square to keep the ribs vertical, glue all the ribs **except** ribs **R1** to the bottom spar. Also be certain the ribs are contacting the wing jig as you go.

❑ ❑ 10. Glue the top spar to the ribs, again making sure the ribs remain vertical. Don't forget to position the top spar to cancel out any warp that may have been in the bottom spar. If any of the ribs lift from the wing jig, use T-pins to hold them down.

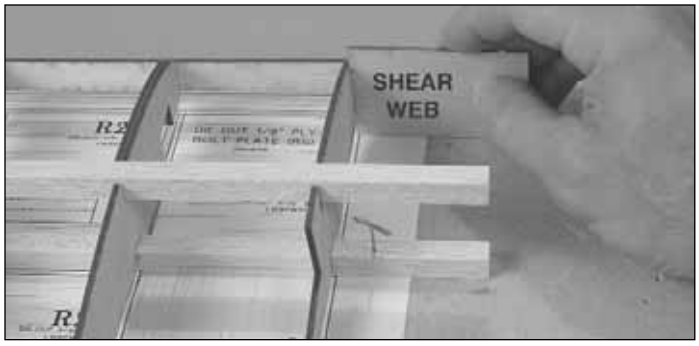


❑ ❑ 11. Glue the die-cut 1/8" [3.2mm] plywood **forward** and **aft dowel plates** into position. Note the angle on one end of the dowel plates. This is the end that goes on R1.

❑ ❑ 12. Fit, but do not glue rib R1 into position. Place a leftover piece of 3/32" [2.4mm] balsa on the plan against the bottom spar.



❑ ❑ 13. Fit, but do not glue the die-cut 3/32" [2.4mm] balsa **shear web (DG)** between R1 and R2. Make sure the shear web is installed with the angled end contacting R1 so that the top of R1 is slanting outward toward the wing tip. Glue R1 to the top and bottom spars only.

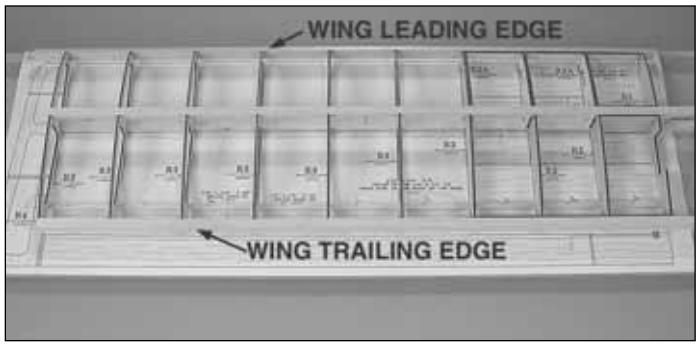


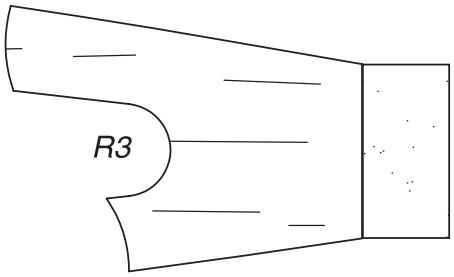
❑ ❑ 14. Remove the shear web. Flip it over, then use it to check the angle of R1 as you glue it to the forward and aft dowel plates.

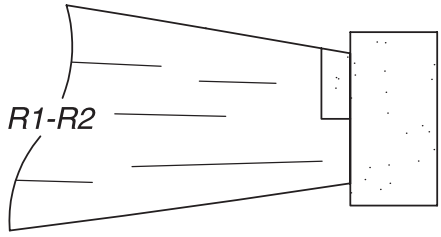
❑ ❑ 15. Using the 3/32" [2.4mm] balsa shim to raise the shear web from the plan, glue the shear web to the back of the spars. Use the same procedure to glue another shear web to the front of the spars. Be careful not to inadvertently glue the leftover balsa shim to the spars or shear web.

❑ ❑ 16. Lightly sand the front of the dowel plates to trim any ribs that may be protruding.

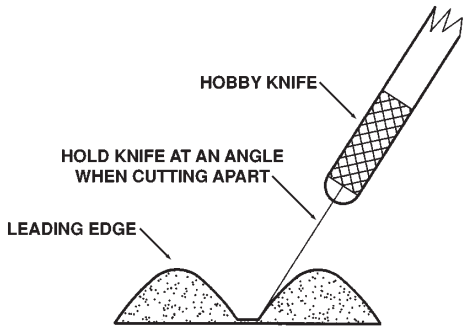
Refer to this photo for the following three steps.





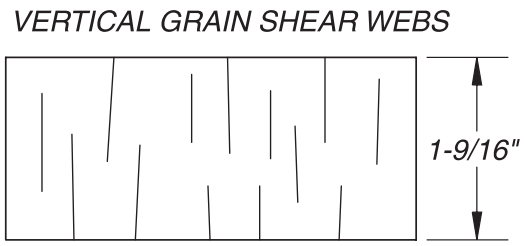


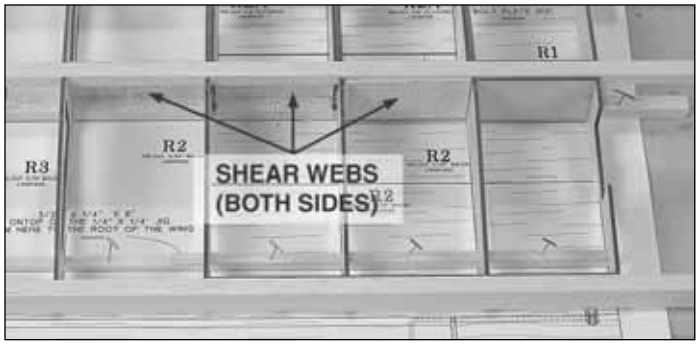
❑ ❑ 17. Glue the 3/8" x 3/4" x 30" [2.4 x 19 x 760mm] balsa **wing trailing edge** into position. Note that the trailing edge should be centered vertically on all the ribs. This means that the top and bottom of all the R3 ribs will be even with the top and bottom of the trailing edge, but there will be a 3/32" [2.4mm] difference between the top and bottom of the other ribs and the top and bottom of the trailing edge.



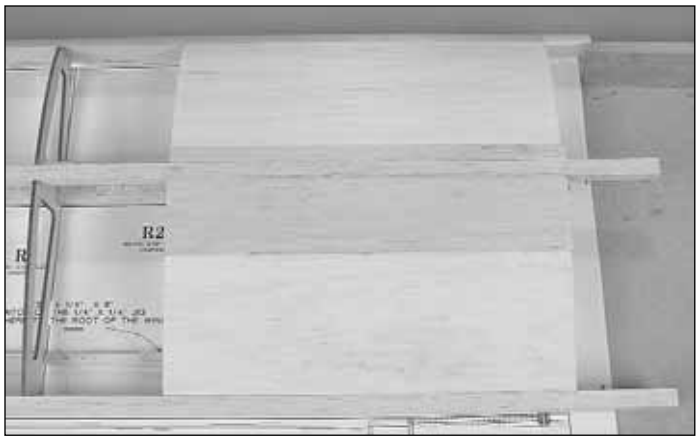
❑ ❑ 18. Use a hobby knife to separate the 30" [760mm] **shaped leading edges** from each other as shown in the sketch.

❑ ❑ 19. Glue one of the leading edges into position. Be certain the leading edge is centered vertically on all the ribs and the dowel plate. Note that the tip of the leading edge should extend approximately 1-1/2" [38mm] beyond R3 at the wing tip.



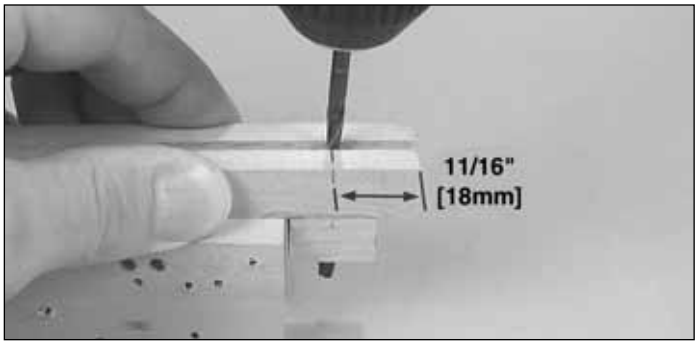


❏ ❏ 20. Cut four 1-9/16" [39mm] **vertical grain shear webs** from the 3/32" x 3" x 24" [2.4 x 76 x 609mm] hard balsa sheet. Trim the ends of the shear webs to fit between the ribs where shown on the plan. The same as when gluing the die-cut shear webs into position, use a piece of leftover 3/32" [2.4mm] balsa to raise the shear webs from the plan. **Note:** Remove any T-pins that are in the way.

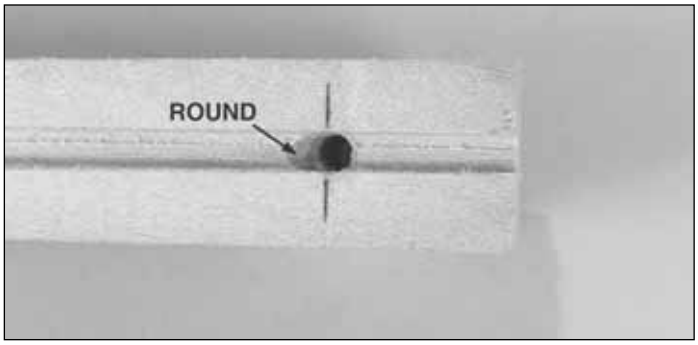


❏ ❏ 21. Remove any T-pins that are in the bottom spar between R1 and the last R2. Sheet the top of the wing with a 3/32" x 3" x 36" [2.4 x 76 x 914mm] balsa sheet.

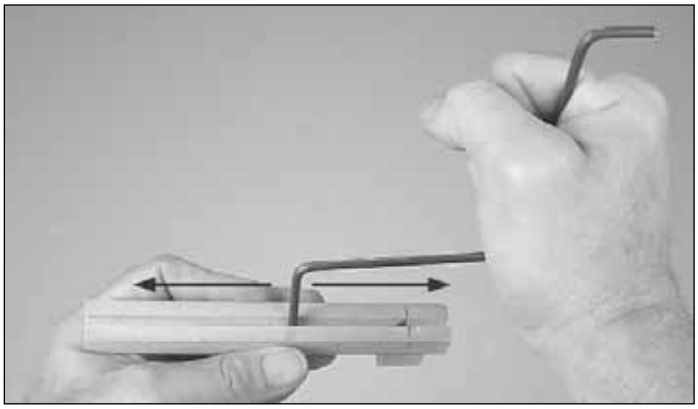
❏ ❏ 22. Now the wing may be removed from the building board. Use part of another 3/32" x 3" x 36" [2.4 x 76 x 914mm] balsa sheet to sheet the bottom of the wing, but only between the trailing edge and the main spar.



❏ ❏ 23. Drill a #20 or 5/32" [4mm] hole through the landing gear rail and the landing gear block 11/16" [18mm] from the end. (The wire is 5/32" [4mm], but using a #20 drill, which is slightly larger than 5/32" [4mm], will make the gear a little easier to install and remove during construction.)



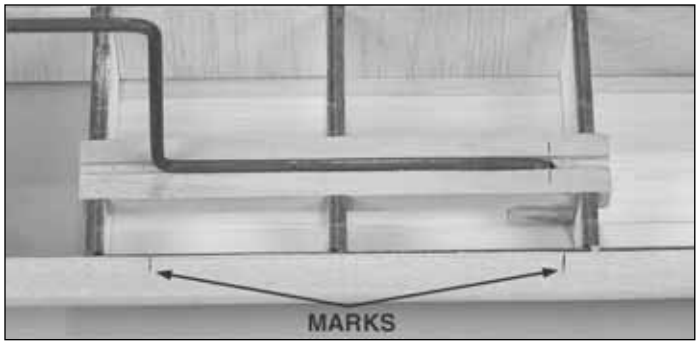
❏ ❏ 24. Use a hobby knife to round the edge of the hole to accommodate the bend in the gear.



❏ ❏ 25. Slightly widen the groove in the rail by pushing one end of the gear back and forth. This will also make it easier to install and remove the gear during test fitting and assembly.

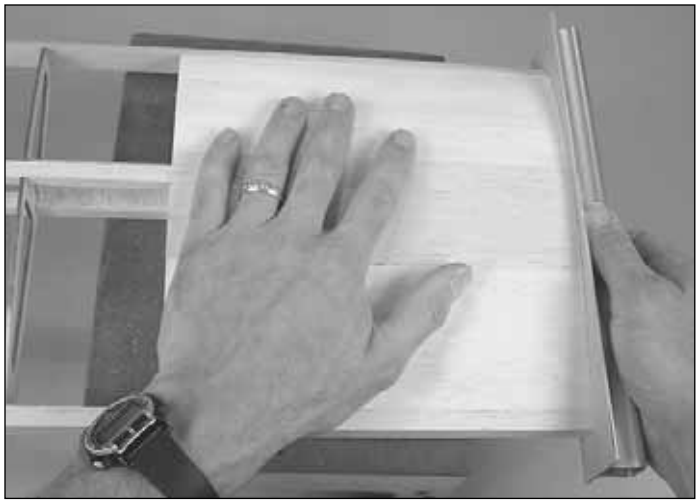
❏ ❏ 26. Test fit the gear in the rail. Make adjustments where necessary.

❏ ❏ 27. Use 30-minute epoxy to glue the previously prepared landing gear rail assembly into position on the bottom of the wing. Be certain to get a **secure** glue joint between the maple landing gear block and the plywood doubler (excess glue isn't required–good contact is the way to a strong joint).

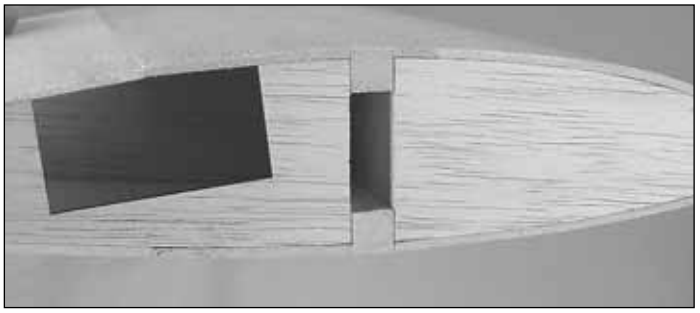


❏ ❏ 28. With the gear in the rail, use a ballpoint pen to mark the leading edge of the wing at both ends of the gear. These marks will note the ends of a groove that will be cut in the sheeting for the gear.

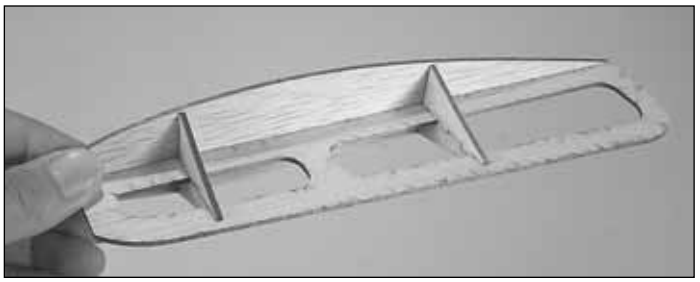
❏ ❏ 29. Sheet the remaining open section of the bottom of the wing panel with leftover 3/32" [2.4mm] balsa sheeting.



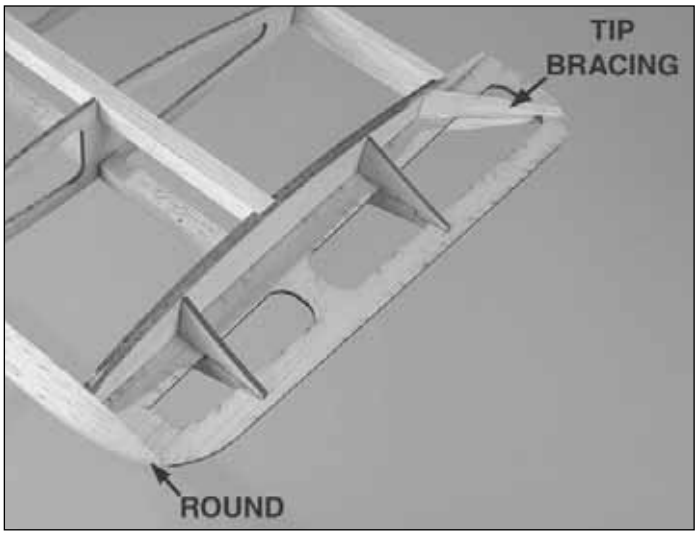
❏ ❏ 30. Cut off the remaining portion of the spars, leading edge and trailing edge so they are even, or nearly even with R1. Do not cut off the leading edge at the tip. Sand the spars and sheeting even with end ribs. Also sand the trailing edge to match the shape of the ribs.

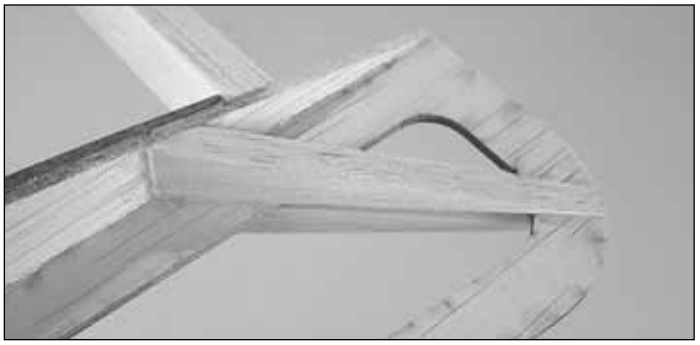


❏ ❏ 31. Using the partially cut guide lines on R1, cut the rest of the way through and remove the section of balsa between the spars.

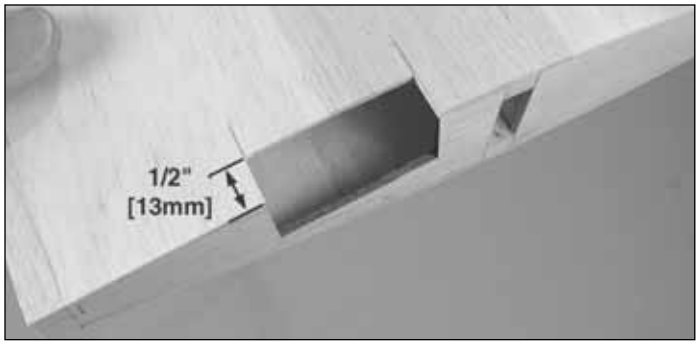


❏ ❏ 32. Test fit, then glue together all the die-cut 3/32" [2.4mm] balsa parts of the **wing tip**. Be certain to make a **right** or a **left** tip depending on which wing panel is currently under construction.





❏ ❏ 33. Glue the completed wing tip assembly to the end of the wing. Round the leading edge as shown in the photo and on the plan. Add the tip bracing from leftover 1/4" [6.4mm] balsa.

