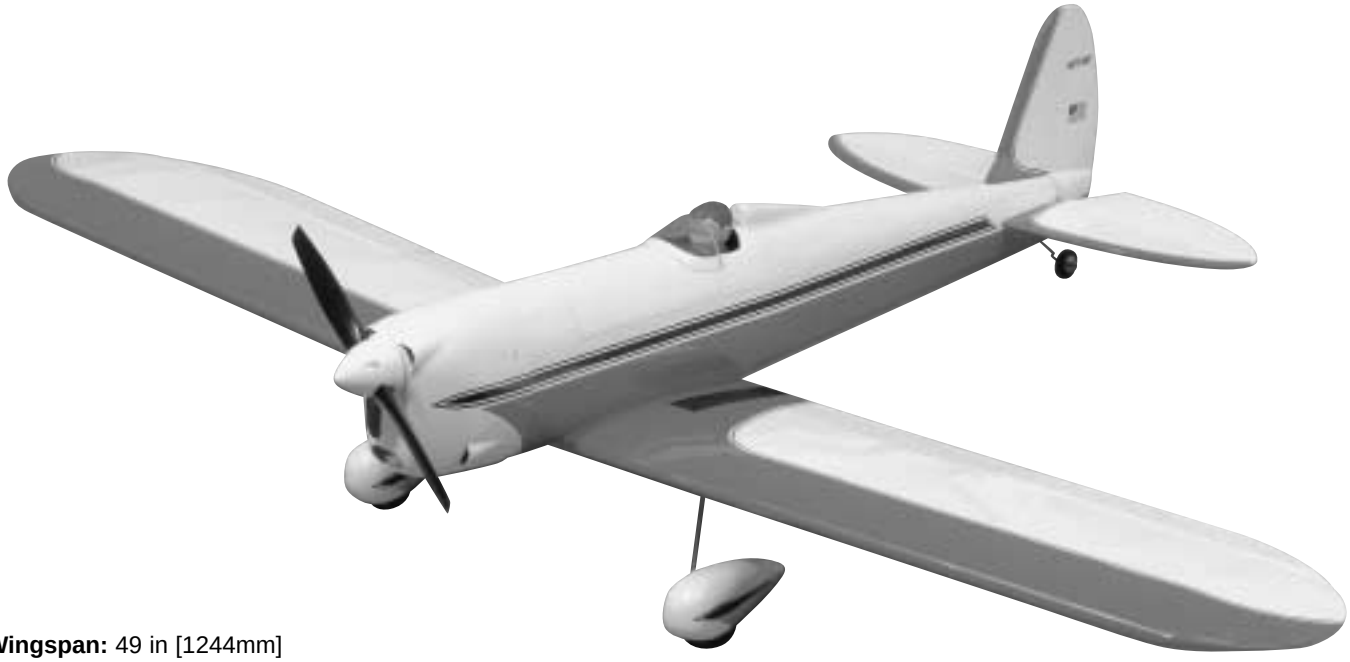
RYAN STA EP

INSTRUCTION MANUAL



Wingspan: 49 in [1244mm]
Wing Area: 401 sq in [25.7 dm²]
Weight: 3 lbs., 8 oz. [1587g]
Length: 36-1/4 in [920.7mm]

WARRANTY

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

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

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

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

GREAT PLANES® MODEL MANUFACTURING COMPANY
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INTRODUCTION

With its white and red trim scheme and black and white checkerboard on the underside of the wing and stabilizer, the Ryan STA is one of the most recognizable civilian aircraft around. You can now have this great looking and flying aircraft as an electric without the mess and fuss of a glow engine. Electrics have been growing in popularity over the last few years and with this comes the availability of high quality motors, electronic speed controls and batteries. Flight times have almost doubled with the newest NiMH batteries available. So if you want to impress your glow flying buddies with an electric, the Great Planes Ryan STA EP is just what you need.

For the latest technical updates or manual corrections for the Ryan STA EP, visit the web site listed below and select the Great Planes Ryan STA EP. If there is new technical information or changes to this kit, a “tech notice” box will appear in the upper left corner of the page.

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

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

1. Your Ryan STA EP should not be considered a toy, but rather a sophisticated, working model that functions very much like a full-size airplane. Because of its performance capabilities, the Ryan STA EP, 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 motor and components (electronic speed control, motor battery, 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.

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

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

Before starting to build, compare the parts in this kit with the Parts List, and note any missing parts. Also inspect all parts to make sure they are of acceptable quality. If any parts are missing, broken or defective, or if you have any questions about building or flying this airplane, please call us at (217) 398-8970, or e-mail us at productsupport@greatplanes.com.

If you are contacting us for replacement parts, please be sure to provide the full kit name (Ryan STA EP) and the part numbers as listed in the Parts List.

You can also check our web site at www.greatplanes.com for the latest Ryan STA EP 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:

AMA SINCE 1936

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

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

DECISIONS YOU MUST MAKE

Radio Selection

Because weight is an important factor in the Ryan STA EP, the ideal radio system is one that has a miniature receiver, four mini servos such as Futaba's® S3101 servos (FUTM0033) and an electronic speed control with BEC (Battery Eliminator Circuitry). The electronic speed control with BEC uses the motor battery, not a separate receiver battery, to power the receiver and servos. When the motor battery voltage reaches a preset voltage, the BEC on the speed control stops the motor while still supplying power to the receiver and servos. The Great Planes ElectriFly™ C-30 (GPMM2030) works great in the Ryan STA EP.

Motor Selection

In testing the Ryan STA EP, many different motors were evaluated. Some of them provided adequate thrust to fly the Ryan STA EP satisfactorily. Some, however, gave such marginal performance that the climb-out was very shallow and flight times were short.

The Great Planes S-60014R reverse rotation motor with a 2.5:1 gear drive unit (GPMG0850) and a 15 tooth pinion gear (GPMG0852) to produce a gear ratio of 3.0:1 enables the motor to turn a larger, more efficient propeller at a slower speed. This usually results in more thrust for a better climb rate and longer flight times up to 6 minutes.

Battery Selection

The Ryan STA EP was designed to fly on a 7-cell 8.4 volt 1700 – 3000 mAh flat battery pack. Even though the Ryan STA EP will fly well on an inexpensive motor battery pack, we recommend a battery pack that uses Sanyo® or Panasonic® cells. These cells have a low internal resistance which translates into more power and less heat.

If you are new to electric airplanes (or even cars and boats) here is a short explanation of rechargeable NiCd and NiMH

batteries. A single cell rechargeable battery supplies 1.2 volts with no load (not powering anything). A 7-cell battery pack can supply 8.4 volts (1.2 volts x 7 cells = 8.4 volts). The cell rating in mAh (milli-amp-hours) is the amount of current the battery can supply. If a battery is rated at 1700 mAh, the battery can supply 1.7 amps for 1 hour (or 1 amp for 1.7 hours). This sounds great, flying for over 1-1/2 hours on a single battery charge! The bad news is that to produce the power needed to fly an airplane the size of the Ryan STA EP, the motor draws from 15-25 amps. The current consumption reduces the run time to 4-6 minutes. The good news is that propellers become more efficient as the speed of the plane increases. This lowers the current draw, allowing the plane to fly longer on a single charge, sometimes up to 20% longer. Also, if an electronic speed control is used, the motor can be throttled back, increasing the flight time. Most airplanes only need full throttle during takeoff.

We recommend the use of high quality battery packs. The higher quality batteries usually have less internal resistance than the average battery. The higher quality battery will provide more power to the motor than the average battery. In rechargeable batteries, internal resistance transforms power into heat. With less internal resistance, there is more power available to the motor and less heat is generated. We hope this helps explain NiCd and NiMH batteries and why a high quality battery should be used in the Ryan STA EP.

Chargers

A fully charged battery pack will provide an initial “surge” of power during the first 15 to 30 seconds of the motor run. Then the power output stays fairly steady for the next several minutes before dropping off quickly. If you do not charge your battery completely, it will not deliver that surge necessary for a good takeoff and climb out. There are three easy ways to “peak-charge” your battery pack.

1. The easiest way is with a “peak-detecting” battery charger. This type of charger will automatically charge your battery until it is fully charged. The NiMH batteries require a peak-detecting charger that meets the specific charging needs of NiMH batteries.

2. The second method of charging your motor batteries is to monitor the voltage of your battery pack with a voltmeter. **This method is only recommended for NiCd batteries.** Your charger may have sockets into which you may plug a voltmeter. If not, you may insert the probes from the voltmeter into the rear of the battery plug, making contact with the metal contacts. As your battery charges, the voltage will gradually increase. When the battery is fully charged, the voltage will start to **drop**. At this point your battery is fully charged.

3. The third (and least reliable) method of peak-charging your battery pack is by checking its temperature. **This method is only recommended for NiCd batteries.** As the battery charges it will remain cool until it is fully charged. When it reaches the fully charged state, it will rapidly build up heat. You can feel this heat with your hand. As soon as the pack starts to noticeably warm up, disconnect it from the charger. **Do not continue charging if the battery pack is hot!** Overcharging will damage your battery pack and can result in an explosion.

ADDITIONAL ITEMS REQUIRED

Hardware & Accessories

In addition to the items listed in the ***“Decisions You Must Make”*** section, following is the list of hardware and accessories required to finish the Ryan STA EP. Order numbers are provided in parentheses and are recognized by most distributors and hobby shops and are listed for your convenience.

- ❏ 4-channel radio with 4 mini servos
- ❏ (2) 2" Ultralite Wheel (GPMQ4201)
- ❏ (1) 1" Tail Wheel (GPMQ4241)
- ❏ (1) Velcro® Hook and Loop material (GPMQ4480)
- ❏ (1) 1-3/4" White Spinner (GPMQ4505)
- ❏ (1) 1/6 Scale (2") Pilot
- ❏ (1) C-30 ElectriFly Electronic Speed Control (GPMM2030, included in GPMG0075)
- ❏ (1) Motor battery pack charger 910 Hobbico® Variable Rate Charger (HCAP0175) or the DuraTrax® Intellipeak™ AC/DC Pulse Charger (DTXP4100)
- ❏ (1)1700 mAh 8.4 volt NiCd battery pack (DTXC2071) or 3000 mAh 8.4 volt NiMH battery pack (DTXC2096)

Recommended Drive Unit

- ❏ (1) GD-600 Gear Drive (GPMG0850)
- ❏ (1) 15 Tooth Pinion Gear (GPMG0852)
- ❏ (1) Motor (14-turn reverse, GPMG0715)
- ❏ (1) 9x8 Propeller (APCQ0908)

or

- ❏ (1) S-600 GD System (GPMG0770), or S-600 GD System with ESC (GPMG0775)
- ❏ (1) White MonoKote Film (TOPQ0204)
- ❏ (1) Red MonoKote Film (TOPQ0201)
- ❏ (1) Black MonoKote Film (TOPQ0208)
- ❏ (1) White LustreKote® Paint (TOPR7204)
- ❏ (1) Red LustreKote Paint (TOPR7201)
- ❏ (1) Black LustreKote Paint (TOPR7208)

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 Ryan STA EP. *We recommend **Great Planes Pro**™ CA and Epoxy glue.*

- ❏ 1/2 oz. Thin Pro CA (GPMR6001)
- ❏ 1/2 oz. Medium Pro CA+ (GPMR6007)

- ❏ 6-Minute epoxy (GPMR6045)
- ❏ 30-Minute epoxy (GPMR6047)
- ❏ Hobby knife (HCAR0105)
- ❏ #11 blades (HCAR0211)
- ❏ Single-edge razor blades (HCAR0212)
- ❏ Small T-pins (HCAR5100)
- ❏ Builder's triangle (HCAR0480)
- ❏ Electric drill and 1/16" [1.6mm], 1/8" [3.2mm], 3/16" [4.8mm], 13/64" [5.1mm], 1/4 [6.4mm] drill bit
- ❏ Great Planes 1/4-20 tap and drill set (GPMR8105)
- ❏ Small phillips and flat blade screwdrivers (HCAR1040)
- ❏ Pliers with wire cutter (HCAR0630)
- ❏ Great Planes Plan Protector™ (GPMR6167) or wax paper
- ❏ Sanding tools and sandpaper assortment *(see **Expert Tip** on bar sanders)*
- ❏ Sealing iron (TOPR2100)
- ❏ Masking tape (TOPR8018)

Optional Supplies & Tools

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

- ❏ Great Planes CG Machine™ (GPMR2400)
- ❏ Top Flite Precision Magnetic Prop Balancer™ (TOPQ5700)
- ❏ Top Flite Hot Sock™ iron cover (TOPR2175)
- ❏ Straightedge with scale (HCAR0475)
- ❏ Cutting mat (HCAR0456)
- ❏ CA Debonder (GPMR6039)
- ❏ CA Applicator tips (GPMR6033)
- ❏ CA Accelerator (GPMR6034)
- ❏ Microballoons (TOPR1090)
- ❏ R/C-56 canopy glue (JOZR5007)
- ❏ Epoxy brushes (GPMR8060)
- ❏ Mixing sticks (GPMR8055)
- ❏ Threadlocker (GPMR6060)
- ❏ Denatured alcohol (for epoxy clean up)
- ❏ Non-elastic monofilament or Kevlar fishing line (for stab alignment)
- ❏ Builder's Triangle Set (HCAR0480) (for fin alignment)
- ❏ Easy-Touch™ bar sander (GPMR6170, or similar)
- ❏ Felt-tip marker (TOPQ2510)
- ❏ Rotary tool such as Dremel® Moto-Tool®
- ❏ Rotary tool reinforced cut-off wheel (GPMR8020)
- ❏ Sealing iron (TOPR2100)
- ❏ Curved-tip Canopy Scissors for trimming plastic parts (HCAR0667)
- ❏ Great Planes AccuThrow™ Deflection Gauge (for measuring control throws, GPMR2405)

EXPERT TIP

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 Ryan STA EP, we used two 5-1/2" Bar Sanders and two 11" Bar Sanders equipped with 80-grit and 150-grit Adhesive-backed Sandpaper.

Here's the complete list of Easy-Touch Bar Sanders and Adhesive Backed Sandpaper:

5-1/2" Bar Sander (GPMR6169)
11" Bar Sander (GPMR6170)
22" Bar Sander (GPMR6172)
33" Bar Sander (GPMR6174)
44" Bar Sander (GPMR6176)
11" Contour Multi-Sander (GPMR6190)

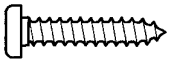
12' roll of Adhesive-backed 80-grit sandpaper (GPMR6180)
150-grit (GPMR6183)
180-grit (GPMR6184)
220-grit (GPMR6185)
Assortment pack of 5-1/2" strips (GPMR6189)

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

IMPORTANT BUILDING NOTES

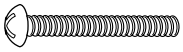
• There are two types of screws used in this kit:

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



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

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



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

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

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

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

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

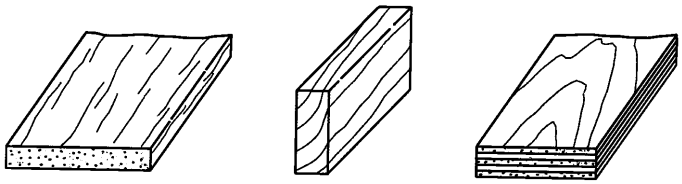
• Not all die-cut parts have a name, or their complete name stamped on them, so refer to the die drawings on page 7 for identification. When it's time to remove the parts from their die sheets, if they are difficult to remove, do not force them out. Instead, use a sharp #11 blade to carefully cut the part from the sheet, then lightly sand the edges to remove any slivers or irregularities. Save some of the larger scraps of wood.

• The easiest way to cut balsa sticks is with a single-edge razor blade or razor saw. Position the stick over the plan, mark its size, then cut the part on a piece of scrap wood. A modeling miter box works well for cutting square corners and 45° gussets.

COMMON ABBREVIATIONS

Fuse = Fuselage
Stab = Stabilizer
Fin = Vertical Fin
LE = Leading Edge
TE = Trailing Edge
LG = Landing Gear
Ply = Plywood
" = Inches

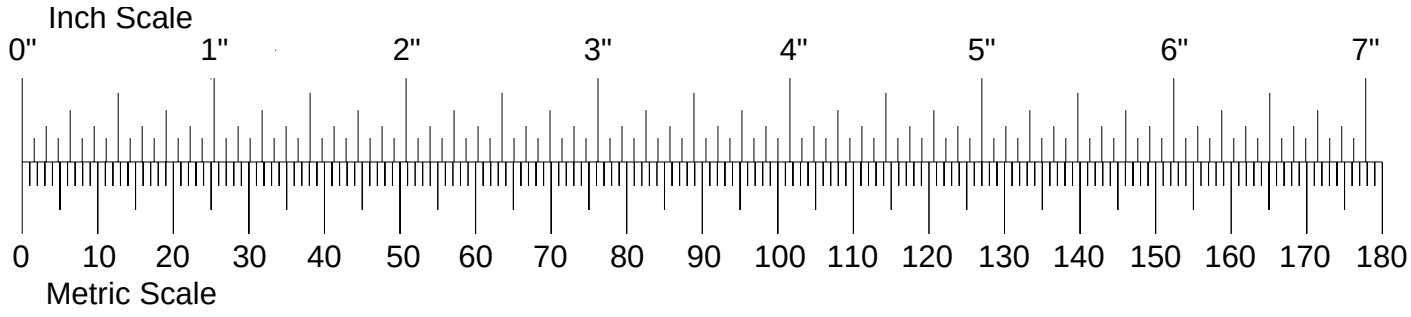
TYPES OF WOOD



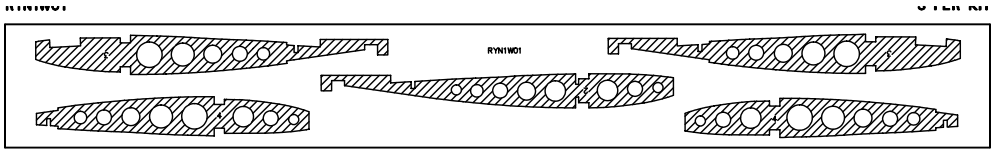
Balsa **Basswood** **Plywood**

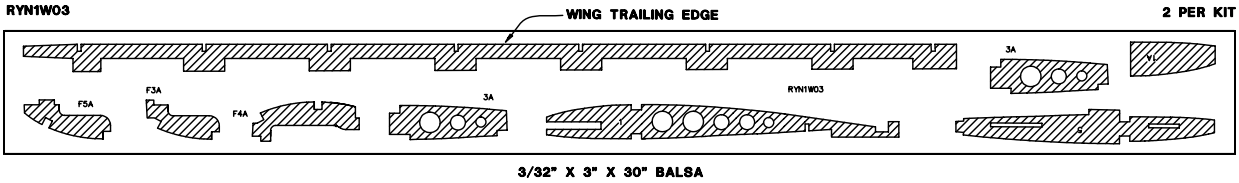
Metric Conversions

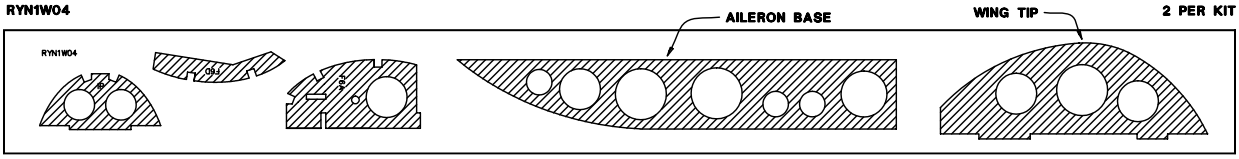
1/64"	=	.4 mm	3/8"	=	9.5 mm	12"	=	304.8 mm
1/32"	=	.8 mm	1/2"	=	12.7 mm	18"	=	457.2 mm
1/16"	=	1.6 mm	5/8"	=	15.9 mm	21"	=	533.4 mm
3/32"	=	2.4 mm	3/4"	=	19.0 mm	24"	=	609.6 mm
1/8"	=	3.2 mm	1"	=	25.4 mm	30"	=	762.0 mm
5/32"	=	4.0 mm	2"	=	50.8 mm	36"	=	914.4 mm
3/16"	=	4.8 mm	3"	=	76.2 mm			
1/4"	=	6.4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

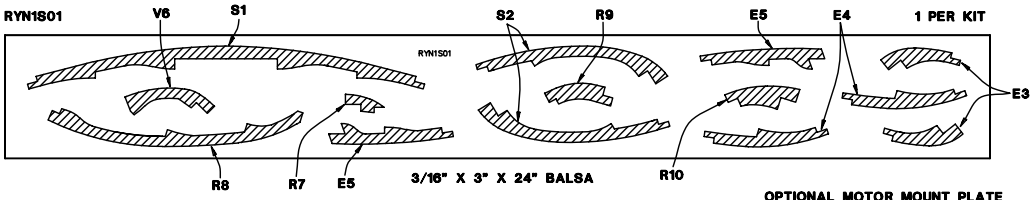


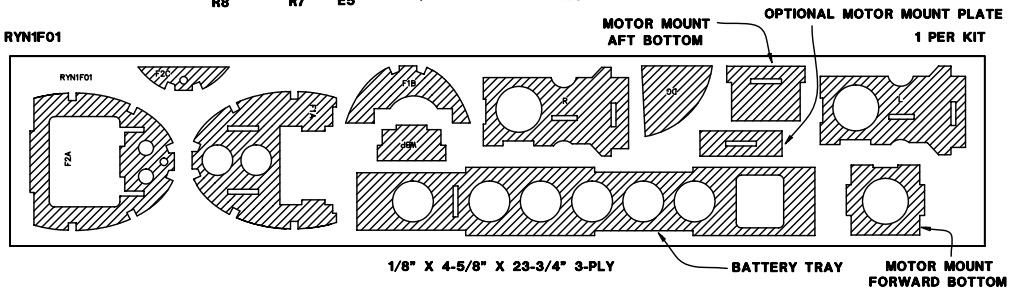
DIE-CUT PATTERNS

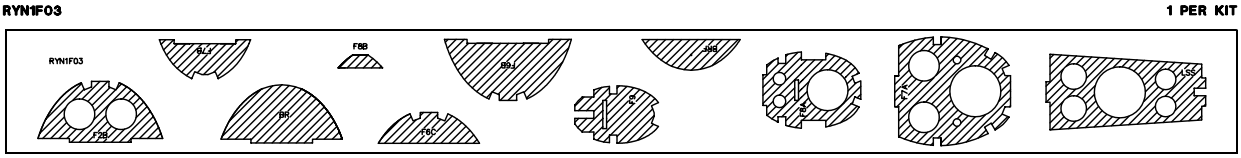


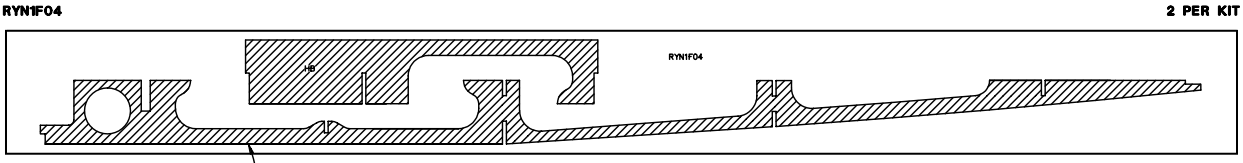


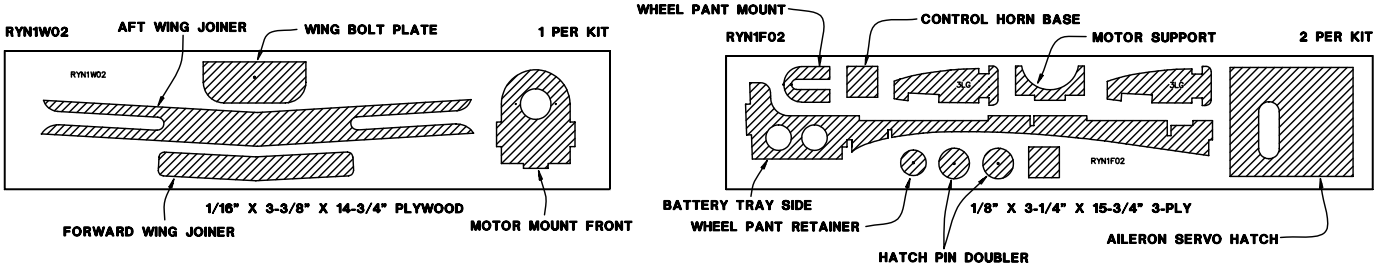










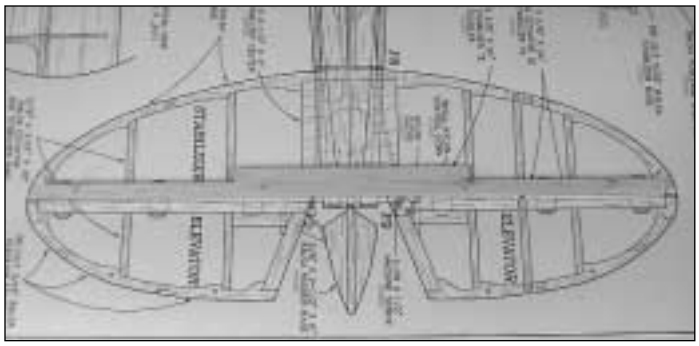


BUILD THE TAIL SURFACES

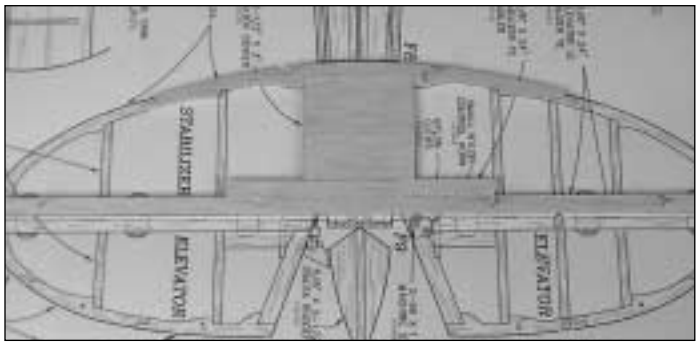
Build the Stabilizer

❏ 1. Unroll the plan sheets. Roll them inside out so they will lie flat.

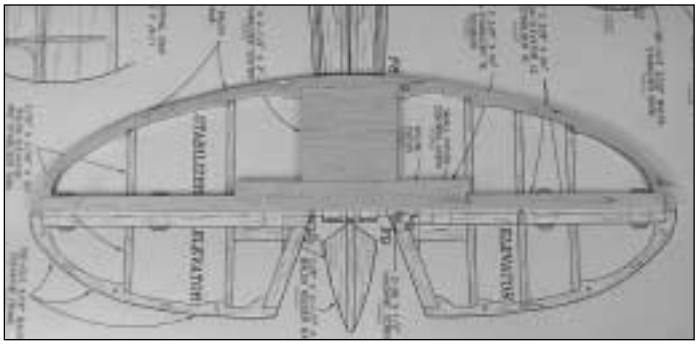
❏ 2. Position the fuse plan so the stab plan is over your flat building board. Cover the plan with Great Planes Plan Protector or wax paper so glue will not adhere.



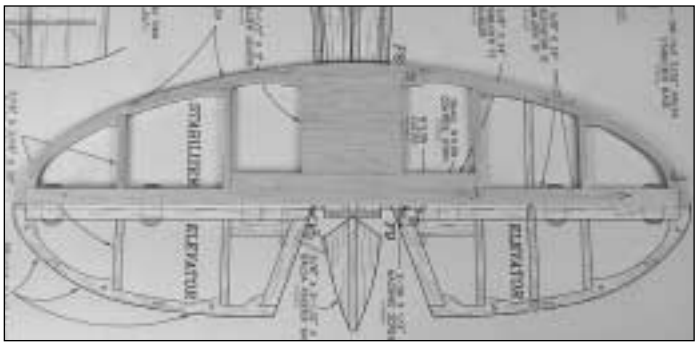
❏ 3. From one of the 3/16" x 3/8" x 24" [4.8mm x 9.5mm x 609.6mm] balsa sticks, cut the **stabilizer trailing edge** and **trailing edge doubler** to match the stabilizer plan. Pin the stab TE over the plan and glue the doubler to the front of the trailing edge.



❏ 4. Pin the die-cut 3/16" [4.8mm] balsa **stabilizer leading edge (S1)** in position. Trim and fit the 3/16" x 3" x 2-1/2" [4.8mm x 76.2mm x 63.5mm] balsa stabilizer center between the die-cut LE and the trailing edge doubler. Glue the stab center to the LE and to the front of the stab TE doubler.



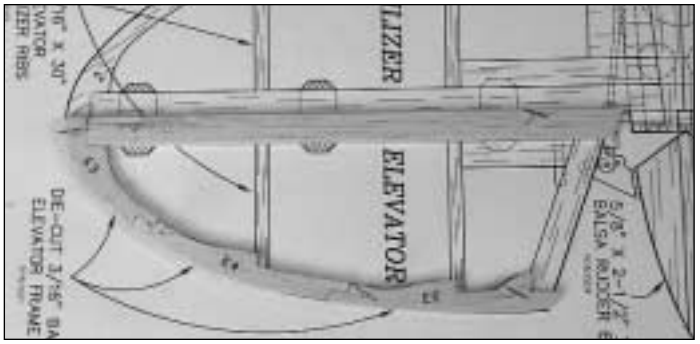
❏ 5. Pin the two die-cut 3/16" [4.8mm] balsa **stab frames (S2)** in position. Glue the frames to the leading edge S1 and the stab TE.



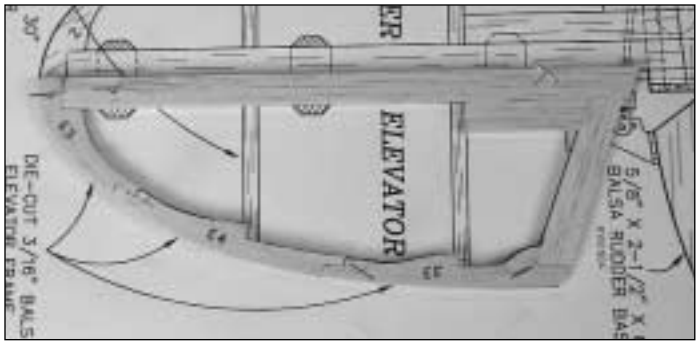
❏ 6. From the 3/16" x 3/16" x 30" [4.8mm x 4.8mm x 762mm] balsa stick, cut and glue the stab ribs to the stab frame.

❏ 7. Remove the stab from your building board. Inspect all the glue joints and add CA to any joints that don't look strong. Fill any gaps with balsa sanding dust and a drop or two of thin CA.

Build the Elevator



❏ ❏ 1. From a 3/16" x 3/8" x 24" [4.8mm x 9.5mm x 609.6mm] balsa stick, cut the **elevator leading edge** to length and pin it over the elevator plan. Pin and glue the die-cut 3/16" balsa **elevator frames E-3** through **E-5** to the LE.

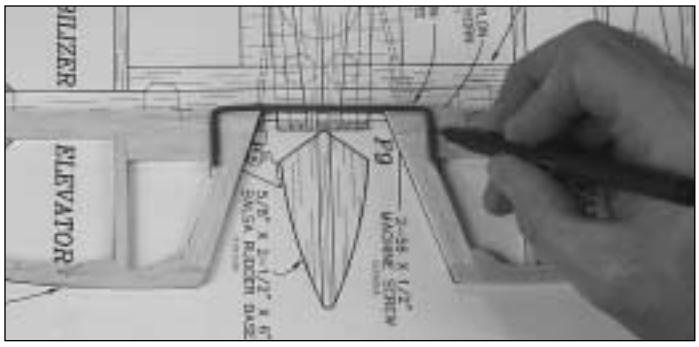


❏❏ 2. From the 3/16" x 3/8" x 24" [4.8mm x 9.5mm x 609.6mm] balsa stick, cut and glue the remainder of the frame and the **LE doubler.**

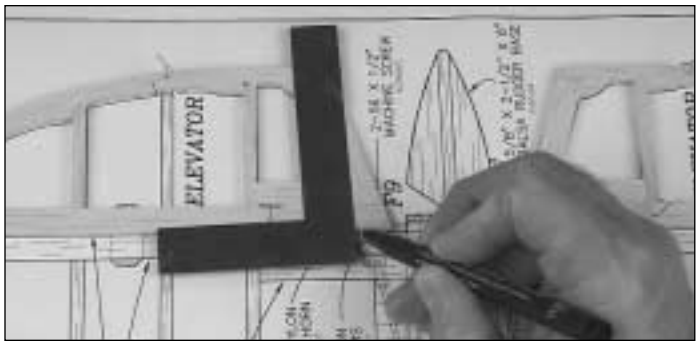
❏❏ 3. From the 3/16" x 3/16" x 30" [4.8mm x 4.8mm x 762mm] balsa stick, cut and glue the **elevator ribs** to the elevator frame.

