GIANT EXTRA 330L

INSTRUCTION MANUAL

WARRANTY

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

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

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

READ THROUGH THIS INSTRUCTION MANUAL FIRST. IT CONTAINS IMPORTANT INSTRUCTIONS AND WARNINGS CONCERNING THE ASSEMBLY AND USE OF THIS MODEL.

GREAT PLANES® MODEL MANUFACTURING COMPANY

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productsupport@greatplanes.com

EXTGP03 V1.0 For GPMA0250

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

Your Extra 330L is not a toy, but rather a sophisticated, working model that functions very much like an actual airplane. Because of its realistic performance, the Extra 330L, if not assembled and operated correctly, could possibly cause injury to yourself or spectators and damage property.

To make your R/C modeling experience totally enjoyable, we recommend that you get experienced, knowledgeable help with assembly and during your first flights. You'll learn faster and avoid risking your model before you're truly ready to solo. Your local hobby shop has information about flying clubs in your area whose membership includes qualified instructors.

You can also contact the national Academy of Model Aeronautics (AMA), which has more than 2,500 chartered clubs across the country. Through any one of them, instructor training programs and insured newcomer training are available. Contact the AMA at the address or toll-free phone number below.

AMA
SINCE 1936

Academy of Model Aeronautics
5151 East Memorial Drive
Muncie, IN 47302-9252
Tele. (800) 435-9262
Fax (765) 741-0057
or via the Internet at http://www.modelaircraft.org

1. Build the plane according to the plan and instructions. Do not alter or modify the model, as doing so may result in an unsafe or unflyable model. In a few cases the plan and instructions may differ slightly from the photos. In those instances the plan and written instructions are correct.

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

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

4. You must properly install all components so that the model operates properly on the ground and in the air.

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

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

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

Please inspect all parts carefully before starting to build! 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 calling for replacement parts, please reference the part numbers and the kit identification number (stamped on the end of the carton) and have them ready when calling.

INTRODUCTION

Congratulations and thank you for purchasing the Great Planes 1/3 scale giant Extra 330L. We'd like to provide you a bit of history on our selection of this aircraft as the newest release in the Great Planes sport scale aerobatic line.

The first of the Extra legacy – the 230 — stormed onto the aerobatic scene in 1984, and its descendants continue to rock the aerobatic world. The Extra 260, a hand built one-of-a-kind prototype, carried Patty Wagstaff to the status of the only woman to hold the US National Aerobatic Champion title, and stands proudly in the Smithsonian. The Extra 300 series burst onto the scene shortly thereafter, first with the 300 – a shoulder wing two seat superstar – followed by the 300S and L – low wing single and two seat models, respectively, with even more performance.

Now Extra threatens to scream to the top of the aerobatic ladder yet again by challenging the current reigning star, the CAP 232, with the 330L and 330XS; modified 300S and L aircraft, powered by Lycoming 330hp engines and larger tail surfaces.

At the time of this writing the 330L and 330XS are still in the prototyping stages, but Extra Germany has recently announced a 330LX which appears to be nearly identical to the 330L prototype from which this aircraft was modeled. Until production aircraft are flying, exactly which model will actually challenge the CAP is yet to be seen.

However, **regardless of which model does get produced**, the prototype 330L in Europe (the one modeled here) and various other retrofitted 300S and L aircraft are already stirring up the aerobatic and air show arenas. This excitement and impressive performance led us to choose this aircraft for our first Giant Scale Competitive Aerobatic Model.

The Extra has a mixed composite/aluminum/cloth covered skin with well defined lines. Coincidentally, this makes the Great Planes Extra 330L relatively easy to build and cover. We have made every effort to maintain this mixed-skin appearance and the scale shapes.

Flying the Extra 330L is a thrilling experience–as it should be for such an aerobatic model! It doesn't take much elevator or aileron throw to put the Extra through its paces. When you have a feel for your Extra 330L, the throws can be increased to high rates (noted on the plans and in the instructions) to really showcase the model's aerobatic potential. The Extra performs surprisingly well on a 50-60 cc single cylinder gas engine or 70cc gas twin cylinder engines such as the MacMinarelli 70 twin, but seasoned experts will want to get the most out of the Extra by strapping on extremely powerful engines such as a 70cc gasoline single or the MacMinarelli 85 twin.

We hope you enjoy building and flying your Great Planes Extra 330L as much as we did the prototypes.

DECISIONS YOU MUST MAKE

Engine Selection

There are several engines that will work well in the Extra 330L, but for Unlimited-level competition or Tournament style performance, we recommend a gasoline powered twin cylinder 85cc such as the MacMinarelli 85 twin (MMLG0085). For sport flying and competition through the Advanced level, we recommend the MacMinarelli 70 twin (MMLG0070).
NOTE: *Please see the* ***FLYING*** *section regarding flutter, propeller selection and aerobatic performance.*

Exhaust System Selection

You will need to choose an appropriate in-cowl muffler for your engine. We chose the MacMinarelli exhaust system designed specifically for the MacMinarelli 70 and 85 engines (MMLG9000).

Performance

You will need to decide if you want to perform the most extreme of 3D aerobatics with this aircraft. If so, you will want to consider four 80+ in. oz. servos for your ailerons and two 80+ in. oz. servos for your rudder. Additionally, you will need to double bevel the elevator leading edge. Instructions to perform all of these modifications are provided in shaded boxes.

PREPARATIONS

Required Accessories

Items in parentheses (GPMQ4243) are suggested part numbers recognized by most distributors and hobby shops and are listed for your ordering convenience. GPM is the Great Planes brand, TOP is the Top Flite® brand, HCA is the Hobbico® brand and COV is the Coverite™ brand.

❏ 6+ Channel Radio with 7-10+ servos - each aileron requires a 100 in oz single servo or twin 50+ in oz servos PER aileron
Rudder requires a 100 in oz single servo or twin 50+ in oz servos
Twin elevator servos (80 in oz each minimum)
Standard Servo for throttle and onboard kill switch
1000+ mah Rx battery pack

AND

❏ Four 24” servo extensions - 2 aileron, 1 rudder, 1 elevator (HCAM1000 for Futaba®)
❏ One Standard Y-Harness - 1 aileron (optional: 1 rudder) (HCAM2500 for Futaba)
❏ One Servo-Reverser and a Y-Harness or Reversing Y-Harness for elevator (HCAM2500 for Futaba Y Harness)

OR

❏ Computer radio and 24” and 36” servo extensions per custom radio set up
❏ Engine and mounting hardware; *See* **Engine Selection**
❏ Muffler; *See* **Exhaust System**
❏ Propeller; *Refer to your engine’s instructions for proper size*
NOTE: ***We recommend staying with a 10 or lesser pitch and the appropriate diameter for your engine to optimize aerobatic performance and minimize flutter risk on this model.***
❏ Top Flite Super MonoKote covering (Approximately three 25’ rolls); *See* **Covering** (page 3)
❏ Fuel-Proof paint; *See* **Painting** (page 44)
❏ Medium Gas Fuel Tubing (PRAQ1750, 3’)
❏ 24 oz. Fuel Tank (GPMQ4101 for gas or glow)
❏ Easy Fueler™ Valve for Gas (GPMQ4161) or Glow (GPMQ4101)
❏ 1/2” Latex Foam Rubber Padding (HCAQ1050)
❏ (2) 4-1/2” Wheels (DUBQ0846)
❏ 24 Giant Scale Pin Hinges (ROBQ2510)
❏ (4) 3/16” Wheel Collar (GPMQ4308)
❏ 5 (optional up to 8) Giant Scale Control Horns (DUBQ1985)
❏ (Optional) Onboard kill switch (GPMG2150) (mandatory for gasoline engines)
❏ (2) 18” nylon pushrod for throttle (nylon required for gasoline applications) (GPMQ3710)
❏ (2) 2-56 nylon clevises (GPMQ3800)
❏ (2) Screw Lock Pushrod Connectors (GPMQ3870)
❏ 6 (optional up to 9) 4-40 solder on clevises (GPMQ3815, qty 12)
❏ 6 (optional up to 9) 4-40 thread on clevises with 12” pushrod (GPMQ3785, qty 12)
❏ Giant scale tail wheel assembly and hardware (OHIQ2020)
❏ (2) 3/16” axles (long) (DUBQ1115)
❏ 5” Spinner (TRUQ2430 - aluminum, giant scale “Menz” cut)
❏ 2 Pilots (DGA 1/3 Scale Sportsman Pilot used in prototype, DGAQ2000)
❏ (4) 1-ft sections of Velcro™ or other non-adhesive-backed hook-n-loop material

Building Supplies

These are the building tools, glue, etc. that we recommend and mention in the manual.

❏ (2) 4-oz. Thin CA (GPMR6004)
❏ (2) 4-oz. Medium CA+ (GPMR6010)
❏ CA Accelerator (GPMR6035)
❏ 6-Minute Pro™ Epoxy (GPMR6045)
❏ 30-Minute Pro Epoxy (GPMR6047)
❏ Pacer Formula 560™ Canopy Glue (PAAR3300)
❏ HobbyLite™ Balsa Filler (HCAR3401)
❏ Masking Tape

❏ Great Planes Plans Protector (GPMR6167)
❏ X-Acto® Razor Saw (XACR2531)
❏ #1 Hobby Knife Handle (HCAR0105)
❏ #11 Blades (HCAR0311, 100 Qty.)
❏ Builder's Triangle Set (HCAR0480)
❏ Small T-pins (HCAR5100)
❏ Medium T-pins (HCAR5150)
❏ 1/4-20 Tap (GPMR8105, drill bit included)
❏ Electric Power Drill
❏ Drill Bits: 1/16", 5/64", 3/32", 7/64", 1/8", 5/32", #18 or 11/64", 3/16", #10 or 13/64" (unless purchased with 1/4-20 Tap listed above), 7/32", 1/4", 17/64"
❏ Monofilament String for aligning wing and stabilizer
❏ Screwdrivers (Phillips and Flat Blade)
❏ Top Flite MonoKote Sealing Iron (TOPR2100)
❏ Bar Sander or Sanding Block and Sandpaper (coarse, medium, fine grit)

EXPERT TIP

On our workbench, we have three 11" **Great Planes Easy-Touch™ Bar Sanders**, equipped with #80, #150 and #220-grit sandpaper. This setup is all that is required for almost any sanding task. We also keep some #320-grit wet-or-dry sandpaper handy for finish sanding before covering.

Great Planes **Easy-Touch Bar Sanders** are made from lightweight extruded aluminum and can be found at most hobby shops. They are available in five sizes.

5-1/2" (GPMR6169) for those tight, hard-to-reach spots; 11" (GPMR6170) for most general purpose sanding; 22" (GPMR6172), 33" (GPMR6174) and 44" (GPMR6176) for long surfaces such as wing leading edges. The **Easy-Touch Adhesive-Backed Sandpaper** comes in 2" x 12' rolls of 80-grit (GPMR6180), 150-grit (GPMR6183) and 220-grit (GPMR6185) and an assortment of 5-1/2" long strips (GPMR6189) for the short bar sander. The adhesive-backed sandpaper is easy to apply and remove from your sanding bar when it's time for replacement.

Custom sanding blocks can be made from balsa or hardwood blocks and dowels for sanding difficult-to-reach spots.

Optional Supplies and Tools

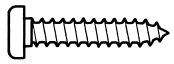
❏ TME Smoke System (TMEG7000)
❏ (1-3) Hobbico Airplane Gyros - allows full function with twin servos (HCAM4010)
❏ CA Applicator Tips (HCAR3780)
❏ Epoxy Brushes (GPMR8060)
❏ Epoxy Mixing Sticks (GPMR8055, Qty. 50)
❏ CA Debonder (GPMR6039)
❏ Clevis Installation Tool (GPMR8030)
❏ Hot Sock™ (TOPR2175)
❏ Trim Seal Tool (TOPR2200)
❏ Heat Gun (TOPR2000)
❏ MonoKote Trim Solvent (TOPR6020)
❏ Great Planes Slot Machine™ Hinge Slotter (GPMQ4010)
❏ Single Edge Razor Blades (HCAR0312, 100 Qty.)
❏ Razor Plane (MASR1510)
❏ 36" Non-Slip Straightedge (HCAR0475)
❏ Denatured or Isopropyl Alcohol (for epoxy clean-up)
❏ Dremel® MultiPro® or similar w/Sanding Drum, Cutting Burr, Cut-off Wheel
❏ Curved-Tip Canopy Scissors (HCAR0667)
❏ Servo Horn Drill (HCAR0698)

Important Building Notes

There are two types of screws used in this kit:

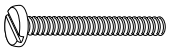
Sheet metal screws are designated by a number and a length.

For example #6 x 3/4" [1.91mm]



Machine screws are designated by a number, threads per inch, and a length.

For example 4-40 x 3/4" [1.91mm]

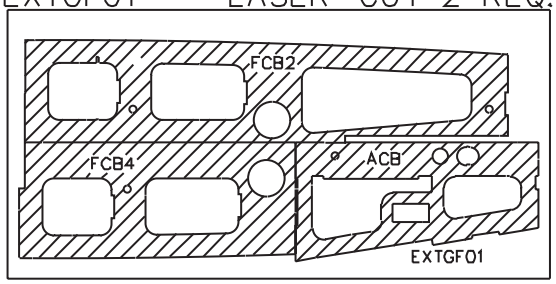


- When you see the term **"test fit"** in the instructions, it means you should first position the part on the assembly **without using any glue**, then slightly modify or "custom fit" the part as necessary for the best fit**.** Do **not** glue until told to do so.

- When you see the term **"fit"** in the instructions, it means you should first position the part on the assembly **without using any glue**, then modify or "custom fit" the part as necessary for the best fit**.** Glue when you are satisfied with the fit. (Continued on page 8)

DIE-CUT PATTERNS

EXTGF01 LASER-CUT 2 REQ.

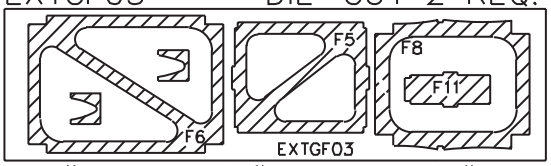


1/8" X 11-3/4" X 23-3/4" PLY

EXTGF02 DIE-CUT 2 REQ.

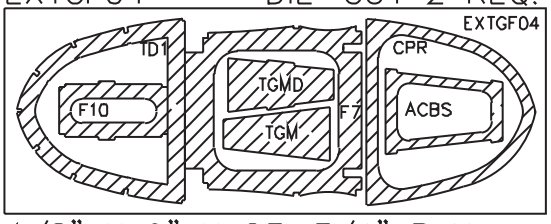
1/8" X 4-5/8" X 23-3/4" PLY

EXTGF03 DIE-CUT 2 REQ.



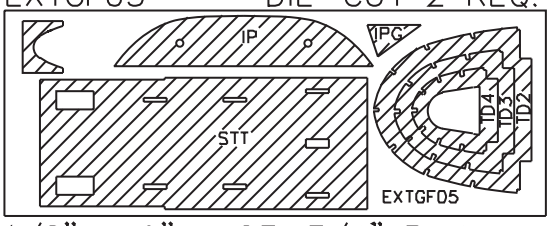
1/8" X 6-5/8" X 23-3/4" PLY

EXTGF04 DIE-CUT 2 REQ.



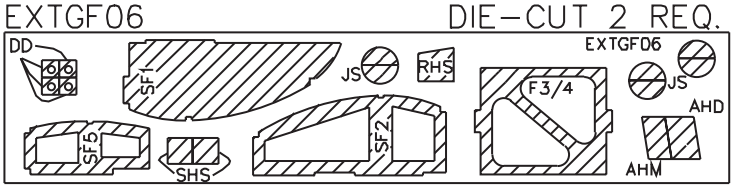
1/8" X 9" X 23-3/4" PLY

EXTGF05 DIE-CUT 2 REQ.



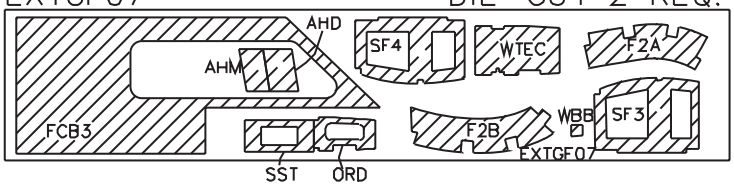
1/8" X 9" X 23-3/4" PLY

EXTGF06 DIE-CUT 2 REQ.



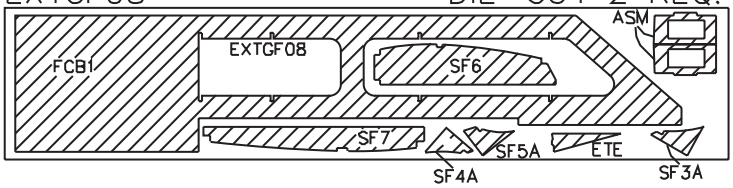
1/8" X 6-5/8" X 31-3/4" PLY

EXTGF07 DIE-CUT 2 REQ.



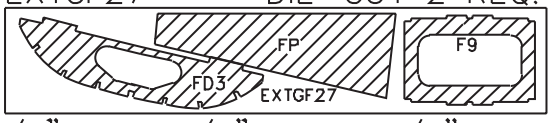
1/8" X 6-5/8" X 31-3/4" PLY

EXTGF08 DIE-CUT 2 REQ.



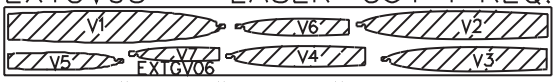
1/8" X 6-5/8" X 31-3/4" PLY

EXTGF27 DIE-CUT 2 REQ.



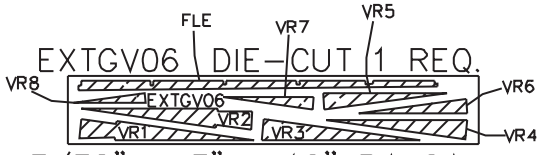
1/8" X 4-5/8" X 23-3/4" PLY

EXTGV05 LASER-CUT 1 REQ.



3/32" X 3" X 24" BALSA

EXTGV06 DIE-CUT 1 REQ.



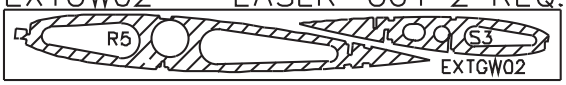
3/32" X 3" X 18" BALSA

DIE-CUT PATTERNS

EXTGW01 LASER-CUT 2 REQ.

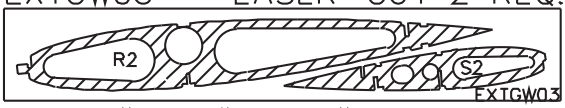
3/32" X 3" X 24" BALSA

EXTGW02 LASER-CUT 2 REQ.



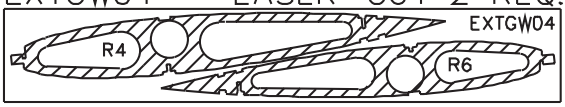
3/32" X 3" X 24" BALSA

EXTGW03 LASER-CUT 2 REQ.



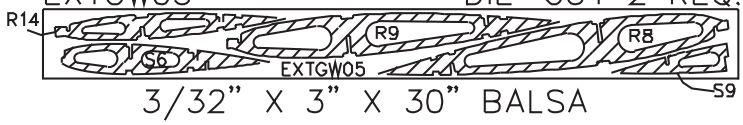
3/32" X 4" X 24" BALSA

EXTGW04 LASER-CUT 2 REQ.



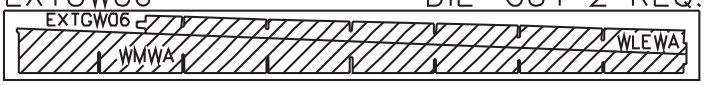
3/32" X 4" X 24" BALSA

EXTGW05 DIE-CUT 2 REQ.



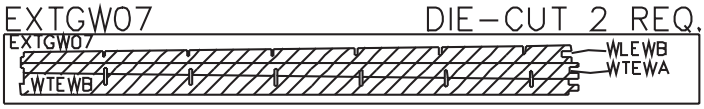
3/32" X 3" X 30" BALSA

EXTGW06 DIE-CUT 2 REQ.



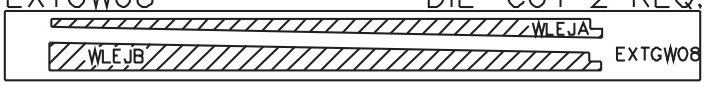
1/8" X 3" X 30" BALSA

EXTGW07 DIE-CUT 2 REQ.



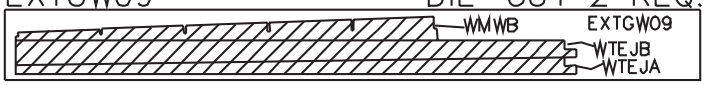
1/8" X 3" X 30" BALSA

EXTGW08 DIE-CUT 2 REQ.



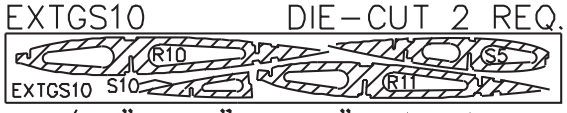
1/8" X 3" X 30" BALSA

EXTGW09 DIE-CUT 2 REQ.



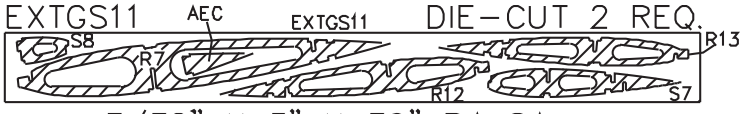
1/8" X 3" X 30" BALSA

EXTGS10 DIE-CUT 2 REQ.



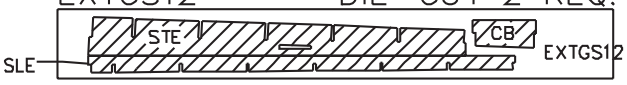
3/32" X 3" X 24" BALSA

EXTGS11 DIE-CUT 2 REQ.



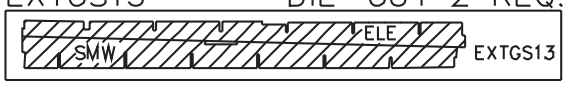
3/32" X 3" X 30" BALSA

EXTGS12 DIE-CUT 2 REQ.



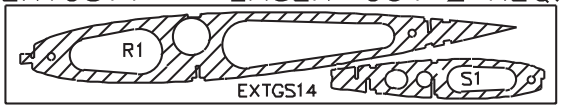
1/8" X 3" X 24" BALSA

EXTGS13 DIE-CUT 2 REQ.



1/8" X 3" X 24" BALSA

EXTGS14 LASER-CUT 2 REQ.



1/8" X 4" X 24" PLY

(Continued from page 5)

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

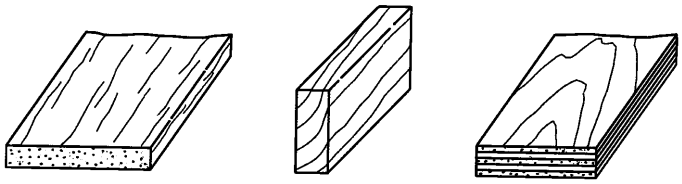
- Where you see the term "glue", it is at your option to select the thickness of CA with which you are most comfortable. If the step indicates a particular thickness of glue, be sure to use the thickness recommended for strength, penetration, and/or working time.

- Several times during construction we refer to the "top" or "bottom" of the model or a part of the model. For example, during fuse construction we tell you to "glue the top stringer". It is understood that the "top" or "bottom" of the model is as it would be when the airplane is right-side-up and will be referred to as the "top" even if the model is being worked on upside-down. For example, the "top" stringer is always the "top" stringer even when the fuse is being built upside-down.