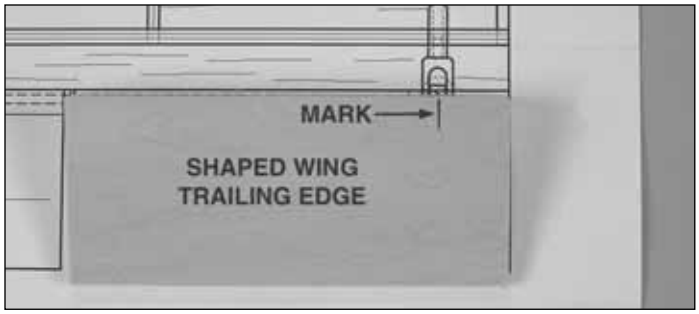


❏ ❏ 34. Cut a 1/2" [13mm] strip from the top sheeting over the opening for the aileron servo.

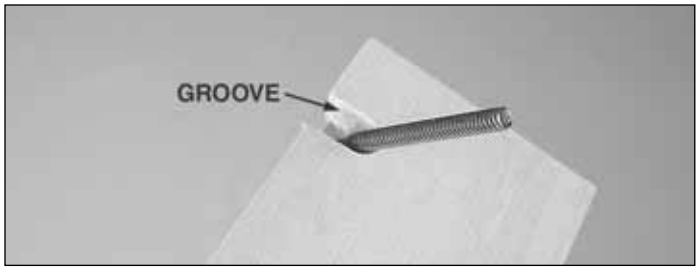
❏ 35. Return to step 4 and build the **right** wing panel. Be sure to place the **right** panel wing plan over your building board so as not to accidentally build another left panel.

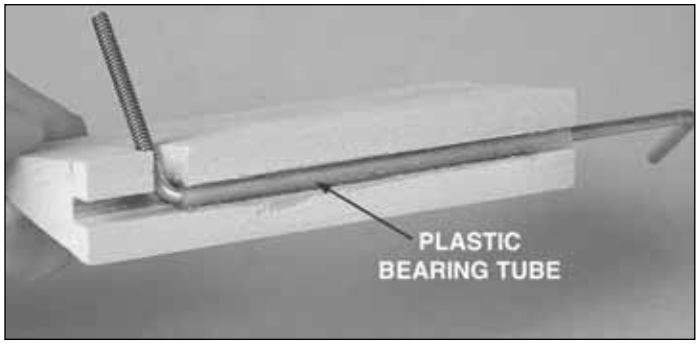
Make the Ailerons

Again, do the left wing first.

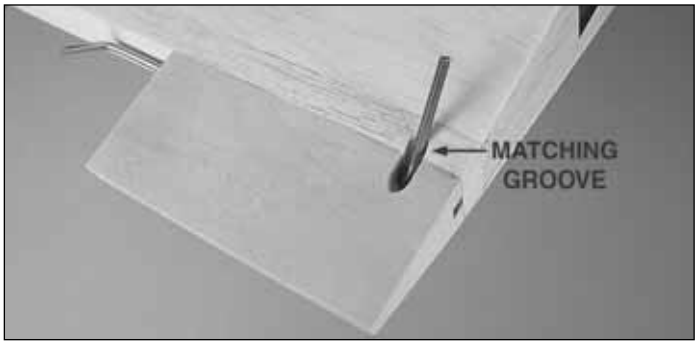


❏ ❏ 1. Mark one of the basswood **shaped wing trailing edges** where the **left aileron torque rod** will go through.





❏ ❏ 2. Use a rotary tool or a hobby knife to cut a groove to accommodate the **left aileron torque rod**.



❏ ❏ 3. Cut a matching groove in the wing trailing edge.

❏ ❏ 4. Roughen the plastic **bearing tube** on the torque rod with coarse sandpaper. Use thick or medium CA to glue the tube into the shaped trailing edge. Use caution not to inadvertently get any glue inside the bearing tube. **Hint:** Add a small dab of petroleum jelly to the end of the bearing tube to keep epoxy from getting in.

❏ ❏ 5. Glue the shaped wing trailing edge to the wing. The wing trailing edge should extend past the root end of the wing by approximately 1/32" [0.8mm] so the angle can be sanded to match R1.

❏ ❏ 6. Sand the top, bottom and end of the shaped wing trailing edge as necessary to blend with the rest of the wing.

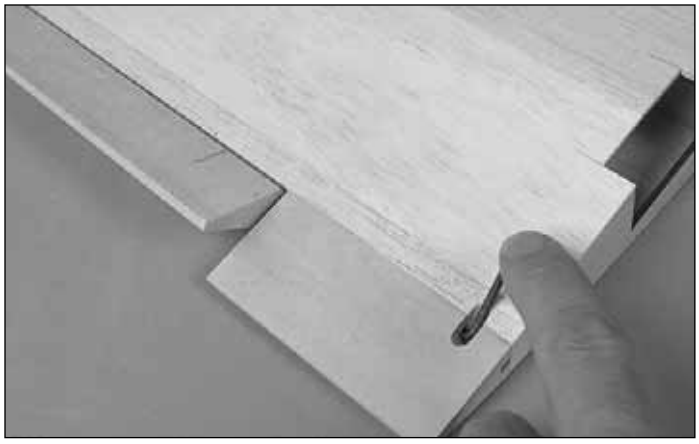
❏ ❏ 7. Prepare the other shaped wing trailing edge for the **right** wing and glue it into position the same way. **Note:** Be certain to cut the groove in the correct location so as not inadvertently make another left side!

❏ ❏ 8. Fit one of the 24" [609mm] shaped balsa **ailerons** up to the wing. If necessary, trim one end of the aileron so there will be an approximately 3/32" [2.4mm] gap on both ends.

❏ ❏ 9. The same as was done for the elevators, mark the location for the torque rod on the aileron, then drill a 1/8" [3.2mm] hole and cut the groove. Mark and cut all the hinge slots as well.

❏ ❏ 10. Cut eight more 3/4" x 1" [19 x 25mm] CA hinges. Test fit the aileron to the wing with four of the hinges. Make adjustments where necessary.

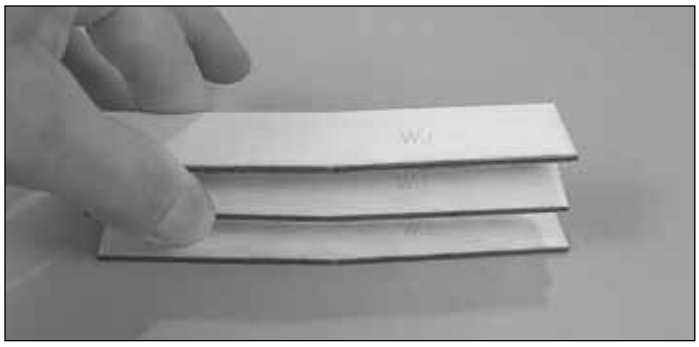
❏ ❏ 11. Remove the aileron from the wing and shape the leading edge to a “V” as shown on the plan.



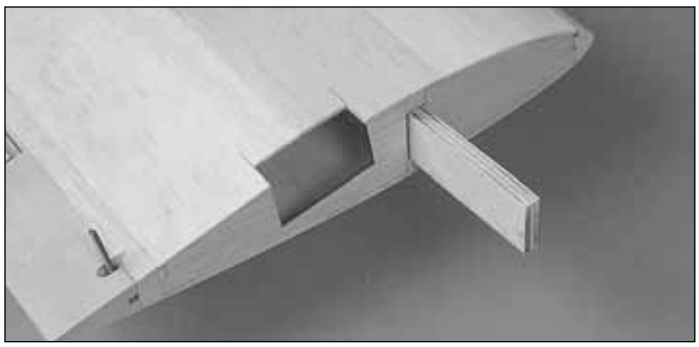
❑ ❑ 12. Test fit the aileron to the wing and torque rod with the hinges. Use the torque rod to move the aileron up and down to make sure you can achieve 1/2" [13mm] of both up and down aileron throw as shown in the control throws chart on page 36.

❑ 13. Make the aileron for the **right** wing the same way.

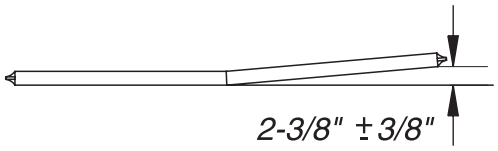
Join the Wing



❑ 1. Use medium CA or epoxy to glue together three die-cut 1/8" [3.2mm] plywood **wing joiners** (four are supplied but only three are used).



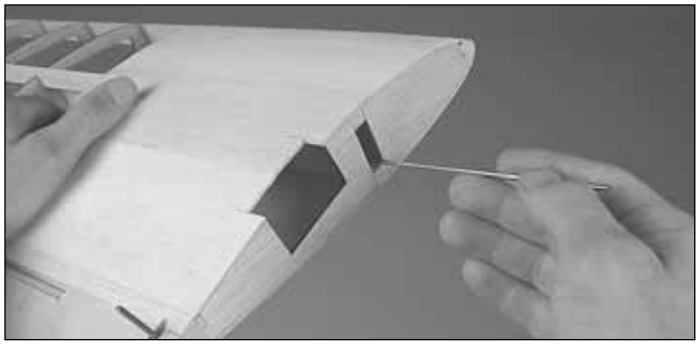
❑ 2. Test fit the wing joiner in one wing half, then the other. Test join the wings with the joiner. Make any adjustments necessary for a good fit. (Sometimes the ends of the wing require a little "fine tuning" with a bar sander or the edges of the joiner might need to be sanded a little.)

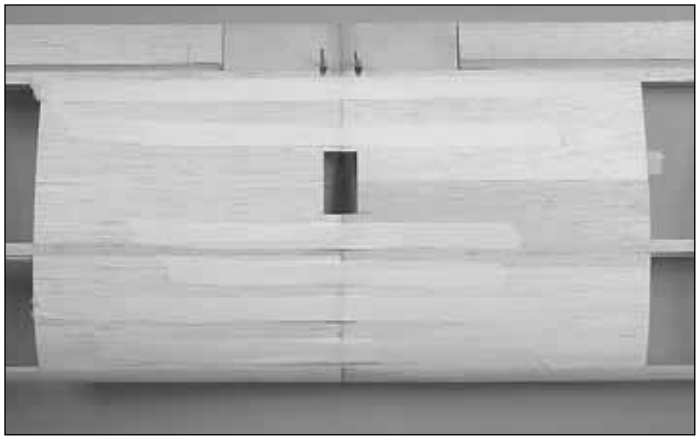


❑ 3. With the wings temporarily fit together, lay one wing panel flat on your workbench and measure the distance between the bottom of the other panel under the bottom spar at the tip. The distance should be 2-3/8" [60mm] plus or minus 3/8" [10mm]. If you are not able to achieve this measurement within the 3/8" [10mm] tolerance, separate the wing halves and look for anything that may interfere with the fit such as glue blobs inside the wings where the joiner goes. **Note:** It is more important to have a good fit between the joining wing panels than it is to have exactly 2-3/8" [60mm] of dihedral.

❑ 4. Gather all the items required for joining the wing: 30-minute epoxy, a mixing cup and mixing stick, an epoxy brush, masking tape, paper towels and denatured alcohol (for clean up).

Note: When joining critical components such as the wing halves, it is imperative to coat **all joining parts** with epoxy. In other words, don't coat only one of the contacting end ribs. Coat the end ribs of **both** wing panels. Similarly, don't just coat the joiner. Also coat the insides of the wing where the joiners go.

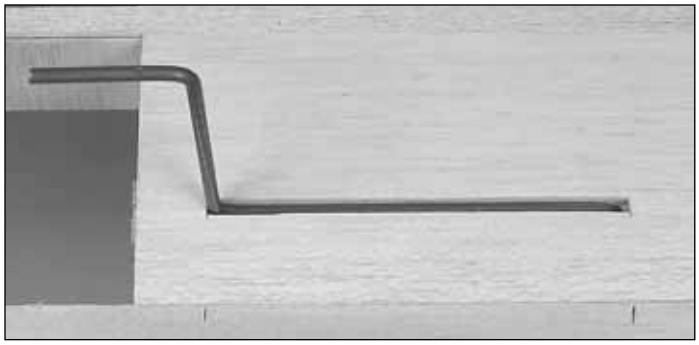




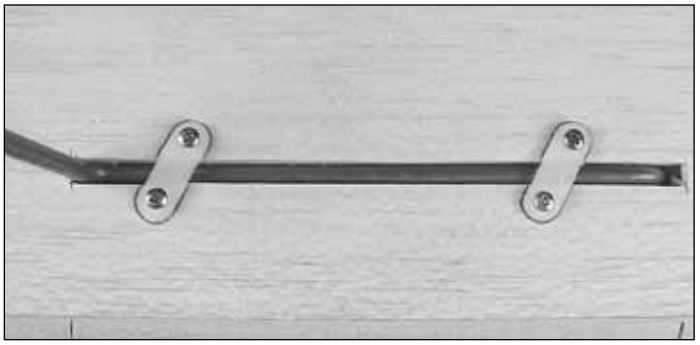
❑ 5. Prepare approximately 3/4 oz. [25cc] of 30-minute epoxy. Use a piece of wire or a small dowel to coat the inside of one of the wing halves where the joiner goes and the rib on the end of the panel. Coat one half of the joiner, then insert the joiner into the panel. Working quickly before the epoxy starts to harden, coat the inside and the end of the other panel and the protruding end of the joiner. Fit the wings together. Wipe away excess epoxy as it squeezes out. Use several strips of masking tape to **tightly** hold the wing halves together, wiping away excess epoxy as it is forced from between the panels. Be certain both panels accurately align–especially the leading and trailing edges. Do not disturb the wing until the epoxy has hardened.

Finish the Wing

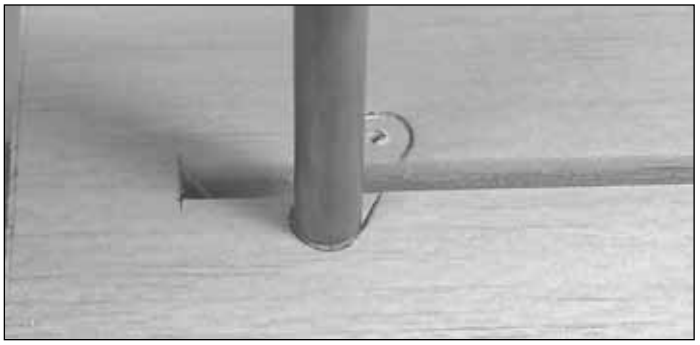
Fit both landing gears at the same time.

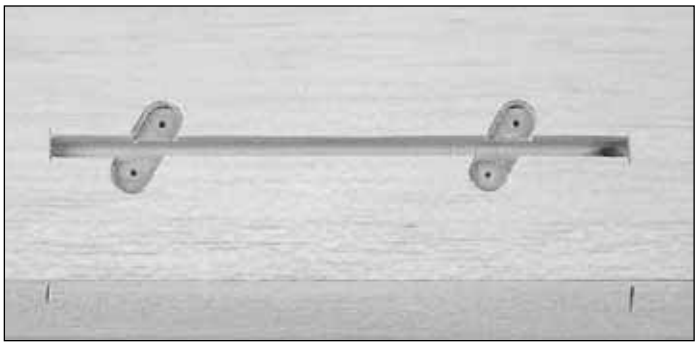


❑ 1. Remove all the masking tape. Using the marks made earlier on the leading edge as a guide, cut the slots in the bottom sheeting for both landing gears. Test fit the gear. Make adjustments where necessary.

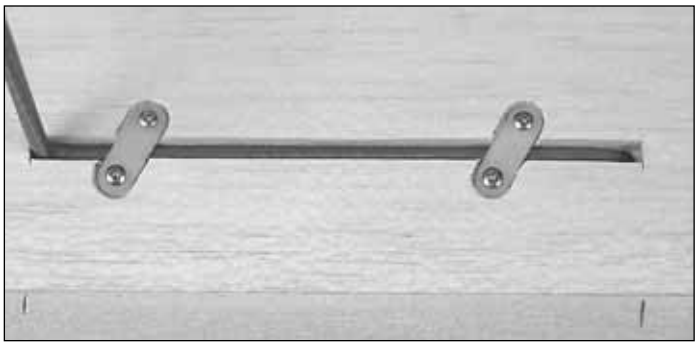


❑ 2. Temporarily mount the landing gear with four nylon landing gear straps and eight #2 x 1/2" [13mm] screws. Drill 1/16" [1.6mm] holes for the screws. Use a fine-point ballpoint pen to draw the outline of the straps onto the sheeting.

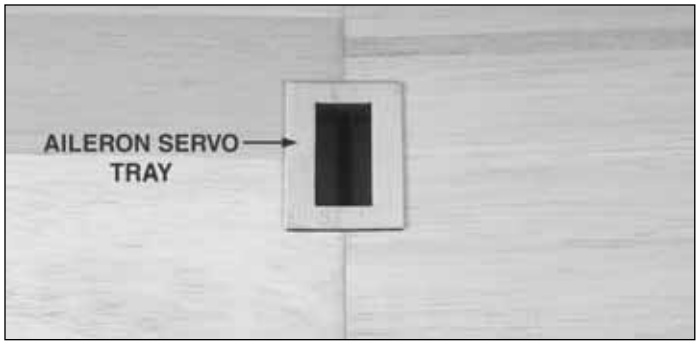




❑ 3. Remove the screws and straps. Use a hobby knife to cut and remove the sheeting around the lines marking the straps. **Hint:** A 5/16" [8mm] brass tube sharpened on the end may be used to cut the sheeting over the ends of the straps.



❑ 4. Refit the gear with the straps and screws.



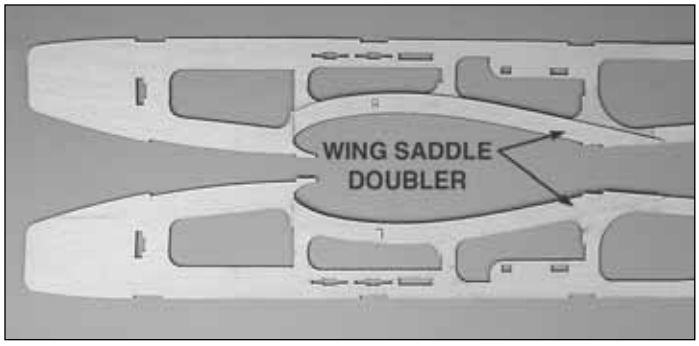
❑ 5. Glue the die-cut plywood **aileron servo tray** to the top of the wing centered over the servo opening.

Set the wing aside and get started on the fuselage.

BUILD THE FUSELAGE

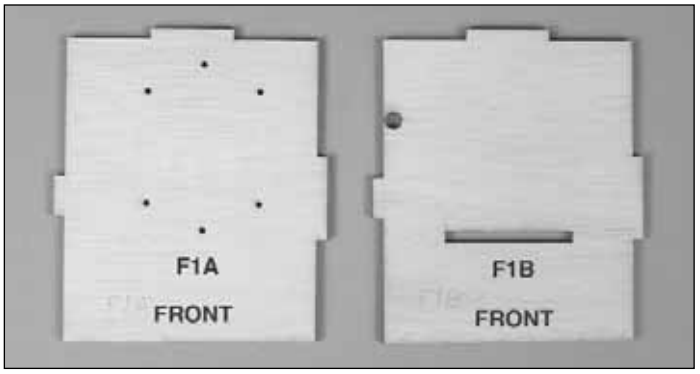
Frame the Fuselage

Note: Unless otherwise noted, all parts used to build the fuselage are die-cut plywood.

