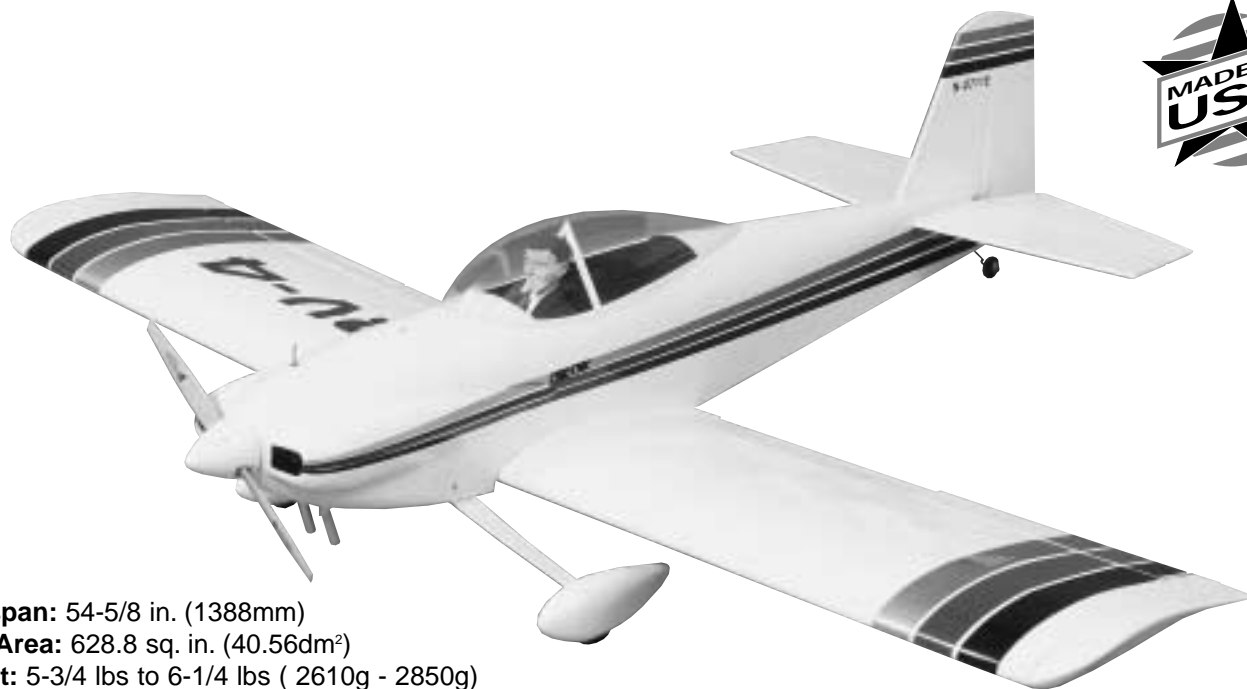# RV-4

INSTRUCTION MANUAL

Wingspan: 54-5/8 in. (1388mm)
Wing Area: 628.8 sq. in. (40.56dm^2)
Weight: 5-3/4 lbs to 6-1/4 lbs (2610g - 2850g)
Length: 49-5/8 in. (1260mm)
Wing Loading: 21 oz per sq ft to 22.9 oz per sq ft (64.4 grams per dm^2 - 70.3 grams per dm^2)

WARRANTY

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

GREATPLANES®
MODEL MANUFACTURING COMPANY

P.O. Box 788   Urbana, IL 61801   (217) 398-8970
productsupport@greatplanes.com

INTRODUCTION

The RV-4 is a great flying semi-scale model that you will be proud to take to the local flying field! This plane has great ground handling characteristics, performs most aerobatic maneuvers with ease and with the addition of the flap option, crawls in very slowly on landing. Take your time and enjoy the building process. You will be rewarded from the very first flight!

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

1. Your RV-4 should not be considered as a toy, but rather a sophisticated, working model that functions very much like a full-size airplane. Because of its performance capabilities, the RV-4, if not assembled and operated correctly, could possibly cause injury to yourself or spectators and damage property.

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

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

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

5. You must properly install all R/C and other components so that the model operates properly 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.

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 RV-4 and the part numbers as listed in the Parts List.

For the latest RV-4 updates, you can also check our web site at www.greatplanes.com.

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

In addition to joining an R/C club, we strongly recommend you join the AMA (Academy of Model Aeronautics). AMA membership is required to fly at AMA sanctioned clubs. There are over 2,500 AMA chartered clubs across the country. Among other benefits, the AMA provides insurance to its members who fly at sanctioned sites and events. Additionally, training programs and instructors are available at AMA club sites to help you get started the right way. Contact the AMA at the address or toll-free phone number below:
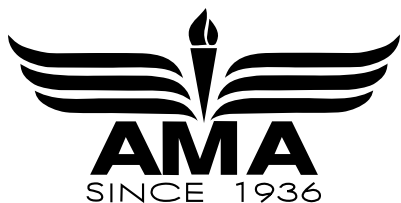
Academy of Model Aeronautics
5151 East Memorial Drive
Muncie, IN 47302-9252
Tele. (800) 435-9262
Fax (765) 741-0057
or via the Internet at http://www.modelaircraft.org

DECISIONS YOU MUST MAKE

This is a list of items required to finish the RV-4 that must be purchased separately. For some of these items there is more than one option which will require a bit of decision making ahead of time. Order numbers (in parentheses) are provided for your convenience.

Radio Equipment

A quality five channel (if you do not plan on flaps you can use a four channel radio) or greater radio system. Seven servos with an output of at least 40 ounce-inches (five servos if you omit the flap option). Two - 12" servo extensions (HCAM2100) for the ailerons, four - 6" servo extensions (HCAM2000) for the flaps and receiver and two "Y" connectors (HCAM250) for the flaps and ailerons.

Engine Recommendations

There are several engines that will work well in the RV-4. Our official engine size recommendation range is .40 to .52 two-stroke or .52 to .70 four-stroke. Engines such as the O.S.® .40 FX (OSMG0540), O.S. .46 FX (OSMG0546), O.S. FS-52 (OSMG0852), O.S. FS-70 (OSMG0870), Super Tigre® GS.40 (SUPG0125), GS .45 ABC (SUPG0150) and the G-.51 (SUPG0154) are all excellent choices for the RV-4. If you select an engine in the upper end of the size range, remember that this is supposed to be a scale model that is intended to fly at scale-like speeds, so prudent throttle management should be practiced.

ADDITIONAL ITEMS REQUIRED

Hardware & Accessories

In addition to the items listed in the **"Decisions You Must Make"** section, the following is a list of hardware and accessories required to finish the RV-4.

❏ 2 - Wheels - 2-1/2" (GPMQ4223)
❏ 1" Tail wheel (GPMQ4241)
❏ Spinner - 2-1/4"
❏ Propellers - See engine manufacturer's recommendation
❏ Fuel line - 3' [914mm] silicone (GPMQ4131)
❏ 10 oz. Fuel tank (GPMQ4104)

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 RV-4. *We recommend **Great Planes Pro**™ CA and Epoxy glue.*

❏ 1 oz. Thin Pro CA (GPMR6002)
❏ 4 oz. Medium Pro CA+ (GPMR6010)
❏ 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], 5/64" [2mm], 3/32" [2.4mm], 1/8" [3mm], 9/64" [3.6mm], 5/32" [4mm],17/64" [6.7mm] and 1/4" [6mm] drill bits
❏ Small Phillips and flat blade screwdrivers (HCAR1040)
❏ Wire cutter (HCAR0630)
❏ Great Planes Plan Protector (GPMR6167) or wax paper
❏ Sanding tools and sandpaper assortment (see Easy-Touch™ Bar Sander section)
❏ Sealing Iron (TOPR2100)
❏ Heat Gun (TOPR2000)
❏ Great Planes tap and drill set (GPMR8108)
❏ 2 - Rolls MonoKote® covering (See page 44)
❏ Trim sheets

Optional Supplies & Tools

Here is a list of optional tools and accessories mentioned in the manual that will help you build the RV-4.

❏ Bisson Muffler (BISG4046)
❏ Pilot Figure (1/5th scale)
❏ Fuel Valve (GPMQ4160)
❏ 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)
❏ Masking Tape (TOPR8018)
❏ CA Debonder (GPMR6039)
❏ CA Applicator tips (GPMR6033)
❏ CA Accelerator (GPMR6034)
❏ R/C-56 Canopy Glue (JOZR5007)
❏ Epoxy Brushes (GPMR8060)
❏ Mixing Sticks (GPMR8055)
❏ Threadlocker (GPMR6060)
❏ Denatured Alcohol (for epoxy clean up)
❏ Felt-Tip Marker (TOPQ2510)
❏ Small metal file
❏ Rotary tool such as Dremel®
❏ Rotary tool reinforced cut-off wheel (GPMR8200)
❏ Curved Tip Canopy Scissors for Trimming Plastic Parts (HCAR0667)
❏ Hook and Loop Material (GPMQ4480)
❏ Dead Center™ Engine Mount Hole Locator (GPMR8130)
❏ Great Planes AccuThrow™ Deflection Gauge (for measuring control throws, GPMR2405)
❏ Great Planes Groove Tube™ (GPMR8140)

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 RV-4, 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"

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

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

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

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

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

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

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

Not all die-cut parts have a name, or their complete name stamped on them, so refer to the die drawings on page 5 and 6 for identification. When it's time to remove the parts from their die sheets, if they are difficult to remove, do not force them out. Instead, use a sharp #11 blade to carefully cut the part from the sheet, then lightly sand the edges to remove any slivers or irregularities. Save some of the larger leftover pieces of wood.

Common Abbreviations

Fuse = Fuselage
LE = Leading Edge (front)
TE = Trailing Edge (rear)
Stab = Stabilizer
" = Inches
Elev = Elevator
LG = Landing Gear
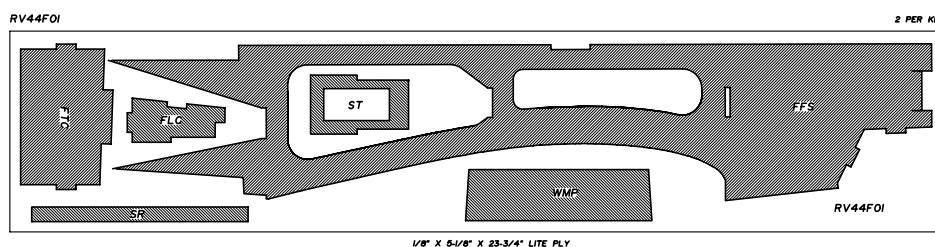Ply = Plywood

Types of Wood
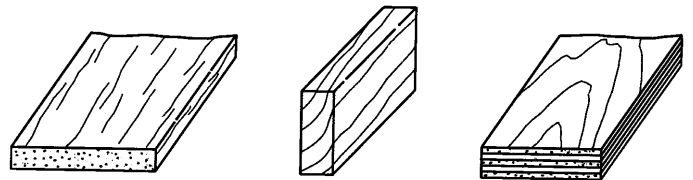
Balsa   **Basswood**   **Plywood**

Metric Conversions								
			1/4"	=	6.4 mm	6"	=	152.4 mm
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			

Inch Scale

0"   1"   2"   3"   4"   5"   6"   7"

0   10   20   30   40   50   60   70   80   90   100   110   120   130   140   150   160   170   180

Metric Scale

DIE-CUT PATTERNS
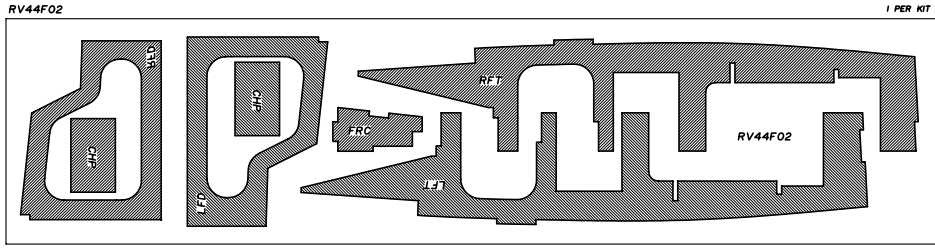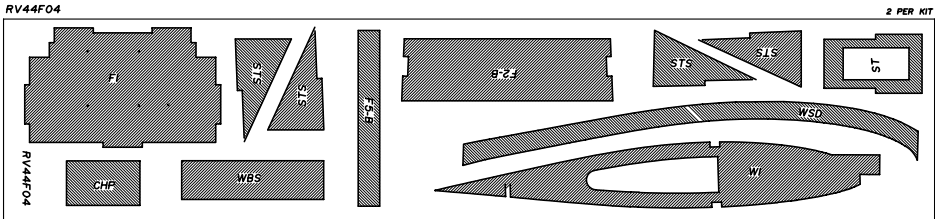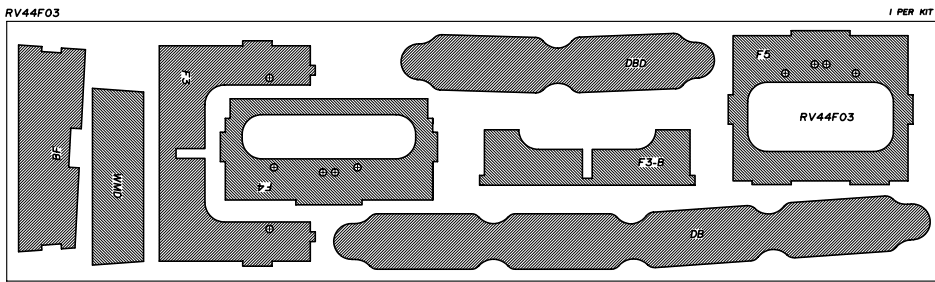
RV44F0I   2 PER KIT

ST

FLC

ZFS

SR

WMF

RV44F0I

1/8" X 5-1/8" X 23-3/4" LITE PLY

DIE-CUT PATTERNS

RV44F02 — 1 PER KIT

RV44F02

1/8" X 5-3/4" X 23-3/4" LITE PLY

RV44F04 — 2 PER KIT

RV44F04

1/8" X 5-1/8" X 23-3/4" LITE PLY

RV44F03 — 1 PER KIT

RV44F03

1/8" X 6-5/8" X 23-3/4" LITE PLY

RV44W02 — 2 PER KIT

RV44W02

3/32" x 4" x 30" BALSA

RV44W0I — 2 PER KIT

RV44W0I

3/32" X 4" X 30" BALSA

RV44W04 — 2 PER KIT

RV44W04

1/8" X 4" X 30" BALSA

RV44F06 — 1 PER KIT

RV44F06

1/8" X 4" X 30" BALSA

RV44F05 — 2 PER KIT

RV44F05
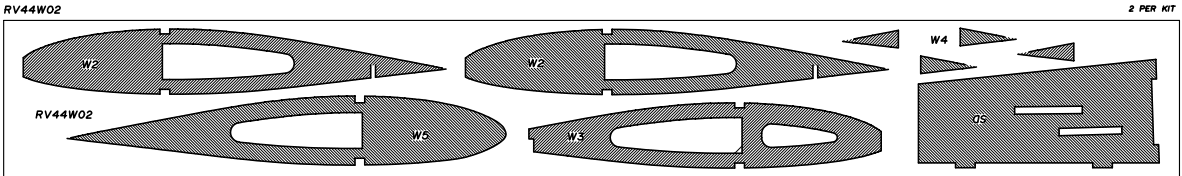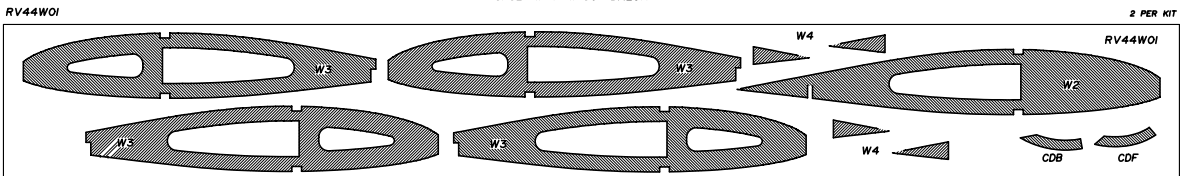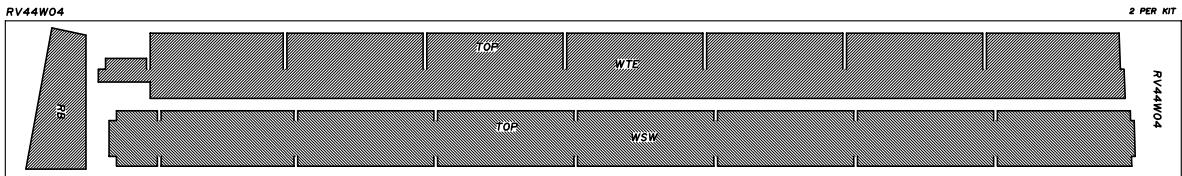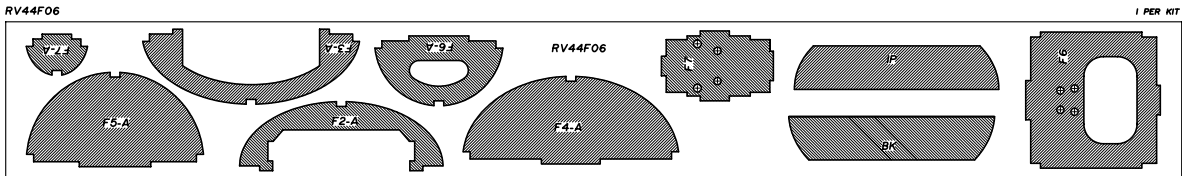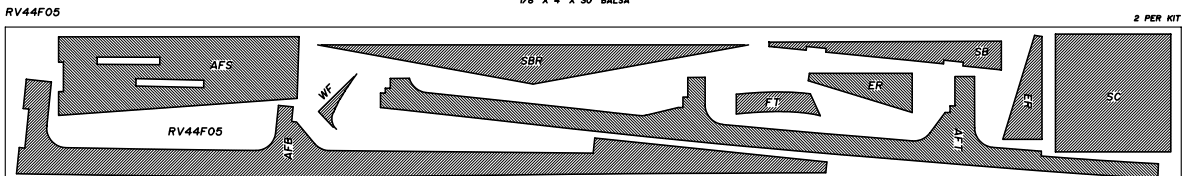
1/8" X 4" X 30" BALSA

Build the Stab & Elevator

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

❏ 2. Position the wing 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. Locate the two die-cut 1/8" [3mm] **balsa stab braces (SBR)** and two die-cut 1/8" [3mm] balsa **stab centers (SC)**. Glue the parts together to form the 1/4" [6mm] balsa stab brace and the 1/4" [6mm] stab center.
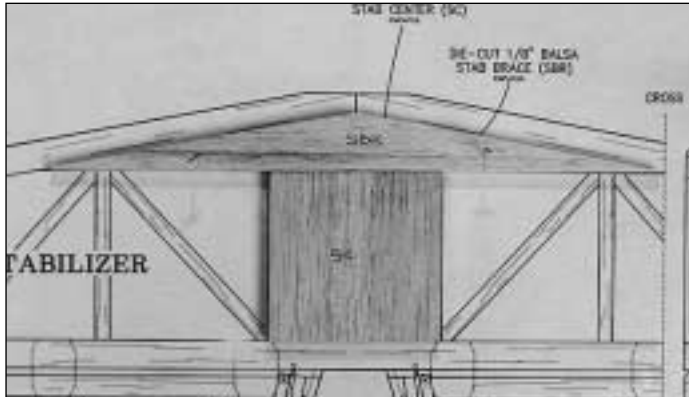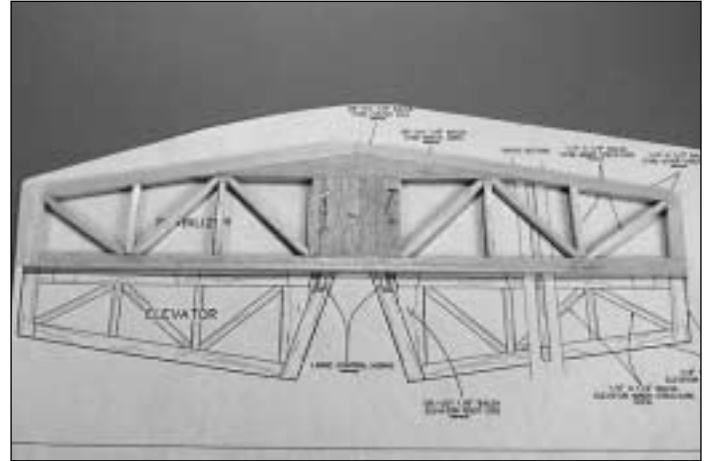

❏ 4. Pin the balsa stab brace (SBR) over the plans. Glue the stab center (SC) to the balsa stab brace (SBR).
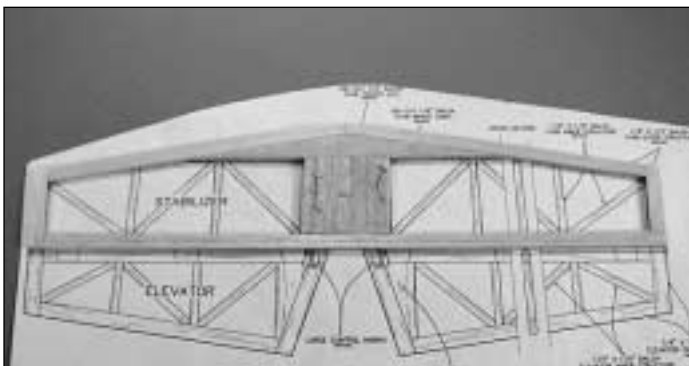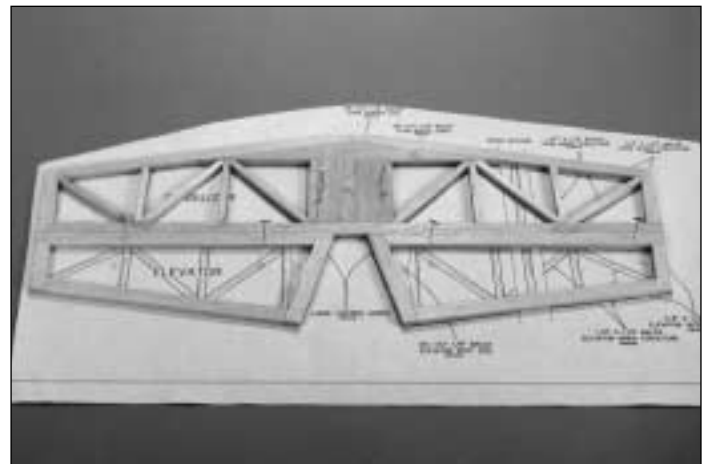

❏ 5. Locate the 1/4" x 1/2" x 30" [6 x 13 x 750mm] balsa sticks. Cut them to size as shown on the plan to form the **stab outer structure**. Pin them to the building board over the plans. Glue them together forming the stab outer structure.

❏ 6. Locate the 1/4" x 1/4" x 30" [6 x 6 x 750mm] balsa sticks. Cut them to size as shown on the plan. Then glue them in place to form the **stab inner structure**.

❏ 7. Cut the 1/4" x 1/2" x 30" [6 x 13 x 750mm] balsa sticks to size as shown on the plan. Then glue them in place to form the **elevator outer structure**.
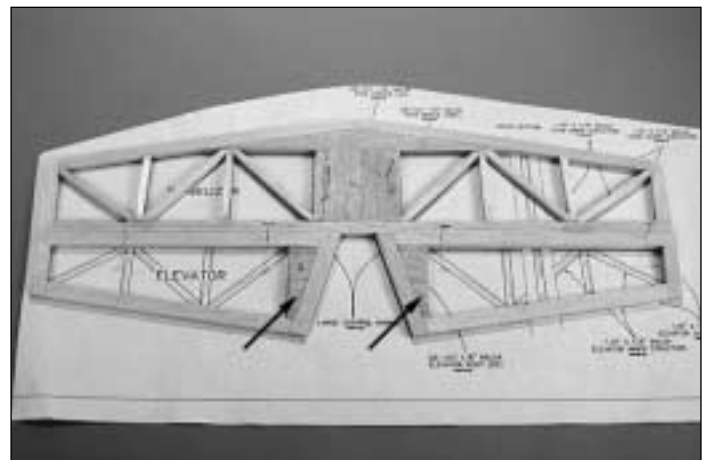
❏ 8. Locate four die-cut 1/8" [3mm] balsa **elevator roots (ER)**. Glue them together to form two 1/4" [6mm] elevator roots. Glue one in place in each elevator half as shown on the plan.

❏ 9. Cut the 1/4" x 1/4" x 30" [6 x 6 x 750mm] balsa sticks to size as shown on the plan. Then glue them in place to form the **elevator inner structure**.
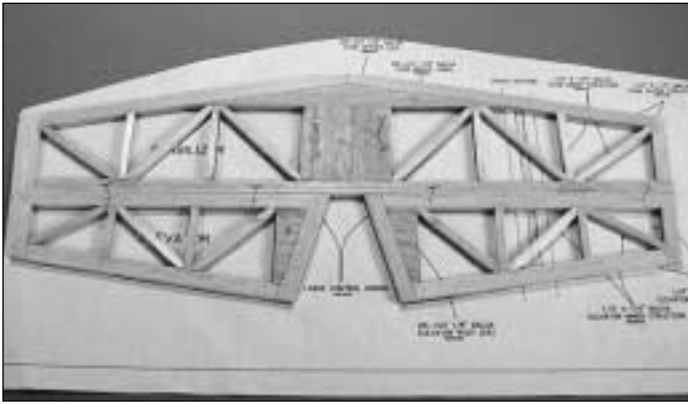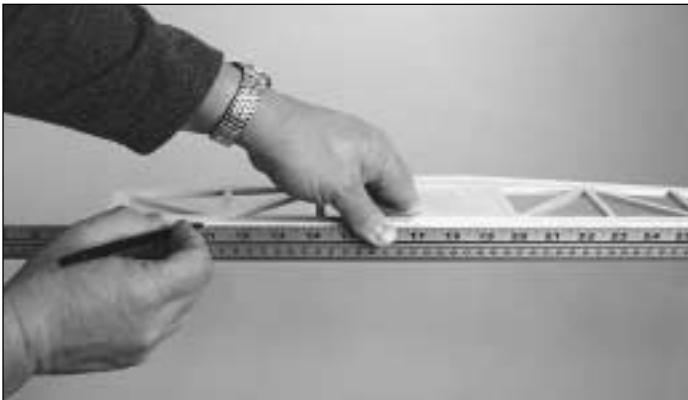
❏ 10. Remove the parts from the plan. Sand the control surfaces smooth and shape the L.E. of the stab and the T.E. of the two elevator halves to match the cross section shown on the plan. *Do not shape the L.E. of the two elevator halves.*

❏ 11. Locate the center of the T.E. of the stab. Place a T-pin on the center at each end of the stab. Lay a straight edge against the pins and draw a center line on the T.E of the stab. Repeat this procedure for each elevator half.

❏ 12. Using the plans as your reference, mark the location for the hinges on the T.E. of the stab and the L.E. of the two elevator halves.

CUT HINGE SLOT
WITH HOBBY KNIFE
AND #11 BLADE
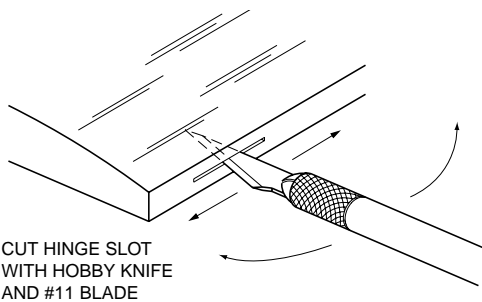
❏ 13. Cut the hinge slot in the stab and elevator using a #11 blade inserted in your hobby knife. Begin by **carefully** cutting a very shallow slit at the hinge location to accurately establish the hinge slot. Make three or four more cuts, going a little deeper each time. As you cut, slide the knife from side to side until the slot has reached the proper depth and width for the hinge.

DRILL A 3/32" HOLE
1/2" DEEP, IN CENTER
OF HINGE SLOT
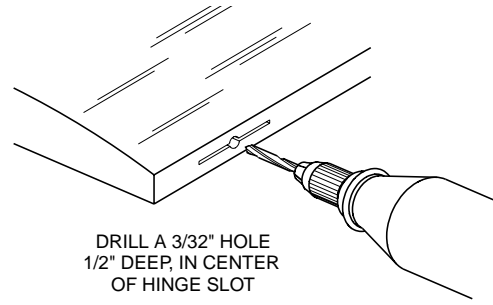
❏ 14. Drill a 3/32" [2.4mm] hole 1/2" [13mm] deep in the center of the hinge slot. This will help the glue to better saturate the hinge and the wood when the hinges are installed.

EXPERT TIP

If you are like most modelers, cutting slots for the hinges is time consuming and tedious. A really great time saver and accurate tool to make this job very simple is the **Great Planes Slot Machine**. This tool is available in a corded 110V AC. (GPMR4010) as well as a cordless version (GPMR4011). With this tool you can cut hinge slots in a matter of seconds.

1. After marking the location for the hinge, place the edge of the cutting blade on the mark and use a little pressure to set the teeth into the wood.