❏ 4. Repeat step 1 through step 3 to build the second elevator half.

❏ 5. Remove the elevators from your building board. Inspect all the glue joints and add CA to any joints that don't look strong. Sand the stabilizer and elevators to shape using the fuse plan as a guide. Sand both sides of the stabilizer and elevator flat and even. Be careful that you don't sand any area too thin. **Do not** bevel the LE of the elevator until after the hinges have been installed.



❏ 6. Pin both elevator halves in position over the plan. Lay the 3/32" **elevator joiner wire** on top of the elevators in the position shown on the plan. Use a pencil to lightly mark the outline of the joiner wire on the elevators.

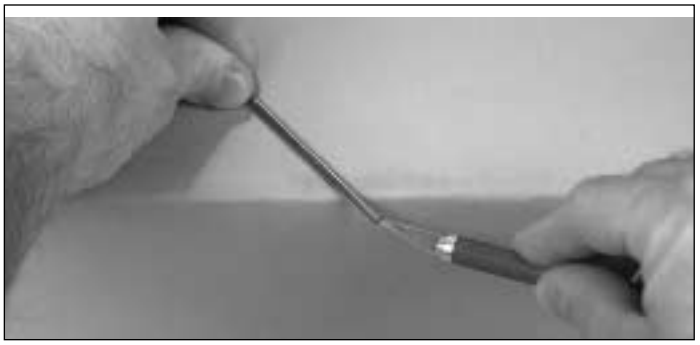


❏ 7. Using a straightedge, extend the sidelines of the elevator joiner outline forward to the leading edge. Also, use a **Great Planes Precision Hinge Marking Tool**™ (GPMR4005) to draw a **centerline on the leading edge** of both elevator halves. Using these lines, you can determine exactly where to drill the holes for the elevator joiner wire.

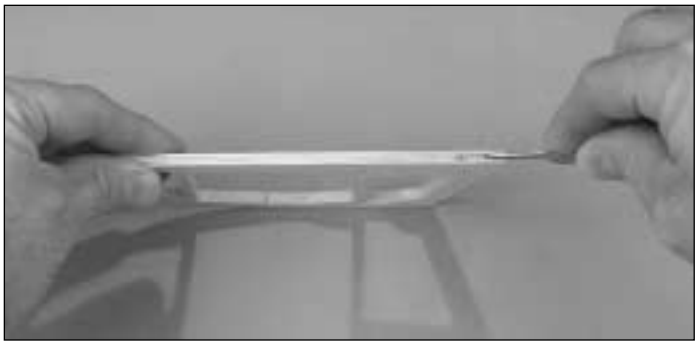
❏ 8. Drill a 3/32" hole through the leading edge of both elevators. As you drill each hole, keep the drill aligned with the top and bottom surface of the elevator and reference lines you made in the previous steps.

❏ 9. Refer to the ***Expert Tip*** that follows to cut a 3/32" groove in the leading edge of both elevators to recess the joiner wire.

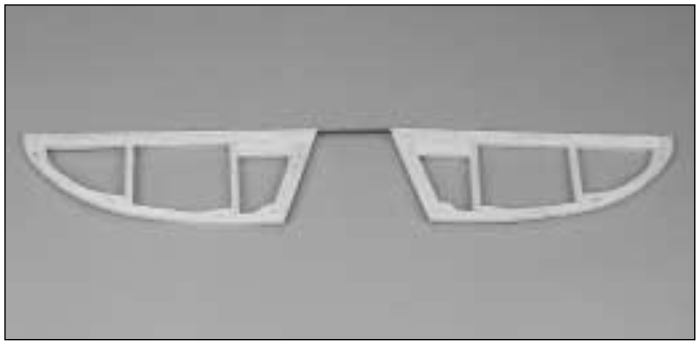
HOW TO CUT A GROOVE FOR A JOINER WIRE



A. Use a #11 knife blade to sharpen the inside of a piece of 3/32" brass tube. Roll the tube as you sharpen the end.



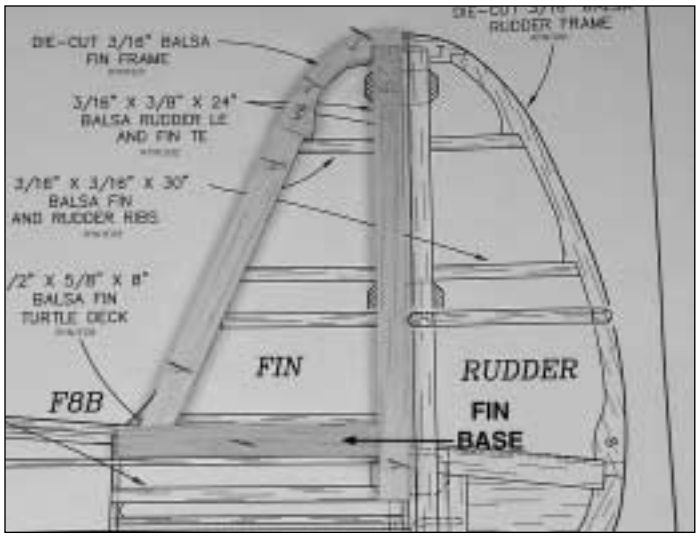
B. Use the sharpened tube to *carefully* gouge the leading edge of the elevators. You'll have to make several passes to make the recess deep enough for the joiner wire.



❑ 10. Temporarily join the elevators with the joiner wire. The joiner wire will be easier to install if you chamfer (bevel) the ends a little. If necessary, “tweak” the joiner wire so the elevators are parallel and lay flat on your building table when the joiner wire is installed. If you found it necessary to “tweak” the joiner wire, use a felt-tip pen to mark it so you can install the joiner wire in the same orientation when you permanently join the elevators.

Build the Fin & Rudder

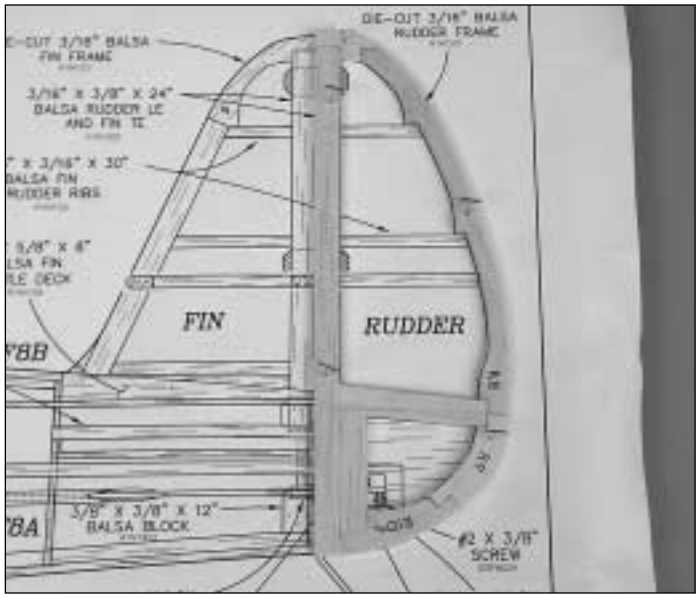
❑ 1. Cover the fin/rudder portion of the plan with waxed paper or Plan Protector.



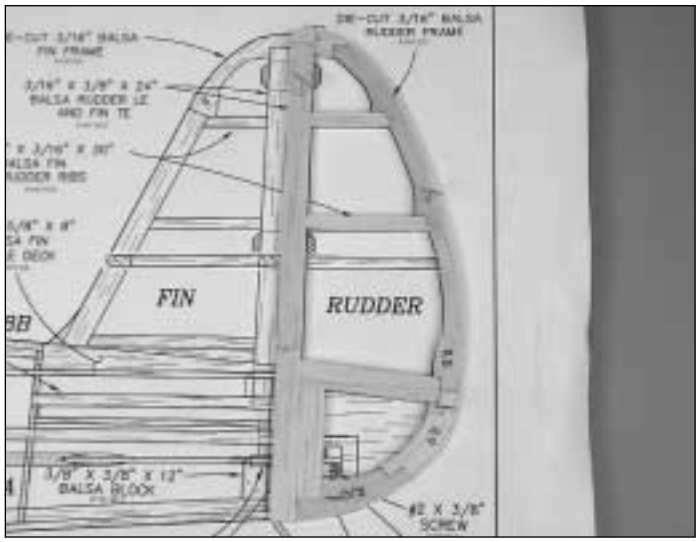
❑ 2. Pin the die-cut 3/16" [4.8mm] balsa **fin frame V-6** in position on the fuse plan. From one of the 3/16" x 3/8" x 24" [4.8mm x 9.5mm x 609.6mm] balsa sticks, cut and glue a LE and TE to V-6. Cut and glue a fin base, along the bottom of the fin, between the LE and TE. Also, cut and shape a LE fin fillet at the bottom of the LE. **Note:** Cut the TE so that it extends to the top of the stabilizer.

❑ 3. From the 3/16" x 3/16" x 30" [4.8mm x 4.8mm x 762mm] balsa stick, cut and glue the **fin ribs** to the frame. Note that one of the ribs is glued to the top edge of the fin base.

❑ 4. Remove the fin from your building board. Inspect all the glue joints and add CA to any joints that don’t look strong. Fill any gaps with balsa sanding dust and a drop or two of thin CA.



❑ 5. Build the rudder frame from the die-cut 3/16" [4.8mm] balsa **R-7**, **R-8**, **R9** and **R-10** frame pieces and a 3/16" x 3/8" [4.8mm x 9.5mm] balsa stick.



❑ 6. From the 3/16" x 3/16" x 30" [4.8mm x 4.8mm x 762mm] balsa stick, cut and glue the **rudder ribs** to the frame.

❑ 7. Remove the rudder from your building board. Inspect all the glue joints and add CA to any joints that don’t look strong. Sand the rudder and fin to shape using the fuse plan as a guide. Sand both sides of the rudder and fin flat and even. Be careful that you don’t sand any area too thin. **Do not** sand the bevel on the LE of the rudder until after the hinges have been installed.

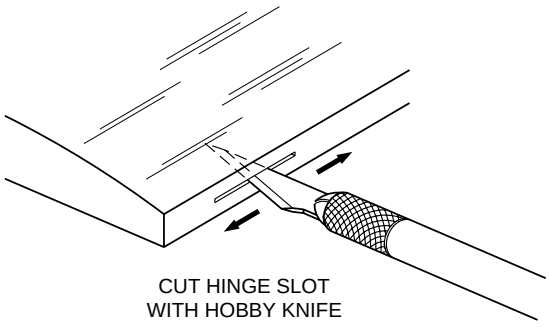
❑ 8. Lay the fin and rudder over the plan and lightly mark the hinge locations on the LE of the rudder and the TE of the fin. Repeat the process to mark the hinge locations on the LE of the elevators and TE of the stab.

❏ 9. We have simplified the task of cutting hinge slots with the introduction of the **Great Planes Slot Machine**™. This simple electric tool cuts a perfect width slot for use with CA hinges.

❏ 10. To cut the hinge slot, first locate the center line of the LE and TE edges using the Great Planes Precision Hinge Marking Tool (GPMR4005). Then place the blades of the Slot Machine onto the wood where you want the slot. Lightly press the teeth into the wood. When you are satisfied with the location, press the button on the handle and the blades will cut easily into the balsa wood.

EXPERT TIP

IF YOU DO NOT HAVE A SLOT MACHINE



CUT HINGE SLOT
WITH HOBBY KNIFE
AND #11 BLADE

Cut the hinge slots in the elevators, stabilizer, fin and rudder using a Hobby Knife with a #11 blade. Begin by carefully cutting a very shallow slit at the hinge location to accurately establish the hinge slot. Make three or four more cuts, going a little deeper each time. As you cut, slide the knife from side to side until the slot has reached the proper depth and width for the hinge.

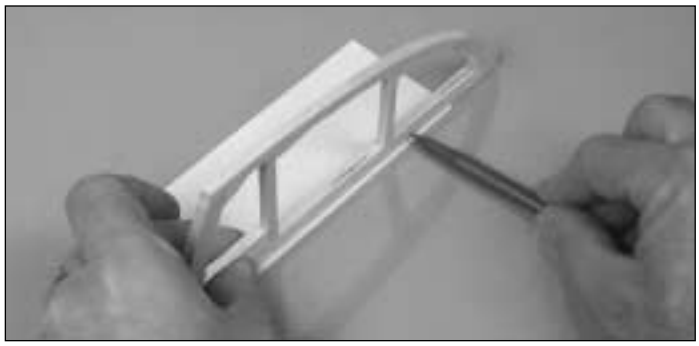
❏ 11. Cut the 1/2" x 1" [12.7mm x 25.4mm] hinges for the elevator and rudder from the supplied 2" x 9" [50.8mm x 228.6mm] **hinge material**, then snip off the corners as shown on the fuselage plan. **Temporarily** join the elevators to the stab and the rudder to the fin with the hinges, adjusting any hinge slots if necessary so they all align. **Do not glue in the hinges until you are instructed to do so after the airplane is covered.**

Finish the Tail Surfaces

❏ 1. Refer to the ***Expert Tip*** that follows and shape the leading edge of the elevators and rudder to a "V" as shown on the plan.

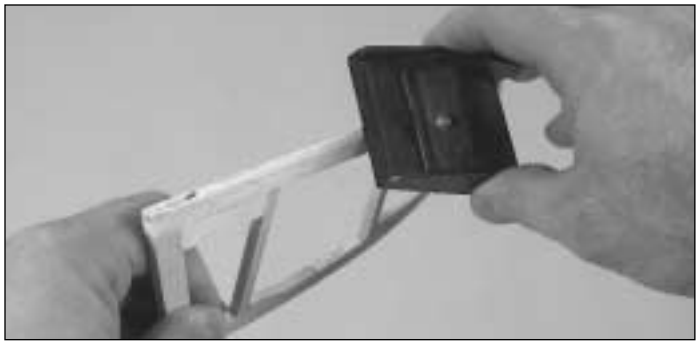
EXPERT TIP

HOW TO BEVEL THE LEADING EDGES



A. Place the leading edge of one of the elevators on your work surface and use your pen to mark a "bevel to" line on both sides, about 3/32" [2.4mm] high.

Note: You will probably have to adjust the height of the elevator with card stock so your "bevel to" line is not too high.



B. Using the “bevel to” lines and the centerline as a guide, make the “V” on the leading edge of the elevators with a razor plane or the Great Planes Multi-Sander (GPMR6190) with 150-grit sandpaper.

❏ 2. Use the same procedure to bevel the leading edge of the rudder.

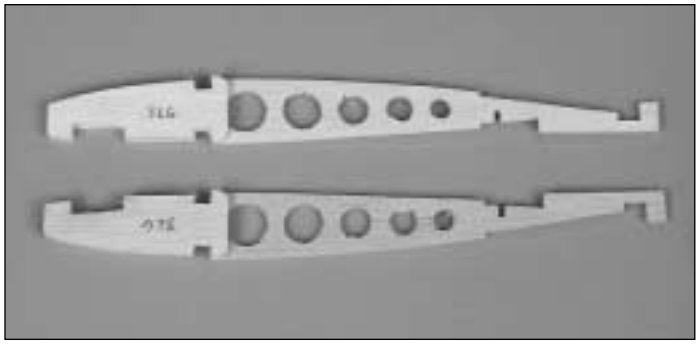
❏ 3. Attach the elevators to the stab and the rudder to the fin. Use your bar sander to round the perimeter of the elevator, stab, rudder and fin (do not round the bottom edge of the fin where it will be glued to the stab and fuse and the bottom half of the rudder where the rudder fairing will be attached later.

BUILD THE WING

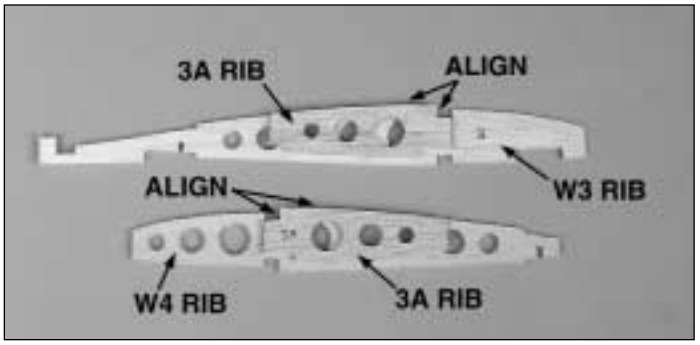
Build the Wing Panels

Start by building the right wing panel right side up over the right wing panel plan so your progress matches the photos.

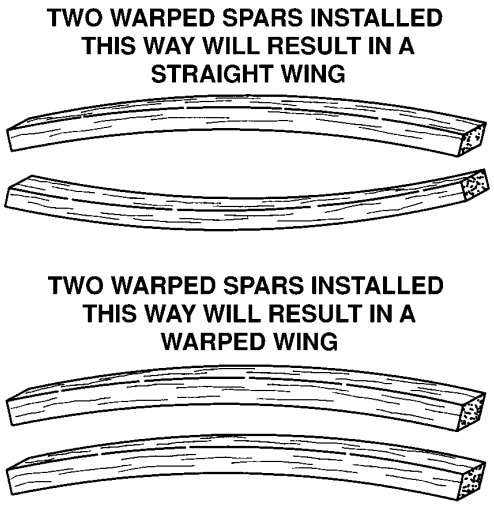
❏ ❏ 1. Cover the wing panel plan with waxed paper or Great Planes Plan Protector.



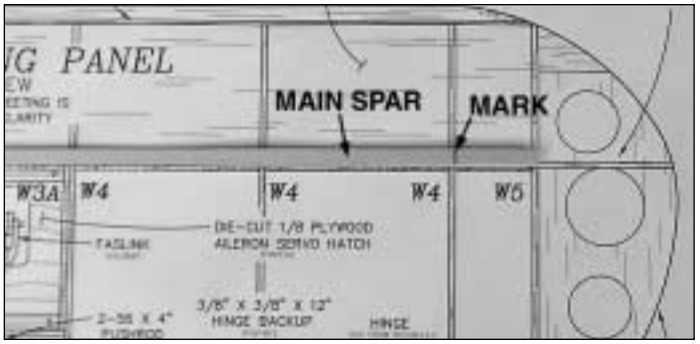
❏ ❏ 2. Glue the die-cut 3-ply **landing gear doubler (3LG)** to the die-cut 3/32" [2.4mm] balsa **wing rib W3**. Make sure to make a left and right rib.



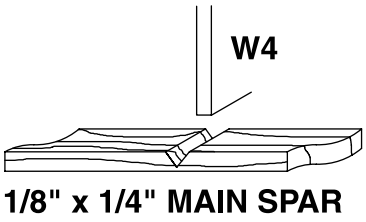
❏ ❏ 3. Glue the die-cut 3/32" [2.4mm] balsa **rib doublers 3A** to a W3 rib and a die-cut 3/32" [2.4mm] balsa **wing rib W4**. Note on the wing plan which side of the ribs the rib doublers are glued to and that the rib doublers are aligned with the top of the W3 and W4 ribs.



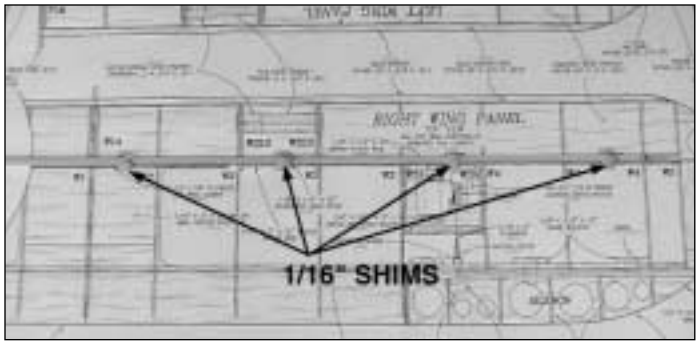
❏ ❏ 4. Match two of the 1/8" x 1/4" x 30" [3.2mm x 6.4mm x 762mm] basswood **main spars** so any warps will counteract each other.



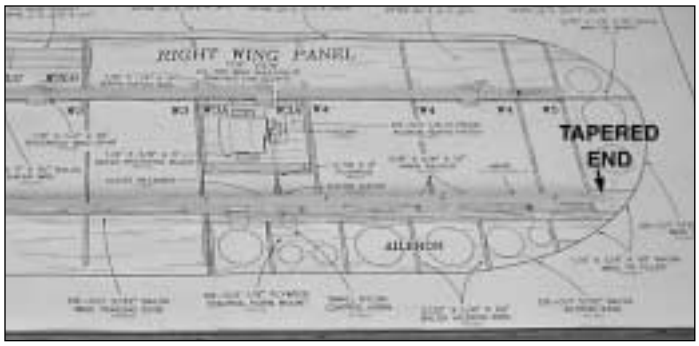
❏ ❏ 5. Position one of the main spars over the plan, aligning one end of the spar with the outboard edge of the tip rib W5. Mark the spar at the tip side of rib W4.



❑ ❑ 6. Cut a V-notch part way through the spar, at the mark, so that the spar can bend at W4.

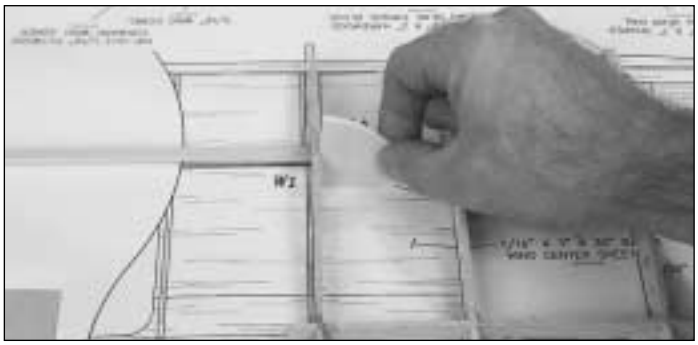


❑ ❑ 7. From one of the 1/16" x 3" x 30" [1.6mm x 76.2mm x 762mm] balsa sheets, cut four 1/2" x 3/4" [12.7mm x 19mm] shims. Place the shims over the spar location on the plan, starting between ribs W1 and W2 and alternating every other rib bay. Pin the main spar, cut in step 6, over the shims, aligned with the wing plan at the W5 tip rib.

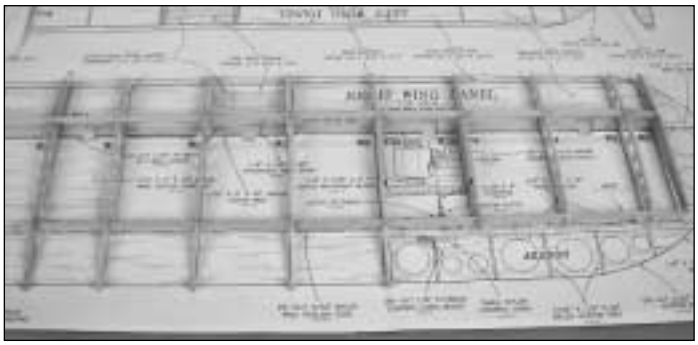


❑ ❑ 8. Pin the die-cut 3/32" [2.4mm] balsa **sub trailing edge**, perpendicular to the building board. The tapered end should be positioned at the wing tip.

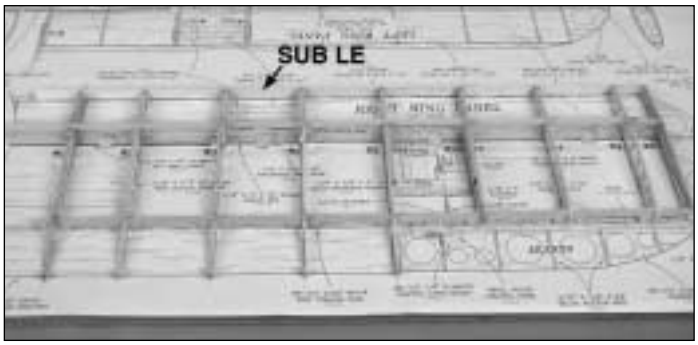
❑ ❑ 9. Pin and glue the die-cut 3/32" [2.4mm] balsa **W2**, **W3**, **W4** and **W5** ribs onto the main spar and the sub TE, perpendicular to the building board. The TE of the ribs do not touch the building board. Note the direction of the W3 ribs with the landing gear doublers and the W3 and W4 ribs with the rib doublers. The main spar will need to be bent upward to contact the W5 rib.



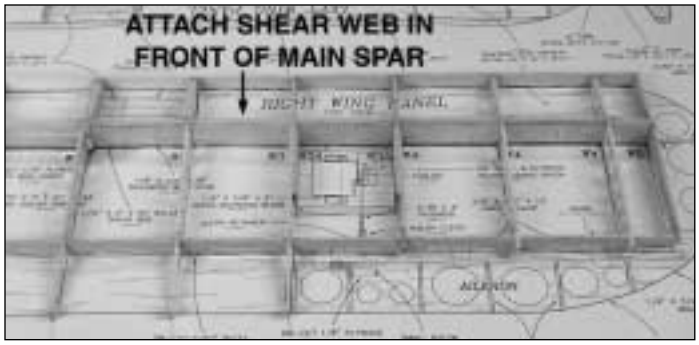
❑ ❑ 10. Position the die-cut 3/32" [2.4mm] balsa **W1 root rib** over the main spar. Place the die-cut 1/8" [3.2mm] 3-ply **dihedral gauge** against the W1 root rib, between ribs W1 and W2. Glue the root rib to the main spar and the sub TE. Note that the notch in the sub TE is cut at the proper angle.



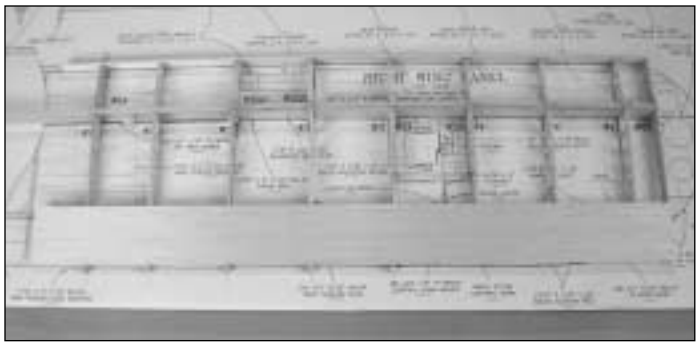
❑ ❑ 11. Cut a V-notch in the basswood top main spar the same as you did in the bottom main spar. Glue the top main spar to the ribs, making sure that the W2 through W5 ribs are perpendicular to the building board. Also make certain that the main spar is fully seated in each rib. The top of the main spar should be flush with the front of each rib.



❑ ❑ 12. Center the 3/32" x 1/2" x 30" [2.4mm x 12.7mm x 762mm] balsa **sub LE** on the front of the ribs. Check that the sub TE is against the building board. Then, glue the sub LE to the front of the ribs. The excess 3/32" x 1/2" [2.4mm x 12.7mm] will be used for the wing tip braces.

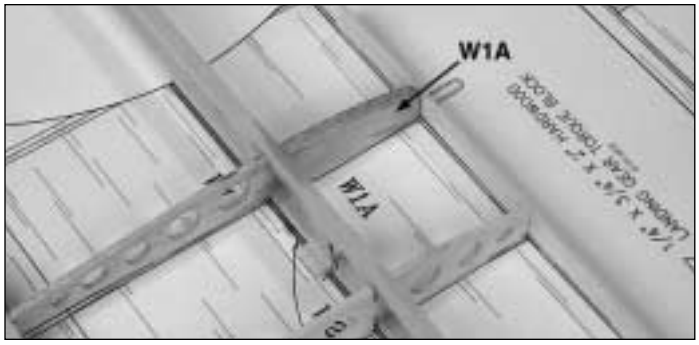


❑ ❑ 13. From the 1/16" x 3" x 30" [1.6mm x 76.2mm x 762mm] balsa sheet that the shims were cut from, cut and glue vertical grain **shear webs** to the spars in the locations shown on the plan. It is not necessary for the shear webs to be glued to the ribs. Make sure they are glued securely to the wing spars. Do not install shear webs in the rib bays between ribs W1 and W3. (The shear web in the aileron bay should be attached to the front of the main spars.)

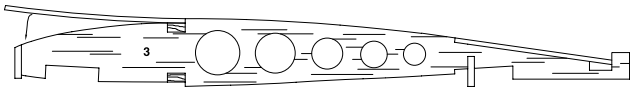


❑ ❑ 14. Use a 1/16" x 3" x 30" [1.6mm x 76.2mm x 762mm] balsa sheet to make the **TE sheet**. Cut the sheet so that it is 23" [584mm] long and 2-1/4" [57.2mm] wide. Glue the TE sheet in the indentations at the aft end of the wing ribs. The sheet should butt against the aft end of ribs W1 through W3. Save the 3/4" [19mm] piece you cut off.

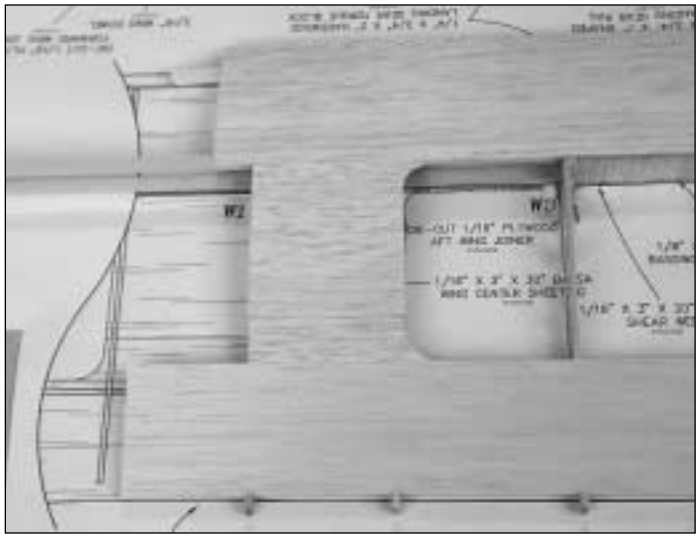
❑ ❑ 15. Sand the balsa sub LE flush with the top of the ribs.



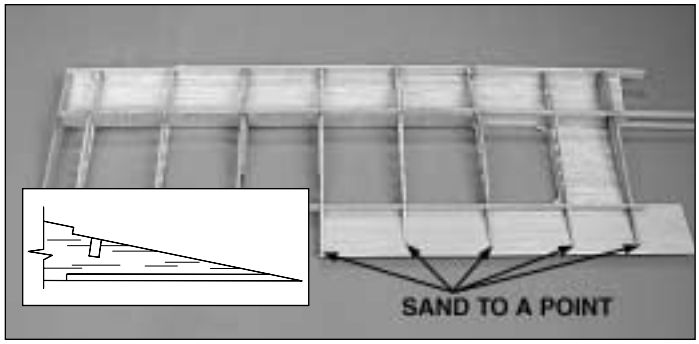
❑ ❑ 16. Glue the die-cut 3/32" [2.4mm] balsa **rib doubler W1A** to the inside forward edge of rib W1.



❑ ❑ 17. Cut a 1/16" x 3" x 30" [1.6mm x 76.2mm x 762mm] balsa sheet 23" [584.2mm] long. Fit the sheet in place, against the notch in the ribs and on top of the main spar. Glue the balsa sheet to the main spar and notches. When the glue has cured, apply a bead of glue to the top of each rib and along the sub LE. Pull the sheeting down, making sure it contacts the surface of each rib and sub LE. Hold it in place until the glue has cured.