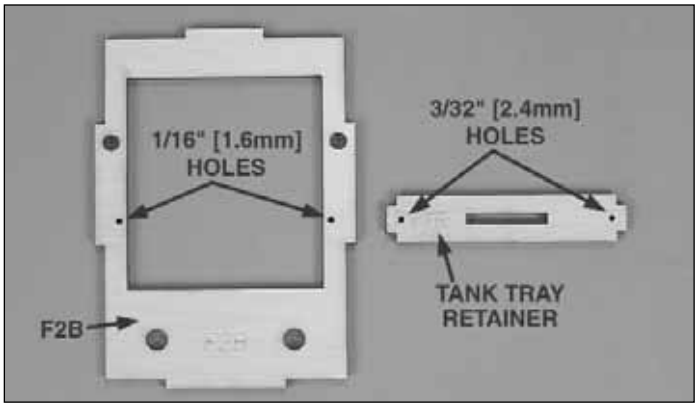


❑ 1. Use medium CA to glue one of the **wing saddle doublers** to one side of one of the **fuselage sides**. Glue the other wing saddle doubler to the **other side** of the other fuselage side. Be certain to make a **right** and a **left** by making two *mirrored* assemblies.

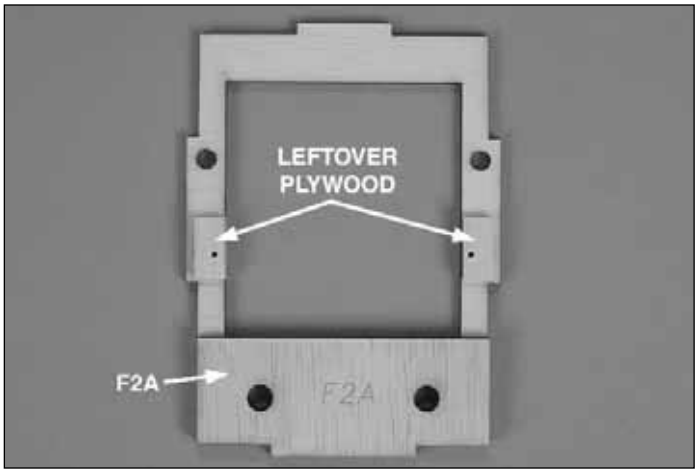
❑ 2. Place the bottom view of the fuselage plan over your flat building board and cover it with Plan Protector or wax paper.



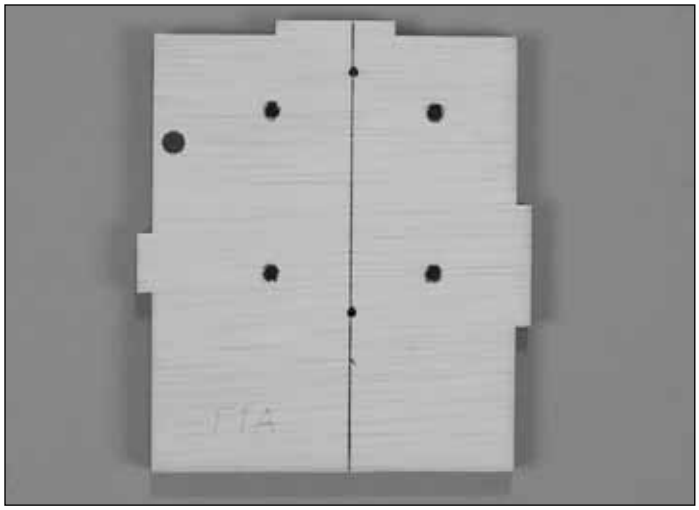
❑ 3. Glue the back of **F1A** to the front of **F1B**. From now on this assembly will be referred to as the ***firewall***.

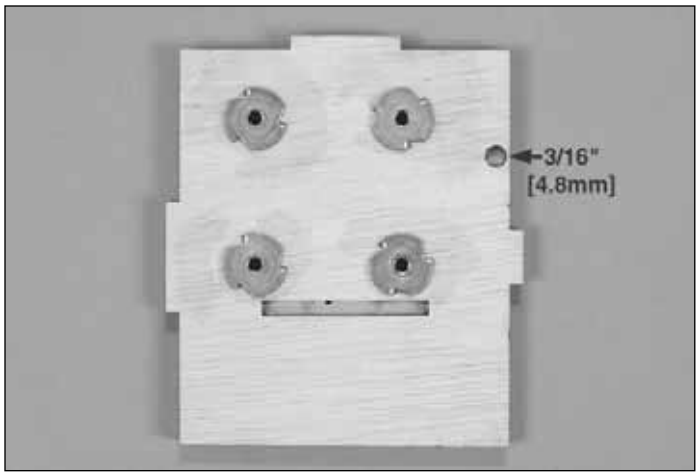


❑ 4. Drill 1/16" [1.6mm] holes through the punchmarks in **F2B**. **Drill** 3/32" [2.4mm] holes through the punchmarks in the **tank tray retainer (TTR)**.

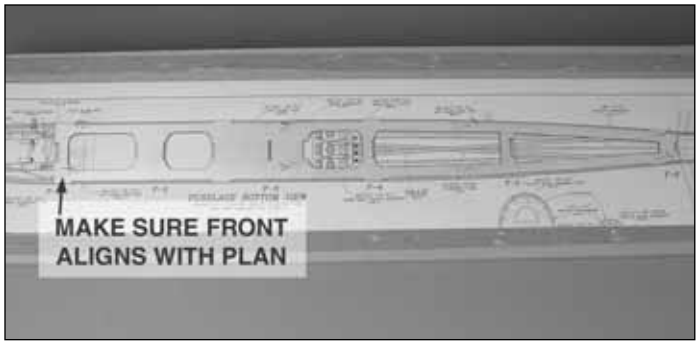


❑ 5. Glue small pieces of leftover plywood to the **front** of F2B over the 1/16" [1.6mm] holes you drilled. Glue **F2A** to the front of **F2B**. Redrill the 1/16" [1.6mm] holes. From now on this assembly will be referred to as ***F2***.

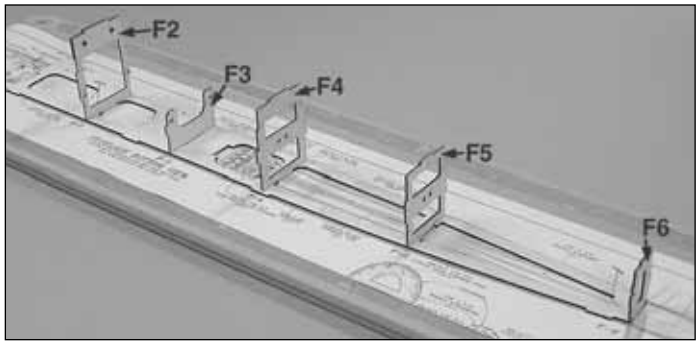




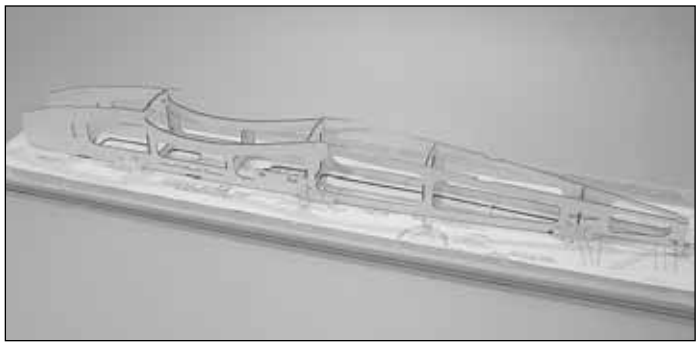
❑ 6. Use a ballpoint pen and a straightedge to draw a vertical line on the front of the firewall connecting the punchmarks in the middle. Drill 5/32" [4mm] holes through the remaining four punchmarks. Press four 6-32 blind nuts partway into the holes on the back of the firewall. Add a few drops of medium CA to the blind nuts where they will contact the firewall, then tap the blind nuts the rest of the way in with a hammer. Wipe away excess CA. If using the O.S.® MAX .40 or .46 FX, drill the 3/16" [4.8mm] hole in the back of the firewall for the throttle pushrod tube the rest of the way through. If using a different engine do not drill the hole (the hole for the throttle pushrod will be drilled later).

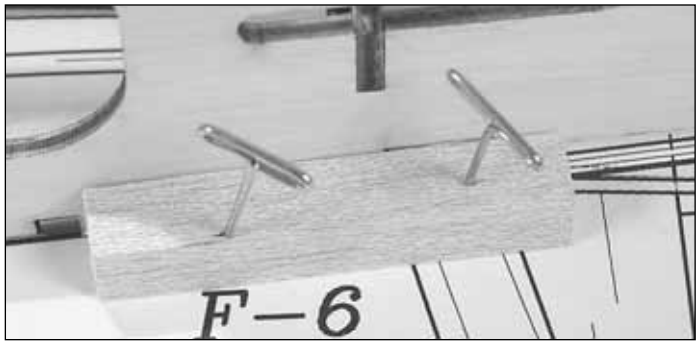


❑ 7. Pin the **aft fuselage top** upside-down to the building board over its location on the plan. You'll know it's upside-down when the front aligns with the plan.



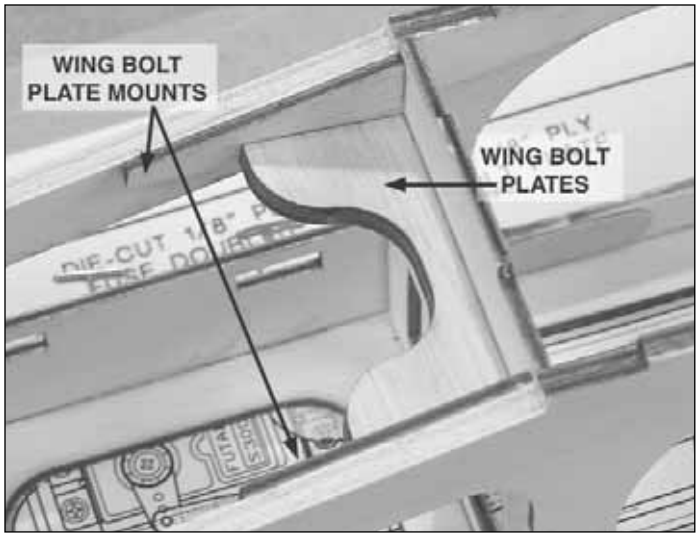
❑ 8. Glue the die-cut plywood formers **F2** through **F6** to the aft fuselage top. Do your best to get the formers vertical, but if they aren't perfect the notches in the fuselage sides will square 'em up anyway.



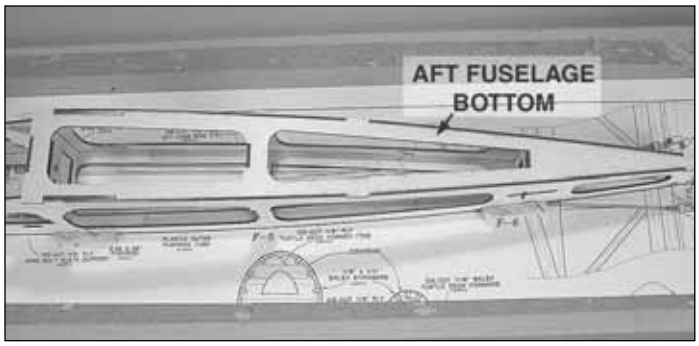


❑ 9. Join, but do not glue the right and left fuselage sides to the fuselage top and formers. Use some of the leftover balsa sticks cut from the ends of the wing to hold the fuselage sides to the fuselage top.

❑ 10. Use thin and medium CA to glue the fuselage sides to the fuselage top and formers aft of F2. **Do not** glue the fuselage sides to the fuselage top forward of F2. Making sure all glue joints are tight and fit well is the way to a true and square fuselage.

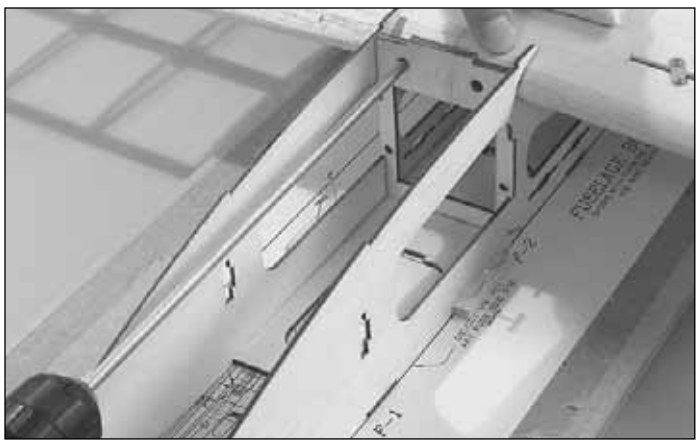


❏ 11. Glue both **wing bolt plate mounts** to both sides of the fuselage. The bottom of the plates should align with the bottom of the wing saddles. Glue both **wing bolt plates** together, then securely glue them into position.



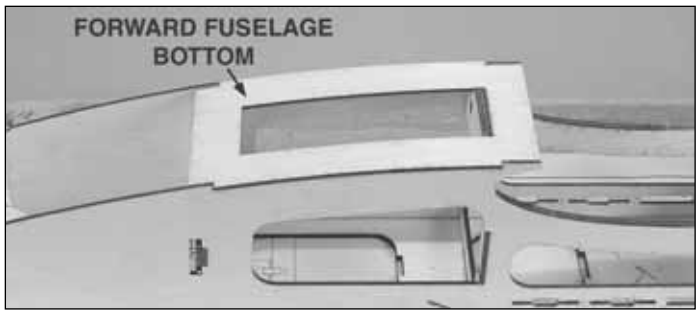
❏ 12. Test fit, then glue the **aft fuselage bottom** into position.

❏ 13. Place the wing on the fuselage. Taking accurate measurements, center the centerline of the wing (the glue joint between the two joining halves) in the fuselage. Place weights on top of the wing to hold it down.



❏ 14. Using the dowel holes in F2 as a guide, drill the holes in the leading edge of the wing with a 1/4" [6.4mm] drill or a 1/4" [6.4mm] brass tube sharpened on the end. As the fuselage sides have not been glued to the fuselage top forward of F2, the sides can be spread apart if necessary to accommodate the drill.

❏ 15. Use 30-minute epoxy and a few clamps to securely glue the firewall into position. Be certain the top of the firewall is fully contacting the fuselage top. Also note that the right side of the firewall should be all the way **back** in the notch in the fuselage side and the left side of the firewall should be all the way **forward** in the notch in the fuselage side.



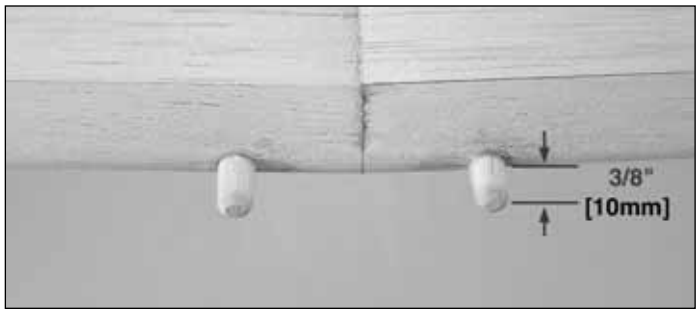
❏ 16. After the epoxy from the previous step has hardened remove the clamps. Test fit, then glue the **forward fuselage bottom** into position. Also glue the fuselage sides to the **fuselage top** forward of F2.

❏ 17. The fuselage may now be removed from the building board. Use a bar sander with 80-grit sandpaper to sand the fuselage sides and top and bottom flat and even.

Mount the Wing

❏ 1. If the wing hasn't yet been final sanded, go ahead and at least sand the area around the dowel holes. The rest of the wing can be final sanded later, but it will be easier to sand around the dowel holes before the dowels have been installed.

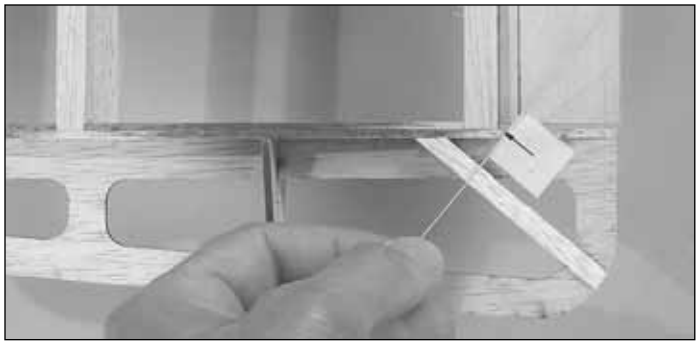
❏ 2. Cut two 1-1/8" [29mm] **wing dowels** from the 1/4" x 6" [6.4 x 150mm] hardwood dowel. Round one end of the wing dowels.



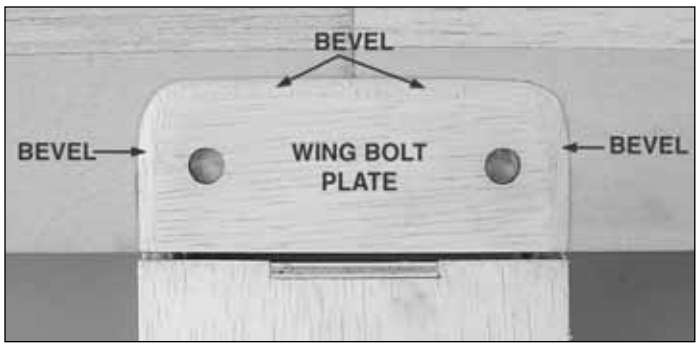
❏ 3. Use 30-minute epoxy to glue the dowels into the front of the wing with the rounded ends out. Be certain

approximately 3/8" [10mm] of the dowels protrude from the leading edge.

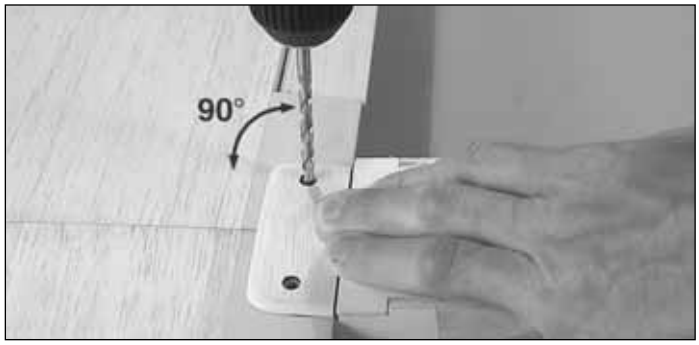
❑ 4. After the epoxy has hardened, place the wing on the fuselage. Stick a T-pin into the **center** of the rear of the bottom of the fuselage. Tie a loop in one end of a 40" [1m] piece of non-elastic string such as monofilament or Kevlar line (K+SR4575). Slip the loop in the string over the T-pin.



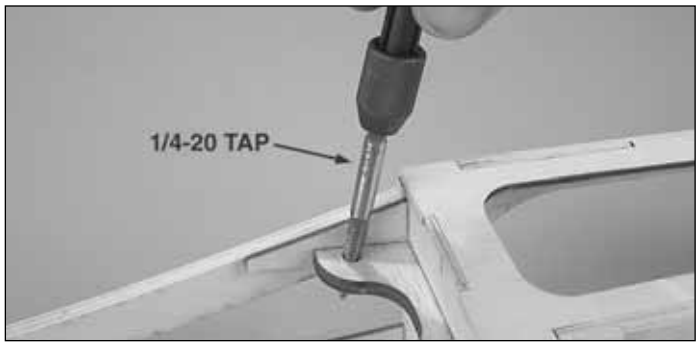
❑ 5. Fold a piece of masking tape over the string near the other end and draw a sharp arrow on it. Slide the tape along the string and align the arrow with one end of the wing as shown in the photo. Swing the string over to the same position on the other end of the wing. Pivot the wing and slide the tape along the string until the arrow aligns with both ends of the wing. Now the wing will be centered.