2. Squeeze the trigger on the Slot Machine and the teeth will cut a perfectly sized width and depth for today's CA type hinges. Optional blades (GPMR4016) are available to cut slots for the nylon type hinges as well.
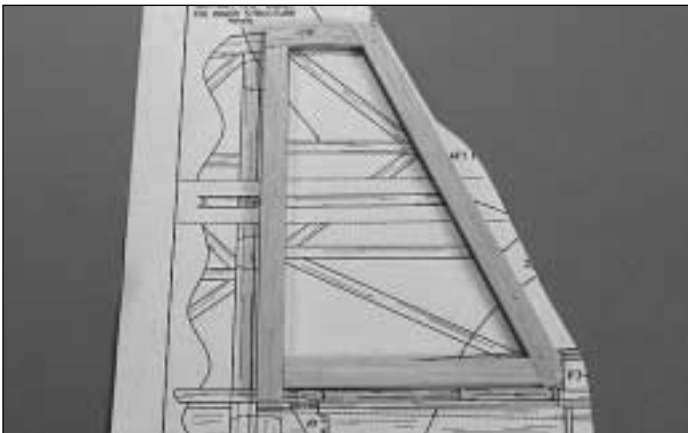
❏ 15. Bevel the L.E. of the elevator halves as shown on the plan cross section.

❏ 16. Trial fit the stab, hinges and elevator halves together. **Important: Do not glue the hinges in place. This will be done <u>after</u> the model has been covered.**
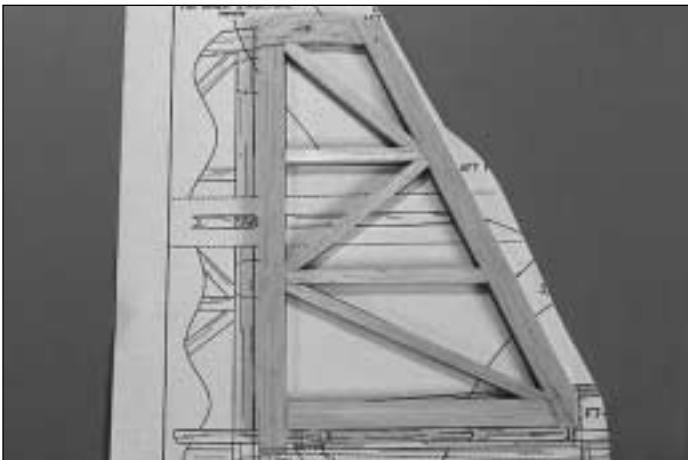
Build the Fin & Rudder
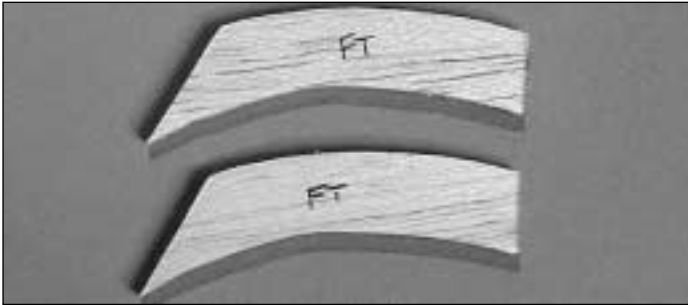
❏ 1. Locate the two die-cut 1/8" [3mm] balsa **fin tops (FT)**. Glue them together forming the 1/4" [6mm] balsa fin top.


❏ 2. Pin the fin top over the plan. Assemble the fin using the 1/4" x 1/2" x 30" [6 x 13 x 750mm] balsa sticks, cuttting them to size as shown on the plan.

❏ 3. Cut the 1/4" x 1/4" x 30" [6 x 6 x 750mm] balsa sticks to size as shown on the plan. Then glue them in place to form the **fin inner structure**.

❏ 4. Locate the two die-cut 1/8" balsa **rudder bases (RB)**. Glue them together forming the 1/4" balsa rudder base.

❏ 5. Pin the rudder base over the plan. Construct the **rudder outer structure** using the 1/4" x 1/2" x 30" [6 x 13 x 750mm] balsa sticks. Cut them to size as shown on the plan Then glue them in place.
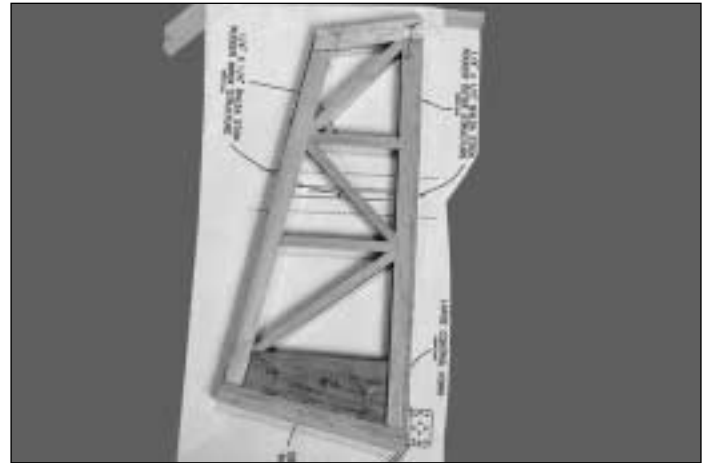
❏ 6.Cut the 1/4" x 1/4" x 30" [6 x 6 x 750mm] balsa sticks to size as shown on the plan to form the **rudder inner structure**.

❏ 7. Remove the parts from the plan. Sand the control surfaces smooth and shape the L.E. of the fin and the T.E. of the rudder to match the cross section shown on the plan. *Do not shape the L.E. of the rudder.*

❏ 8. Locate a center line on the T.E. of the fin. Follow the same procedure used for doing this on the stab and elevator.

❏ 9. Using the plans as your reference, mark the location for the hinges on the T.E. of the fin and the L.E. of the rudder.

❏ 10. Cut the hinge slots using the same procedure used for the stab and elevator.

❏ 11. Bevel the L.E. of the rudder as shown on the plan cross section.
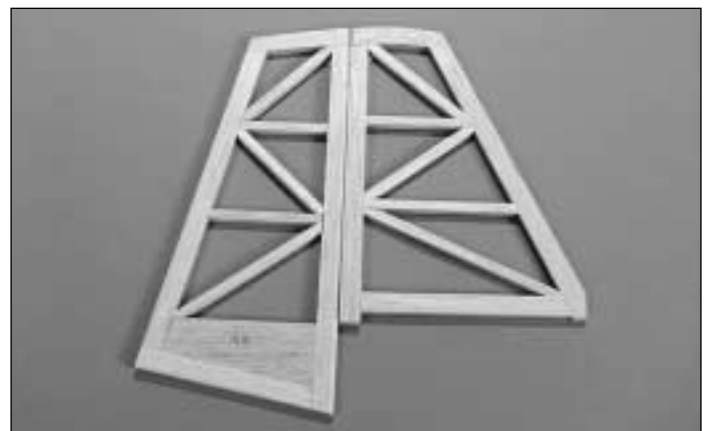
❏ 12. Trial fit the fin, hinges and rudder halves together. **Important: Do not glue the hinges in place. This will be done <u>after</u> the model has been covered.**
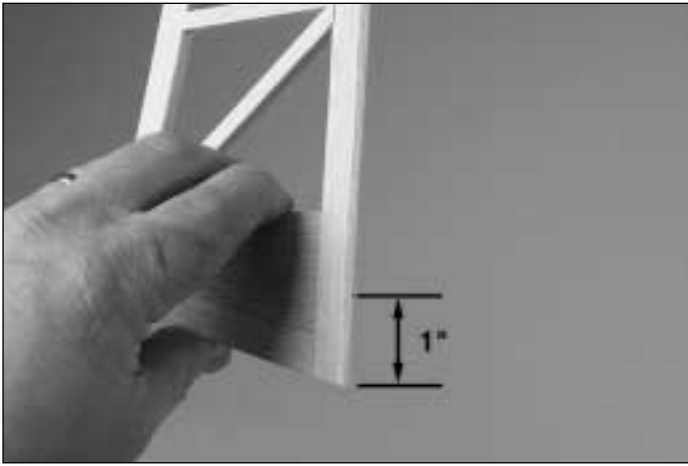
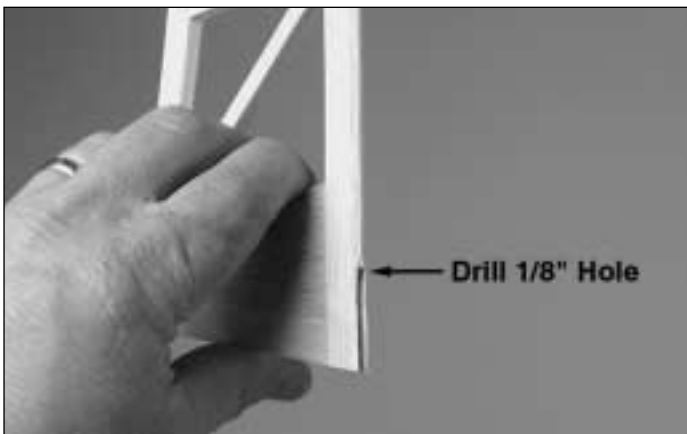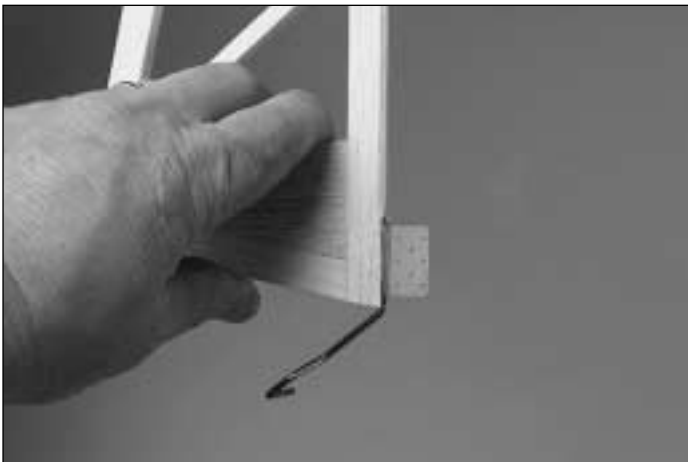❏ 13. Remove the rudder from the fin. Measure up from the bottom of the rudder 1" [25mm] and make a mark on the leading edge of the rudder.

❏ 14. On the mark drill a 1/8" [3mm] hole 3/4" [19mm] deep into the leading edge of the rudder. From the bottom of the rudder up to the hole you have drilled, cut a groove 1/8" [3mm] wide. **Hint:** A perfect tool for this is the Great Planes Groove Tube (GPMR8140).


❏ 15. Locate the **tailwheel wire** assembly. Trial fit it into the hole and slot. When you are satisfied with the fit, mark the location for the nylon bushing on the fin. Cut a slot in the fin to accept the bushing. Trial fit the rudder with the tailwheel wire into the fin. **Do not glue the nylon bushing in place. This will be done <u>after</u> the model has been covered.**

BUILD THE WING

Build the Wing Panels

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

❏ 2. Locate the left wing panel on the plan. You may find it helpful to cut the plans in half, making them a more manageable size to pin to your building board.

❏ 3. Position the left wing plan flat on the building board. Cover the plan with Great Planes Plan Protector or wax paper so glue will not adhere to it.
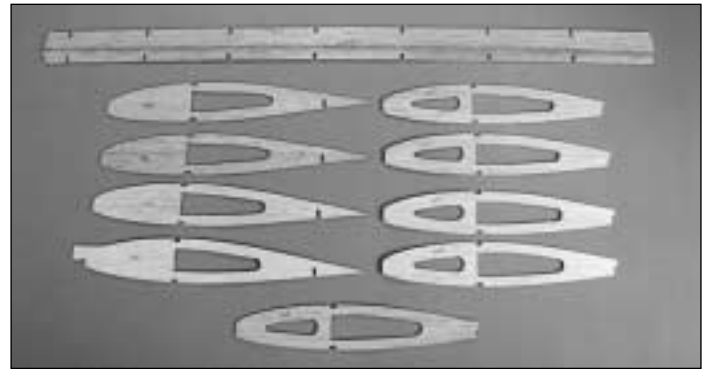
❏ ❏ 4. Locate the die-cut 1/8" [3mm] balsa **wing shear web (WSW)**, three die-cut 3/32" [2.4mm] balsa **W2 ribs**, five die-cut 3/32" balsa **W3 ribs** and one die-cut 3/32" [2.4mm] **W1 rib**.

Note: *In the following steps it is* ***important*** *to pay careful attention to assemble the parts exactly as instructed. Failure to do so* <u>*will*</u> *result in a wing that is not straight.*
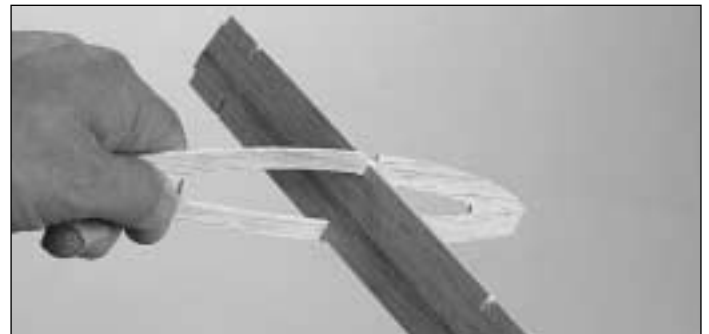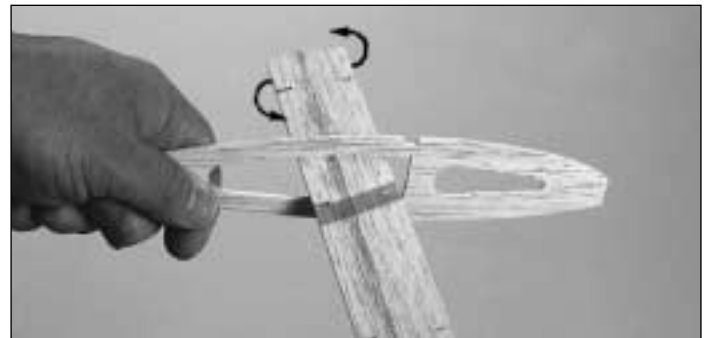
❏ ❏ 5. Locate the die-cut 1/8" [3mm] balsa **wing shear web (WSW)**. Insert the end of WSW into one of the W3 ribs.

Position the rib over the third set of notches and then twist it into the notch. <u>Do not</u> glue them to each other at this time.

❏ ❏ 6. Using your plan as your guide, install the remaining W3 ribs into the proper notches. <u>Do not</u> glue them in place at this time.

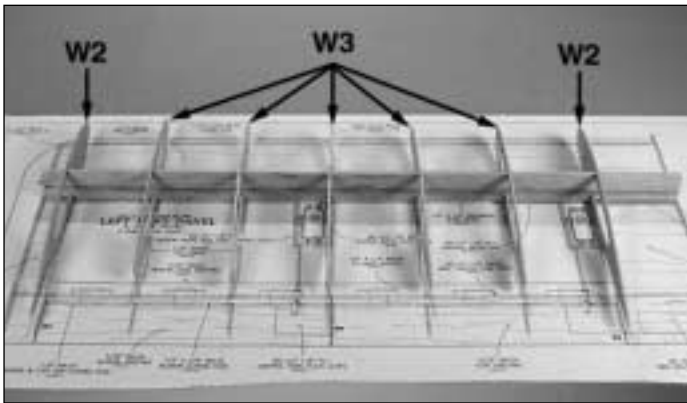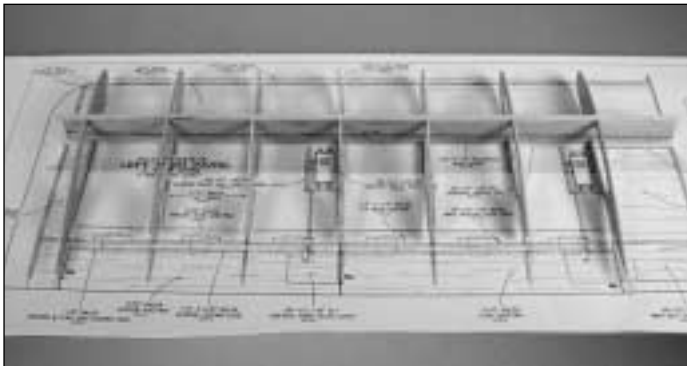❏ ❏ 7. Install two W2 ribs at the location shown on the plan. <u>Do not</u> glue them at this time.

❏ ❏ 8. Locate two 1/8" x 1/4" x 30" [3 x 6 x 762mm] basswood **wing spars**. Cut them to a length of 26-1/4" [667mm]. Place one of the spars at the location shown on the plan. With all of the ribs now positioned on the wing shear web (WSW), place WSW and the ribs onto the basswood wing spar. Then place the top wing spar into the notches. Do not glue the assembly together at this time.
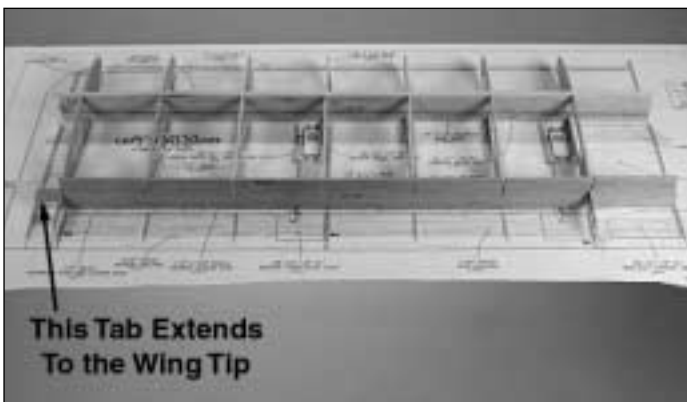
❏ ❏ 9. Locate the die-cut 1/8" [3mm] balsa **wing trailing edge (WTE)**. Insert it into the notches at the trailing edge of each of the ribs. Be sure that the tab end of WTE is at the wingtip. <u>Do not</u> glue them in place at this time.
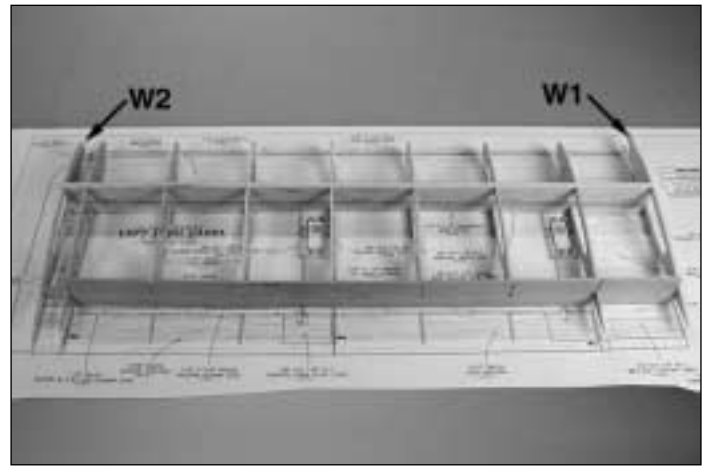
❏ ❏ 10. Position the remaining W2 rib at the wingtip and the W1 rib at the wing root. **Note:** Refer to the wing root detail cross-section for proper orientation of the W1 rib. When you are satisfied with the fit of all of the wing components, glue them together with thin CA.
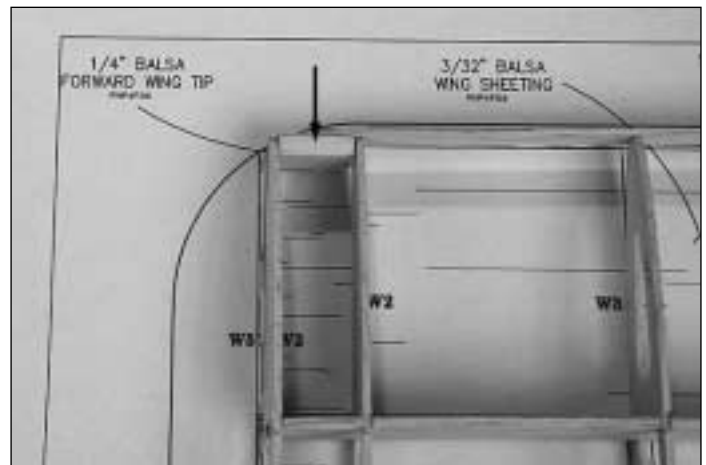
❏ ❏ 11. Locate the 5/8" x 1/4" x 24" [15.9 x 6 x 457mm] balsa stick. Cut a piece to fit between the two W2 ribs. This will be the **forward balsa wing tip**. Glue it in place.
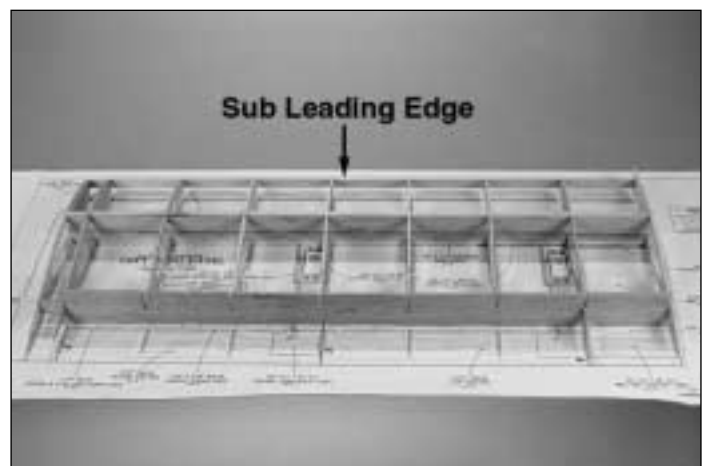
❏❏ 12. Locate the 1/16" x 1/2" x 30" [1.6 x 13 x 762mm] balsa **sub leading edge**. Use a butt joint at rib W1 and then glue it in place on the front of each of the ribs. After gluing it in place, lightly sand the top and bottom of the sub leading edge with a sanding bar making sure it matches the shape of the ribs.
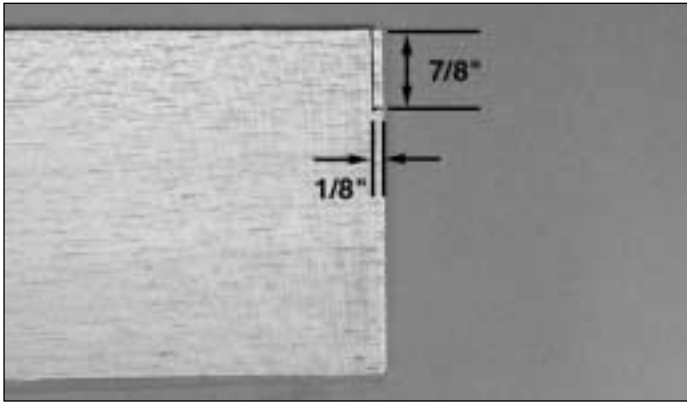
❏ ❏ 13. Locate a 3/32" x 4" x 30" [2.4 x 102 x 762mm] balsa sheet. Cut a notch on the end of the sheet 7/8" [22.2mm] from the L.E. and 1/8" wide.

Align Sheeting on Spar

❏ ❏ 14. Glue the 3/32" x 4" x 30" [2.4 x 102 x 762mm] balsa sheet in place on the top of the wing. Align the sheet with the trailing edge and on top of the wing spar when gluing it to the wing.

Trailing Edge Sheet
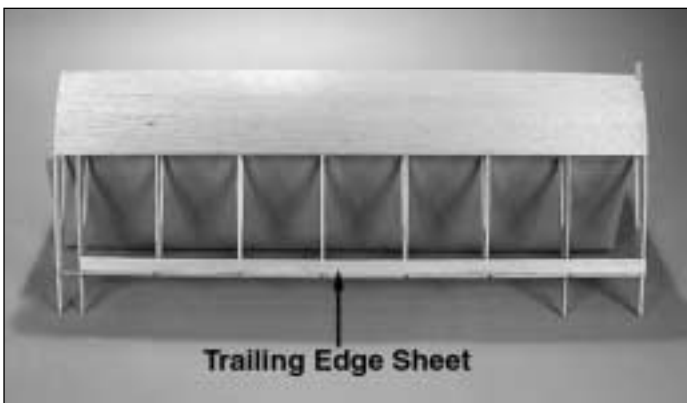
❏ ❏ 15. Glue the 3/32" x 5/8" x 30" [2.4 x 15.9 x 762mm] balsa wing trailing edge sheet in place. Now would be a good time to add some thin CA to all joints to be sure that everything is glued together well.

❏ ❏ 16. Turn the wing over and sheet the bottom of the wing the same way you did the top of the wing. **NOTE:** You do not need to cut the notch in the 3/32" x 4" x 30" [2.4 x 102 x 762mm] balsa sheet as you did for the top of the wing.

❏ ❏ 17. Glue the 3/32" x 5/8" x 30" [2.4 x 15.9 x 762mm] balsa wing trailing edge sheet in place on the bottom of the wing.
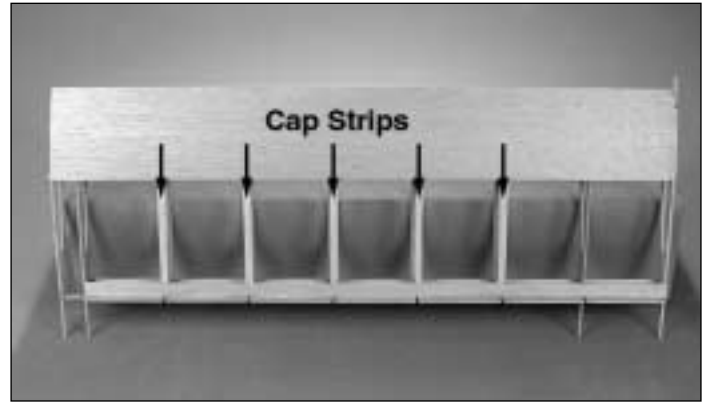

Cap Strips

❏ ❏ 18. Locate the 3/32" x 5/16" x 24" [2.4 x 7.9 x 610mm] balsa **cap strips**. Cut the cap strips to fit between the forward sheeting and the trailing edge sheeting. Use the plan as your guide to identify the ribs that should be cap stripped. Cap strip both the top and the bottom of the wing.

❏ ❏ 19. Sheet the bottom of the wing between the outboard W2 ribs from leftover 3/32" x 4" x 30" [2.4 x 102 x 762mm] balsa sheet. Extend the sheeting 3/4" [19mm] beyond the end of the ribs.
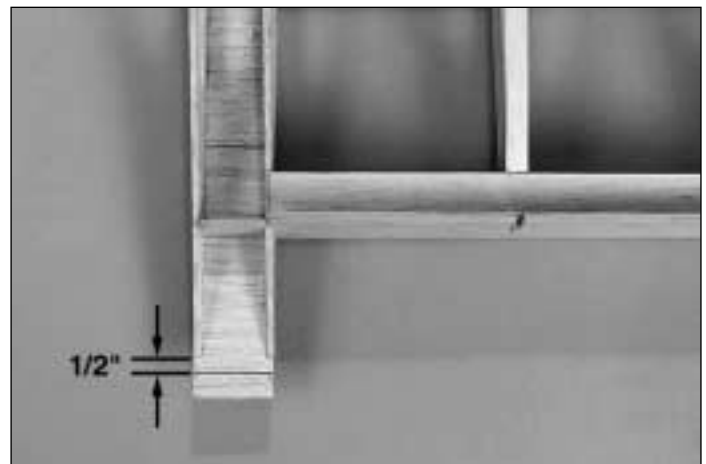
❏ ❏ 20. After the sheeting is glued in place make a line across the sheet, 1/2" [13mm] from the trailing edge of the W2 ribs.

❏ ❏ 21. Using a sanding bar, bevel the end of the balsa sheeting to match the wing rib. Sand from the end of the sheeting up to the line you drew.
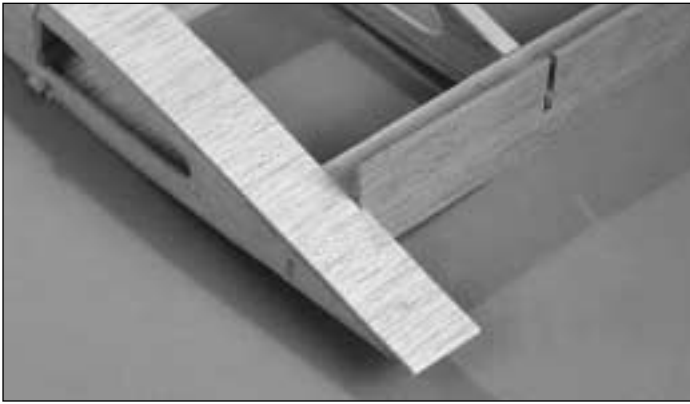
❏ ❏ 22. Sheet the top of the wing between the outboard W2 ribs from leftover 3/32" x 4" x 30" [2.4 x 102 x 762mm] balsa sheet.