Common Abbreviations

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

Types of Wood



Balsa **Basswood** **Plywood**

Metric Conversions

1" = 25.4mm (conversion factor)

1/64" = .4mm	1" = 25.4mm
1/32" = .8mm	2" = 50.8mm
1/16" = 1.6mm	3" = 76.2mm
3/32" = 2.4mm	6" = 152.4mm
1/8" = 3.2mm	12" = 304.8mm
5/32" = 4mm	15" = 381mm
3/16" = 4.8mm	18" = 457.2mm
1/4" = 6.4mm	21" = 533.4mm
3/8" = 9.5mm	24" = 609.6mm
1/2" = 12.7mm	30" = 762mm
5/8" = 15.9mm	36" = 914.4mm
3/4" = 19mm	

GET READY TO BUILD

1. Unroll the plan sheets, then reroll the plan inside-out to make them lie flat.

2. Sort through the sticks and sheets, grouping them by size. Masking tape can be used to bundle matching sheets and sticks. Using a felt tip or ballpoint pen, lightly write the part **name** or **size** on each piece or bundle. Refer to the parts list and plan for sizes and quantities. Use the die-cut patterns shown on pages 6 & 7 to identify the die-cut parts and mark them **before** removing them from the die sheet. Save all leftovers. If any of the die-cut parts are difficult to remove, do not force them! Instead, cut around the parts with a hobby knife or lightly sand the back of the sheet. After removing the die-cut parts, use your sanding block to **lightly** sand the edges to remove any die-cutting irregularities.

3. As you identify and mark the parts, separate them into groups, such as **fuse** (fuselage), **wing**, **fin**, **stab** (stabilizer) and **hardware**.

Zipper-top food storage bags are handy to store the small parts as you sort, identify and separate them into sub-assemblies.

DESIGNER'S NOTE: *Before you begin construction, it is important that we take a moment to cover the issues of structure and weight. This model is designed to be EXTREMELY lightweight. As such, it is a superb aerobatic performer and is also VERY structurally sound. However, if you are concerned about strength and modify the design, adding material such as sheeting for the bottom of the fuselage, you may unintentionally increase the flying weight of the aircraft without adding sufficient structural integrity to compensate. While one small change won't likely hurt the aircraft, small changes quickly accumulate to the point of actually increasing the risk to the aircraft. If you trust the design and add nothing, you will be rewarded with an exceptional flying, extremely durable, gorgeous aircraft.*

Because of the incredible light weight of this design, some of the structure is fragile during construction. Be sure to take your time and handle the model with care, being particularly careful about not picking up sheeted areas by the sheeting for risk of putting your fingers through the sheet, etc. The balsa cross trusses in the fuse are likewise fragile and should not be used to pick up the aircraft; however, structurally they do their job perfectly: in flight, the cross trusses would never be subject to such a load. Again, do not let this fragileness concern you, and we strongly recommend NOT making changes to the design based upon this apparent fragileness. When completed and covered, the aircraft is VERY structurally sound.

BUILD THE TAIL SURFACES

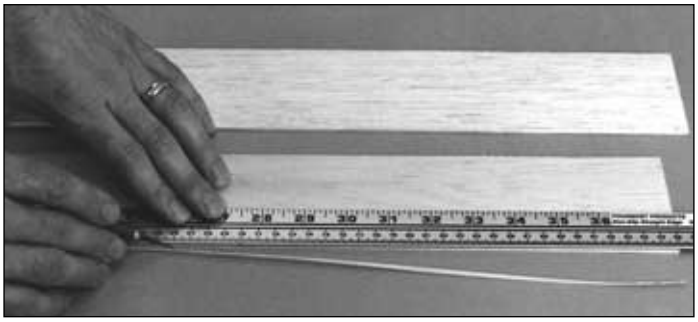
Assemble the Stab Sheeting

Right now, while the building board is clear, is a great time to assemble the stab sheeting.

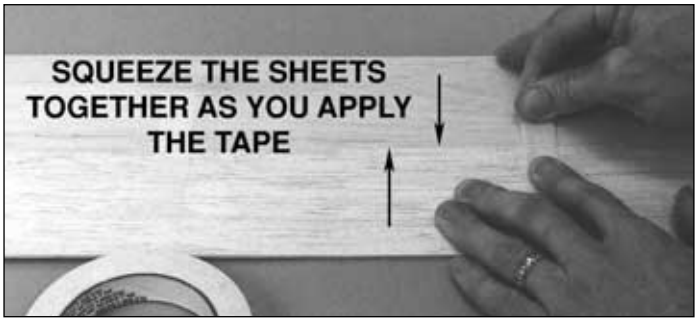
❏ 1. See the Expert Tip that follows, then edge glue four sets of two 3/32"x4"x24" balsa sheets together, creating four stab sheets. Set them aside.

EXPERT TIP

HOW TO JOIN SHEETING



A. Use a metal straightedge as a guide to trim one edge of both sheets.



B. Use masking tape to tightly tape the two sheets together, joining the trimmed edges.

C. Turn the sheet over and place weights on top of the sheet to hold it. Apply thin CA sparingly to the seam between the two sheets, quickly wiping away excess CA with a paper towel as you proceed.

D. Turn the sheet over and remove the masking tape, then apply thin CA to the seam the same way you did for the other side.

E. Sand the sheet flat and smooth with your bar sander and 150-grit sandpaper.

Build the Stab & Elevators

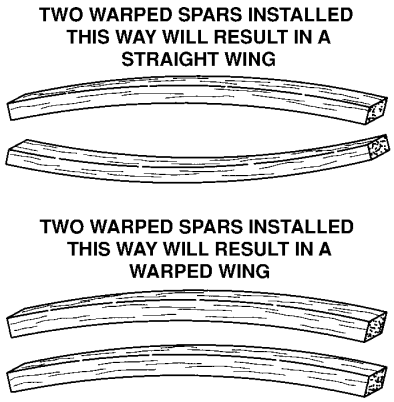
The construction of this stab, fin and wing are all engineered specifically to provide perfectly straight and true panels with minimum effort on your part. To do so, the building sequence and pieces are quite different from what you may be accustomed to. Be sure to read all steps carefully and pay particular attention to the instructions of when and where to apply adhesives. DO **NOT** GLUE until instructed to do so.

Occasionally outside forces such as humidity and dramatic temperature changes can result in slight inaccuracies in the dimensions of printed plans. One of the many advantages of a fully interlocking stab such as this one is that exact alignment over a printed plan is not necessary to ensure a straight stab. If the ribs do not align perfectly over the plans, don't worry! As long as the spar is aligned as shown, the stab will be right.

You may separate the stab and elevator drawing from the plan by cutting along the dashed line. Don't forget to always cover the plans with Great Planes Plans Protector so the glue won't stick to the plan.

❏ ❏ 1. Tape the **left** stab plan to the building board, and cover the stab drawing with Great Planes Plans Protector (so you won't glue the stab to the plan!)

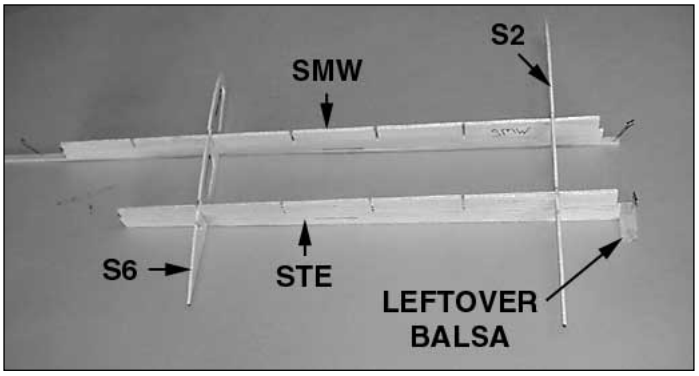
❏ ❏ 2. Before using the 1/8" x 1/4" x 24" basswood **spars**, examine them carefully for warps. If the spars are warped slightly, try to "balance them out" by installing the warped spars in opposite directions (see sketch).



❏ ❏ 3. Position the spar on top of the plan with excess overhanging both S1 and S8. Pin it in place inboard of S1 and outboard of S8.

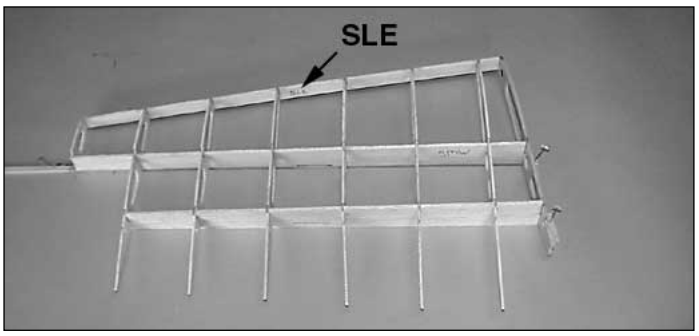
❏ ❏ 4. Carefully punch out the four die-cut 1/8" balsa **stab webs (SLE, SMW, STE,** and **ELE),** laser-cut 1/8" ply **stab rib S1,** die-cut 1/8" ply **dowel doubler (DD)** and the die-cut 3/32" balsa **stab ribs S2** through **S8.** Sand the edges **slightly** to remove any die-cutting irregularities. Be careful not to alter the shapes or angles of any of the pieces. If this is your first stab half, align the dowel holes and glue the stab dowel doubler to the left side of S1 when positioned over the plans. If this is your second stab half, align and glue the doubler to the right side of S1.

❏ ❏ 5. Select the S1 through S4 ribs, the phenolic **stab tube socket** and the 18" aluminum **stab tube**. Cut the 18" aluminum stab tube down to 17" and sand the cut end smooth so it will slide into the socket easily. Carefully slide the stab tube socket into the tube holes in ribs S1 through S4. If the socket does not slide into the ribs, DO NOT force it. Wrap a small piece of 220 grit sand paper around the aluminum stab tube and gently sand the inside of the rib holes. Test fit until the stab tube socket fits properly into the ribs. Set the tube and socket aside.



❏ ❏ 6. Select the rib S2, main web (SMW), and trailing edge web (STE). Slide S2 into its slots in the main web and the TE web. **NOTE:** Be sure the rib is slid all the way into the notches, particularly in the TE web which extends beyond the rib both top and bottom.

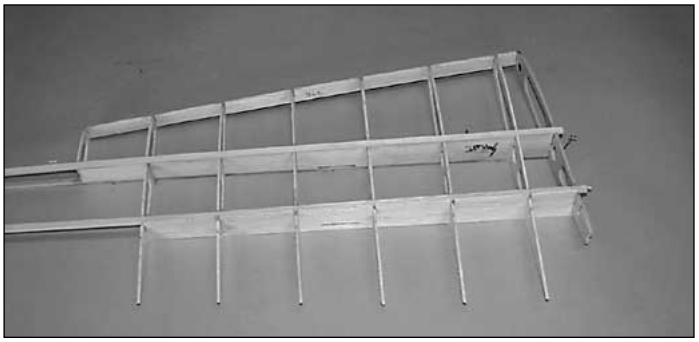
❏ ❏ 7. Position S6 in its slots to lock the webs in place. Glue S2 and S6 to the main web and spar. Pin a piece of leftover balsa flush against the root end of the trailing edge web to hold the trailing edge web in place.**NOTE:** If you happen to crack or break one of the ribs during installation, simply take it out of the stab, position the pieces together and glue with thin CA. Allow to dry and reinstall.



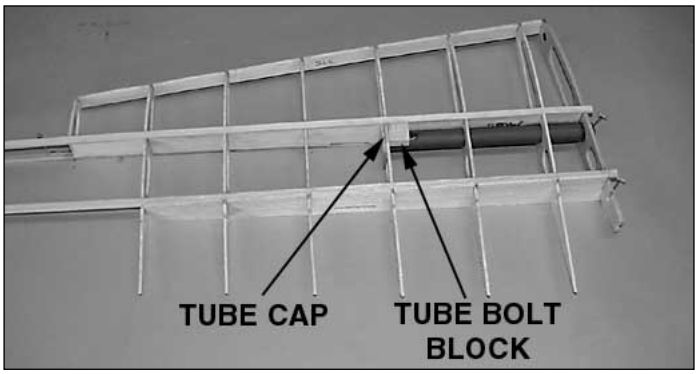
❏ ❏ 8. Insert ribs S1, S3, S4, S5, S7 and S8 into their locations.

❏ ❏ 9. Carefully slide the stab LE web (SLE) onto the front of the ribs in their notches. Glue all 8 ribs to all 3 webs and the spar, and the main web to the spar.

❏ ❏ 10. Test fit (DO NOT GLUE) the top spar into the ribs, leaving the excess overhanging both S1 and S8. When you are confident you can fit the spar in place, remove the spar. Lay a bead of medium CA along the top of the main web and the corners of the rib slots, and reinstall the top spar.



❏ ❏ 11. Test fit the 1/8" x 1/4" x 24" *balsa* **top aft stab spar** into the ribs as you did the main spar. Glue it to the ribs and trailing edge web.

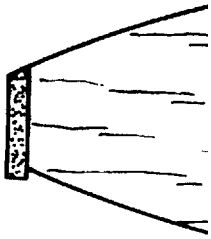


❏ ❏ 12. Align the die-cut 1/8" ply **tube cap (SHS)** against the outboard edge of R4 and the main web, centered vertically on R4. Glue it to the main web and R4. **Note:** This piece is identical to the stab horn support.

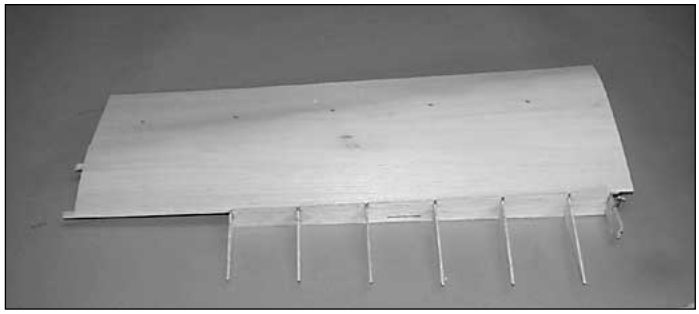
❏ ❏ 13. Carefully slide the stab tube socket through ribs S1, S2 and S3 and tight against the tube cap on the aft side of S4. (When building your second stab half, put the uncut end into the stab half, and trim off the excess in step 14. Remember to keep the leftover piece for in the fuselage.)

❏ ❏ 14. Glue the stab tube socket to the ribs and web with medium CA. Trim the inboard end of the stab tube socket 1/8" inboard of S1. **NOTE:** Do NOT use thin CA for this step, as you may saturate the stab tube socket and get CA into the inside of the stab tube socket, making fitting the aluminum stab tube impossible.

❏ ❏ 15. Position the 3/8" x 3/4" x 3/4" basswood **tube bolt block** against the inboard edge of R4 and the main web. Glue it in place with medium CA. **Note:** It may be necessary to sand the tube bolt block slightly to make it flush with the top of the ribs and spar.



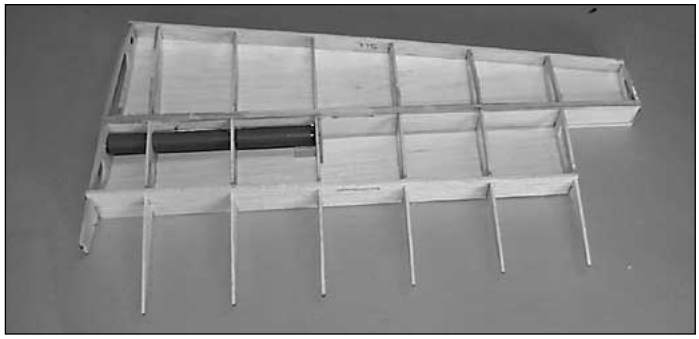
❑ ❑ 16. Use a sanding block to shape the LE web so it aligns with the tops of the ribs and the shape of the airfoil as shown in the sketch. Be careful not to gouge the ribs or LE web.



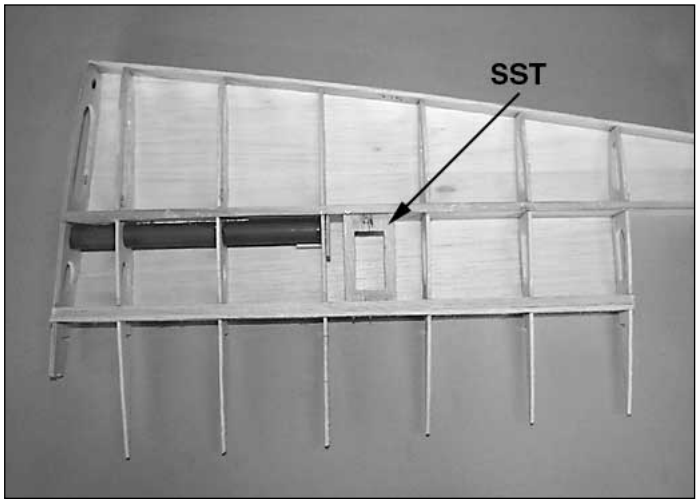
❑ ❑ 17. Coat the ribs, spar, LE web, aft spar and spar/TE web joint liberally with medium CA. Carefully position one of the stab sheets you previously built flush against the TE web and overhanging S1, S8 and the LE web, being sure the TE web and spar are both pressed down tight against the plan. Weight it in place and allow the CA to cure.

EXPERT TIP

You can coat the stab parts with CA, then lightly spray the underside of the sheeting with CA Accelerator, then roll the sheeting carefully from the trailing edge web, over the ribs and over the LE. This guarantees an immediate set with no need to weight the sheeting, and with no chance of movement of the sheeting.
CAUTION: This technique is "not for the faint of heart" and requires a steady, confident hand, as the accelerator WILL cure the CA immediately and any errors made in placement will be **VERY** difficult to fix.

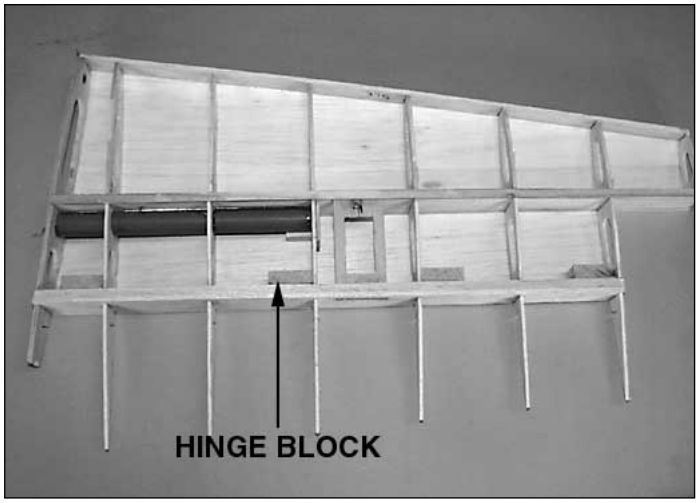


❑ ❑ 18. Because you have sheeted the top of the stab, you will need to pull the stab, pins and all, from your work surface, then unpin the spars from the plan. Trim and sand the sheeting from the top side of the stab behind the main web and outboard of S7. Trim and sand the sheeting, spars and stab tube socket flush with the LE web, ribs S1 and S8. **Hint:** Now is a great time to make sure the top sheeting is firmly glued to all ribs, spars and webs. Touch up with medium CA as necessary.

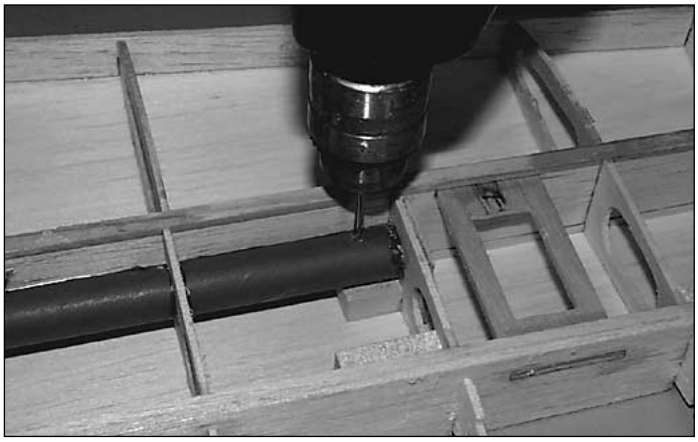


❑ ❑ 19. Fit and glue the die-cut 1/8" ply **elevator servo tray (SST)** in the slots in the webs.

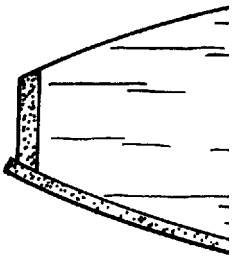
❑ ❑ 20. Fit and glue the bottom aft stab spar into the ribs and against the TE web. Cut the aft stab spar flush with S7 and S1.



❑ ❑ 21. From a 3/8" x 5/8" x 24" balsa stick, cut twelve 3/8" x 5/8" x 1-1/4" **hinge blocks**. Position and glue the 8 hinge blocks within this stab half, against the webs and ribs as shown on the plan.



❑ ❑ 22. Using a 7/64" drill bit, drill a hole 1/2" inboard of R4 and centered on the tube, all the way through the stab tube socket, tube support block, and top sheeting. **NOTE:** The aluminum stab tube IS NOT drilled in this step. It will be fitted and drilled to match the fuselage later.



❑ ❑ 23. Use a sanding block to shape the LE web so it aligns with the tops of the ribs and the shape of the airfoil.

❑ ❑ 24. Sheet the bottom of the stab as you did the top. Trim the sheeting from the counterbalancer area (behind the main spar and outboard of S7) and inboard of S1 and outboard of S8 as you did for the top.

Finish the Elevators

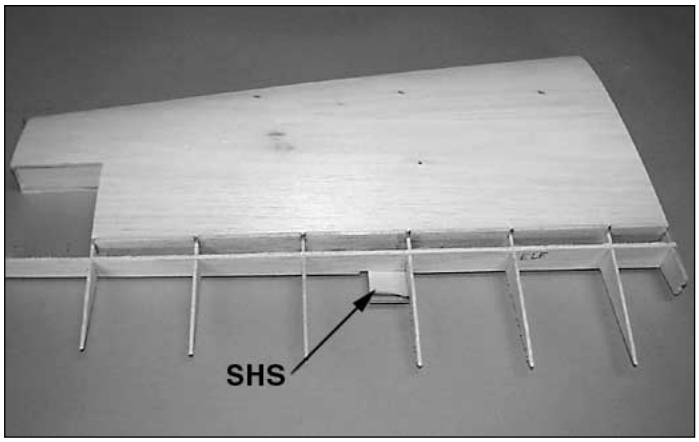
❑ ❑ 1. Using the plan and the location of the trailing edge of the elevator servo tray as references, cut an opening in the bottom sheeting for your servo. **Note:** Be careful not to split the sheeting.

❑ ❑ 2. Turn the stab right-side-up. Slide the elevator LE web (**ELE**) over the ribs in their notches until the top of the web is flush with the top of each rib. Glue in place with thin CA.

NOTE for Non-Computer Radio and Entry Level Computer Radio Users:
If you are using an entry level computerized radio, you will need to find out now whether or not your radio has the ability to properly support twin elevator servos (some entry level computer radios can't mix two elevator servos properly because the trims do not function correctly.) If your radio cannot properly support twin elevator servos, you will need to choose one of the options below. (Futaba's 6XA, 8U, and 9Z all handle twin elevator servos without difficulty.)

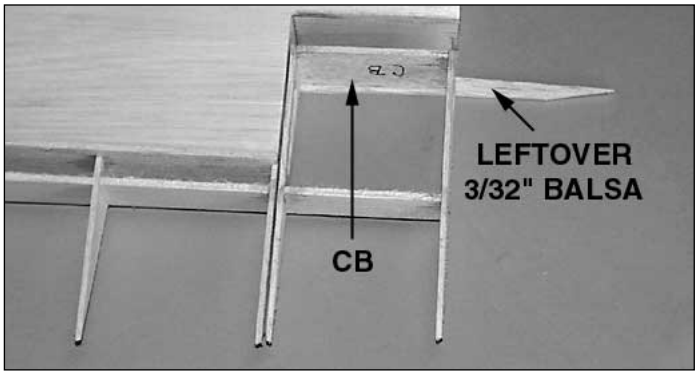
If you are not using a computer radio, you need to make an important decision now. A computerized radio user would simply mix the 2 channels together and switch the direction of one of the servos to make this ideal pushrod configuration work properly; however, if you are not using a computerized radio you will need to:

a) purchase a servo-reversing Y-harness which reverses one servo's direction; or
b) purchase a standard Y-harness and a servo reversing extension; or
c) purchase a standard Y-harness and a reversed servo for one of the elevator halves; or
d) purchase a standard Y-harness and move the control horn mount on the right stab half from the outboard edge of S4 to the inboard edge of S5, and mount each servo's arm to the upright aircraft's right side. (Computerized radio users have both toward the inboard edge of the stab.)