❑ ❑ 18. Sheet the center-section with the remaining 7" [177.8mm] long, 1/16" [1.6mm] balsa sheet cut in the last step.



❑ ❑ 19. Remove the wing panel from your building board. Trim and sand the LE sheeting flush with the sub LE. Sand the LE and TE sheeting, main spars and sub LE flush with

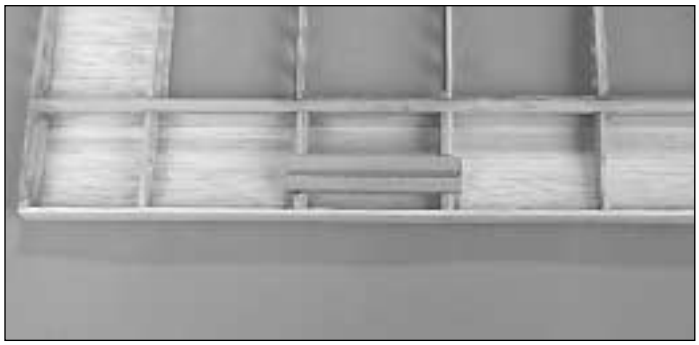
rib W5. Trim the building tabs off of the bottom of the sub TE. Trim the TE sheeting stop tabs, at the aft end of the W1, W2 and W3 ribs, to a point. Also sand the aft edge of the TE sheeting to match the angle of the ribs. Trim the TE sheeting flush with the sub TE at ribs W4 and W5.

❑ ❑ 20. Trim the main spars flush with rib W1 and save the excess main spar for use later. Trim and sand the LE sheeting, TE sheeting, sub LE and sub TE flush with rib W1.

❑ ❑ 21. With the wing upside-down, pin the sub TE to your building board. Cut a 1/16" x 3" x 30" [1.6mm x 76.2mm x 762mm] balsa sheet 23" [584.2mm] long and 2-1/4" [57.2mm] wide. Fit and glue the sheet to the ribs, sub TE and the top TE wing sheeting.

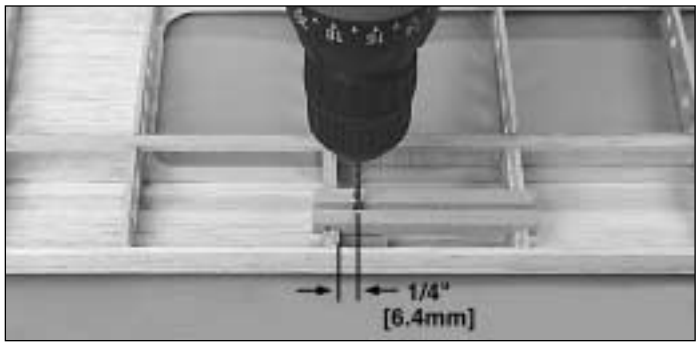
❑ ❑ 22. Sand the balsa sub LE flush with the top of the ribs.

❑ 23. Cut the 1/4" x 3/4" x 7" [6.4mm x 19mm x 177.8mm] grooved basswood **landing gear rail** in half.



❑ ❑ 24. Use epoxy to glue the landing gear rail in the notches, centered between the W3 ribs.

❑ ❑ 25. Use epoxy to glue the 3/8" x 3/4" x 3/4" [9.5mm x 19mm x 19mm] **landing gear torque block** to the back of the landing gear rail and the W3 rib. Make sure the torque block is glued towards the tip end. A couple of T-pins can be inserted from the top of the wing, through the LE sheeting, to press the torque block against the landing gear rail.

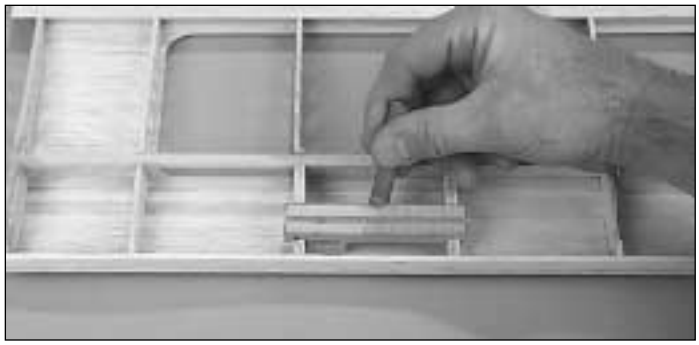


❑ ❑ 26. Drill an 1/8" [3.2mm] hole, 1/2" [12.7mm] deep through the landing gear rail and torque block. The hole should be perpendicular to the landing gear rail and 1/4" from the W3 rib. Be careful not to drill through the top LE sheeting.

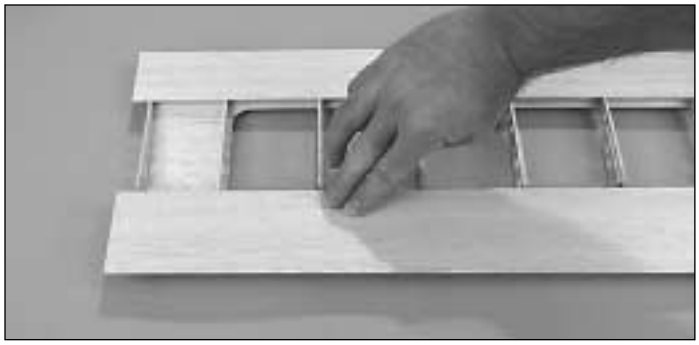
❑ ❑ 27. Cut a 1/16" x 3" x 30" [1.6mm x 76.2mm x 762mm] balsa sheet 23" [584.2mm] long for the forward bottom sheeting. The sheeting must be trimmed to fit around the landing gear rail so that it fits flush with the top of the rail.

EXPERT TIP

HOW TO LOCATE STRUCTURE UNDER SHEETING



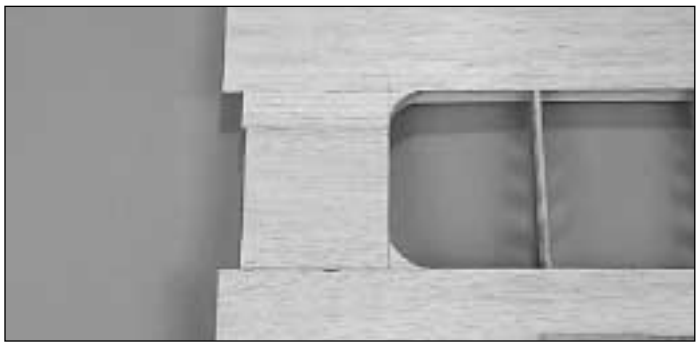
A. Using chalk, mark the outline of the landing gear rail.



B. Position the sheeting against the notch at the back of the main spar. Press down on the sheeting around the landing gear rail. This will leave a chalk mark on the sheeting.

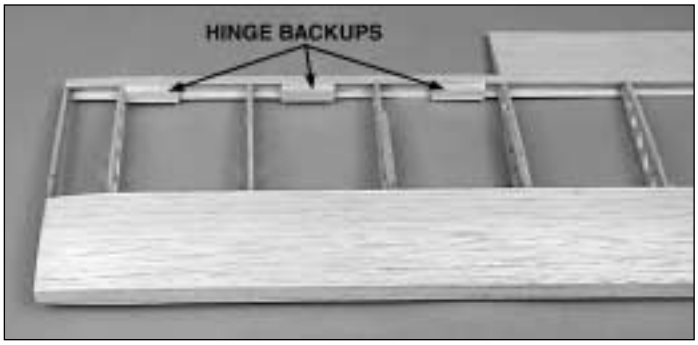
C. Cut out the hole for the landing gear rail slightly smaller. Then, trim the sheeting to fit.

❏ ❏ 28. Once you have the 1/16" [1.6mm] forward lower sheeting trimmed to fit around the landing gear rail, glue the sheeting to the main spar, bottom of the ribs, sub LE edge and landing gear rail.

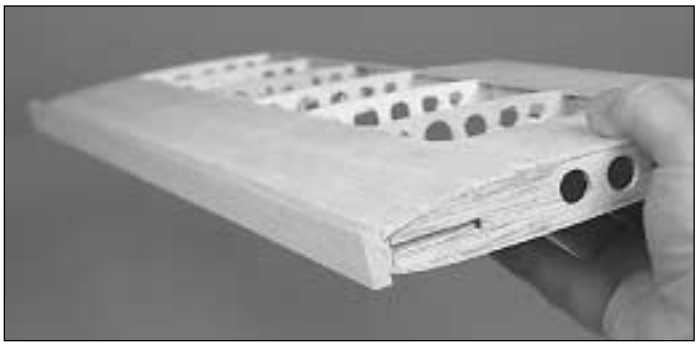


❏ ❏ 29. From the 1/16" [1.6mm] balsa sheeting trimmed from the forward lower sheeting, sheet the center-section.

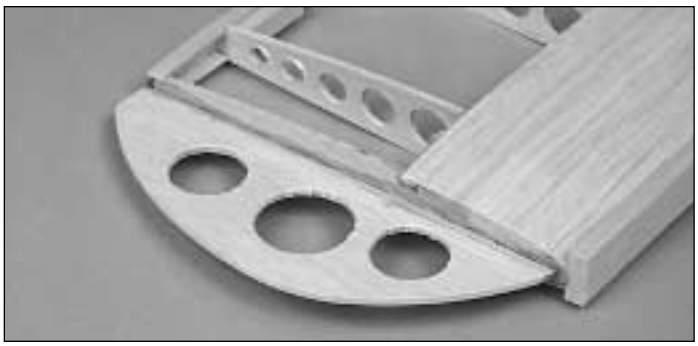
❏ ❏ 30. Trim and sand the lower sheeting flush with ribs W1, W5 and the sub LE.



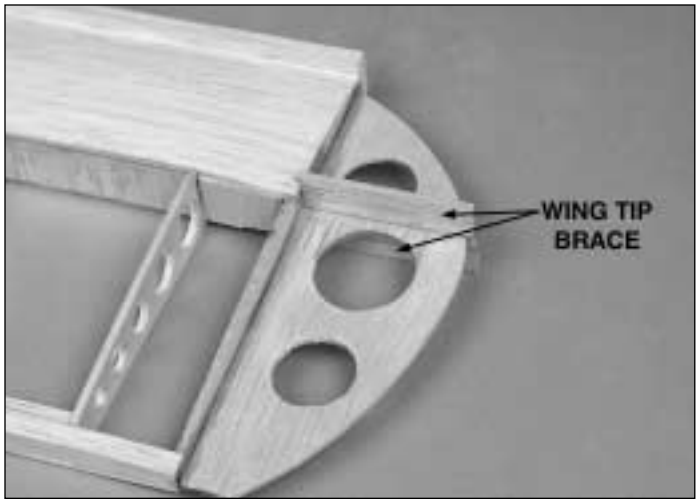
❏ ❏ 31. From the 3/8" x 3/8" x 12" [9.5mm x 9.5mm x 304.8mm] balsa stick cut three 1-1/4" [31.8mm] long **hinge backups**. Glue the hinge backups to the front of the sub TE as shown on the wing plan.



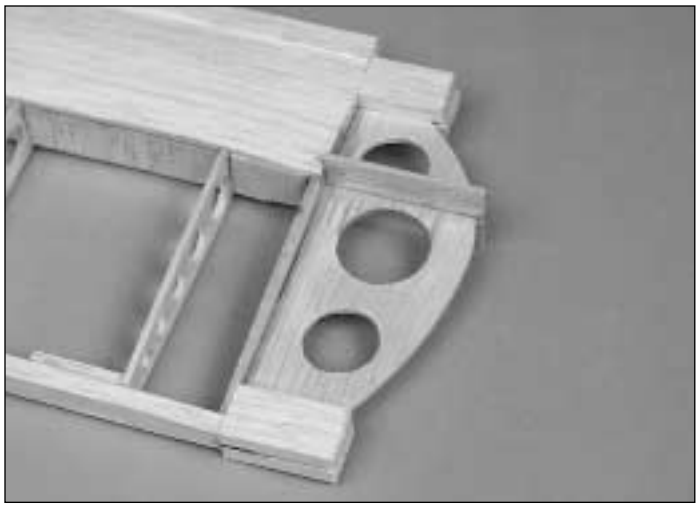
❏ ❏ 32. Glue the 1/4" x 3/4" x 30" [6.4mm x 19mm x 762mm] balsa **leading edge**, centered on the front of the sub LE. Trim and sand the LE flush with the W1 and W5 ribs. The remainder of the 1/4" x 3/4" [6.4mm x 19mm] stick will be used for the **wing tip filler**.



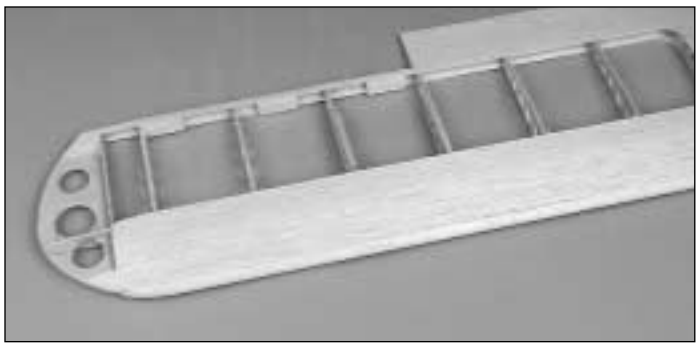
❏ ❏ 33. Glue the die-cut 3/32" [2.4mm] balsa **wing tips**, perpendicular to rib W5.



❏ ❏ 34. From the remaining 3/32" x 1/2" [2.4mm x 12.7mm] stick used for the sub LE, cut and glue **wing tip braces** on the top and bottom of the wing tip.



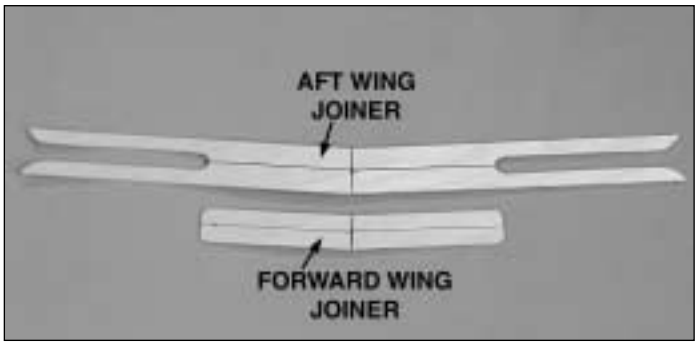
❏ ❏ 35. From the remaining 1/4" x 3/4" [6.4mm x 19mm] stick used for the LE, cut and glue **wing tip filler blocks** on the top and bottom of the leading and trailing edges.



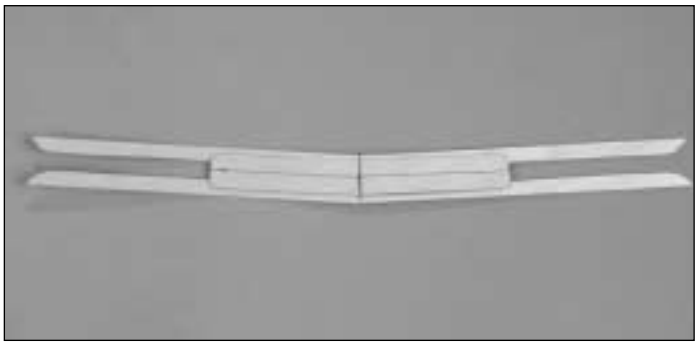
❏ ❏ 36. Use a razor plane and sanding bar to shape the LE and wing tip to the shape shown on the wing plan.

❏ 37. Return to step 2 and build the left wing panel.

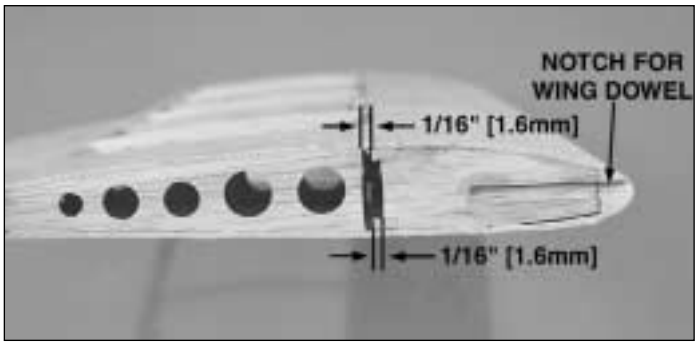
Join the Wing Panels



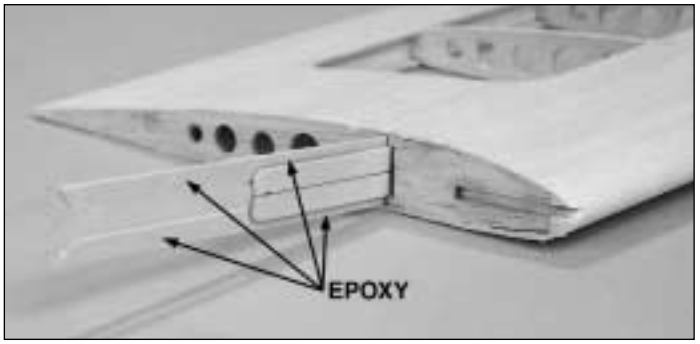
❏ 1. Draw centerlines along the width and the length of the two die-cut 1/16" [1.6mm] plywood **forward wing joiner** and **aft wing joiner**.



❏ 2. Using the centerlines as a guide, use epoxy to glue the forward wing joiner centered on the aft wing joiner.

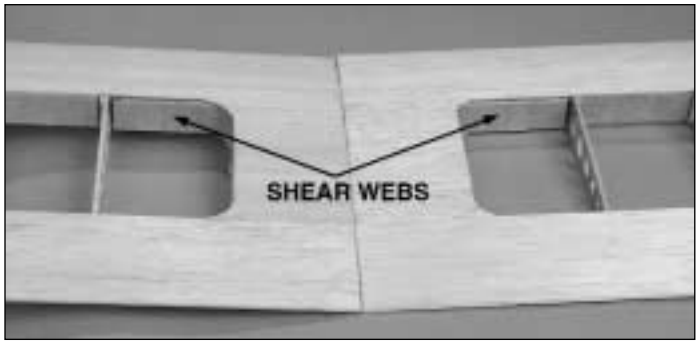


❏ 3. Carefully cut a slot in the root rib of both wing panels to allow the wing joiner to be inserted. Also cut a notch, extending the wing dowel slot through the LE.

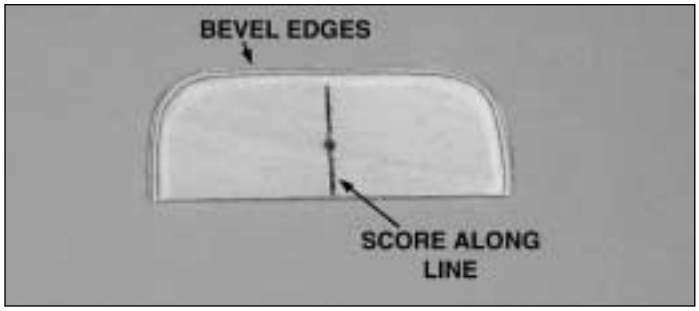


❏ 4. Check the fit of the wing joiner in each wing half. The main spars and TE on both wing halves should meet. With

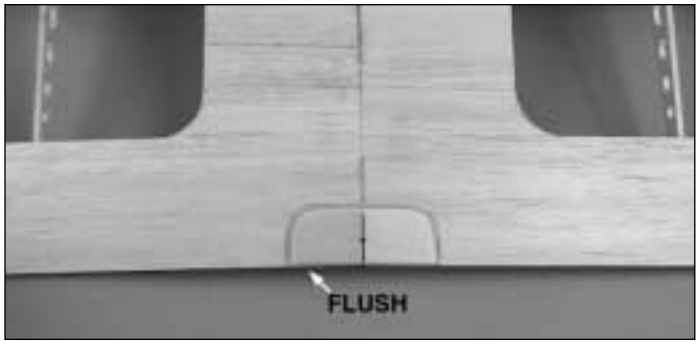
one wing half flat on your building board, block up the other wing tip 2-1/4" [57.2mm] at the outer most rib W4. Sight down the wing from the wing tip, checking that the main spar and TE are straight. When satisfied with the fit, apply 30-minute epoxy to the back of the main spars, the surface between the main spars, the front of the aft wing joiner, the top and bottom edges of the forward wing joiner and the root ribs. Slide everything back together. Make sure the wing joiner is inserted to the centerline. Use masking tape to hold the wing joiner tight against the main spars. Wipe off any excess epoxy with a paper towel dampened with denatured alcohol. Check that the one wing is blocked up 2-1/4" [57.2mm] at rib W4.



❏ 5. From one of the 7" [177.8mm] pieces of 1/16" [1.6mm] balsa you trimmed for the wing sheeting, cut and glue shear webs on the back of the aft wing joiner.



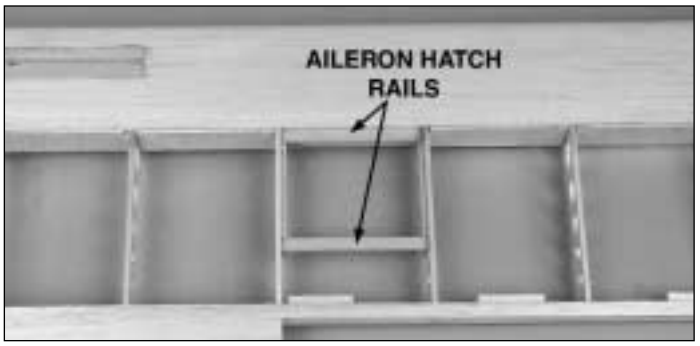
❏ 6. Draw a centerline on the top (the side with the punch mark) of the die-cut 1/16" [1.6mm] plywood **wing bolt plate**. Use a sanding bar to bevel the edges as shown. Use a hobby knife to score along the centerline. This will allow the wing bolt plate to bend when it is glued to the bottom of the wing.



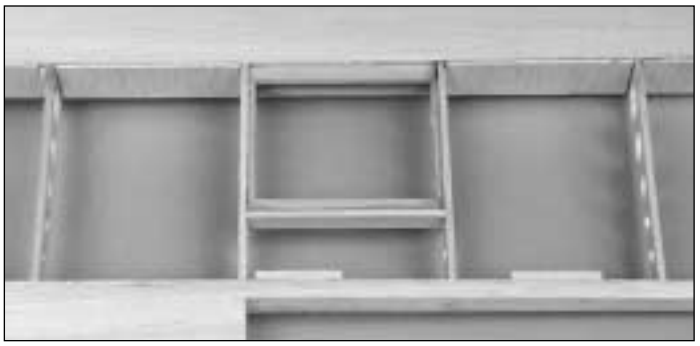
❏ 7. Use epoxy to glue the wing bolt plate to the bottom of the wing. The aft edge of the plate should be flush with the TE of the wing.

❏ 8. Use a 3/16" [4.8mm] drill bit to enlarge the hole for the 3/16" [4.8mm] wing dowel in the LE of the wing.

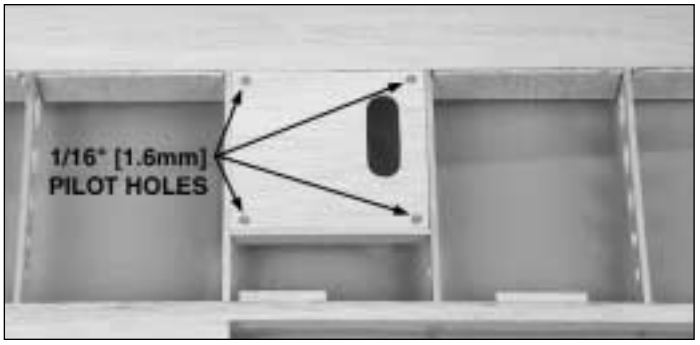
❏ 9. Cut the 3/16" [4.8mm] hardwood **wing dowel** 2-1/4" [57.2mm] long. Round both ends of the wing dowel and test fit it in the wing. Do not glue it in until after the wing has been covered.



❏ ❏ 10. From the remaining 1/8" x 1/4" [3.2mm x 6.4mm] basswood main spar, cut and glue **aileron hatch rails** between the W3A ribs.



❏ ❏ 11. From the remaining 3/32" x 1/2" [2.4mm x 12.7mm] balsa sub LE, fit and glue a stick to the aft edge of the aft aileron hatch rail. The stick must be slightly higher than the bottom of the wing ribs so that it can be sanded flush with the ribs. This will provide a surface for the covering to be attached to.

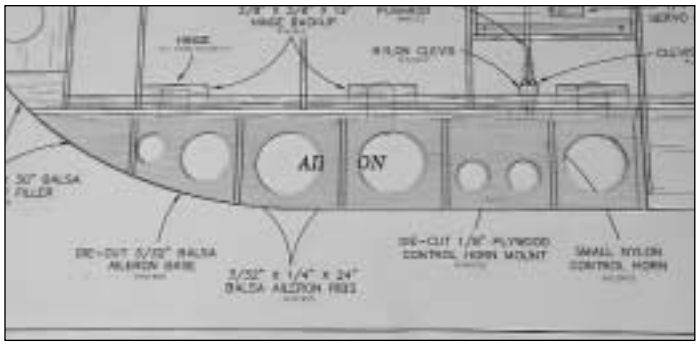


❏ ❏ 12. Position the die-cut 3-ply **aileron hatch** in the opening. You may need to sand the edges of the hatch to get it to fit well. Drill 1/16" [1.6mm] pilot holes in each corner of the hatch and into the rails. Remove the hatch and enlarge the holes in it to 3/32" [2.4mm]. Countersink the holes in the hatch to accept the #2 x 3/8" flat head screws. A Dremel High Speed Steel Cutter #178 will make countersunk holes easy. Secure the hatch to the hatch rails with the screws.

Then, remove the hatch and put a drop of thin CA in each hole in the rails to harden the wood. After the CA has cured, replace the hatch and screws.

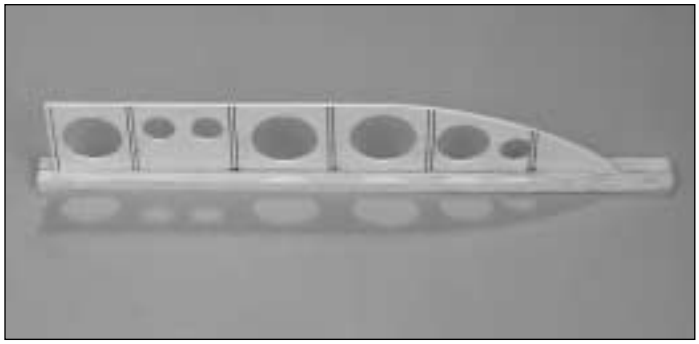
❏ 13. Go back to step 10 and install the other aileron hatch.

Assemble the Ailerons

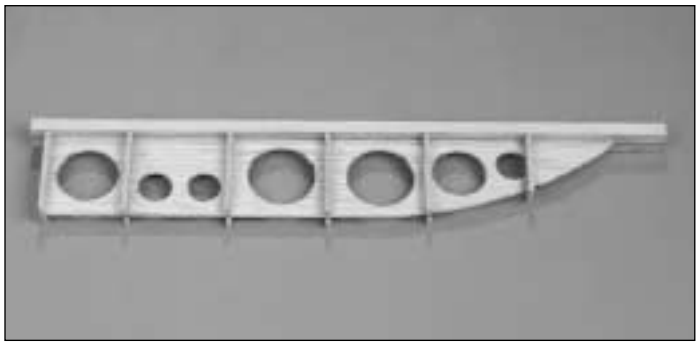


❏ ❏ 1. Position the die-cut 3/32" [2.4mm] balsa **aileron base** over the plan. Mark the aileron rib locations on both sides of the aileron base.

❏ ❏ 2. Cut the 1/4" x 1/2" x 24" [6.4mm x 12.7mm x 609.6mm] balsa **aileron LE** in half. Draw a centerline lengthwise on the 1/2" x 12" [12.7mm x 304.8mm] side.

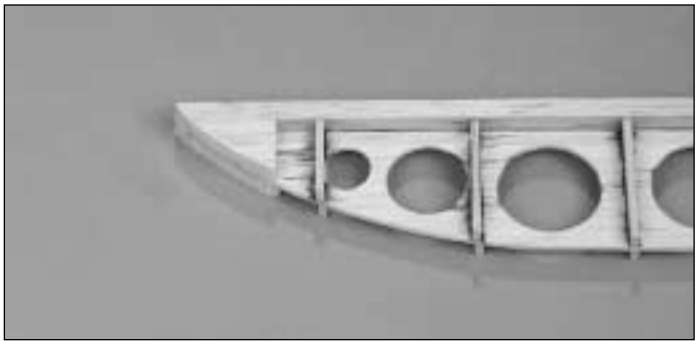


❏ ❏ 3. Glue the aileron base on the aileron LE along the centerline and perpendicular to the face of the LE.



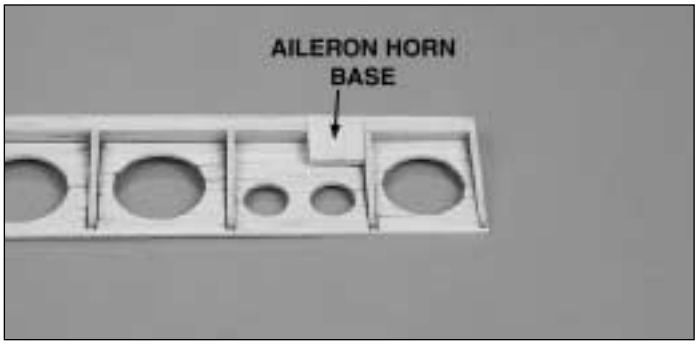
❏ ❏ 4. From the 3/32" x 1/4" x 24" [2.4mm x 6.4mm x 609.6mm] balsa sticks, cut and glue **aileron ribs** to both sides of the aileron base, perpendicular to the base.

❏ ❏ 5. Trim the ends of the aileron LE and ribs flush with the aileron base.



❏ ❏ 6. From the remaining 1/4" x 3/4" x 30" [6.4mm x 19mm x 762mm] balsa stick, cut and glue **aileron tip fillers** on the top and bottom of the aileron.

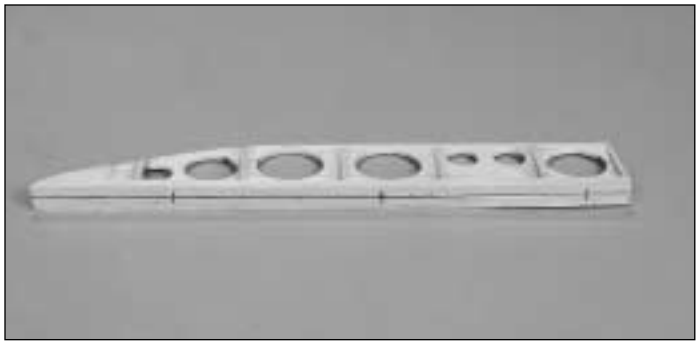
❏ ❏ 7. Use a razor plane and sanding bar to shape the aileron ribs and LE to shape.



❏ ❏ 8. Position the die-cut 3-ply **aileron horn base** on the aileron LE. Mark the outline of the base on the LE. Carefully trim a recess in the LE so that the base is flush with the LE and the aileron rib.

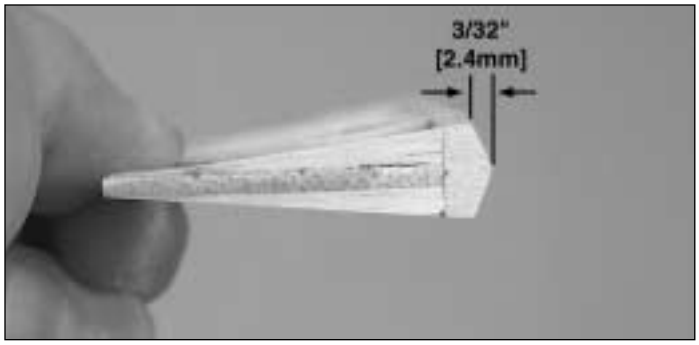
❏ ❏ 9. Glue the horn base to the LE and the rib. Make a small wedge from leftover 3/32" [2.4mm] balsa to fit between the horn base and the aileron base.