❏ ❏ 23. Locate the 5/8" x 1-3/4" x 7" [15.9 x 44 x 178mm] balsa block. Cut it into two 3-1/2" [89mm] long pieces.
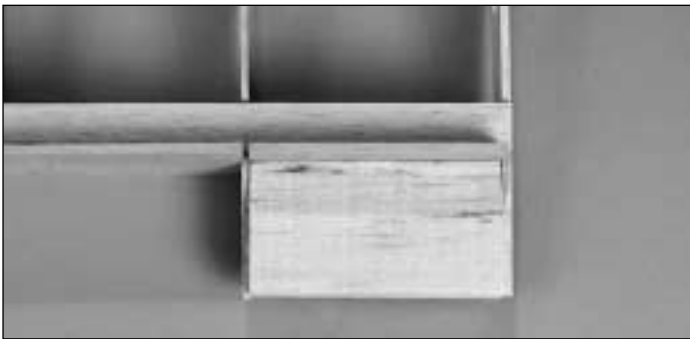
❏ ❏ 24. Fit one of the balsa blocks between rib W1 and W2 at the trailing edge of the rib.
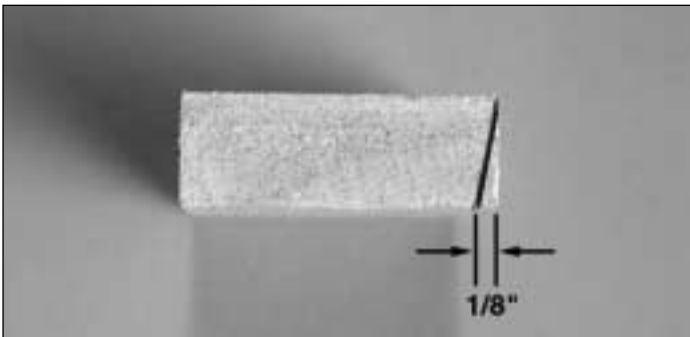
❏ ❏ 25. On the block make a mark 1/8" [3mm] from the end. Draw a line from that mark to the corner as shown in the photograph.

❏ ❏ 26. Sand the end of the block to the line you just made.
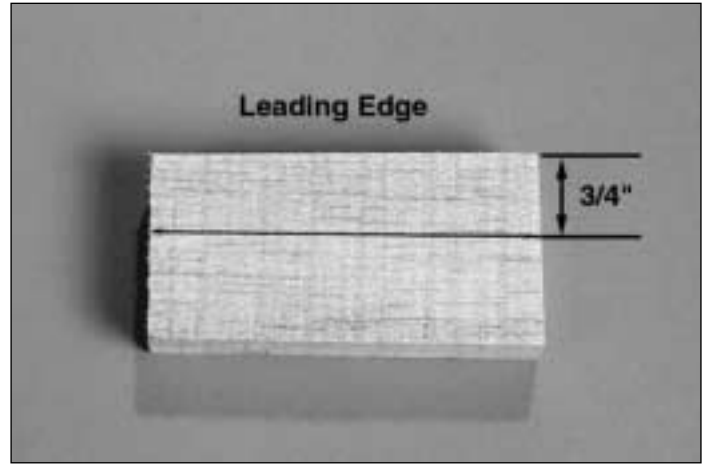
Leading Edge

❏ ❏ 27. From the end of the block where you sanded the taper into the block, measure forward 3/4" [19mm] from the leading edge and draw a line across the block.
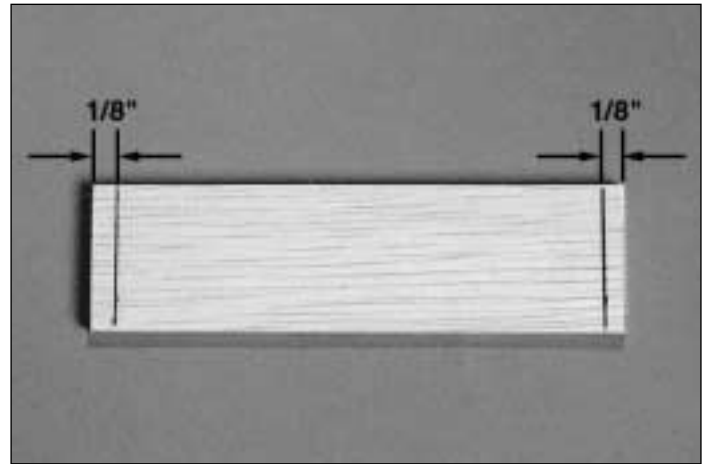
❏ ❏ 28. Locate the die-cut 1/8" plywood **WBS**. On each end measure in 1/8" [3mm] and draw a line across WBS.
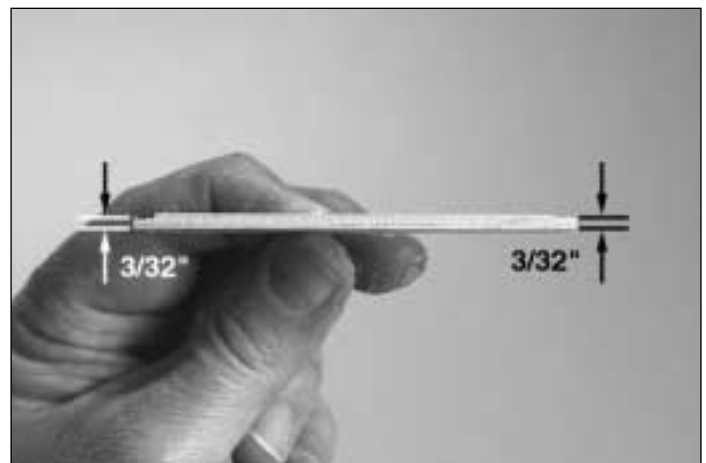
❏ ❏ 29. From the line out to the edge, sand the plywood to a thickness of 3/32" [2.4mm].
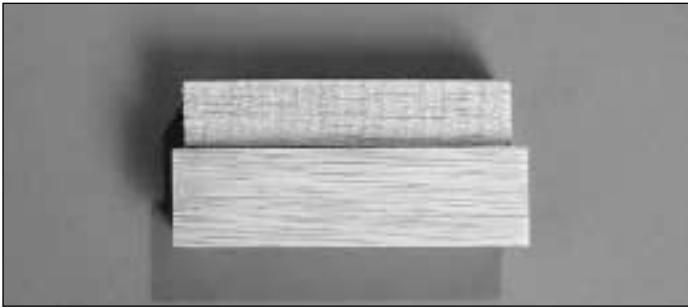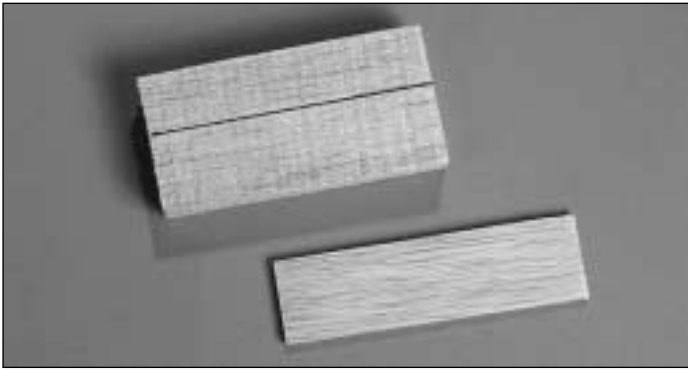
❏ ❏ 30. Glue WBS to the balsa block between the end of the block and the line you have made on the balsa block. Position WBS so that it extends equally over each end of the balsa block.
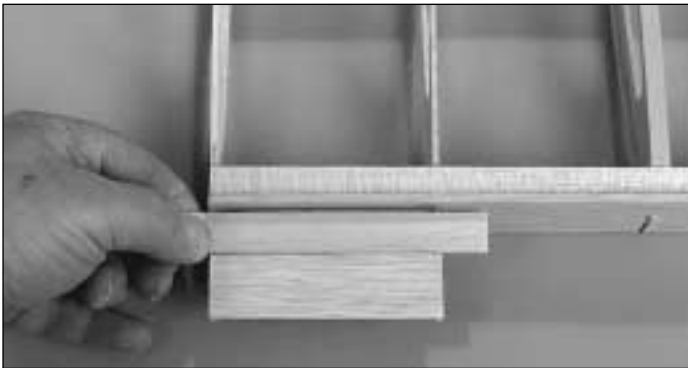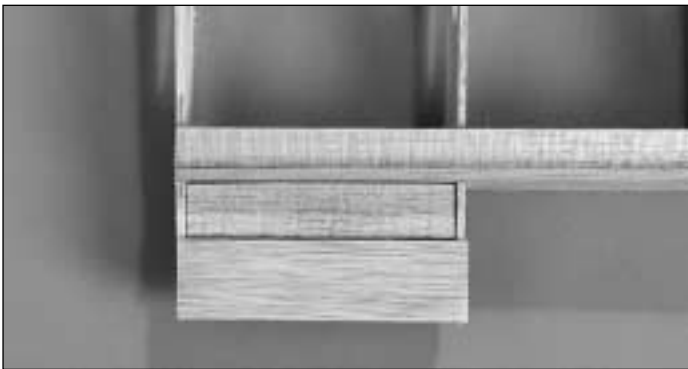
❏ ❏ 31. Trial fit WBS and the balsa block in place between the W2 ribs at the inboard of the wing. Using a leftover piece of 3/32" [2.4mm] sheet, lay it in place across the W2 ribs and the balsa block. Check to be sure the sheeting and WBS match in thickness. If WBS is slightly high, sand a bit more from the sheeting as indicated in step 29. Note: Make sure you work from the bottom of the wing.

❏ ❏ 32. One you are satisfied with the fit of the balsa block and WBS, glue it in place between the W1 and W2 ribs.
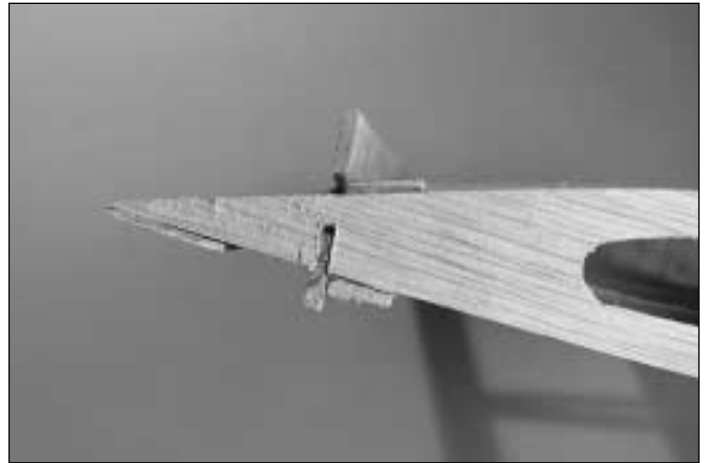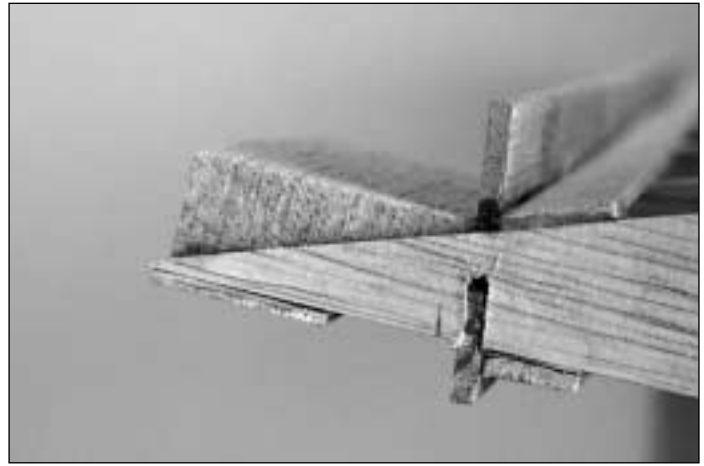
❏ ❏ 33. When the balsa block is glued in place you will see that the block extends well beyond the W2 rib. Use a razor plane to shape the block to match the shape of the W2 rib. If you do not have a hobby razor plane you can cut this block down with a long bladed knife or a sanding block. **Hint:** If you do not currently own a hobby plane it really is one of the most worthwhile tools you can own. It is worth a trip to the hobby shop to purchase one.
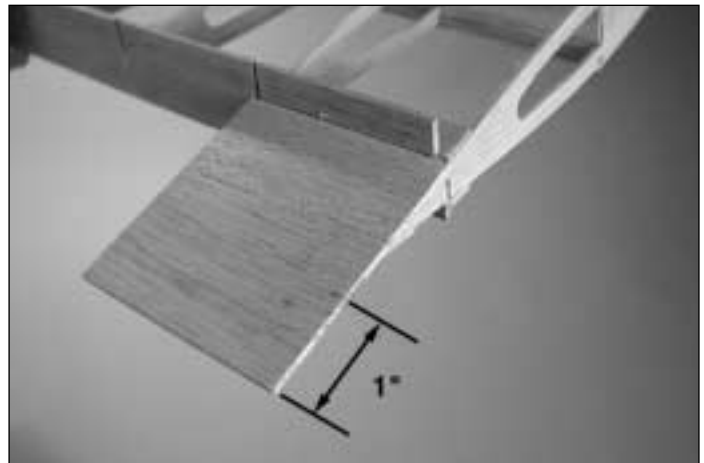
❏ ❏ 34. Sheet the top of the wing between W1 and W2. Sheet the area from the wing trailing edge (WTE) to 1" [25mm] beyond the end of the ribs.
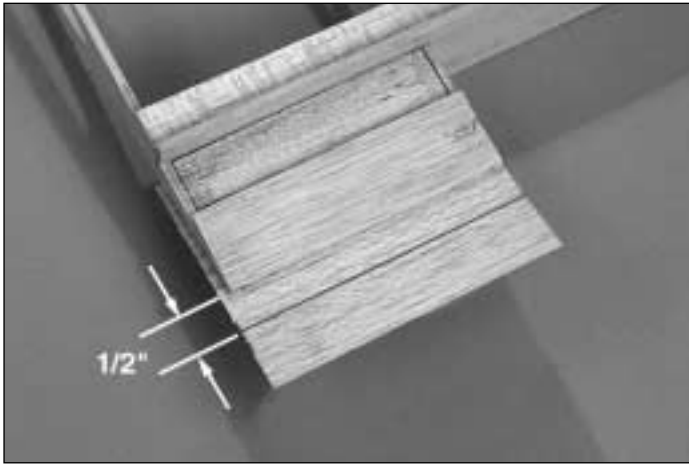
❏ ❏ 35. Turn the wing over on the bench so that you are looking at the bottom of the wing. From the end of each of the ribs measure back 1/2" [13mm] and draw a line across the sheeting. Cut the sheeting on this line.
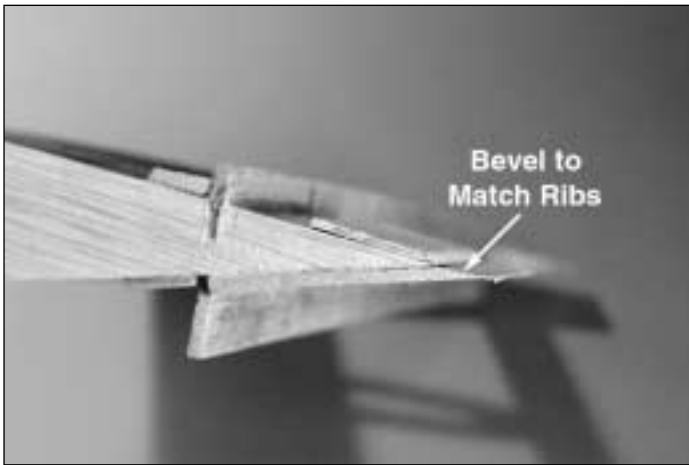
Bevel to Match Ribs

❏ ❏ 36. Using a sanding bar, bevel the sheeting to match the ribs.

Cross-Grain the Sheeting in this Area

❏ ❏ 37. From leftover 3/32" [2.4mm] balsa sheeting, apply balsa onto the upper wing skin from the root of the wing up to WBS. When applying the balsa sheet it must be installed cross grain. This will provide much more strength to the trailing edge of the wing.

❏ ❏ 38. Sheet the area between WTE and WBS, gluing 3/32" [2.4mm] balsa sheet to the balsa block.
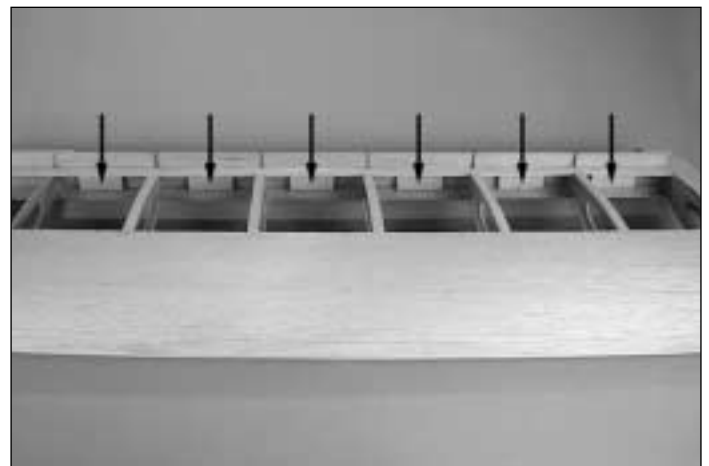
❏ ❏ 39. Locate the 5/8" x 1/4" x 18" [15.9 x 6 x 457mm] balsa stick that is used for the **CA hinge blocks**. From the 18" stick cut six blocks 1-1/2" [38mm] long. Glue each of the blocks in place inside the wing on the backside of the wing trailing edge. Refer to your plan for the proper placement of each of the blocks.

1/8"
3/8"
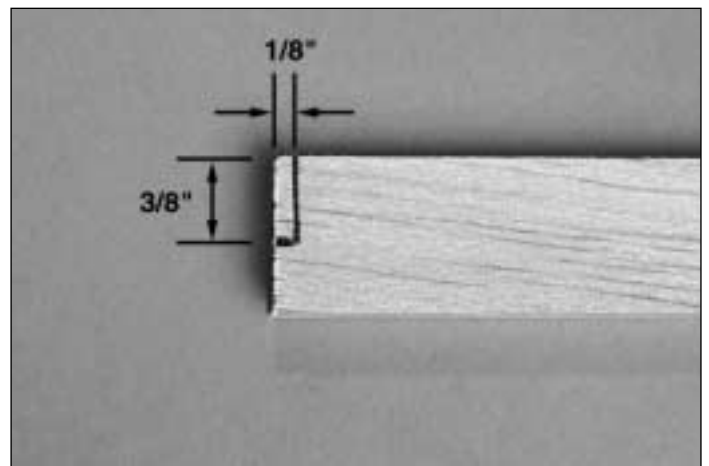
❏ ❏ 40. Locate the 1/4" x 3/4" x 30" [6 x 19 x 762mm] balsa **leading edge**. On one end make a line 1/8" [3mm] from the end, extending 3/8" [9mm] from the edge of the leading edge. Cut this area away.
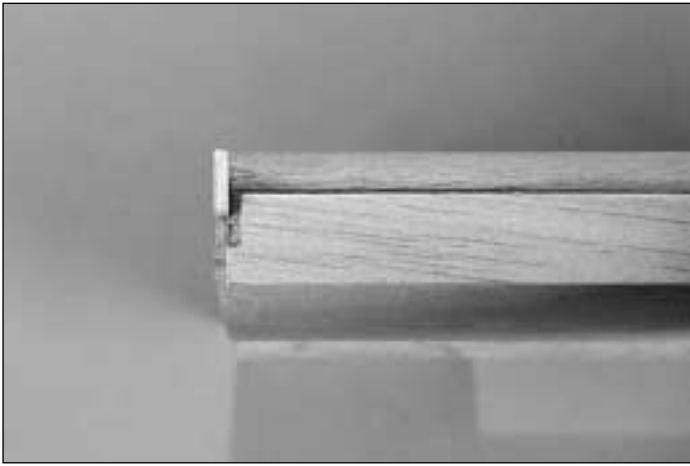
❏ ❏ 41. Fit the leading edge in place on the balsa sub leading edge. The notch you just cut from the leading edge should fit around the tab extending from W1. Once you are satisfied with the fit, glue the leading edge to the balsa sub leading edge on the front of the wing.
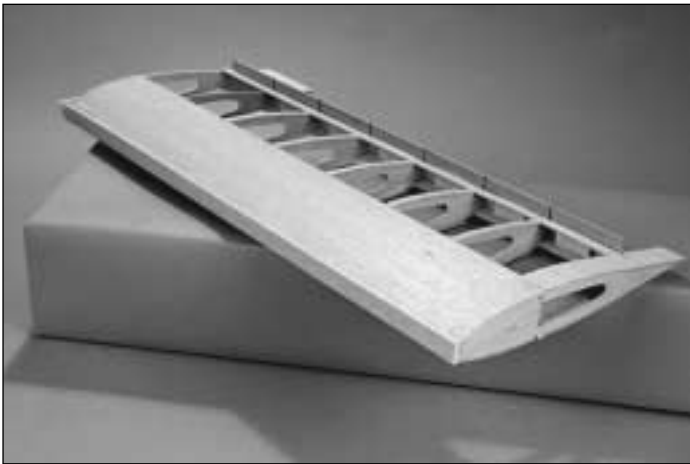
❏ ❏ 42. Trim the ends of the leading edge to be flush with the ends of the wing.

Cut Line and Gap
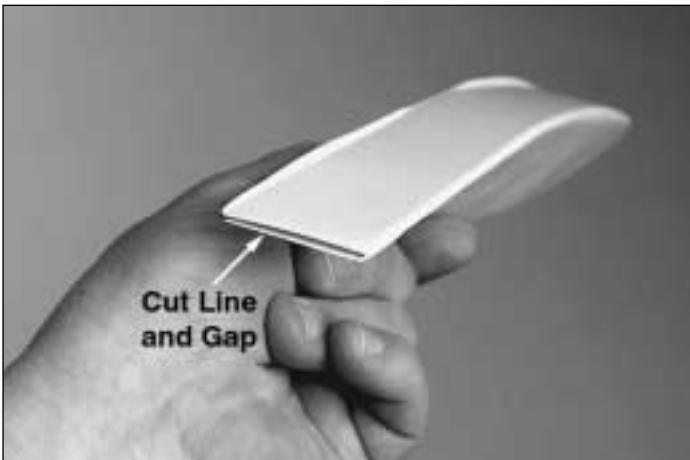
❏ ❏ 43. Locate the left ABS plastic wing tip. Trim it on the cut lines. When cutting the trailing edge of the wig tip there is a cut between the top and bottom of the wingtip.
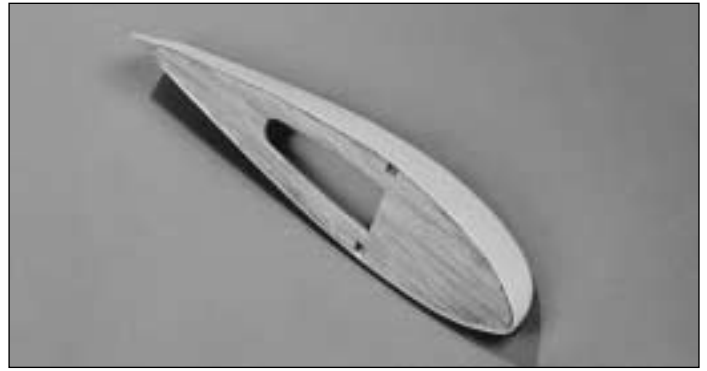
❏ ❏ 44. Locate rib W5 and insert it into the plastic wing tip. Position the rib to be flush with the end of the wing tip then glue it in place with thin CA. At the trailing edge of the plastic wing tip, the top and bottom of the plastic wing tip will need to be glued together with thin CA.

❏ ❏ 45. Place the wing tip onto the end of the wing. The notches in W5 should fit onto the wing spars that are extending from the wing. **Important:** You now need to make a decision on how you wish to do the final installation of the wing tip. You can permanently glue the wing tip in place on the end of the wing or you can tack glue it in place by applying a drop of CA to a few spots on the wing tip and the wing. If you choose to tack glue the wing tip in place it can be removed, making it easier to apply your covering. This will also allow you to paint the wing tip without it being attached to the wing. After the covering is applied and the wing tip is painted, you can permanently glue the wing tip in position. Either way will work. The choice is left to your personal preference.

❏ ❏ 46. Sand the leading edge of the wing to shape as shown on the wing cross section of your plan. Sand the wing top and bottom to match the ABS wing tip.

Build the Ailerons & Flaps

❏ ❏ 1. Locate a 3/32" x 4" x 24" [2.4 x 102 x 610mm] balsa sheet. Cut it into two pieces 2" wide and cut each piece to a length of 21-3/16" [537.8mm]. These will become the top and bottom aileron/flap sheeting.
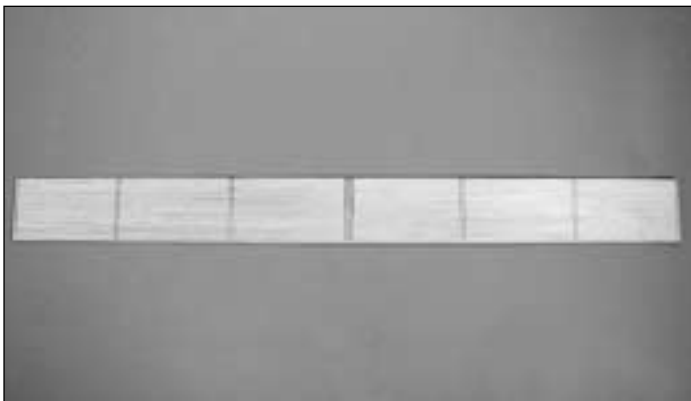
❏ ❏ 2. Using the plan as your guide, mark the location of each of the W4 ribs onto one of the aileron/flap sheets.
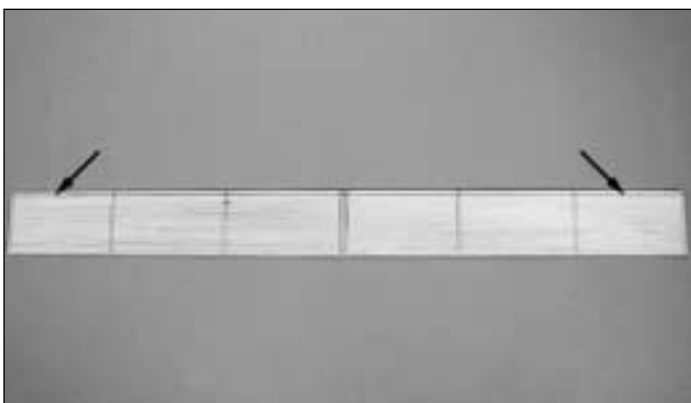
❏ ❏ 3. On one edge of the sheeting, draw a line the length of the sheeting, 1/8" [3mm] from the edge of the sheet.
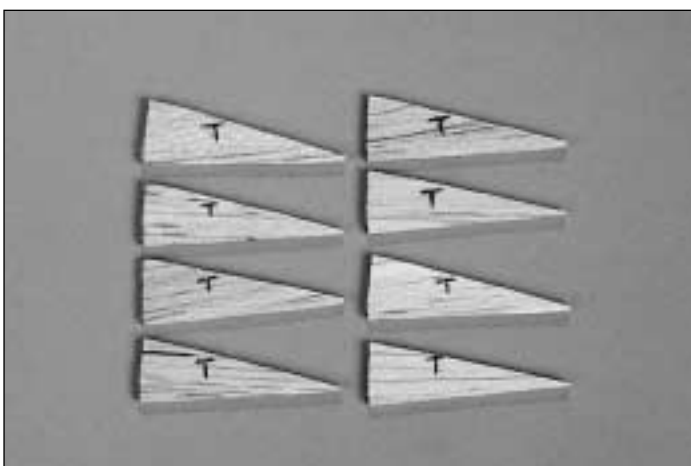
❏ ❏ 4. Locate the wing plan. On the wing plan there is a pattern of the W4 ribs with the top of the rib being shown on this drawing. Find the die-cut ribs and mark each of the ribs with a "T" to indicate the top of the rib.
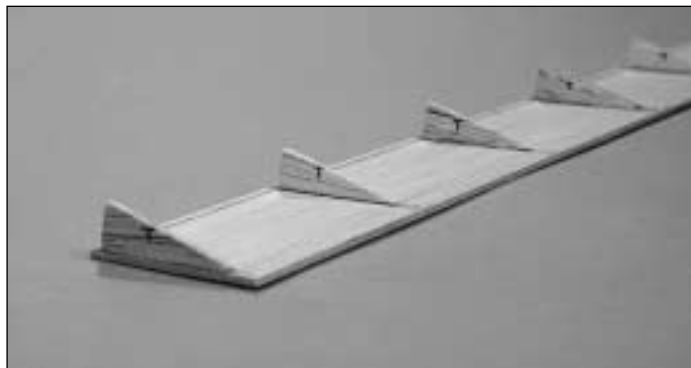
❏ ❏ 5. Glue eight W4 ribs onto the marks you have made on the sheeting. The front edge of each W4 rib should be placed on the line, 1/8" [3mm] from the edge of the sheeting. Be sure that each of the ribs is glued onto the sheeting with the top of the ribs perpendicular to the sheeting as shown in the photograph.
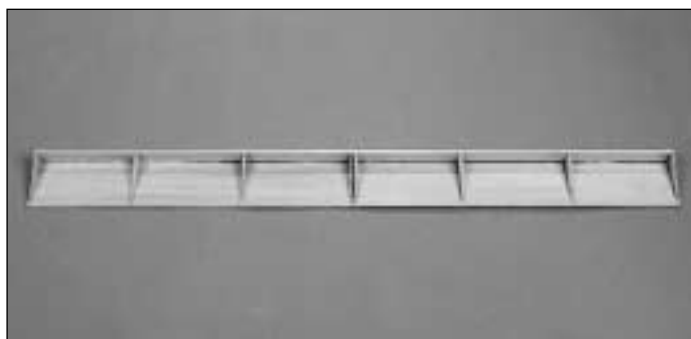
❏ ❏ 6. Locate the 1/8" x 1/2" x 24" [3 x 13 x 610mm] balsa **aileron/flap sub leading edge**. Position this on the lower skin and against the front of each of the W4 ribs. Glue them in place with thin CA.