❑ ❑ 3. Fit and glue the die-cut 1/8" ply **elevator control horn support (SHS)** in the slots in the ELE web and S4. (See note above BEFORE completing this step.)

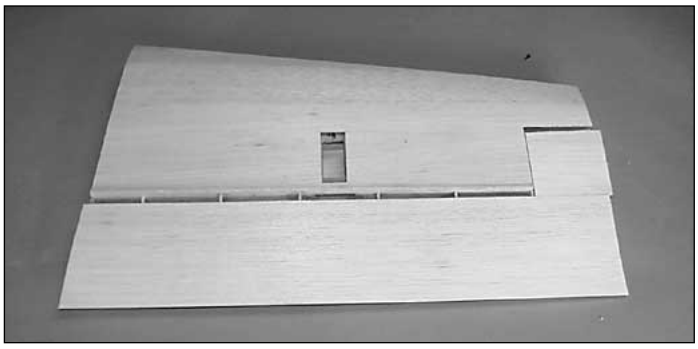
❑ ❑ 4. Place a piece of leftover 1/16" balsa flush against S7 and over the position of CB. (This piece acts as a spacer and ensures a straight counterbalance.) Carefully position the die-cut 3/32" balsa **rib S9** in its slot in the elevator LE web 1/16" away from S7. Glue it in the web with thin CA.



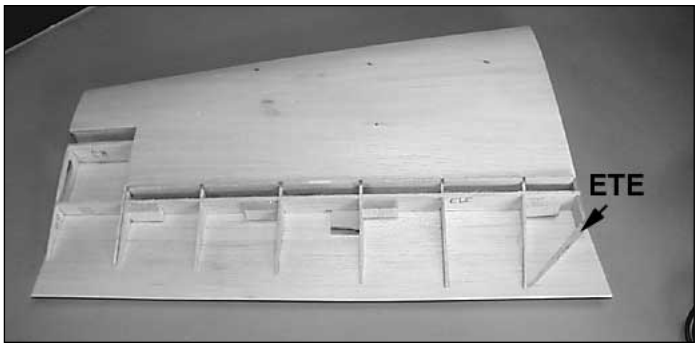
❏ ❏ 5. Place the **S10** rib onto the elevator LE web. Place the die-cut 1/8" balsa **counterbalance web (CB)** into the notches in the front of S9 and S10. Tack glue CB to the S9 and S10 ribs. Glue S10 to CB and elevator LE web. **Note:** Be careful not to glue anything to the spacer or to the stab.

❏ ❏ 6. From a 3/32" x 4" x 24" sheet, cut a 3" long **counterbalance sheet** and the 21" long **elevator sheet**. Trim the counterbalance piece to 3/32" x 3" x 3" and set aside.

❏ ❏ 7. Place a bead of medium CA along the portion of each rib aft of the elevator LE web and the elevator LE web. Being careful not to press hard enough to rotate the counterbalance or twist the ribs, hold the sheeting in place until the CA dries.



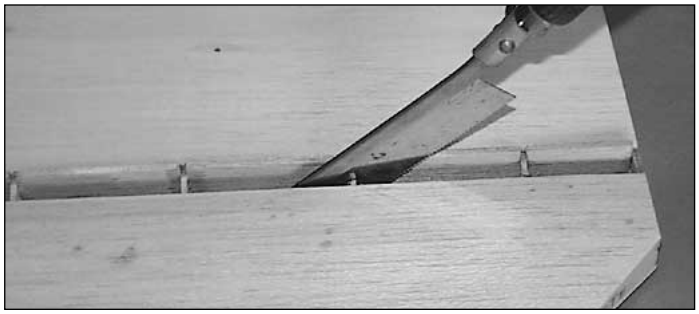
❏ ❏ 8. With the grain running the same direction as the main elevator sheeting, position and glue the counterbalance sheeting in place.



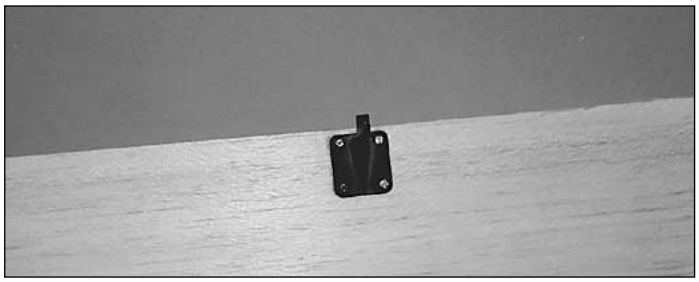
❏ ❏ 9. Flip the stab/elevator right-side-up. Position and glue the remaining 4 hinge blocks in place in the elevator. Position and glue the 1/8" die-cut ply **elevator trailing edge rib (ETE)** in place on the bottom elevator sheeting and into the notch in S1.

❏ ❏ 10. Measure 5/16" aft of the TE of S2 and S10, and draw a line between the 2 points. Cut the sheeting along this line and flush with S1, S10 and the elevator trailing edge. Sand the sheet flush with S1, S10 and the elevator trailing edge. Sand the TE of the sheeting to the contour of the ribs.

❏ ❏ 11. Sheet the top of the elevator and counterbalance as you did the bottom. Trim and sand the sheeting.



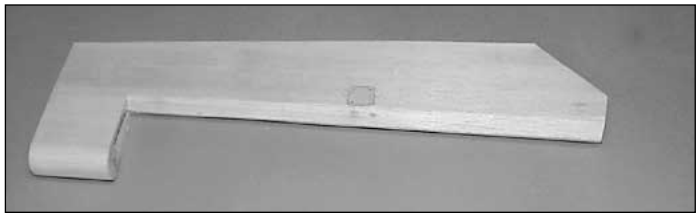
❏ ❏ 12. Using a razor saw, cut the elevator from the stab by cutting ribs S1 through S7 between the stab TE web and the elevator LE web. Be VERY careful not to cut into S9. Sand the leading edges.



❏ ❏ 13. Position the elevator control horn (not included) on the elevator as shown on the plan. Drill four 1/16" holes, then mount the control horn to the elevator with four #2 x 3/8" sheet metal screws.

❏ ❏ 14. Draw a line around the control horn, remove it, and poke approximately a dozen pin holes in the top sheeting within the rectangle you drew, then apply a generous amount of thin CA. Allow the CA to cure, hardening the balsa, then sand the sheeting smooth. **NOTE:** Use enough CA to have some enter the screw holes; however, do not use so much that you fill the holes with CA.

❏ ❏ 15. Select the 3/8" x 1-1/4" x 24" **elevator leading edge**. Glue it, centered on the leading edge of the elevator and flush with S9.

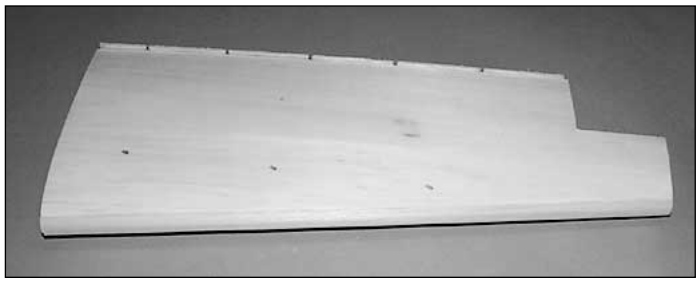


❑ ❑ 16. Select the 9/16" x 1-3/8" x 2-3/4" balsa **counterbalance leading edge** and glue it centered on the leading edge of the counterbalance portion of the elevator with excess overhanging both ends. Sand both leading edges flush with the sheeting, S1 and S9, S10.

If you are going to double bevel your elevators, glue an additional 1/2" x 1-3/8" balsa counterbalance leading edge to your counterbalance (not included).

❑ ❑ 17. Bevel the elevator LE and round the counterbalance's leading edge.

Finish the Stab Panels

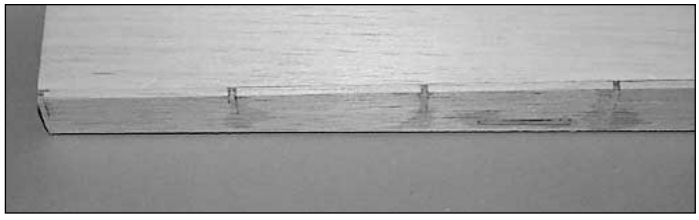


❑ ❑ 1. Select a 1/4" x 1" x 24" balsa stick, for the **stab leading edge**. Leaving 1/4" of LE stock extending beyond the inboard edge of S1 and keeping the LE centered vertically on the LE web, glue the LE to the front of the wing with medium CA.

❑ ❑ 2. Trim the LE flush with S1 and S10. Sand the LE to blend with the stab, forming a smooth airfoil shape.

❑ ❑ 3. Sand the trailing edge web flush with the sheeting top and bottom.

If you are going to double bevel your elevators, glue an additional 1/2" x 1-1/4" x 16" balsa stick (not included) to the trailing edge of the stab. Bevel this new trailing edge as you did the elevator leading edge.



❑ ❑ 4. Use HobbyLite™ balsa colored filler to fill in the gaps in the trailing edge web at the ribs as well as any other minor blemishes in your stab or elevator. Allow the filler to dry completely before sanding it to shape.

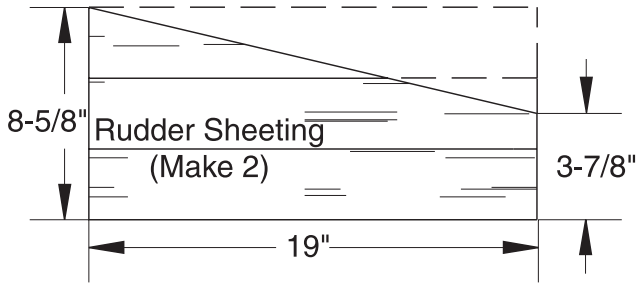
❑ ❑ 5. Using leftover 3/32" balsa, cap the outboard ends of both elevator halves and stab halves. Trim and sand the caps smooth.

❑ ❑ 6. Using giant scale hinges (not included — we used Robart Giant Scale Pin Hinges on the prototypes), hinge the elevator to the stab.

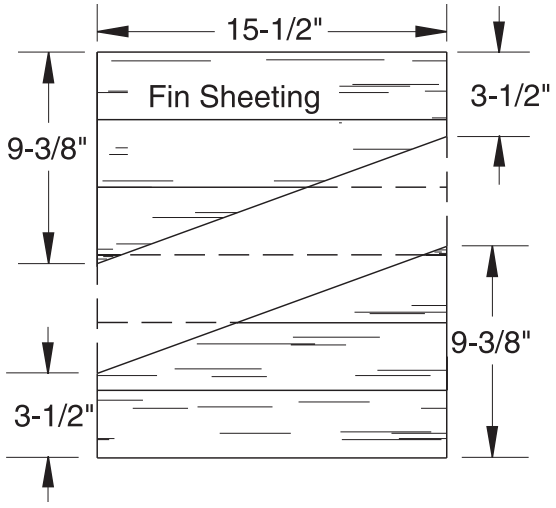
❑ 7. If this is the first time through, go back to the start of **BUILD THE STAB/ELEVATORS** and build the other stab half. If it's your second time through, get a good night's sleep! You've got a great start! At this rate, your Extra will be framed up in no time.

Build the Fin & Rudder

Build the Fin and Rudder Sheeting



❑ 1. While your work surface is clear, now is the perfect time to build your fin and rudder sheeting. Select six 3/32" x 3" x 36" balsa **fin and rudder sheets**. Cut all 6 sheets into two pieces, one 19" long and one 15-1/2" long, and set aside the leftover. Edge glue two sets of three 19" sheets. Cut these two 19" long sheets into two rudder sheets which are 19" long and 9" wide at one end and 4-1/2" wide at the other.

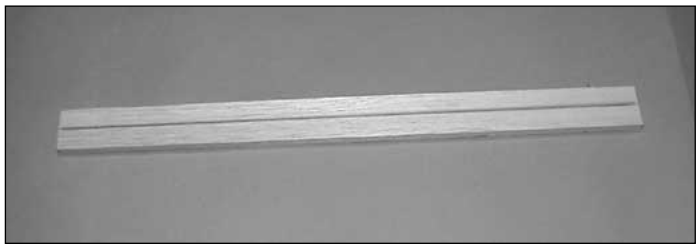


❑ 2. Edge glue the six 15-1/2" long sheets together. From one end, cut one 15-1/2" long stab sheet which is 9-3/8" long at one end and 3-3/4" long at the other. From the other square edge, cut the second stab sheet.

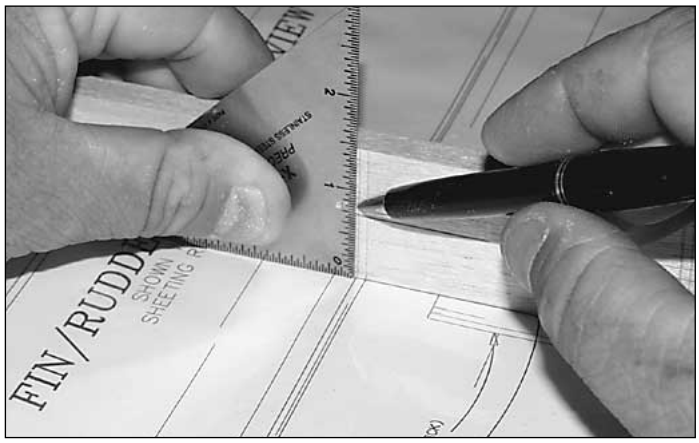
Build the Fin

❏ 1. Cut the Fin plan from the plan sheet. Cover it with Great Planes Plan Protector so the glue won't stick to the plan.

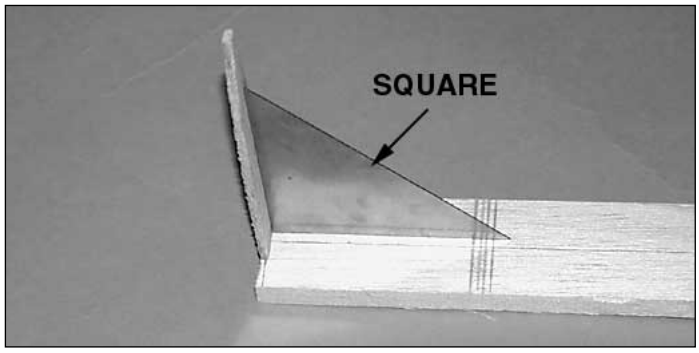
❏ 2. Select the two 3/8" x 1-5/8" x 24" balsa sticks and carefully choose the straightest of the 2 sticks for the **fin post**. Set the second post aside for the rudder LE.



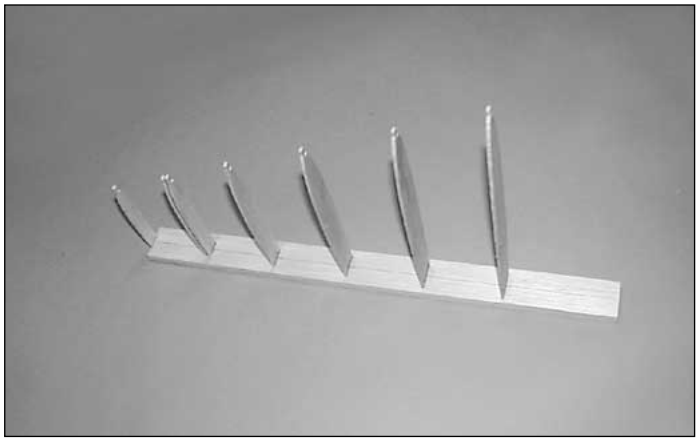
❏ 3. Cut the fin post to 18-7/8" long. Draw a centerline down the fin post lengthwise to mark where the fin ribs will be centered.



❏ 4. Carefully position the fin post over the plan. Using a square, mark the top and bottom edges of each rib on the fin post. **HINT:** You may temporarily pin the fin post in place during this process.

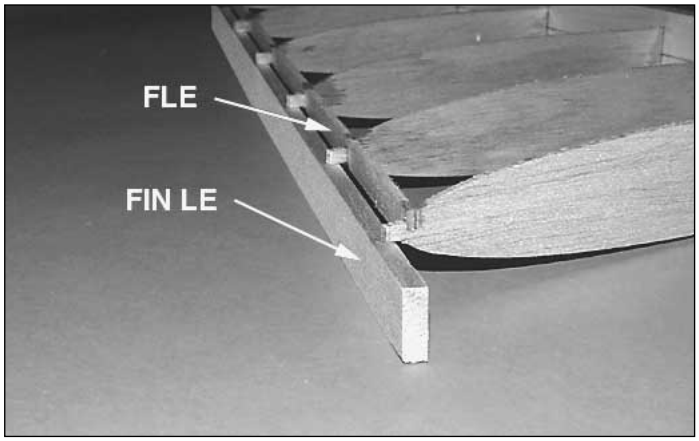


❏ 5. Position the laser-cut 3/32" balsa **vertical rib V7** so that the rib is:
a) positioned between the lines you drew in step 6;
b) centered laterally on the fin post on the centerline you drew;
c) vertical;
d) and with the LE web notch pointing toward the model's left as shown in the photo. When you are confident it is positioned properly, glue with thin CA. **NOTE:** Remember that all references such as "laterally" and "model's left" indicate the part's final position on the finished model and not necessarily its current orientation.



❏ 6. Install the laser-cut vertical ribs **V1-V6** as you did V7, being careful that all tabs are pointing to the model's left.

❏ 7. Aligning the fin post and ribs over the plan, pin the fin post to the plan.



❏ 8. Select the 1/4" x 3/4" x 18" balsa **fin LE**, which will be temporarily used as a LE jig at this time, and the die-cut 3/32" balsa **fin LE web (FLE)**. Slip the LE jig under the tabs on ribs V1-V7 so that the tabs are held 3/4" off the work surface. Slide the LE web into position on all 7 ribs, being careful that ribs V5 and V6 are properly positioned to the top and bottom edges of the jig notch respectively. Glue the LE web in place, being careful not to glue it to the LE jig or to glue V5 to V6.

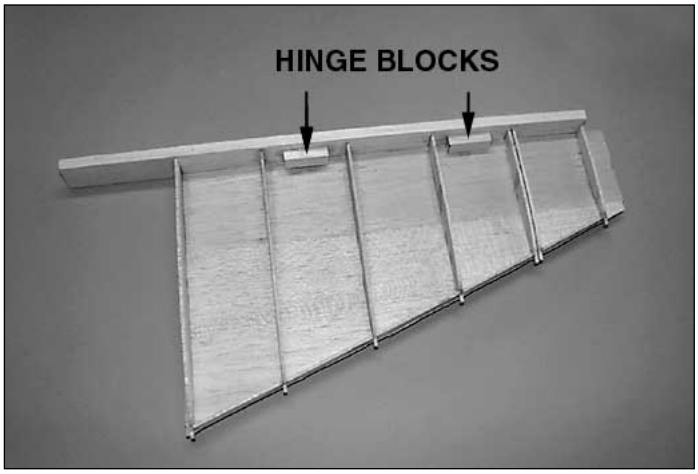
❏ 9. Sand the left side of the LE web to match the airfoil of the ribs as you did on the stab LE web.

❏ 10. Position the first fin sheet flush against the fin post and the TE of the ribs, with the lower edge overhanging rib V1 slightly. Glue the sheet to the fin post with thin CA.

❏ 11. Gently pull the sheeting back from the ribs and apply a bead of medium CA along each rib and along the LE web. Roll the sheet back over the ribs and hold in place until the CA cures.

❏ 12. Gently pull your fin off your work surface, remove the pins, and turn it over.

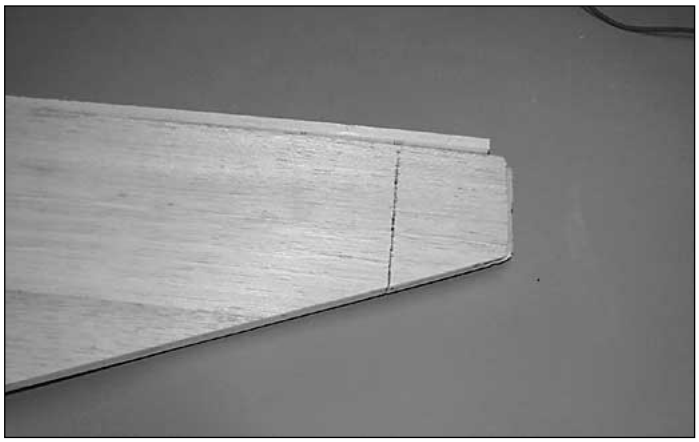
❏ 13. Cut the LE web and the sheeting between ribs V5 and V6, separating the counterbalance's sheeting from the fin sheeting. Cut the LE of the sheeting flush with the LE web, being careful not to cut the tabs off the ribs.



❏ 14. From the 3/8" x 5/8" x 12" balsa stick, cut and glue the two 1-1/2" long **hinge blocks** in position as shown on the plan.

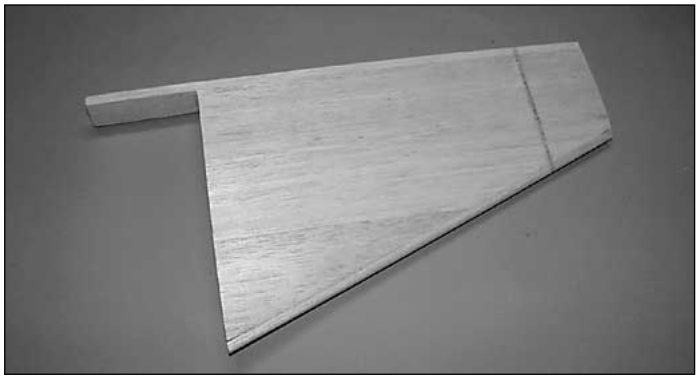
❏ 15. Reposition the fin flat on your work surface on its left side with the LE again acting as a LE jig under the tabs. Sand the LE web flush with the airfoil shape of the ribs. Sheet the right side as you did the left, being SURE to keep the tabs pressed firmly against the jig and the fin post sitting flat on your work surface. Weight the sheeted fin down and allow the CA to fully cure. **NOTE:** Using the jig and weighting the fin at this critical point will ensure that your fin is as straight as your work surface. Failure to do so may result in a warped fin, which will negatively affect the great flying characteristics of this model.

❏ 16. Once the CA has fully cured, trim the rib tabs off with a razor saw. Sand the sheet and ribs flush with the LE web.

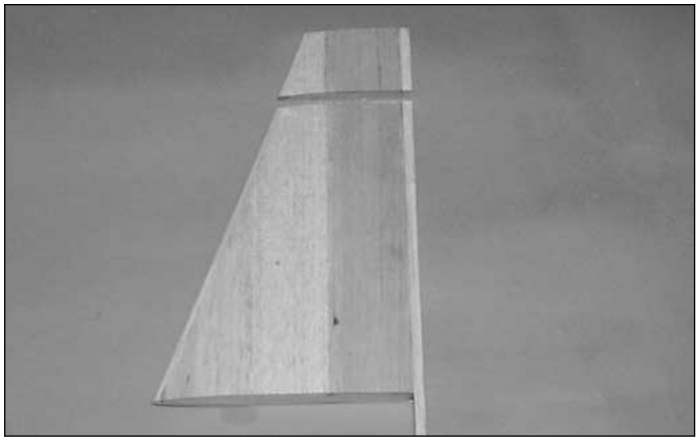


❏ 17. Trim the sheeting between ribs V5 and V6 with a razor saw. Trim the excess sheeting off the top and bottom of the fin and sand flush with ribs V1 and V7.

❏ 18. Center the LE laterally on the LE web, and glue it in place. Trim the excess off the top and bottom of the fin. Shape the LE to the airfoil shape of the fin, using the cross section on the plan as a reference.



❏ 19. Shape the fin post to the shape of the fin. **Note:** Be careful not to change the shape of the fin by sanding into the fin sheet.