❏ ❏ 10. Position the aileron on the wing and mark the location of the hinges on the aileron and wing.



❏ ❏ 11. Draw a centerline on the LE of the aileron and the TE of the wing.

❏ ❏ 12. Cut the hinge slots in the aileron and the wing. Cut three 1/2" wide hinges from the supplied hinge strip and trim the corners. Insert the hinges in the aileron and fit the aileron to the wing. Do not glue the hinges until instructed to do so.



❏ ❏ 13. Remove the aileron from the wing. Mark the "bevel to" lines on both sides of the aileron, 3/32" from the LE. Shape the LE of the aileron to a "V" as shown on the plan.

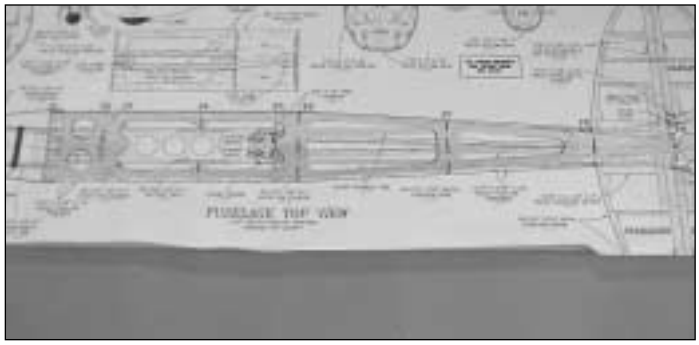
❏ ❏ 14. Temporarily attach the aileron to the wing. Sand the tip of the aileron to match the shape of the wing tip.

❏ 15. Return to step 1 of ***"Assemble the Ailerons"*** and build the second aileron.

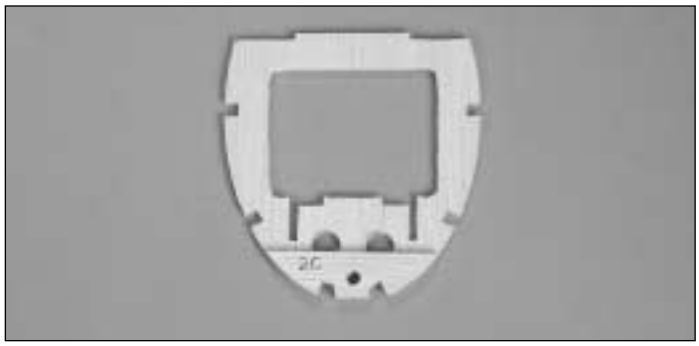
BUILD THE FUSELAGE

Assemble the Fuselage Bottom

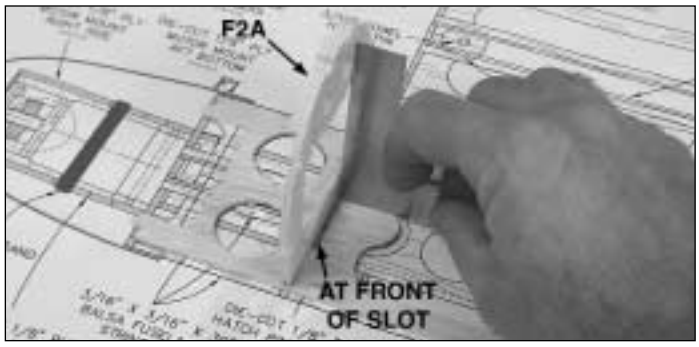
❏ 1. Cover the fuselage plan with waxed paper or Great Planes Plan Protector. When installing the formers, make sure the enbossed lettering is always facing forward.



❏ 2. Glue the two die-cut 3/32" [2.4mm] balsa **fuselage bases** together. Pin the base over the fuselage top view.



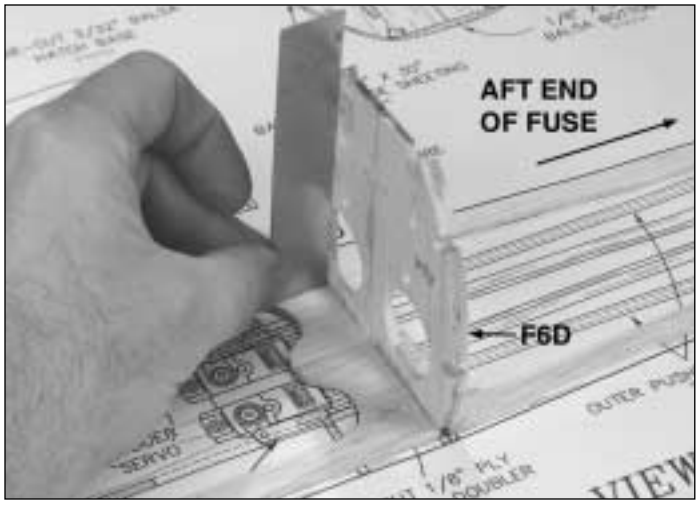
❏ 3. Glue the die-cut 3-ply former **F2C** to the front of **F2A**. Make sure the wing dowel holes are aligned.



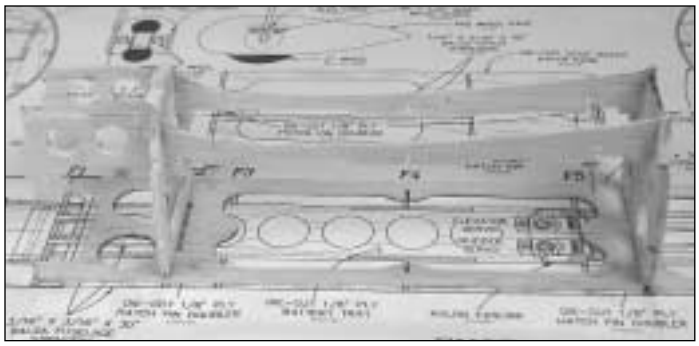
❏ 4. Glue former F2A perpendicular to the fuselage base so that F2C is toward the front and F2A is positioned at the front of the slot.

❏ 5. Glue the two die-cut 3/32" [2.4mm] balsa former halves **F6A** together.

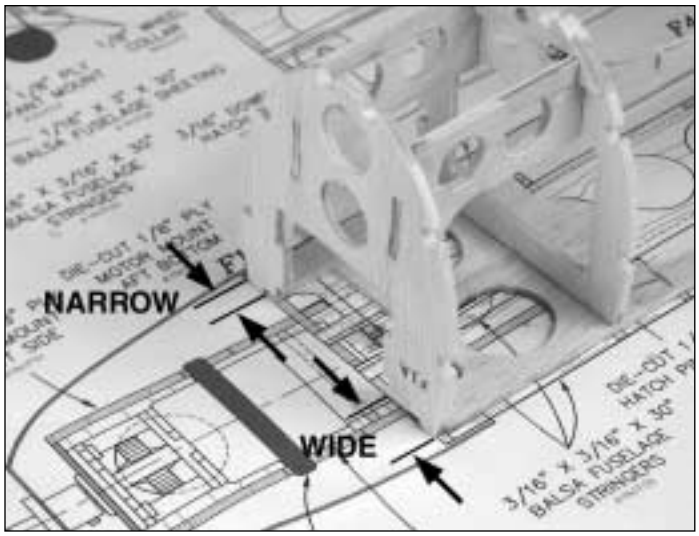
❏ 6. Glue the two die-cut 3/32" [2.4mm] balsa doublers **F6D** to the back of former F6A.



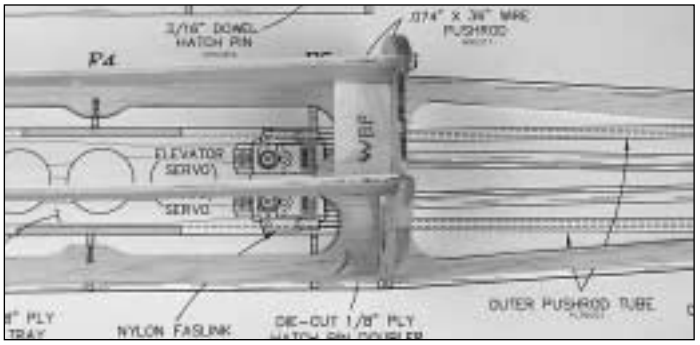
❑ 7. Glue former F6A perpendicular to the fuselage base with formers F6D towards the aft end of the fuselage.



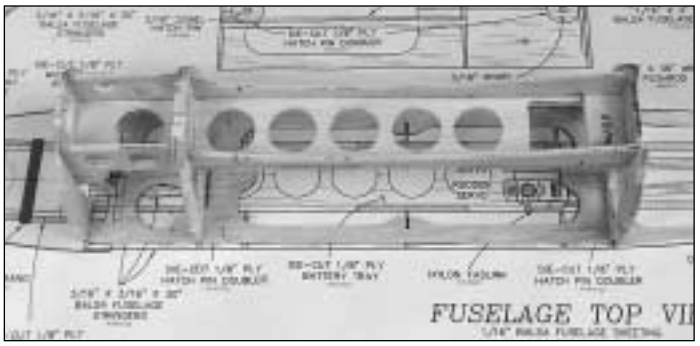
❑ 8. Glue the two die-cut 3-ply **wing saddles** between formers F2A and F6A. Make sure the wing saddles are fully seated in the slots.



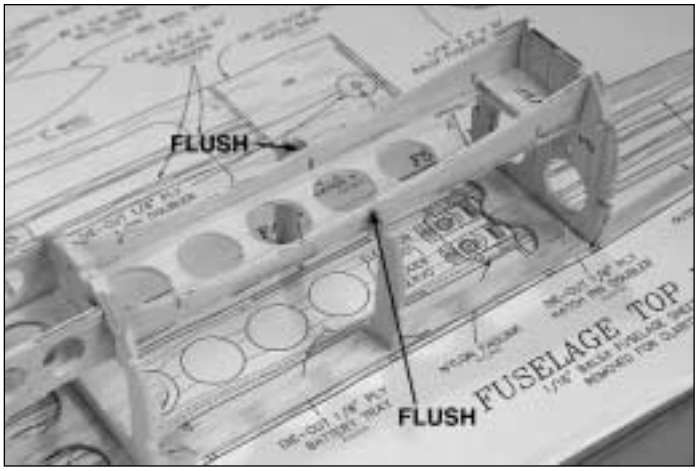
❑ 9. Glue the die-cut 3-ply former **F1A** to the front of the wing saddle and the fuselage base. Make sure the embossed ***F1A*** faces forward. **Note:** The front of the wing saddle will provide approximately 2 degrees of down thrust when the motor is installed.



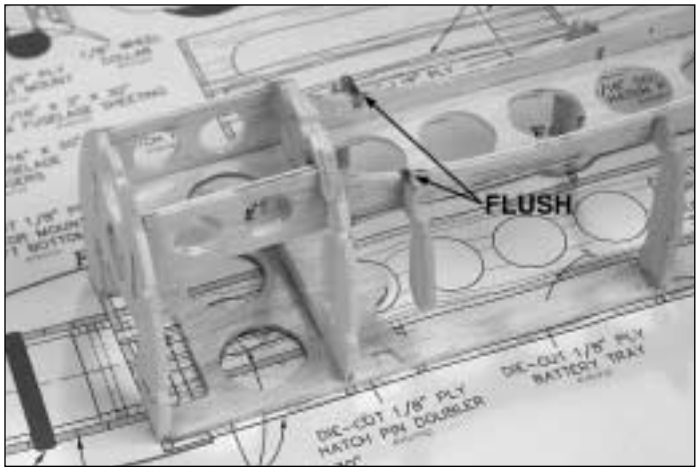
❑ 10. Glue the die-cut 3-ply **wing bolt plate (WBP)** to the wing saddle and former F6A.



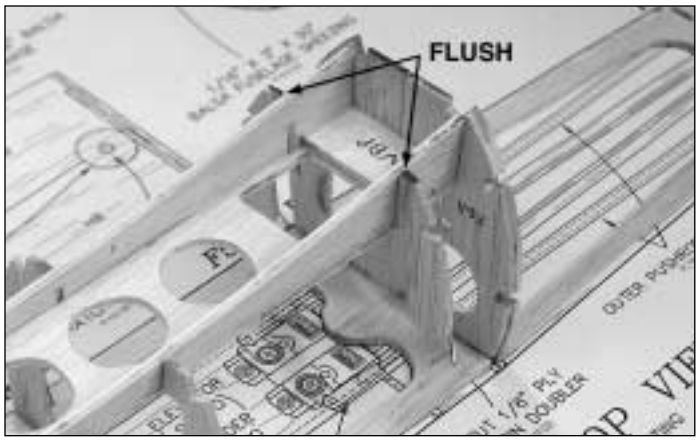
❑ ❑ 11. Glue the die-cut 3-ply **battery tray** to the top of the wing saddle and formers F1A, F2A and F3A.



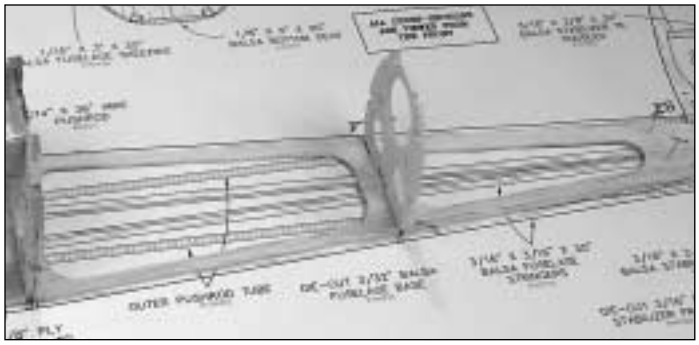
❑ 12. Glue the die-cut 3/32" [2.4mm] balsa formers **F4A** to the wing saddle and the fuselage base. The former should be flush with the bottom of the wing saddle.



❑ 13. Glue the die-cut 3/32" [2.4mm] balsa formers **F3A** to the wing saddle.

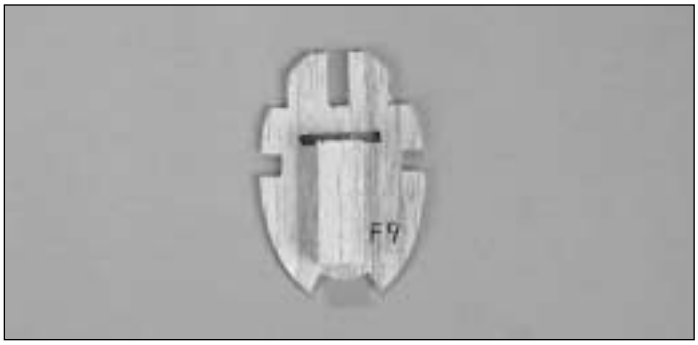


❑ 14. Glue the die-cut 3/32" [2.4mm] balsa formers **F5A** to the wing saddle.



❑ 15. Glue the die-cut 3/32" [2.4mm] balsa former **F7A** perpendicular to the fuselage base.

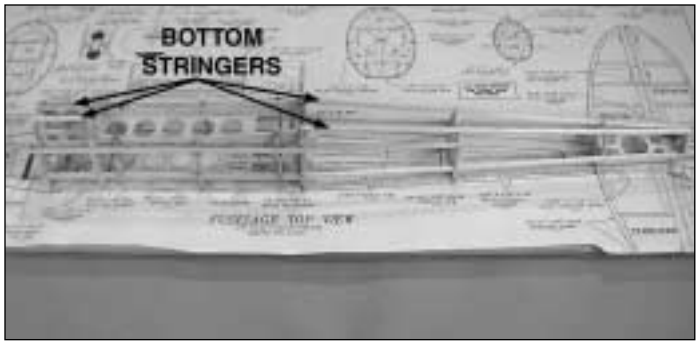
❑ 16. Glue the die-cut 3/32" [2.4mm] balsa former **F8A** perpendicular to the fuselage base.



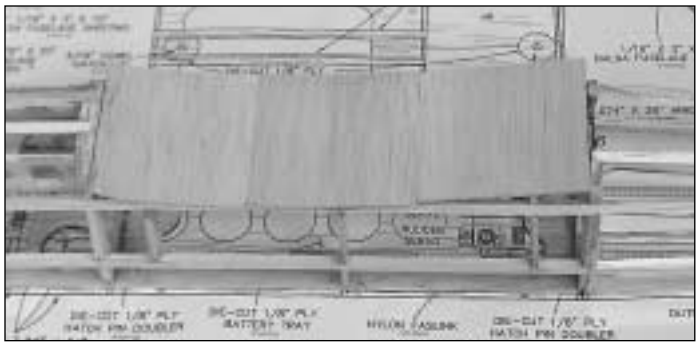
❑ 17. Cut and glue a 3/8" x 3/8" [9.5mm x 9.5mm] stick to the front of the die-cut 3/32" [2.4mm] balsa former **F9**. The stick is centered on the former and runs from the stab saddle slot to the bottom of the former.

❑ 18. Glue the die-cut 3/32" [2.4mm] balsa **lower stabilizer saddle (LSS)** to former F8A and F9. Glue former F9 to the fuselage base aligning the fin slot in the base with the fin slot in F9.

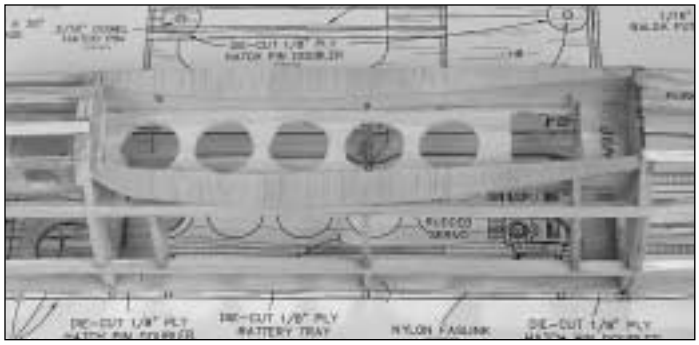
❑ 19. Glue the 3/16" [4.8mm] balsa **upper** and **lower side stringers** in the notches from former F1A to F9. A notch needs to be cut in the stringers at former F6A to allow the stringers to bend past the former without bowing out in front of the former. Note that the lower side stringer ends at former F7A.



❑ 20. Glue the 3/16" [4.8mm] balsa **aft bottom stringers** between F6A and F9. Glue the 3/16" [4.8mm] balsa forward bottom stringers between F1A and F2A.



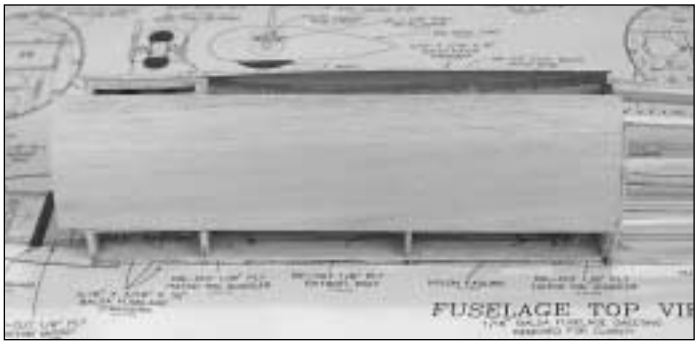
❑ 21. Use a sanding bar to sand formers F3A, F4A and F5A flush with the wing saddle. From a 1/16" x 3" x 30" [1.6mm x 76.2mm x 762mm] balsa sheet, cut and glue cross-grain wing saddle sheeting to the 3-ply wing saddle and formers F3A, F4A and F5A.



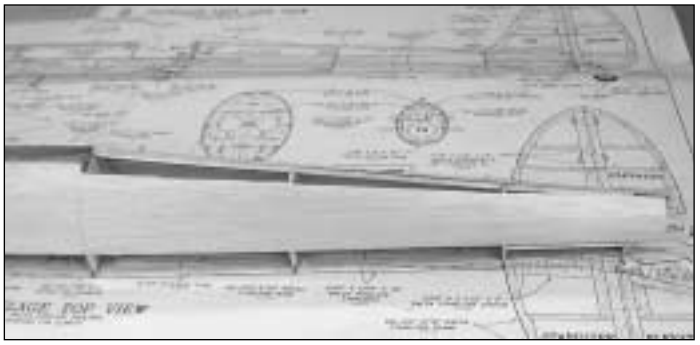
❑ 22. Carefully sand the edges of the wing saddle sheeting by using the contour of the formers as a guide. Trim the wing saddle sheeting from between the 3-ply wing saddle.

Sheet the Lower Half of the Fuselage

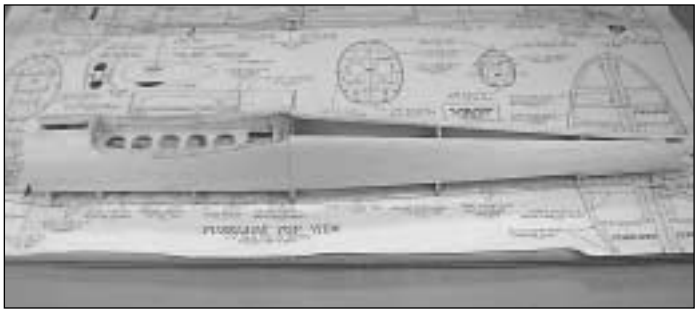
❑ 1. Use a sanding bar to sand the stringers flush with the formers.



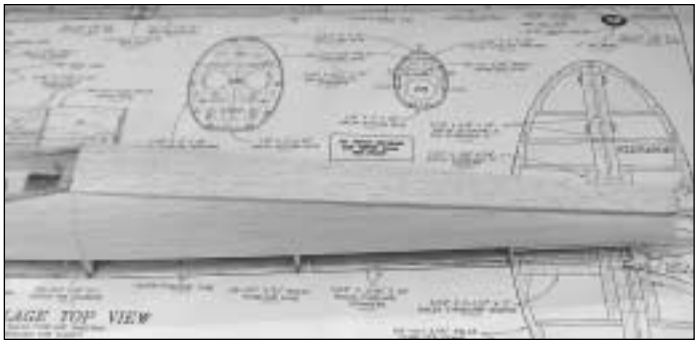
❑ 2. Trim a 1/16" x 3" x 30" [1.6mm x 76.2mm x 762mm] balsa sheet to fit between F1A and F6A. **Note:** Do not glue the **forward lower sheeting** to formers F6D, which is glued behind F6A. The sheeting should be glued so that it only covers the bottom half of the top stringers. Cut a second sheet to fit on the other side. The remaining 1/16" [1.6mm] balsa sheet will be use on the aft end of the fuselage.



❑ 3. From the remaining sheeting cut in step 2, trim and glue the **aft lower sheeting** between F6D and F9.

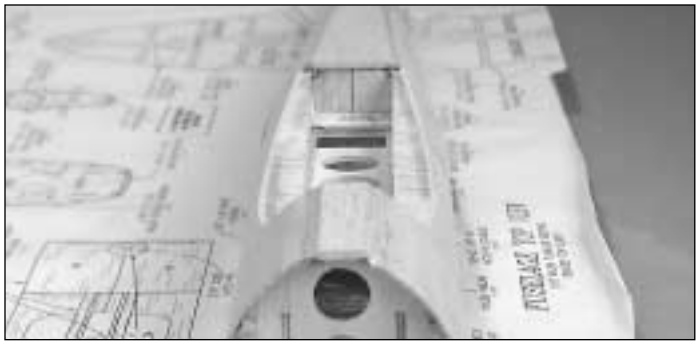


❑ 4. Trim and sand the lower sheeting flush with the bottom of the formers and wing saddle sheeting.



❑ 5. From the 1/8" x 3" x 30" [3.2mm x 76.2mm x 762mm] balsa sheet, cut the **aft bottom deck** as shown on the fuse plan, and glue it to the bottom stringers and formers.

❏ 6. From the remaining 1/8" x 3" x 30" [3.2mm x 76.2mm x 762mm] sheet cut in step 5, trim and glue a **forward bottom deck** to formers F1A, F2A and the lower forward sheeting.

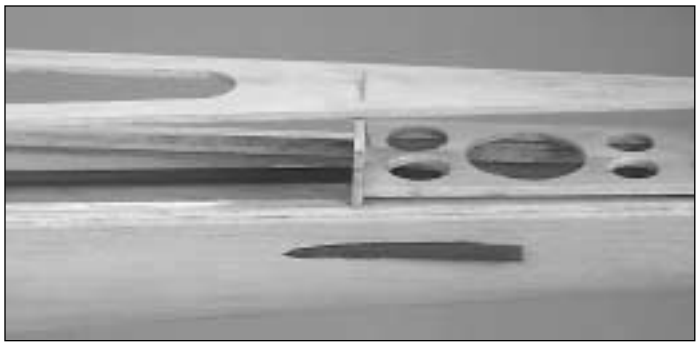


❏ 7. Trim the bottom deck flush with the lower sheeting.

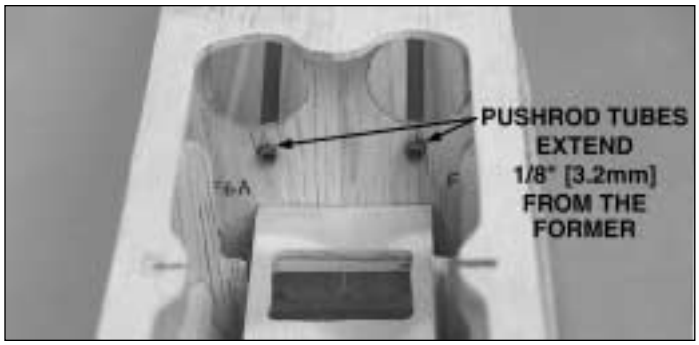
❏ 8. *Congratulations!* You have half of the fuselage built. Remove the fuse from your building board and let's get started on the top of the fuse.

Install the Outer Pushrod Tubes

❏ 1. Cut the gray plastic **outer pushrod tube** in half. Use 320-grit sandpaper to roughen the pushrod tube.

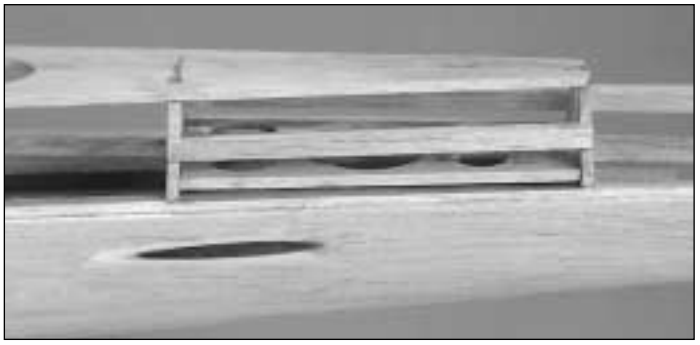


❏ 2. Insert the outer pushrod tubes through formers F6A, F7A and up to F8A. Use a T-pin to locate the notch in F8A. Then, carefully cut slots for the outer pushrod to exit. A sharpened 3/16" [4.8mm] brass tube can also be used to cut the slot.



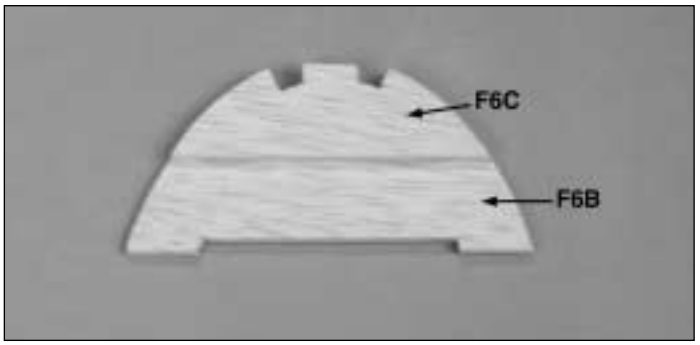
❏ 3. Adjust the pushrod tubes so that the ends are protruding 1/8" [3.2mm] in front of former F6A. Glue the pushrod tubes to the formers and the lower sheeting. The slots in the side of the fuse for the pushrod tube exit can be filled with Hobbico balsa filler or a 50/50 mixture of microballoons and epoxy. After the filler has cured, cut off the excess pushrod tube and sand the tube and filler flush with the fuselage sheeting. Save the excess tubes for use in attaching the battery hatch.

Finish the Top of the Fuselage

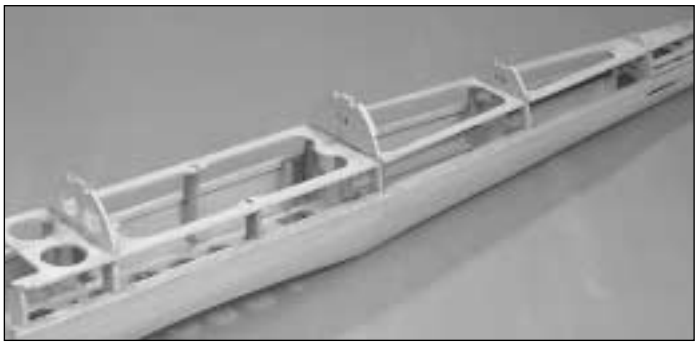


❏ 1. Glue 3/16" x 3/16" [4.8mm x 4.8mm] stringers between formers F8A and F9.

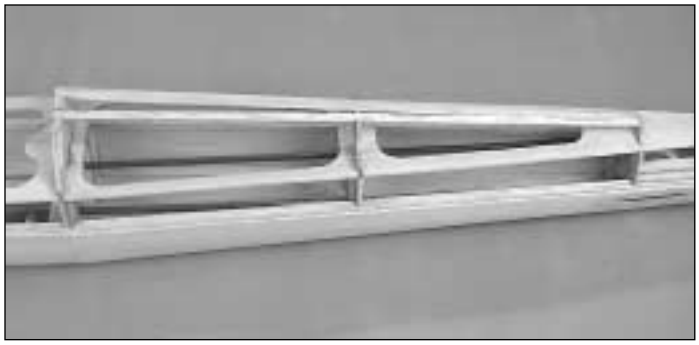
❏ 2. Sand the stringers so that they match the contour of formers F8A and F9.



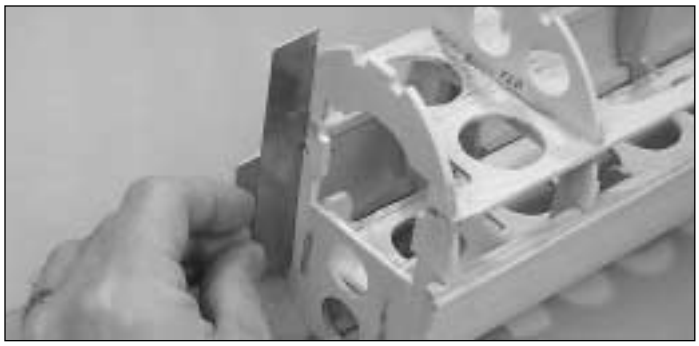
❏ 3. Glue the die-cut 3/32" [2.4mm] balsa former **F6C** to the back of **F6B**.



❏ 4. Glue the die-cut 3/32" [2.4mm] balsa formers **F2B**, **F6B**, **F7B** and **F8B**, perpendicular to the fuselage base. **Note:** F6B should be positioned so that F6C is toward the tail of the plane.



❏ 5. Glue 3/16" x 3/16" [4.8mm x 4.8mm] stringers from former F6B to F8B. The stringers glue to the front of former F8B.



❏ 6. Use a sanding bar to remove any excess glue from the joint between former F1A and the fuselage base. Glue the die-cut 3-ply former **F1B** to the top of F1A. Use a straightedge to make sure that F1B is in line with F1A.

❏ 7. Glue 3/16" x 3/16" [4.8mm x 4.8mm] balsa stringers from F1B to F2B. Make sure that F2B is perpendicular to the fuselage base.

❏ 8. Use a sanding bar to sand the edges of the fuselage base flush with the edge of the formers. Part of the stringers will need to be sanded at former F8B.

❏ 9. As on the bottom of the fuselage, sheet the top of the fuselage with 1/16" x 3" x 30" [1.6mm x 76.2mm x 762mm] balsa sheeting. Wetting the sheeting with water will allow the sheeting to bend around the tight radius at the aft end of the fuse.