❏ ❏ 7. Sand the balsa aileron / flap sub leading edge with a sanding bar to match the shape of the W4 ribs.
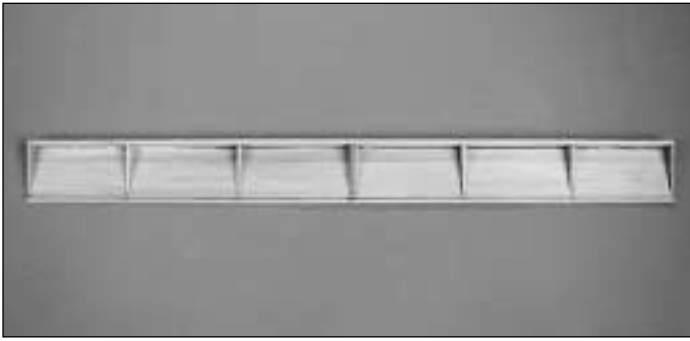
❏ ❏ 8. Draw a line the length of the aileron/flap 1/4" [6mm] from the trailing edge of the sheeting.

❏ ❏ 9. Bevel the sheeting to match the top of the W4 ribs. When sanded properly the bevel should meet the line you have just drawn.

❏ ❏ 10. Locate two die-cut 1/8" [3mm] plywood **control horn plates (CHP)**. Glue one in the flap and one in the aileron at the location shown on the plan.

❏ ❏ 11. Use a T-pin and punch two holes through the flap/aileron skin between the two W4 ribs. This will identify where to cut the flap and aileron apart in a later step.

❏ ❏ 12. Glue the remaining 3/32" x 2" x 21-3/16" [2.4 x 102 [537.8mm] balsa aileron / flap sheeting to the top of the aileron/flap.
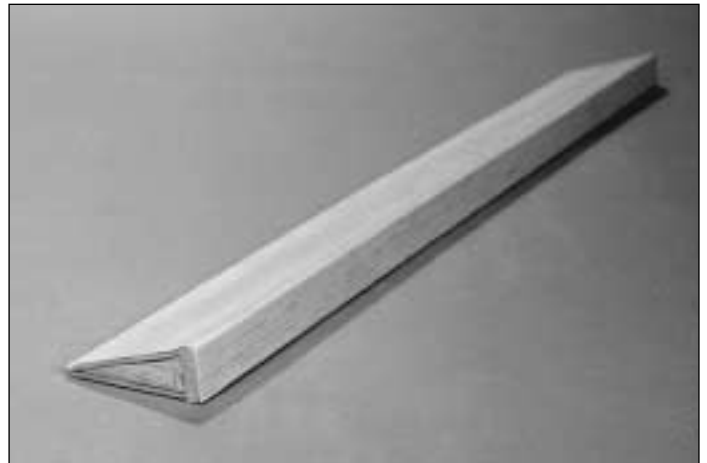
❏ ❏ 13. Locate the 1/4" x 3/4" x 24" [6 x 19 x 610mm] balsa **aileron/flap leading edge**. Glue it in place on the front of the aileron/flap sub leading edge.

❏ ❏ 14. Turn the aileron/flap over. Mark a line through the pin holes that you pierced through the skin.
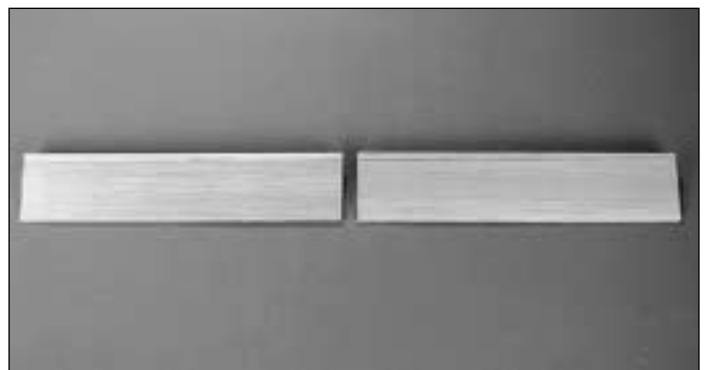
❏ ❏ 15. Cut the aileron and flap apart by cutting on the line you have drawn. Now would be a good time to mark which one is the flap and which is the aileron. Be sure to indicate which is the top and bottom of each control surface. Referencing the control surfaces will eliminate confusion and insure that you install the aileron and flap properly so that the control horn plates are located on the bottom of the control surfaces.

❏ ❏ 16. Sand the top and bottom of the flap and aileron, making the leading edge match the control surfaces.
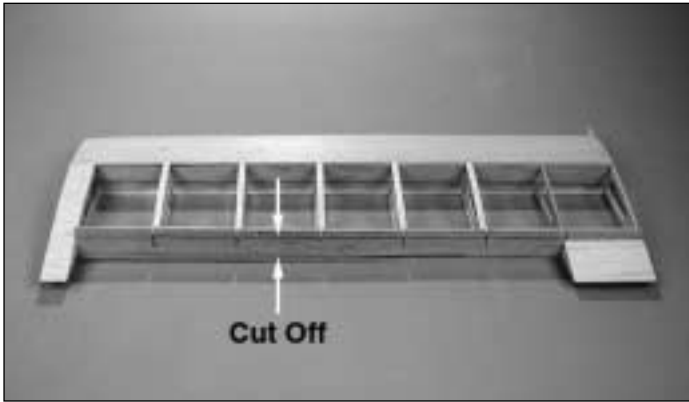
Cut Off

❏ ❏ 17. Cut off the top and bottom of the wing trailing edge that extends above and below the surface of the wing. Sand the wing trailing edge to match the wing surface.

Aileron Installation
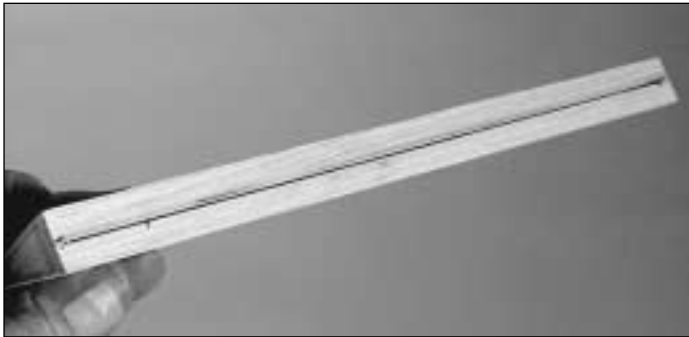
❏ ❏ 1. Mark a center line the length of the aileron.

Hinge Location

❏ ❏ 2. Using the plan as your guide, mark the location of the hinges on the center line of the aileron.

❏ ❏ 3. Shape the leading edge of the aileron to match the shape shown on the aileron cross section on the plan.

1/16"
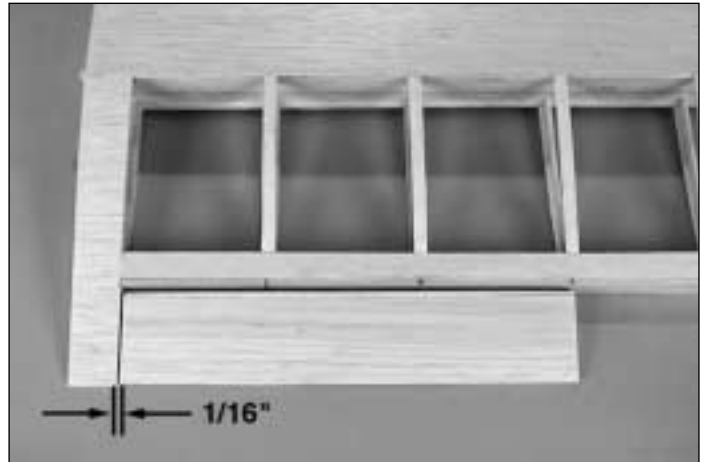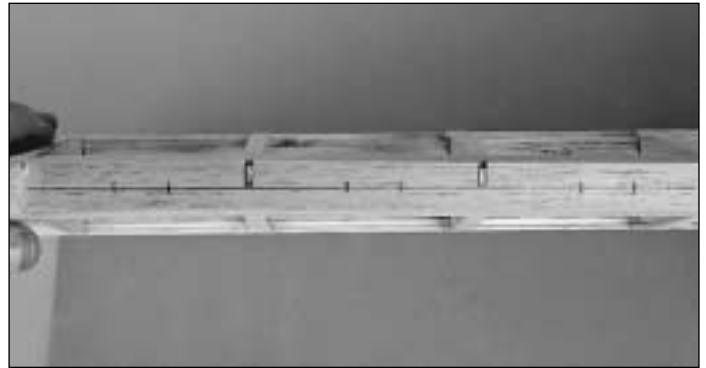
❏ ❏ 4. Draw a center line on the trailing edge of the wing where the aileron will be installed. Place the aileron in position at the trailing edge of the wing making sure that you leave at least 1/16" [1.6mm] clearance between the end of the aileron and the outboard end of the wing. Transfer the location of the hinge slots from the aileron to the trailing edge of the wing.

❏ ❏ 5. Refer to your plans for the location of the aileron control horn. The aileron cross - section shows where the clevis needs to be positioned in relation to the hinge line. Mark the location for the mounting screws. Drill 1/16" [1.6mm] pilot holes in the aileron. **Important:** When you drill the holes you should be drilling into the plywood control horn plate. If you do not hit the plate check to make sure you are drilling into the bottom of the aileron which is where the plate is located. Attach the control horn with two #2 x 3/8" [9.5mm] sheet metal screws.

Flap Installation

You now have to decide if you want to build the wing with or without the flap option. If you decide to build it with the flap you will need two additional standard 40 oz. servos and a 5th channel available on your radio system. The use of flaps allows the plane to fly markedly slower than without the flap option. This allows you to fly slower, land slower and take-off in a much shorter distance. If you have a computer radio with flap to elevator mixing you can also program the plane to do very tight loops with flap elevator coupling.

If you are **not** installing operational flaps proceed with the next two steps. If you are installing operational flaps proceed to step 3.

NON-FUNCTIONAL FLAP INSTALLATION

❏ ❏ 1. Glue the flap leading edge to the wing trailing edge and the root rib of the flap to the rib W2.

❏ ❏ 2. Sand the flap to match the contour of the top and bottom of the wing.

FUNCTIONAL FLAP INSTALLATION
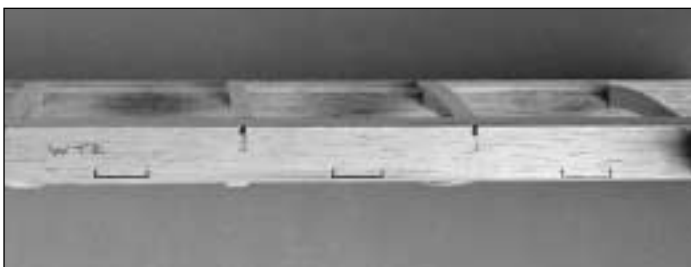
❏ ❏ 3. Mark the location for the flap hinges on the wing trailing edge and the leading edge of the flap. The slot for the hinge needs to be 1/16" from the bottom of the wing. Do not mark the hinge location on a centerline.

Hinge Slot 1/16"
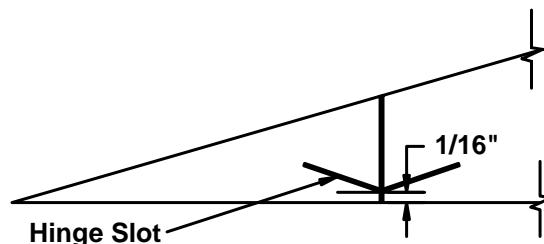
❏ ❏ 4. Cut the slots for the hinges using the same procedure used for the aileron except the slot needs to be cut into the wing and the flap at an angle as shown.

❏ ❏ 5. Trial fit the aileron and flap with the hinges to the wing making sure that you have at least a 1/16" [1.6mm] clearance between the control surfaces.

❏ ❏ 6. Attach the control horn to the bottom of the flap following the same procedure used for mounting the control horn to the elevator.

❏ 7. This completes the construction of the left wing panel. The sheeting and servo trays that have not yet been installed will be completed after the two wing halves are joined together. Go back and repeat the wing assembly procedure for the right wing panel.

Join the Wing Halves

❏ 1. Locate the die-cut 1/8" [3mm] plywood **dihedral brace (DB)** and **dihedral brace doubler (DBD)**. Use 6-minute epoxy to glue the dihedral brace doubler to the dihedral brace, centering the doubler on the brace.
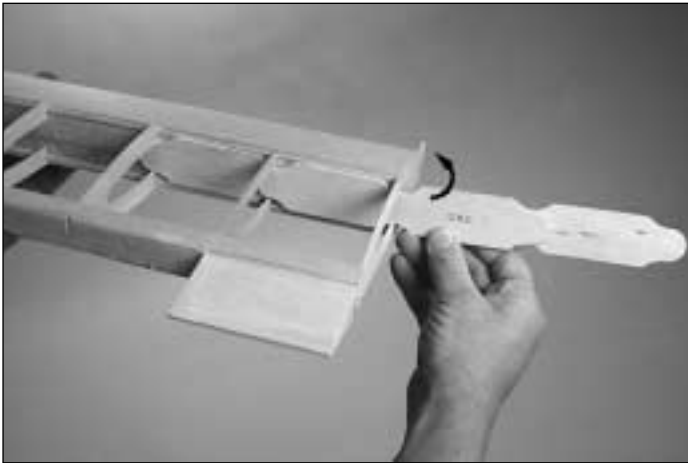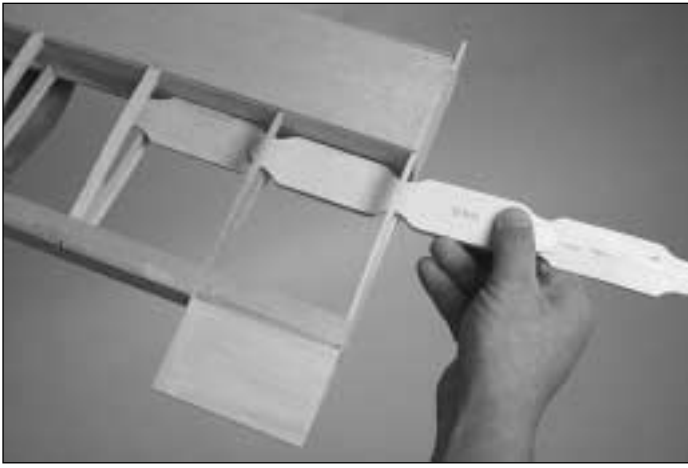
❏ 2. Trial fit the dihedral brace into the wing by inserting it into the left wing panel and then twisting it into position between the wing spars.

❏ 3. Slide and twist the right wing panel onto the other end of the dihedral brace to check the fit of the two wing panels.

❏ 4. When you are satisfied with the fit, glue the dihedral brace to both wing panels with 30 minute epoxy. Be sure to apply glue to the root ribs of both wing panels as well. Clamp the entire wing assembly together and allow the glue to cure.

❏ 5. Now that the wing panels have been joined, use the leftover 3/32" x 4" x 24" [2.4 x 102 x 610mm] balsa sheeting to sheet the top and bottom center section of the wing.
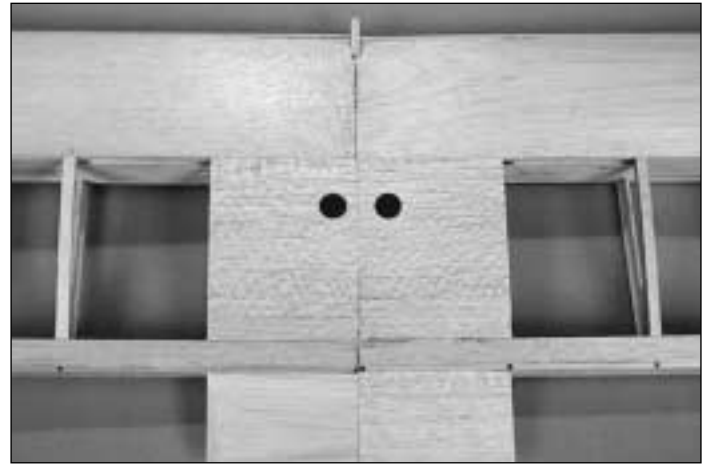
❏ 6. At the location shown on the plans, cut two 1/2" [13mm] holes in the top of the wing for the aileron and flap servo leads to exit the wing.
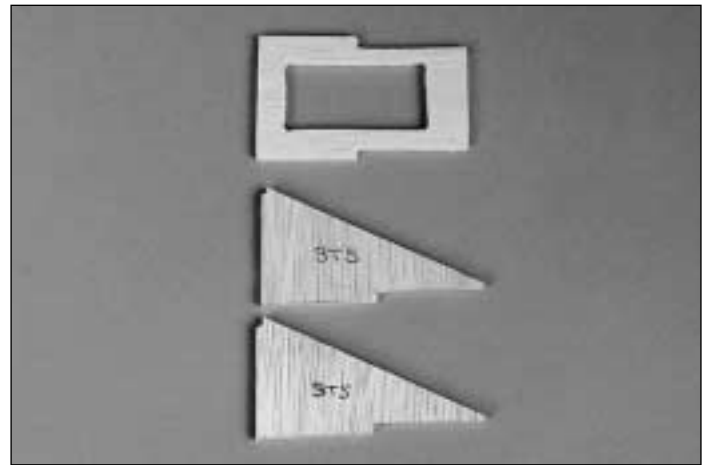
❏ 7. Locate the die-cut 1/8" [3mm] plywood **servo tray support (STS)** and the die-cut 1/8" [3mm] plywood **servo tray (ST)**.
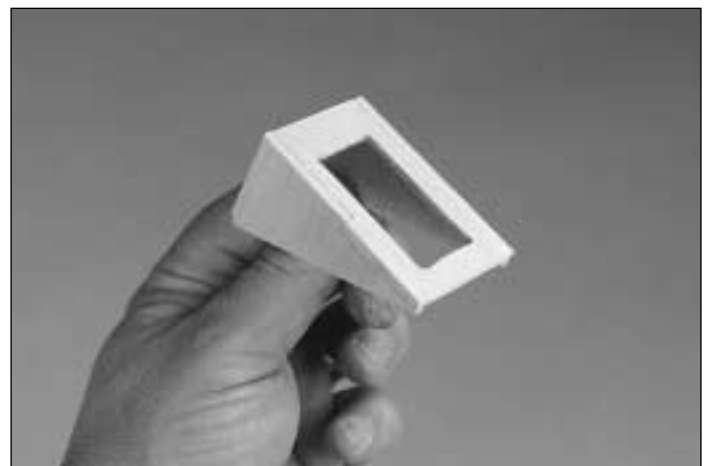
❏ 8. Assemble the servo tray as shown. If you are using flaps in your model you will need to assemble four servo trays. If you are only going to have ailerons on your airplane you will need to assemble two.
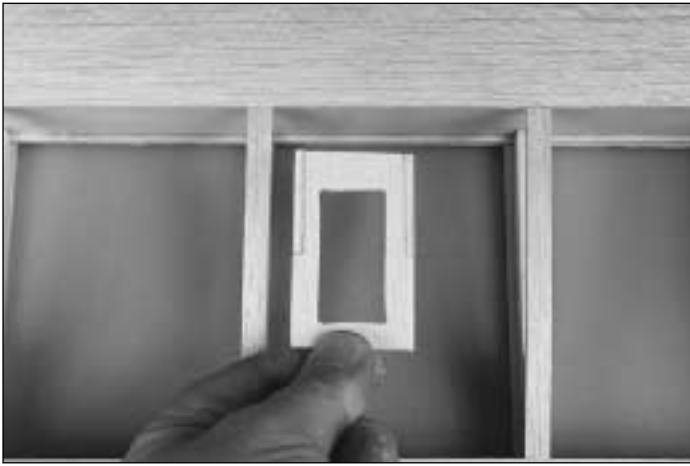
❏ 9. Working from the bottom of the wing, trial fit the aileron servo trays in place at the location on the plan. When you are satisfied with the fit, glue it in place to the rib and the wing shear web (WSW).

Note: If you did not choose to install the flaps, skip step 10.

❏ 10. Trial fit the flap servo trays in place at the location on the plan. When you are satisfied with the fit, glue it in place to the rib and the wing shear web (WSW).

❏ 11. Glue left over 1/8" [3mm] balsa stick around the two sides of the trays. This will give you a surface to attach the covering to when you finish the model.

❏ 12. Use a sanding bar to do the final sanding of the wing.

❏ 13. This completes the construction of the wing. Take the time to get your bench cleaned up so you can get started on the fuselage!

BUILD THE FUSELAGE
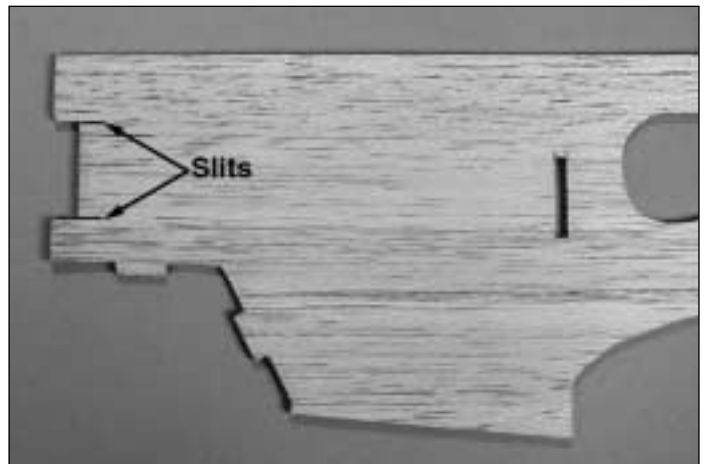
❏ 1. Locate the two die-cut 1/8" [3mm] plywood **forward fuselage sides (FFS)**. At the front of FFS there is a notch with two additional slits.
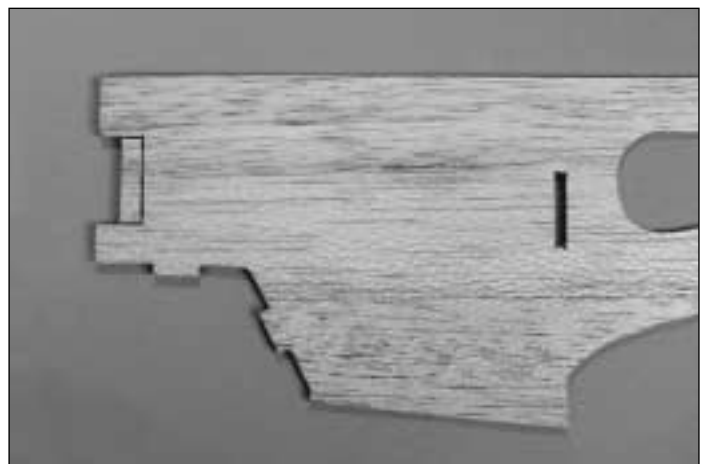
❏ 2. On *one* **FFS only**, draw a line from the end of each slit.

❏ 3. Using a hobby knife, cut on the line. This will provide you with one FFS that has a deeper notch than the other.
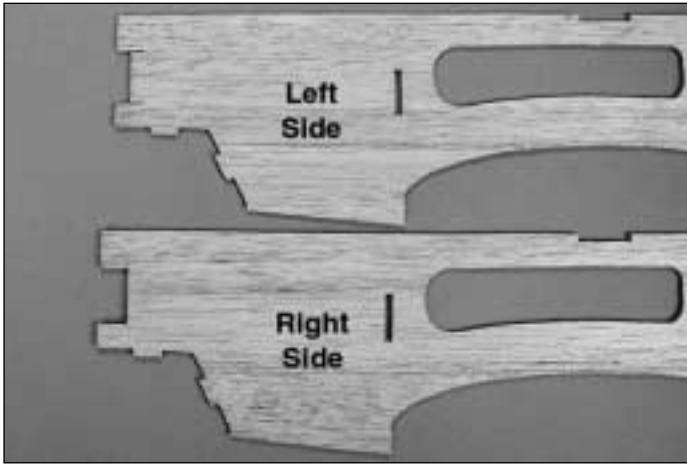
❏ 4. The forward fuselage side (FFS) with the deeper notch is the right side of the fuselage. **This is important!** Somewhere on the part mark "right" to make sure that there is no confusion as you proceed to the next few steps. The deeper notch on the right side of the fuselage is what builds in the right thrust so it is important to install the left and right side correctly.

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

❏ 6. Locate the fuselage on the plan. You may find it helpful to cut the plans and separate the fuselage side view from the fuselage top view, making them a more manageable size to pin to your building board.

❏ 7. Position the fuselage side view on the building board. Cover the plan with Great Planes Plan Protector or wax paper so glue will not adhere to it.