❑ 6. Bevel the front and both ends of one side of the **bolt plate (BP)** as shown in the photo. Glue the bolt plate to the bottom of the wing centered on the fuselage.



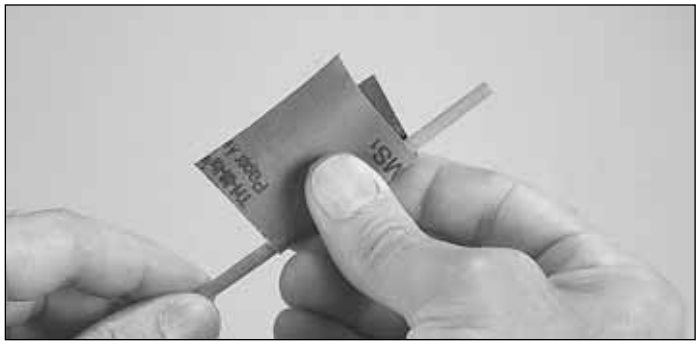
❑ 7. Recheck the wing alignment. Using the holes in the bolt plate as a guide, drill #7 (.201" [5mm]) (or 13/64") holes through the wing and wing bolt plate in the fuselage. Be certain to hold the drill perpendicular to the bottom of the wing.



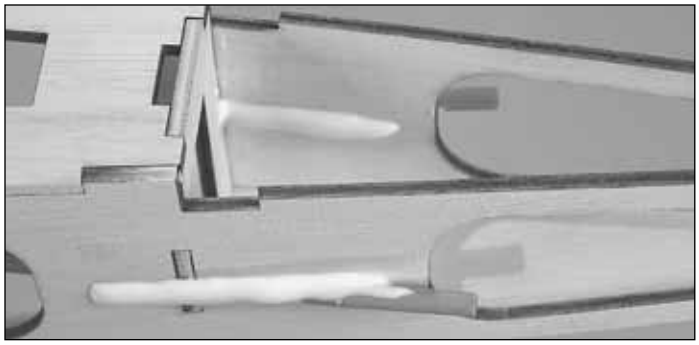
❑ 8. Remove the wing from the fuselage. Thread the holes in the wing bolt plate with a 1/4-20 tap. Add a few drops of thin CA to the threads in the holes and allow to **fully** harden. Run the tap back through, then repeat the procedure one more time.

❑ 9. Enlarge the bolt holes in the wing with a 17/64" [6.4mm] or 1/4" [6.8mm] drill. Mount the wing to the fuselage with two 1/4-20 nylon bolts to see how it all fits (the bolts may be cut down to 1-1/4" [30mm]).

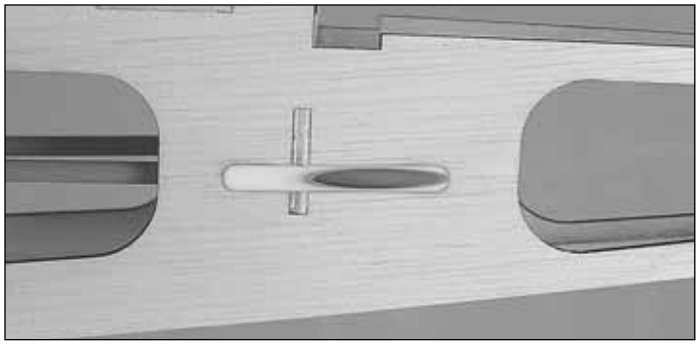
Install the Guide Tubes, Fuel Tank, & Engine



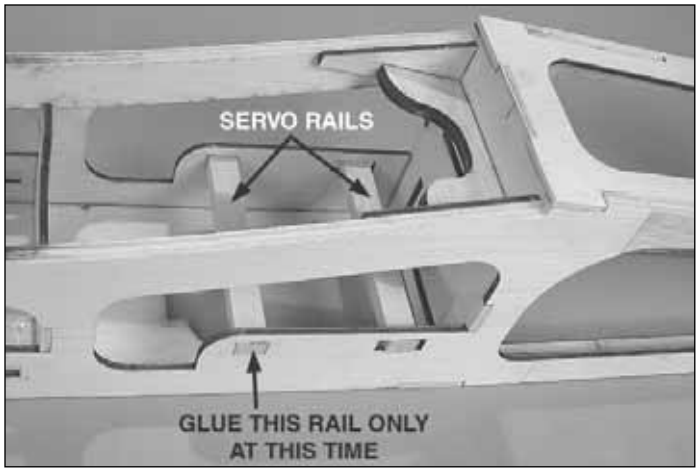
❑ 1. Cut both 3/16" [4.8mm] gray plastic **pushrod guide tubes** to a length of 18-1/2" [470mm]. Use coarse sandpaper to sand the guide tubes so glue will adhere. Insert the tubes through the holes in the fuselage formers as shown on the plan. Note that the tubes cross between formers F4 and F5.



❑ 2. Mix a small batch of 30-minute epoxy and microballoons. Use the mixture to glue the guide tubes in the exit slots in the back of the fuselage. Be sure to build up a small fillet around both guide tubes on the inside and outside of the fuselage. Allow the epoxy to fully harden.

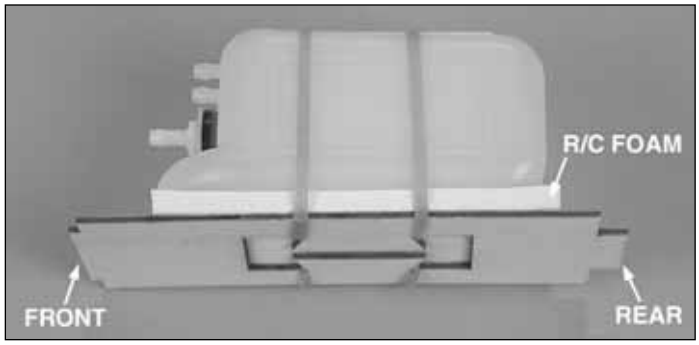


❑ 3. Use medium CA to glue the guide tubes to the rest of the formers. After the epoxy from the previous step has hardened, use coarse sandpaper to sand the guide tubes even with the fuselage sides.



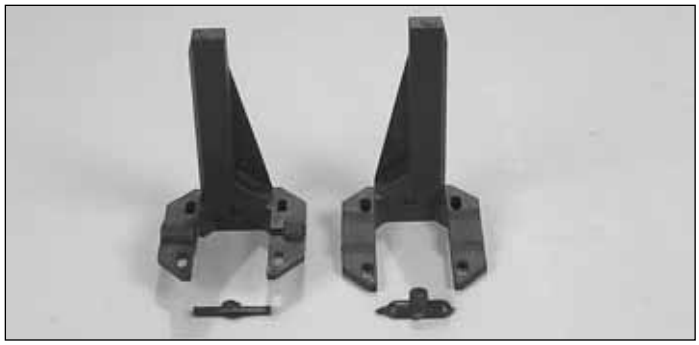
❑ 4. Cut the **servo rails** from the 1/4" x 3/8" x 9" [6.4 x 9.5 x 230mm] basswood stick to fit in the slots in the fuselage sides. Install the rails, but glue only the **front** rail into position.

❑ 5. Temporarily install two or three servos on the rails. Using the servos to set the correct spacing, glue the aft rail into position. Be sure to leave a small space between the servos and the rails so the servos can be removed. After the glue hardens remove the servos.



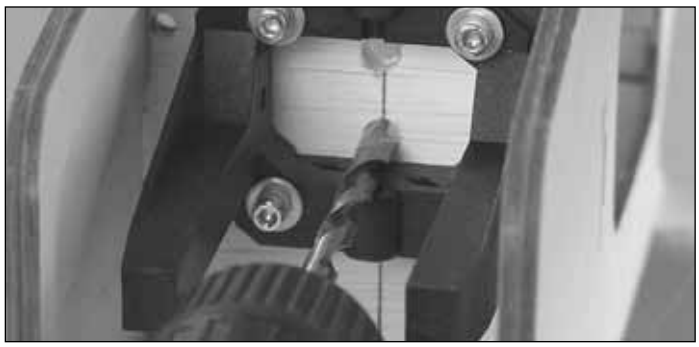
❑ 6. Assemble the fuel tank (not included) according to the instructions that came with it. Mount the fuel tank to the **tank tray (TT)** with a #64 rubber band and a sheet of 1/4" [6.4mm] R/C foam rubber in between.

❑ 7. Temporarily mount the tank tray in the fuselage with the tank tray retainer and two #2 x 1/2" [13mm] screws. Note that the tab on the front of the tank tray keys into the notch in the back of the firewall.

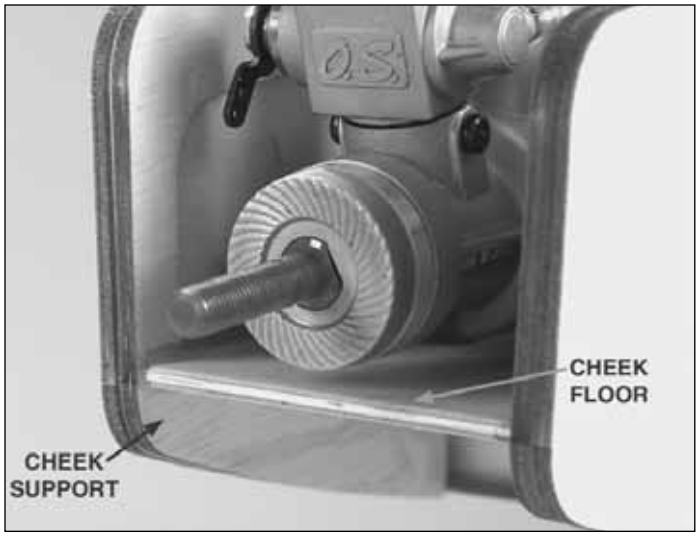


❑ 8. Cut the **spreader bar** from both engine mount halves.

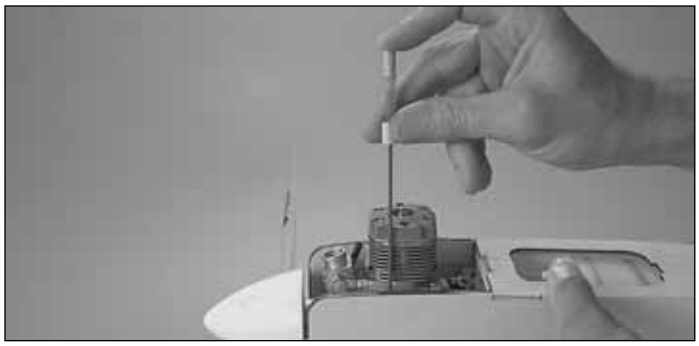
❑ 9. Temporarily mount the engine mount to the firewall with four 6-32 x 1" [25mm] socket head cap screws and #6 lock washers and #6 flat washers.



❑ 10. Drill 15/64" [6mm] (or 1/4" [6.4mm]) holes through the firewall for the fuel lines. **Hint:** If the engine mount is in the way, draw the outline of the inside of the engine mount on the firewall. Remove the mount, then drill the holes.



❏ 11. Use epoxy to glue the **cheek supports (CS)** to the inside of both fuselage sides in front of the firewall. With the engine resting on the engine mount, test fit, then glue the **cheek floor** into position as you squeeze the fuselage sides to it. Make certain the cheek floor doesn't interfere with the engine.

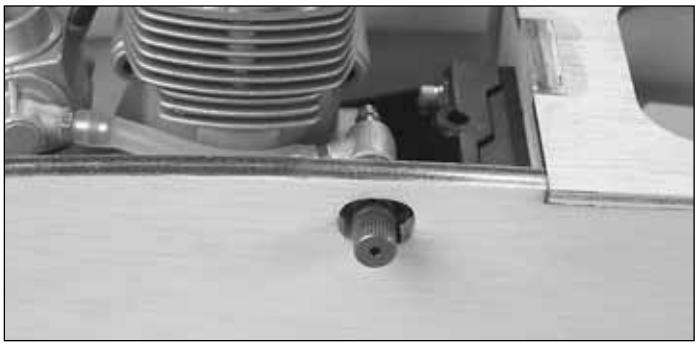


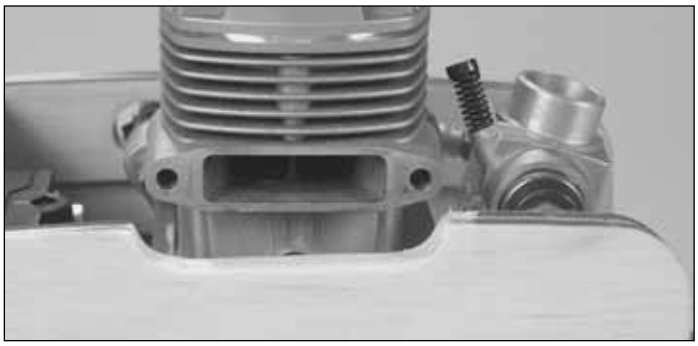
❏ 12. Mount a 2-1/2" [64mm] spinner (not included) and propeller to the engine. Place the engine on the mount. Adjust the spacing of the mount halves to fit the engine, then temporarily tighten the screws. Position the engine on the mount so there will be an approximately 1/8" [3mm] space between the spinner and fuselage sides. Use a Great Planes Dead Center engine mount hole locator or a wire sharpened on the end to mark the engine mounting holes on the mount.

❏ 13. Remove the engine and mount from the fuselage. Drill 3/32" [2.4mm] holes through the engine mount at the marks you made. Re-mount the engine mount to the firewall, then mount the engine to the mount with four #4 x 3/4" [19mm] screws and #4 flat washers and lock washers. Center the engine mount from side-to-side on the centerline drawn down the firewall, then tighten the screws. **Hint:** Some modelers prefer machine-thread screws rather than sheet metal screws for mounting their engines. If this is your preference, drill #43 [2.2mm] holes and use a 4-40 tap to cut threads into the holes. Mount the engine with four 4-40 x 1" [25mm] screws (not included), #4 lock washers and flat washers.

❏ 14. If using the O.S. MAX .40 or .46 FX engine the hole in the firewall and formers for the throttle pushrod guide tube are already in the correct location. If using a different engine the hole in the firewall for the guide tube might have to be relocated to align with the carburetor arm on the engine. If necessary, determine where a new hole is to be drilled, then drill a 3/16" [4.8mm] hole.

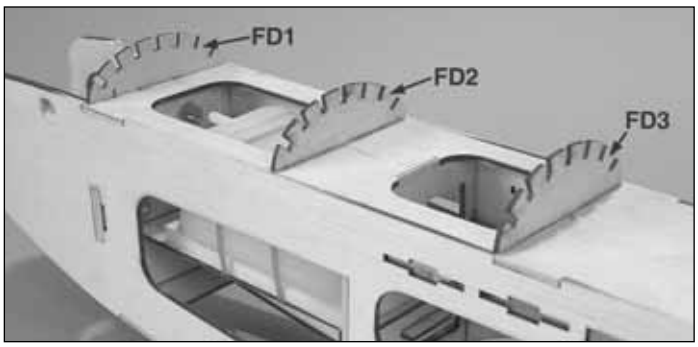
❏ 15. Cut one of the leftover gray pushrod guide tubes to the length shown on the plan to be used for the throttle guide tube. Roughen the outside of the tube with coarse sandpaper, then install and glue the tube into position.



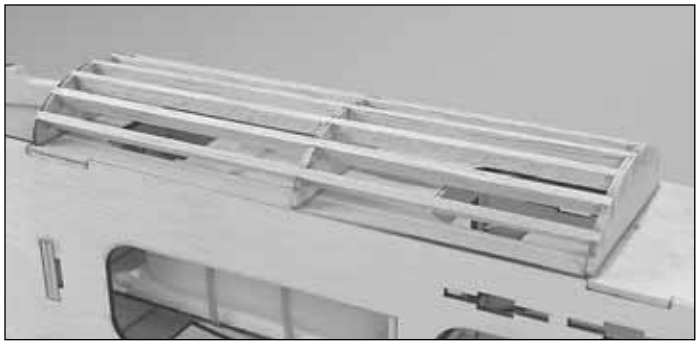


❏ 16. Cut or drill the hole where necessary for the needle valve and trim the fuselage side for the muffler. A rotary tool with a carbide cutter works best.

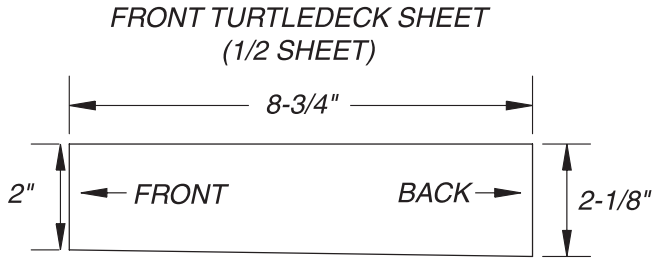
Build the Front Turtledeck

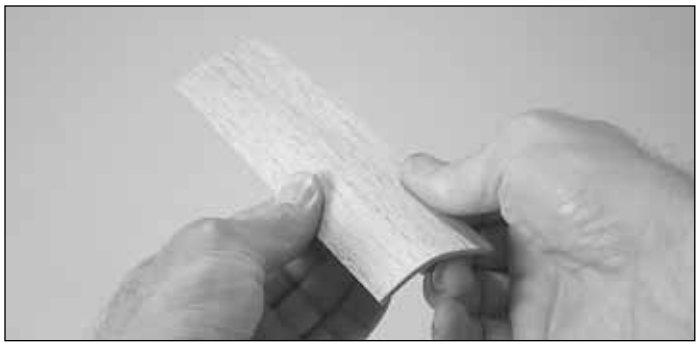


❏ 1. Glue on the **front turtledeck formers FD1, FD2** and **FD3**. Use a small builder's square to make sure the formers are vertical.



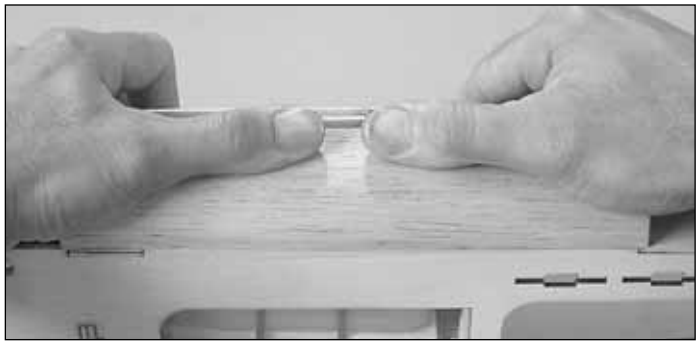
❑ 2. Cut seven stringers for the front of the turtledeck from two 1/8" x 1/4" x 36" [3.2 x 6.4 x 910mm] balsa sticks. Glue the stringers into the notches in the stringers. Sand the ends of the stringers even with formers FD1 and FD3.