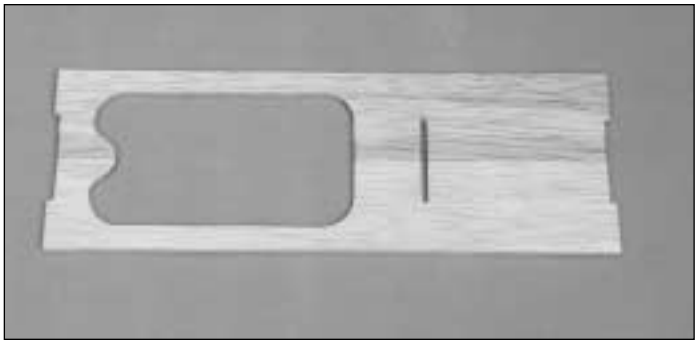
❏ 10. Trim and sand the upper fuselage sheeting flush with the face of formers F1A and F9. Cut out the battery hatch area. Sand the top of the sheeting and stringers flat with the top of formers F1B and F2B and F6B and F8B.

❏ 11. From the remaining 1/8" x 3" x 30" [3.2mm x 76.2mm x 762mm] balsa sheet, cut in step 5 of ***"Sheet the Lower Half of the Fuselage,"*** fit and glue the **top deck** to the stringers and upper sheeting.

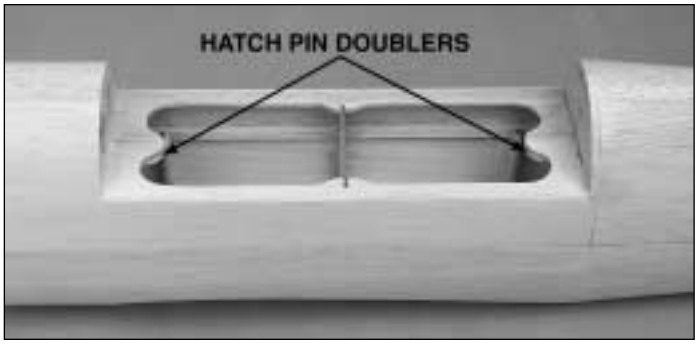
❏ 12. Use a razor plane and sanding bar to shape the fuselage as shown in the cross-section drawings on the fuse plan.

Build the Battery Hatch Cover

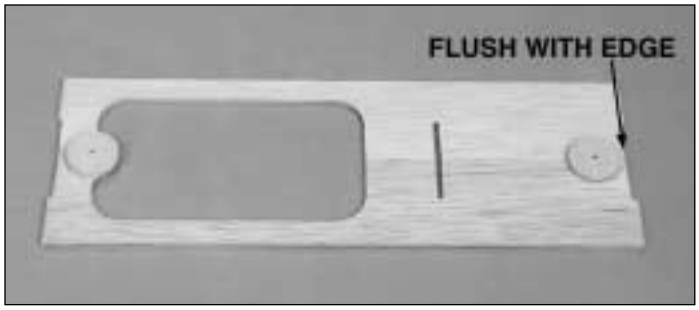
❏ 1. Sand the fuselage base smooth in the area for the battery hatch cover.



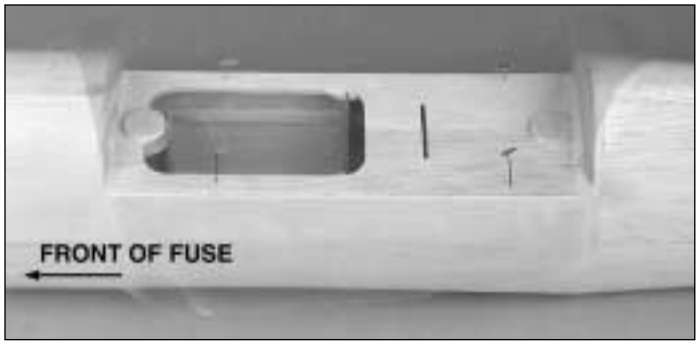
❏ 2. Glue the die-cut 3/32" [2.4mm] balsa **battery hatch base** halves together.



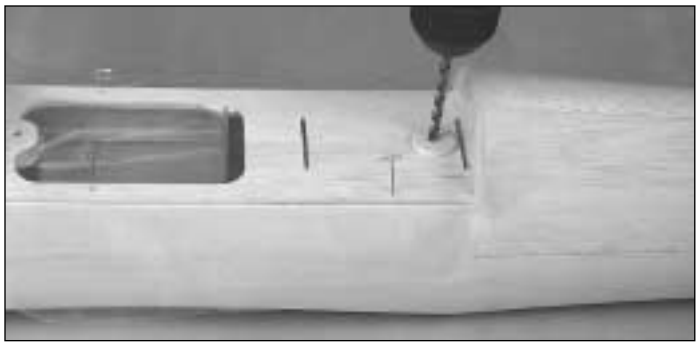
❏ 3. Glue the two die-cut 3-ply **hatch pin doublers** under the fuselage base as shown on the fuse plan.



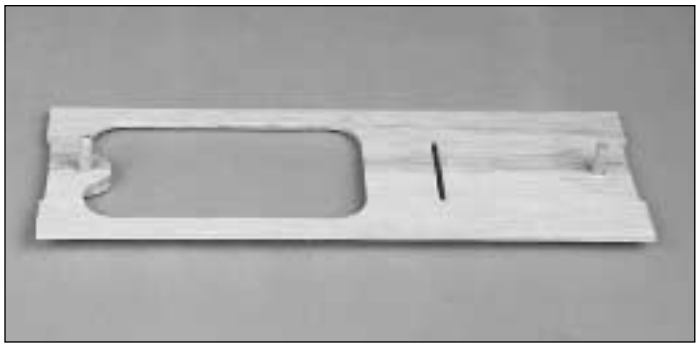
❑ 4. Glue the other two hatch pin doublers to the top of the battery hatch base.



❑ 5. Center the battery hatch base on the fuselage base. The opening in the battery hatch base goes towards the front of the fuselage. Use T-pins to hold the hatch base in position.

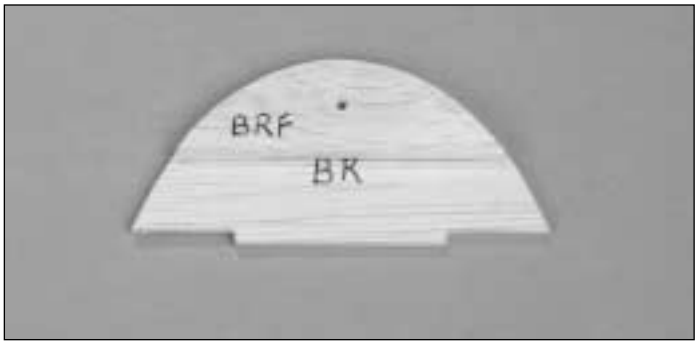


❑ 6. Drill a 3/16" [4.8mm] hole at both punch marks in the hatch pin doublers, perpendicular to the battery hatch base. The hole goes through the hatch pin doubler, battery hatch base, fuselage base and the second hatch pin doubler.



❑ 7. Cut the remaining 3/16" [4.8mm] hardwood dowel in half. Round one end of each dowel. Remove the battery hatch base and insert the two dowels in the bottom of the battery hatch base and hatch pin doublers.

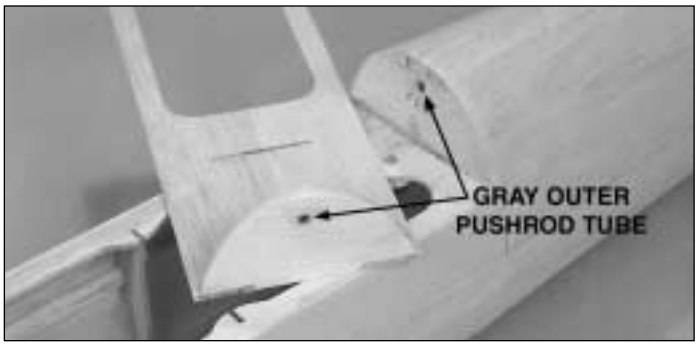
❑ 8. Place a piece of plan protector or waxed paper in the battery hatch area and make a hole in the protector at both pin holes. Reinstall the battery hatch base, centered in the opening. Glue the hatch pins to the hatch base and hatch pin doublers.



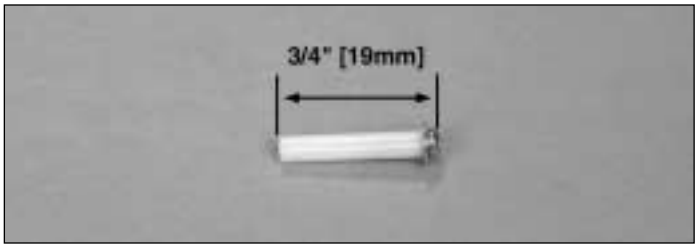
❑ 9. Glue the die-cut 3/32" [2.4mm] balsa **backrest front (BRF)** to the front of the **back rest (BR)**.

❑ 10. With the battery hatch base flat against the fuselage base, glue the back rest in the slot at the aft end of the battery hatch base. Make sure the back rest is against former F6B.

❑ 11. Drill a 3/16" hole at the punch mark in the backrest front, perpendicular to the backrest front. The hole should go through the backrest front, backrest, F6B and F6C.



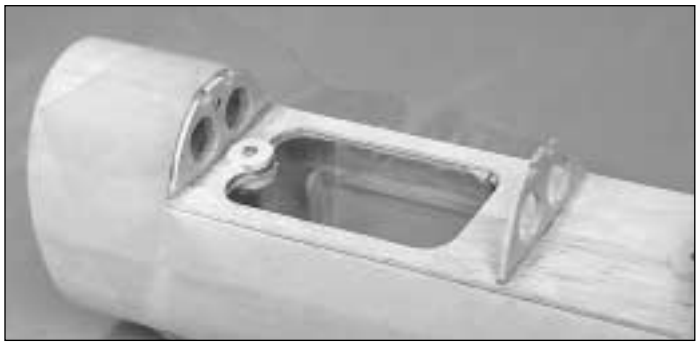
❑ 12. Remove the battery hatch and glue a piece of remaining gray outer pushrod tube in former F6B and F6C. Also, glue a piece of tubing in the backrest. Sand the tubing flush with the back of the backrest and the front of former F6B.



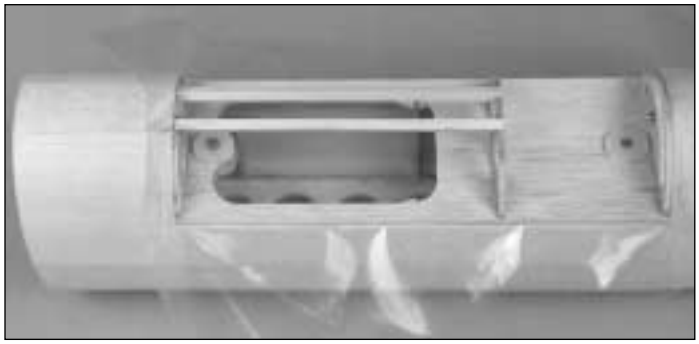
❑ 13. Cut a 3/4" [19mm] long retainer pin from the 6-1/2" [165mm] white inner pushrod tube. Place a #2 washer on a #2 x 3/8" sheet metal screw. Thread the screw into the plastic retainer pin.

❑ 14. With the plan protector under the battery hatch, reinstall the hatch on the fuse. Secure the battery hatch to

the fuse by temporarily inserting the retainer pin through the backrest.



❏ 15. Glue the two die-cut 3/32" [2.4mm] balsa instrument panels (IP) to the battery hatch base. The center panel should be glued perpendicular to the base. The front panel should be against former F2B.

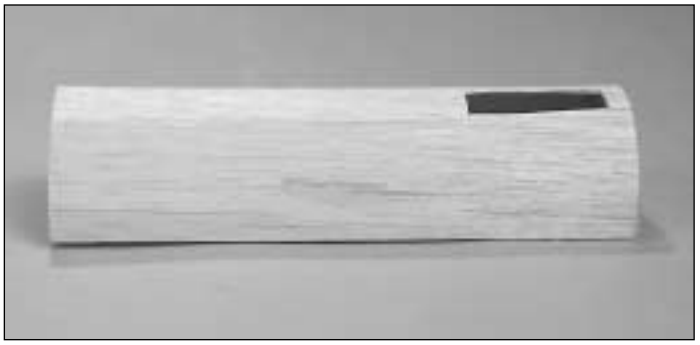


❏ 16. Glue stringers between the two instrument panels.

❏ 17. Remove the battery hatch and sand the edges of the hatch base flush with the backrest and instrument panels.

❏ 18. Reinstall the battery hatch with the plan protector under it. From the remaining 1/16" balsa sheet, glue sheeting on both sides of the battery hatch from the forward instrument panel to the back rest.

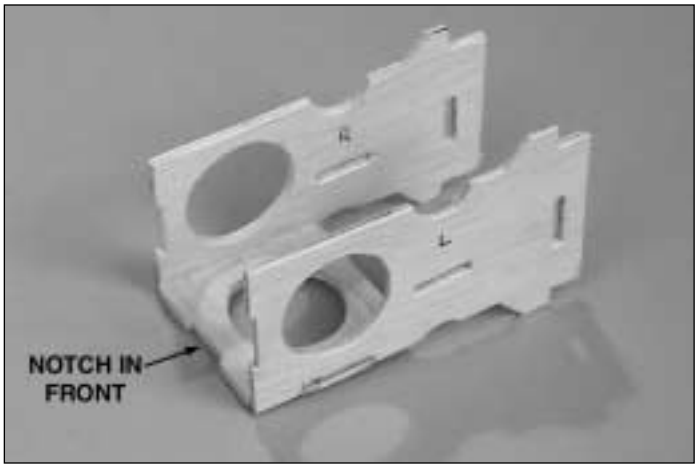
❏ 19. Sand the top of the sheeting and stringers flush with the top of the instrument panels. Do not sand the sheeting on the backrest.



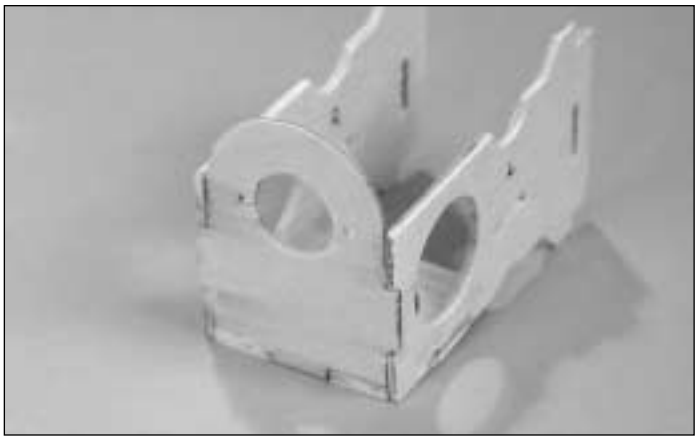
❏ 20. Glue the remaining 1/8" x 3" [3.2mm x 76.2mm] sheeting to the top of the battery hatch from the forward IP to the aft IP. Trim and sand the top sheeting flush with the side sheeting.

❏ 21. Place the battery hatch on the fuselage. Sand the hatch to match the fuselage sides. Balsa filler can be used to fill any gaps between the hatch and the fuselage.

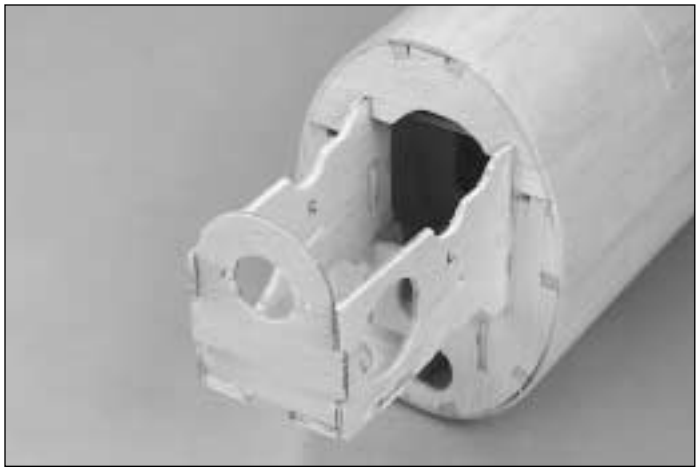
Build the Motor Mount

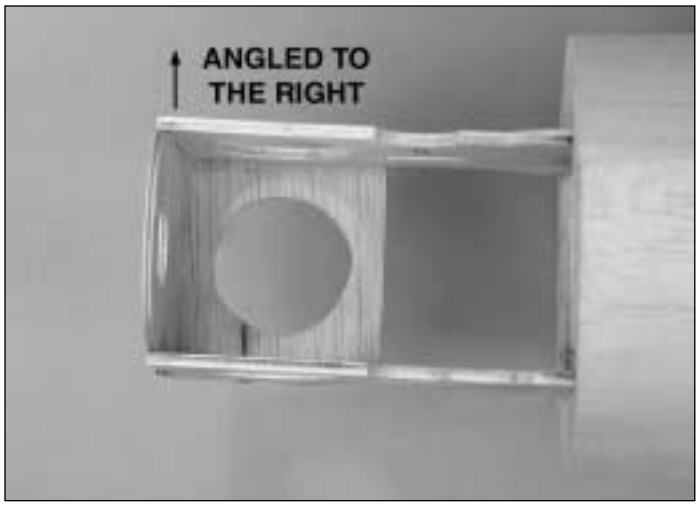


❏ 1. Glue the die-cut 3-ply **left** and **right motor mount sides** perpendicular to the **forward bottom motor mount**. Note that the forward bottom motor mount has a notch that faces the front.

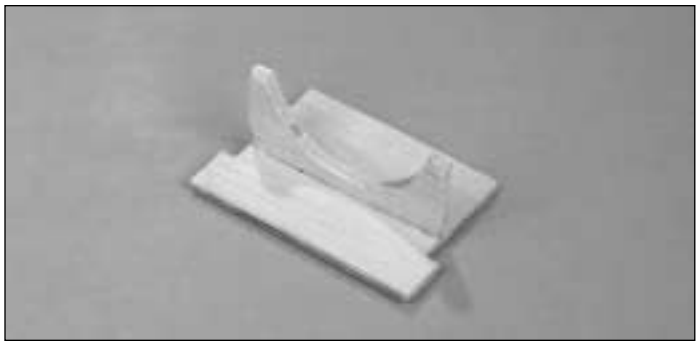


❏ 2. Glue the die-cut 1/16" plywood **motor mount front** to the sides and bottom. Reinforce the glue joints with medium CA.

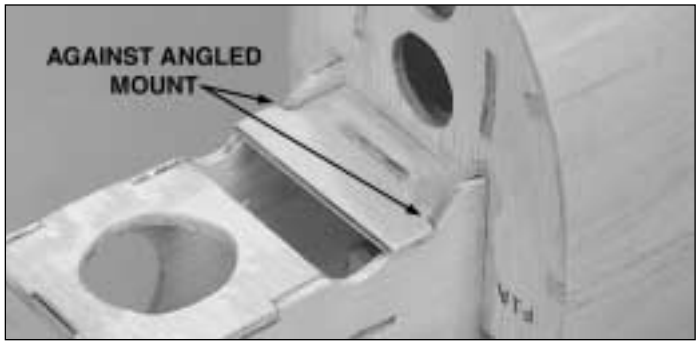




❑ 3. Install and glue the motor mount to former F1. When viewed from the top, the mount should angle to the right.



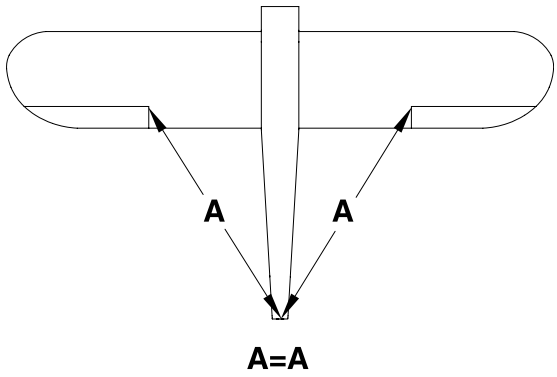
❑ 4. Insert and glue the die-cut 3-ply **motor support** in the notch of the die-cut 3-ply **motor mount aft bottom**. Check that the motor support is perpendicular to the motor mount aft bottom.



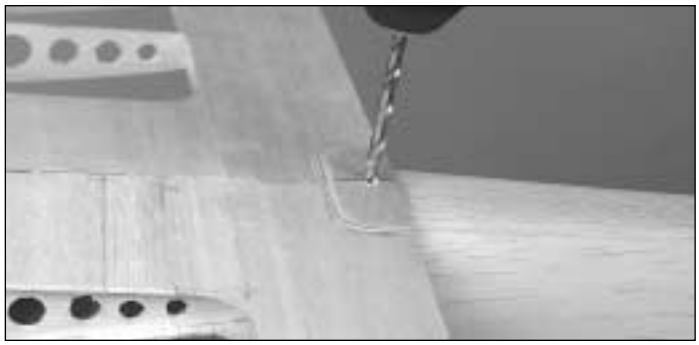
❑ 5. Glue the aft bottom motor mount between the sides. The tabs on the motor mount aft bottom should be against the angled part of the motor mount sides. The motor mount aft bottom should also be tight against former F1A.

Mount the Wing on the Fuselage

❑ 1. Position the wing in the wing saddle and visually align it with the fuselage.



❑ 2. Use a tape measure to measure the distance from the corner of the aileron bay to the center of the tail. Then, measure the distance from the other aileron bay and check that the distances are the same. Adjust the wing until both distances are equal. When the wing is perfectly aligned, make reference marks on the wing TE and the bottom of the fuselage to help keep the parts aligned during the next step.



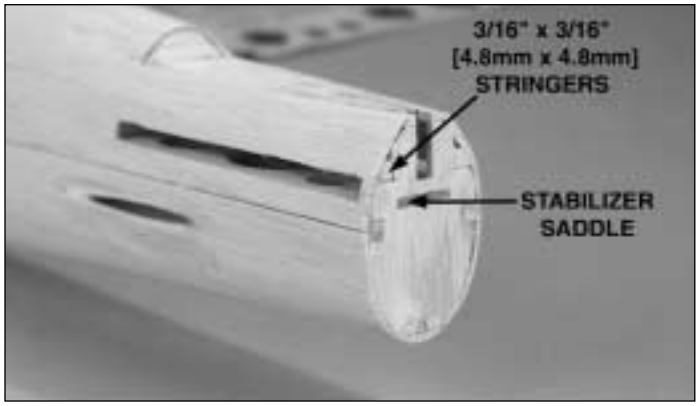
❑ 3. Tape the wing in position so that it cannot move. Use a 13/64" [5.1mm] (or #10) drill bit to drill a hole through the wing and the bolt plate in the fuselage, at the punch mark on the wing bolt plate. Two small 90° triangles will help you to align the drill perpendicular to the top surface of the wing.

Important: Do not allow the wing to shift during this procedure.

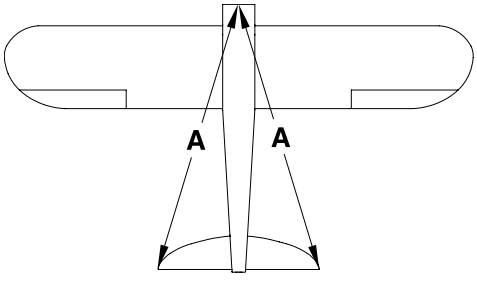
❏ 4. Remove the wing and use a 1/4" [6.4mm] drill bit to enlarge the hole in the wing only.

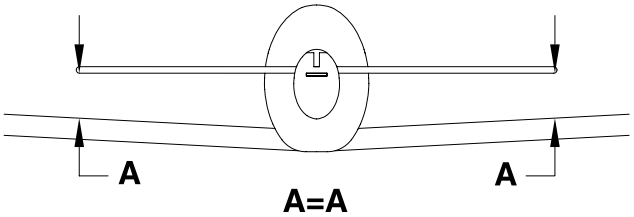
❏ 5. Use a 1/4-20 tap to cut threads into the bolt plate. After cutting the threads, put a couple of drops of thin CA on the threads in the bolt plate. Allow the CA to cure before threading the tap back through the hole to clean up the threads. Bolt the wing to the fuse with a nylon **1/4-20 wing bolt** and check the fit.

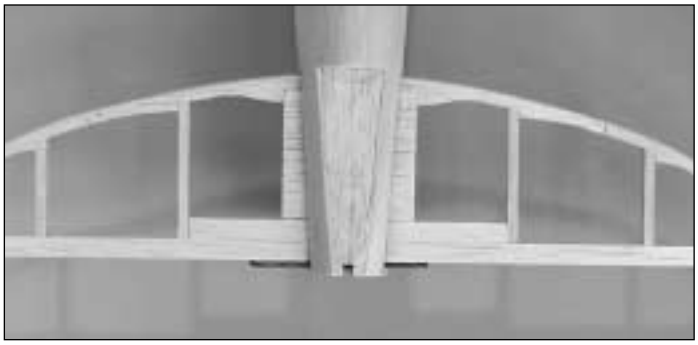
Mount the Stabilizer & Fin



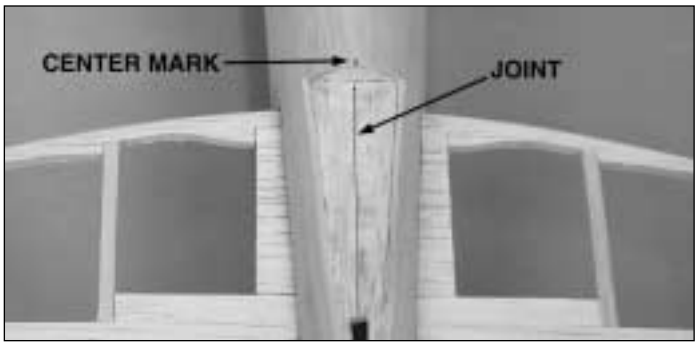
❏ 1. Looking at former F9, note the location of the stabilizer saddle and the 3/16" x 3/16" [4.8mm x 4.8mm] stringers above the stabilizer saddle. Cut the fuselage sheeting between the stringers and stabilizer saddle.



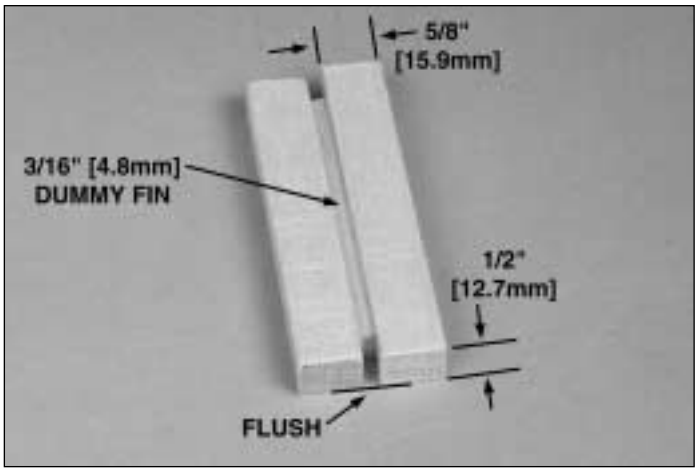




❏ 2. Insert the stabilizer in the fuselage. Measure from the tip of the stabilizer to the fuselage on both sides to center it. Measure from the center of the front of the fuselage back to both stabilizer tips. Adjust the stabilizer so that both measurements are the same. The LE of the stabilizer should be against the back of former F8A. With the wing mounted to the fuselage, view the stabilizer from a few feet behind the fuselage. Check that the stabilizer is parallel to the wing. If not, remove the stabilizer and sand the stabilizer saddle slightly. Use a piece of 3-ply left over from a die sheet with a piece of 220-grit sandpaper attached. When satisfied with the fit, **insert the elevator joiner wire in the slot**. Then, use 30-minute epoxy to glue the stab to the fuselage. Double-check the stab alignment while the epoxy is curing. Wipe off any excess epoxy with a paper towel dampened with denatured alcohol. Check that the elevator joiner wire is not glued to the stab.



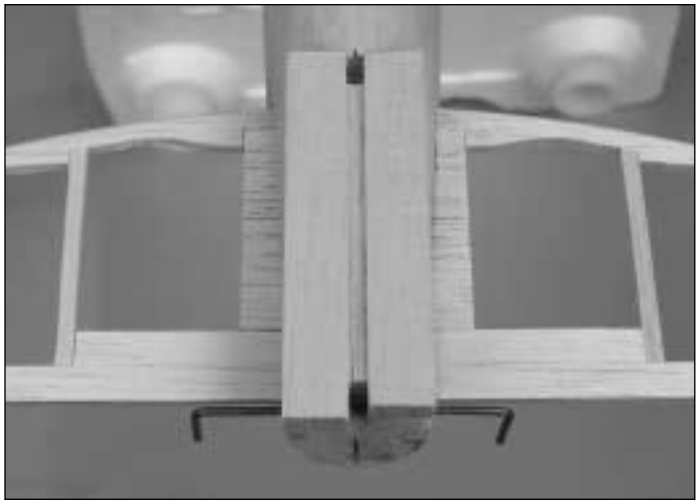
❏ 3. Using the joint between the two fuselage base halves, mark the center of the top deck.



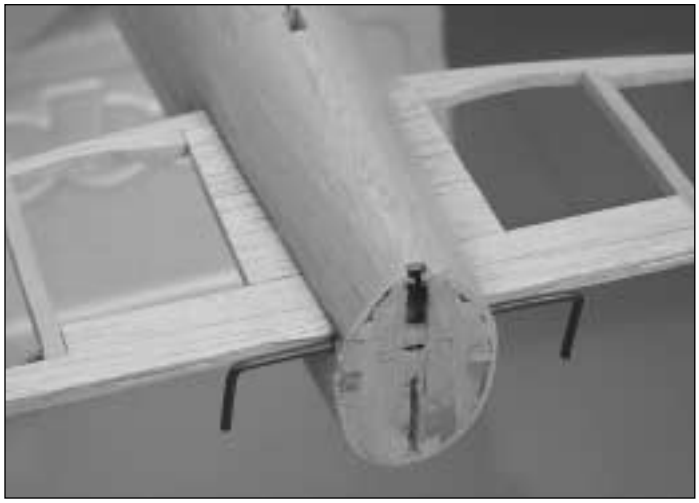
❏ 4. Cut the 1/2" x 5/8" x 8" [12.7mm x 15.9mm x 203.2mm] balsa stick in half to make two **fin fairings**. Cut a remaining

piece of 3/16" x 3/8" balsa stick to make a dummy fin to fit between the two fairings.

❑ 5. Using only one or two drops of CA, tack glue the fairings to the dummy fin. Make sure one of the ends and the bottoms of the fairings are flush.

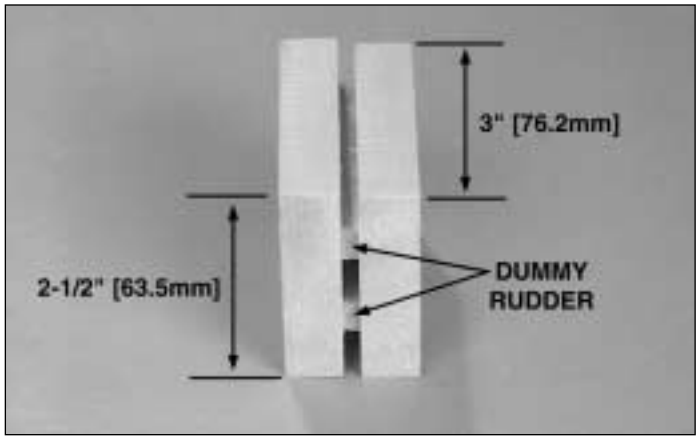


❑ 6. Tack glue the fairings and the dummy fin to the fuselage base. Make sure that the dummy fin is aligned with the slot in former F9 and the center mark on the top deck.