❏ ❏ 8. Pin the left forward fuselage side (FFS) over the plan. *(Remember, the left side is the one that has the shallow notch cut into the front.)*
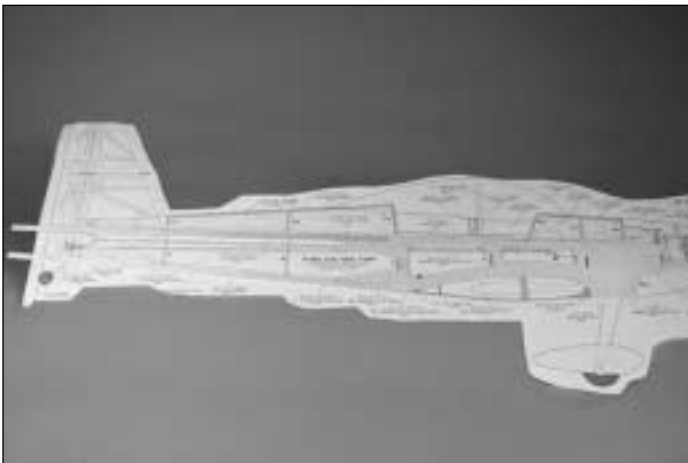
❏ ❏ 9. Locate two 1/8" x 3/8" x 24" [3 x9.5 x 610mm] balsa sticks. These make up the **fuselage side**. Glue them in place at the rear of the forward fuselage side (FFS).
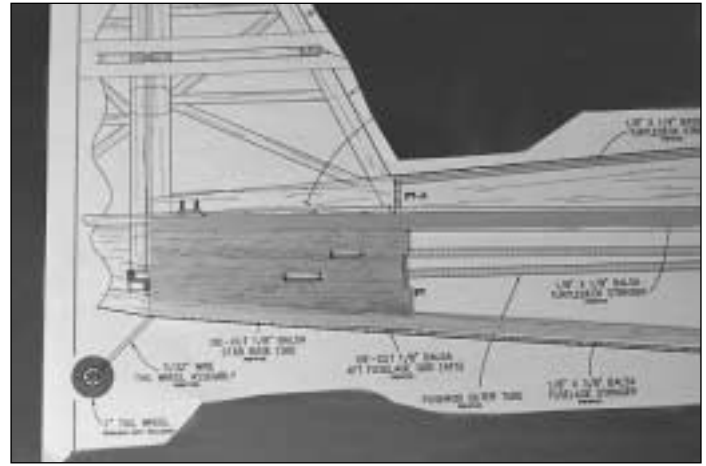
❏ ❏ 10. Glue the die-cut 1/8" [3mm] balsa **aft fuselage side (AFS)** to the balsa sticks at the rear of the fuselage as shown on the plan. Cut the balsa sticks flush with AFS.
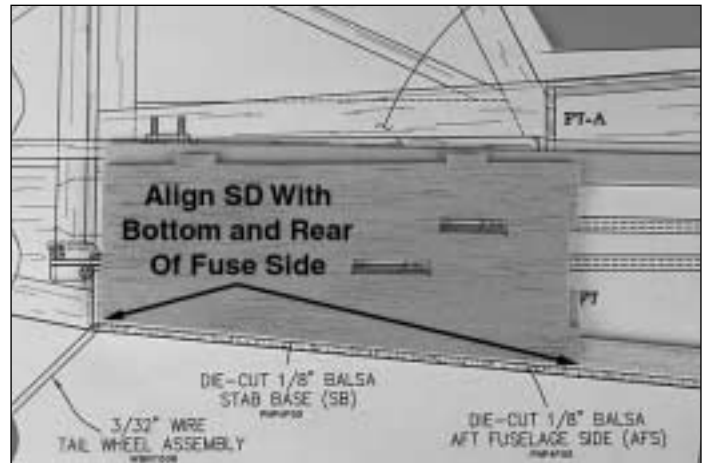
❏ ❏ 11.Locate the 3/32" [2.4mm] die-cut balsa **stab doubler (SD)**. Glue it in place onto the balsa aft fuselage side (AFS), aligning it with the bottom and rear of the fuselage side.
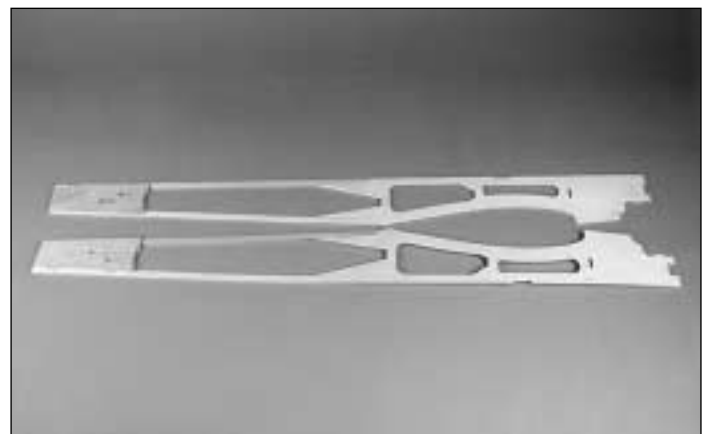
❏ 12. Repeat steps 8 - 10 for the right fuselage side. Remember, the right side mirrors the left side of the fuselage. ***Be sure not to build two left fuselage sides!***
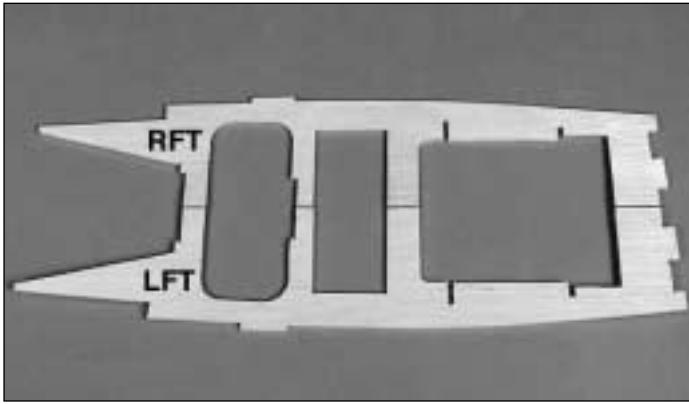
❏ 13. Locate the die-cut 1/8" [3mm] plywood **forward right fuselage top (RFT)** and the **forward left fuselage top (LFT)**. Glue RFT and LFT together as shown.
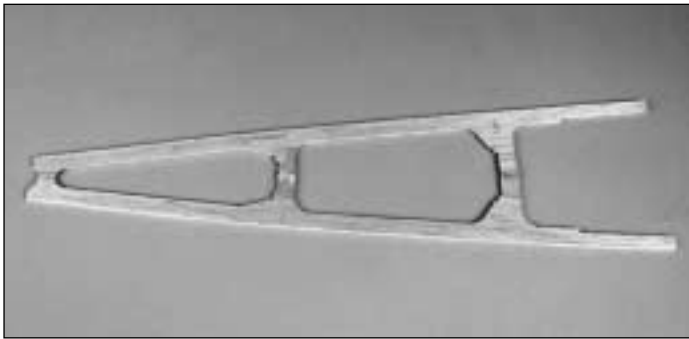
❏ 14. Locate the two die-cut 1/8" [3mm] plywood **aft fuselage tops (AFT)**. Glue them together the same way you did the forward right and left fuselage top.
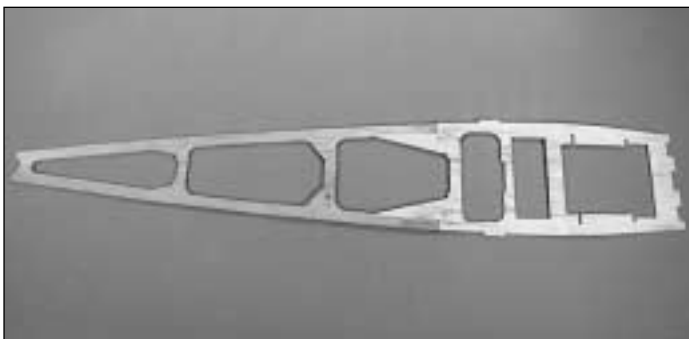
❏ 15. Glue the forward fuselage top to the aft fuselage top as shown. This forms the fuselage top and will be referred to as the fuselage top throughout the construction process.
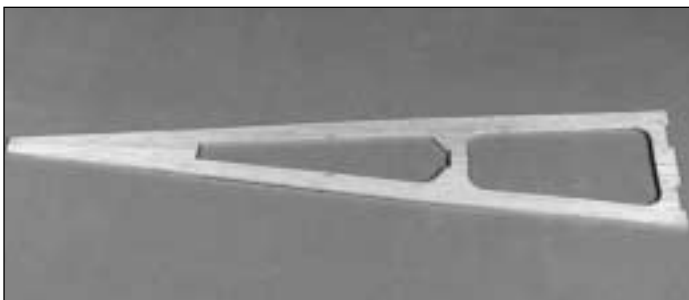
❏ 16. Locate the two die-cut 1/8" [3mm] balsa **aft fuselage bottoms (AFB)**. Glue them together the same way as the fuselage tops.

❏ 17. Pin the fuselage top over the plans. **Important!** The fuselage will be assembled on the plans upside down. When you are assembling components that reference the right or left side of the fuselage, take the time to be sure you are working with the correct side of the fuselage.
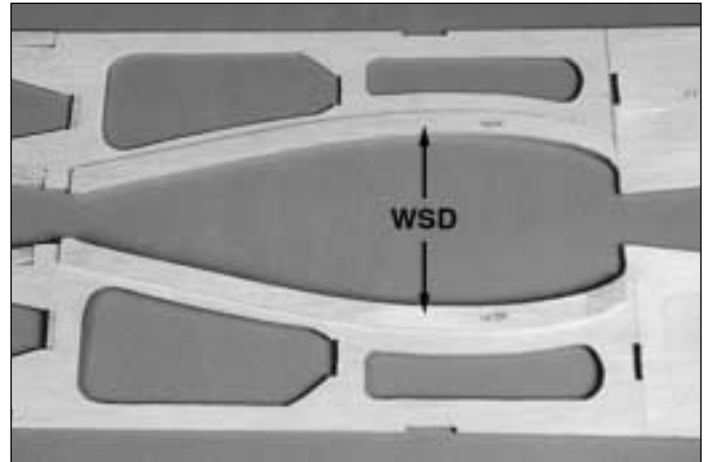
❏ 18. On the **inside** of the left and right side of the fuselage glue the die-cut 1/8" [3mm] plywood **wing saddle doubler (WSD)** in place as shown on the plan.
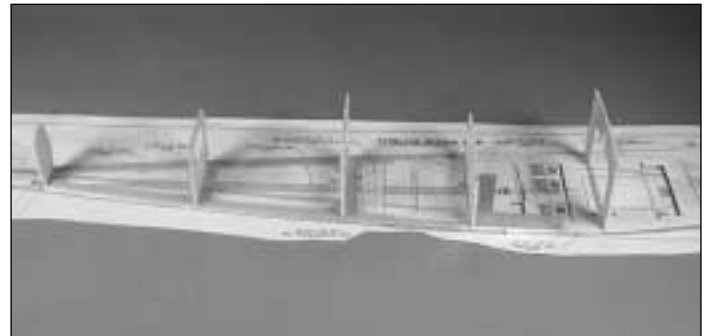
❏ 19. Locate die-cut 1/8" [3mm] plywood **formers F3, F4 and F5** as well as die-cut 1/8" [3mm] balsa **formers F6 and F7**. Test fit formers F3 through F7 onto the fuselage top at the location shown on the plans. When you are satisfied with the fit, glue the formers in place to the fuselage top. Use a small modeling square to assure that the formers are perpendicular to the fuselage top.

❏ 20. Glue the right side of the fuselage to the fuselage top. When completed, glue the left side in place.

❏ 21. Locate the die-cut 1/8" [3mm] plywood **left fuselage doubler (LFD)** and the **right fuselage doubler (RFD)**.
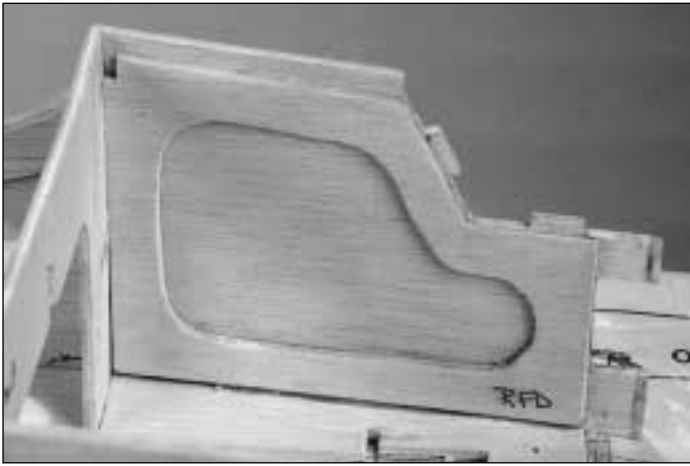
❏ 22. Glue the right fuselage doubler (RFD) to the inside of the right fuselage side between F1 and F3.

❏ 23. Glue the left fuselage doubler (LFD) to the inside of the left fuselage side between F1 and F3.
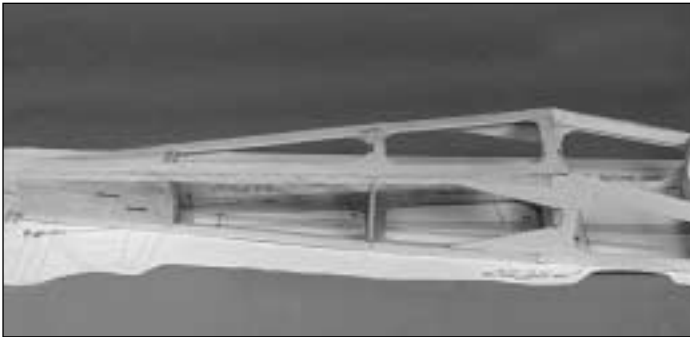
❏ 24. Glue the aft fuselage bottom in place at the rear of the fuselage. It should fit into the notches at F5 - F7.
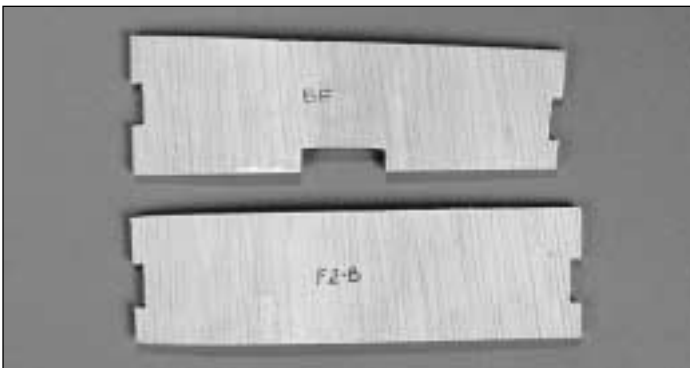
❏ 25. Locate the die-cut 1/8" [3mm] plywood **bottom firewall (BF)** and **F2-B**.

❏ 26. Sand a 45 degree bevel on the top and bottom of F2-B.
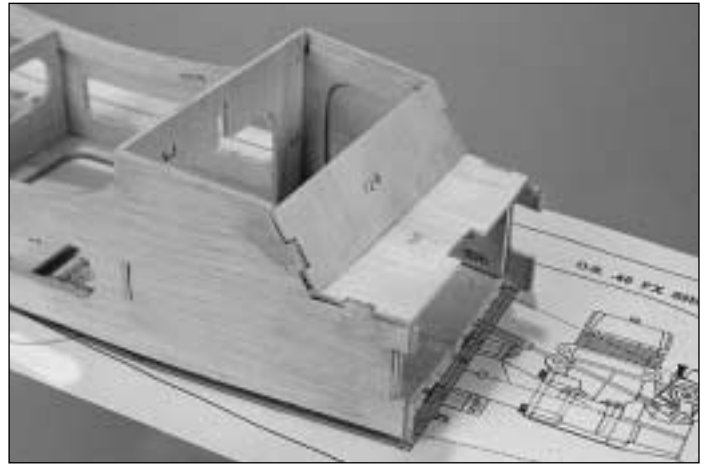
❏ 27. Glue the die-cut 1/8" [3mm] plywood bottom firewall (BF) to the fuselage sides at the front of the fuselage. After BF is in place, glue F2-B to the fuselage sides and the top of BF.

❏ 28. Locate the die-cut 1/8" [3mm] plywood **F3-B doubler**. Glue it in place onto F3, fitting it into the notches between LFD and RFD.
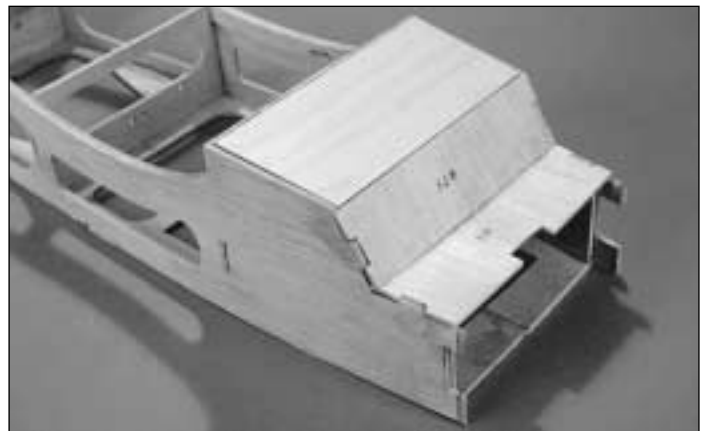
❏ 29. Locate the 1/4" x 2-3/4" x 5-1/2" [6 x 64 x 140mm] birch plywood **landing gear mount**. Cut the landing gear plate to fit at the location shown on the plan between F3, the firewall and the fuselage sides. Glue the plate in place using 30-minute epoxy.

❏ 30. Locate the two die-cut 1/8" [3mm] plywood **F1 firewalls**. Glue the two F1's together to form one 1/4" [6mm] firewall.
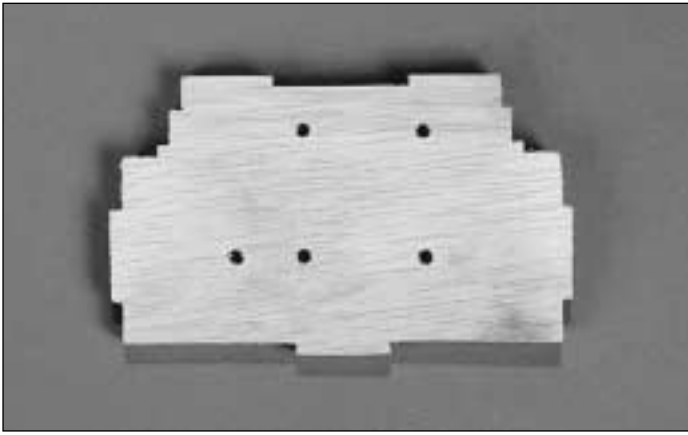
❏ 31. Drill a 5/32" [4mm] through each of the punch marks on the firewall.
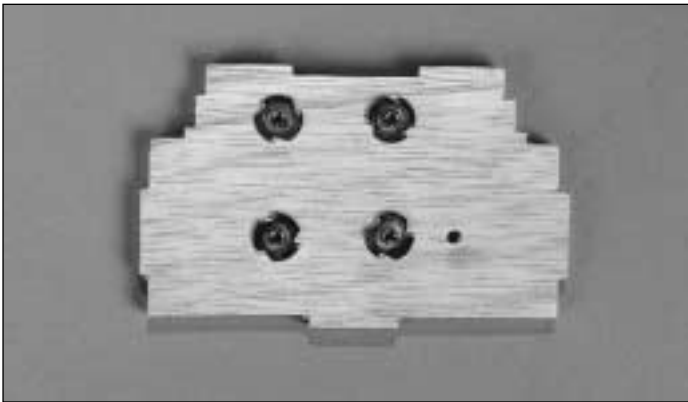
❏ 32. Remove the fuselage from the plan and turn it over. Test fit the firewall to the fuselage. The firewall needs to be 90 degrees to the fuselage top. If it is not, sand the fuselage to adjust until the firewall is 90 degrees to the fuselage top. When you are satisfied with the fit, apply a small drop of medium CA to the flange of each of the 6-32 blind nuts, being careful not to get any of the glue into the threads. Then insert the 6-32 blind nuts into the holes you have drilled on the backside of the firewall.
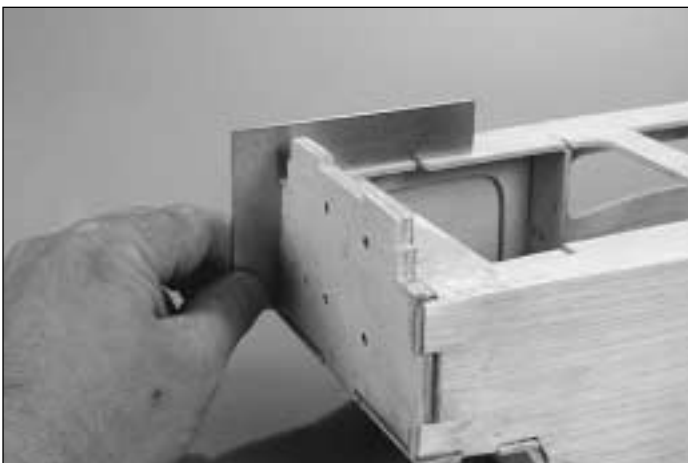
❏ 33. Using 30-minute epoxy, glue the firewall in place to the fuselage sides, the fuselage top and the bottom firewall (BF). Use a small builders square and check again to be sure that the firewall is 90 degrees to the fuselage top once the firewall is glued into place.
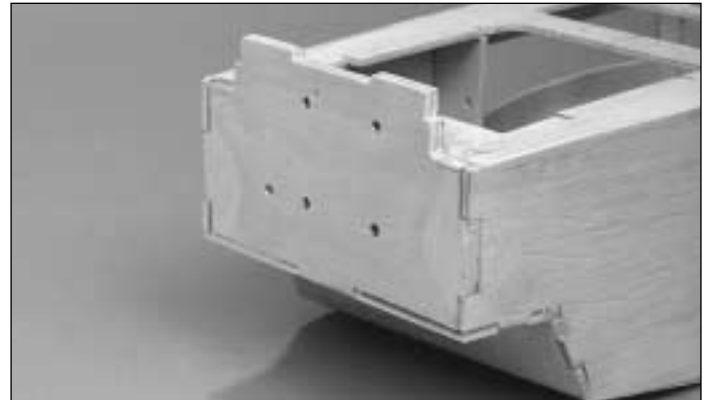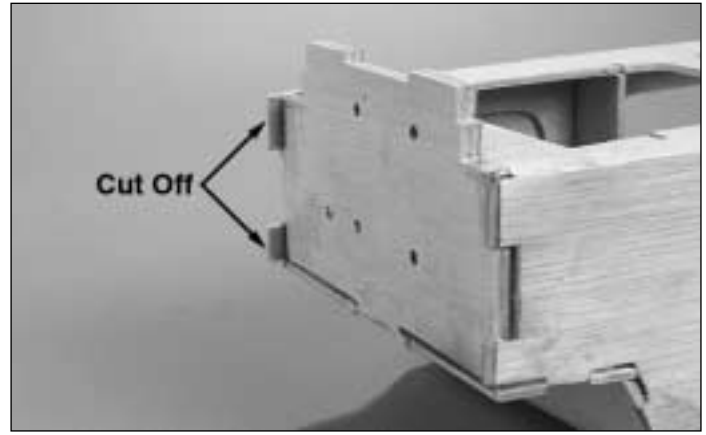
Cut Off

❏ 34. Cut off the fuselage side that extends beyond the firewall and sand the sides flush with the firewall.

❏ 35. Glue the 1/8" [3mm] die-cut plywood **F5B** to F5 as shown on the plan.

❏ 36. Locate the two die-cut 1/8" [3mm] plywood **wing mounting plates (WMP)**. Glue them together to form one 1/4" [6mm] plate.
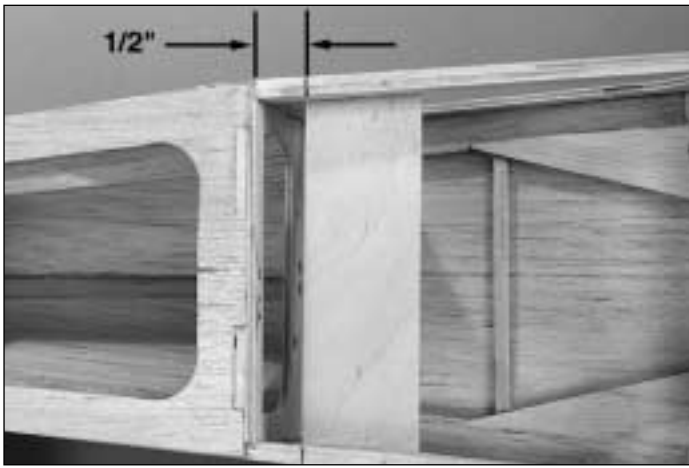
❏ 37. From former F5B measure forward 1/2" [13mm] and make a mark on each side of the fuselage. With 6-minute epoxy glue the wing mounting plate to the fuselage sides, over the wing saddle doubler at the the mark you made.

❏ 39. Locate two die-cut 1/8" [3mm] balsa **stab braces (SB)**. Glue them together to form the stab brace.

❏ 40. Turn the fuselage over and glue the stab brace in place on top of the fuselage at the aft of the fuselage.

❏ 38. Locate the die-cut 1/8" [3mm] plywood **wing mounting plate doubler (WMD)**. Glue the wing mounting plate doubler to the wing mounting plate with 6-minute epoxy.
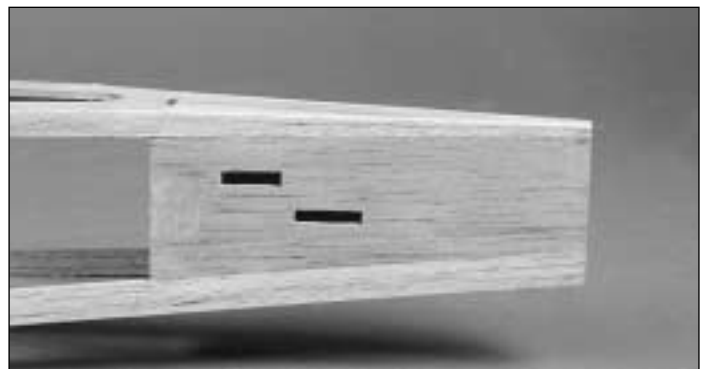
❏ 41. Sand the fuselage sides flush with the stab brace.

❏ 42. Locate the die-cut 1/8" [3mm] balsa **formers F7A, F6A, F5A, F4A F3A and F2A.** Glue them in place at the location and angles as shown on the plan.
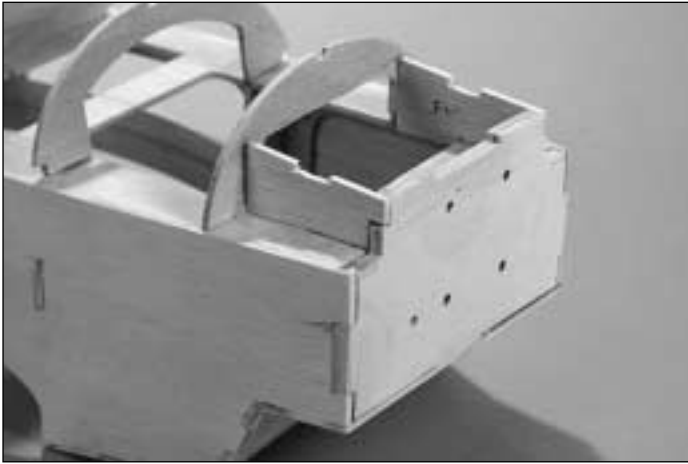
❏ 43. Locate the die-cut 1/8" [3mm] plywood **fuel tank right cover (FRC)** and **fuel tank left cover (FLC)**. Glue the fuel tank right cover into the notches in F2A and F1A on the right side of the fuselage and glue the fuel tank left cover into the notches in F2A and F1A on the left side of the fuselage.
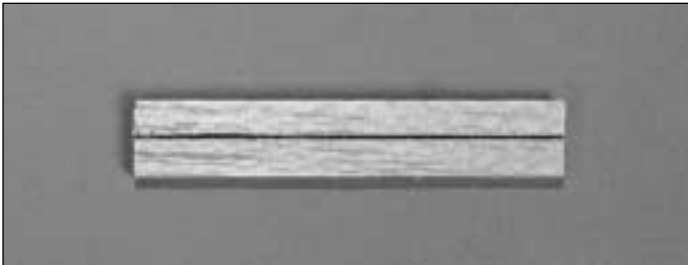
❏ 44. From a leftover piece of 1/8" [3mm] plywood, cut a piece 1/2" x 3" [13 x 76mm]. Draw a center line across the length of this piece.
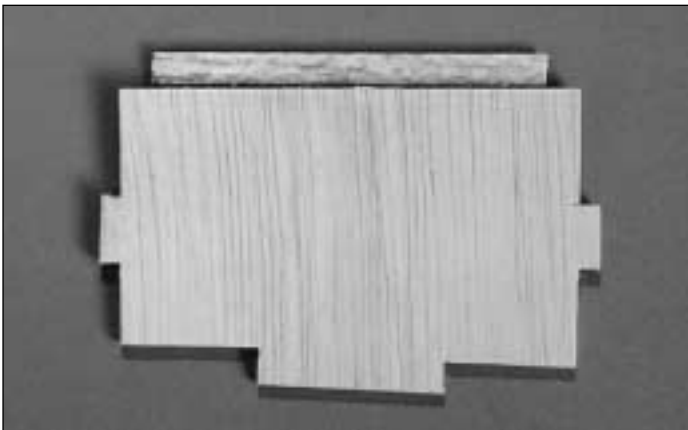
❏ 45. Locate the die-cut 1/8" [3mm] plywood **fuel tank top cover (FTC)**. Trial fit the fuel tank cover into the notches in FRC, FLC and the firewall. When satisfied with the fit, remove FTC and glue the 1/8" x 1/2" x 3" [3 x 13 x 76mm] plywood piece (from the previous step) to the bottom of the fuel tank cover using the line as the reference for gluing it to FTC.
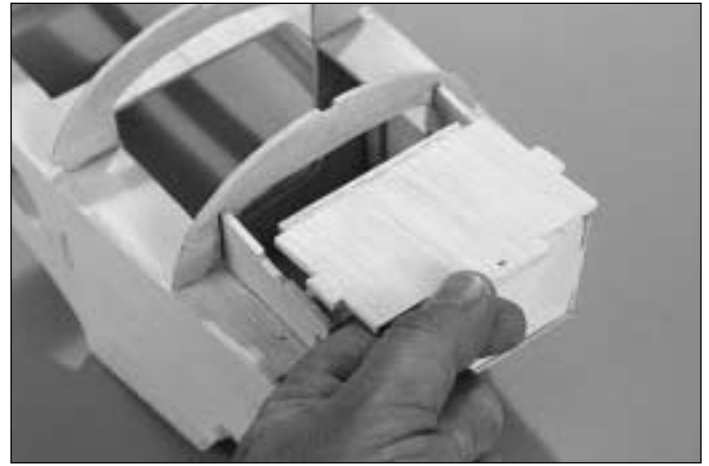
❏ 46. Place FTC back into the notches in FRC, FLC and the firewall. The tab that you have glued to the botom of FTC should fit under the opening in F2-A.
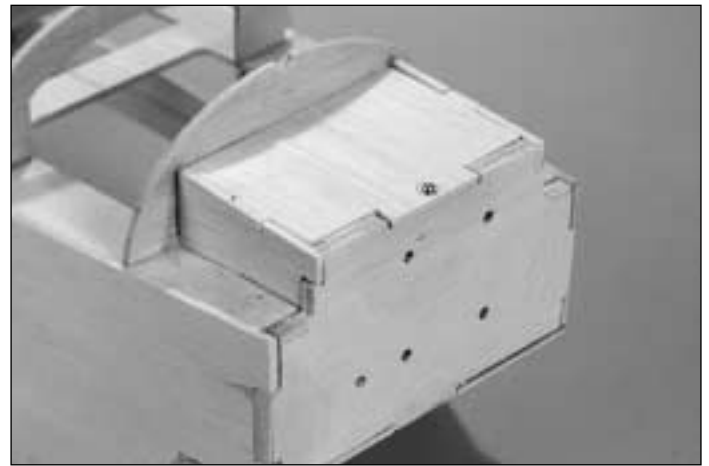
❏ 47. When you are satisfied with the fit make a mark on the center of the tab on the front of FTC and center it over the 1/4" [6mm] firewall. Drill a 1/16" [1.6mm] hole on this mark through FTC and the firewall. Hold the FTC in place with a #2 x 5/8" [15.9mm] sheet metal screw and a #2 washer.
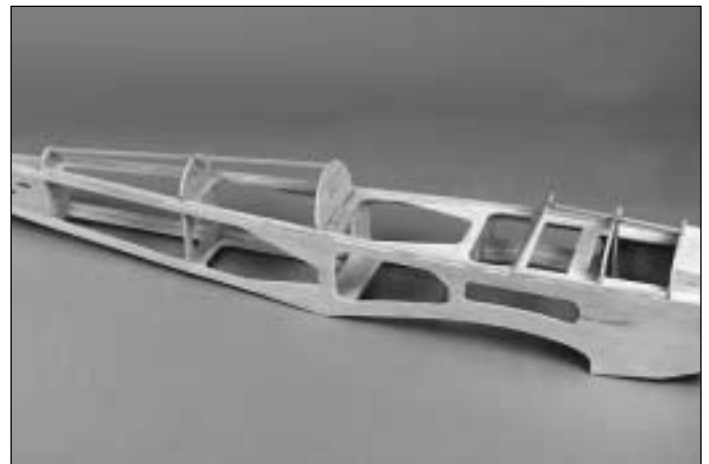
❏ 48. Locate the 1/8" x 1/4" x 24" [3 x 6 x 610mm] basswood **turtledeck stringer**. Cut it to fit on top of formers F2A through F4A. Cut the remaining piece to fit on top of formers F5A through F7A.
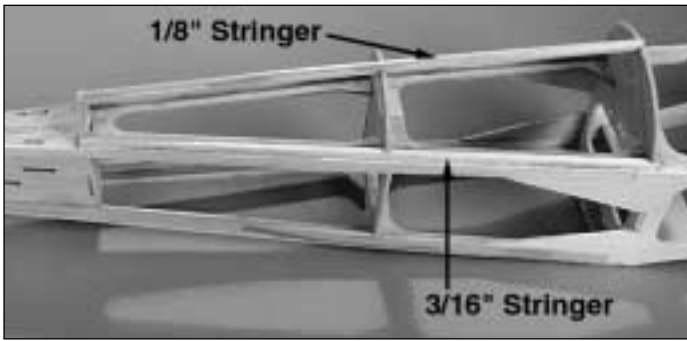
❏ 49. Locate the 1/8" x 1/8" x 24" [3 x 3 x 610mm] balsa stick. Glue it in place on top of the basswood turtledeck stringer, making sure that it is glued in the center of the turtledeck stringer. Do this for both the front and rear turtledeck stringer.