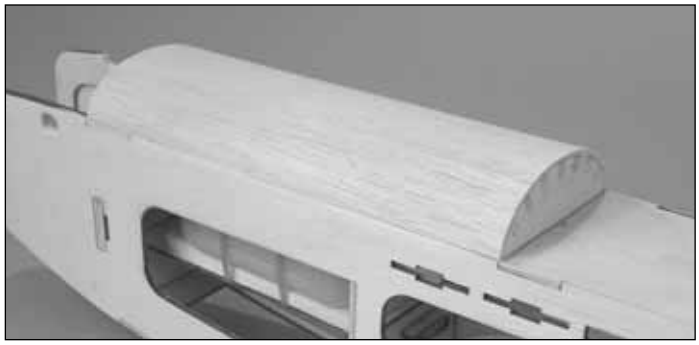


❑ 3. Cut half of the front turtledeck sheeting to the dimensions shown in the sketch from a 3/32" x 3" x 24" [2.4 x 75 x 610mm] balsa sheet. Wet the outside of the sheet with a few sprays of window cleaner, then gradually soften the sheet by bending it as shown.

❑ 4. Test fit and bend the sheet into position. Trim the sheet as necessary so the top edge ends in the middle of the top, middle stringer. After the sheet has been cut to the correct size, glue only the bottom edge to the fuselage.

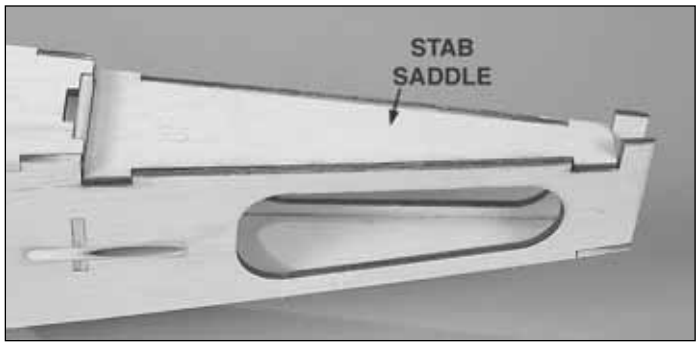


❑ 5. Apply medium or thick CA to the stringers and formers, then bend the sheet down into position. Hold tightly for a few seconds until the CA has hardened enough to hold on its own.

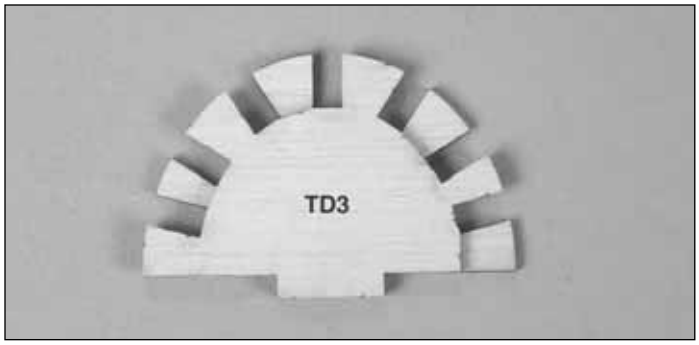


❑ 6. Cut, wet, bend, then glue the other half of the turtledeck sheeting into position. Sand the ends of the sheeting even with the formers. Add balsa filler if necessary, allow to dry, then sand smooth.

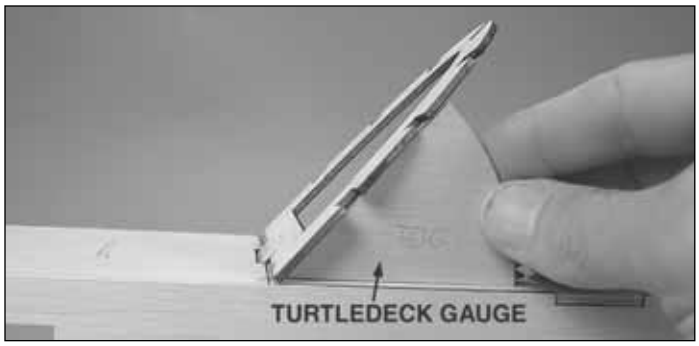
Build the Rear Turtledeck



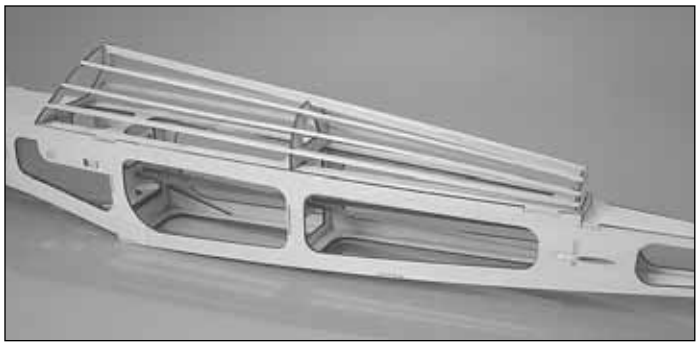
❑ 1. Glue the **stab saddle (SS)** into position.



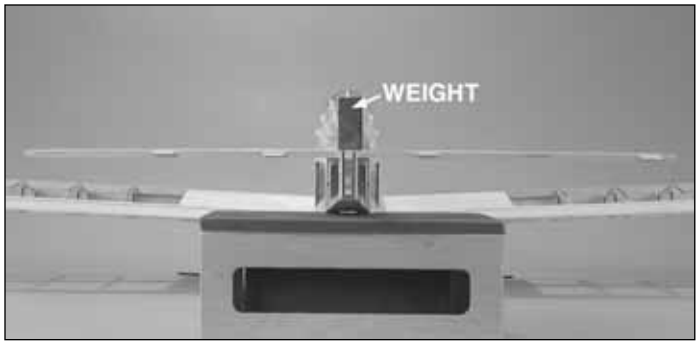
❑ 2. Glue together both die-cut 1/16" [1.6mm] balsa **turtledeck formers TD3**. Note that the formers are "flip-flopped" thus forming 1/8" [3.2mm] notches for the stringers.



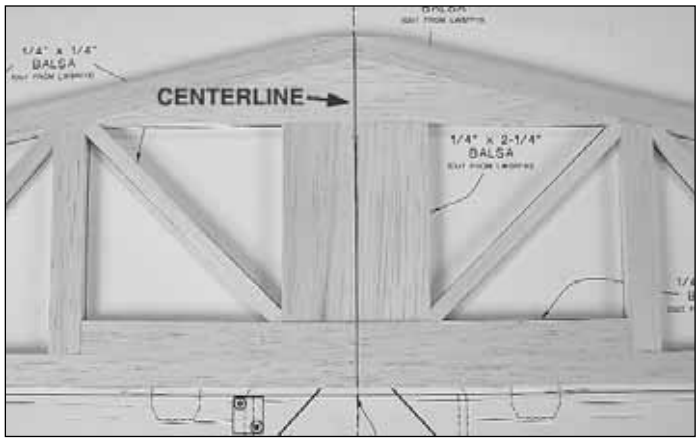
❑ 3. Glue **turtledeck formers TD1**, **TD2** and TD3 into position. Use one of the die-cut 1/16" [1.6mm] balsa **turtledeck gauges (TDG)** to set TD1 at the correct angle.



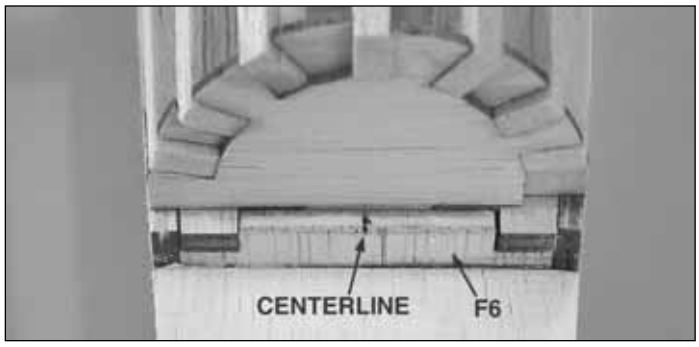
❑ 4. Use the remaining six 1/8" x 1/4" x 36" [3.2 x 6.4 x 910mm] balsa sticks for the aft turtledeck stringers and glue them into position.



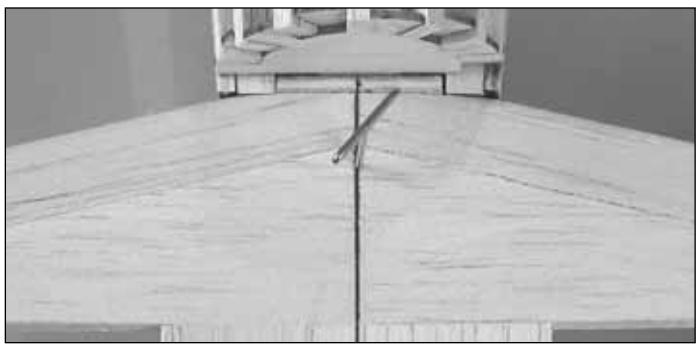
❑ 5. Bolt the wing to the fuselage. Place a weight on top of the stab to hold it down. Stand approximately ten feet behind the model and view the alignment between the stab and wing. If necessary, shift the weight slightly to align the stab with the wing. If shifting the weight doesn't do the trick, remove the stab and carefully sand the stab saddle to get the stab in alignment with the wing.



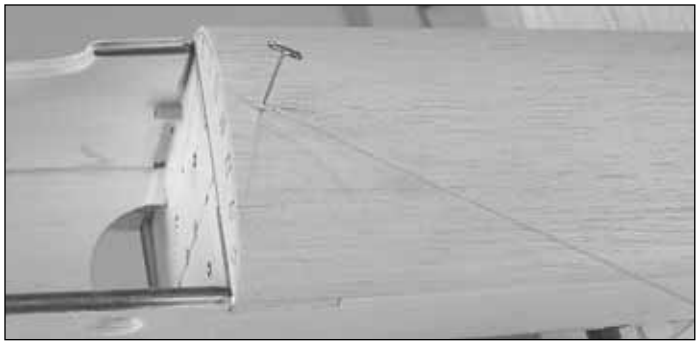
❑ 6. Place the stab over the stab plan. Transfer the centerline on the stab plan onto the top of the stab.

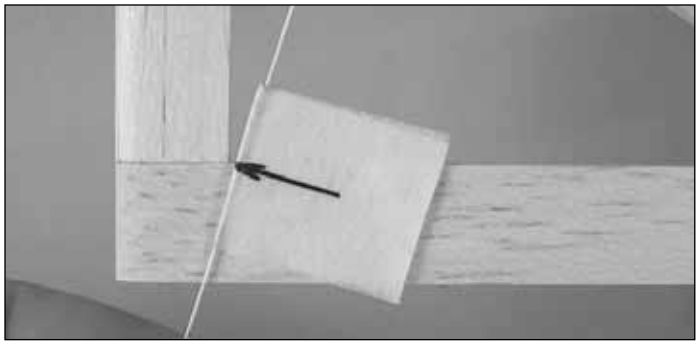


❑ 7. Taking accurate measurements, mark the centerline of the fuselage on the top of F6.

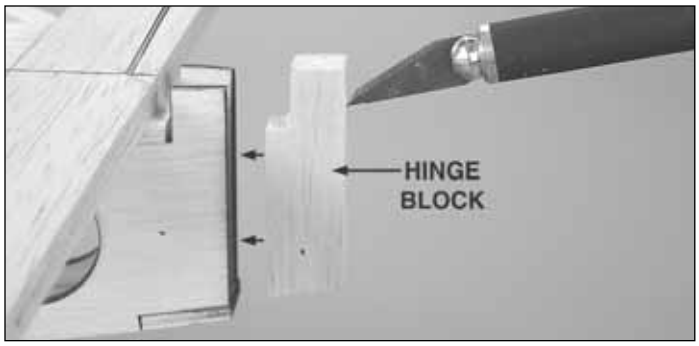


8. Place the stab on the fuselage, aligning the lines. Hold the front of the stab to the fuse with T-pin.



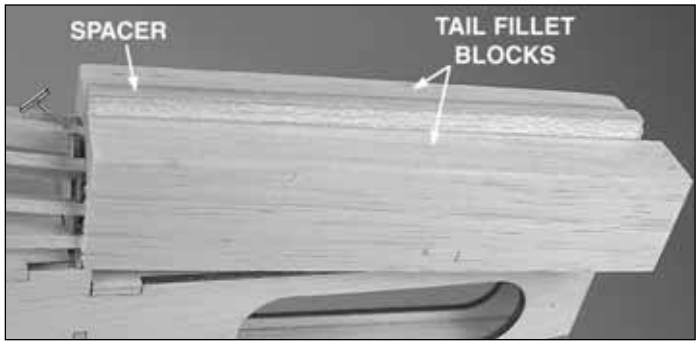


❑ 9. Use the pin-and-string technique to align the stab (this time the T-pin will be stuck into the sheeting over the top, middle stringer in the front of the fuselage). Once the stab has been centered stick another T-pin into the rear of the stab.



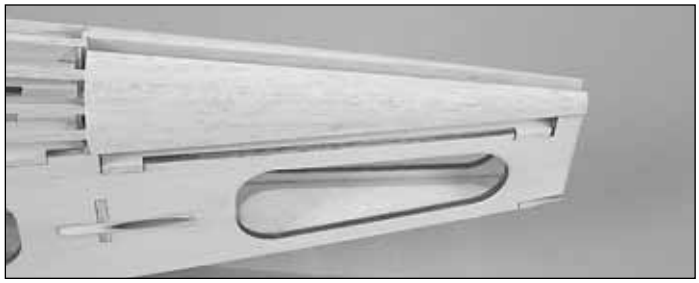
❑ 10. Cut a **hinge block** for the tail gear from leftover 1/4" x 1/2" [6.4 x 13mm] balsa and glue it into position.

❑ 11. Cut two 6-1/4" **tail fillet blocks** from the 3/4" x 1-1/4" x 18" [19 x 32 x 460mm] balsa block.



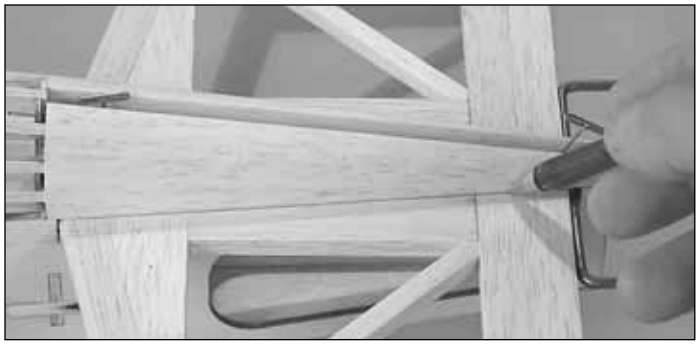
❑ 12. Remove the stab from the fuselage. Using a piece of leftover 1/4" x 1-1/2" [6.4 x 38mm] balsa as a **fin spacer**, place the fillet blocks on the fuselage with the spacer in between (where the fin would be). Center the rear of the spacer between the fuselage sides and center the front on the top, middle stringer. Use a straightedge to make sure the spacer is centered. Hold the spacer in place with a T-pin in the front and the back.

❑ 13. Glue the tail fillet blocks to the fuselage, but **not** to the spacer.



❑ 14. Remove the spacer without disturbing the tail fillet blocks. Shape the spacer as shown on the fin spacer

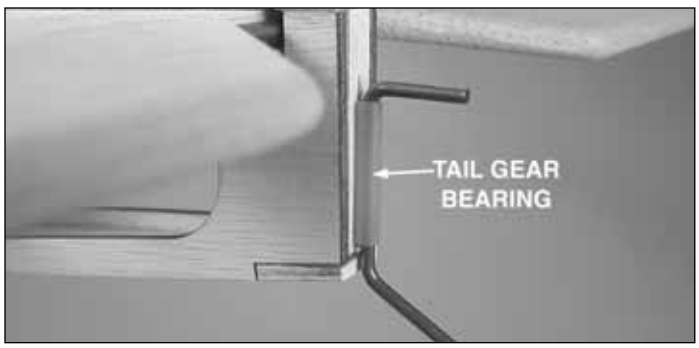
template on the plan. Reinsert the spacer. Use a carving knife to carefully whittle down the fillet blocks around the spacer. When you start getting close to the final shape, switch to a razor plane followed by a bar sander.



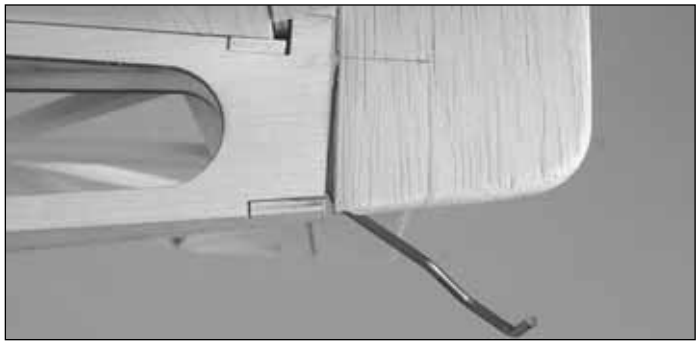
❏ 15. Remove the spacer. Without using any glue, install the stab and elevator joiner wire into the fuse between the fillet blocks and the stab saddle. Align the stab the same as before, holding it in position with T-pins (you should be able to use the same pin holes–thus recapturing the original alignment). Use the pin and string to confirm the stab alignment, then use a ballpoint pen to lightly mark the outline of both sides of the fuselage on the top and bottom of the stab.

❏ 16. Remove the T-pins holding the stab in place. Insert the fin and rudder into the fuselage and add the elevators to the stab. Make any adjustments necessary for a good fit. Mark the outline of the tail fillet blocks on both sides of the fin.

We'll be ready to start covering soon, but first mount the tail gear.



❏ 17. Cut a slot in the hinge block for the nylon tail gear bearing on the tail gear. Insert the bearing.



❏ 18. The same as was done with the ailerons and elevators, drill a 3/32" [2.4mm] hole and cut a groove in the rudder for the tail gear wire. Test fit the rudder. Make adjustments where necessary for a good fit.

COVER THE MODEL

Prepare the Model for Covering

❏ 1. Remove the fuel tank. Fuelproof the fuel tank compartment including the back of the firewall using epoxy, epoxy thinned with denatured alcohol or fuelproof paint. Only a light coating is required.

❏ 2. Remove the wing, stab and fin from the fuselage. Remove any components that may interfere with final sanding or covering such as the landing gear, tail gear, engine, etc. Final sand the model with progressively finer grades of sandpaper, finishing up with 320 or 400-grit.

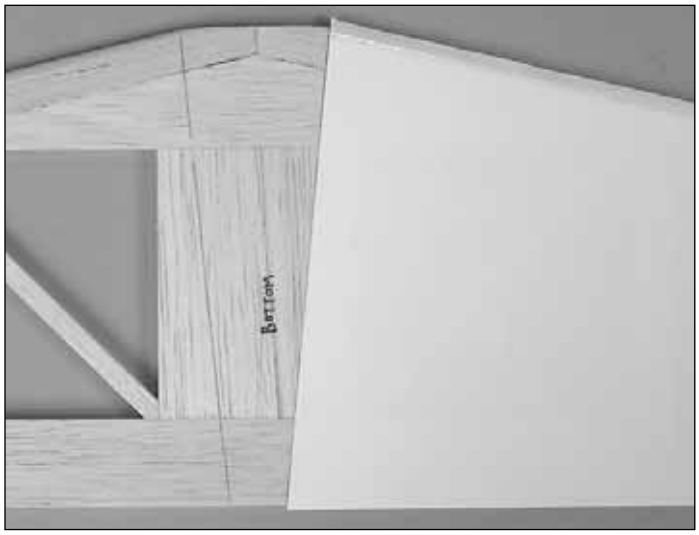
❏ 3. Use a tack cloth, compressed air or a shop vac with a brush attachment to remove all balsa dust from the model.