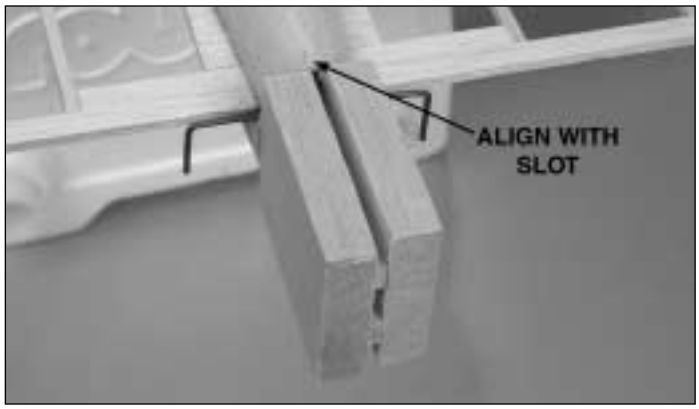


❑ 7. Trim and sand the fairings to match the contour of the fuselage.

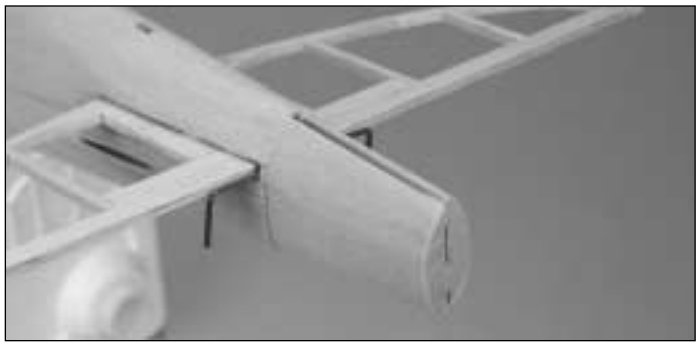
❑ 8. Cut the 3/4" x 2-1/2" x 6" [19mm x 63.5mm x 152.4mm] balsa block in half to make two **rudder fairings**. Cut two pieces from the remaining piece of 3/16" x 3/8" balsa stick to make a dummy rudder to fit between the two fairings.



❑ 9. Using only one or two drops of CA, tack glue the fairings to the dummy rudder. Make sure one of the ends and the bottoms of the fairings are flush.

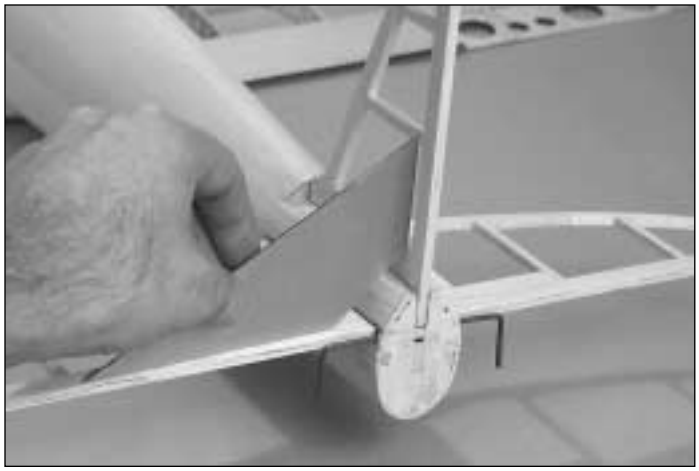


❑ 10. Tack glue the fairings and the dummy rudder to former F-9. Make sure that the dummy rudder is aligned with the slot in former F9.



❑ 11. Trim and sand the fairings to match the contour of the fuselage.

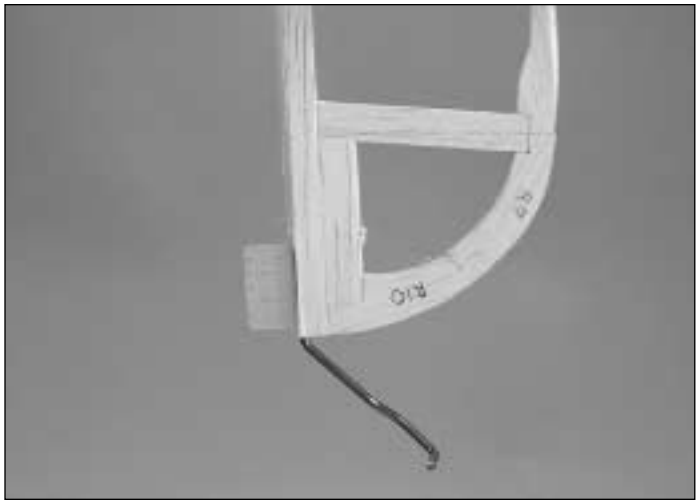
❑ 12. Remove the fairings from the fuselage and break them off of the dummy fin and rudder.



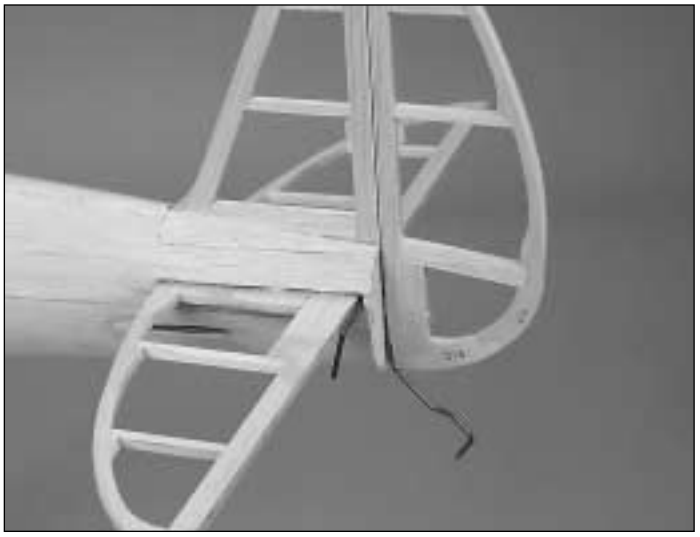
❏ 13. Test fit the fin in the fuselage base. You may need to sand the bottom end of the TE to allow the bottom of the fin to fit tightly against the base. Align the LE of the fin with the center mark on the top deck. Use a builders triangle to check that the fin is perpendicular to the stab. When satisfied with the fit, use 30-minute epoxy to glue the fin to the fuselage base, former F9 and F8B. Before the epoxy cures, recheck that the fin is perpendicular to the stab.

❏ 14. Use 6-minute epoxy to glue the two fin fairings to the side of the fin and the fuselage base.

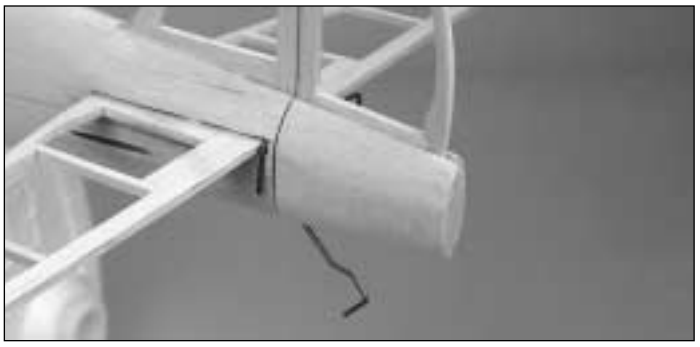
❏ 15. Mark the location of the **tailgear wire** on the rudder and the nylon tailgear bearing on the fuselage.



❏ 16. Drill a 3/32" hole in the LE of the rudder at the mark you made for the tailgear wire. Then, cut a groove for the nylon tailgear bearing. Test fit the tailgear wire in the rudder.



❏ 17. Cut a slot in the aft edge of former F9 at the marks you made for the tailgear bearing. Without using any glue, join the rudder to the fuse.

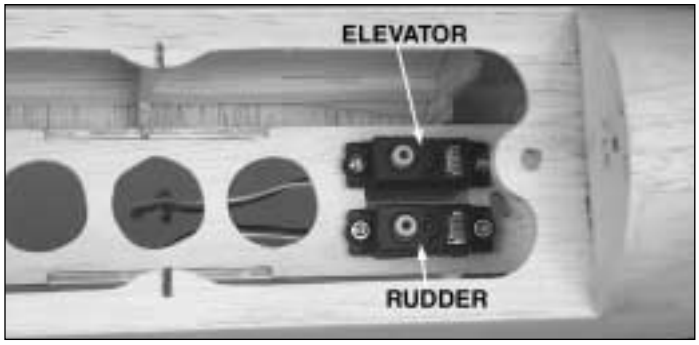


❏ 18. Glue the two rudder fairings on the bottom of the rudder, aligned with the fuselage.

❏ 19. Remove the rudder from the plane. Trim and sand the rudder fairings to match the shape of the rudder. Bevel the fairings to match the angle of the leading edge.

RADIO INSTALLATION

Install the Servos



❑ 1. Install the elevator and rudder servos in the servo tray using the hardware provided with the servos. Note their orientation in the photo.

❑ 2. From the 6-1/2" white nylon inner pushrod, cut eight 1/8" [3.2mm] long **bushings**.

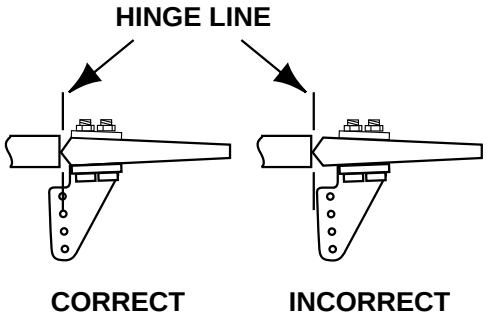
❑ 3. Make a **rudder** and an **elevator pushrod** by cutting two 2-56 x 36" [914.4mm] pushrods so that each is 22" [558.8mm] long measured from the threaded end.

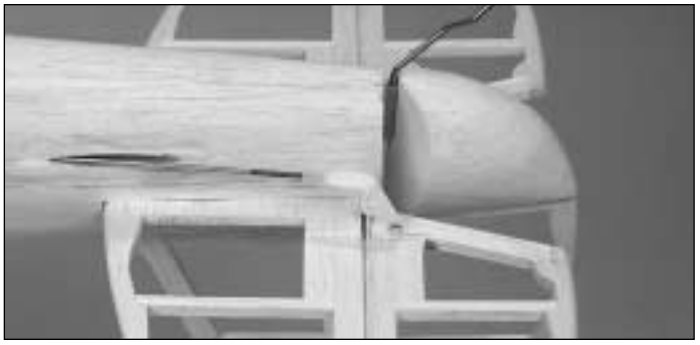
❑ 4. Wipe the pushrods off with a paper towel dampened with denatured alcohol to remove any oil left on the rods during manufacturing. Slide four bushings evenly spaced onto each pushrod. Adjust the bushings nearest the ends of the rod so they will not interfere with the ends of the outer pushrod tube and possibly become jammed during flight. If the bushings slide onto the rods without much resistance, use a drop of thin CA to hold them in position.

❑ 5. Thread a **nylon clevis** approximately 14 turns onto the threaded ends of the pushrods. Remove the backing plate from one of the **small control horns** and connect the control horn to the clevis on one of the pushrods. Insert the pushrod in the rudder pushrod tube on the left side of the fuse. Position the control horn on the rudder fairing and mark the control horn location on the fairing.

❑ 6. Position a 3-ply **control horn base** over the control horn location. Mark the outline of the control horn base on the fairing. Carefully trim the fairing so that the control horn base can be recessed into the fairing, flush with the top of the fairing. When satisfied with the fit, glue the control horn base to the fairing.

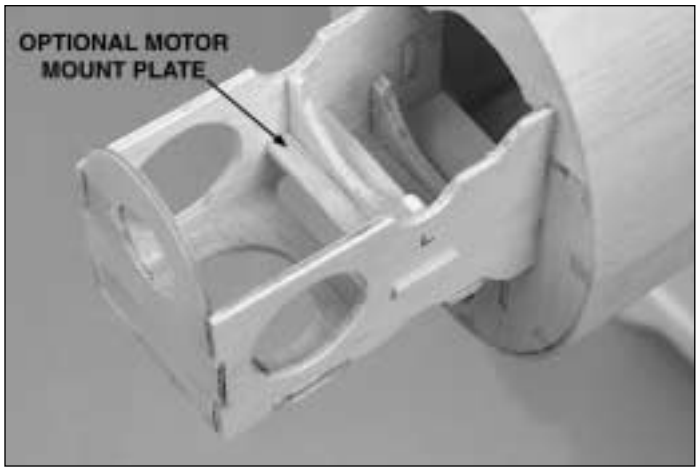
❑ 7. Attach the rudder control horn to the control horn base with two **#2 x 3/8" [9.5mm] sheet metal screws**. Remove the two screws and put a drop of thin CA in each hole to harden the wood. After the CA has cured, reinstall the control with the #2 x 3/8" [9.5mm] sheet metal screws.



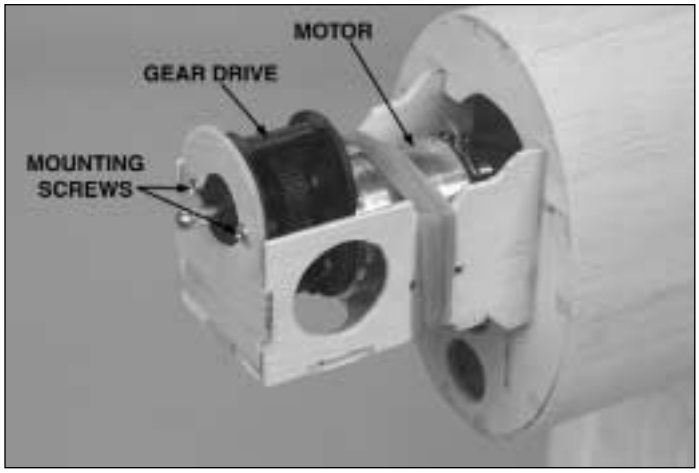


❑ 8. Attach the elevator halves to the stabilizer. Attach a small control horn on the second pushrod and insert it in the elevator pushrod tube. Position the control horn on the elevator as shown on the plan. Mark the location of the control horn mounting holes and drill 3/32" [2.4mm] holes at the marks. Temporarily mount the elevator control horn on the elevator with the backing plate and **2-56 x 1/2" [12.7mm] machine screws**.

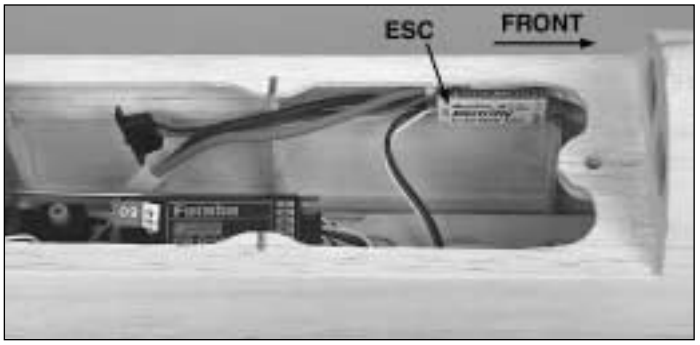
Install the Motor & Speed Control



❏ 1. Our plane flew great using the Great Planes GD-600 geardrive (GPMG0850). If you would prefer to use a 600 size motor on direct drive, drill the mounting holes in the motor front plate to match the mounting screw size for your motor. Most motors require an 1/8" [3.2mm] hole. Slide the die-cut 3-ply **optional motor mount plate** through the side of the motor mount. Insert the second 3-ply motor support in the optional motor mount plate. Mount the motor to the front plate with the mounting screws sized for your motor.

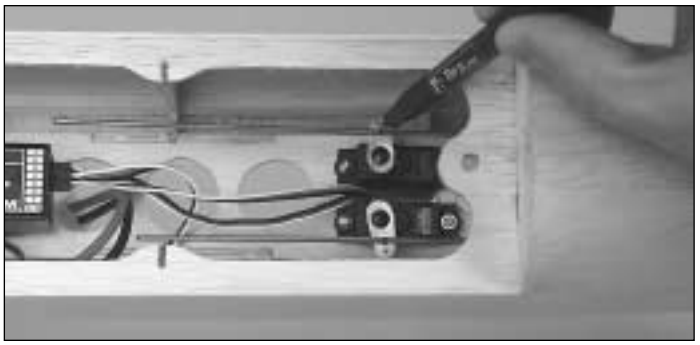


❏ 2. If you are using the recommended Great Planes GD-600 geardrive system (GPMG0775) with a S-60014R motor and C-30 electronic speed control, attach the geardrive to the front of the motor and solder the capacitors and wires, from the ESC, to the back of the motor, as shown in the ESC instructions. Use a 7/64" [2.7mm] drill bit to drill mounting holes at the punch marks in the front plate. Install the motor/geardrive in the motor mount using two #4 x 3/8" [9.5mm] sheet metal screws. Wrap two #64 rubber bands around the motor and motor mount.

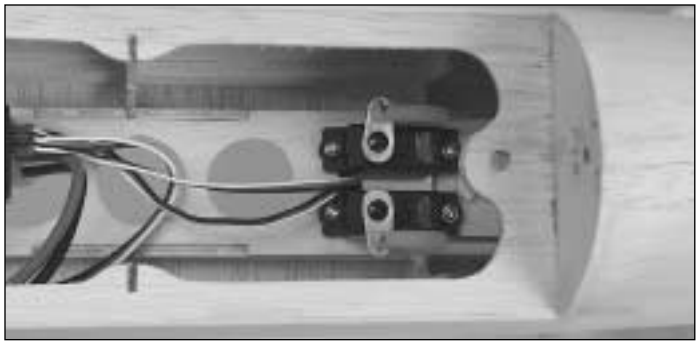


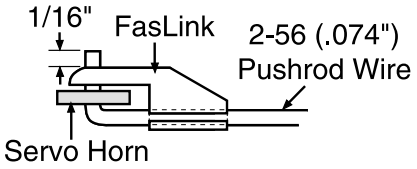
❏ 3. Use Velcro Hook and Loop material to mount the speed control on the side of the fuselage. The material will adhere better if you first apply thin CA to the balsa sheeting and allow it to cure before applying it. Plug the ESC, rudder and elevator servos into the receiver. After the C.G. location is checked and the motor battery location is determined, the receiver can be attached to the fuselage side similar to the ESC. On our show model, we waited until after the model was covered to install the on/off switch from the ESC. We installed it in the center of the black stripe on the side of the fuselage.

❏ 4. Connect the 8.4 volt motor battery into the ESC. Switch on the transmitter, then the ESC, and center the trims on your transmitter and the servo arms on the rudder and elevator servos.



❏ 5. With the servos centered and the control surfaces in neutral position, use a felt-tip pen to mark where the elevator and rudder pushrods cross the mounting holes in the servo arms. **Note:** The servo arms have been painted for clarity.

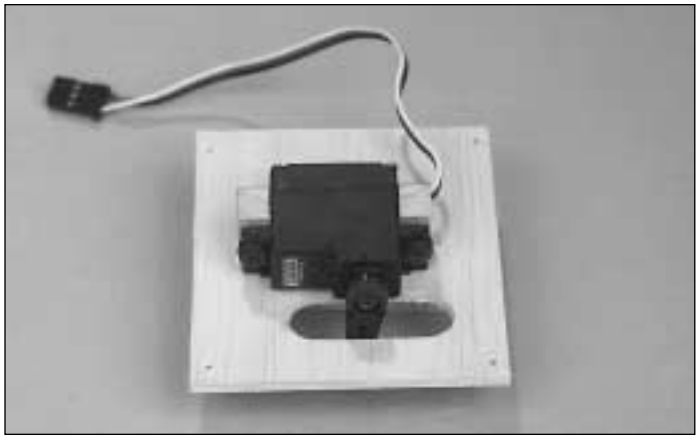




❏ 6. Disconnect the clevises from the control horns. Make a 90° bend at the marks you made. Temporarily install a nylon Faslink™ on each pushrod and cut the wire so it slightly protrudes out of the Faslink. **Hint:** If you prefer to bend and cut the pushrods **out of the fuselage,** remove the clevis, pull the pushrod out, make the 90° bends at the marks and cut the rods. Reinstall the pushrods in the pushrod tubes from the front and screw the clevises back on.

Note: If necessary, enlarge the holes in the servo arms with a 5/64" [1.9mm] drill bit (or a #48 drill for precision).

Install the Aileron Pushrods

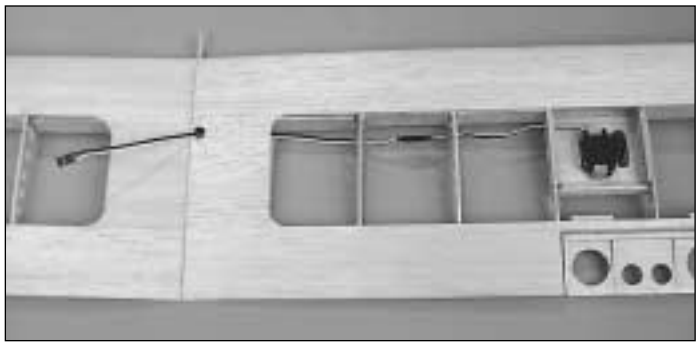


❏ ❏ 1. Remove the aileron servo hatch from one of the wing halves. Position the servo on the hatch so that the servo arm is centered in the hatch opening. From the 1/4" x 3/8" x 6" [6.4mm x 9.5mm x 152.4mm] basswood stick, cut two **servo mounting blocks** 1/2" [12.7mm] long. Use 30-minute epoxy to glue the servo mounting blocks to the servo hatch.

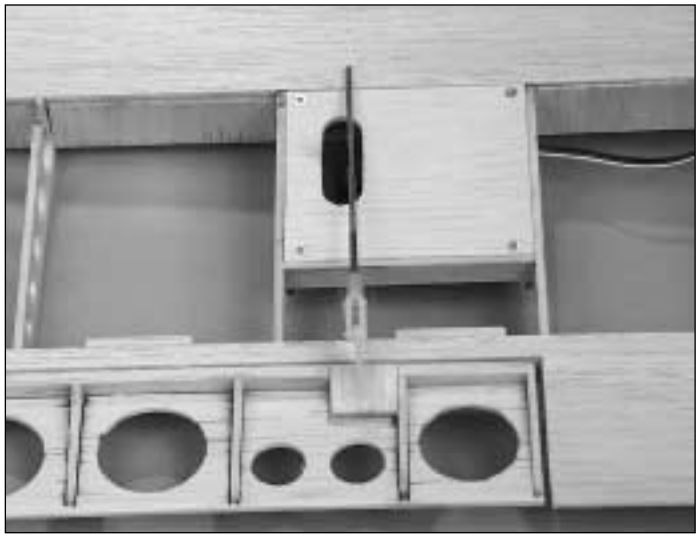
Note: Secure the servo mounting blocks by first drilling several 1/16" [1.6mm] holes about 1/8" [3.2mm] deep into the gluing surface of the basswood blocks. Roughen the servo hatch where the epoxy will be applied. Pack epoxy into the 1/16" [1.6mm] holes before clamping the blocks into position.

❏ ❏ 2. After the epoxy has fully cured, insert a 1/32" [.8mm] temporary shim between the servo and the plywood hatch. Drill 1/16" [1.6mm] pilot holes and mount the servos to the mounting blocks using the hardware that came with the servos. Remove the shims.

❏ ❏ 3. Trim a servo arm so that only one arm remains. Install the servo arm on the servo and reinstall the hatch in the wing.

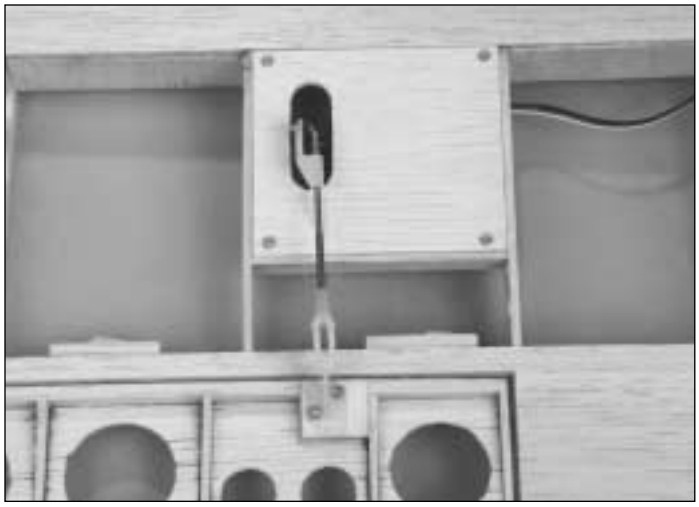


❏ ❏ 4. Connect a 12" [304.8mm] servo extension to the aileron servo. Cut a small exit hole for the servo wires in the top wing sheeting, at the center of the wing. Route the servo wires through the wing and out the exit hole.



❏ ❏ 5. Thread a nylon clevis 14 turns onto a 2-56 x 4" [101.6mm] wire pushrod. Attach the clevis to a small nylon control horn. Position the control horn on the aileron control horn mount. With the pushrod aligned with the servo horn, mark the control horn mounting holes.

❏ ❏ 6. Drill a 1/16" [1.6mm] pilot hole at each mark. Attach the control horn with two #2 x 3/8" [9.5mm] sheet metal screws. Remove the screws and harden the screw holes with a drop of thin CA. After the CA has cured, reinstall the horn and screws.

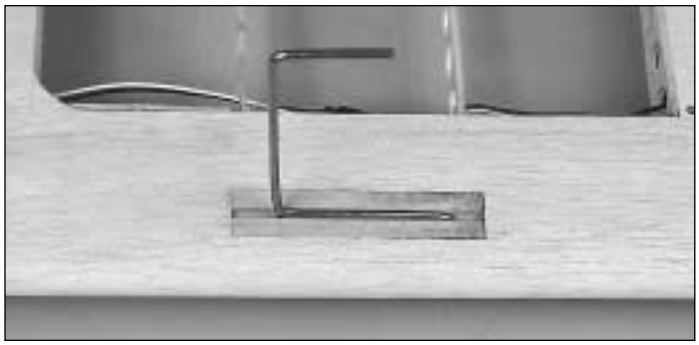


❏ ❏ 7. Connect the aileron servo to the receiver with a Y-connector. Center the servo arm and set the aileron to neutral. Mark where the pushrod crosses the servo arm. Make a 90° bend at the mark, cut the pushrod and attach it to the servo arm with a Faslink.

❏ 8. Return to step one of ***"Install the Aileron Pushrods"*** and install the other aileron servo.

FINISH THE FUSELAGE ASSEMBLY

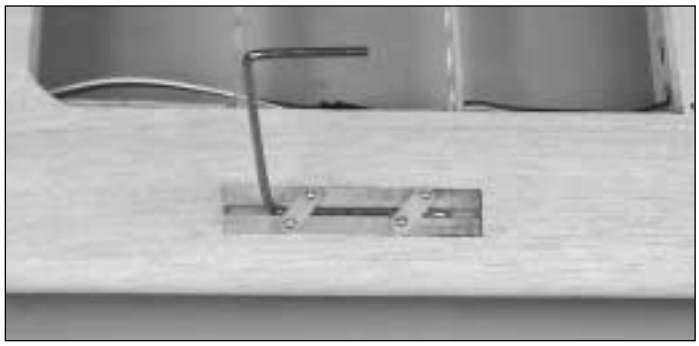
Mount the Landing Gear



❏ ❏ 1. Insert the 1/8" [3.2mm] **main landing gear** in the slot of the landing gear rail.

❏ ❏ 2. Position the two nylon landing gear straps over the main landing gear as shown on the plan. Mark the screw hole locations on the landing gear rail.

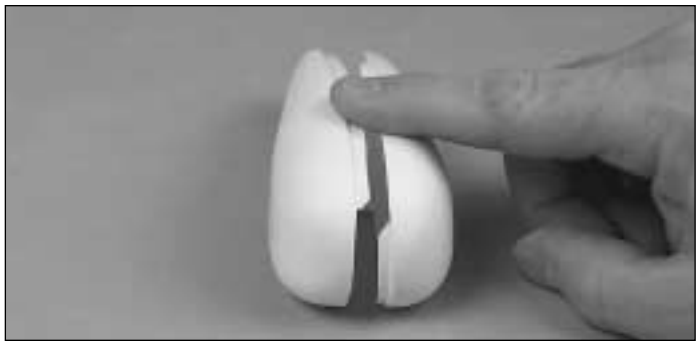
❏ ❏ 3. Drill a 1/16" [1.6mm] diameter pilot hole at each mark.



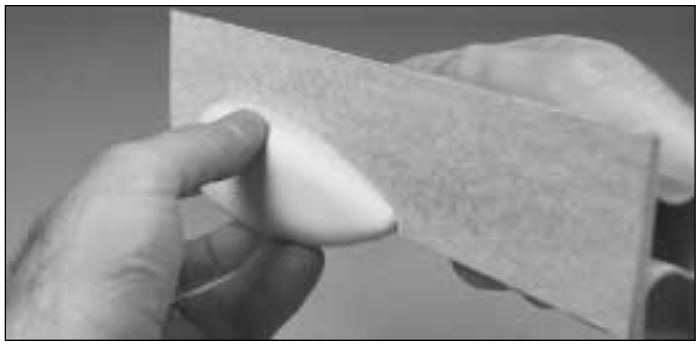
❏ ❏ 4. Temporarily secure the main landing gear to the landing gear rail with the landing gear straps and four #2 x 3/8" sheet metal screws.

❏ 5. Return to step 1 of ***"Mount the Landing Gear"*** and install the main landing gear in the other wing half.

Assemble the Wheel Pants



❏ ❏ 1. Trim one matching set of **wheel pant halves** along the molded cut lines. You can use a hobby knife to **carefully** score along the cut lines and flex the plastic until the excess breaks free, or use Hobbico Curved-tip Canopy Scissors (HCAR0667) to cut along the lines. Notice that the top of the inner pant goes over the lip of the outer pant. For now, don't worry about accurately cutting out the opening in each wheel pant half – just cut an approximate opening for the wheels.

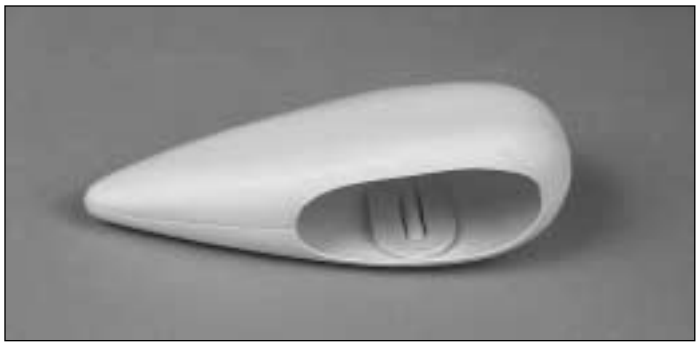


❏ ❏ 2. Use a sanding bar to carefully true the edges of the overlapping pieces of the wheel pant halves so when they are glued together the seam will be as small and straight as possible. Use 320-grit sandpaper to roughen the inside of both pants and the outside along the gluing tab.

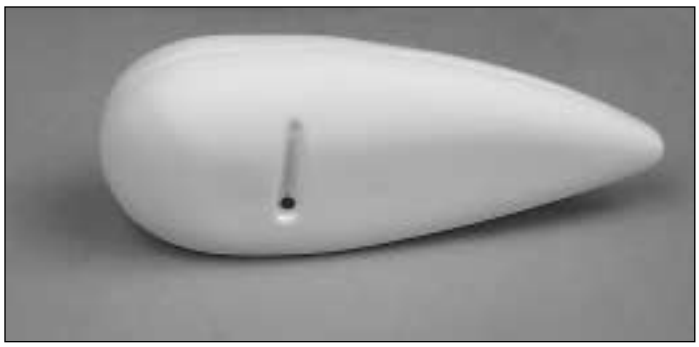
❑ ❑ 3. Test fit the wheel pant halves together and make adjustments where necessary for the best possible fit.

❑ ❑ 4. Fit and glue the die-cut 3-ply **wheel pant mount** around the recess in the inside of the inner wheel pant. The end of the pant mount will need to be sanded to a taper to fit the curvature of the wheel pant. **Important:** Do not use CA accelerator on the ABS plastic as it may develop cracks and/or keep the paint from adhering.