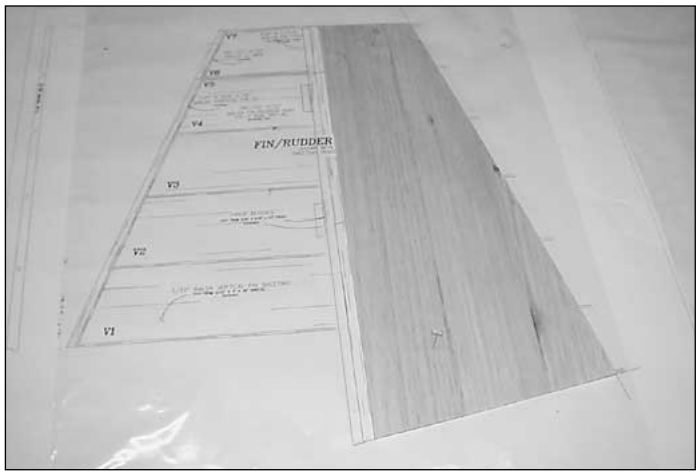


❏ 20. Cut the LE and TE between ribs V5 and V6, making the **rudder counterbalance**. Sand the top of the fin and top and bottom of the rudder counterbalance flush with ribs V5, V6 and V7 respectively.

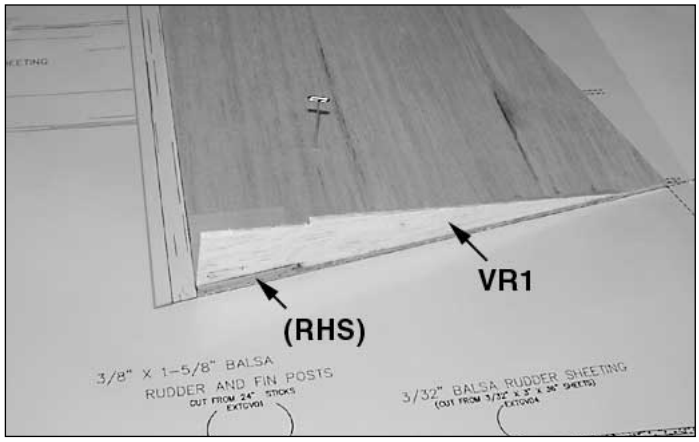
If you are going to double bevel your elevators, glue a 1/2" x 1-5/8" balsa spacer (not included) onto the leading edge of the fin post from V1 down to the bottom of the post.

Build the Rudder

❏ 1. Select the two rudder sheets you made earlier. Trim the first sheet to size, using the 1" dashed lines on the plan as a reference. Make the second sheet just like the first, and set the second (left side sheet) aside.



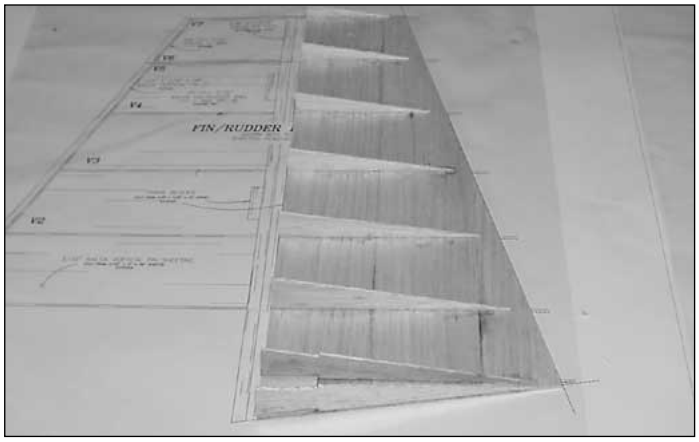
❏ 2. Pin the right side sheet in place over the plan.



❏ 3. Glue the first die-cut 1/8" ply **control horn support (RHS)** in position on the sheeting. **Hint:** Use the mini-plan in the center of this manual as a handy reference.

❏ 4. Position and glue the die-cut 3/32" balsa rib **VR1**, aligned flush with the bottom and leading edges of the sheeting. Use a square to be sure the rib is vertical.

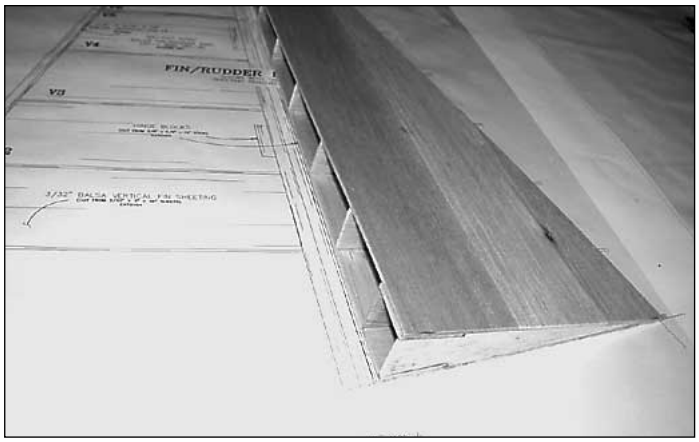
❏ 5. Position **VR2** in place on the sheeting, aligning it with the top of the control horn support and the leading edge of the sheeting. Again use a square to be sure the rib is vertical. Glue VR2 to the sheet and the control horn support with thin CA. **Hint:** the shorter dashed lines extending past the trailing edge of the fin are alignment marks to help you position ribs VR2-VR8.



❏ 6. Position and glue the die-cut 3/32" balsa ribs **VR3 through VR8** to the sheet as you did VR2.

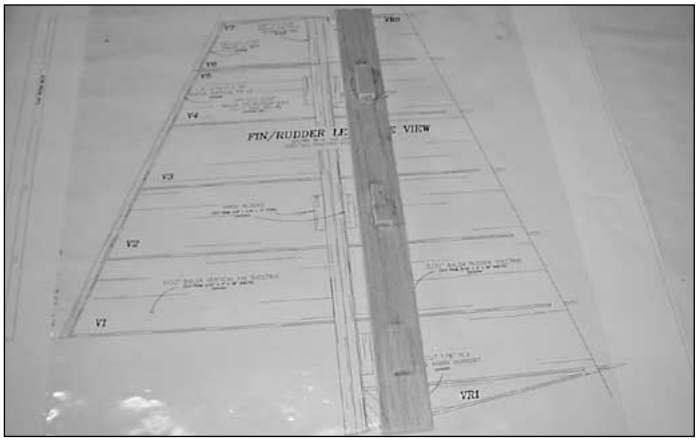
❏ 7. Position and glue the left side control horn support into its notches in VR1 and VR2.

❏ 8. Unpin the fin from the plan. Use a bar sander to sand the TE of the sheet until it matches the angle of the ribs. Be careful not to nick or break the ribs.

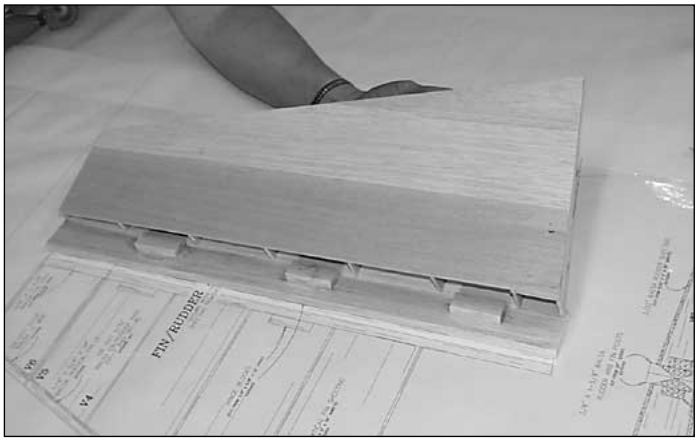


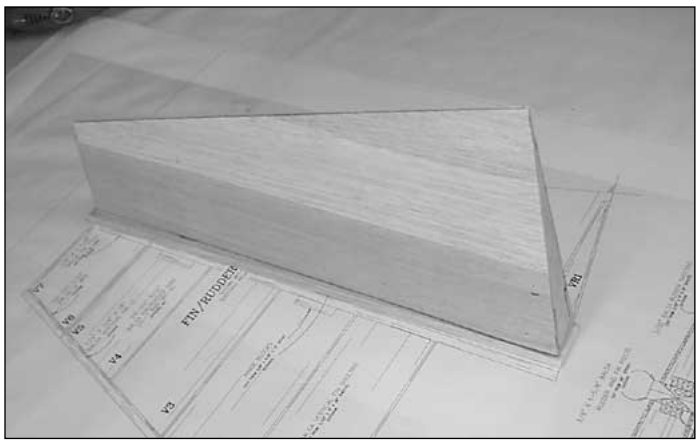
❏ 9. Trial fit the left side sheeting to the ribs. When confident you can position it easily, coat the ribs, right side trailing edge and left control horn support with medium CA. Position the left side sheet, aligned with the LE of the ribs and control horn support, the top and bottom rib and the trailing edge of the right side sheet. Carefully weight the rudder down and allow the CA to cure completely.

❏ 10. From a 3/8" x 1-5/8" x 24" balsa stick, cut one 18-3/4" long **rudder LE.** From the 3/8" x 5/8" x 9" balsa stick leftover from making fin hinge blocks, cut three 1-1/2" long rudder hinge blocks.



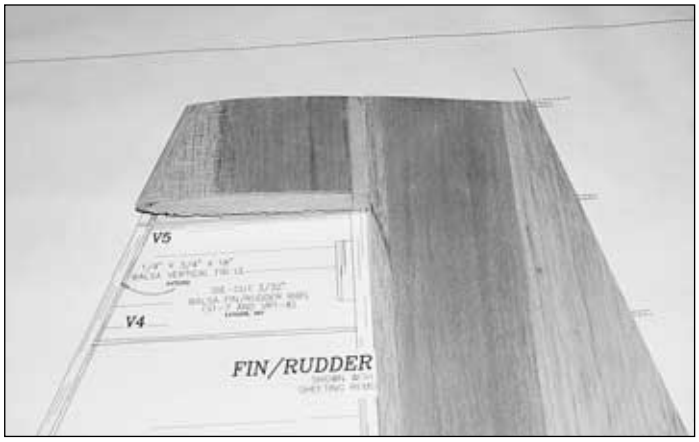
❏ 11. Lay the LE on its 1-5/8" wide side on the plan as shown in the photo, with its top aligned with the top of the rudder on the plan, thereby allowing the small excess to overhang the bottom. Glue the three hinge blocks centered on the LE post in the positions shown on the plan.





❏ 12. Stand the sheeted structure vertically and centered on the LE laterally and aligned with the top of the LE. Glue in place with thin CA.

❏ 13. Trim and sand the LE flush with the sheeting, being careful not to damage the sheeting. Sand the LE flush with ribs VR1 and VR8, maintaining VR8's angle.



❏ 14. Using medium CA, glue the rudder counterbalance to the rudder LE, aligning the tops of VR8 with V7 and centering the counterbalance's TE on the rudder LE. Lightly sand any imperfections in the fit.

❏ 15. Using leftover 3/32" balsa, glue a balsa cap onto the top and bottom of the rudder. Sand the caps to the shape of the ribs and sheeting.

❏ 16. Using giant scale hinges (not included), hinge the rudder to the fin.

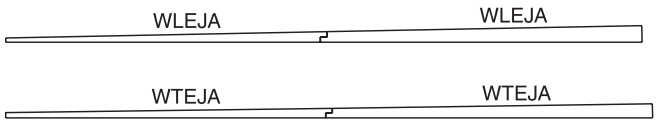
Note: The TE of the fin and the LE of the rudder will be beveled after the fin is mounted on the plane.

That's about it for the tail surfaces. Now, how was that for lightweight, easy to build, airfoiled surfaces? They are light, strong, scale, aerodynamic, and a nice piece of craftsmanship. Clean off the building board and get ready for the wings!

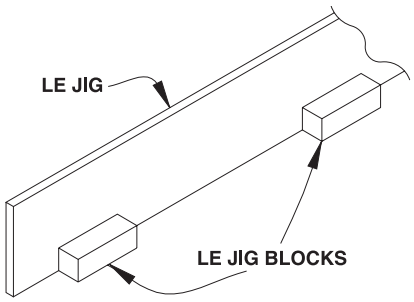
BUILD THE WING

Right now, while the building board is clear, is a great time to assemble the wing support jigs, wing sheeting and several other important items in preparation for the wing assembly.

Assemble the Wing Jigs



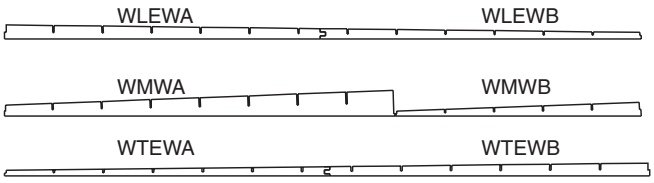
❏ 1. Select the die-cut 1/8" balsa **WLEJA, WLEJB, WTEJA and WTEJB support jig** pieces. Glue WLEJA to WLEJB and WTEJA to WTEJB using a straightedge to be sure the jigs remain straight. These two jigs are now known as the leading edge and trailing edge support jigs.



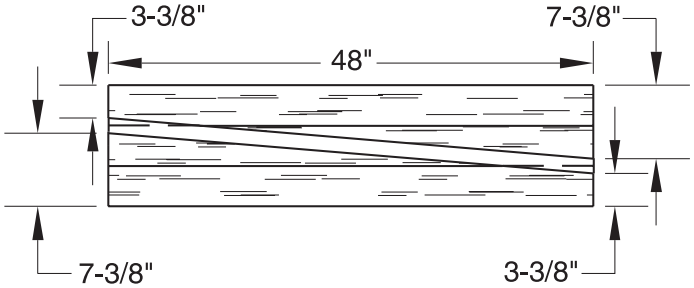
❑ 2. From a 1/4" x 1/4" x 6" balsa stick, cut eight 1/2" long blocks and glue four of them onto one side of each jig, aligning with one edge as shown in the sketch.

❑ 3. Select the two 25" phenolic **wing tube sockets.** Cut 6" segments off each socket, setting aside one 6" socket for going through the fuselage. The second 6" segment is leftover.

Build the Wing Panels



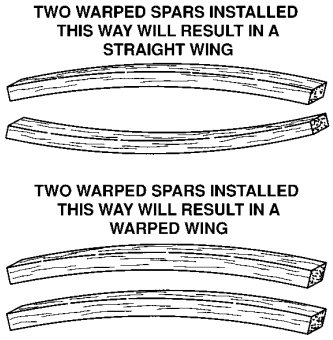
❑ ❑ 1. Select the die-cut 1/8" balsa **WLEWA, WLEWB, WMWA, WMWB, WTEWA and WTEWB** web pieces. Glue WLEWA to WLEWB, WMWA to WMWB, and WTEWA to WTEWB, using a straightedge to be sure the webs remain straight. These 3 webs are now known as the leading edge, main, and trailing edge webs.



❑ ❑ 2. Edge glue three 3/32" x 4" x 48" balsa sheets together. Cut the sheets as shown above, cutting diagonally so that you create two **LE sheets**.

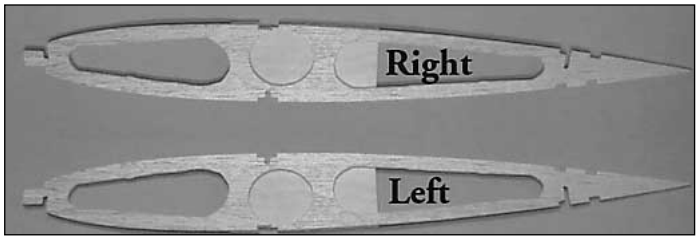
❑ ❑ 3. Tape the **right** wing plan to the building board, and cover it with Great Planes Plan Protector (so you won't glue the wing to the plan!) We are building the right wing **right-side-up** over the right wing top view.

❑ ❑ 4. Before using the 1/8" x 1/2" x 48" basswood spars, examine them carefully for possible imperfections. Look for knots, soft spots, diagonal grain and any other imperfections. If possible, position each spar so the imperfections (if any) are on the outer half of the wing panel (toward the tip), where they will be least affected by high stress. If the spars are warped slightly, try to "balance them out" by installing the warped spars in opposite directions (see sketch).



❑ ❑ 5. Position the spar on top of the plan, allowing excess to extend past both the inboard and outboard ribs. Pin in position in three places; each end and in the center.
HINT: Instead of attempting to pin through the basswood, capture the spar **between** two vertical pins at the middle of the spar and cross-pin the spar on each end.

❑ ❑ 6. Carefully punch out one laser-cut 1/8" ply **rib** (**R1**) and 5 laser-cut 3/32" balsa **wing ribs (R2-R6).** Slip the 1-1/2" x 36" aluminum **wing tube** into the **wing tube socket** and test fit the tube socket into the holes in the six laser-cut ribs. Gently sand if necessary (as was done when building the stab) so that the ribs easily slide onto the tube socket but are not sloppy.

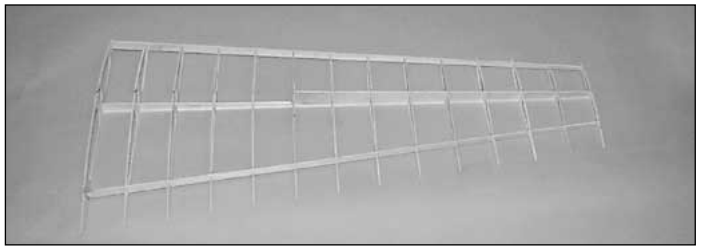


❑ ❑ 7. Glue the die-cut 1/8" ply **wing tube end cap (WTEC)** to the outboard end of R6, being sure that the notches in the rib and end cap are properly aligned. Similarly glue the die-cut 1/8" ply **dowel doubler (DD)** to the outboard end of R1, aligning the dowel holes. **Note:** Be SURE to double-check that you have secured the end cap to the outboard end of R6 with the wing tube holes toward the top of the wing. See the photo to confirm your R6 and end cap are properly assembled prior to gluing.

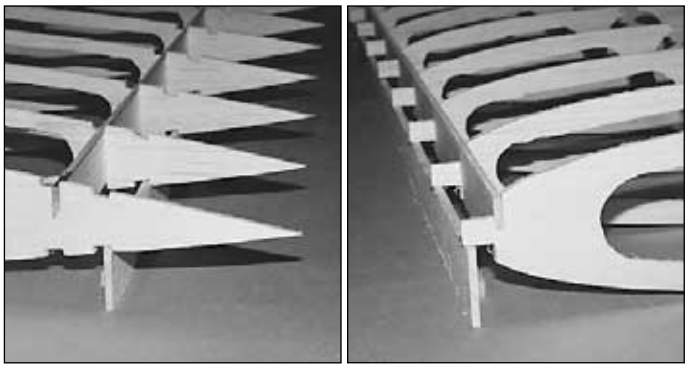
❑ ❑ 8. Carefully punch out eight die-cut 3/32" balsa wing ribs (**R7-R14**)**.** Sand the edges **slightly** to remove any die-cutting irregularities. Be careful not to alter the shapes or angles of any of the pieces.
NOTE: DO **NOT** GLUE until instructed to do so.

❑ ❑ 9. Position the main web you assembled previously on top of the spar with the notched side up. Slide R1 into its slots in the main web. Align the main web, centering it on the spar.

❏ ❏ 10. Position the remaining 13 ribs in place on the main web and spar. **NOTE:** If you happen to crack or break one of the ribs during installation, simply take it out of the wing, position the pieces together and glue them with thin CA. Allow the rib to dry and reinstall it.



❏ ❏ 11. Carefully slide the wing LE and TE webs you assembled earlier over the ribs in their notches until the top of the webs are flush with the top of each rib. Take your time and be gentle; this balsa structure is still fragile at this point, but when finished will provide you a strong, light structure.

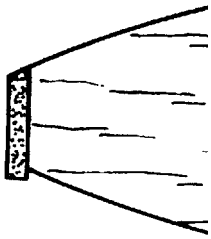


❏ ❏ 12. Position the LE and TE jigs in position, pinning through the support blocks you attached previously.
Note: The TE jig is aligned at the rear edge of the aileron spar slot.

❏ ❏ 13. Remove the aluminum tube from the tube socket. Fit the tube socket into the 5 laser-cut ribs until the wing tube socket is into the R5 rib and flush with the end cap. **Hint:** It is easiest to install the wing tube socket by turning it gently in a rotating motion like turning a screw.

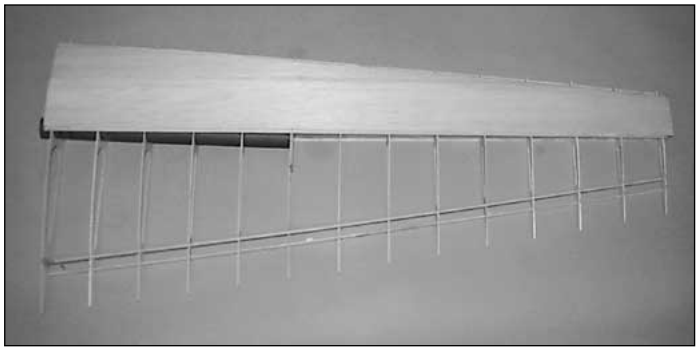
❏ ❏ 14. Confirm that your spar is pinned firmly to the building board and all ribs are pressed down tight against the jigs and spar. Glue all wing joints in place with thin CA, being careful not to get thin CA on the socket and being careful NOT to glue the jigs to the wing structure. **Use medium CA to secure the socket in place**. **Note:** The ribs are angled slightly in the webs. Do not attempt to force the ribs vertical.

❏ ❏ 15. Test fit (DO NOT GLUE) the top spar into the ribs. When you are confident you can fit the spar in place, remove the spar. Lay a bead of medium CA along the top of the main web and wing tube socket and the corners of the rib slots, and reinstall the spar.



❏ ❏ 16. Use a sanding block to shape the LE web so it aligns with the tops of the ribs and the shape of the airfoil as shown in the sketch. Be careful not to gouge the ribs or LE web.

❏ ❏ 17. Using medium CA, glue a LE sheet you made previously to the LE web. Allow the CA to cure completely before proceeding. **Note:** Make sure the sheeting overhangs the tip rib and the center of the wing slightly.



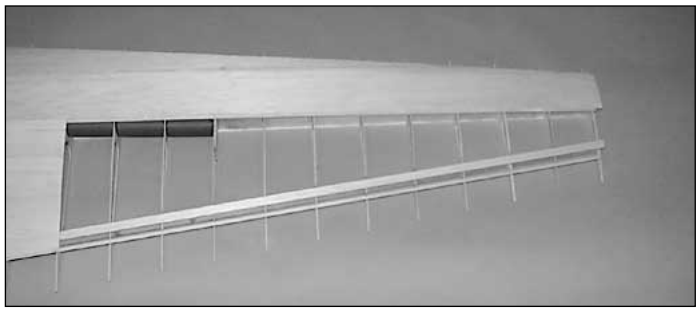
❏ ❏ 18. Carefully lift the sheeting away from the ribs, then apply a bead of medium or thick CA to the top of each rib and the front half of the main spar. Working quickly, reposion the sheeting as you press it down to the ribs and the spar. Use weights to hold the sheeting to the ribs and spar until the CA cures.

❏ ❏ 19. Once the glue is dry, lift off the weights and remove the T-pins from the spars. Do not remove the wing from the building board.

❏ ❏ 20. Glue the 1/8" x 1/4" x 48" basswood top TE spar to the ribs and the TE web. Glue the 1/8" x 1/4" x 48" basswood top aileron spar in the slots in the ribs.

❏ ❏ 21. From a 3/32" x 3" x 36" sheet, cut four 8" long sheets. Edge glue these 4 sheets together, creating the **main center sheet**.

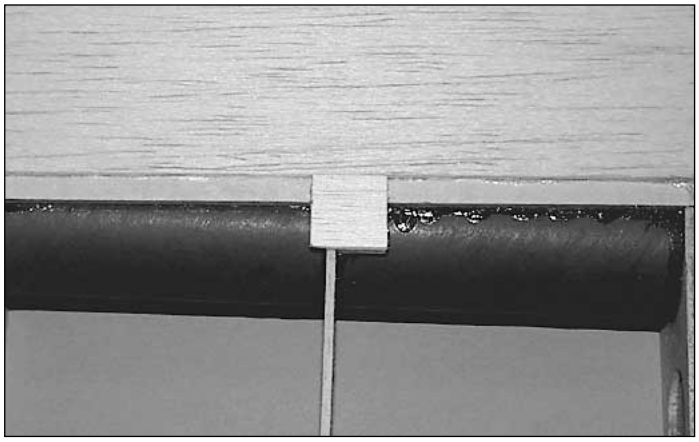
❑ ❑ 22. Position the main center sheet flush against the LE sheet and the outboard edge of R3. Trim the center sheet with the center line of the aileron spar. Glue the center sheet to the LE sheet, ribs, and aileron spar.