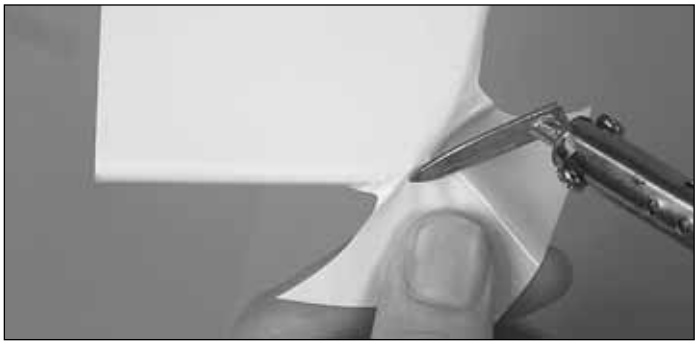
Cover the Model

❏ 1. Gather the covering and tools you will use to cover the model including plenty of new #11 blades, a metal straightedge, a covering iron with a covering sock (and spare covering socks) and a trim iron. Some builders prefer to use single-edge razor blades for trimming excess covering from the model.

❏ 2. Cover the separate parts of the model in the order you prefer, or follow the suggested covering sequence.

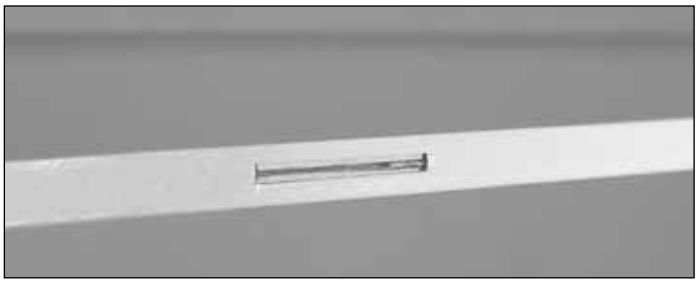
Tail Parts





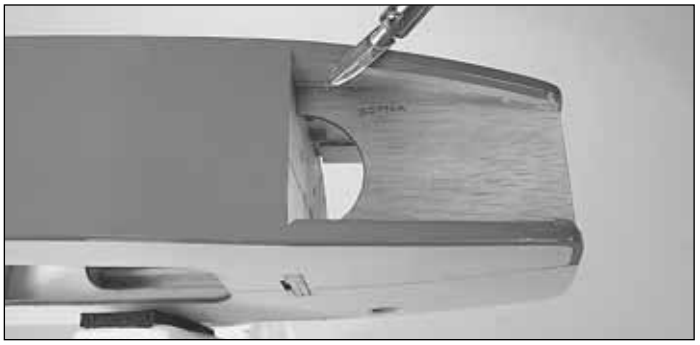
❏ 1. Cover the **bottom**, of one side, then the other side of the stabilizer first. Apply the covering up to the lines you marked noting the sides of the fuselage. Cut the front, tip and back edges of the covering with a straightedge before sealing the edges down, but leave a small “handle” that you can hold onto to remove wrinkles around the corner.

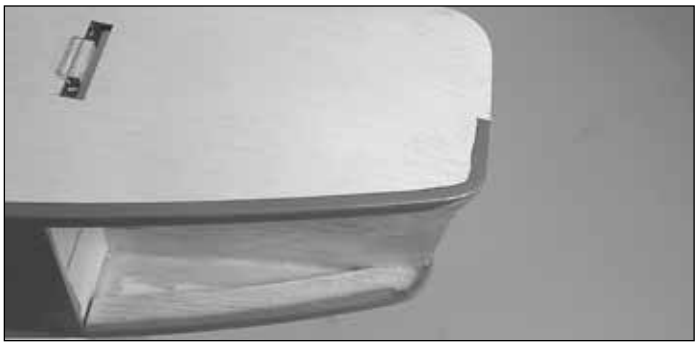
❏ 2. Cover the top of both sides of the stab the same way, then cover one side, then the other of the fin, elevators and rudder.



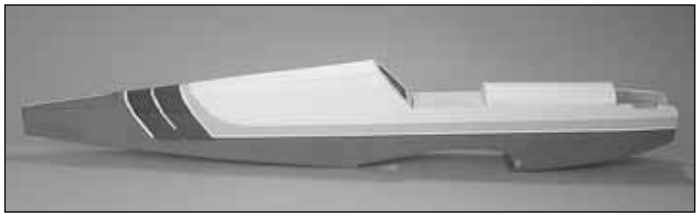
❏ 3. Cut a small strip of covering from all the hinge slots.

Fuselage



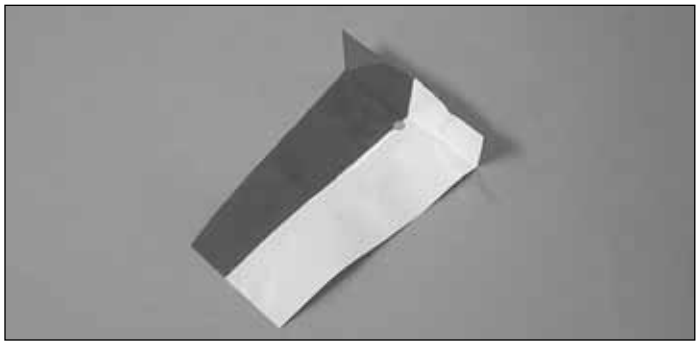


❏ 1. Cover the bottom of the fuselage first. When you get to the front, use a trim iron to seal the edges down around the sides.

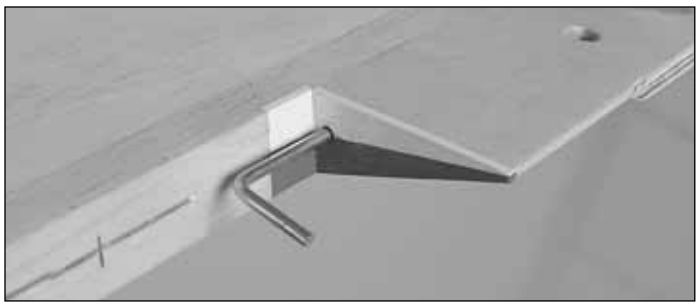


❏ 2. Cover the top of the fuselage between the cockpit and the firewall next, followed by the sides and the turtledeck. Those who are less experienced with applying iron-on covering could cover the turtledeck separately from the fuselage sides.

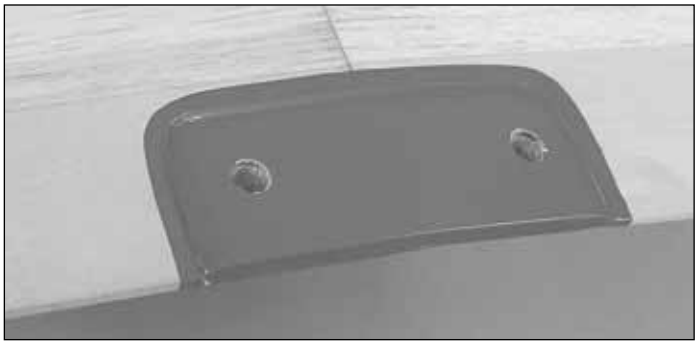
Wing



❏ 1. Cover the corner areas first. When covering the corners at the aileron torque rods, fold a piece of covering near the end, then cut a hole with a 1/8" [3mm] brass tube sharpened on the end. (Since the model in the photos is red on the bottom and white on top, two pieces of covering were first ironed together over a sheet of glass.)



❏ 2. Slip the covering over the torque rod, then use a trim iron to iron it into place. Trim the covering approximately 1/8" [3mm] around the edges, then iron the edges down.



❏ 3. Iron a piece of covering over the wing bolt plate before covering the rest of the wing. Cover one side, then the other side of the bottom of the wing, then cover one side, then the other side of the top of the wing.

❏ 4. Cover the ends, then the top and bottom of the ailerons.

❏ 5. The same as was done for the tail surfaces, cut a strip of covering from all the hinge slots in the wing and ailerons.

❏ 6. Cut the covering from the bottom of the wing over the landing gear rails and the notches for the straps.

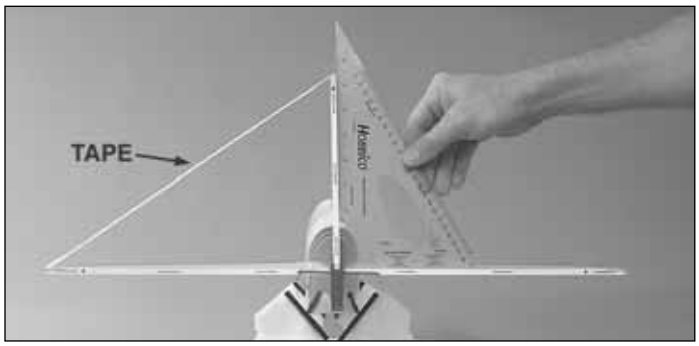
FINAL ASSEMBLY

Glue on the Stab & Fin

❏ 1. If you haven't already done so, cut the covering from the slots in the fuselage for the stab and fin. Test fit the stab and fin into the fuselage. Make any adjustments necessary.

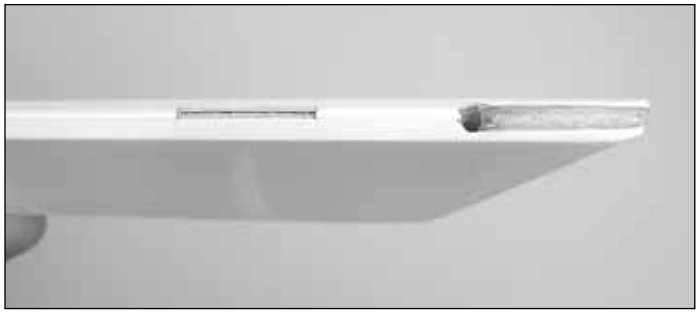
Note: The best way to glue in the stab is to apply epoxy to both the top and bottom of the stab and to the stab saddle and the tail blocks in the fuselage. This gets a little messy as some epoxy will be deposited on one half of the stab when you slide it in, but before the epoxy hardens it can be cleaned off with paper towels and alcohol. Applying epoxy in the fuselage and to the stab is the best way to ensure a **secure** bond.

❏ 2. Bolt the wing to the fuselage. Apply 30-minute epoxy to both sides of the stab and in the fuselage to the stab saddle and the tail blocks. **Don't forget** to install the **elevator joiner wire**, then slide the stab into position. Wipe away epoxy that was deposited on the stab with paper towels and alcohol. The same as was done before the model was covered, use the pin and string to align the stab. View the model from the rear and make sure the stab is aligned with the wing. If necessary, place weight on the "high side" of the stab to get it to align with the wing. Allow the epoxy to fully harden before proceeding.



❏ 3. Glue the fin into position the same way. Use a Hobbico Builder's Triangle to make certain the fin is perpendicular to the stab. If necessary tape can be used to pull the fin to one side or the other to get it vertical.

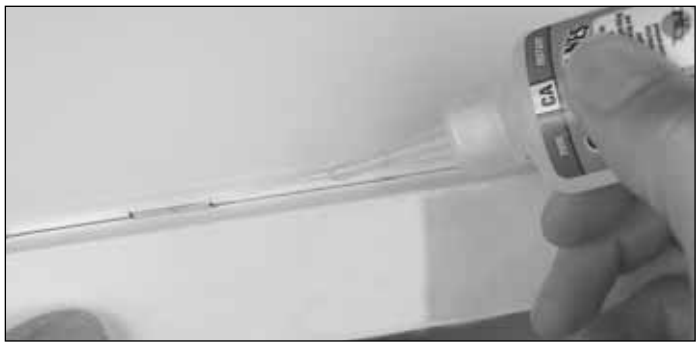
Join the Control Surfaces



❏ 1. If you haven't already done so, cut a small strip of covering from all the hinge slots. Also cut the covering from the grooves in the elevators and ailerons for the joiner wires and torque rods.

❏ 2. Test fit the ailerons to the wing with the hinges. If any of the hinges don't remain centered, stick a T-pin through the middle of them to hold them in place.

❏ 3. Apply 30-minute epoxy in the groove and in the hole in one of the ailerons for the torque rod. Also apply epoxy to the aileron torque rod for the aileron you are installing. Join the aileron to the wing and the torque rod. Wipe away any epoxy that squeezes out.

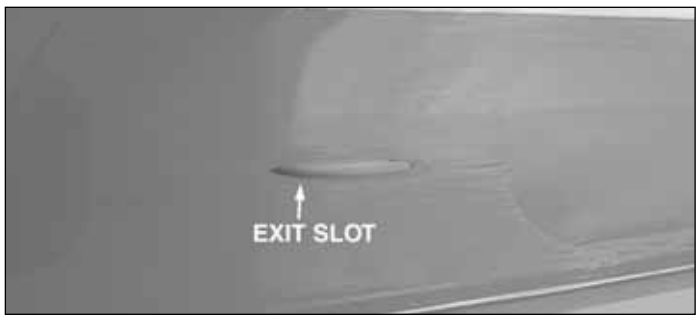


❏ 4. Adjust the aileron so there is a small gap between it and the wing–just enough to see light through or to slip a piece of paper through. Apply six drops of thin CA to both sides of all four aileron hinges. Wait a few seconds between drops to allow the previous drop of CA to soak in so it doesn't run down the hinge gap. If you do get any CA in the hinge gap you can soak it up before it hardens with a tissue or a paper towel square. If any CA in the hinge gap hardens, most of it can be picked out with a #11 blade. Any remaining hardened CA can be cleaned out with CA debonder.

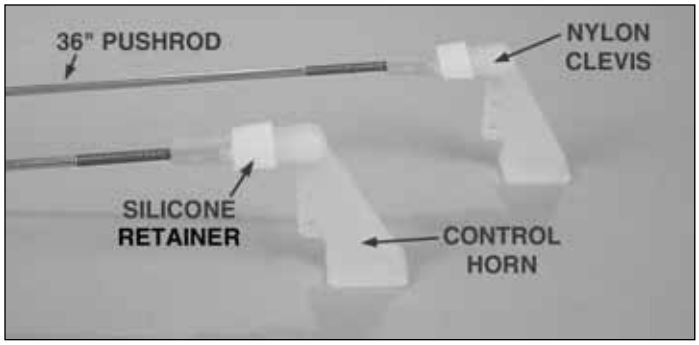
❏ 5. Hinge the elevators and rudder the same way. Don't forget to install the tail gear before gluing in the hinges. Glue the tail gear bearing into the fuselage with epoxy, but don't inadvertently glue the bearing to the rudder.

❏ 6. Mount a 1" [25mm] tail wheel (not included) to the tail gear with a 3/32" [2.4mm] wheel collar and a set screw. Before installing the screw, apply a drop of threadlocker to the threads.

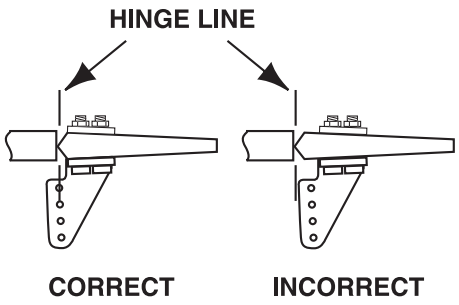
Hook up the Controls

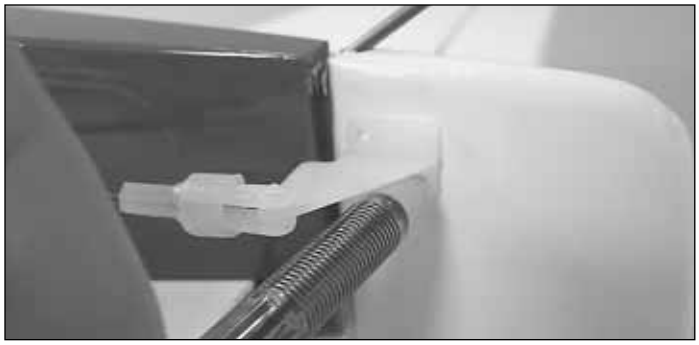


❏ 1. Cut the covering from both sides of the fuselage over the pushrod exit slots in the guide tubes.



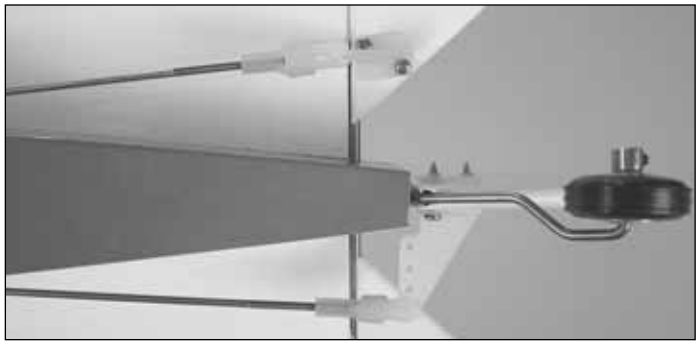
❏ 2. Thread a nylon clevis twenty full turns onto the threaded end of a 36" [910mm] wire pushrod. Slip a silicone retainer over the clevis, then connect the clevis to the outer hole in a control horn. Make another assembly the same way.





❏ 3. Cut both pushrods to a length of 26" [660mm]. Guide the pushrods up through the tubes in the fuselage. Position the rudder control horn on the rudder as shown. Note that the clevis holes in the horn should be positioned over the pivot point (leading edge) of the rudder. Use a ballpoint pen or a piece of leftover pushrod to mark the location of the two mounting holes in the horn on the rudder.

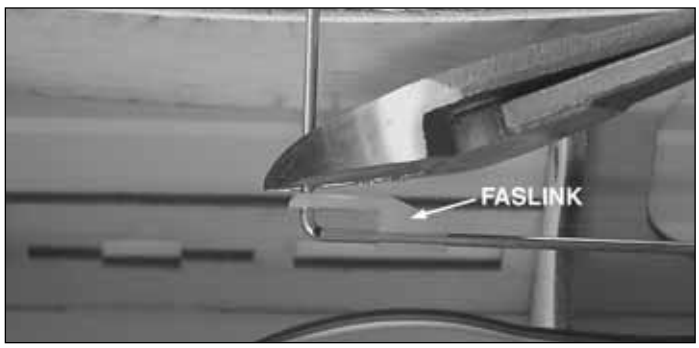
❏ 4. Drill 3/32" [2.4mm] holes at the marks. Mount the horn to the rudder with two #2 x 1/2" [13mm] screws and the nylon mounting plate.



❏ 5. Mount the elevator control horn to the elevator the same way. Note that the horn must be as close to the edge of the elevator as possible so the screw does not interfere with the joiner wire.