❏ 50. Locate three 3/16" x 3/16" x 30" [4.8 x 4.8 x 762mm] balsa sticks. Cut them to fit at the base of the turtledeck on both the front and rear turtledeck on both sides of the fuselage.

❏ 51. On the fuselage plan is the **turtledeck sheeting template**. From a 3/32" x 4" x 24" [2.4 x 102 x 610mm] balsa sheet, cut two turtledeck sheets.

❏ 52. Sheet the turtledeck with the sheets you cut. This is a fairly tight bend so we recommend that you soak one side of the wood with water or isopropyl alcohol, allowing the balsa to soften and become more flexible. When the balsa is sufficiently softened, glue the sheeting to F5-A, F6-A, F7-A and the turtledeck stringers. After the wood has dried, sand the turtledeck to match the fuselage sides and the balsa turtledeck stringer to match the shape of the turtledeck.

❏ 53. From the remaining 3/32" x 4" x 24" [2.4 x 102 x 610mm] balsa sheet, cut the deck sheeting for the front of the airplane. Locate the deck patterns on the plan and use them to make the sheets.

❏ 54. Glue the forward deck sheeting between F2A and F3A and the deck stringers. Glue the rear deck sheeting between

F3A and F4A and the deck stringers. Sand the sheeting to match the fuselage sides and sand the balsa deck stringers to match the deck sheeting.
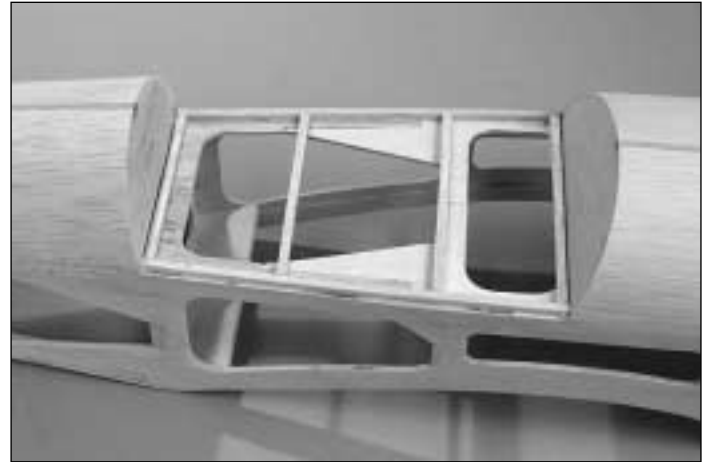
❏ 55. From leftover 3/16" [4.8mm] square balsa stick, cut four sticks to fit between the 3/16" [4.8mm] turtledeck stringers as shown in the photograph.
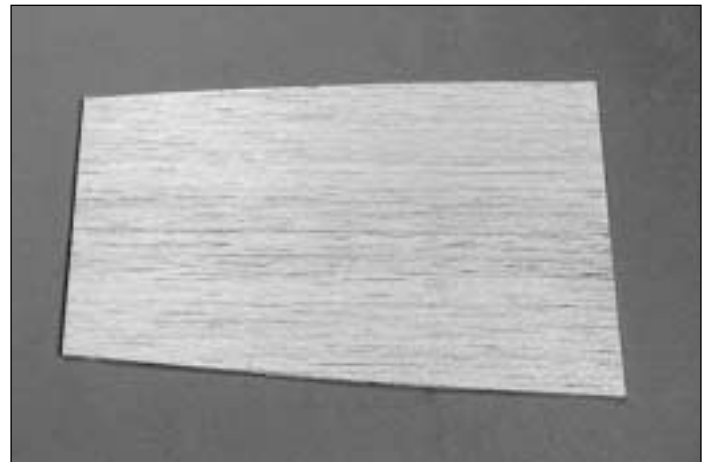
❏ 56. Locate the 1/16" x 3" x 18" balsa sheet. Cut the sheet in half and edge glue the sheets together forming a 6" wide sheet. Cut the sheet to fit in the cockpit of the plane, making sure the sheet fits on top of the 3/16" [4.8mm] balsa sticks and balsa turtledeck stringers. Glue the sheeting to the balsa sticks.

Mount the Wing to the Fuselage

❏ 1. Turn the fuselage upside down. *(Hint: Position a small box under the cockpit to support the plane on your bench.)* Install the wing onto the wing saddle.

A   A

A = A
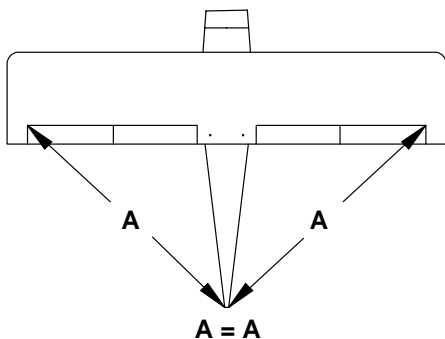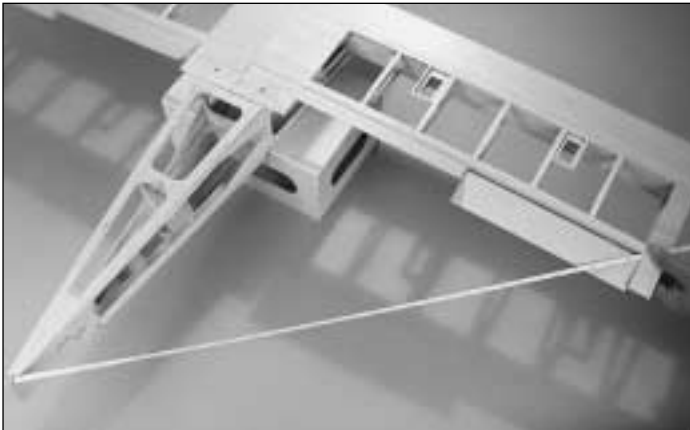
❏ 2. Measure from the tip of the tail to a point on the end of the wing. The distance from the tip of the wing to the tail needs to be equal on both sides. Once the wing is positioned properly, make reference marks on the wing and the fuselage.

Drill Here
2"   2"
1/2"   1/2"

❏ 3. With the wing still resting in the wing saddle and aligned on the marks you have made, mark the location to drill the wing bolt holes. From the outer end of the wing bolt plate measure in 2" [51mm] and draw a line. Measure up from the side of the wing bolt plate 1/2" [13mm] and draw another line. Where the two lines intersect is where you will drill the wing bolt holes.

❏ 4. At the intersection of the lines on the wing bolt support, drill a 9/64" [3.6mm] (or use a #25 drill bit) pilot hole perpendicular to the bottom of the wing, through the wing and the wing bolt mounting plate in the fuselage.

❏ 5. Remove the wing. Tap the holes in the wing bolt mounting plate with a 1/4-20 tap. After they have been tapped, apply a small amount of thin CA to the threads. Once the glue has cured run the tap through the threads once more to clean out any excess glue.

❏ 6. Enlarge the wing bolt holes in the wing by drilling a 17/64" [6.7mm] hole through the 9/64" [3.6mm] holes you drilled in Step 4. This will provide clearance for the nylon wing bolts. Be sure you only drill the hole in the wing, **not the wing bolt mounting plate**.
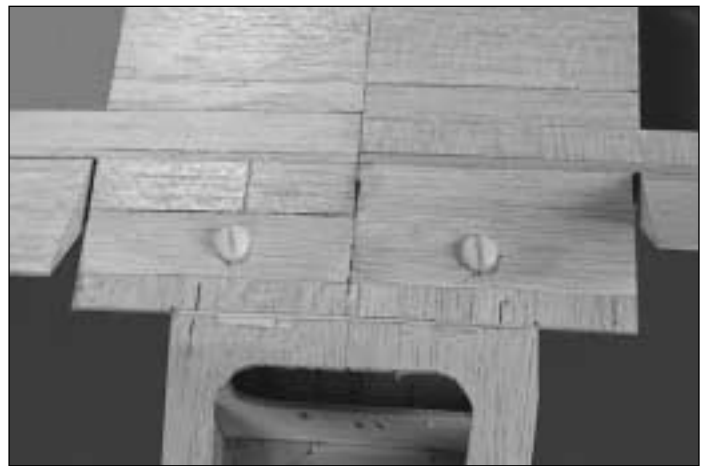
❏ 7. Attach the wing to the fuselage with the nylon **wing mounting bolts**, checking to be sure the wing fits well.
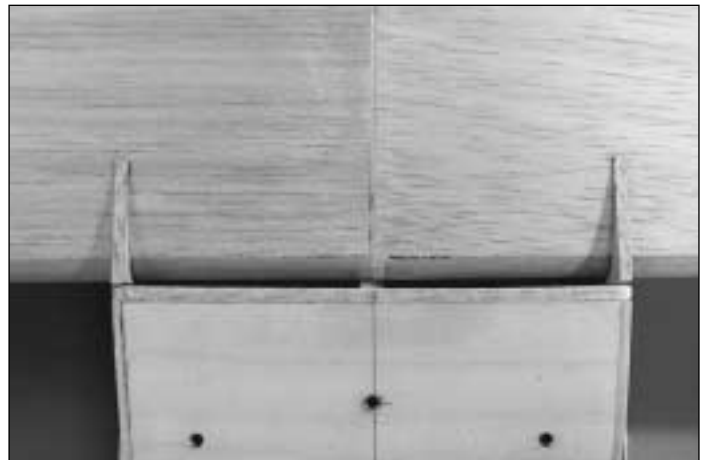
❏ 8. Locate two die-cut 1/8" [3mm] balsa **wing fairings (WF)**. Glue them to the leading edge of the wing flush with the top of the fuselage. Remove the wing.
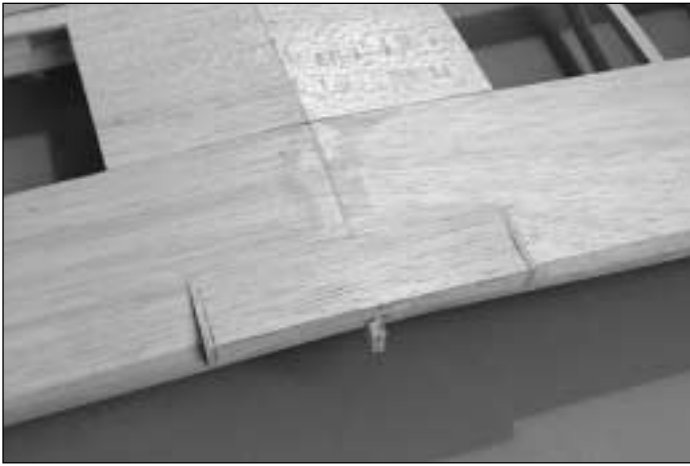
❏ 9. From left over 3/32" [2.4mm] balsa sheet cut a piece to fit between the two wing fairings and a piece to fill the front of the fairing at the leading edge of the wing. Glue them in place. Then sand the wing fairing to blend into the wing.

Finish the Fuselage

❏ 1. Locate the 3/32" [2.4mm] die-cut balsa **cockpit doublers (2- CDB and 2-CDF)**. Note: Doublers CDF are shorter than CDB.

❏ 2. Glue the CDF doublers to F4A. Be sure to set them back from the edge of the fuselage 3/32" [2.4mm], the width of the fuselage sheeting. When positioned properly they should fit the outer edge of F4A.

❏ 3. Glue the CDB doublers to F5A. Position them the same way as you did for CDF.

❏ 4. Using your plan as the reference, mark the location of BK and IP by drawing lines across the floor of the cockpit.

❏ 5. Locate die-cut 1/8" [3mm] balsa formers **IP (instrument panel)** and **BK (back seat)**. Glue former BK on the forward most line on the cockpit floor and glue IP on the rearward line.

❏ 6. On the plan you will find the paper **cockpit sheeting template**. Use this as the pattern and cut two cockpit sides from 3/32" x 4" x 24" [2.4 x 102 x 610mm] balsa sheet.

❏ ❏ 7. Trial fit the cockpit sides to one side of the fuselage between F4A and F5A. Sand the cockpit sheeting as needed to fit. Once you are satisfied with the fit, glue the cockpit sides to F4A, F5A, IP and BK. *Hint: You may need to wet the balsa wood to bend it without cracking.*

❏ 8. Repeat step 7 for the opposite side of the cockpit.

❏ 9. From leftover 3/32" [2.4mm] balsa sheet, cut a piece to fit on top of BK and IP as shown.
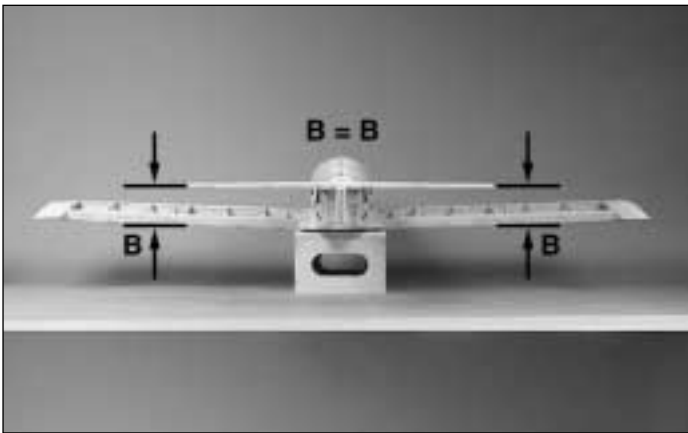
❏ 10. Attach the wing to the fuselage. Place the stab in place on the stab base at the back of the fuselage. Stand back 9' to 15' [3 to 5m] and view the airplane from the rear. The distance between the wing and the stab must be equal on both sides of the stab. If the stab is not in line with the wing, sand the high side of the stab base until the wing and stab are aligned with each other. Remove the wing when everything is aligned.
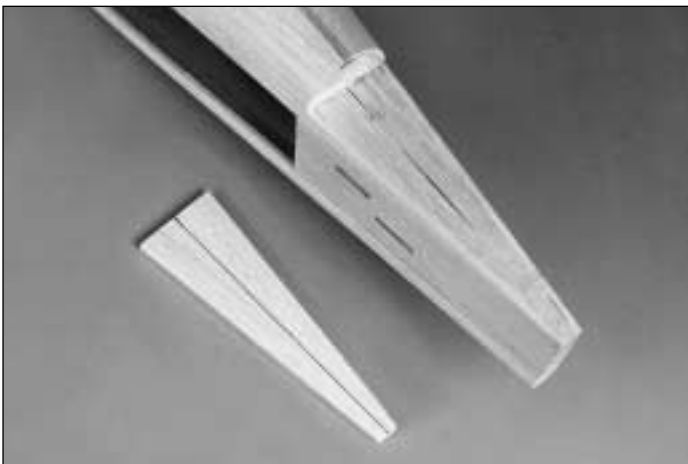
❏ 11. From the 1/4" x 1/2" x 6" [6 x 63 x 152mm] balsa stab block, make a plate that is the same size as the stab saddle. When you have it done, draw a line down the center of the stab plate.
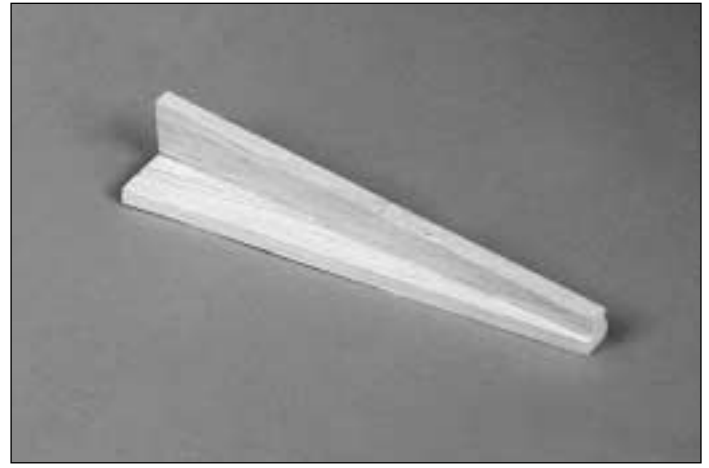
❏ 12. Glue an additional 1/4" x 3/4" [6 x 19mm] balsa stick to the base centered on the line you have drawn. The stick needs to be perpendicular to the base. Sand the top of the stick to match the rear turtledeck.
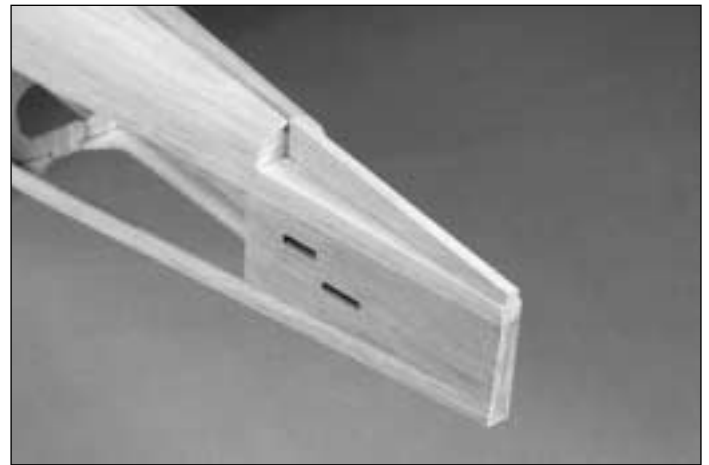
❏ 13. Set this fixture in place on the stab base.
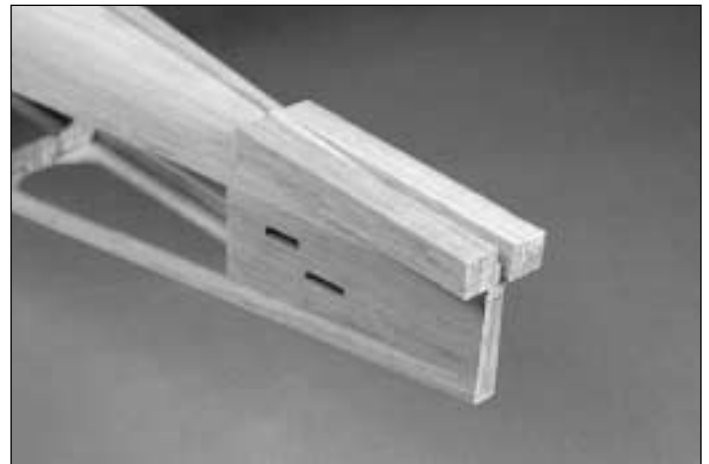
❏ 14. Locate the 3/4" x 3/4" x 12" [19 x 19 x 305mm] balsa block. Cut it into two 6" [152mm] lengths. Glue the end of the block to fuselage former F7A. **IMPORTANT!** *Glue only the end of the balsa blocks to F7A. Do not glue the balsa blocks to the fixture! The fixture will be removed later and it must be able to slide out from under the blocks.*
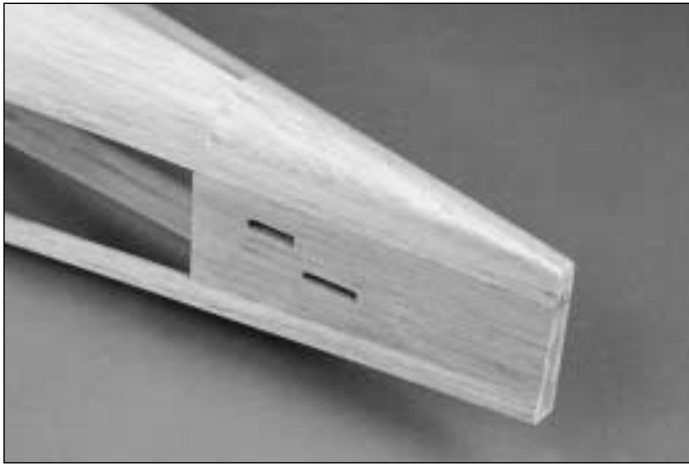
❏ 15. Using a razor plane and sanding block, shape the balsa blocks to match the fuselage.
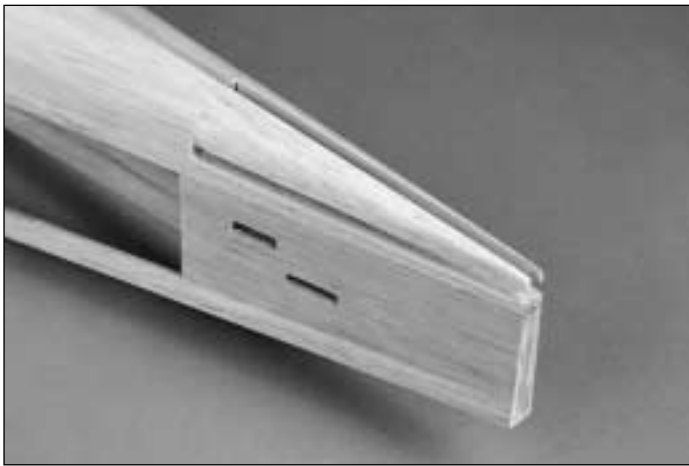
❏ 16. Remove the fixture you've made to be sure that it slides out of the fuselage freely and that no glue is holding it in place. The slots in the blocks will now fit the stab and fin when we install them later in the manual.
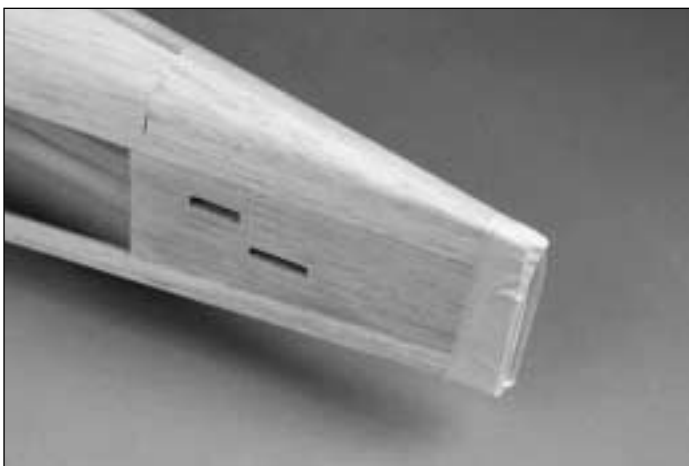
❏ 17. Put the fixture back into the slots. Wrap masking tape around the tail to keep the fixture in place. This will help prevent accidentally knocking the shaped blocks out of place before gluing the stab and fin in place.

Mount the Landing Gear

❏ 1. Mark a line down the center of the landing gear plate.
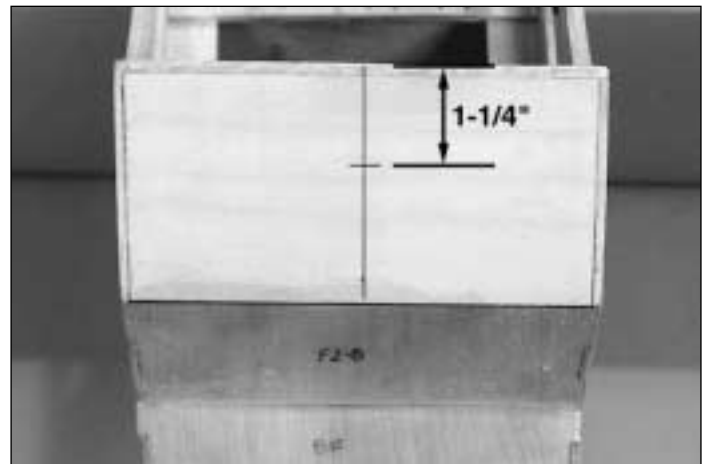
❏ 2. Measure 1-1/4" forward from fuselage former F3 and mark a line perpendicular to the line you have drawn.

❏ 3. Place the aluminum **landing gear** so the center hole is at the intersection of the two lines. Make sure that the landing gear is parallel to former F3.

❏ 4. Use a pen to mark the location of each of the three landing gear mounting holes.

❏ 5. Drill a 5/32" [4mm] hole through each of the locations you marked on the landing gear plate.
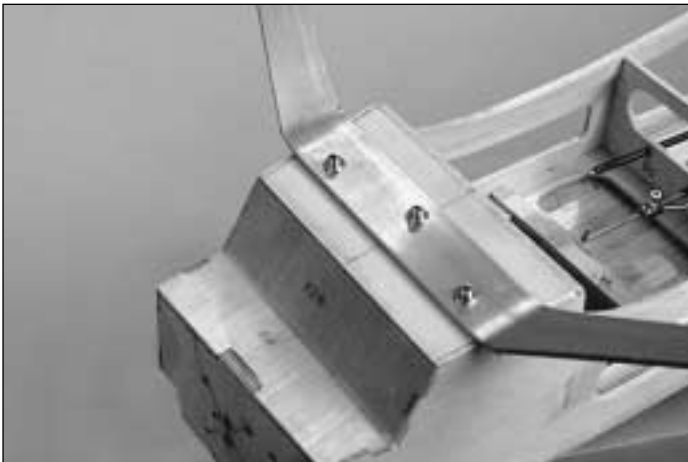
❏ 6. Locate three 6/32 blind nuts. Apply a drop of medium CA on the flange, being careful not to get any glue onto the threads. Then press them into the holes from inside the fuselage. Position the landing gear over the mounting holes. Insert a 6-32 x 3/4" [19mm] socket head cap screw and #6 washer through the landing gear and into the blind nut. Tighten the screw against the landing gear, pulling the blind nut into place tightly to the underside of the landing gear plate. Do this for each of the three landing gear mounting screws.