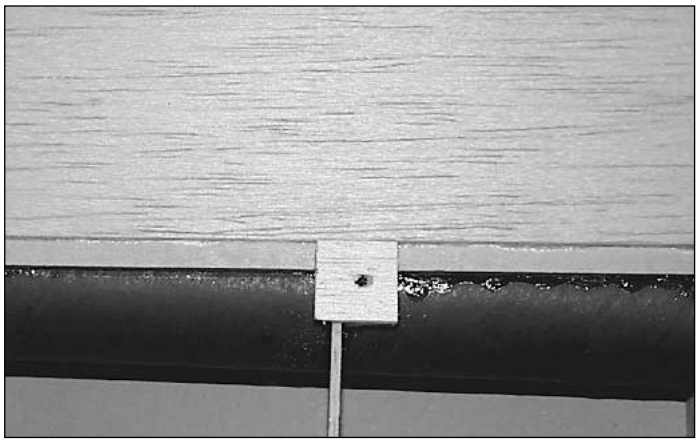
❑ ❑ 23. Select the 3/32" x 1/2" x 42" **wing trailing edge sheet**, and sand one end so it meets with the center sheet when aligned with the aft edge of the trailing edge web. Glue in place to the center sheet, ribs, and trailing edge web.

❑ ❑ 24. Position the die-cut 1/8" ply **wing tube bolt block (WBB)** flush with the top of the outboard edge of R4 and the top of the top spar. Glue it in place.

❑ ❑ 25. Use a small piece of leftover 1/8" ply to secure the trailing edge of the bolt block to the wing tube socket.



❑ ❑ 26. Cut a 3/4" square from leftover 3/32" balsa. Use this piece to sheet over the bolt block and R4, allowing sufficient sheeting to hang over the inboard edge so that the cap strip will line up properly.



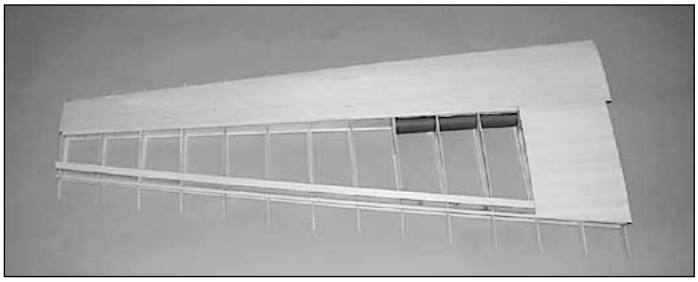
❑ ❑ 27. Using a 7/64" drill bit, drill a hole centered on the bolt block you just installed, being **careful** to drill close to but DO NOT TOUCH the spar. **NOTE:** The aluminum tube IS NOT drilled at this step. The tube will be drilled through the hole you make now when the wing is mounted on the fuselage.

❑ ❑ 28. Using two 3/32" x 3/8" x 36" sticks, cut and glue **cap strips** to ribs R4 through R14 between the LE sheet and TE sheet only.

❑ ❑ 29. Remove the wing from the building board. Trim everything flush with the root and tip ribs.

❑ ❑ 30. Pin the LE jig to the building board. Place the wing upside-down on the jig.

❑ ❑ 31. Shape the bottom of the LE web to the airfoil shape of the ribs as you did the top.

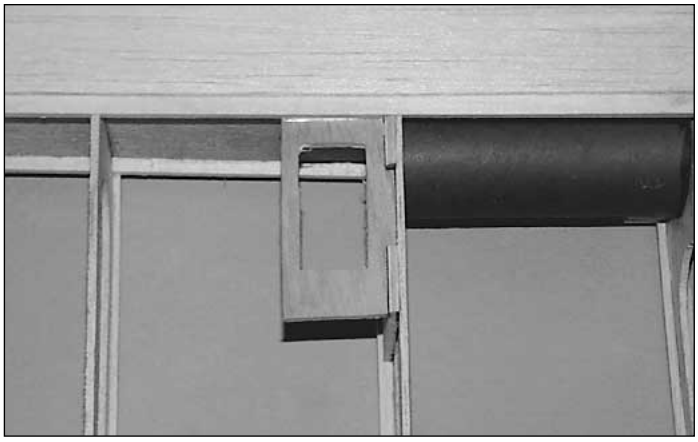


❑ ❑ 32. Glue the bottom leading edge sheeting in place the same as the top.

❑ ❑ 33. Install the bottom TE and aileron spars.

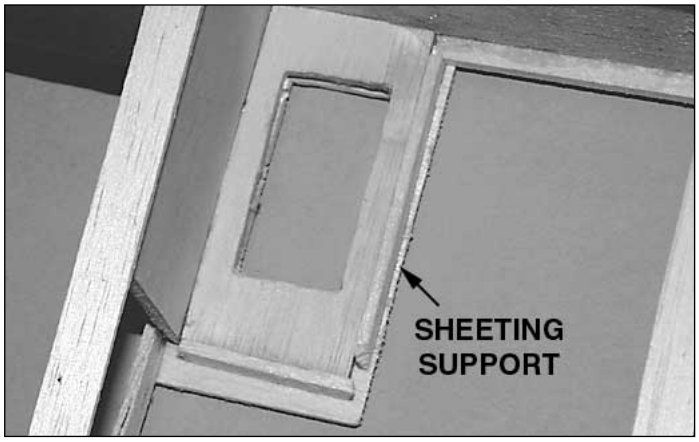
❑ ❑ 34. Make and glue the center sheet and TE sheeting in place the same as you did the top.

Before you continue, you must decide whether you are going to use one aileron servo per aileron or two. All parts and instructions are provided for either configuration. If you have chosen not to purchase high torque servos with at least 100 in oz of torque, we strongly recommend utilizing twin servos for the safety of your model. Alternatively, if you intend to exceed the recommended throws and utilize this model for 3D or freestyle aerobatic competition, we strongly recommend using twin aileron servos. Twin servos offer you not only redundancy, but also additional rigidity for the surface, decreased possibility of flutter, and more consistent response under heavy aerodynamic loads. You should note that sufficient room is provided for 45° throws. Please read the Great Planes booklet: "A Look at Aerobatics" for more information.



❑ ❑ 35. Glue the die-cut 1/8" ply **servo mount (ASM)** to the spar and the tube end cap.

❑ ❑ 36. Sheet over the servo mount with leftover 3/32" balsa.

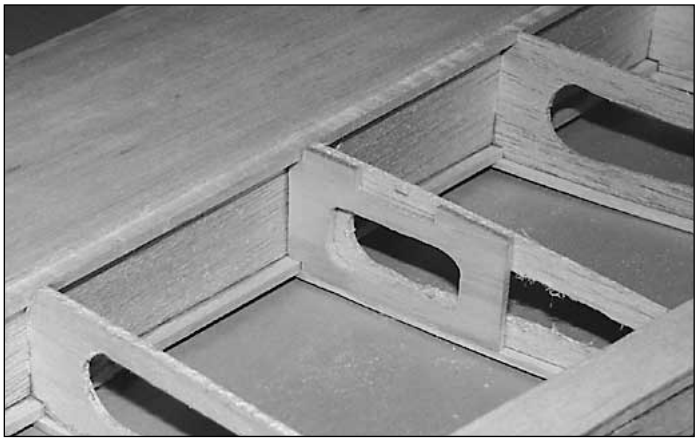


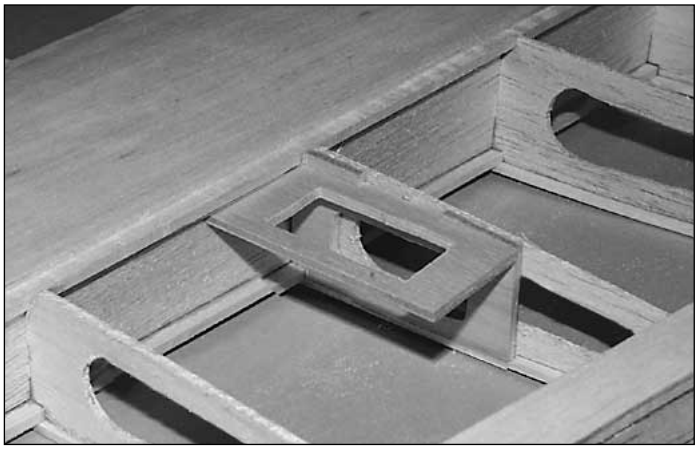
❑ ❑ 37. Set the wing right-side up on the building board. From a piece of leftover sheeting, make a **sheeting support** for the inboard side of the aileron servo tray. Carefully sand the airfoil shape onto the top of the support. Glue with thin CA. Make and glue a second sheeting support for the trailing edge of the aileron servo tray.
NOTE: Be careful not to change the shape of the sheeting when installing these supports.

❑ ❑ 38. Use a hobby knife to cut the opening for the servo in the sheeting, using the servo mount as a guide.
HINT: While the wing is right-side-up, use a hobby knife to cut just the corners of the servo opening. Turn the wing upside-down again, and use a straightedge to cut straight lines between the 4 corners you marked. Remove the piece of sheeting.

❑ ❑ 39. With the wing upside-down, fit the aileron servo in place and trim the sheeting around the rubber grommets on the servo.
Note: Provide approximately 1/16" of clearance between the servo and the sheeting.

Twin Servos Option



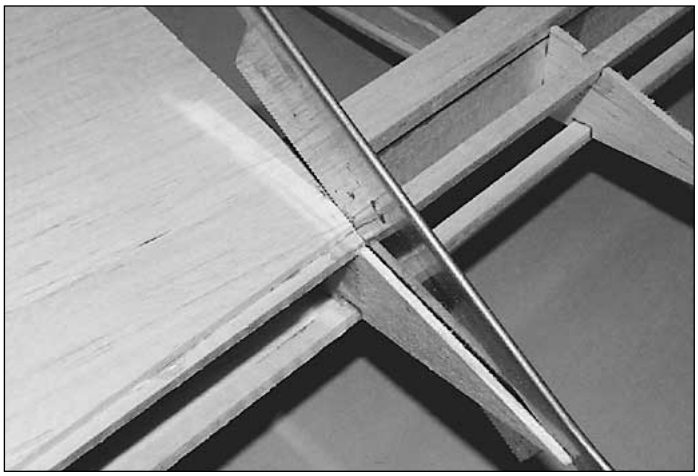


If you are installing the optional second aileron servo, glue the die-cut 1/8" ply **optional rib doubler (ORD)** to the outboard edge of R11. Repeat steps 35 through 37 for the optional second servo tray.

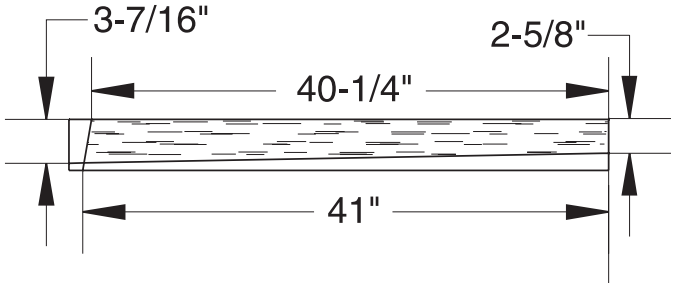
❏ ❏ 40. Use two 3/32" x 3/8" x 36" sticks to cap strip the bottom of the wing from the LE sheet to TE sheet only.

❏ ❏ 41. Trim everything flush with ribs R1 and R14.

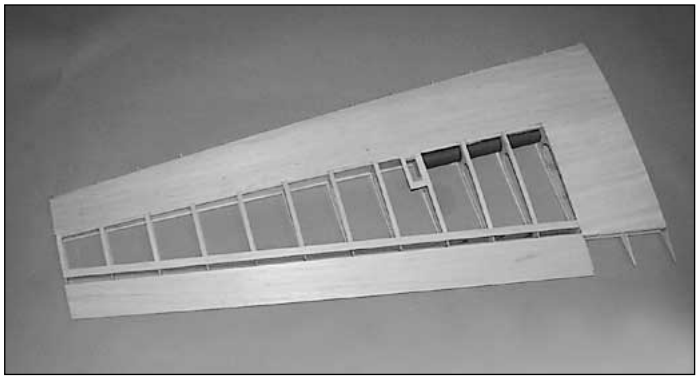
❏ ❏ 42. Glue the die-cut 3/32" balsa **aileron end cap (AEC)** to the spars, leaving a 1/16" gap between the end cap and R3.



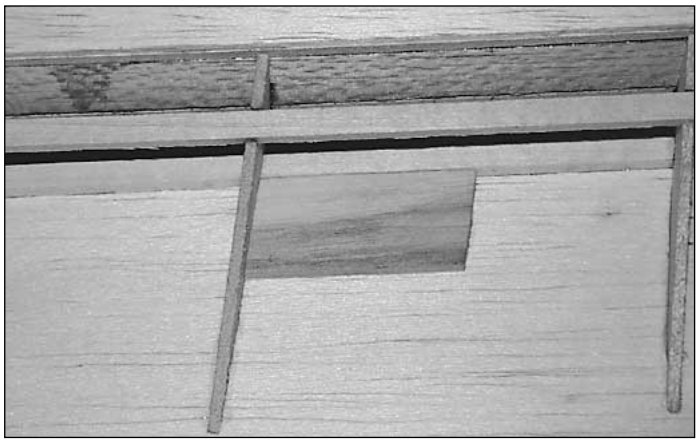
❏ ❏ 43. Using a razor saw, cut the top and bottom aileron spars between R3 and the end cap, being careful not to cut the trailing edge spar.



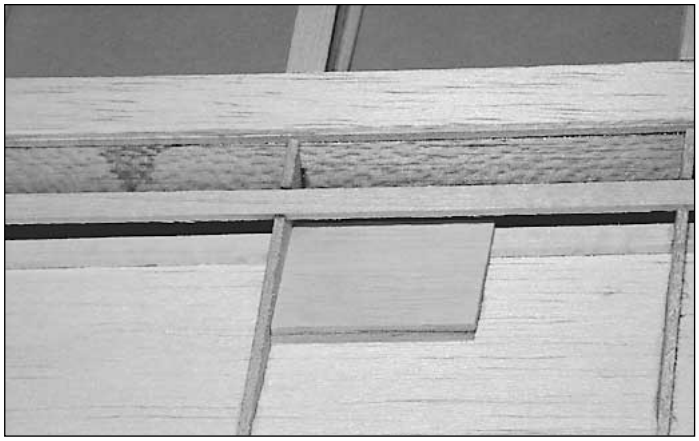
❏ ❏ 44. True one 42" edge on each of two 3/32" x 4" x 42" balsa sheets. Cut the sheets as shown in the sketch above, making two **aileron sheets**.



❏ ❏ 45. Position your wing upside down on the work surface. Test position the aileron sheet even with the leading edge of the aileron spar and the inboard end of the aileron end cap. When you are comfortable positioning the sheeting, coat the aileron ribs, end cap, and aileron spar with medium CA and set the sheet back in position. Hold it down until cured. **Note:** Be sure the sheet is making contact with all the ribs; however, DO NOT weight the sheeting as you may twist the aileron.



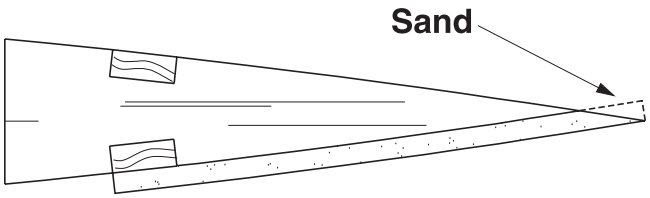
❏ ❏ 46. Turn your wing right-side up. Glue the die-cut 1/8" ply **aileron control horn mount (AHM)** in position against the outboard edge of R6 and the aft edge of the bottom aileron spar.



❏ ❏ 47. Glue the die-cut 1/8" ply **large aileron control horn doubler (AHD)** to the aileron control horn mount, against the outboard edge of R6 and on top of the bottom aileron spar.

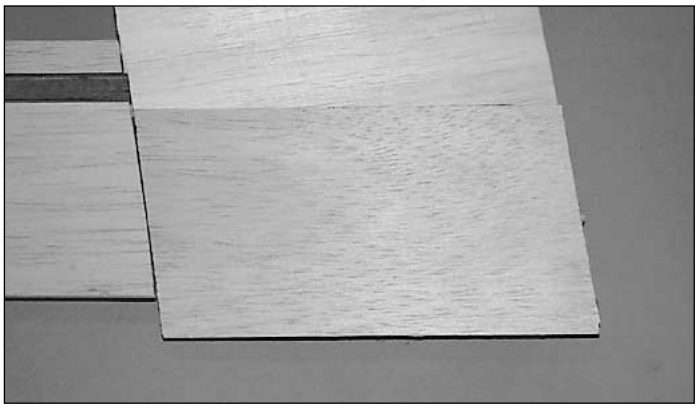
Twin Servos Option

If you chose to install twin aileron servos, repeat steps 44 and 45, securing the second set of control horn mounts against the outboard edge of R11.

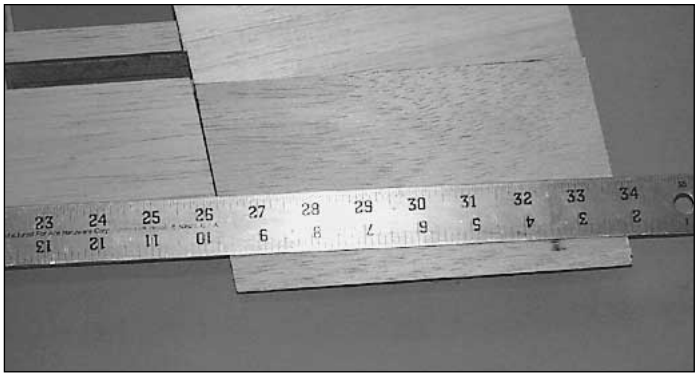


❏ ❏ 48. Sand the TE of the aileron sheet to the shape of the ribs, as shown above. **Hint:** Blocking up the leading edge of the wing so that the bottom aileron sheeting is flat on your building board makes this task very easy.

❏ ❏ 49. Glue the top aileron sheet in position, aligning it over the bottom sheet, and positioning and gluing in place as you did the bottom sheet in step 43.



❏ ❏ 50. Place your wing upside down on your work surface. Position a 3/32" x 4" x 36" balsa sheet against the center sheeting and flush with the outboard edge of R3. Trim the sheet slightly inboard of R1, making one **aft center sheet**. Glue the aft center sheet to the ribs and spar, being careful not to glue R3 to the aileron end cap. **Note:** If this is your second time through this step, you will be using the leftover 3/32" x 4" sheet from the first wing, not a new 36" sheet.



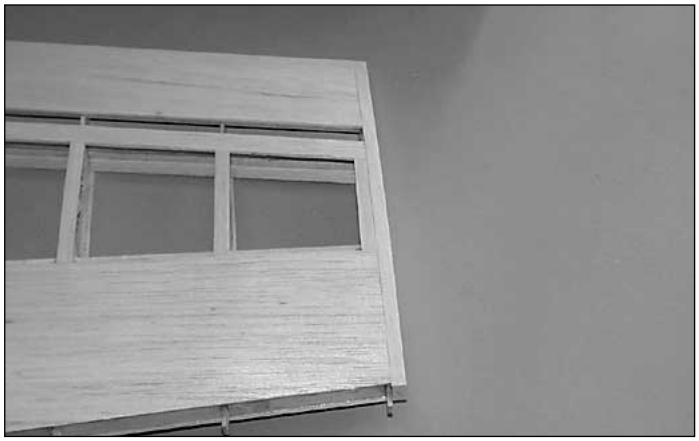
❏ ❏ 51. Position your straightedge flush with the trailing edge of the aileron sheet and extending inboard past R1. Trim the aft center sheet flush with the rest of the trailing edge.

❏ ❏ 52. Turn the wing right-side-up. Sand the trailing edge of the aft center sheet as you did the aileron sheet in step 46.

❏ ❏ 53. From the 3/32" x 4" wood left over from making the bottom aft center sheet, position, cut and glue the top aft center sheet. **Note:** Save the remaining 3/32" x 4" wood for sheeting the second wing half.

❏ ❏ 54. Trim the trailing edge of the top aft center sheet flush with the trailing edge of the bottom aft center sheet.

❏ ❏ 55. Sand all sheeting flush with R1 and R14.



❏ ❏ 56. Position and glue a 1/4" x 1-1/2" x 12" balsa **wing tip** so that there is a small amount of overhang past the leading edge, trailing edge, top and bottom of R14. Trim and sand the wing tip to match the airfoil shape of R14.

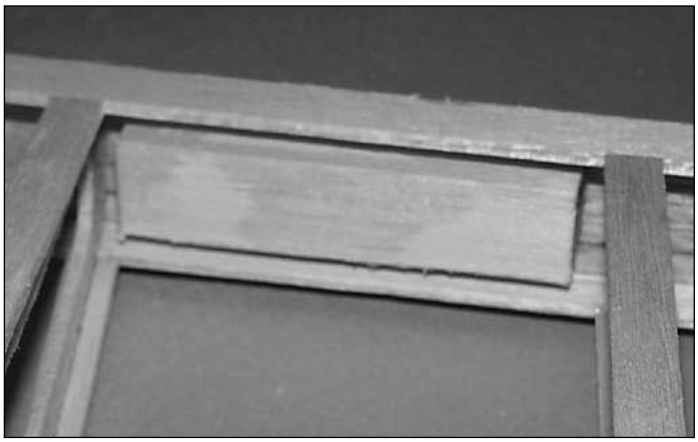
❏ ❏ 57. Use a razor saw to cut the tabs off of the LE. Sand everything flush with the LE web.

❏ ❏ 58. Glue a 1/2" x 1-1/4" x 48" balsa stick, the **wing leading edge,** centered onto the front of the LE web. Sand the ends of the leading edge flush with ribs R1 and R14. **Hint:** By aligning your leading edge flush with the outboard edge of one side of the sheeting, then drawing a line along the other side of the sheeting, and pre-cutting the leading edge to that line (being careful not to cut it too small), you minimize the excess wood needing to be sanded.

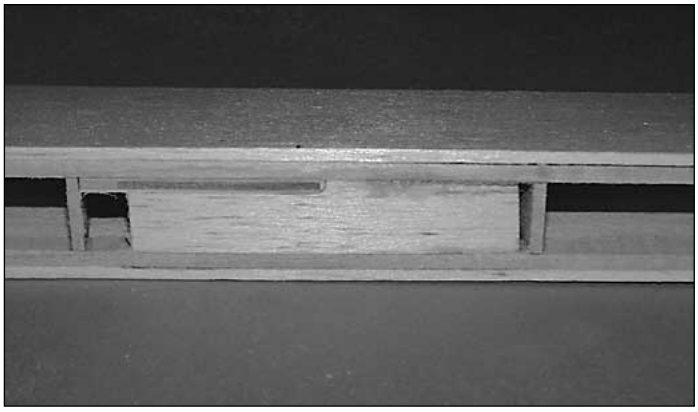
❑ ❑ 59. Shape the leading edge to transition between the templates provided. **Note:** There is one template for the root which is fairly wide and blunt. This should be used for the root of this wing in all cases. Use the appropriate tip template for your style of flying. If you plan to utilize the model for aerobatics competition and wish for maximum snap performance, use the smaller, sharper tip template. If you plan to utilize this model for sport flying only and desire an airplane which is slightly less "snappy" and less prone to tip stall, utilize the larger, wider tip template.

❑ ❑ 60. Using your razor saw, cut the aileron from the wing. Sand the remaining rib pieces flush with the wing's TE web and the aft center sheeting flush with R3. Sand everything flush with the leading edge of the aileron spars. Sand the sheeting flush with the inboard and outboard ends of the aileron.

❑ ❑ 61. From a 1/2" x 3/4" x 36" balsa stick, cut ten 3" long **hinge blocks**.



❑ ❑ 62. Carefully fit and glue five hinge blocks between the TE spars of the wing and flush against the leading edge of the TE web as shown on the plan.