❑ ❑ 5. Use masking tape to hold the wheel pants together while you carefully spot glue them together in a few places with thin CA. After the halves are joined, securely glue them along all seams with thin CA.

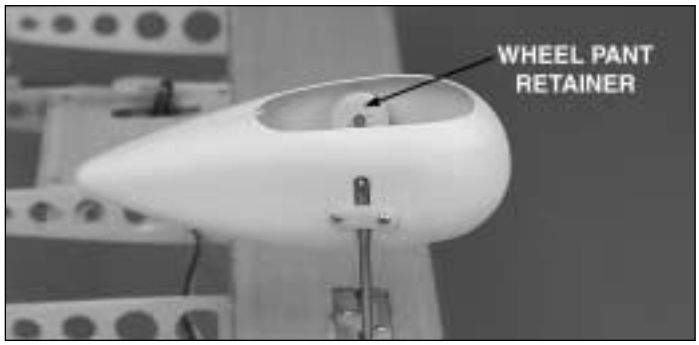


❑ ❑ 6. Use a hobby knife or Curved-tip Canopy Scissors to cut out the wheel openings. **Note:** Make the wheel openings wide, as this will make installing the wheels and wheel collars easier and cause less interference with the wheels upon landing and takeoff.

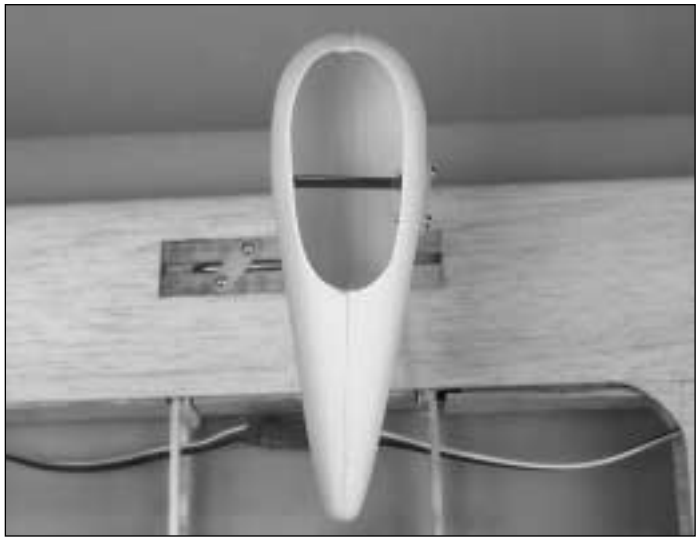


❑ ❑ 7. Drill a 1/8" [3.2mm] hole in the wheel pant at the bottom of the slot for the main landing gear.

❑ ❑ 8. Slide the wheel pant over the main landing gear so that the wire is recessed into the slot in the wheel pant. Center a nylon landing gear strap over the slot and mark the mounting holes. Remove the strap and drill a 1/16" pilot hole at both marks.



❑ ❑ 9. Drill a 1/8" hole in the center of the die-cut 3-ply **wheel pant retainer.** Slide the retainer over the landing gear. Then, securely attach the wheel pant to the main landing gear with the nylon landing gear strap and two #2 x 3/8" sheet metal screws.



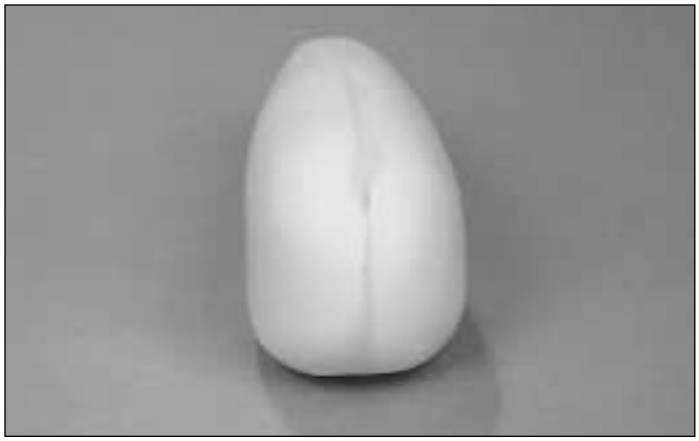
❑ ❑ 10. Adjust the position of the wheel pant so that the axle wire of the main landing gear is perpendicular to the centerline of the wheel pant. Stand back a few feet from the plane and view the wheel pant from the front and side, making sure it is positioned correctly. When satisfied with the position use epoxy to glue the wheel pant retainer to the side of the wheel pant. By using epoxy to glue the retainer on, you can re-adjust the position of the wheel pant before the glue cures.

❑ ❑ 11. After the glue has cured, remove the two screws holding the nylon landing gear strap on the wheel pant. Slide the wheel pant partially off of the landing gear. Slide a **1/8" [3.2mm] wheel collar**, a 2" [50.8mm] wheel (not included) followed by a second 1/8" [3.2mm] wheel collar onto the landing gear. Reinstall the wheel pant to the landing gear with the nylon landing gear strap. Use 4-40 set screws to secure the wheel collars to the landing gear wire. Refer to the fuse plan for a detailed view of the wheel pant assembly. **Note:** To reduce weight, we recommend that lite foam wheels be used for the main wheels.

❏ ❏ 12. Adjust and tighten the wheel collars on the landing gear so that the wheel rotates freely. The use of thread lock on the set screws will prevent them from coming loose during flight.

❏ 13. Return to step 1 of ***"Assemble the Wheel Pants"*** and assemble the other wheel pant.

❏ 14. Before painting the wheel pants, fill the seams with a filler such as Bondo® Auto Body Filler or an automotive scratch and dent glazing compound. We use Bondo most of the time as it cures quickly and sands easily, but it is normally sold in large quantities. Automotive glazing compound usually comes in small tubes, dries quickly and sands easily, but for proper drying can only be applied in thin layers.



❏ 15. After the filler cures, wet sand the wheel pants with 400-grit sandpaper to prepare them for primer.

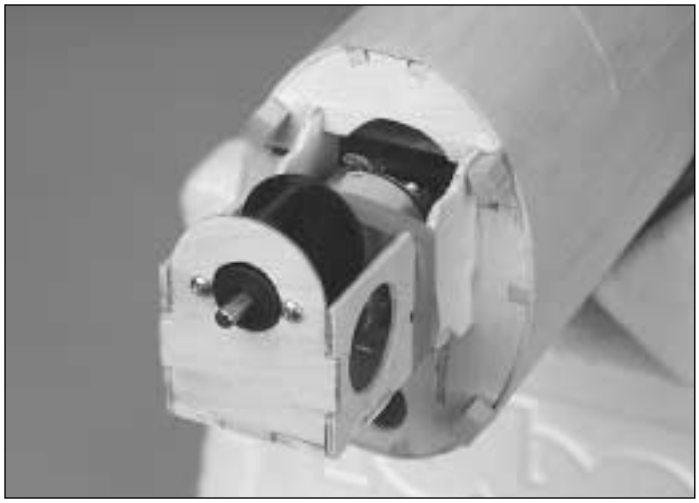
Assemble the Cowl

❏ 1. The cowl is assembled the same as the wheel pants. Cut the cowl along the cut lines, use a sanding bar to true the edges and roughen the inside along all the seams and the outside along the tabs.

❏ 2. Tape the two halves together. Then, wick thin CA along the joints.

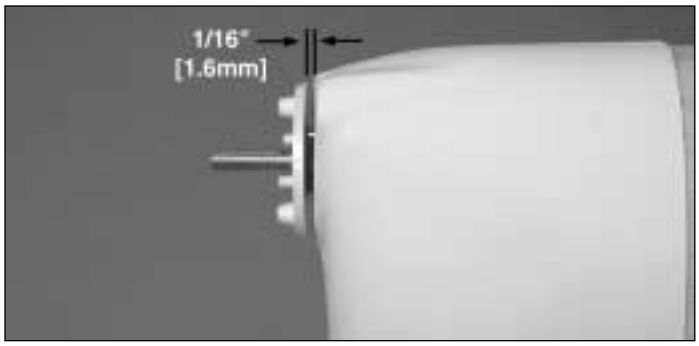
❏ 3. Use a sharp hobby knife and Curved-tip Canopy Scissors to accurately trim the openings in the front of the cowl and the air scoops.

❏ 4. From the remaining 1/4" x 3/8" [6.4mm x 9.5mm] basswood stick, cut four **cowl mounting blocks** 3/8" [9.5mm] long.

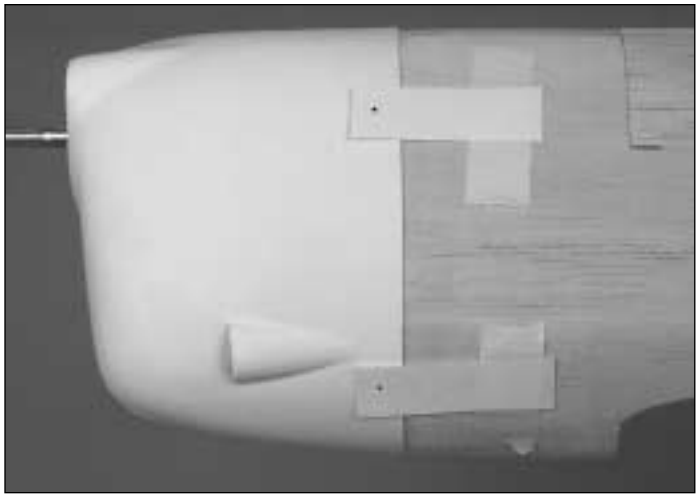


❑ 5. Use 6-minute epoxy to glue the cowl mounting blocks to former F1 in the locations shown on the plans.

❑ 6. Install the prop drive on the geardrive or if using direct drive, install the prop drive on the motor shaft.



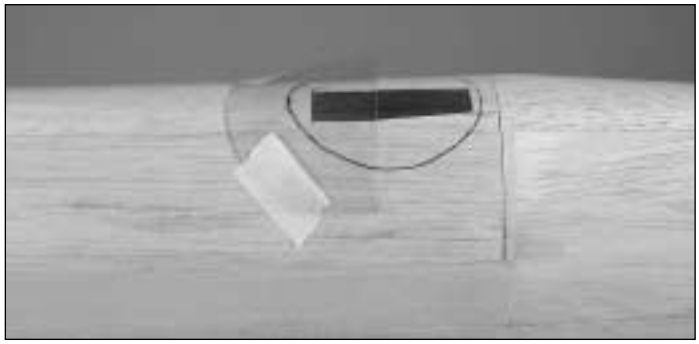
❑ 7. Check the fit of the cowl on the fuselage. The aft end of the cowl should cover the fuselage by only 1/8" to 1/4" [3.2mm to 6.4mm]. On the full-size Ryan STA the aft end of the cowl stops at the front of the firewall, leaving a small gap between the cowl and the fuselage. If you would like, you can trim your cowl like the full-size one. Install a 1-3/4" [44.4mm] spinner on the prop drive. Position the cowl approximately 1/16" [1.6mm] behind the back of the spinner.



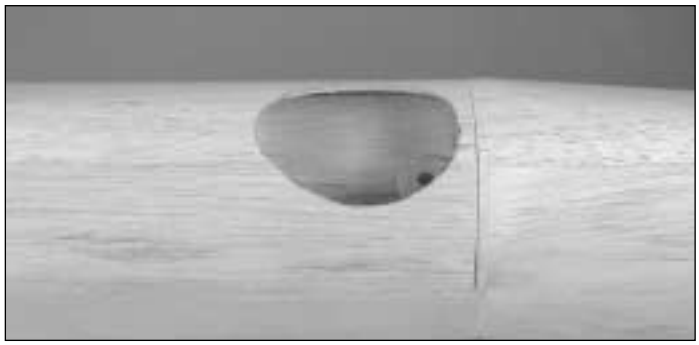
❑ 8. Use a piece of thin cardboard, taped to the fuselage, as a template to locate the cowl mounting blocks. Reinstall the cowl and mark the location of the mounting blocks on the cowl. Drill 1/16" pilot holes through the cowl and mounting blocks at each mark. Attach the cowl to the mounting blocks with #2 x 3/8" sheet metal screws.

Fit the Windscreen & Headrest

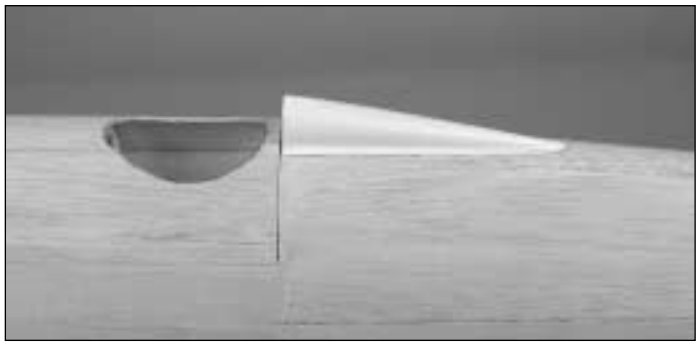
❑ 1. Trim the **windscreen** along the cut line.



❑ 2. Position the windscreen on the battery hatch as shown on the plan. The aft edge of the windscreen is approximately 1" [25.4mm] back from the aft former IP. Tape the windscreen to the battery hatch and mark the outline of the cockpit sides.



❑ 3. Cut out and sand the cockpit following the outline made in the previous step.



❑ 4. Cut the ABS headrest along the cut line and fit it to the top deck of the fuselage. The headrest fits just behind the aft edge of the battery hatch. It must clear the hatch so that the hatch can be removed. Do not glue it in position until after the fuselage is covered.

FINISHING

Final Sanding

❏ Fill any scuffs and dings with balsa filler or by "expansion." See the ***Expert Tip*** below. After the filler has dried, use progressively finer grades of sandpaper to even and smooth all the edges, seams and surfaces. A great way to sand the curved fuselage is to use a strip of sandpaper approximately 1" [25.4mm] wide, grabbing both ends of the sandpaper and working it side-to-side like polishing a shoe. Remove all the balsa dust from the model with compressed air, a tack cloth or a vacuum with a brush.

EXPERT TIP

Many surface blemishes on a framed model are caused by bumps and balsa chips on the work surface. This type of "ding" is best repaired by applying a drop or two of tap water to the blemish, then running a hot sealing iron over the spot to expand the wood fibers. After the surface has dried, sand the expanded area smooth.

Balance the Airplane Laterally

SPECIAL NOTE: Do not confuse this procedure with "checking the C.G." or "balancing the airplane fore and aft." That very important step will be covered later in the manual.

Now that you have the basic airframe completed, this is a good time to balance the airplane laterally (side-to-side). Here is how to do it.

1. Temporarily attach the wing, servos, receiver and motor to the fuselage.

2. With the wing level, lift the model by the propeller shaft and the bottom of the rudder (this may require two people). Do this several times.

3. If one wing tip consistently drops when you lift the plane, it means that side is heavy. Balance the airplane by gluing weight to the inside of the other wing tip. **Note:** An airplane that has been laterally balanced will track better in loops and other maneuvers.

Cover the Model with MonoKote® Film

The Ryan STA EP does not require much painting to obtain the scheme shown on the box, as most of the finish is done with Top Flite MonoKote covering. The only painting required is the cowl, windscreen, headrest and wheel pants.

The technique we will describe here is how the model pictured on the box was finished. Remove the motor, landing gear, cowl and control horns.

Cover the model with Top Flite MonoKote film, using the sequence that follows. The use of a Top Flite MonoKote Hot Sock™ on your covering iron will prevent scratching the MonoKote film.

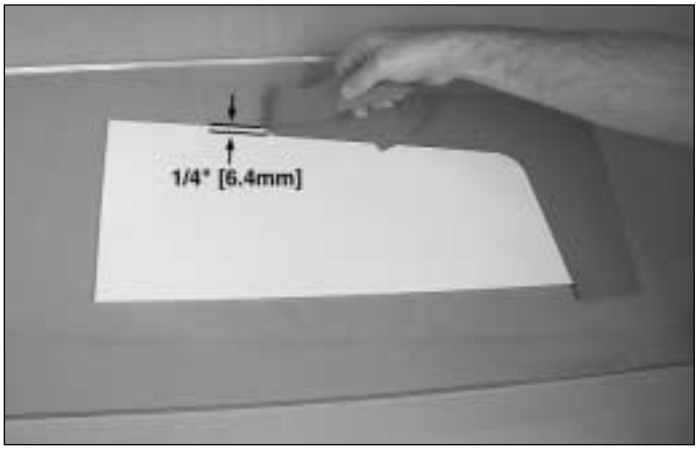
Before you cover the fuselage, first apply 1/4" wide strips of white MonoKote film in the corners where the stab and fin meet the fuselage. Proceed to cover the stab with pre-cut pieces that meet in the corners and overlap the 1/4" strips. **Do not, under any circumstances, attempt to cut the covering on the stab after it has been applied except around the leading and trailing edges and the tips.** Modelers who do this may cut through the covering and into the stab. This will weaken the structure to a point where it may fail during flight.

EXPERT TIP

COVERING AN OPEN STRUCTURE WITH MORE THAN ONE COLOR OF MONOKOTE FILM

A problem some modelers have when covering with more than one color of film is that air bubbles can become trapped between the two pieces of film. This becomes a big problem when covering over an open structure.The procedure that was used to cover the Ryan uses a template made from paper for the white and red covering. The white template was drawn approximately 1/4" [6.4mm] larger than needed. A piece of white MonoKote film was laid on a piece of glass that was lightly wetted with a glass cleaner such as Windex™. A squeegee wrapped with a paper towel was used to remove the glass cleaner from under the covering film. The white film should now be flat on the glass. Tape the template, for the white film, on top of the film. Use the template as a guide to cut the film.

Follow the same procedure to cut out the red film.



Again, with the white film flat on the glass, position the red film so that it overlaps the white film by approximately 1/4" [6.4mm]. With a covering iron set close to high, iron down the seam between the two colors.

Allow the covering to cool for a minute and carefully start lifting one end of the white covering. The two pieces should be connected along the seam. If they are not, increase the heat of the covering iron and repeat the process. It may require more heat than normal for the film to seal, because the glass absorbs some of the heat.

After removing the film from the glass, position the film on the structure. Use a covering iron to tack the film down every few inches. Then go back and seal the covering to the wood all over.

A heat gun can be used to shrink the covering, but care must be taken to not pull the seams apart.

We used Top Flite MonoKote White (TOPQ0204), Red (TOPQ0201) and Black (TOPQ0208) to cover our Ryan STA EP.

Suggested Covering Sequence

Fuselage and Tail:

- ❑ 1. 1/4" strips at fin and stab as described
- ❑ 2. Red on fuselage lower right side wrapped around the bottom
- ❑ 3. Red on fuselage lower left side wrapped around the bottom
- ❑ 4. White on fuselage upper right side wrapped around the top
- ❑ 5. White on fuselage upper left side wrapped around the top
- ❑ 6. Stab bottom, followed by top
- ❑ 7. Fin left side, followed by the right side
- ❑ 8. Elevator bottoms, followed by the top
- ❑ 9. Rudder right side followed by the left side
- ❑ 10. Battery hatch
- ❑ 11. Black stripe on right side then the left
- ❑ 12. Pin striping on stab and fin
- ❑ 13. Black checkerboard on bottom of stab

Wing:

- ❑ 1. Bottom right, followed by the left wing panel
- ❑ 2. Top right, followed by the left wing panel
- ❑ 3. Aileron LE, followed by the bottom and top
- ❑ 4. Pin striping on top and bottom of the wing
- ❑ 5. Black checkerboard on bottom of wing

The black squares for the checkerboard are installed over the white covering. Each black square should be put into position and ironed down starting at the center of the square and working towards the edges to work out any air bubbles.

Painting Your Model

Top Flite LustreKote® high quality paint perfectly matches Top Flite MonoKote film. The paint is well suited to putting a high quality finish on ABS (cowl and wheel pants), but does have a tendency to curl materials such as styrene and butyrate (windshield and side windows).

Do not paint the frame of the clear windscreen with LustreKote directly from the can. It can cause the plastic to curl. We recommend Formula-U for painting the clear windshield directly from the can.

If you have any doubt about the material you are painting, we suggest that you try painting on a small piece of leftover material and watch it for a few days to be sure that you are satisfied with the end results.

We used LustreKote White (TOPR7204) and Red (TOPQ7227) to paint the cowl, wheel pants and headrest. The inside of the cockpit was first coated with thinned epoxy and was then brushed with flat black. The epoxy will prevent the black paint from bleeding through.

FINAL HOOKUPS & CHECKS

Install the Hinges

❑ 1. Cut the covering from the hinge slots in the elevator and stab. Also cut the covering from the groove for the elevator joiner wire and the tailgear wire.

❑ 2. Clean the elevator joiner wire with alcohol and a paper towel to remove any oil residue.

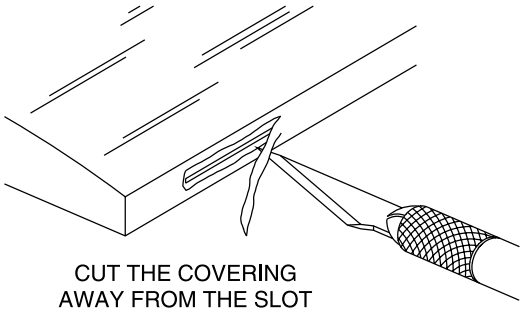
❑ 3. Reinstall the CA hinges in the elevator without glue.

EXPERT TIP

INSTALLING CA HINGES

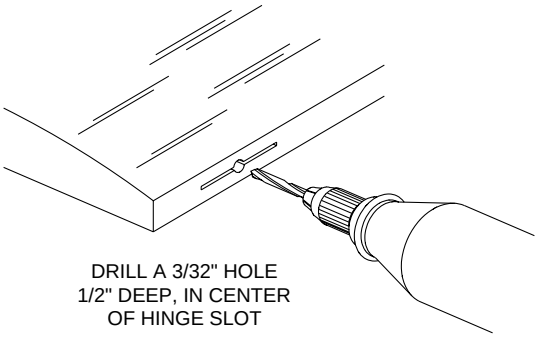
The hinge material supplied in this kit consists of a 3-layer lamination of mylar and polyester. It is specially made for the purpose of hinging model airplane control surfaces. Properly installed, this type of hinge provides the best combination of strength, durability and ease of installation. We trust even our best show models to these hinges, but it is essential to install them correctly. Please read the following instructions and follow them carefully to obtain the best results. These instructions may be used to effectively install any of the various brands of CA hinges.

The most common mistake made by modelers when installing this type of hinge is not applying a sufficient amount of glue to fully secure the hinge over its entire surface area; or, the hinge slots are very tight, restricting the flow of CA to the back of the hinges. This results in hinges that are only “tack glued” approximately 1/8" to 1/4" into the hinge slots. The following technique has been developed to help ensure thorough and secure gluing.



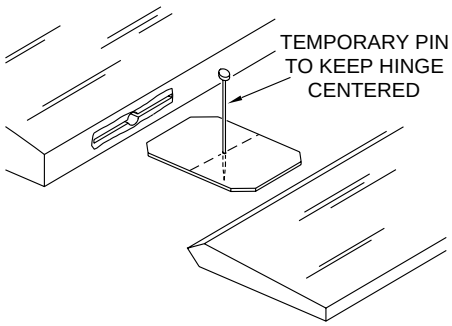
CUT THE COVERING
AWAY FROM THE SLOT

A. Cut the covering from the hinge slots–don’t just slit the covering but remove a small strip the size of the hinge.



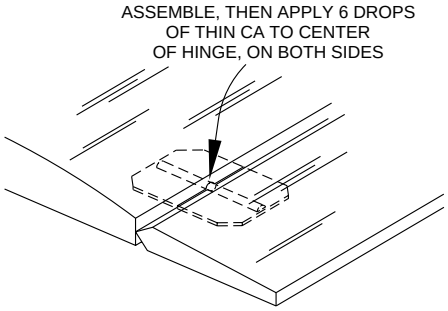
DRILL A 3/32" HOLE
1/2" DEEP, IN CENTER
OF HINGE SLOT

B. Drill a 3/32" [2.4mm] hole 1/2" [12.7mm] deep in the center of each hinge slot. A high speed Dremel Tool works best for this. If you use a regular drill, clean the hinge slots with your hobby knife.



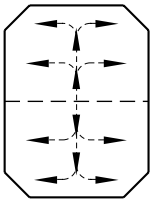
TEMPORARY PIN
TO KEEP HINGE
CENTERED

C. It is best to leave a very slight hinge gap, rather than closing it up tight, to help prevent the CA from wicking along the hinge line. The gap is large enough if you can just start to see light through it. Make sure the control surfaces will deflect to the recommended throws without binding. If you have cut your hinge slots too deep, the hinges may slide in too far, leaving only a small portion of the hinge in the control surface. To avoid this, you may insert a small pin through the center of each hinge before installing. This pin will keep the hinge centered while you install the control surfaces.



ASSEMBLE, THEN APPLY 6 DROPS
OF THIN CA TO CENTER
OF HINGE, ON BOTH SIDES

THE CA WICKS
ALONG THE "TUNNELS"
TO THE ENTIRE
HINGE SURFACE



❑ 4. Glue the joiner wire in the elevator halves with 6-minute epoxy. Before the epoxy cures, apply 6 drops of thin CA adhesive to both sides of each hinge. Allow a few seconds between drops for the CA to wick into the slot. Use a paper towel to wipe off any excess CA that may have gotten onto the covering.

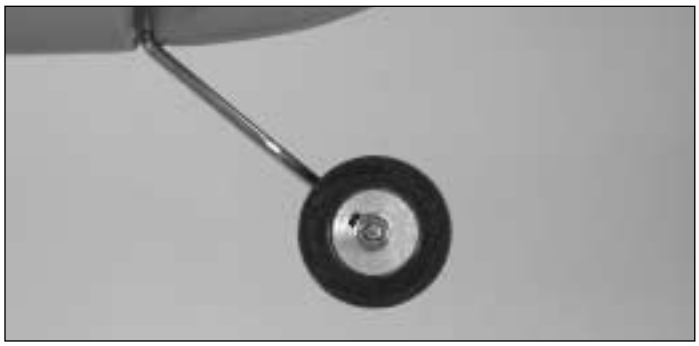
Do not use accelerator on any of the hinges. Do not glue the hinges with anything but thin CA and do not attempt to glue one half of the hinge at a time with medium or thick CA. They will not be properly secured and the controls could separate while the model is in flight.

❏ 5. Install the ailerons with their hinges, repeating the gluing technique described previously.

❏ 6. Wipe off the nylon tailwheel bearing with a paper towel dampened with rubbing alcohol. Use 6-minute epoxy to glue the tailwheel bearing in the aft end of the fuse. After the epoxy has cured, pack the tailwheel wire hole in the rudder with 6-minute epoxy. Install the rudder with its hinges. Repeat the gluing technique described previously and allow the epoxy to cure.

Hint: Apply a little petroleum jelly to the tail gear wire where it passes through the nylon bearing. This will prevent the wire from being glued to the bearing.

Install the Wheels



❏ 1. Install a 1" tail wheel (not included) followed by a 3/32" wheel collar on the tailwheel wire. Secure the wheel collar to the tailwheel wire with a 4-40 set screw. Use thread locking compound on the set screw to prevent it from loosening.

❏ 2. Reinstall the main landing gear on the fuse using the nylon landing gear straps and #2 x 3/8" [9.5mm] sheet metal screws.

❏ 3. Slide a wheel pant over the landing gear, followed by a 1/8" [3.2mm] wheel collar, a 2" [50.8mm] wheel (not included) and a second 1/8" [3.2mm] wheel collar. Secure the wheel pant to the landing gear with a nylon landing gear strap and #2 x 3/8" [9.5mm] sheet metal screws. Secure the wheel collars to the landing gear with 4-40 set screws.

Finish the Model

❏ 1. Reinstall the cowl.

❏ 2. Hold the windscreen in place on the fuselage. Use a fine tip marker to trace the outline of the windscreen onto the covering. Remove the windscreen and use a sharp #11 blade to cut a 1/16" [1.6mm] strip from the covering just inside the line you drew. A sharp blade is important so you do not have to use much pressure. It will allow you to cut only the covering and not the underlying wood.

❏ 3. Carefully glue the windscreen in place with a “canopy glue,” such as Pacer Formula 560 Canopy Glue (PAAR3300). We do not recommend CA, as it may fog the plastic. Use masking tape to hold it in place while the glue dries.

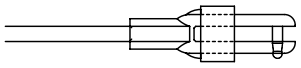
❏ 4. Follow the same procedure to attach the headrest to the top deck behind the battery hatch.

❏ 5. The Ryan STA EP kit contains a decal sheet including the American flags and “N” numbers which would be difficult to reproduce otherwise. These decals are the “peel-and-stick” type. Cut around the individual decal emblems, peel off the protective backing, and apply them to your airplane.

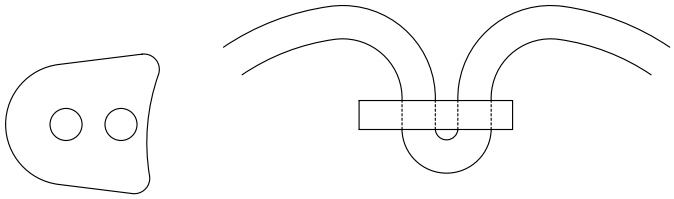
❏ 6. A 1/6 scale 2" tall pilot was used in the Ryan. It cannot be glued in the cockpit so that the battery hatch retainer pin can be inserted and removed. We applied a piece of hook and loop material on the bottom of the pilot and the top of the cockpit floor. The pilot can be removed when changing the battery.

Reinstall the Radio System

❏ 1. Reinstall the rudder, elevator and aileron control horns, pushrods, receiver, ESC and servos. If the on/off switch for the ESC is black, it can be installed in the black stripe on the side of the fuselage to hide it.



I**mportant:** Slide the silicone clevis retainers over all the clevises before connecting the clevises to the control horns.



❏ 2. Make a strain relief from a cut-off servo arm and place it on the antenna where the antenna exits the fuse. Route the receiver antenna out of the fuse. Anchor the antenna to the top of the fin with a rubber band and T-pin.

Note: We drilled a 9/64" hole through the top of the headrest and top deck, into the fuselage right behind former F6. The remaining white nylon inner pushrod tube was then inserted through the headrest and into the fuselage. A couple drops of thin CA were applied to hold it in place. The receiver antenna was then routed out of the top of the headrest and attached to the top of the fin.

Note: Do not shorten the antenna! Leave any excess trailing behind the model.

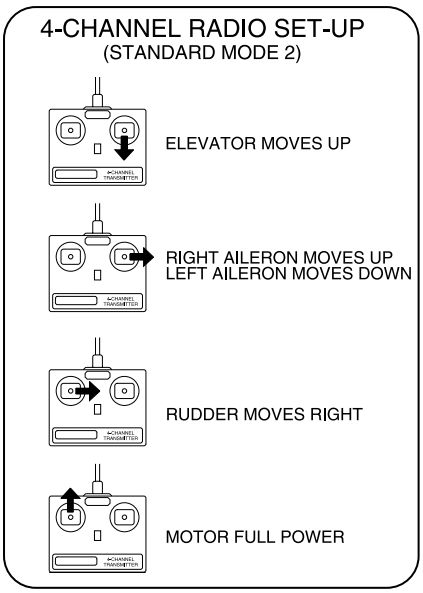
❏ 3. To secure the battery in the fuselage, glue hook and loop material to the top of the battery tray and the face of the motor batteries.

GET THE MODEL READY TO FLY

Check the Control Directions

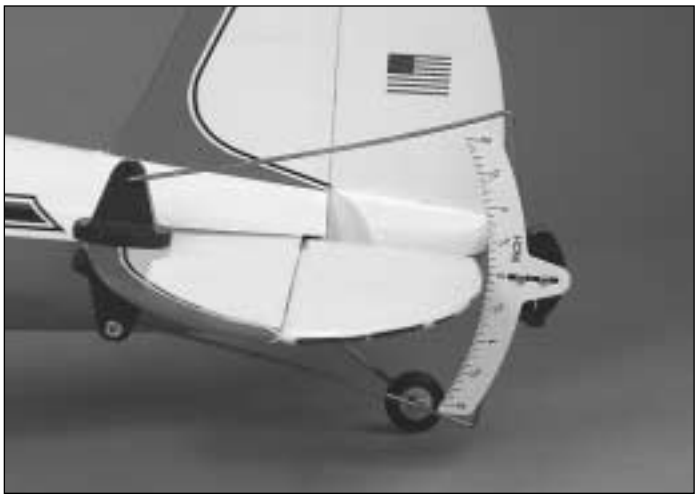
❏ 1. Turn on the transmitter and receiver and center the trims. If necessary, remove the servo arms from the servos and reposition them so they are centered. Reinstall the screws that hold on the servo arms.