Mount the Engine

❏ 1. Cut the "spreader bars" from the supplied Great Planes **motor mount**, then use a hobby knife to remove any flashing leftover from the molding process so the halves fit together well.
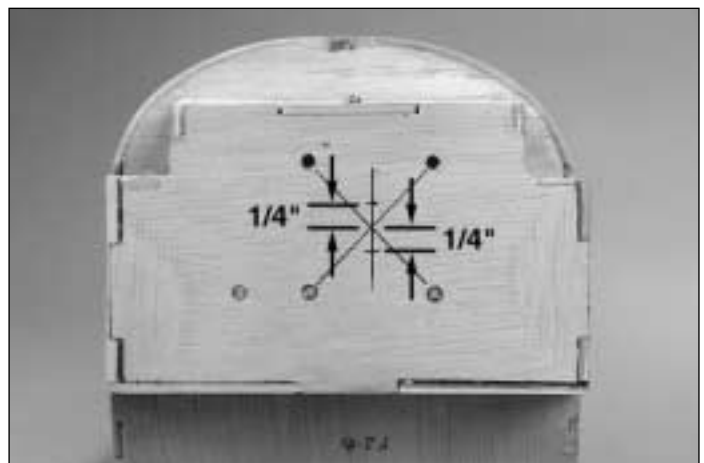
❏ 2. Draw an angled line from the corner of each of the engine mounting holes across the firewall. Where the lines intersect is the center of the engine mount. At the point the lines intersect draw a vertical line. From the point the lines intersect draw a horizontal line 1/4" [6mm] above and below the center as shown in the photograph. These points are where you will drill two holes for the fuel line to pass through the firewall.
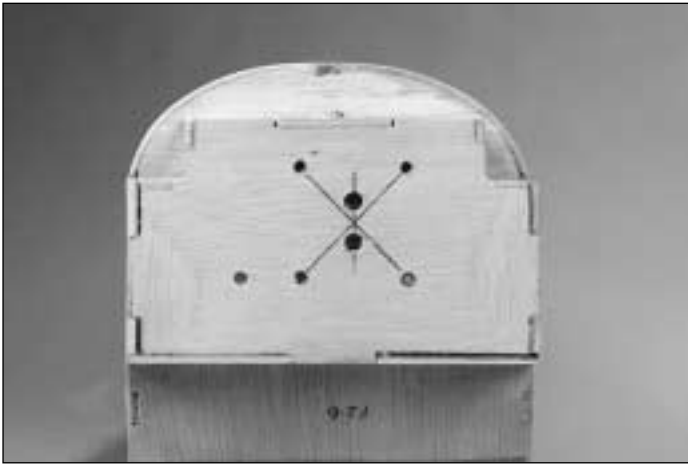
Fuel
Filler
Valve

❏ 3. Drill a 17/64" [6.7mm] hole on each of the two marks you have made on the firewall. These holes will accommodate the fuel line and the pressure line. **Note:** A two line fuel system will require the use of a fueling valve. We mounted ours to the firewall in the cowl opening. If you prefer to have a third line for the fill line you will have to drill a third hole in the firewall.
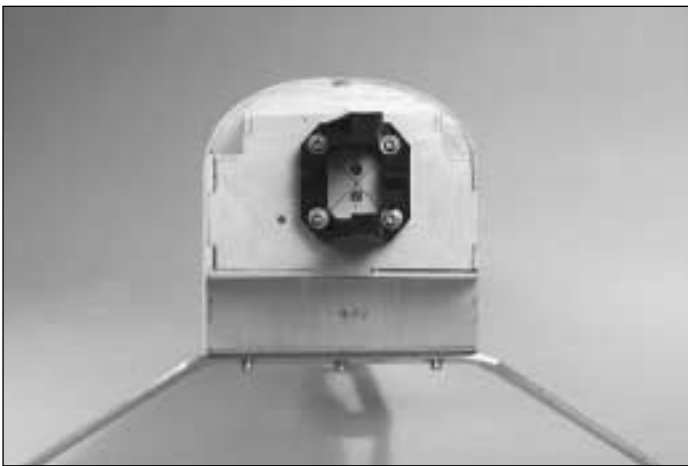
❏ 4. Attach the engine mount to the firewall. Insert a 6-32 x 1" [25mm] socket head cap screw and #6 washer into each corner of the engine mount, screwing the screw into each of the four blind nuts that were previously installed on the back side of the firewall but do not overtighten. **Note:** The engine installation is a side mount so be sure that engine mount is installed for a side mount installation.

4-1/2"
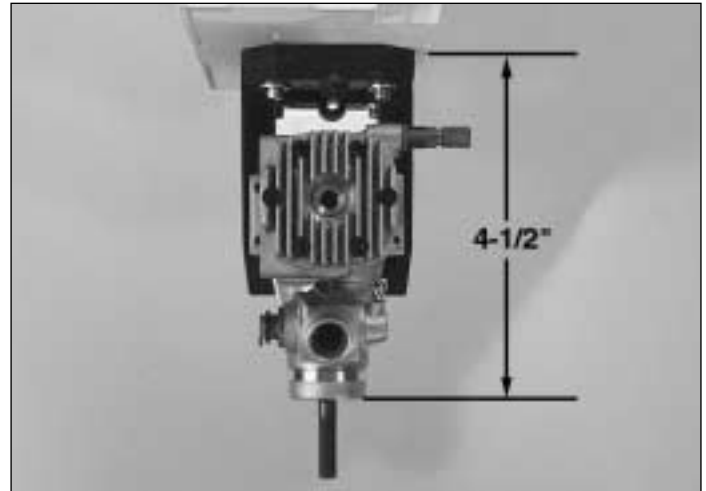
❏ 5. Place the fuselage into a cradle or set it up on the bench so that you can place the engine onto the engine mount. Position the engine so that the distance from the firewall to the front of the thrust washer is 4-1/2" [115mm] and that the engine mount is centered on the firewall. When satisfied with the positioning tighten the engine mounting bolts to the firewall.

❏ 6. Mark the location for the holes for mounting the engine to the engine mount. **Hint:** The Great Planes Dead Center™ Tool (GPMR8130) works fast and easy for marking these holes!
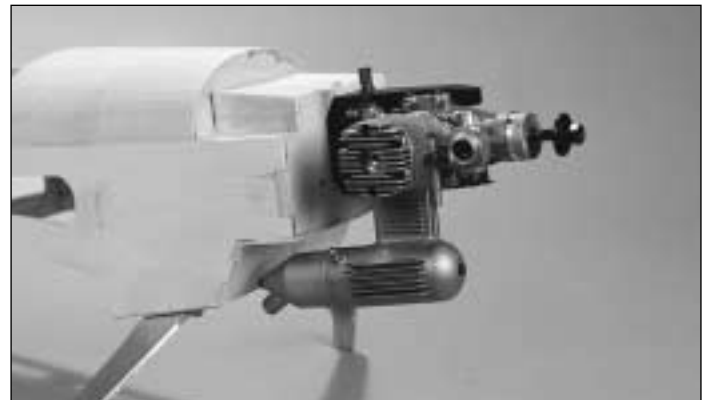
❏ 7. On the marks you made on the engine mount, drill a 7/64" [2.8mm] hole into the engine mount. After drilling the hole, tap each hole with a 6-32 tap. Once tapped, mount the engine to the engine mount with four 6-32 x 3/4" [19mm] socket head cap screws and #6 washers.

❏ 8. Remove the engine from the firewall. Mix 1/4 ounce of 6-minute epoxy. Using an epoxy brush, apply a coating of epoxy to the entire firewall and the area under the firewall where the engine muffler will exit the cowl. Do not get any glue into the threads of the blind nuts. A dab of Vaseline® applied into the threads of the blind nut will prevent any epoxy from sticking to the threads. You may want to remove the fuel tank cover so that it does not get glued in place. If you chose to leave it in place you may need to cut the glue to remove the hatch cover.

Install the Fuselage Components

❏ 1. Locate three 36" [914mm] **plastic flexible outer pushrod tubes**. Using the plan as your guide, install the outer pushrods into the holes in fuselage formers, exiting the slots in the rear of the fuselage.

❏ 2. Make a mark on the tubes where they contact the fuselage and fuselage formers. Remove the tubes. Then roughen the tubes with sandpaper at the marks you have made. Reinstall the outer pushrods tubes back into the fuselage and use a small amount of 6-minute epoxy to glue the tubes to the fuselage formers.
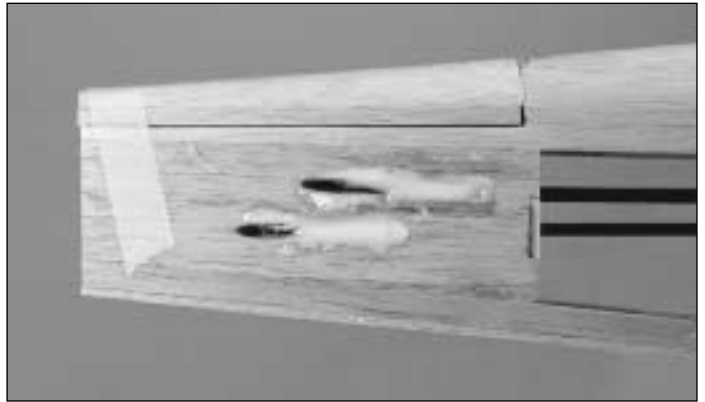
❏ 3. Cut the tubes at an angle where they exit the fuselage. Fill the slots where the tubes exit the fuselage with a 50/50 mix of 6-minute epoxy and micro balloons. The addition of the micro balloons thickens the epoxy, preventing it from running and making it sand easier. Do this for both the left and right side of the fuselage.
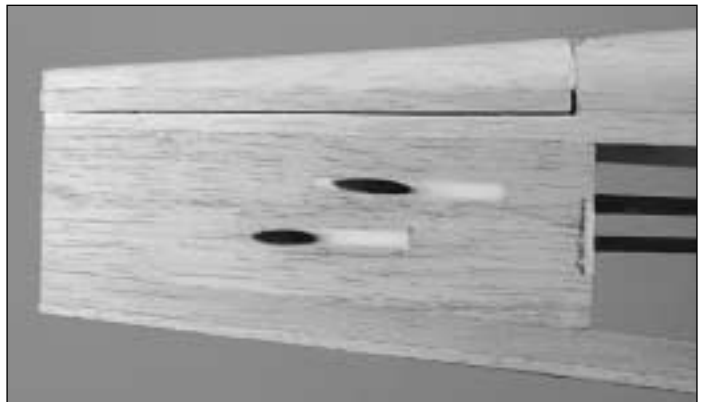
❏ 4. After the epoxy is fully cured, use a sanding bar to sand the pushrod exits flush with the fuselage on both sides of the fuselage.

Correct   Incorrect
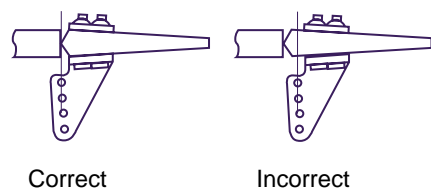
❏ 5. Refer to your plan for the proper position of the elevator **control horns**. Position the control horn on the bottom of

the elevator. Using a felt tip pen, mark the drilling locations for the screws. Drill a 1/16" [1.6mm] hole through the marks. Attach a control horn to one of the elevator halves by inserting two 2-56 x 5/8" [15.9mm] machine screws through the control horn and elevator, attaching it to the nylon control horn plate. Do this for both elevator halves.

❏ 6. Install a control horn to the right side of the rudder following the same procedure used for the elevator.

❏ 7. Locate two die-cut 1/8" [3mm] plywood **servo rails (SR)**. Glue them into the servo bay in the fuselage at the location shown on the plan.

❏ 8. From a leftover piece of the 36" [914mm] plastic flexible outer pushrod, cut a piece to a length of 5-3/4" [146mm] and install it through the remaining hole in the firewall and former F3 for the throttle pushrod. Mark where the tube contacts the firewall and former, roughen that area with sandpaper, and then glue the tube in position.

❏ 9. Following the radio manufacturer's instructions for mounting servos, install three servos onto the servo mounting rails at the locations shown on the plan. Center the servos. Then, position the servo arm as shown in the photo.
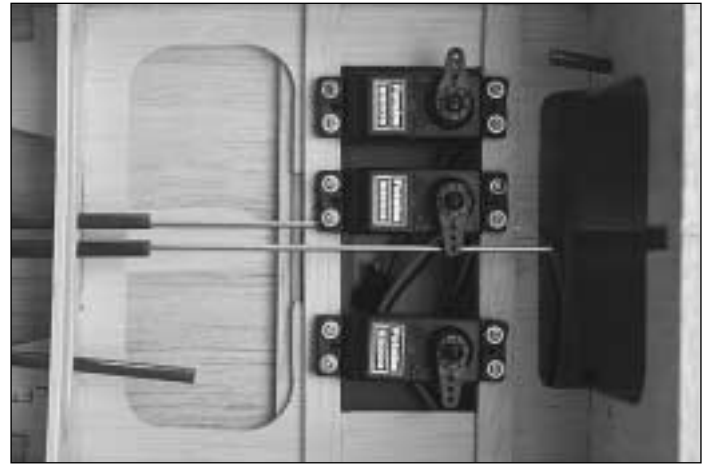
❏ 10. Locate two 2-56 x 36" [914mm] **wire pushrods**. Cut one to a length of 30-1/2" [775mm] and the other to a length of 27-1/2" [699mm]. Insert the wires into the two elevator outer pushrods. (The threaded end should be at the rear of the fuselage.) The longer wire should be in the tube on the left side of the fuselage, the shorter on the right as shown in the photo.
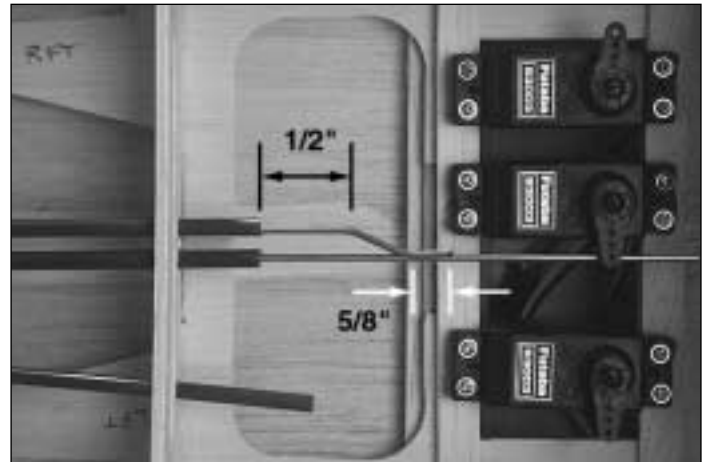
❏ 11. Bend the shorter wire at the locations shown in the photo.
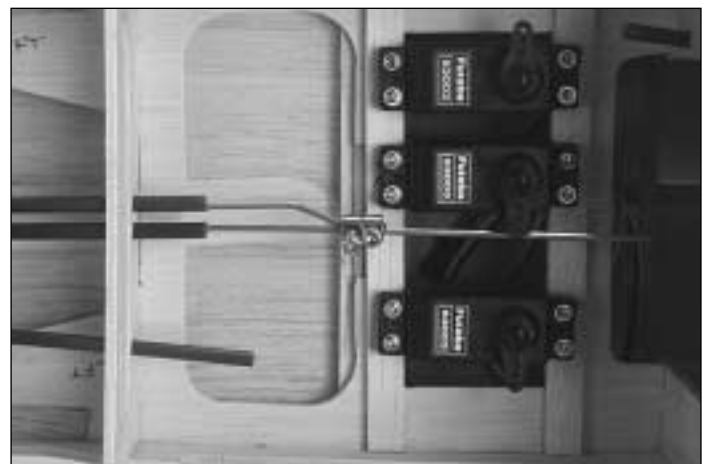
❏ 12. Locate two 5/32" [4mm] **wheel collars** and two 6-32 x 1/2" [13mm] **socket head cap screws**. Install the screws into the wheel collars. Slide both wheel collars over the two elevator pushrods. Do not tighten the set screws yet.

❏ 13. On the threaded end of both elevator pushrods attach a clevis retainer and then a clevis by turning it onto the threaded end approximately 25 turns.

❏ 14. In the "Finishing the Fuselage" section of the manual you made a balsa fixture to help in shaping the tail block. If you followed our recommendations you did not install the stab/elevator and fin/rudder to the fuselage. If you have not installed them, temporarily remove the fixture and then slide the stab/elevator and fin/rudder into the slots. ***Do not glue them in place.***

❏ 15. Snap the clevis onto the bottom hole of the control horn on each elevator half. Position both halves of the elevator at neutral. Once they are set, tighten both set screws in the wheel collars onto the two pushrod wires.

❏ 16. Cut another 2-56 x 36" [914mm] wire pushrod to a length of 31-1/2" [800mm] for the rudder. Attach the clevis and clevis retainer in the same way you installed them on the elevator. Then, install the clevis onto the rudder control horn.

❏ 17. Enlarge the end hole in the servo arm of the elevator and rudder servo with a 1/16" [1.6mm] drill bit. Position the elevator to be neutral. Then, make a mark on the pushrod wire with a felt tip pen where it meets the end hole in the servo arm.

❏ 18. Position the rudder to be neutral. Then, make a mark on the rudder pushrod wire with a felt tip pen where it meets the end hole in the servo arm.

FasLink

Servo Horn   2-56 (.074") Pushrod Wire
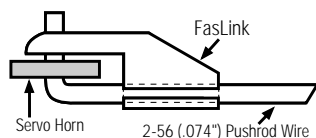
❏ 19. Make a 90 degree bend on the mark for both wire pushrods. Cut off any pushrod wire extending above the FasLink.

❏ 20. Insert the wire through the hole in the servo arm and retain it with a nylon FasLink.

❏ 21. Remove the stab and fin from the fuse. Put the fixture in place at the rear of the fuse.

❏ 22. Following the radio manufacturer's instructions, install the radio switch harness on the side of the fuselage.

Receiver & Battery

G P
10oz (800cc)
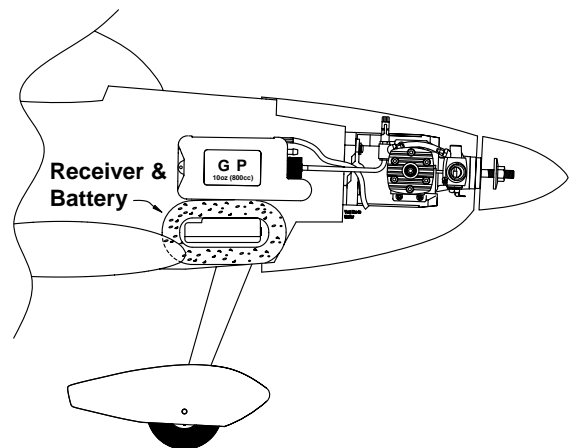
❏ 23. Referring to this sketch and the plan, install the receiver and battery pack into the front lower half of the fuselage. Connect all of the servos and servo extensions for the flaps and ailerons, following the radio manufacturer's instructions.

Install the Fuel Tank

Vent

Fitting

Fuel Pick-up Line

Cap

Clunk

Rubber Stopper
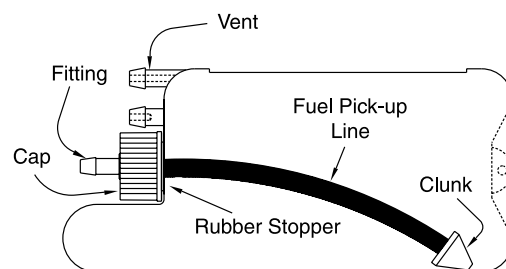
❏ 1. We are now going to break away from the radio installation to install the fuel tank. As you can see in the previous sketch, the foam wrapped receiver and battery are going to support the fuel tank. Assemble the components of the **fuel tank** as shown.

❏ 2. Now is the time to decide if you are going to fill the tank through a fuel filling valve or whether you are going to use a third line as a fill line. If you choose to use a fill valve, insert two 12" [305mm] lengths of silicone fuel tubing through the holes in the firewall. Pull the tubing into the radio compartment of the fuselage. If you are going to use a third line for filling, drill 1/16" [1.6mm] hole in the center of the third nipple on the fuel tank. Clean any debris from inside of the tank. Then insert three 12" [305mm] lengths of silicone fuel tubing through the holes in the firewall. Attach the lines to the fuel tank following the instructions with the fuel tank.
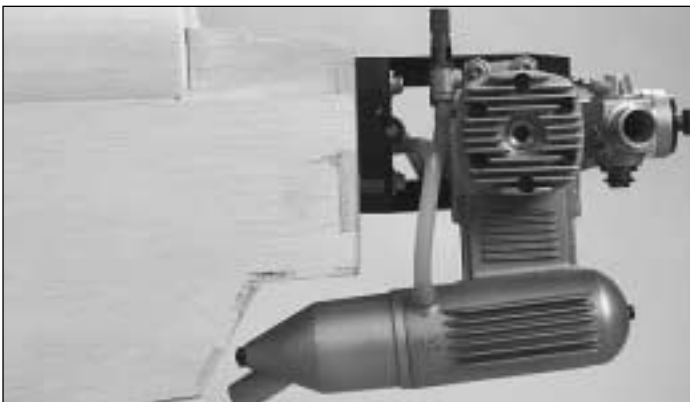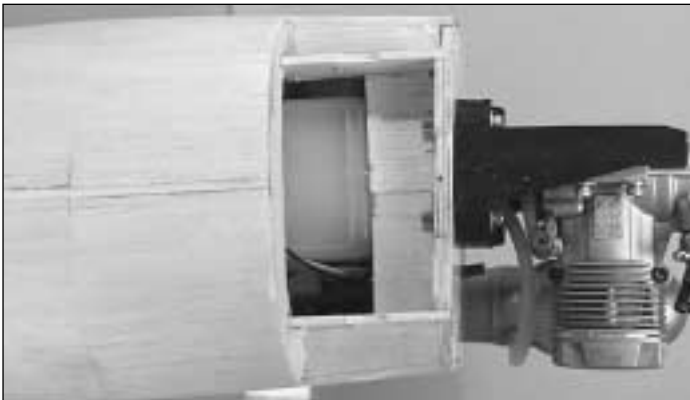
❏ 3. Remove the fuel tank top cover from the engine mount box. This will assist you as you install the fuel tank. Pull the tank into the fuselage by pulling on the fuel lines where they exit from the firewall. Position the tank against the firewall by reaching into the top of the engine mount box. Re-install the engine. Attach the vent line to the muffler and the fuel pickup to the carburetor. The lines from the fuel tank should be just long enough to reach the carburetor and the muffler. Cut the lines as needed. When everything is positioned, re-attach the fuel tank cover.

Finish the Radio Installation

❏ 1. Locate the 2-56 x 12" [305mm] wire pushrod. Cut it to a length of 10-1/2" [267mm]. On the threaded end of the pushrod attach a clevis retainer and clevis by turning it onto the threaded end approximately 25 turns. Slide the wire into the outer pushrod tube in the firewall. Attach the clevis to the throttle arm and slide the clevis retainer in place on the clevis.

RETAINER
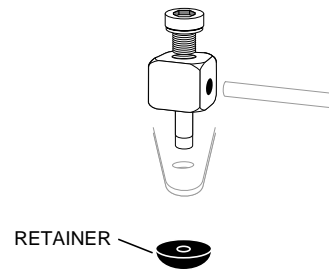
❏ 2. Install the brass **Screw Lock Set** onto the end hole of the servo arm of the throttle servo. Assemble it as shown in this sketch.

❏ 3. Slide the throttle pushrod into the screw lock set on the servo arm. Turn on the transmitter and receiver. Advance the throttle servo to the full throttle position. Open the carburetor on the engine to the fully opened position Tighten the set screw on the screw lock set onto the throttle pushrod wire. Turn the radio system off when finished.

Finish the Servo Installation

❏ ❏ 1. Install a servo into the aileron servo bay in the right wing following the radio manufacturer's instructions. Center the servo, then install a servo arm onto the servo. The servo arm should be installed 90 degrees to the servo case and the arm should be pointing toward the wingtip. Enlarge the end hole in the servo arm of the elevator and rudder servo with a 1/16" [1.6mm] drill bit.
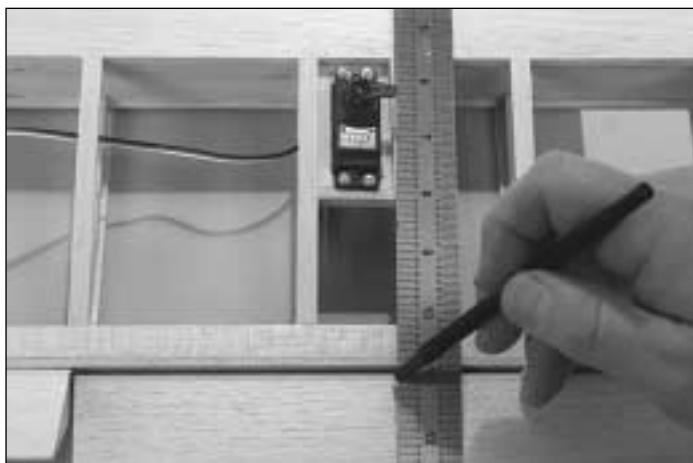
❏ ❏ 2. Place a straight edge at the end hole in the servo arm. Make a mark on the aileron in line with the end hole in the servo arm. **Important:** If you have had the ailerons off and on the wing it would be a good idea to check to make sure that you are working with the correct aileron. Press a T-pin into the balsa skin of the aileron at the mark you have just made. You should feel the pin push into the plywood control horn plate. If you do not feel the plywood plate you either have the wrong aileron or you have installed it upside down. **Do not** proceed to the next step until the aileron is correctly installed.

Correct   Incorrect
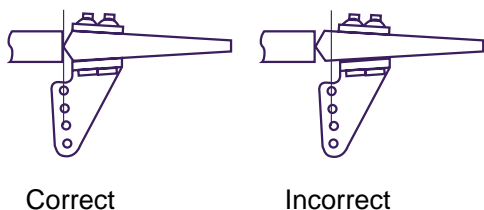
❏ ❏ 3. On the mark on the aileron install the aileron control horn. Position the control horn so that it is centered on the mark you made on the aileron. Using a felt tip pen, mark the drilling locations for the screws. Drill a 1/16" [1.6mm] hole through the marks. Saturate the holes with thin CA. After it has cured, attach the control horn to the aileron with two #2 x 5/8" [15.9mm] sheet metal screws.

❏ ❏ 4. Locate a 2-56 x 12" [305mm] wire pushrod. Cut the pushrod to a length of 4-3/4" [121mm]. On the threaded end of the pushrod attach a clevis retainer and clevis by turning it onto the threaded end approximately 25 turns.
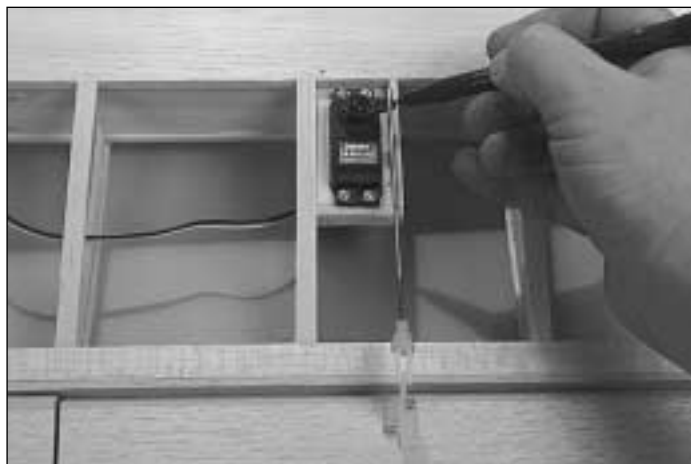
❏ ❏ 5. Attach the clevis to the control horn. Then, slide the clevis retainer in position on the clevis. Center the aileron, and then make a mark on the wire pushrod where it meets the outer hole in the servo arm. Make a 90 degree bend in the wire on the mark you have made.
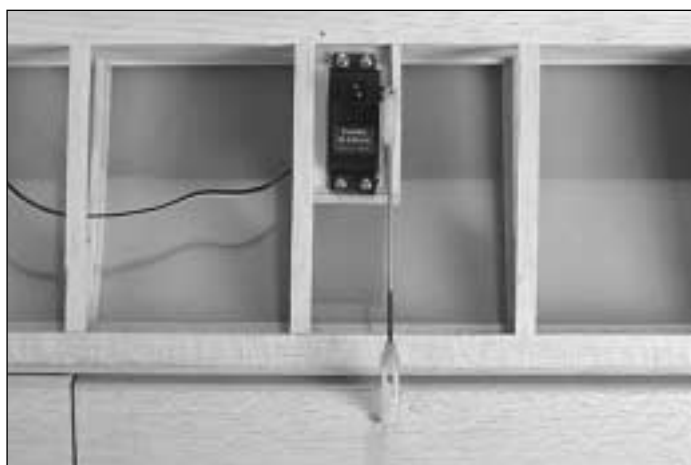
❏ ❏ 6. Insert the wire into the servo horn and retain it in place with a nylon FasLink.
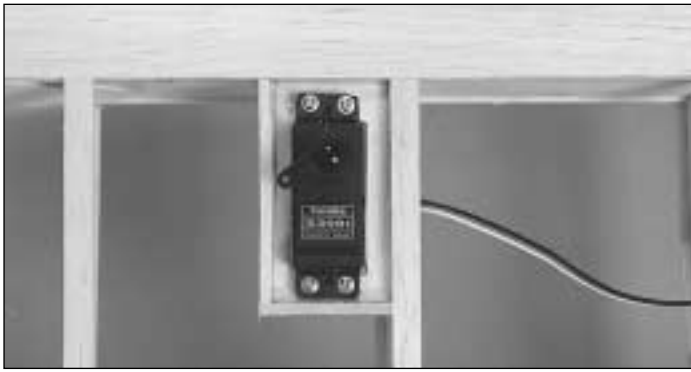
❏ ❏ 7. Install a servo into the flap servo bay in the right wing following the radio manufacturer's instructions. Temporarily plug the flap servo into the receiver and then turn on the radio and transmitter. Activate the switch that will be used for the flaps so that the servo is in the position for the flaps retracted. Install a servo arm onto the servo. The servo arm should be installed at approximately 45 degrees to the servo case and the arm should be pointing toward the center of the wing. Enlarge the end hole in the servo arm of the elevator and rudder servo with a 1/16" [1.6mm] drill bit.