❑ ❑ 63. Fit and glue the remaining 5 hinge blocks between the aileron spars as shown on the plan, being sure they are flush with the leading edge of the aileron spars and glued firmly to the aileron spars. **Note:** The hinge block positioned on top of the control horn support must be trimmed to snugly fit against the control horn support AND both spars.

❑ ❑ 64. Glue a 1/2" x 1-1/4" x 42" balsa stick, the **aileron leading edge,** to the leading edge of the aileron spars. Sand the aileron leading edge flush with the aileron end cap and R14.

❑ ❑ 65. Sand the top and bottom of the aileron leading edge to the shape of the aileron sheeting.

❑ ❑ 66. Sand a V shape onto the aileron leading edge as shown on the plan.

❑ ❑ 67. Using giant scale hinges (not provided), hinge BUT DO NOT GLUE the aileron to the wing as you did the elevators to the stab halves.

Sit back and relax! Take a look at your great work! Go ahead, pick it up. Incredible how light, yet rigid, the structure is, isn't it? Just wait until you fly it!

❑ 68. If this is the first time through, go back to step one of **Build the Wing Panels** and build the left wing half.

BUILD THE FUSELAGE

Determine the Right-Thrust Offset

❑ 1. Use the formula below to calculate your box lengths. Measure the length of your engine from the back of the thrust washer to the back of the mounting plate. Subtract this engine length from 13-3/8", determining the left firewall box length. Subtract 1/4" from left firewall length to determine the right firewall box length.
Hint: For example, if the engine is 6-3/4" long, the left firewall box length is13-3/8" - 6-3/4" = 6-5/8" and the right firewall box length is 6-5/8 - 2/8" = 6-3/8".

Calculate Left firewall box length:

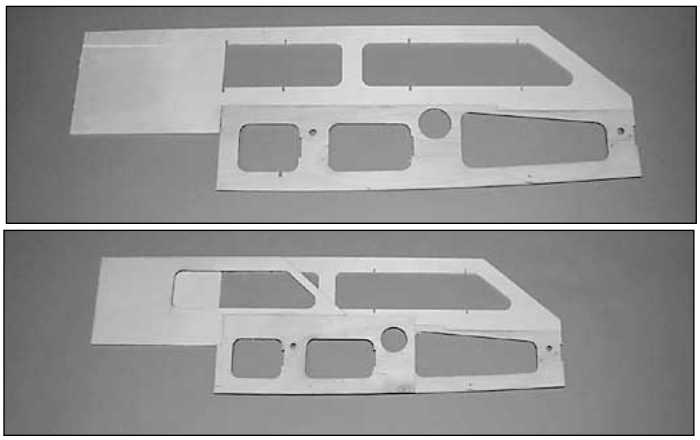
13-3/8"
less Engine Length: - _____"
Left firewall box length = _____"

Calculate Right firewall box length:

"Left firewall box length: _____"
less 1/4" - 1/4"
Right Firewall box length: = _____"

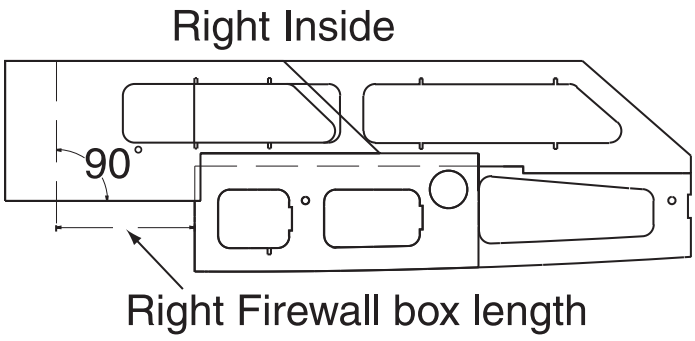
Build the Fuselage Center Box Sides

❏ 1. Unroll your fuselage plan onto your work surface. Cut the left edge of Fuselage Plan 2 at the dotted line. Overlap Plan 2 over Plan 1, aligning the “align here” markers and tape in place.



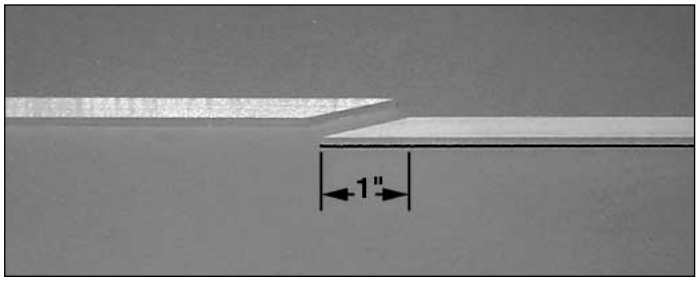
❏ ❏ 2. Unroll your fuse plan onto your work surface. Be sure to cover it with Great Planes Plan Protector. Select one 1/8" die-cut ply **FCB1 and FCB3** and one 1/8" laser-cut ply **FCB2 and FCB4**. Building over the plan and using thin CA, glue FCB1 to FCB2 as shown. Sand both sides of the glue joint smooth. Use medium CA to glue FCB4 onto FCB1 and FCB2, aligning the dowel hole and wing tube. Using medium CA, glue FCB3 to FCB1, 2 and 4. This assembly is now known as your **right forward center box side.** Write “right inside” on FCB3.

❏ 3. Repeat step 1, building a **left forward center box side**. **NOTE:** Be sure to build a left and a right side.

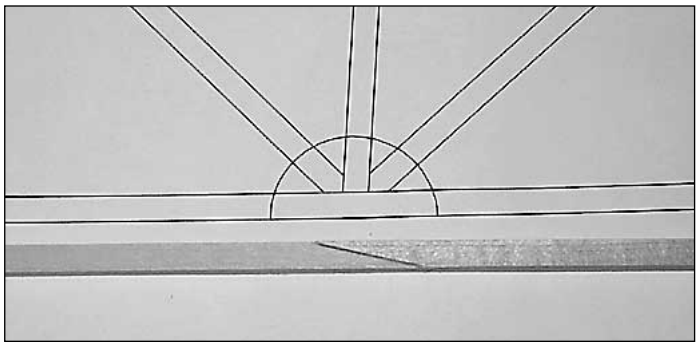


❏ 4. Select the right center box side. Measure from the leading edge of FCB4 forward the Right Firewall Box Length which you calculated in step 1. Trim the center box side to this length. Similarly measure and trim the left center side to the Left Firewall Box Length.

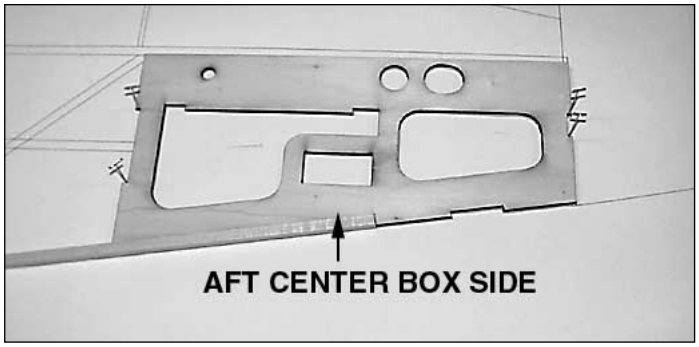
❏ ❏ 5. Pin the right forward center box side in position over the plan. Pin the laser-cut 1/8" ply right **aft center box side** (ACB) in position over the plan. **NOTE**: If you are building the left side, align the tube holes - **not** the firewall.

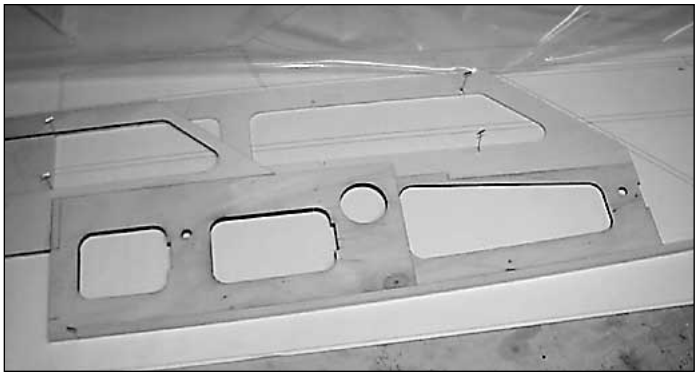


❏ ❏ 6. Select four 1/4" x 1/4" x 36" basswood sticks. Cut a smooth angle 1" deep into one end of each of the 4 sticks. Using medium CA, splice 2 pairs together, making 2 **center box longerons. Hint**: By laying two sticks on top of each other and then cutting the angle, a perfect joint will be made.

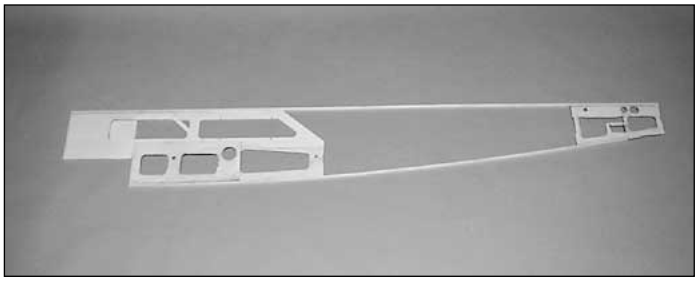


❏ ❏ 7. Position the lower center box longeron over the plan with the splice centered over the joint support and with the angled sides of the splice facing toward the inside/outside of the aircraft, NOT top-to-bottom. **HINT:** Remember, ALL references such as top and bottom always refer to the finished aircraft’s top or bottom, not your work surface’s top. When in doubt, picture yourself in the aircraft’s cockpit.

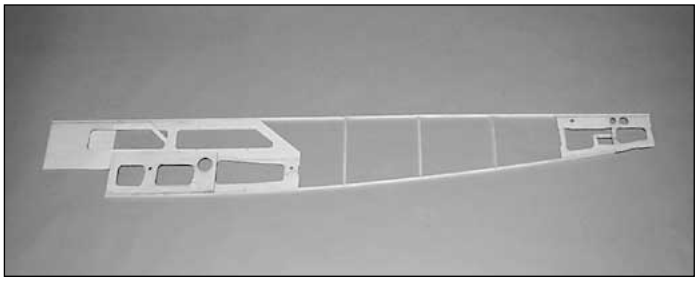




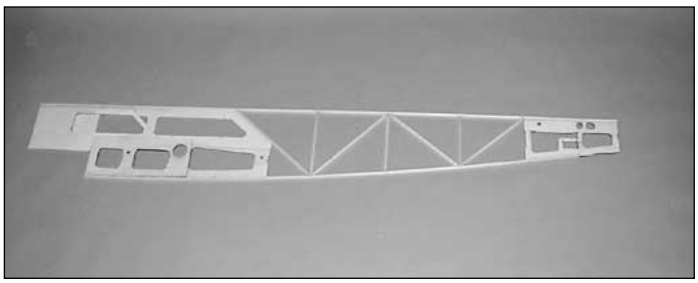
❏ ❏ 8. Trim the lower longeron to fit into the aft center box side and flush with the leading edge of FCB4. Glue the longeron to the forward and aft center box sides with thin CA.



❑ ❑ 9. Position the upper center box longeron, again being careful that the splice is properly positioned over the joint support and with the angled sides facing in/out. Trim the upper longeron to length and glue it to the forward and aft center box sides with thin CA.

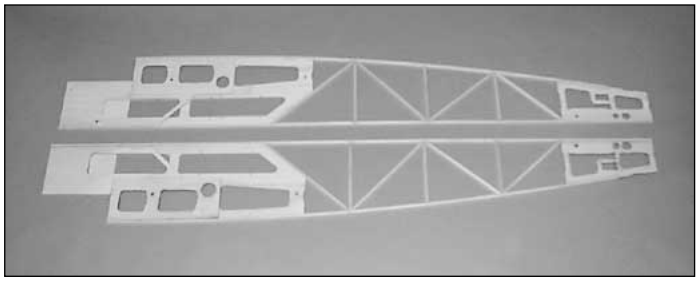


❑ ❑ 10. Using a 1/4" x 1/4" x 36" balsa stick, cut, fit and glue the 3 **fuse box vertical trusses**. **NOTE:** It is critical that you do not spread or pinch the longerons when you install the trusses. You may wish to use T pins to support the outside edges of the fuselage to be sure they don't get pushed out of position.

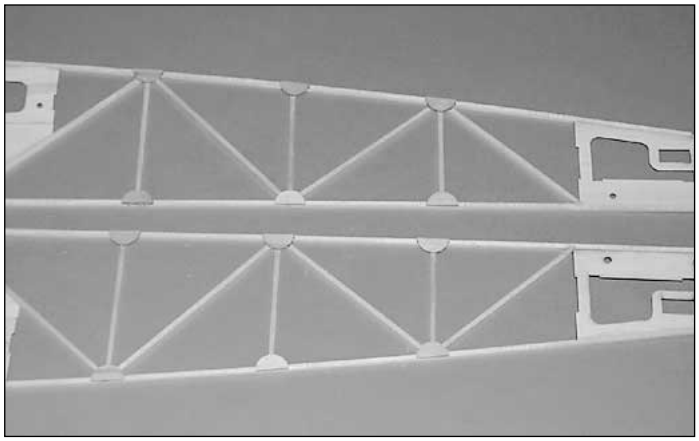


❑ ❑ 11. Using the remaining 1/4" x 1/4" balsa and an additional 1/4" x 1/4" x 36" balsa stick, cut, fit and glue the 4 **fuse box diagonal trusses**, again being careful not to deform or reposition the longerons.

❑ 12. Unpin the right fuse side from the plan. Flip it over so the right inside is now against the work surface. Cover the right fuse side with Great Planes Plan Protector.



❑ 13. Repeat steps 4 through 10, building the **LEFT** fuse side as a mirror image **on top** of the **RIGHT** fuse side.

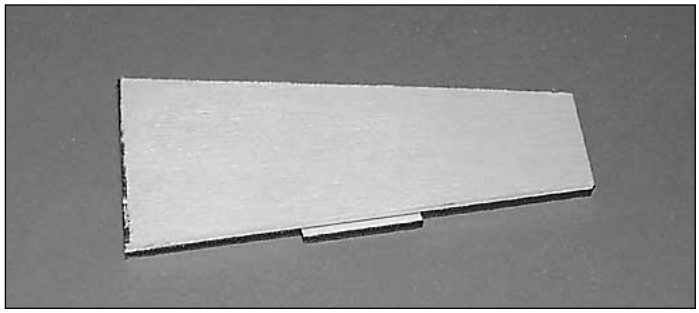


❑ 14. With the fuse sides laying mirrored as shown in the photo above, gently sand the joints where the joint supports will be installed. Then install the 12 die-cut 1/8" ply **joint supports (JS)** over their locations on the plan. **NOTE:** Be SURE you are putting the joint supports on the INSIDE of the left and INSIDE of the right fuse sides.

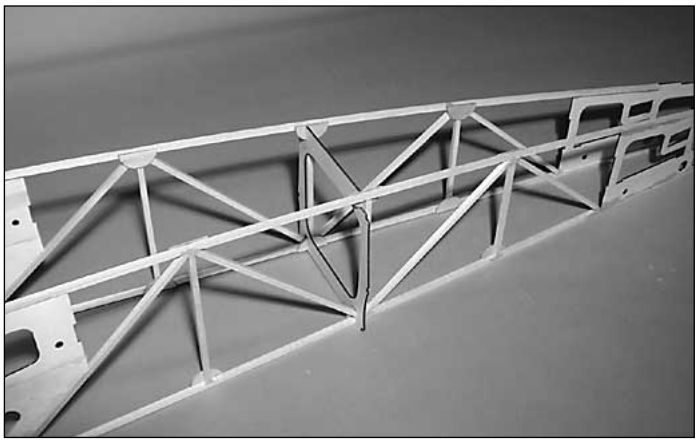
Assemble the Fuselage Center Box

***DESIGNER'S NOTES**: During this entire segment of assembly the center box sides MUST be perpendicular to the work surface. You should check that the sides remain perpendicular to the work surface prior to gluing each and every piece.*

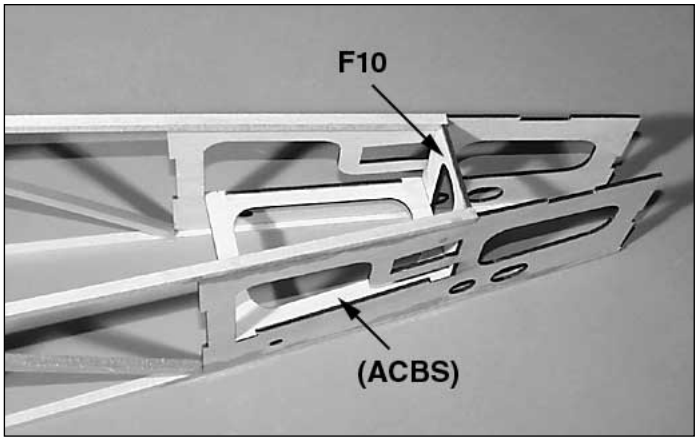
All formers are installed with the embossed part #s going toward the front of the aircraft AND with the "top" label, if applicable, toward the top of the aircraft.



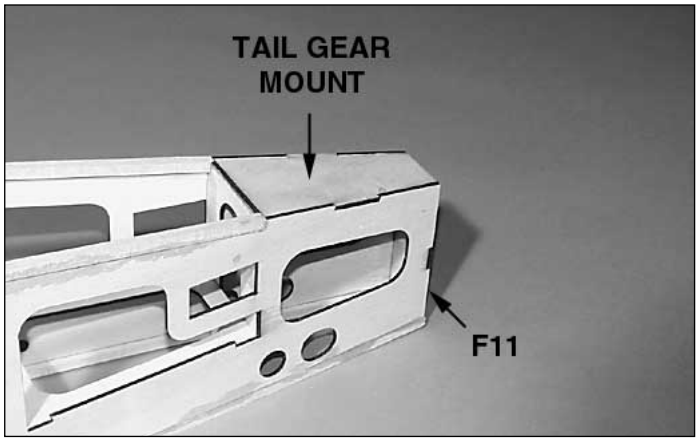
❏ 1. Select the die-cut 1/8" ply **tail gear mount (TGM)** and **tail gear mount doubler (TGMD)**. Glue the doubler to the tail gear mount, aligning the leading and trailing edges. This assembly is now known as the tail gear mount assembly.



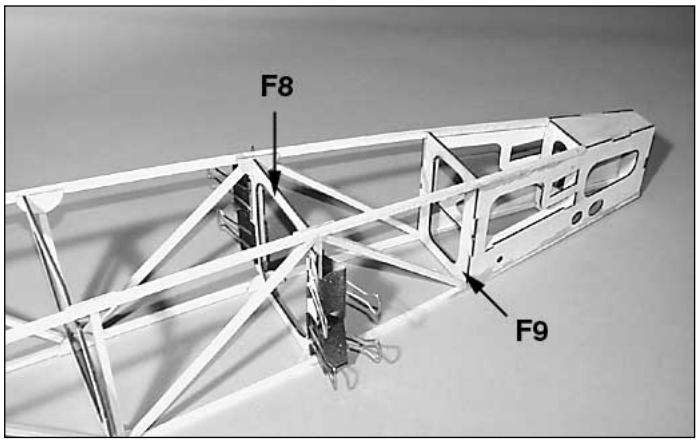
❏ 2. Select the die-cut 1/8" ply former **F7.** Position your center box sides inverted over the bottom view plan (the upper longeron will set flush along the entire length of the fuse plan.) Temporarily lock F7 in place over the center box sides in front of the vertical trusses with the **"top" label against your work surface**. **NOTE:** This former is in position temporarily to help keep the center box sides in position while you assemble the aft center box. **Don't glue it in place until step 6.**



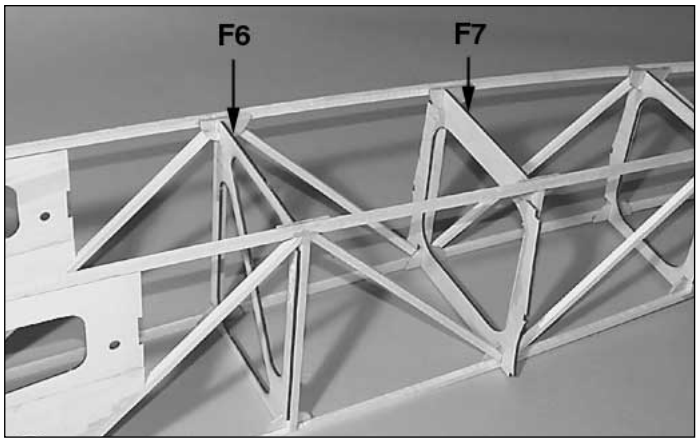
❏ 3. Select the die-cut 1/8" ply **aft center box support (ACBS)** and **F10.** Test fit both pieces between the aft box sides. When comfortable installing them, glue them in place with thin CA. Be sure to hold all pieces tightly in place until your CA has cured completely.



❏ 4. Glue the die-cut 1/8" ply **F11** and the tail gear mount assembly in position. **NOTE:** The doubler slides in between the aft box sides with the tail gear mount being flush with the bottom of the aft box sides.

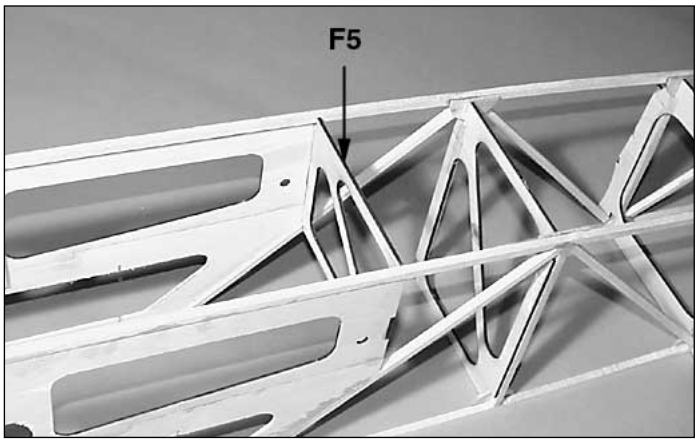


❏ 5. Position the die-cut 1/8" ply formers **F9 and F8** in front of the vertical trusses, with F8's top label against the plan. Glue F9 and F8 in position. **HINT:** Using C clamps or regular office clamps to secure the formers to the vertical trusses while the CA cures will help ensure an excellent bond.



❏ 6. Position the die-cut 1/8" ply former **F6** in front of the

vertical trusses. Glue F7 and then F6 in position.



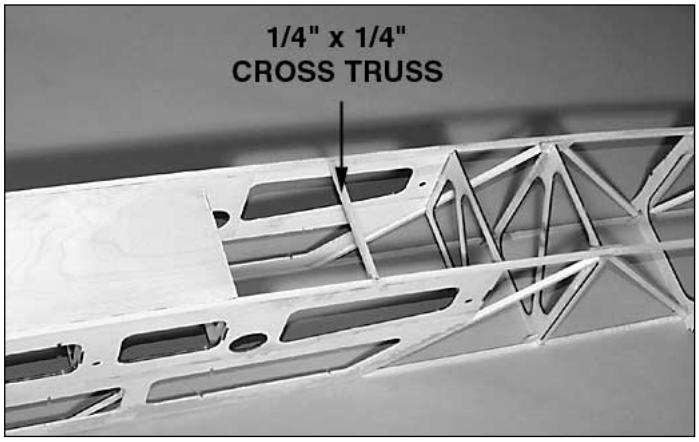
❏ 7. Select the die-cut 1/8" ply former **F5**. Position it at the trailing edge of the forward box sides and glue it to the forward center box sides.

❏ 8. Select the two die-cut 1/8" ply formers **F3/4**. Position them in their notches in the forward center box sides and use thin CA to glue them in place in the F3 and F4 locations.
NOTE: F3 and F4 are the same part; two are provided for you.