❏ 6. Place the elevator, rudder and throttle servos on the servo rails in the fuselage. Make three one-arm servo arms by cutting off the unused arms. If using Futaba servos, use the shorter, six-arm servo arms instead of the four-arm servo arms. If using another brand of servos, the arms must be short enough so they do not interfere with the other servos. Enlarge the holes in only the rudder and elevator servo arms with a 5/64" [2mm] drill or a Hobbico Servo Arm Drill. Install the arms on the servos.

❏ 7. Hold the rudder pushrod over the outer hole in the rudder servo arm. Push or pull on the pushrod to center the rudder. Use a fine-point felt-tip pen to mark the pushrod where it crosses the hole in the arm.



❏ 8. Disconnect the rudder pushrod from the rudder control horn. Make a 90° bend in the pushrod at the mark. Slip a

nylon Faslink over the pushrod and snap it into place. Cut the pushrod approximately 1/16" [2mm] above the Faslink as shown in the photo.

❏ 9. Connect the pushrod to the outer hole in the rudder servo arm using the Faslink. Reconnect the clevis on the other end of the pushrod to the rudder control horn.

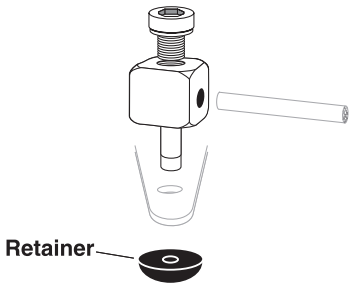
❏ 10. Cut the elevator pushrod and mount it to the elevator servo arm the same way.

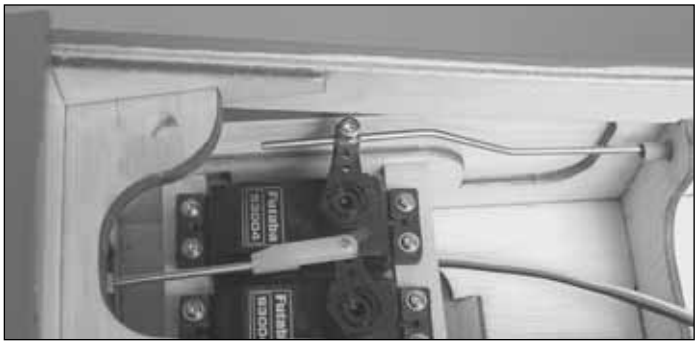
❏ 11. Use an extended 1/16" [1.6mm] drill, or a Great Planes Engine Mount Hole Locator drill to drill holes into the servo rails for mounting the servos–it's okay if some of the holes are at an angle to clear the wing bolt plate. If you don't have a drill that is long enough, you can make an extended drill by gluing a 1/16" [1.6mm] drill in a 3/32" [2.4mm] brass tube. After drilling the holes, the drill can be removed from the tube by heating with a match or a small torch. Do not inhale any of the fumes from heated glue!

❏ 12. Mount the servos using the wood screws that came with them. Temporarily remove the screws, then harden each screw hole with a few drops of thin CA. Allow to fully harden.

❏ 13. Install the fuel tank with the fuel lines. This can be done by guiding extra-long lines through the holes in the firewall. Connect the lines to the tank, then guide the tank into position while simultaneously drawing the lines out. Cut the lines to the correct length when connecting them to the engine.

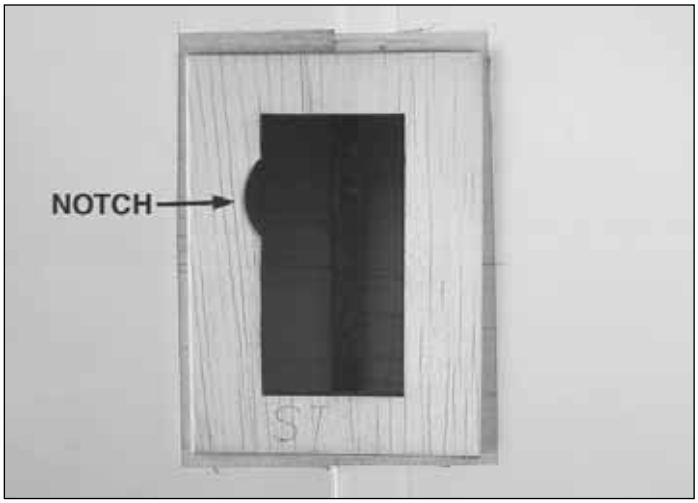
❏ 14. Mount the engine mount and engine. Thread a nylon clevis onto the remaining 36" [910mm] long pushrod. Cut the pushrod to a length of 21" [530mm]. Bend the pushrod as necessary so the clevis will align with the carburetor arm. Guide the pushrod through the tube and connect the clevis to the carburetor arm with a silicone retainer.





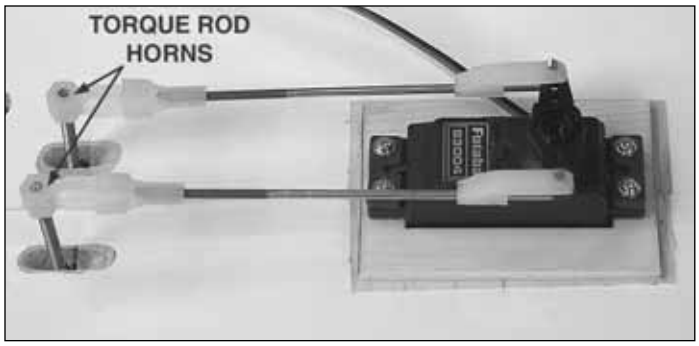
❏ 15. Connect the other end of the throttle pushrod to the throttle servo arm using a brass screw-lock pushrod connector with a nylon retainer and a 4-40 x 1/8" [3mm] screw. Cut the pushrod so it protrudes approximately 1/2" [10mm] from the connector.

Now the ailerons.



❏ 16. Cut a small notch in the aileron servo tray to accommodate the aileron servo wire.

Refer to this photo for the following two steps.

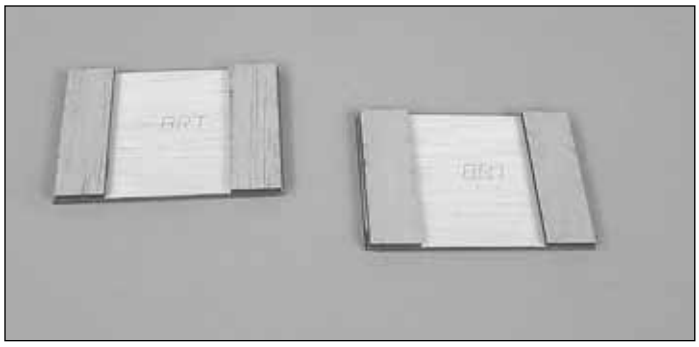


❏ 17. Mount the aileron servo in the wing. The same as you should be doing all along, don't forget to harden the screw holes with thin CA. Make a two-arm servo arm by cutting off the unused arms.

❏ 18. Thread a torque rod horn onto each torque rod until the top of the horn is even with the top of the torque rod. Make the aileron pushrods and connect them to the aileron servo and the torque rod horns the same way you did the elevators and rudder.

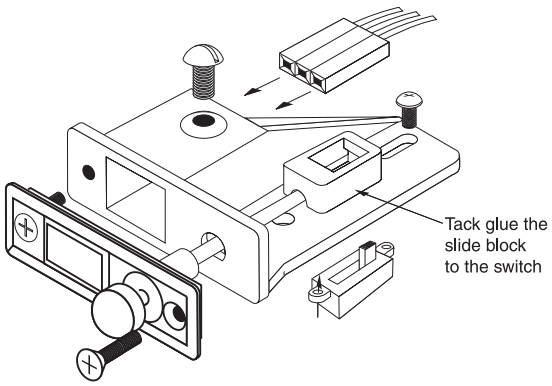
❏ 19. Mount the main landing gear in the wing using the screws and straps.

Complete the Radio Installation

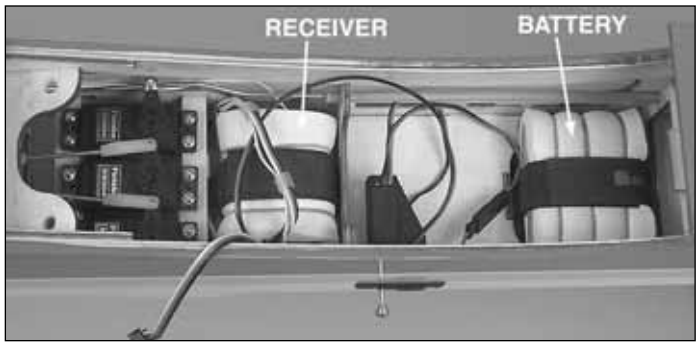


❏ 1. Make the **receiver tray** and **battery tray** by gluing the balsa and plywood parts together as shown. When overturned you will be able to slip tape or Velcro® around the trays to hold the battery pack and receiver down.

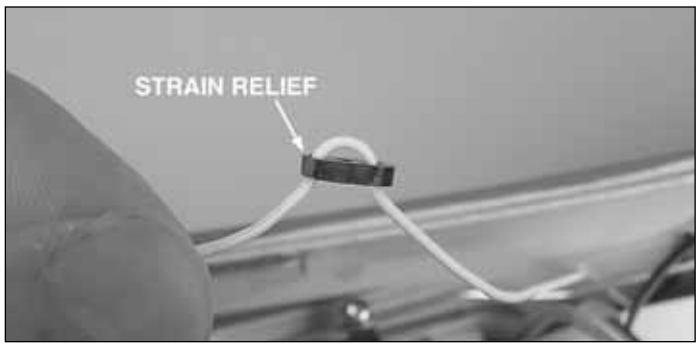
❏ 2. Wrap the receiver and battery in 1/4" [6mm] R/C foam rubber. Hold the foam in place with small rubber bands or tape. Mount the receiver and battery to the trays with tape or Velcro.



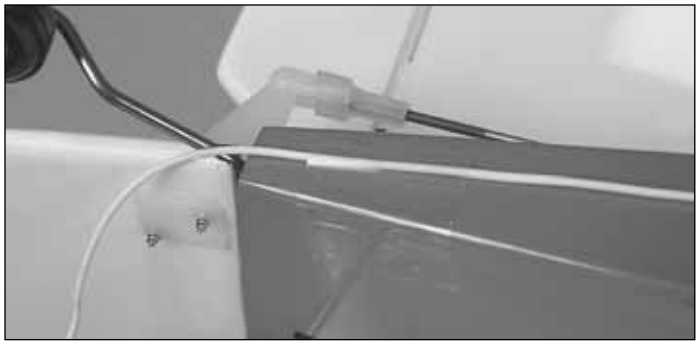
❏ 3. Mount the on/off receiver/battery switch to the side of the fuselage opposite the engine exhaust. There are cut outs in the fuselage sides that should accommodate most types of switches. The model shown in the manual uses the Great Planes Switch & Charge Jack Mounting Set (GPMM1000). This serves both as a switch mount and a charge jack mount for a battery charger or volt meter. The setup must be mounted upright, so the switch slide block must be tack-glued to the switch with a small drop of medium CA so it doesn't fall off when overturned for mounting.



❏ 4. Securely glue the receiver and battery trays in the fuselage where they will fit. Make sure they do not interfere with the servos or on/off switch. It's best to mount the battery pack in front of the receiver.



❏ 5. Make a strain relief for the receiver antenna from a leftover servo arm. Guide the antenna through the holes in the arm.

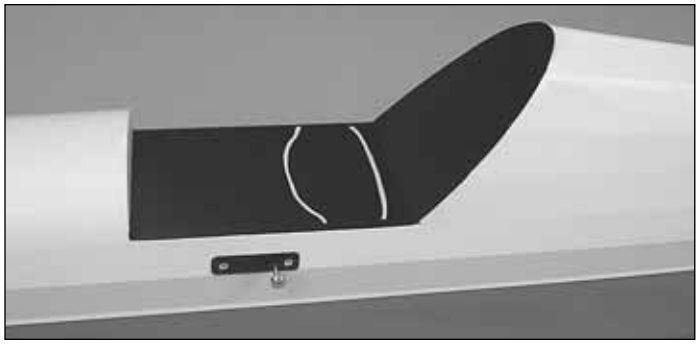


❏ 6. The receiver antenna must be fully extended–either inside or outside the fuselage. To mount the antenna outside the fuselage drill a 3/32" [2.4mm] hole through former F-4 and drill a 1/8" [3mm] hole through the bottom of the fuselage. Guide the antenna through F-4 and through a small piece of tubing in the bottom of the fuselage. Tape the end of the antenna to the bottom of the fuselage.

Finish the Cockpit

❏ 1. Use iron-on covering or paint to make the cockpit the color of your choice. On the model in the instruction manual the cockpit was covered with flat black MonoKote.

❏ 2. Test fit the pilot you will be using. Trim the pilot where necessary to get him to fit in the cockpit, then paint per your taste. Acrylic paints found at craft and hobby stores are recommended because they are easy to use and clean up with water.

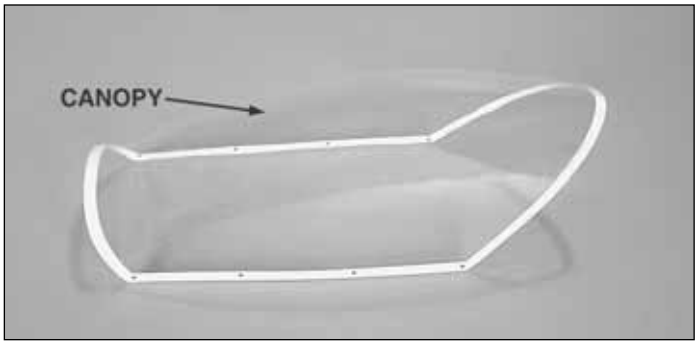


❏ 3. If the cockpit was covered with iron-on covering, cut away the covering so the pilot can be glued to bare wood. This is not necessary if the cockpit was painted. Glue the pilot into position with medium CA or epoxy.

❏ 4. Cut out the instrument panel decal and stick it into position on former FD3.

❏ 5. Cut out the canopy along the molded-in cutlines. True the edges with a bar sander, then wash in soapy water. Rinse thoroughly and dry.

❏ 6. Place the canopy on the fuselage. Drill four 1/16" [1.6mm] holes through both sides of the canopy and into the fuselage. Enlarge the holes **in the canopy only** with a 3/32" [2.4mm] drill.



❏ 7. Apply 1/4" [6mm] striping tape around the perimeter of the canopy. Screw the canopy to the fuselage with eight #2 x 3/16" [4.8mm] screws.

Apply the Decals

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

The best way to apply sticky-back decals is to use the "soap and water" method. This allows easy, accurate positioning and eliminates air bubbles underneath.

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. Peel off the paper backing and submerse the decal in the soap and water.

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

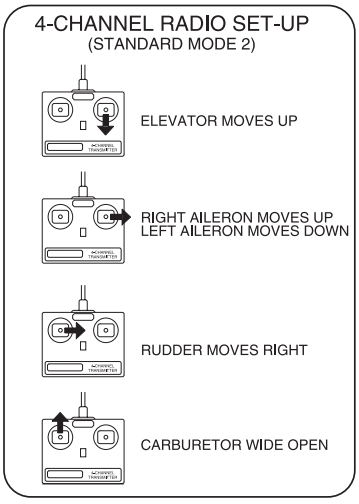
4. Use a piece of soft balsa or something similar to squeegee remaining water from under the decal. Apply the rest of the decals the same way.

GET THE MODEL READY TO FLY

Check the Control Directions

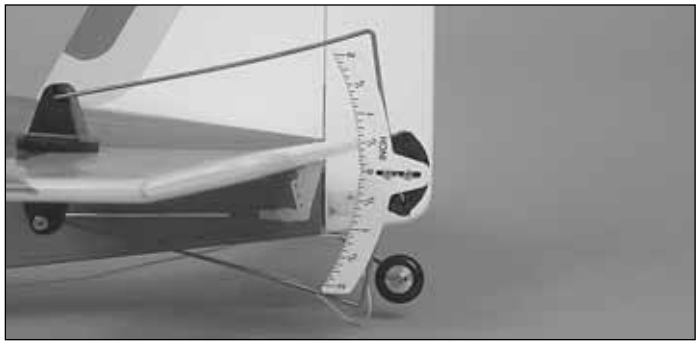
❑ 1. Center the trims on the transmitter, then turn on the transmitter and receiver. If necessary, remove the servo arms from the servos and reposition them so they are centered. **Be sure to install the screws that hold on the servo arms.**

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



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

Set the Control Throws



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

These are the recommended control surface throws:

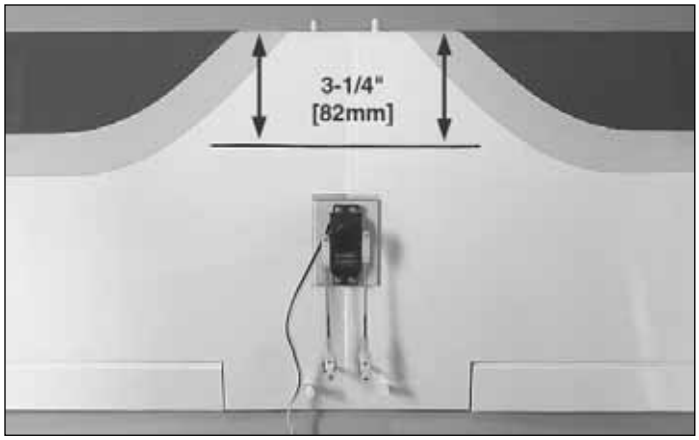
	High Rate	Low Rate
ELEVATOR:	1/2" [13mm] up 1/2" [13mm] down	3/8" [9mm] up 3/8" [9mm] down
RUDDER:	1" [25mm] right 1" [25mm] left	3/4" [19mm] right 3/4" [19mm] left
AILERONS:	1/2" [13mm] up 1/2" [13mm] down	3/8" [9mm] up 3/8" [9mm] down

IMPORTANT: The Rapture 40 has been **extensively** flown and tested to arrive at the throws at which it flies best. Flying your model at these throws will provide you with the greatest chance for successful first flights. If, after you have become accustomed to the way the Rapture flies, you would like to change the throws to suit your taste, that is fine. However, too much control throw could make the model difficult to control, so remember, "more is not always better."

Balance the Model (C.G.)

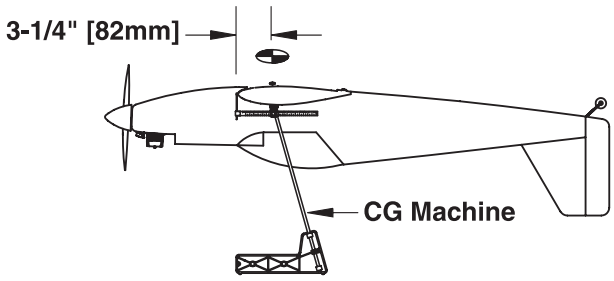
More than any other factor, the **C.G.** (balance point) can have the **greatest** effect on how a model flies, and may determine whether or not your first flight will be successful. If you value this model and wish to enjoy it for many flights, **DO NOT OVERLOOK THIS IMPORTANT PROCEDURE.** A model that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

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



❏ 1. If using a **Great Planes C.G. Machine** set the rulers to 3-1/4" [82mm]. If not using a C.G. Machine, use a felt-tip pen or 1/8"-wide [3mm] tape to accurately mark an approximately 7" [200mm] line on the top of the wing 3-1/4" [82mm] back from the leading edge.