❏ ❏ 8. Locate a 2-56 x 12" [305mm] wire pushrod. Cut the pushrod to a length of 4-3/4" [121mm]. On the threaded end of the pushrod attach a clevis retainer and clevis by turning it onto the threaded end approximately 25 turns.

❏ ❏ 9. Attach the clevis to the control horn. Then, slide the clevis retainer in position on the clevis. Center the aileron and make a mark on the wire pushrod where it meets the outer hole in the servo arm. Make a 90 degree bend in the wire on the mark you have made.

❏ ❏ 10. Insert the wire into the servo horn and retain it in place with a nylon FasLink.

❏ ❏ 11. Attach a 6" [152mm] servo extension to the flap servo. Apply a piece of heat shrink tubing or tape to the connectors to be sure they cannot pull apart.

❏ ❏ 12. Attach a 12" [305mm] servo extension to the aileron servo. Apply a piece of heat shrink tubing or tape to the connectors to be sure they cannot pull apart.

❏ ❏ 13. Route each of the leads through the wing. The leads should exit the wing through the hole in the top of the wing center section.

❏ 14. Repeat steps 1 -14 for the left wing panel.

❏ 15. The leads for the flap and ailerons need to be connected together with a "Y" harness. (If you are using an 8 or 9 channel radio you may have the ability to plug each of the lines into separate channels in your receiver. See the radio instruction manual before deciding which way you will proceed.)

Assemble the Cowl
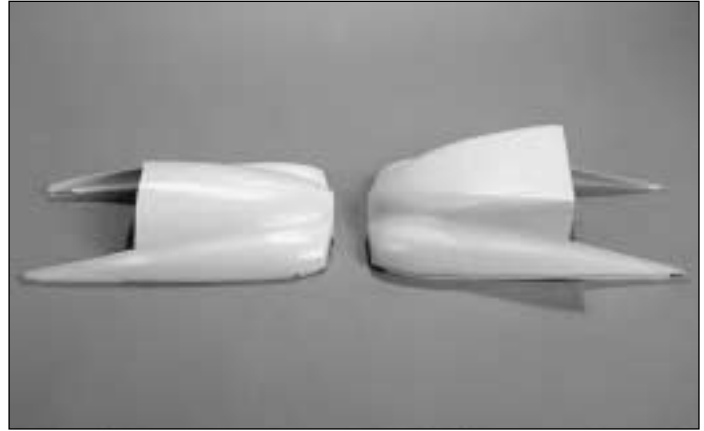
❏ 1. Cut out the two halves of the ABS **cowl**. Cut the cowl halves on the cut lines. When cut properly there will be interlocking tabs to glue the sides of the two halves together.
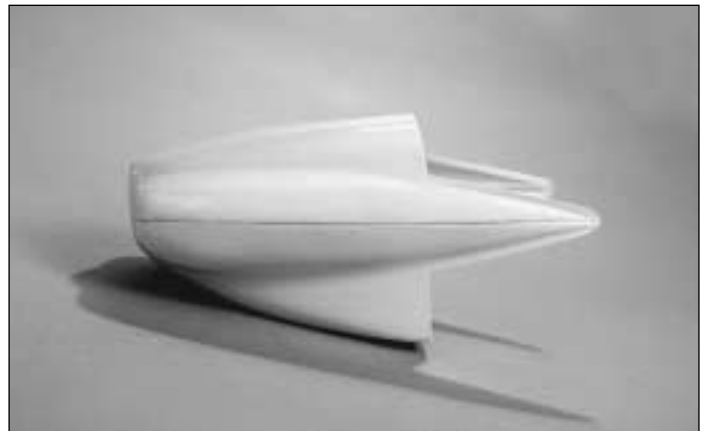
❏ 2. Glue the two halves of the cowl together with medium CA. Work on one side first, applying glue to a small section at a time. Use CA accelerator sparingly or not at all as it can cause the ABS plastic to get brittle. Work your way around the cowl until it is completely glued together. Use pieces of leftover ABS plastic to reinforce the cowl in the front.
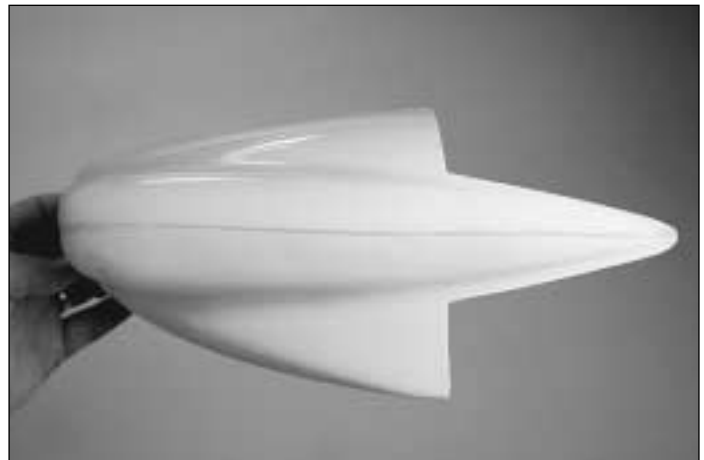
❏ 3. Apply a plastic filler such as Bondo® to fill the seam where the cowl halves are joined. After the filler has cured, sand the seam until the two cowl halves blend smoothly together.

❏ 4. Cut the openings in the front of the cowl. Wet sand the entire cowl with 400-grit wet or dry sandpaper. The cowl is now ready to be primed.

Assemble the Wheel Pants

❏ ❏ 1. Cut out the left and right half of the wheel pants along the cut line molded in the pants. When cut properly there will be interlocking tabs to glue the two halves together.

❏ ❏ 2. Glue the two halves of the pants together with medium CA. Work a small section at a time. Use CA accelerator sparingly or not at all as it can cause the ABS plastic to get brittle. Work your way around the wheel pant until it is completely glued together.

❏ ❏ 3. Use a filler like you did with the cowl to fill the seam. After the filler has cured, sand the seam with 400 grit wet or dry sandpaper until the wheel pant halves blend smoothly together.

❏ ❏ 4. Cut the opening in the bottom of the wheel pant for the wheel.

❏ 5. Repeat steps 1-4 for the remaining wheel pant.

Install the Cowl
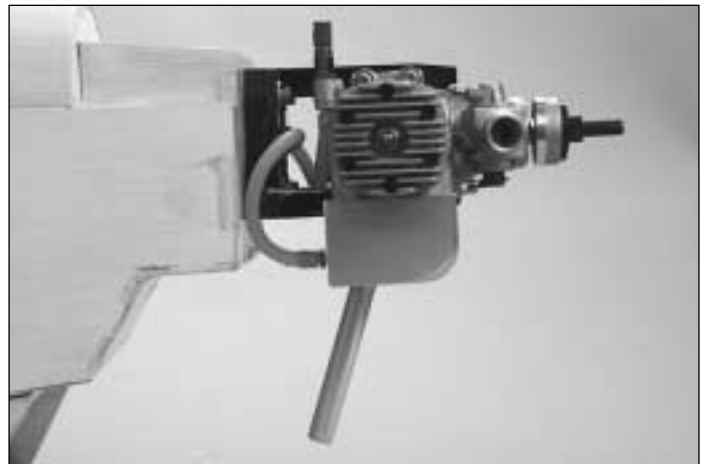
❏ 1. When you installed the engine we showed the engine with the stock muffler. The Bisson Custom Muffler, Pitts style for the O.S. .40 - .46FX (BISG4046) is an alternative muffler you may consider if you would like to hide most of the muffler inside of the cowl. Before making the cut-outs in the cowl for the engine and muffler you need to decide which muffler you are going to use.

❏ 2. Mark an arc on the cowl similar to the sketch. Cut away the cowl on the arc you have made. This is a good starting point for cutting some clearance for the landing gear and muffler.

❏ 3. Remove the muffler from the engine. Slide the cowl over the engine onto the front of the fuselage.
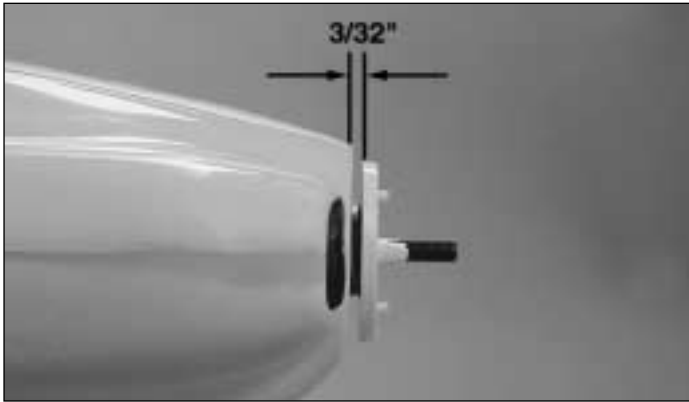
❏ 4. Position the cowling so that there is approximately 3/32" [2.4mm] between the back of the spinner plate and the front of the cowl.

❏ 5. Mark the position for the cowl on the fuselage. Drill three 1/16" mounting holes in the cowl and into the fuselage. One hole should be located in the top of the cowl. The other two should be drilled on the side at the bottom of the fuselage. Remove the cowl and drill a 3/32" [2.4mm] clearance hole through the three mounting holes your drilled in the cowl. **Do not** drill clearance holes in the fuselage. Apply a drop of thin CA into each of the mounting holes in the fuselage. This will harden the wood, giving a stronger surface for the screws. Mount the cowling to the fuselage with three #2 x 5/8" [15.9mm] sheet metal screws.

❏ 6. Cut holes in the cowling to provide access to the muffler, glow plug and the needle valve for the engine you have installed.

Install the Wheel Pants

❏ ❏ 1. Place a wheel pant onto a leg of the landing gear. Be sure you match the slot on one side of the wheel pant to the leg of the landing gear. Using a felt tip pen, mark the location for the wheel axle onto the wheel pant.

❏ ❏ 2. Drill a 5/32" [4mm] hole through the mark you have made on the inside of the wheel pant. Drill through this mark and through the outer side of the wheel pant.
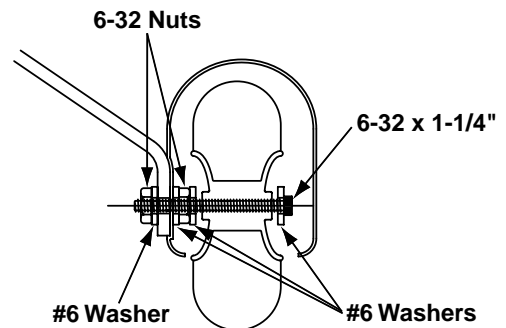
❏ ❏ 3. Locate a 6/32 x 1-1/4" [32mm] socket head cap screw, four #6 washers and two 6-32 nuts. These are the axle assembly. Install the wheel and wheel pant onto the axle assembly and then onto the landing gear following the sketch above.

❏ 4. Repeat steps 1-3 for the other wheel pant.

PREPARE THE MODEL FOR COVERING

❏ 1. Inspect all surfaces for uneven glue joints and seams that require filler. Apply filler where needed. Many small dents or scratches can be repaired by applying a few drops of water or moistening the area with a wet tissue. This will swell the wood, allowing you to sand it smooth after the balsa wood has dried.

❏ 2. Sand the entire model with progressively finer grits of sandpaper, finishing with 320 or 400-grit sandpaper.

❏ 3. Use a Top Flite Tack Cloth to remove sanding dust from the model.

BALANCE THE MODEL LATERALLY

❏ 1. Mount your wing to the fuselage. Temporarily remove the stab and fin fixture from the rear of the fuselage and temporarily insert the stab and fin into the slots.

❏ 2. With the wing level, carefully lift the model by the engine propeller shaft and the aft end of the fuselage at the bottom of the fin trailing edge (this may require two people). Do this several times.

❏ 3. If one wing always drops when you lift the model, that side is heavy. Balance the airplane by gluing weight inside the other wing tip. Glue the weight in place with epoxy. An airplane that has been balanced laterally will track better in loops and other maneuvers.

❏ 4. Remove the stab and fin. Then, reinstall the fixture in the rear of the fuselage.

FINISH THE COCKPIT

❏ 1. Now is the time to finish the cockpit area. We painted our entire cockpit with flat black paint, then installed the instrument panel decal. We also chose to install a pilot and a rollover bar. Should you decide to install the rollover bar refer to the drawing on the plan. This can be made from the two 5/16" x 4-1/2" [7.9 x 115mm] wood dowels.

COVER THE MODEL WITH MONOKOTE®

It is assumed that you have already covered a couple of models in the past, so we won't go into many details on covering techniques, but here are some tips you should consider.

1. NEVER CUT THE COVERING DIRECTLY ON THE SHEETING. The RV-4 depends on the sheeting for some of its strength. Modelers who cut through the covering tend to cut the sheeting and this will weaken the structure.

2. Use a Top Flite Hot Sock™ to minimize dents in the wood from your covering iron.

3. When you cover large sheeted surfaces such as the wing, bond the covering in the middle and work outward, pushing out air as you proceed. Do not move the iron in a circular motion, but move it span-wise with the grain of the wood.

4. When you cover smaller parts with square edges such as the elevators and ailerons, cover the ends first with separate pieces of covering. Then, all you have to do is wrap the covering around the top and bottom and iron it down.

5. When you cover sharp junctions like where the stab meets the fuse, cut narrow strips of covering and apply them in the corners before you cover the major surfaces. The larger pieces of covering will overlap the smaller pieces. This technique also eliminates the need to cut the covering after it has been applied.

6. If you want to duplicate the trim scheme pictured on the box, you will need the following: 2 rolls of MonoKote White (TOPQ0204), 1 roll of MonoKote Black (TOPQ0208), 1 roll of MonoKote Royal Blue (TOPQ0221) and 1 roll MonoKote Aluminum (TOPQ0205). Trim Sheets will also work well over the white base color.

Covering Sequence

FUSELAGE

❏ 1. Tail *junctions strips* as described previously.
❏ 2. Stab tops, then bottoms.
❏ 3. Fin right, then left side.
❏ 4. Fuse bottom aft, then front.
❏ 5. Fuse sides.
❏ 6. Turtle deck (may be done in one or two pieces).
❏ 7. Front deck (aft of cowl).

WING

❏ 1. Hidden areas and corners such as the trailing edge on the flap and aileron area.
❏ 2. Bottom of one, then the other half of the wing.
❏ 3. Top of one, then the other half of the wing.

❏ 1. Ends, bottoms, then tops of elevators, ailerons and flaps.
❏ 2. One, then the other side of the rudder.

Install the Stab and Fin

Once you have the stab, fin and fuselage covered you can permanently install the stab and fin to the fuselage.

B = B
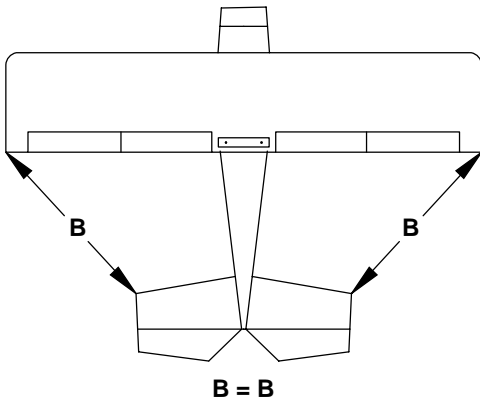
❏ 1. Mount the wing to the fuselage. Then, insert the stab into the slots in the fuselage. Measure the distance from the tip of the stab to the tip of the wing on the right side of the fuselage. Measure the same point on the left side of the fuselage. Adjust the stab until both sides measure the same.

❏ 2. If you covered the center section of the stab, mark the outline of the fuselage on the stab with a felt tip marker. Then, cut away the covering in the center section so that you can achieve a good glue joint between the balsa stab center section and the stab base on the fuselage. When cutting the covering away **be careful** not to cut the balsa wood. Cutting the balsa wood can weaken the structure!

❏ 3. Glue the stab to the fuselage with 6-minute epoxy, checking the distance from the stab to the wing before the glue cures.

❏ 4. After the glue has cured on the stab, insert the fin into the slots in the fuselage. Mark the outline of the fuselage onto both sides of the fin. Remove the fin and cut the covering, being careful not to cut into the balsa wood structure.
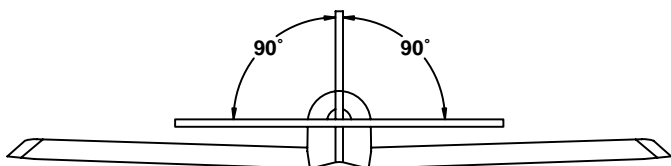
❏ 5. Be sure the fin is 90 degrees to the stab. Then, glue the fin to the fuselage with 6-minute epoxy.

PAINTING

At this stage all of your plastic pieces should have the seams filled with Bondo or putty. If you haven't already done so, wet sand the plastic parts with 400-grit wet-or-dry sandpaper so the paint will adhere. Spray the cowling and wheel pants with at least one coat of Top Flite LustreKote® primer. Wet sand the the plastic parts between coats with 400-grit sandpaper. Use Great Planes 1/8" [3mm] EZ-Mask Flexible Masking Tape (GPMR1000) for masking sharp lines. A Top Flite Tack Cloth (TOPR2185) is useful to remove dust before you paint. LustreKote paint gives a matching finish to your MonoKote finish.

JOIN THE CONTROL SURFACES

After the control surfaces are covered, you can permanently install the hinges into the control surfaces.

CUT THE COVERING
AWAY FROM THE SLOT
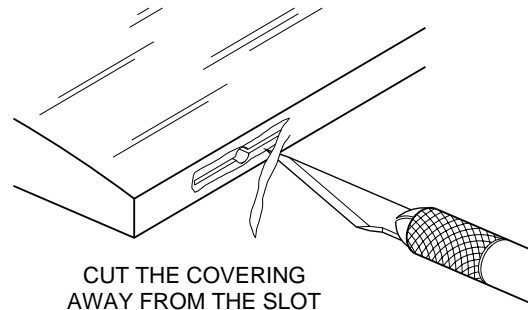
❏ 1. Start with the stab and elevators. Remove a small strip of covering from the hinge slot.

❏ 2. Fit the hinges in the stab and elevator (without glue).

TEMPORARY PIN
TO KEEP HINGE
CENTERED
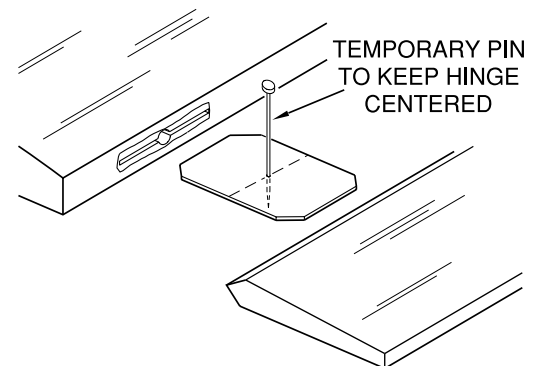
❏ 3. Join the elevators to the stab with the hinges. If the hinges do not remain centered as you join the elevators to the stab, remove the stab and insert a pin in the center of the hinge to keep them centered. Make sure there is approximately a 1/64" [.4mm] gap between the elevators and the stab so you do not glue them together.

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

ASSEMBLE, THEN APPLY 6 DROPS
OF THIN CA TO CENTER
OF HINGE, ON BOTH SIDES
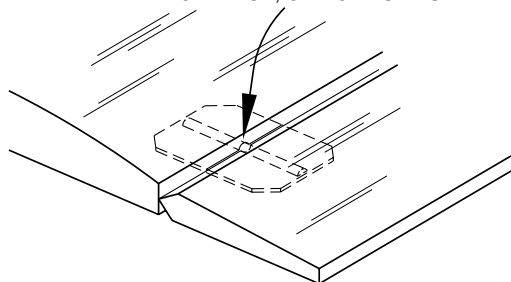
THE CA WICKS
ALONG THE "TUNNELS"
TO THE ENTIRE
HINGE SURFACE
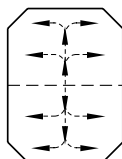
❏ 4. Add six drops of thin CA to the center of the hinges on both the top and bottom. The holes you drilled in the hinge slot will wick the CA into the entire hinge surface. Use a paper towel to absorb excess CA from the hinge gap before it cures.

❏ 5. Use the same hinging method to join the rudder to the fin, the ailerons to the wing and the flaps to the wing.

❏ 6. Reinstall the pushrods you disconnected before covering and mount the control horns to the ailerons, flaps, elevator and rudder. Reinstall any hardware and other components you may not already have in place such as the fuel valve, fuel lines, servos, on/off switch, etc.

CANOPY INSTALLATION
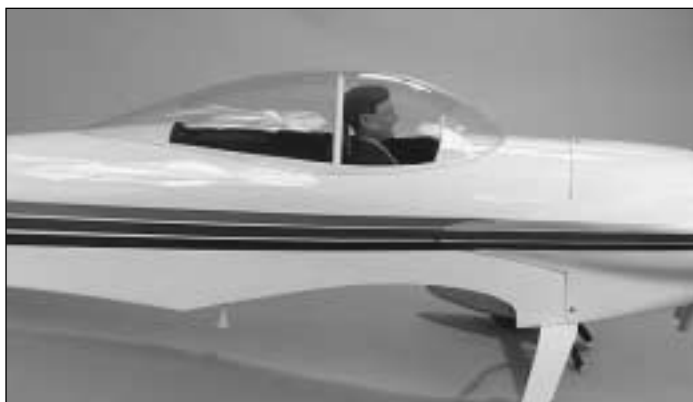
❏ 1. Cut the canopy on the cut line. Position the canopy in place on the top of the fuselage after the covering of the fuselage is complete.

❏ 2. When you are satisfied with the fit, apply a small bead of Z-56 canopy glue to the bottom of the canopy where it comes in contact with the fuselage. (We recommend this glue because it dries virtually clear.) Hold the canopy in place with masking tape until the glue is fully cured (overnight).

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.

4-CHANNEL RADIO SETUP
(STANDARD MODE 2)

ELEVATOR MOVES UP

RIGHT AILERON MOVES UP
LEFT AILERON MOVES DOWN

RUDDER MOVES RIGHT

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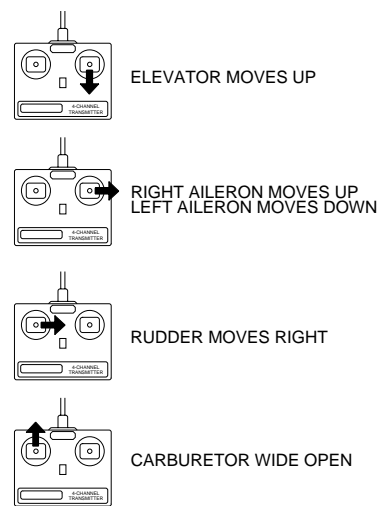
❏ 3. Make certain that the control surfaces and the carburetor respond in the correct direction as shown in the diagram. If any of the controls respond in the wrong direction, use the servo reversing in the transmitter to reverse the servos connected to those controls. Be certain the control surfaces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

Set the Control Throws

Use a Great Planes AccuThrow™ (or a ruler) to accurately measure and set the control throw of each control surface as indicated in the chart that follows. If your radio does not have dual rates, we recommend setting the throws at the low rate setting for the first flights. **NOTE:** The throws are measured at the **widest part** of the elevators, rudder and ailerons.

These are the recommend control surface throws:

	High rate	**Low rate**
Elevator:	5/8" [16mm] up	1/4" [7mm] up
	5/8" [16mm] down	1/4" [7mm] down
Rudder:	1-1/16" [27mm] right	7/8" [22mm] right
	1-1/16" [27mm] left	7/8" [22mm] left
Ailerons:	3/4" [19mm] up	1/2" [13mm] up
	3/4" [19mm] down	1/2" [13mm] down
Flaps:	1" [25mm] down	1/2" [13mm] down

IMPORTANT: The RV-4 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 RV-4 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.** (Center of Gravity) can have the **greatest** effect on how a model flies and may determine whether or not your first flight will be successful. If you value this model and wish to enjoy it for many flights, **DO NOT OVERLOOK THIS IMPORTANT PROCEDURE.** A model that is not properly balanced will be unstable and possibly unflyable.

At this stage the model should be in ready-to-fly condition with all of the systems in place including the engine, landing gear, covering and paint and the radio system.
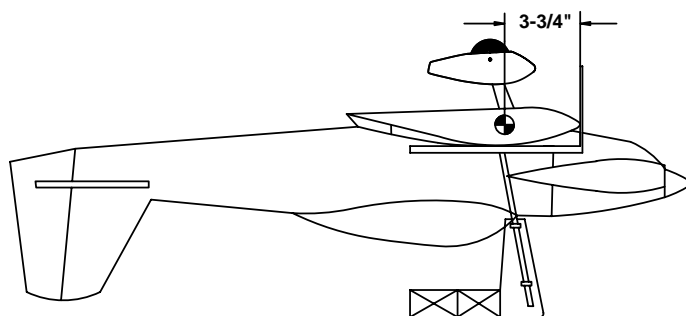
❏ 1. Use a felt-tip pen or 1/8" [3mm] - wide tape to accurately mark the C.G. on the bottom of the wing on both sides of the fuselage. **The C.G. is located 3-3/4" [95mm] back from the leading edge of the wing.**

This is where your model should balance for your first flights. Later, you may wish to experiment by shifting the C.G. up to 1" [25mm] forward or 3/8" [9.5mm] back to change the flying characteristics. Moving the C.G. forward may improve the smoothness and stability, but it may then require more speed for takeoff and make it more difficult to slow down 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, all parts of the model installed (ready to fly) and an empty fuel tank, place the model upside down on a Great Planes CG Machine, or lift it at the balance point you marked.

❏ 3. If the tail drops, the model is "tail heavy" and weight must be added to the nose to balance. If the nose drops, the model is "nose heavy" and the battery pack and/or receiver must be shifted aft or weight must be added to the tail to balance. If possible, relocate the battery pack and receiver to minimize or eliminate any additional ballast required. If additional weight is required, nose weight may be easily added by using a "spinner weight" (GPMQ4645 for the 1 oz. weight, or GPMQ4646 for the 2 oz. weight). If spinner weight

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

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

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

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.

Charge the Batteries

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

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

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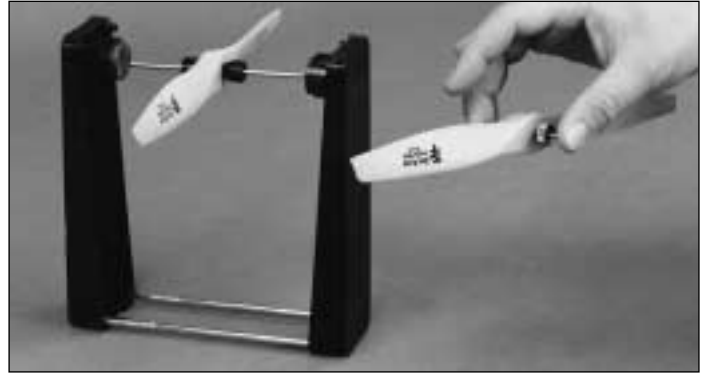
Carefully balance your propeller and spare propellers before you fly. An unbalanced prop can be the single most significant cause of vibration that can damage your model. Not only will engine mounting screws and bolts loosen, possibly with disastrous effect, but vibration may also damage your radio receiver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

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

Ground Check

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

Range Check

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

ENGINE SAFETY PRECAUTIONS

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

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

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

Use safety glasses when starting or running engines.

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

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

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

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

Make all engine adjustments from behind the rotating propeller.

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

To stop a glow engine, cut off the fuel supply by closing off the fuel line or following the engine manufacturer's recommendations. Do not use hands, fingers or any other body part to try to stop the engine. Do not throw anything into the propeller of a running engine.

AMA SAFETY CODE (EXCERPT)

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

General

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

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

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

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

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

Radio Control

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

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

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

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

CHECK LIST

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

❏ 1. Fuelproof all areas exposed to fuel or exhaust residue such as the firewall, wing saddle area, etc.

❏ 2. Check the C.G. according to the measurements provided in the manual (page 47).

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

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

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

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

❏ 7. Add a drop of oil to the axles so the wheels will turn freely.

❏ 8. Make sure all hinges are securely glued in place.

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

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

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

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

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

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

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

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

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

❏ 18. Tighten the propeller nut and spinner.

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

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

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

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

FLYING

The RV-4 is a great-flying model that flies smoothly and predictably. The RV-4 does not, however, posses the self-recovery characteristics of a primary R/C trainer and should be flown only be experienced R/C pilots.

Fuel Mixture Adjustments

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

Takeoff

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

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

Flight

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

Take it easy with the RV-4 for the first few flights, gradually getting acquainted with it as you gain confidence. Adjust the

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

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

Landing

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

If you have installed the functional flaps the landing approach is very similar. Lower the throttle while on the downwind leg. Then, lower the flaps approximately 1/2" [13mm]. The nose will most likely pitch up slightly. When it does, continue lowering the throttle until the nose levels.

Continue to lose altitude as you turn onto the downwind leg. Line up with the runway, allowing the nose to come down but maintaining airspeed and control. Fly the airplane to two or three feet above the runway and then drop the throttle to idle. Add elevator to flare the airplane to touchdown.

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!

2-View
Use the 2-view or photocopy it and use
the copy to design your trim scheme.