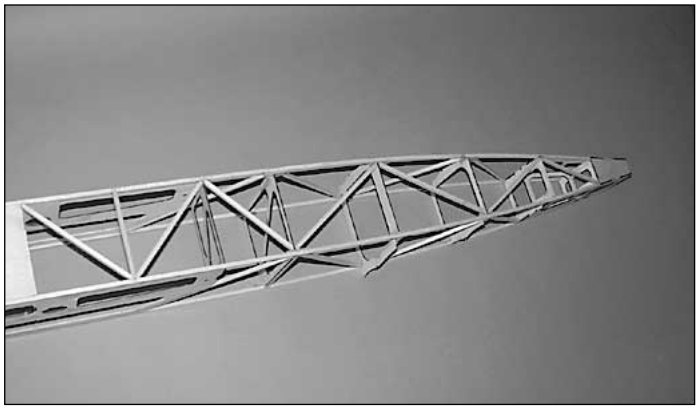
❏ 9. Position and glue the 1/8" x 5-1/2" x 9-3/4" birch ply **landing gear support plate** to the forward fuse sides and formers.

DESIGNER'S NOTE: *Steps 10 through 12 are where the fuselage is locked into its final configuration. Check for straightness and be sure the fuse is positioned properly over the plan. It is CRITICAL that it does not have a twist or banana shape. Be very careful during these steps to make sure the cross trusses are a perfect fit and* ***do not*** *bow the fuse longerons.*

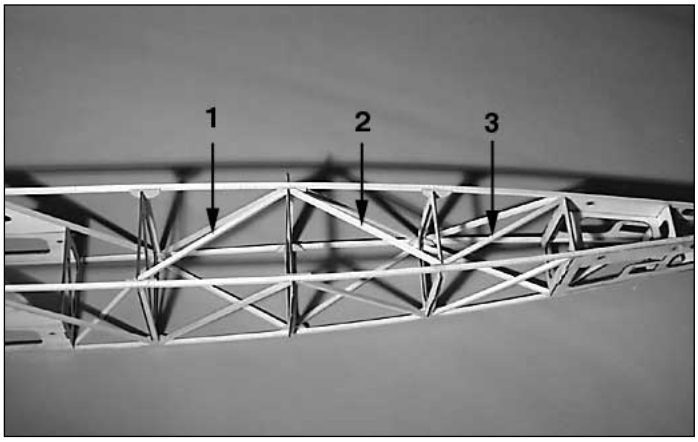
We would like to again remind you of our earlier caution – trust the design. It is very strong and light weight. It performs exceptionally well and is able to stand the most extreme aerobatic maneuvers in its stock configuration.



❏ 10. Using a 1/4" x 1/4" x 36" balsa stick, cut, fit and glue one side-to-side **cross truss** between the bottom longerons which is centered between formers F4 and F5 as shown on the plan.



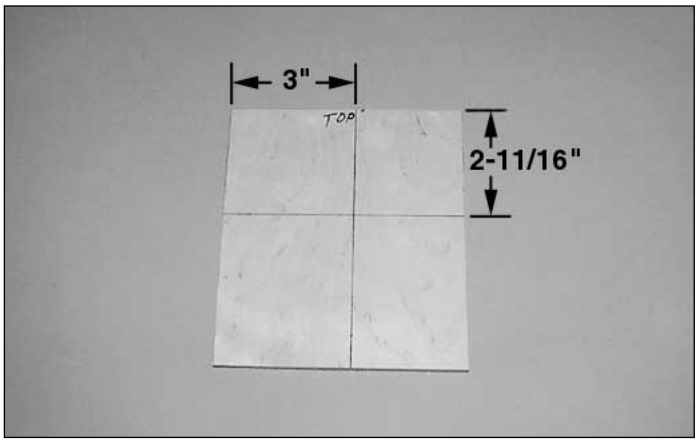
❏ 11. Using the leftover 1/4" x 1/4" balsa stick and an additional 1/4" x 1/4" x 36" balsa stick, cut, fit and glue the seven bottom diagonal cross trusses as shown on the plan.



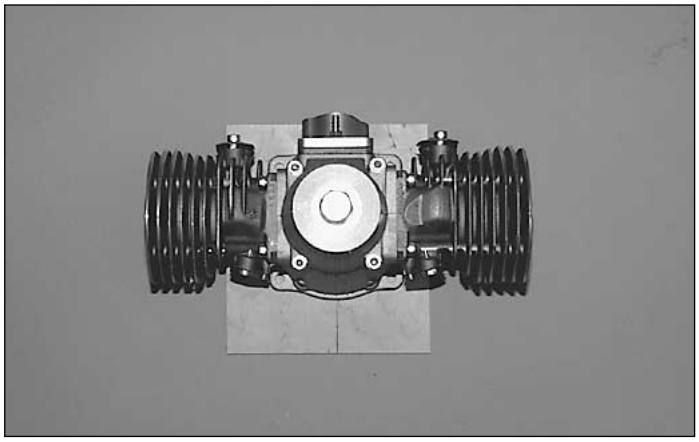
❏ 12. Turn the fuselage right-side-up. Using 1/4" x 1/4"x 36" balsa sticks, fit and glue the 3 upper diagonal cross trusses. **Note:** The upper cross trusses run opposite to the lower cross trusses as shown on the plan.

Install the Firewall

❏ 1. Select the two pre-cut 1/4" x 5-1/2" x 6-7/32" ply **firewalls.** Laminate them together with 6-minute epoxy. This assembly is now known as the firewall or **F1.**



❏ 2. Mark a top front on your firewall. Make a vertical line 3" from the left edge and a horizontal line 2-11/16" from the top. (Note that this location is offset for the thrust angles built into the model and will result in your crankshaft exiting centered on the thrust line and on the cowl.)

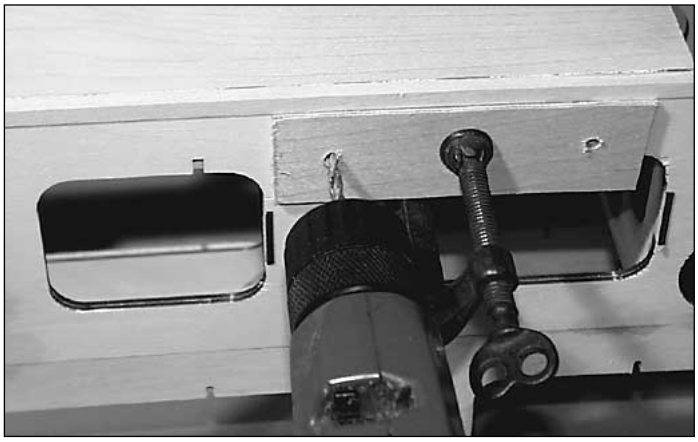


❏ 3. Temporarily mount your engine to the firewall, centered on the marks you just made. This is the technique we used to mount the MacMinarelli engines: mark the four holes for the mounting bolts onto the firewall. Drill 15/64" holes through the firewall. Tap four 10-32 blind nuts (not included, GPMQ3330) into the back of the firewall with a hammer. Use thin CA around the blind nuts to help secure them, being careful not to get CA in the threads. Use four 2" long 10-32 Allen bolts and #10 lock washers (not included) to mount your engine to the firewall. Remove the engine and set it and its hardware aside.

❏ 4. Aligning the forward edge of the firewall with the forward edge of the forward box sides, glue the firewall to the box sides with 30-minute epoxy. **NOTE:** Be sure to clamp it in position and leave it to cure completely.

❏ 5. Drill three 1/8" holes one inch deep through each of the forward fuse sides into the firewall. Space the holes evenly down each side of the firewall. From the 1/8" dowel, cut 1" long pieces. Glue the dowels into the firewall/box side with 6-minute epoxy and allow to cure completely.

Mounting the Landing Gears

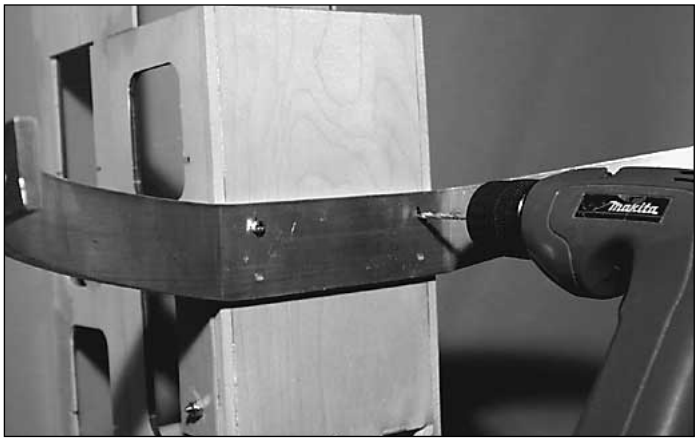


❏ ❏ 3. Using an 11/64" drill bit, drill 2 holes through each doubler, forward box side and landing gear support. The holes are positioned 1/2" up from the bottom of the doubler and 3/4" from the leading edge and 1-1/4" from the TE.

❏ ❏ 4. Using the 8-32 x 3/4" socket head cap screws and the 8-32 nylon lock nuts, bolt the landing gear support to the forward center box side and landing gear support doubler. Remove the clamp.

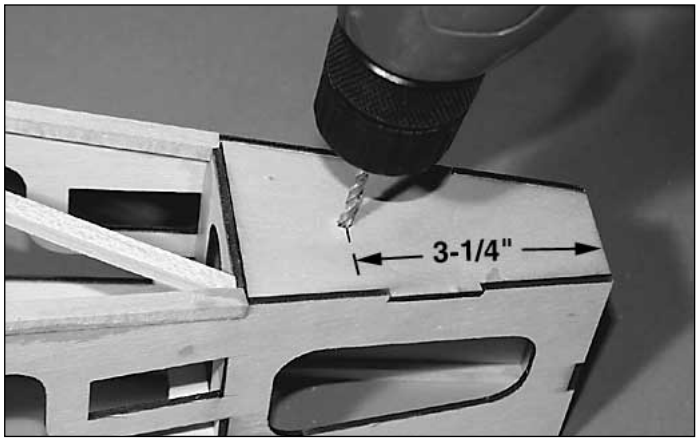
❏ 5. Repeat steps 1 through 4 for the left landing gear support.

❏ 6. Locate the aluminum **main landing gear**. Using the fuselage bottom view on the plan as a reference, drill four 11/64" holes in the gear. The holes are placed 3/4" from the bend and 1/2" from the leading and trailing edges of the gear respectively.



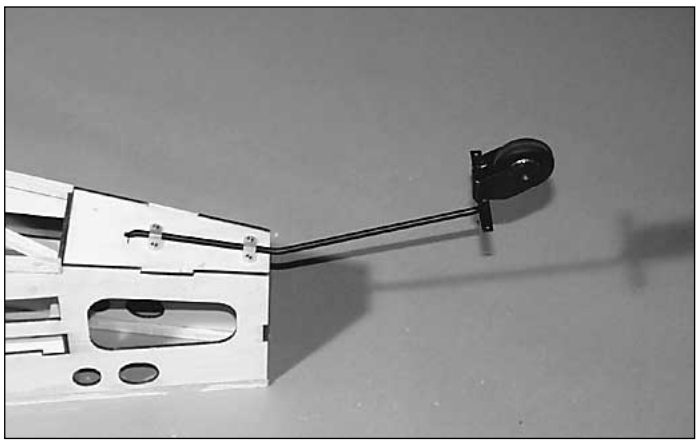
❏ 7. Center the main gear on the fuselage with the leading edge of the gear flush with the trailing edge of F3. Using the hole in the gear as a guide, drill the right front 11/64" hole through the birch landing gear plate and the aluminum landing gear supports. Bolt the gear to the fuse with an 8-32 x 3/4" socket head cap screw and a nylon lock nut. Drill and bolt the remaining 3 holes one at a time.

If you are not using the recommended Ohio SuperStar Large Tail Gear, mount and secure your tail gear as recommended by the manufacturer. To attach the recommended tail gear (not included), complete steps 8 through 10.



❏ 8. Drill a 5/32" hole which is centered on the fuselage and is 3-1/4" forward of the fuse's trailing edge as shown in the photo.

❏ 9. Glue the 3/4" x 3/4" x 1-1/2" birch ply **tail gear torque block** to the top of the tail gear mount, centered on the hole with the block running width-wise across the fuse. Redrill your 5/32" hole back through the tail gear mount and the tail gear torque block after the glue has cured.



❏ 10. Fit the tail gear in place. Mount the straps to the tail gear mount using the screws included with the tail gear. Use the plan as a reference.

WOW!!! The GEAR'S on already!! It won't be long now before this giant beauty is done!

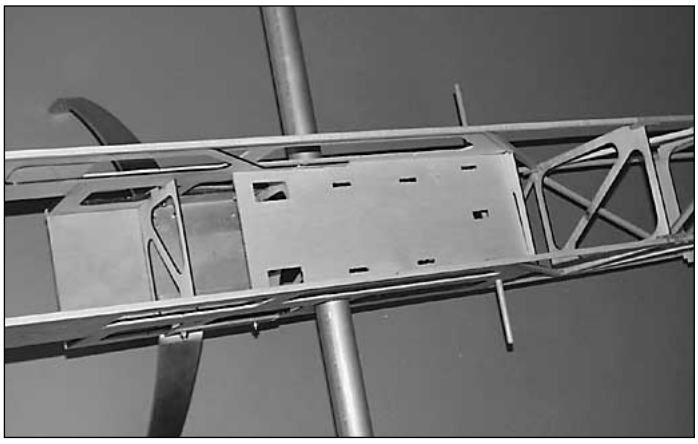
Mounting the Wing & Tail

❏ 1. From the two 5/16" x 18" dowels, cut one 9" long **wing forward anti-rotation dowel,** one 13" long **wing aft anti-rotation dowel**, and one 5" long **stab anti-rotation dowel.** Round both ends of the dowels as shown on the plan.

❏ 2. Fit the 6" fuselage segment of wing tube socket through the holes in the center box sides. DO NOT GLUE the wing tube socket in position at this time.

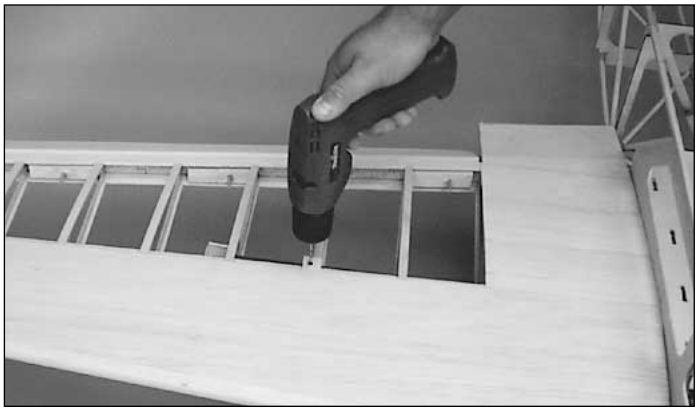
❏ 3. Slide the 36" aluminum tube through the fuse. Center the tube on the fuse, and mark the tube with a permanent marker where it exits both of the center box sides.

❏ 4. Fit the aft anti-rotation dowel through the slots in the center box sides and center it on the fuse. **NOTE:** The forward anti-rotation dowel will not be installed until final assembly. Set it aside in a safe place.



❏ 5. Temporarily fit the die-cut 1/8" ply **servo/tank tray (STT)** in position. **NOTE:** Do NOT glue this tray at this time. You will install the servos, tank, receiver and battery onto the tray prior to its final installation.

❏ 6. Slip the right wing panel onto the tube and dowel until it is tight against the center box side, making sure that the mark you made on the tube is still properly positioned off the left side of the center box. **NOTE:** If the wing panels do not fit perfectly flush the whole length of the root rib, that's OK. The outer shell will cover the wing/fuse joint. Simply be sure the wing has good, firm contact against the fuse.

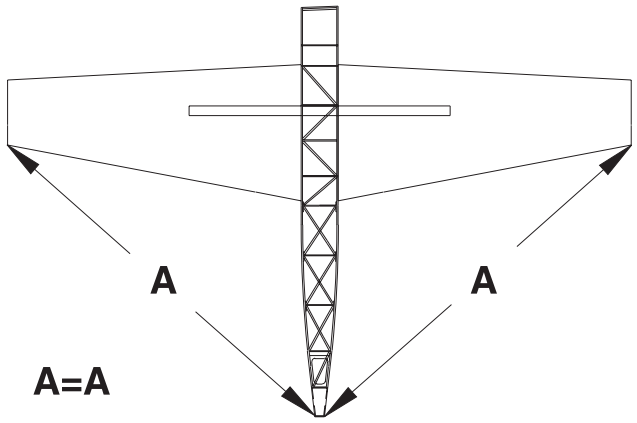


❏ 7. Using the previously drilled hole in the wing tube bolt block as a guide, drill a 7/64" hole through the wing tube bolt block and through the top of the wing tube. Tap the top of the wing tube with a 6-32 tap. Bolt the tube to the right wing panel with a 6-32 x 3/4" bolt.

❏ 8. Slide the left wing panel onto the tube and flush against the fuse. DO NOT drill or mount the left wing panel at this time.

INSTALLING YOUR WING

When you fit the Extra's wing to the tube, you will find it is a snug fit that requires some force. When putting your aircraft together to fly, it is helpful to have someone putting light pressure against the first wing tip or to butt the tip against a car tire, then push the wing onto the tube from the other side. To remove the wing from the aircraft, stand with the fuselage resting against the back of your legs and pull the wing away from the fuselage. Always handle the wing by the leading and trailing edges and be careful not to put your hand through either the wings' or fuselage's sheeting.

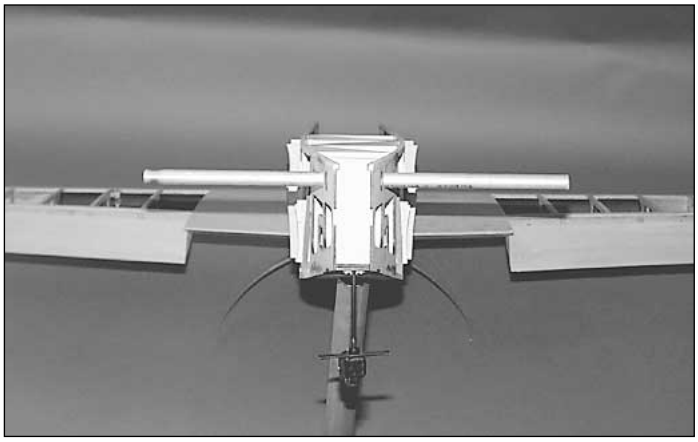


❏ 9. Using a tape measure, measure from the center of F11 to the trailing edge of each wing panel. If the measurements are not identical, note which side needs to be shifted, then remove the wings and the wing tube socket from the fuse. Enlarge the hole in the center box slightly. Reinstall and re-measure. Adjust as needed until a perfect fit is achieved. **NOTE:** This measurement's accuracy is critical to 1/16".

❏ 10. Once the wing is properly aligned, glue the center wing tube socket to the center box with medium CA and sand it flush. **DO NOT** glue the servo/tank tray in at this time.

❏ 11. Drill, tap and bolt the left wing to the tube as you did the right.

❏ 12. Install the remaining piece of stab tube socket in place in the round forward hole in the aft box sides. **DO NOT** glue at this time. Slide the aluminum tube through the stab tube socket and center it on the fuse.
NOTE: The oblong hole to the rear of the tube hole is for running the elevator servo leads.



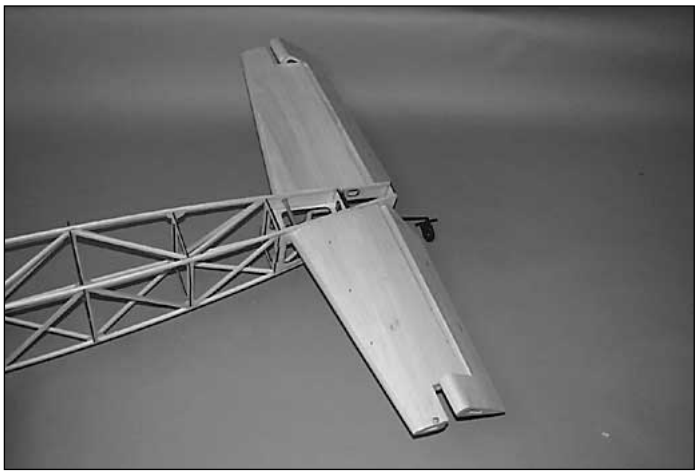
❏ 13. Step back approximately 5' from the tail of the aircraft, and confirm the stab tube is parallel to the wing. If it is not parallel, remove the tube and socket, and adjust the holes in the aft center box sides in SMALL increments until the alignment is perfect.

❏ 14. Glue the stab tube socket in place. Cut the excess flush with the fuse sides, then sand the socket flush with the outside of the aft center box sides.

❏ 15. Slide the stab anti-rotation dowel into the aft center box sides and center it. **DO NOT** glue at this time.

❏ 16. Slide the 17-1/2" aluminum stab tube through the stab tube socket and center it on the fuse. Mark on the tube where it meets the outside of the aft center box sides.

❏ 17. Slide the right stab panel onto the tube flush with the fuse side. Confirm the tube is still in position. Drill through the stab bolt block with a 7/64" drill bit and tap with a 6-32 tap. Bolt it in place with a 6-32 x 3/4" bolt.



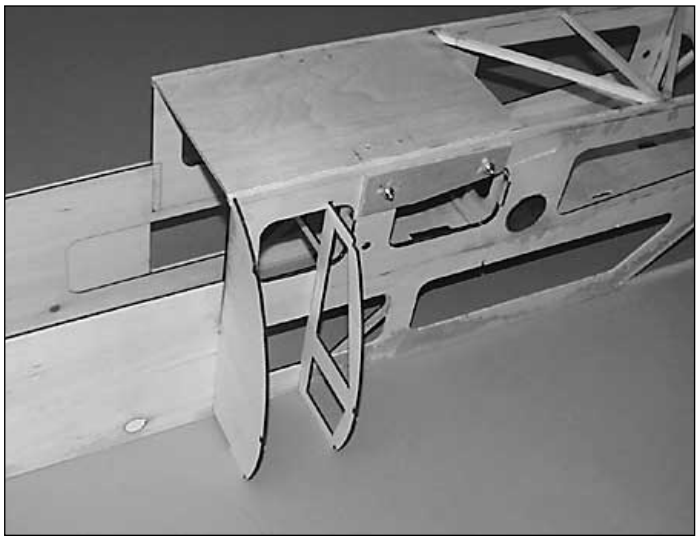
❏ 18. Slide the left stab panel onto the tube. Drill, tap and bolt the panel to the tube.

WOW! Look at it! Doesn't it look great?? Don't worry that the structure can still twist some at this point; the decks and sheeting will take care of all that. You should be VERY proud! It'll be ready to fly in no time! Go ahead, call your favorite flying buddies to come see it! We'll wait for you.

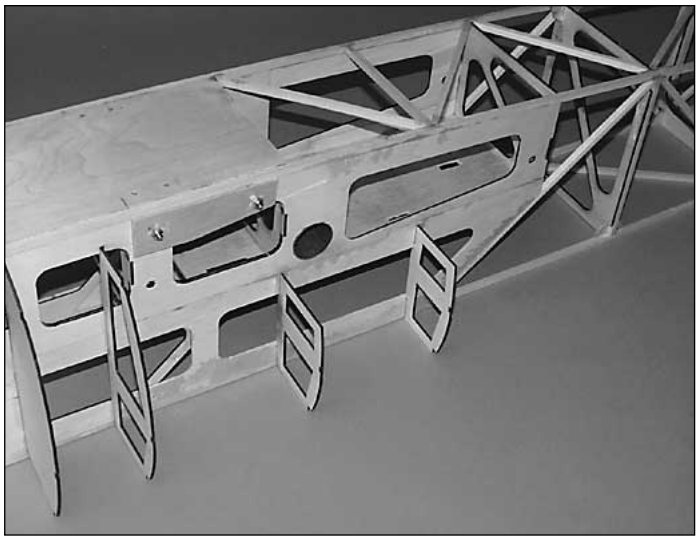
OK, had an evening to show off your progress? Terrific, let's get back to work.

❏ 19. Remove the wings, stab, anti-rotation dowels, and main and tail gear and set them aside. Leave the tank/servo tray in place but DO NOT glue.