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



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

Set the Control Throws



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

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

These are the recommended control surface throws:

	High Rate	Low Rate
ELEVATOR:	3/8" [9.5mm] up 3/8" [9.5mm] down	1/4" [6.4mm] up 1/4" [6.4mm] down
RUDDER:	1" [25.4mm] right 1" [25.4mm] left	3/4" [19mm] right 3/4" [19mm] left
AILERONS:	1/2" [12.7mm] up 1/2" [12.7mm] down	3/8" [9.5mm] up 3/8" [9.5mm] down

IMPORTANT: The Ryan STA EP 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 Ryan STA EP 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.”

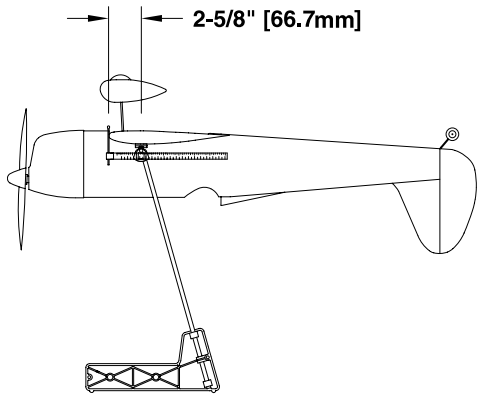
Balance the Model (C.G.)

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 motor, prop, electronic speed control, motor battery and the radio system.

❏ 1. Use a felt-tip pen or 1/8"-wide tape to accurately mark the C.G. on the top of the wing on both sides of the fuselage. The C.G. is located 2-5/8" [66.7mm] back from the leading edge of the wing.

This is where your model should balance for your first flights. Later, you may wish to experiment by shifting the C.G. up to 3/16" [4.8mm] forward or 3/16" [4.8mm] back to change the flying characteristics. Moving the C.G. forward may improve the smoothness and stability, but it may then require more speed for takeoff and make it more difficult to slow for landing. Moving the C.G. aft makes the model more maneuverable, but could also cause it to become too difficult for you to control. In any case. start at the location we recommend and do not at any time balance your model outside the recommended range.



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

❏ 3. When the Ryan STA EP is properly balanced, the stab will be level. If the tail drops, the model is "tail heavy" and the motor battery must be shifted forward or weight must be added to the nose to balance. If the nose drops, the model is "nose heavy" and the motor battery must be shifted aft or weight must be added to the tail to balance. If possible, relocate the motor battery to minimize or eliminate any additional weight required. If additional weight is required, use Great Planes (GPMQ4485) "stick-on" lead. A good place to add stick-on nose weight is inside the cowl or on the bottom of the stabilizer. Begin by placing incrementally increasing amounts of weight in the fuse until the model balances. Once you have determined the amount of weight required, it can be permanently attached. Make sure the tail weight does not interfere with the movement of the elevator pushrod.

If moving the motor battery forward or aft will balance the plane without adding additional weight, mark the battery tray or the fuselage inside where the aft end of the battery should be placed. This will allow you to position the battery correctly before each flight.

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

PREFLIGHT

Identify Your Model

No matter if you fly at an AMA sanctioned R/C club site or if you fly somewhere on your own, you should always have your name, address, telephone number and AMA number on or inside your model. It is **required** at all AMA R/C club flying sites and AMA sanctioned flying events. Fill out the identification tag on the decal sheet 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 batteries the night before you go flying, and at other times as recommended by the radio manufacturer.

PROPER CARE OF YOUR MOTOR

1. Most motors will benefit from a short "break-in" by running the motor without the propeller for at least 15 minutes. This will seat the motor brushes on the commutator, insuring that the motor will provide full power for your first flight and extend the life of your motor. If you notice a decrease in motor power after several flights, it may be due to carbon build-up on the brushes or commutator. To remove this build-up, repeat the above break-in procedure.

2. Using multiple battery packs to run the motor for successive flights may cause the motor to become excessively hot. We recommend at least a 10-minute cool-down period between flights.

3. The ideal power source for the Ryan STA EP is a 7-cell, 8.4 volt 1700 – 3000 mAh battery pack. The use of a higher voltage battery may reduce the motor life and damage the electronic speed control.

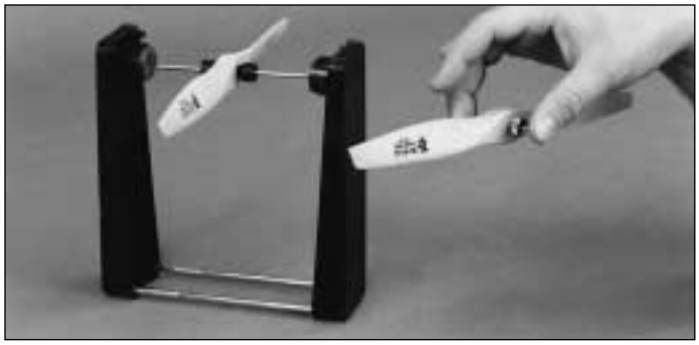
PERFORMANCE TIPS

1. A new battery pack should be "cycled" for best results. You should peak charge the battery, then discharge it almost completely by actually running your motor with the propeller attached. Do this 2 or 3 times on the ground before actually flying. Be sure you remove the battery from the airplane between each cycle and allow it and the motor to cool before recharging.

2. The standard Tamiya battery connectors supplied with your electronic speed control and motor battery are adequate for most installations. However, if you are looking for maximum performance, you may want to consider installing high-performance battery connectors such as DuraTrax® Powerpole™ connectors (DTXC2300).

3. Examine your propeller for irregularities caused by the injection molding process. Carefully remove the imperfections with fine sandpaper.

BALANCE THE PROPELLER



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 motor mounting screws and bolts loosen, possibly with disastrous effect, but vibration may also damage your radio receiver and battery.

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.

FIND A SAFE PLACE TO FLY

The best place to fly your Ryan STA EP is at an AMA chartered club field. Ask the AMA or your local hobby shop dealer it there is a club in your area and join. Club fields are set up for R/C flying and that makes your outing safer and more enjoyable. The AMA also can tell you the name of a club in your area. We recommend that you join the AMA and a local club so you can have a safe place to fly and have insurance to cover you in case of a flying accident. The AMA address and telephone number are in the front of this manual.

If a club and flying site are not available, find a large, grassy area at least 6 miles away from houses, buildings and streets and any other R/C radio operation like R/C boats and R/C cars. A schoolyard may look inviting but is too close to people, power lines and possible radio interference.

Ground Check

After you break-in the motor 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

Whenever you go to the flying field, check the operational range of the radio before the first flight of the day. First, make sure no one else is on your frequency (channel). Have an assistant hold the model, staying clear of the prop. With your transmitter on, you should be able to walk at least 100 feet away from the model and still have control. While you work the controls, have your assistant tell you what the control surfaces are doing. Repeat this test with the motor running at various speeds. If the control surfaces are not always responding correctly, do not fly! Find and correct the problem first. Look for loose servo connections or corrosion, loose bolts that may cause vibration, a defective on/off switch, low battery voltage, a damaged receiver antenna, or a receiver crystal that may have been damaged from a previous crash. If the radio appears to only be affected when the motor is running, try moving your receiver and receiver antenna farther away from the motor battery and motor. Recheck the C.G. Also, installing a couple more capacitors on the motor may help. The capacitors should be soldered from the terminals to the motor case, and from one terminal to the other.

MOTOR SAFETY PRECAUTIONS

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

Use safety glasses when running the motor.

Do not run the motor 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 run the motor.

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.

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. Check the C.G. according to the measurements provided in the manual.
- ❏ 2. Be certain the motor battery and receiver are securely mounted in the fuse.
- ❏ 3. Extend your receiver antenna and make sure it has a strain relief inside the fuselage to keep tension off the solder joint inside the receiver.
- ❏ 4. Balance your model *laterally* as explained in the instructions (see page 39).
- ❏ 5. Add a drop of oil to the axles, so the wheels turn freely.
- ❏ 6. Make sure all hinges are **securely** glued in place.
- ❏ 7. Reinforce holes for wood screws with thin CA where appropriate (servo mounting screws, cowl mounting screws, etc.).
- ❏ 8. Confirm that all controls operate in the correct direction and the throws are set up according to the manual (see page 43).
- ❏ 9. Make sure there are silicone retainers on all the clevises and that all servo arms are secured to the servos with the screws included with your radio.
- ❏ 10. Secure connections between servo wires and Y-connectors or servo extensions, and the connection between your battery pack and the on/off switch with vinyl tape, heat shrink tubing or special clips suitable for that purpose.
- ❏ 11. Make sure any servo extension cords you may have used do not interfere with other systems (servo arms, pushrods, etc.).
- ❏ 12. Use an incidence meter to check the wing for twists and attempt to correct before flying.
- ❏ 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. If you wish to photograph your model, do so before your first flight.
- ❏ 17. Range check your radio as soon as you get to the flying field.

FLYING

The Ryan STA EP is a great-flying model that flies smoothly and predictably. The Ryan STA EP does not, however,

possess the self-recovery characteristics of a primary R/C trainer and should be flown only be experienced R/C pilots.

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

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, turn off the motor and bring the model back into the pits. Re-peak the motor battery, then check all fasteners and control linkages for peace of mind.

Remember to takeoff into the wind. When you're ready, point the model straight down the runway, hold a bit of up elevator to keep the tail on the ground to maintain tail wheel steering, then gradually advance the throttle. As the model gains speed decrease up elevator allowing the tail to come off the ground. One of the most important things to remember with a tail dragger is to always be ready to apply **right** rudder to counteract motor 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 motor 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 Ryan STA EP 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 motor battery remaining, 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 power level, but use this first flight to become familiar with your model before landing.

Landing

With electric planes it's best to land with some battery power remaining. This will allow you to abort the landing and go around again if needed. 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.

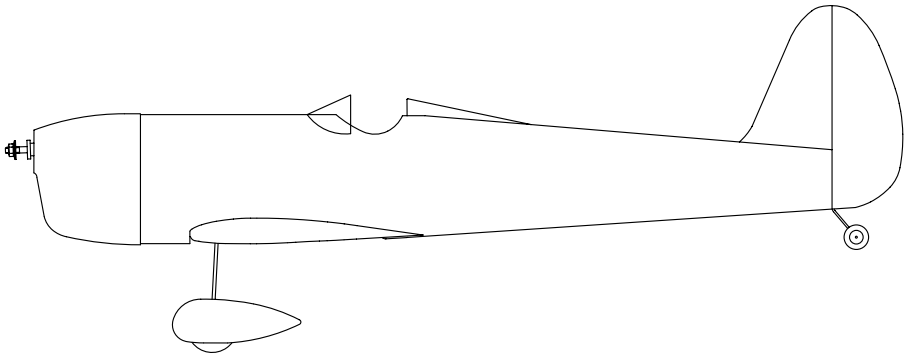
One final note about flying your model. Have a goal or flight plan in mind for **every** flight. This can be learning a new maneuver(s), improving a maneuver(s) you already know, or learning how the model behaves in certain conditions (such as on high or low rates). This is not necessarily to improve 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.**

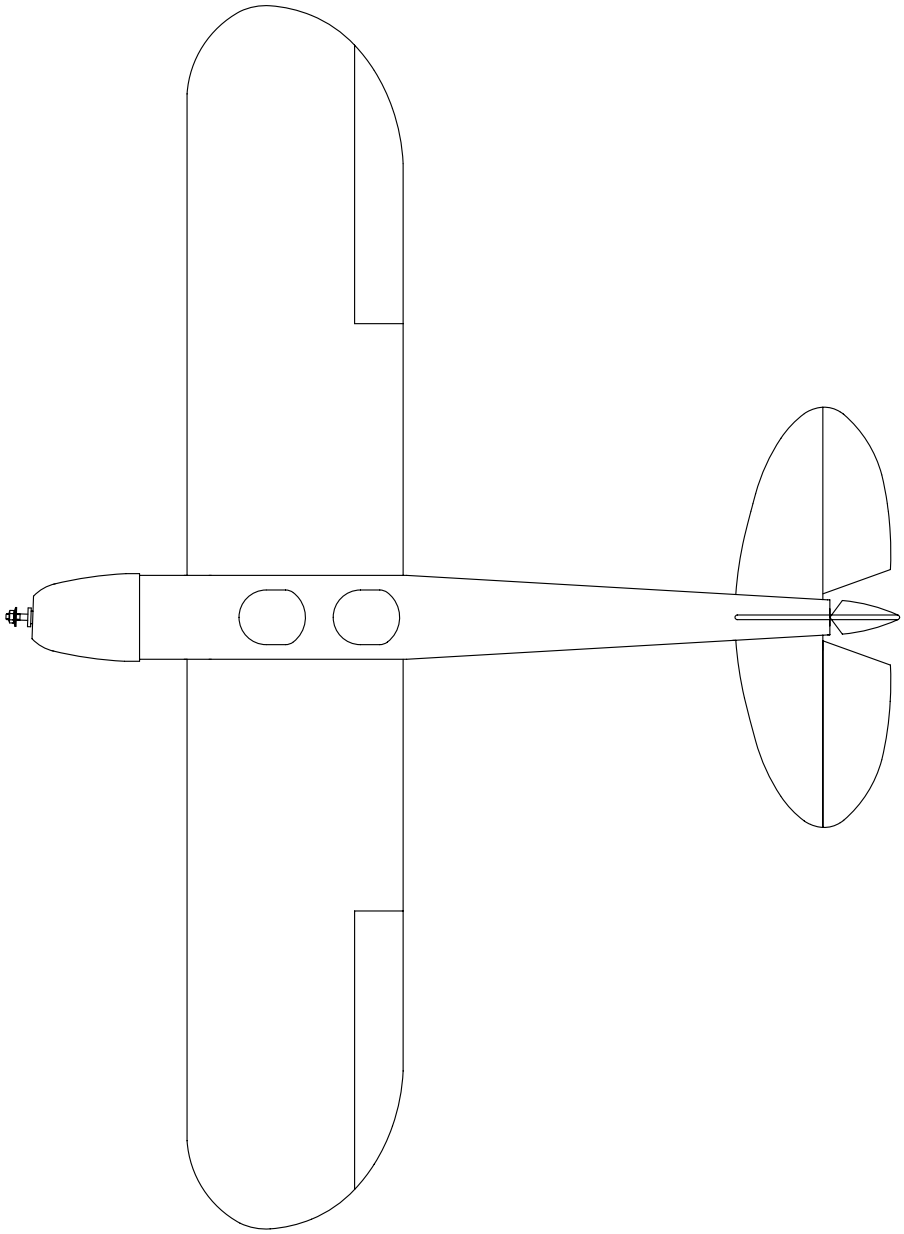
Have a ball! But always stay in control and fly in a safe manner.

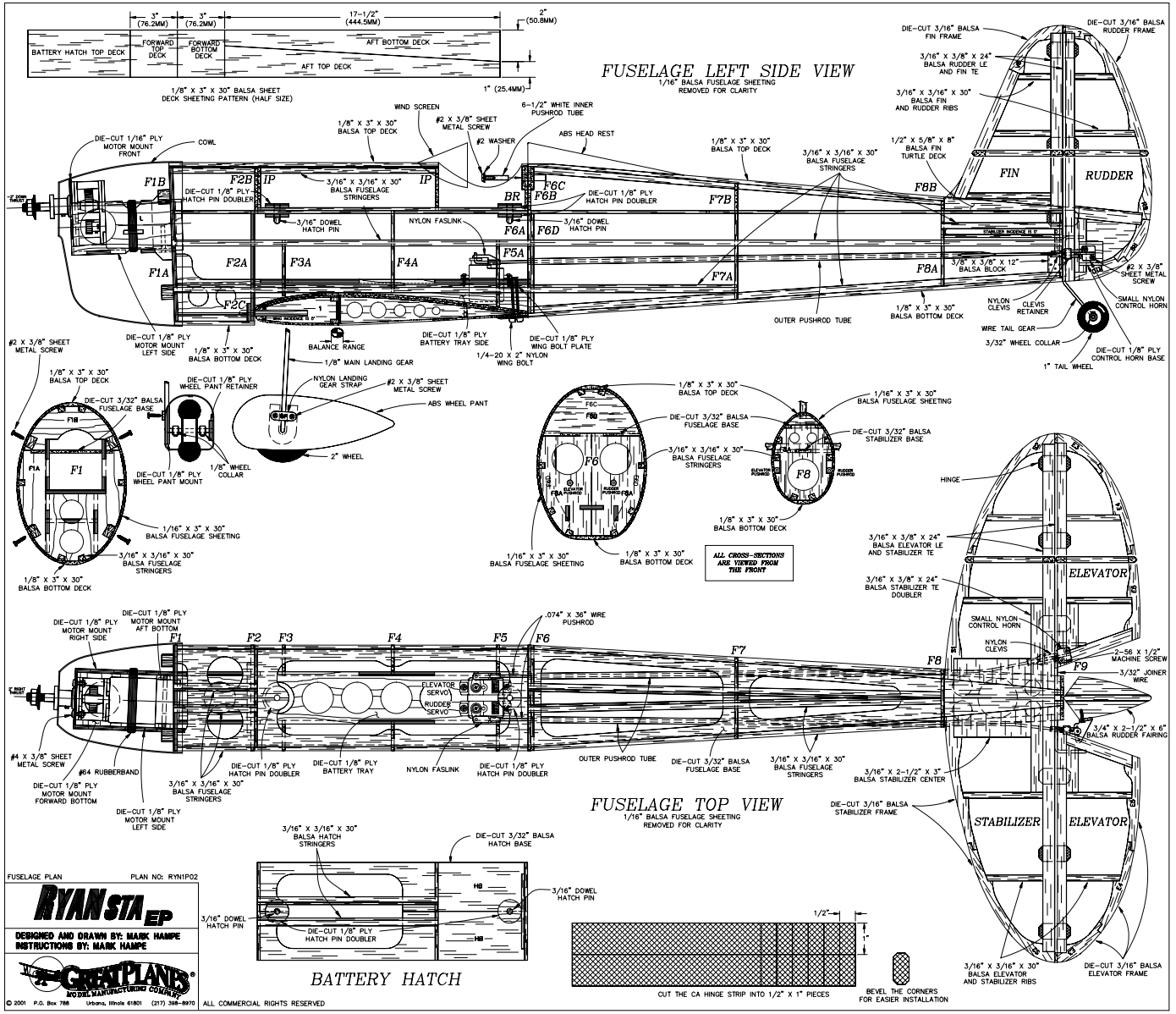
GOOD LUCK AND GREAT FLYING!

TWO VIEW DRAWING

Use copies of this page to plan your trim scheme






FUSELAGE LEFT SIDE VIEW
1/16" BALSA FUSELAGE SHEETING REMOVED FOR CLARITY
3" (76.2MM)
3" (76.2MM)
17-1/2" (444.5MM)
2" (50.8MM)
1" (25.4MM)
BATTERY HATCH TOP DECK
FORWARD TOP DECK
FORWARD BOTTOM DECK
AFT BOTTOM DECK
AFT TOP DECK
1/8" X 3" X 30" BALSA SHEET DECK SHEETING PATTERN (HALF SIZE)
WIND SCREEN
6-1/2" WHITE INNER PUSHROD TUBE
#2 X 3/8" SHEET METAL SCREW
#2 WASHER
ABS HEAD REST
1/8" X 3" X 30" BALSA TOP DECK
3/16" X 3/16" X 30" BALSA FUSELAGE STRINGERS
1/2" X 5/8" X 8" BALSA FIN TURTLE DECK
DIE-CUT 3/16" BALSA FIN FRAME
DIE-CUT 3/16" BALSA RUDDER FRAME
3/16" X 3/8" X 24" BALSA RUDDER LE AND FIN TE
3/16" X 3/16" X 30" BALSA FIN AND RUDDER RIBS
FIN
RUDDER
DIE-CUT 1/16" PLY MOTOR MOUNT FRONT
COWL
F1B
F2B
IP
DIE-CUT 1/8" PLY HATCH PIN DOUBLER
3/16" DOWEL HATCH PIN
NYLON FASLINK
BR
F6C
F6B
F6A
F6D
F7B
F8B
F2A
F3A
F4A
F5A
F1A
F7A
F8A
F2C
3/8" X 3/8" X 12" BALSA BLOCK
#2 X 3/8" SHEET METAL SCREW
NYLON CLEVIS
CLEVIS RETAINER
SMALL NYLON CONTROL HORN
WIRE TAIL GEAR
3/32" WHEEL COLLAR
1" TAIL WHEEL
DIE-CUT 1/8" PLY CONTROL HORN BASE
OUTER PUSHROD TUBE
1/8" X 3" X 30" BALSA BOTTOM DECK
DIE-CUT 1/8" PLY MOTOR MOUNT LEFT SIDE
1/8" X 3" X 30" BALSA BOTTOM DECK
BALANCE RANGE
1/8" MAIN LANDING GEAR
DIE-CUT 1/8" PLY BATTERY TRAY SIDE
DIE-CUT 1/8" PLY WING BOLT PLATE
1/4-20 X 2" NYLON WING BOLT
#2 X 3/8" SHEET METAL SCREW
1/8" X 3" X 30" BALSA TOP DECK
DIE-CUT 3/32" BALSA FUSELAGE BASE
F1B
F1A
F1
DIE-CUT 1/8" PLY WHEEL PANT RETAINER
DIE-CUT 1/8" PLY WHEEL PANT MOUNT
1/8" WHEEL COLLAR
NYLON LANDING GEAR STRAP
#2 X 3/8" SHEET METAL SCREW
ABS WHEEL PANT
2" WHEEL
1/16" X 3" X 30" BALSA FUSELAGE SHEETING
3/16" X 3/16" X 30" BALSA FUSELAGE STRINGERS
1/8" X 3" X 30" BALSA BOTTOM DECK
1/8" X 3" X 30" BALSA TOP DECK
DIE-CUT 3/32" BALSA FUSELAGE BASE
3/16" X 3/16" X 30" BALSA FUSELAGE STRINGERS
F6C
F6B
F6
1/16" X 3" X 30" BALSA FUSELAGE SHEETING
1/8" X 3" X 30" BALSA BOTTOM DECK
ALL CROSS-SECTIONS ARE VIEWED FROM THE FRONT
1/16" X 3" X 30" BALSA FUSELAGE SHEETING
DIE-CUT 3/32" BALSA STABILIZER BASE
F8
1/8" X 3" X 30" BALSA BOTTOM DECK
HINGE
3/16" X 3/8" X 24" BALSA ELEVATOR LE AND STABILIZER TE
ELEVATOR
3/16" X 3/8" X 24" BALSA STABILIZER TE DOUBLER
SMALL NYLON CONTROL HORN
NYLON CLEVIS
2-56 X 1/2" MACHINE SCREW
3/32" JOINER WIRE
F9
3/4" X 2-1/2" X 6" BALSA RUDDER FAIRING
3/16" X 2-1/2" X 3" BALSA STABILIZER CENTER
DIE-CUT 3/16" BALSA STABILIZER FRAME
STABILIZER
ELEVATOR
3/16" X 3/16" X 30" BALSA ELEVATOR AND STABILIZER RIBS
DIE-CUT 3/16" BALSA ELEVATOR FRAME
DIE-CUT 1/8" PLY MOTOR MOUNT RIGHT SIDE
DIE-CUT 1/8" PLY MOTOR MOUNT AFT BOTTOM
F1
F2
F3
F4
F5
F6
F7
F8
.074" X 36" WIRE PUSHROD
ELEVATOR SERVO
RUDDER SERVO
#4 X 3/8" SHEET METAL SCREW
#64 RUBBERBAND
DIE-CUT 1/8" PLY MOTOR MOUNT FORWARD BOTTOM
DIE-CUT 1/8" PLY MOTOR MOUNT LEFT SIDE
3/16" X 3/16" X 30" BALSA FUSELAGE STRINGERS
DIE-CUT 1/8" PLY HATCH PIN DOUBLER
DIE-CUT 1/8" PLY BATTERY TRAY
NYLON FASLINK
DIE-CUT 1/8" PLY HATCH PIN DOUBLER
OUTER PUSHROD TUBE
DIE-CUT 3/32" BALSA FUSELAGE BASE
3/16" X 3/16" X 30" BALSA FUSELAGE STRINGERS
FUSELAGE TOP VIEW
1/16" BALSA FUSELAGE SHEETING REMOVED FOR CLARITY
3/16" X 3/16" X 30" BALSA HATCH STRINGERS
DIE-CUT 3/32" BALSA HATCH BASE
3/16" DOWEL HATCH PIN
3/16" DOWEL HATCH PIN
DIE-CUT 1/8" PLY HATCH PIN DOUBLER
BATTERY HATCH
1/2"
1"
CUT THE CA HINGE STRIP INTO 1/2" X 1" PIECES
BEVEL THE CORNERS FOR EASIER INSTALLATION
FUSELAGE PLAN
PLAN NO: RYN1P02
RYAN STA EP
DESIGNED AND DRAWN BY: MARK HAMPE
INSTRUCTIONS BY: MARK HAMPE
GREAT PLANES MODEL MANUFACTURING COMPANY
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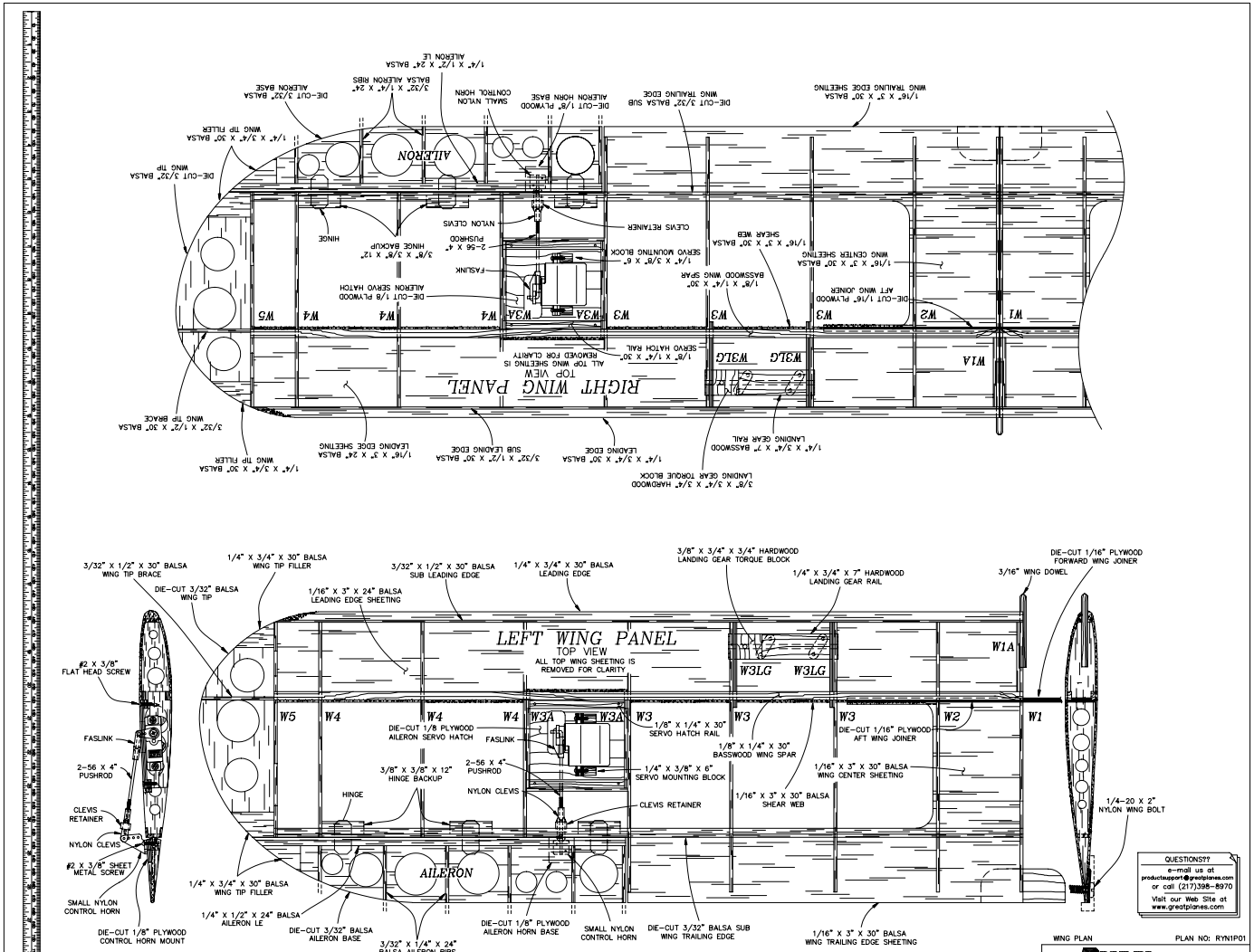
B

C


RIGHT WING PANEL
TOP VIEW
ALL TOP WING SHEETING IS REMOVED FOR CLARITY
AILERON
W1
W1A
W2
W3
W3A
W3LG
W4
W5
1/4" X 1/2" X 24" BALSA AILERON LE
1/16" X 3" X 30" BALSA WING TRAILING EDGE SHEETING
DIE-CUT 3/32" BALSA WING TRAILING EDGE
SMALL NYLON CONTROL HORN
DIE-CUT 1/8" PLYWOOD ALLERON HORN BASE
3/32" X 1/4" X 24" BALSA AILERON RIBS
DIE-CUT 3/32" BALSA AILERON BASE
3/32" X 1/4" X 24" BALSA AILERON RIBS
1/4" X 3/4" X 30" BALSA WING TIP FILLER
DIE-CUT 3/32" BALSA AILERON BASE
1/4" X 3/4" X 30" BALSA WING TIP FILLER
DIE-CUT 3/32" BALSA WING TIP
1/16" X 3" X 30" BALSA WING CENTER SHEETING
1/16" X 3" X 30" BALSA SHEAR WEB
1/8" X 1/4" X 30" BASSWOOD WING SPAR
1/4" X 3/4" X 7" HARDWOOD LANDING GEAR RAIL
3/8" X 3/4" X 3/4" HARDWOOD LANDING GEAR TORQUE BLOCK
1/4" X 3/4" X 30" BALSA LEADING EDGE
3/32" X 1/2" X 30" BALSA SUB LEADING EDGE
1/16" X 3" X 24" BALSA LEADING EDGE SHEETING
3/32" X 1/2" X 30" BALSA WING TIP BRACE
1/4" X 3/4" X 30" BALSA WING TIP FILLER
#2 X 3/8" FLAT HEAD SCREW
FASLINK
2-56 X 4" PUSHROD
CLEVIS RETAINER
NYLON CLEVIS
#2 X 3/8" SHEET METAL SCREW
SMALL NYLON CONTROL HORN
DIE-CUT 1/8" PLYWOOD CONTROL HORN MOUNT
DIE-CUT 1/8 PLYWOOD AILERON SERVO HATCH
3/8" X 3/8" X 12" HINGE BACKUP
HINGE
1/8" X 1/4" X 30" SERVO HATCH RAIL
1/4" X 3/8" X 6" SERVO MOUNTING BLOCK
DIE-CUT 1/16" PLYWOOD AFT WING JOINER
DIE-CUT 1/16" PLYWOOD FORWARD WING JOINER
3/16" WING DOWEL
1/4-20 X 2" NYLON WING BOLT
QUESTIONS??
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PLAN NO: RYN1P01
RYAN STA EP
DESIGNED AND DRAWN BY: MARK HAMPE
INSTRUCTIONS BY: MARK HAMPE
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