This is where your model should balance for the first flights. Later, you may wish to experiment by shifting the C.G. up to 1/4" [6mm] forward or 1/4" [6mm] back to change the flying characteristics. Moving the C.G. forward may improve the smoothness and stability, but the model may then require more speed for takeoff and make it more difficult to slow for landing. Moving the C.G. aft makes the model more maneuverable, but could also cause it to become difficult to control. In any case, **start at the recommended balance point** and do not at any time balance the model outside the specified range.



❏ 2. Bolt the wing to the fuselage. With, all parts of the model installed (ready-to-fly) and an empty fuel tank, place the model upside-down on the Great Planes CG Machine, or lift it upside-down with one finger from each hand on the line you marked on the balance point.

❏ 3. If the tail drops, the model is “tail heavy” and weight must be added to the nose to balance. If the nose drops, the model is “nose heavy” and weight must be added to the tail to balance. If possible, start out by relocating the battery pack and/or receiver to minimize or eliminate any additional ballast required. If additional weight is still required, nose weight may be easily added by using a “spinner weight” (GPMQ4645 for the 1 oz. weight, or GPMQ4646 for the 2 oz. weight). If spinner weight is not practical or is not enough, use Great Planes (GPMQ4485) “stick-on” lead. A good place to add stick-on nose weight is to the firewall or to the inside of one of the fuselage sides in front of the firewall. To find out how much weight is required, begin by placing incrementally increasing amounts of weight on the bottom of the fuselage over nose or tail until the model balances. Once you have determined the amount and location of weight required, it can be permanently attached. Tail weight may be added by cutting the covering from the side of the fuselage and gluing it inside. Cover the hole with another piece of covering.

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

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

Balance the Model Laterally

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

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

PREFLIGHT

Identify Your Model

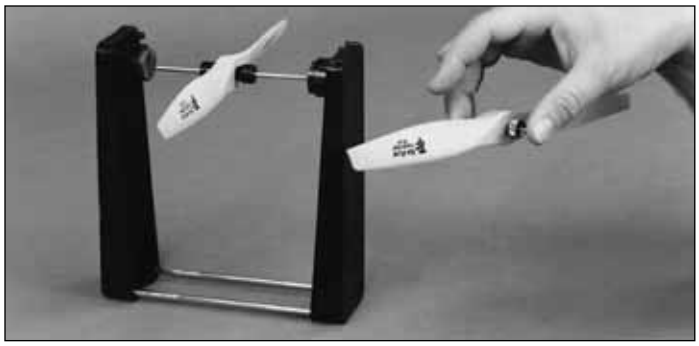
No matter if you fly at an AMA sanctioned R/C club site or if you fly somewhere on your own, you should always have your name, address, telephone number and AMA number on or inside your model. It is **required** at all AMA R/C club flying sites and AMA sanctioned flying events. Fill out the identification tag on page 41 and place it on or inside your model.

Charge the Batteries

Follow the battery charging instructions that came with your radio control system to charge the batteries. You should always charge your transmitter and receiver batteries the night before you go flying, and at other times as recommended by the radio manufacturer.

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

Balance the Propellers



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

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

Ground Check

If the engine is new, follow the engine manufacturer's instructions to break-in the engine. After break-in, confirm that the engine idles reliably, transitions smoothly and rapidly to full power and maintains full power-indefinitely. After you run the engine on the model, inspect the model closely to make sure all screws remained tight, the hinges are secure, the prop is secure and all pushrods and connectors are secure.

Range Check

Ground check the operational range of your radio before the first flight of the day. With the transmitter antenna collapsed and the receiver and transmitter on, you should be able to walk at least 100 feet [30m] away from the model and still have control. Have an assistant stand by your model and, while you work the controls, tell you what the control surfaces are doing. Repeat this test **with the engine running** at various speeds with an assistant holding the model, using hand signals to show you what is happening. If the control surfaces do not respond correctly, **do not fly!** Find and correct the problem first. Look for loose servo connections or broken wires, corroded wires on old servo connectors, poor solder joints in your battery pack or a defective cell, or a damaged receiver crystal from a previous crash.

ENGINE SAFETY PRECAUTIONS

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

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

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

Use safety glasses when starting or running engines.

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

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

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

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

Make all engine adjustments from behind the rotating propeller.

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

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

AMA SAFETY CODE (excerpt)

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

GENERAL

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

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

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

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

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

RADIO CONTROL

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

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

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

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

CHECK LIST

During the last few moments of preparation your mind may be elsewhere anticipating the excitement of the first flight. Because of this, you may be more likely to overlook certain checks and procedures that should be performed before the model is flown. To help avoid this, a check list 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 firewall and the rest of the engine compartment and the wing saddle area.
- ❏ 2. Check the C.G. according to the measurements provided in the manual.
- ❏ 3. Be certain the battery and receiver are securely mounted in the fuse. Simply stuffing them into place with foam rubber is not sufficient.
- ❏ 4. Don't forget to extend the receiver antenna and make sure it has a strain relief inside the fuselage to keep tension off the solder joint inside the receiver.
- ❏ 5. Balance the model *laterally* as explained in the instructions.
- ❏ 6. Use thread-locking compound to secure critical fasteners such as the set screws in the wheel collars and the screw in the screw-lock pushrod connector.
- ❏ 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, landing gear strap screws, etc.).
- ❏ 10. Confirm that all controls operate in the correct direction and that the throws are set up according to the manual.
- ❏ 11. Make sure there are silicone retainers on all the clevises and that the screws that hold the servo arms to the servos are installed.
- ❏ 12. Make sure the fuel lines are connected and are not kinked.
- ❏ 13. Balance your propeller (and spare propellers).
- ❏ 14. Tighten the propeller nut and spinner.
- ❏ 15. Place your name, address, AMA number and telephone number on or inside your model.
- ❏ 16. The condition of a battery pack can be determined by cycling it and comparing the actual capacity to the rated capacity on the label. Cycle the receiver battery pack (if necessary) and make sure it is fully charged.
- ❏ 17. If you wish to photograph your model, do so before the first flight.
- ❏ 18. Range check the radio when you get to the flying field.

FLYING

The Rapture 40 is a great-flying model that flies smoothly and predictably. The Rapture does not, however, possess the self-recovery characteristics of a primary R/C trainer and should be flown only by experienced R/C pilots, or by intermediate pilots with the assistance of an experienced pilot.

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.

Takeoff

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

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

Flight

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

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

Landing

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

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

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

GOOD LUCK AND GREAT FLYING!

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

This model belongs to:

Name

Address

City, State, Zip

Phone number

AMA number

Futaba® 4YF 4-Channel FM Radio
Receiver: R127DF, Servos: S3004 (4). Look at the price, the features and the performance of the 4YF, and you'll see why it's the most popular 4-channel around. Its FM technology is complemented with NiCds, a charger, easy access trims and a dual-conversion, 7-channel receiver. Two LEDs instantly show battery power status. The trainer system features a spring-loaded toggle switch instead of a button, so it's easy to hold "on," and automatically turns "off" when you release it. The trainer jack now features a micro-pin connector port, for less clutter with the optional cord. Available on 72 or 75MHz. **FUTJ40****

OTHER ITEMS AVAILABLE FROM GREAT PLANES

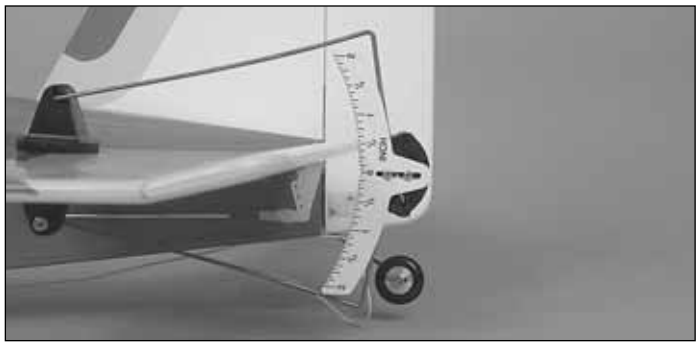
Great Planes Ultra Sport™ 40 Plus Kit
If you've progressed past trainers and want an easy-to-fly sport model with a wide performance range, the 58.5" span Ultra Sport 40 Plus is for you! Its fully symmetrical NACA63014 airfoil and large control surfaces support the most outrageous 3D moves imaginable. Cut speed to a crawl, however, and handling becomes smooth and predictable enough for inexperienced low-wing fliers. The kit features CAD-engineered, self-aligning, all-wood parts plus fixed landing gear (or you can install optional retracts, not included). No specialty or digital servos are required...with low-cost standard servos, you'll enjoy spectacular maneuvers! **GPMA0390**

O.S. Engines® .40 LA
Never before has a mid-size sport engine been so powerful, dependable and user-friendly! The .40 LA's remote needle valve increases your safety while making adjustments. An allen screw makes it easy to add an optional needle extension for versatility with engine positioning. For easy fuel line access, the fuel inlet points upward. And for years of maximum performance, O.S. strengthened the crankcase and increased cooling fin area! Includes 2-year warranty protection and muffler. **OSMG0041**

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

Top Flite MonoKote® Covering
With all of MonoKote's advantages, no wonder it's been the #1 choice of kit builders for over 25 years! Over 50 high-gloss, cloud-free colors give you endless creative options. Stronger and thicker than most films, MonoKote helps you avoid rips and heat damage during application – yet it's also flexible enough to conform easily to curves and contours. And once applied, MonoKote stays in place with a firm, fuelproof grip. Its permanently bonding adhesive formula prevents nitro from sneaking under the seams, which keeps your beautiful covering job intact, season after season!

Top Flite® Powerpoint® Wood Propellers
Lighter than maple props of the same size, these fuelproofed beechwood props reduce rotational mass, letting your engine produce more power with less work. Wood construction also makes Power Point props stiffer than nylon, so they perform predictably throughout the full RPM range. Their symmetric pitch reduces prop vibration and boosts thrust at any RPM – a top choice for all fliers.



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

Great Planes Slot Machine™ Motorized Hinge Slotting Tool
You probably dread cutting hinge slots...for one project, the job can take over an hour! With the electric-powered Slot Machine, you'll safely and easily cut all of your kit's hinge slots in only about 10 minutes. The sawing action of its two blades cuts through wood — even hard spots — without gouging or compressing it like knife blades do. The result is a clean, consistent slot with room for CA to wick all around and form a dependable bond. The Slot Machine comes fully assembled with two pre installed, replaceable blades and a rugged plastic body. U.S. Pat. 6,096,357. **GPMR4010**

BUILDING NOTES

Kit Purchased Date: _____

Where Purchased:_____

Date Construction Started: _____

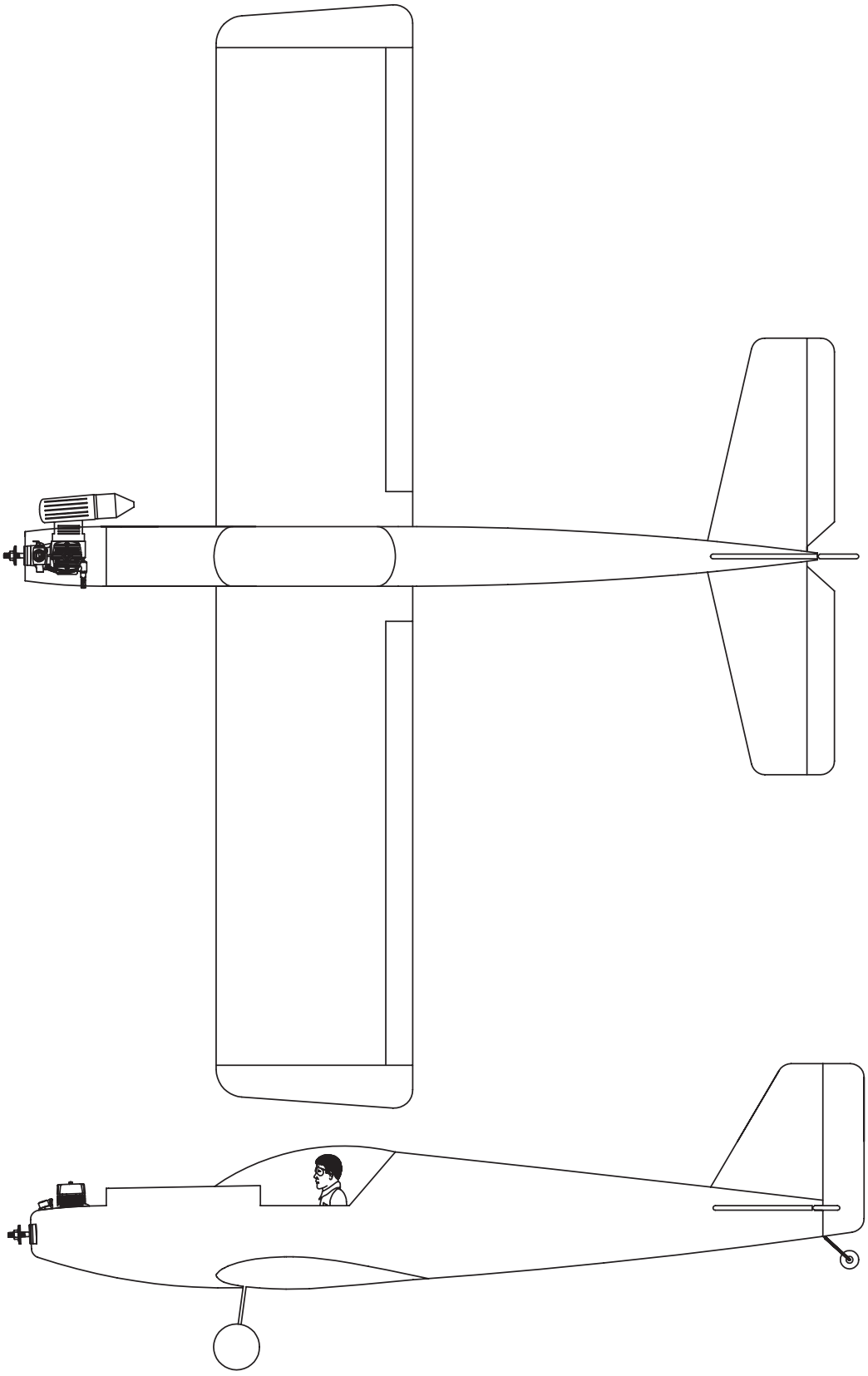
Date Construction Finished: _____

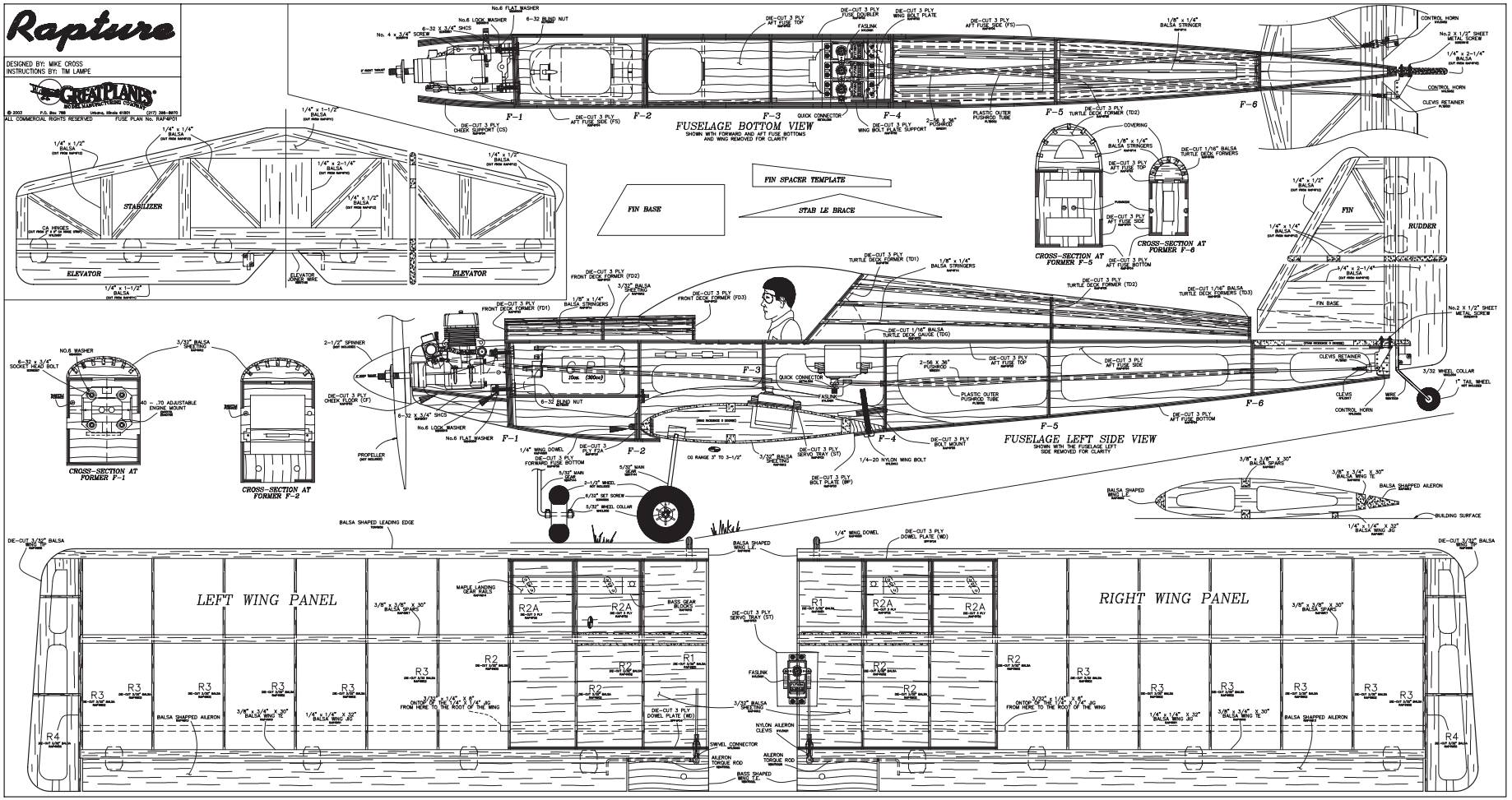
Finished Weight: _____

Date of First Flight: _____

FLIGHT LOG

TWO VIEW DRAWING
Use copies of this page to plan your trim scheme




Rapture
DESIGNED BY: MIKE CROSS
INSTRUCTIONS BY: TIM LAMPE
GREAT PLANES
ELECTRIFLIGHT
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FUSE PLAN No. RAP4PDT
FUSELAGE BOTTOM VIEW
SHOWN WITH FORWARD AND AFT FUSE BOTTOMS AND WING REMOVED FOR CLARITY
STABILIZER
ELEVATOR
FIN SPACER TEMPLATE
FIN BASE
STAB LE BRACE
FIN
RUDDER
CROSS-SECTION AT FORMER F-1
CROSS-SECTION AT FORMER F-2
CROSS-SECTION AT FORMER F-5
CROSS-SECTION AT FORMER F-6
FUSELAGE LEFT SIDE VIEW
SHOWN WITH THE FUSELAGE LEFT SIDE REMOVED FOR CLARITY
LEFT WING PANEL
RIGHT WING PANEL
BALSA SHAPPED AILERON
BUILDING SURFACE