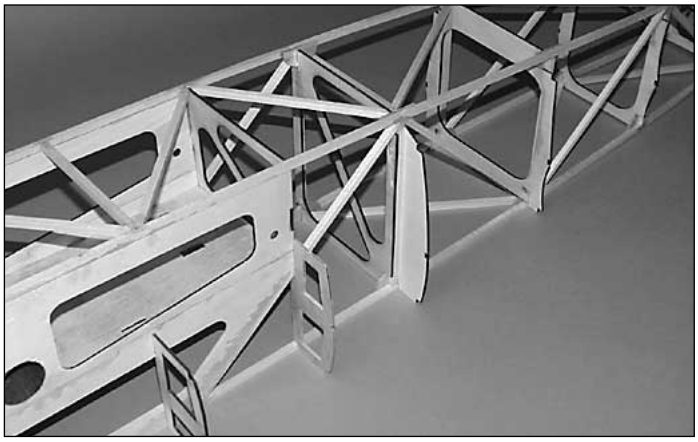
Install the Fuselage Outer Shell



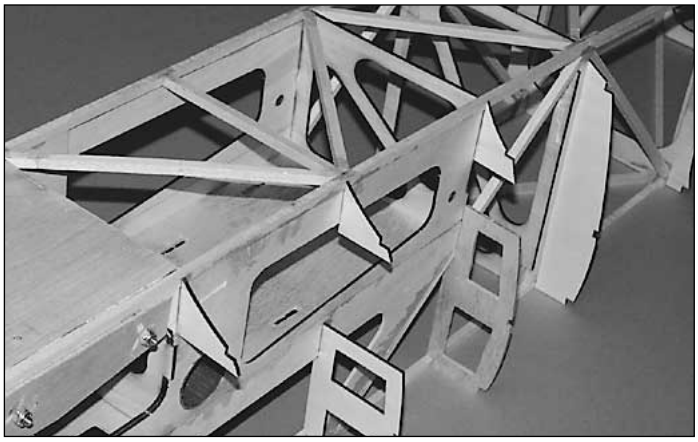
❏ ❏ 1. Fit and glue one of each of the die-cut 1/8" ply **shell formers SF1** and **SF2** in position on the right fuse side, making sure they are perpendicular to the center box side.



❏ ❏ 2. Fit and glue one of each of the die-cut 1/8" ply **SF3 and SF4** in position, again making sure they are perpendicular to the center box side and also confirming the parts are oriented with the notches toward the top of the aircraft, as shown in the photo.



❏ ❏ 3. Fit and glue one of each of the die-cut 1/8" ply **SF5 and SF6** in position. Note that SF5 aligns with F5, and SF6 is positioned behind and glued to the aft side of the balsa vertical truss.

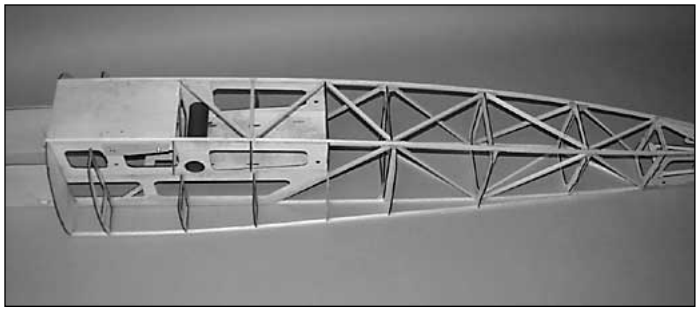


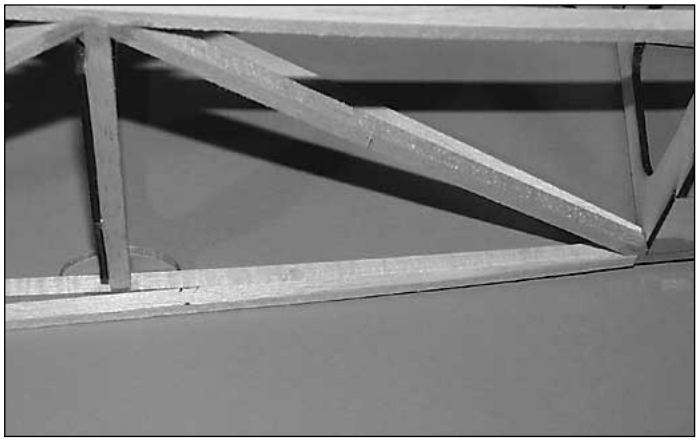
❏ ❏ 4. Fit and glue one of each of the die-cut 1/8" ply **shell sub-formers SF3A, SF4A and SF5A** in position with the point aligned with the bottom of the lower center box longerons. Note that the sub-formers are aligned with the SF3, SF4 and SF5 formers respectively.

❏ 5. Repeat steps 1 through 4, installing the shell formers and sub formers to the left fuse side.

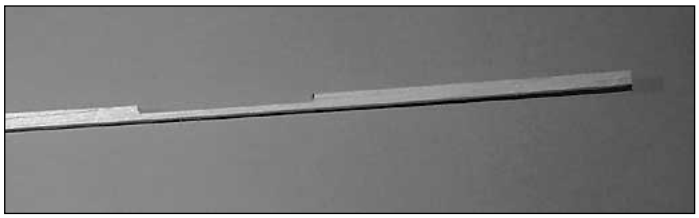
Build the Outer Shell Stringers

❏ 1. Using the same technique as when you made the inner box longerons, splice and glue eight 1/4" x 1/4" x 36" balsa sticks in pairs, making four 72" long **outer shell stringers.**

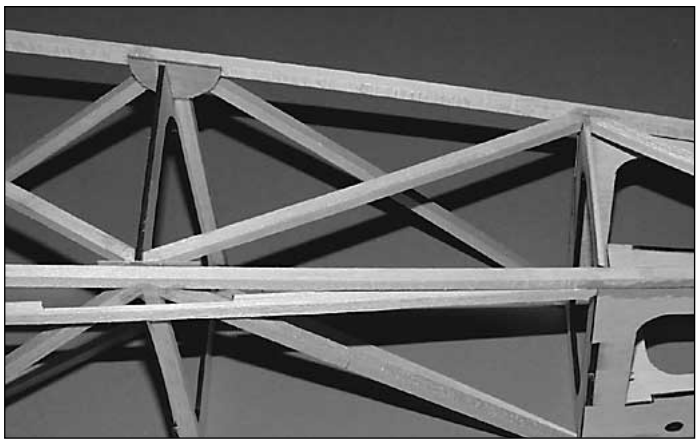


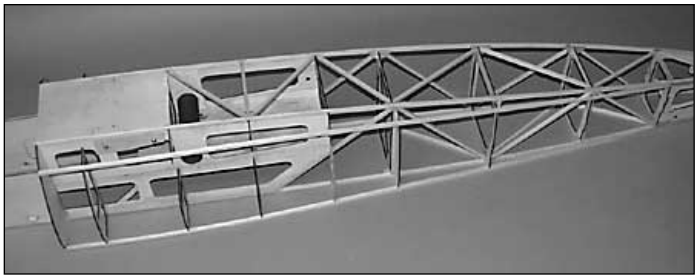


❏ ❏ 2. Select one of the four outer shell stringers to be used as the right upper outer shell stringer. Sand a 6-1/2" long taper onto the stringer and position the tapered end flush with the upper inner box longeron and aligned with the leading edge of F9. Position the stringer flush against the notches in the shell formers and over the plan and glue it in place. Trim the leading edge flush with SF1.



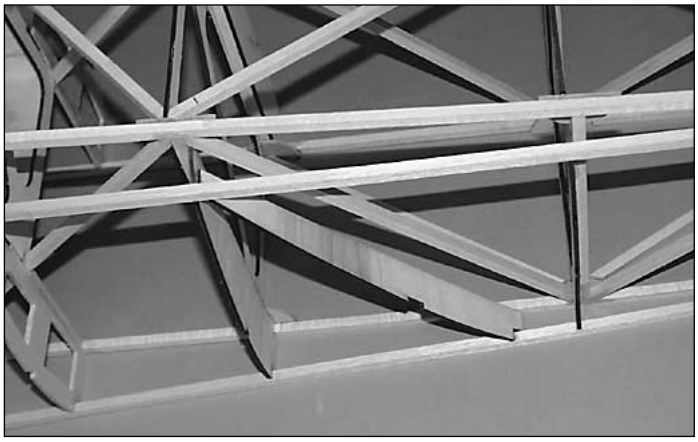
❏ ❏ 3. Select one of the three remaining outer shell stringers to be used as the right lower outer shell stringer. Measure 6" in from one end and make a notch which is 2-1/2" long (from 6" to 8-1/2") and 1/8" deep.



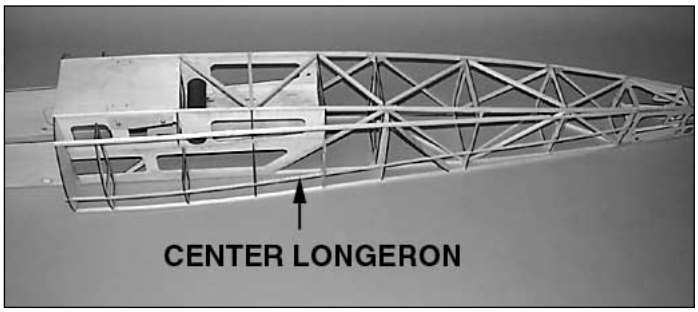


❏ ❏ 4. Position the stringer flush against F9 and on the notches along the shell formers and sub formers. Glue the trailing edge of this stringer flush against the leading edge

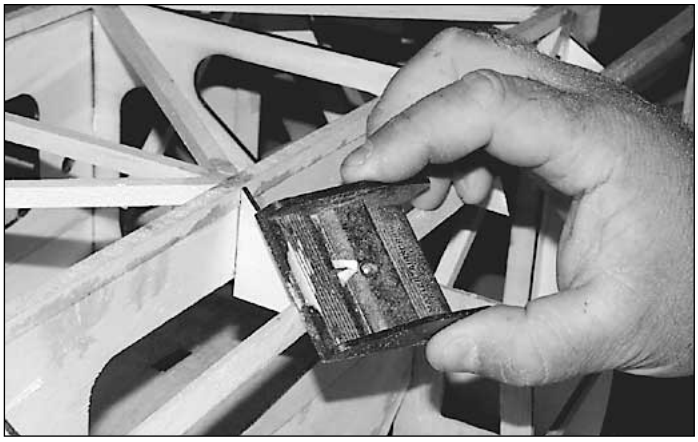
of F9 and with the very trailing edge corner flush against the top of the bottom inner box longeron. Carefully position and glue the stringer flush with the outer edge of F8, NOT touching the trusses. Glue the stringer into the notches in the remaining formers and cut the excess off flush with SF1.



❑ ❑ 5. Locate the die-cut 1/8" ply **SF7** former. Position the lower corner flush with the trailing edge of SF6 and with the outer edge flush with the outer edge of the lower stringer. Gently slide the upper end of SF7 forward until it contacts the inner box longeron and the outer stringer, being careful not to bow SF7. Glue it in place to the stringer, SF7 and longeron.



❑ ❑ 6. Splice two 1/8" x 1/4" x 30" basswood sticks, making a 60" long right side **outer shell center longeron.** Position and glue the center longeron into the notches in the formers.



❑ ❑ 7. Use a razor plane to shape the lower outer stringer from SF6 forward to SF1, matching the shape shown on the cross sections.

❑ 8. Repeat steps 2-7 for the left side of the fuse.

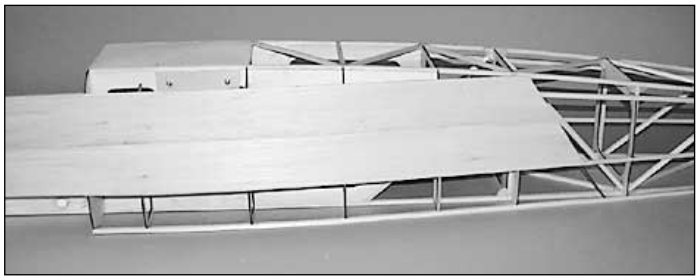
Sheeting the Fuselage

DESIGNER'S NOTE: *The sheeting on this fuselage is intentionally designed to provide your model with a scale appearance as well as exceptional strength in critical areas. The full size Extra has a mixed composite and cloth skin: the fuselage is skinned in composite from just behind the cockpit back all the way forward to the cowl; the rear portion of the fuselage is covered in fabric. This model is sheeted where the full scale model is composite skinned, and is open structure to be covered in MonoKote for the optimum scale appearance behind the cockpit.*

❑ ❑ 1. Edge glue two 3/32" x 3" x 36" sheets, making a 6" wide **outer shell lower sheet**.

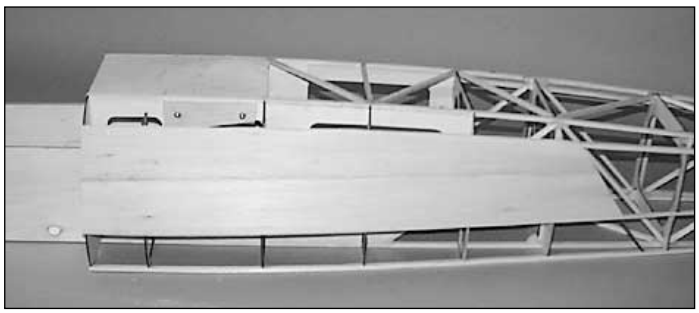
❑ ❑ 2. Press one pin into the center of the right side outer shell center longeron at formers SF1, SF4 and SF7. **NOTE:** The pins are just to locate sheeting and should not be pressed deeply into the bass longeron.

❑ ❑ 3. Position the outer shell lower sheet 1/4" behind the aft most point of SF7 and sitting on the pins, pressed tight against the longeron. (Leave the excess overhanging SF1 for now.) Glue the sheet to the longeron.

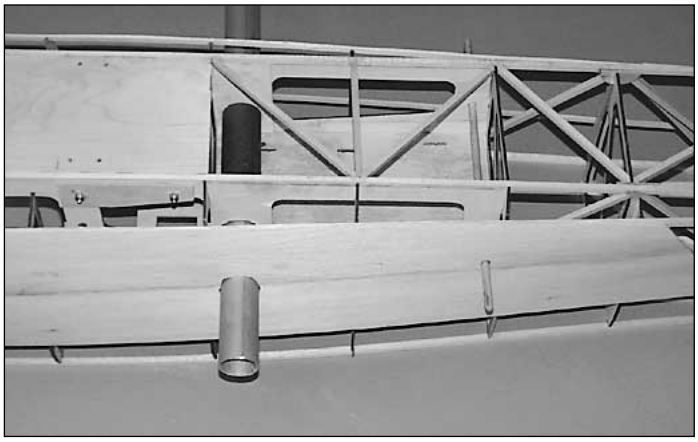


❑ ❑ 4. Trim the sheeting extending 1/4" behind the TE of SF7.

❑ ❑ 5. Taking your time, use medium CA to glue the sheeting to formers SF1 through SF7, and to the lower stringer. **HINT:** You may want to spray the outside of the sheet with a water/ammonia mix to help it bend without cracking.



❑ ❑ 6. Trim the sheeting flush with the LE of SF1 and the bottom of the outer shell lower stringer.



❏ ❏ 7. Slide the wing tube through from the left side of the fuse until it is pushing lightly on the side sheet you just installed. Working a little at a time, cut an opening in the sheeting for the wing tube. **NOTE:** The size and position of this hole is not critical front-to-back, but there is only 1/4" of wing above the tube, so be very careful with how high you cut the sheeting.

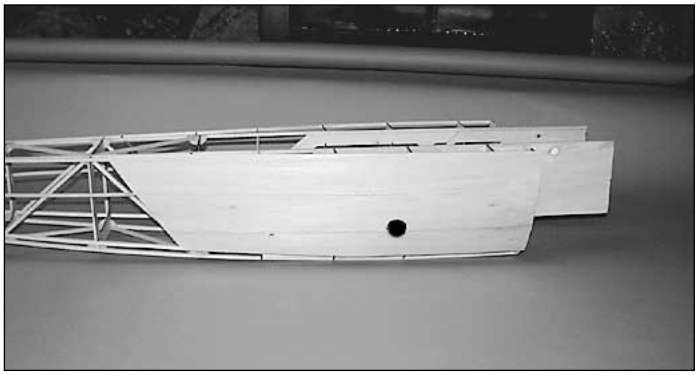
❏ ❏ 8. Slide in the aft anti-rotation dowel and trim the sheeting as you did for the wing tube.

❏ ❏ 9. Remove the anti-rotation dowel and wing tube.

❏ 10. Repeat steps 1-9, sheeting the right side of the fuse.

❏ ❏ 11. Turn the fuselage right-side-up on your work surface. Use a razor plane to shape the right side upper center box stringer just as you did the lower center box stringer.

❏ ❏ 12. Glue a 3/32" x 3" x 36" **outer shell upper sheet** to the center longeron and the lower sheet, making sure to leave at least 1/4" of balsa extending behind the trailing edge of the upper end of SF7.



❏ ❏ 13. Use a straightedge to continue the angle on the trailing edge of the sheeting from the lower sheet onto this upper sheet.

❏ ❏ 14. Glue the upper sheet to the formers and the upper stringer. Trim the sheet flush with the top of the upper stringer and the leading edge of SF1.

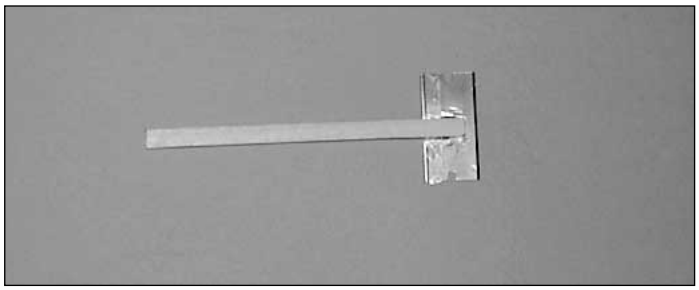
❏ 15. Repeat steps 11 to 14, installing the upper sheeting on the left side.

❏ 16. Cut two 3/32" x 1/4" x 36" balsa sticks into six 12" **fuse side shapers**. Cut an angle on each one to match the angle of the side sheeting when positioned lengthwise so it is 3/32" wide and 1/4" tall. Position and glue each shaper along the outer shell stringers (3 on each side) and flush against the fuse outer shell sheeting.

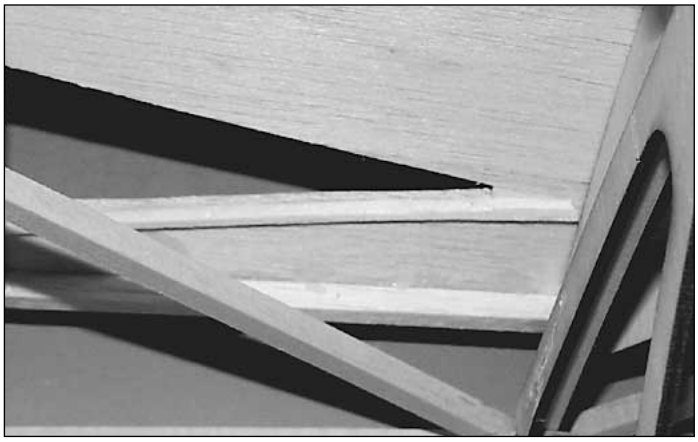
❏ 17. Gradually taper each shaper from the sheeting into the outer shell stringers. **HINT:** A razor plane does this task exceptionally well. If you've never used a razor plane, do yourself a favor and buy or borrow a razor plane for this task. This one task alone will very likely show you just how invaluable this tool is.

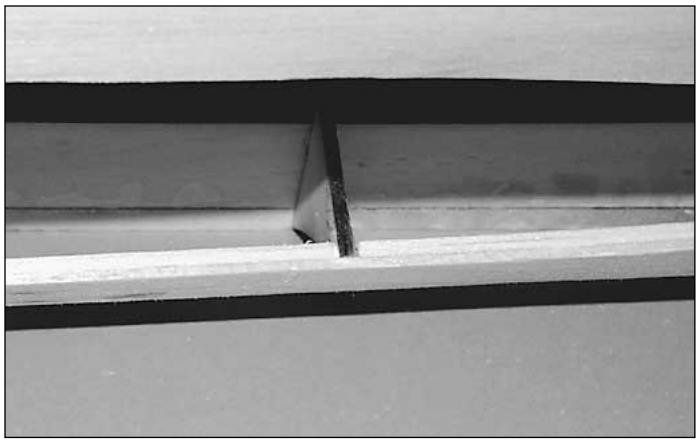
❏ 18. Read the following expert tip then cut out both wing openings in the sheeting as shown in the photo.

EXPERT TIP



A simple tool made from some leftover basswood and a single-edge razor blade can really help make this task easier. Glue a piece of leftover 1/8" x 1/4" basswood (at least 4", ideally about 6" in length) to one side of a single-edge razor blade, standing up vertically. You can now hold the bass stick along the wing and slide the razor through the sheeting along the edge of the wing without risking cutting the wing.



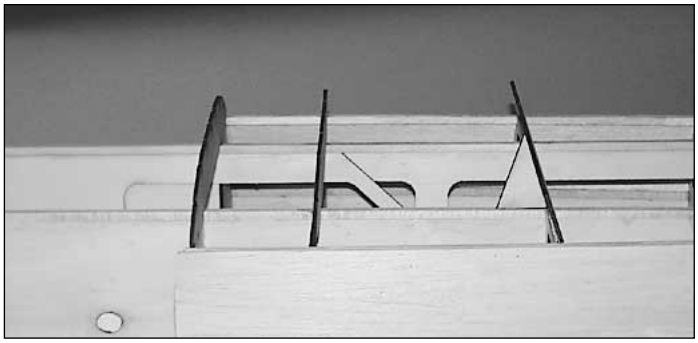


❏ 19. Using three 1/8" x 1/8" x 36" balsa sticks, line the inner edge of the wing openings in the fuse outer shell sheeting. **HINT:** Cut pieces to fit between the formers. Bend this inner lining to follow the wing shape on the inside of the sheeting (above and below the wing), giving the sheeting additional support. Glue the strips in place.

Build the Front Deck

❏ 1. Set the fuse right-side-up on your work surface. Position FD1 into its notches and glue in place.

❏ 2. Position FD2 flush against the trailing edge of former SF2 and tight against the stringers and longerons. Glue it in place.



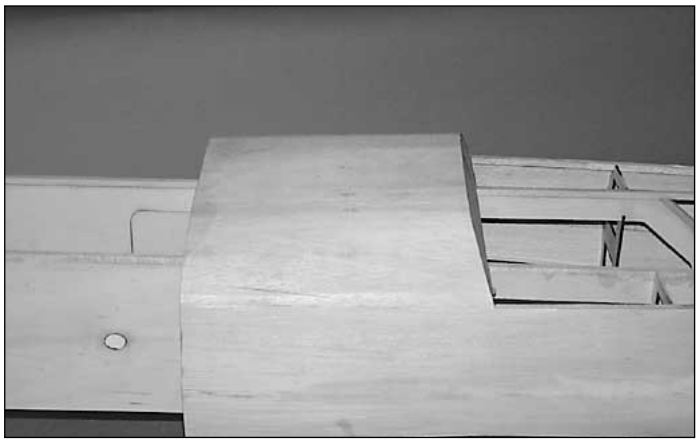
❏ 3. Position FD3 flush against the trailing edge of former SF3, and set the angle using the IP gauge. Glue FD3 in place. **NOTE:** Be careful not to glue the IP gauge.

❏ 4. From leftover 1/4" x 1/4" balsa stick, position and glue the center top deck stringer and trim it flush with the leading edge of FD1 and the trailing edge of FD3.

❏ 5. From six 1/8" x 1/4" x 36" balsa sticks, cut six 10" long **front deck side stringers**. **Note:** Cut one 10" piece from each 36" stick. Fit and glue the six side stringers and trim them flush with the leading edge of FD1 and the trailing edge of FD3.
NOTE: Save the six 26" long pieces for the turtle deck stringers.

❏ 6. From 1/8" x 1/8" balsa stick (left over from the wing saddle sheeting support), fit and glue two **front deck gluing stringers** flush against the outer shell longerons and tight in the notches in FD1, 2, and 3. Trim the gluing stringers flush with FD1 and FD3 as you did the others.

❏ 7. From two 3/32" x 3" x 36" balsa sheets, cut five 11" long sheets. Edge glue the 5 sheets together, creating one 11" x 15" **front deck sheet**. Sand both sides of the sheet smooth.



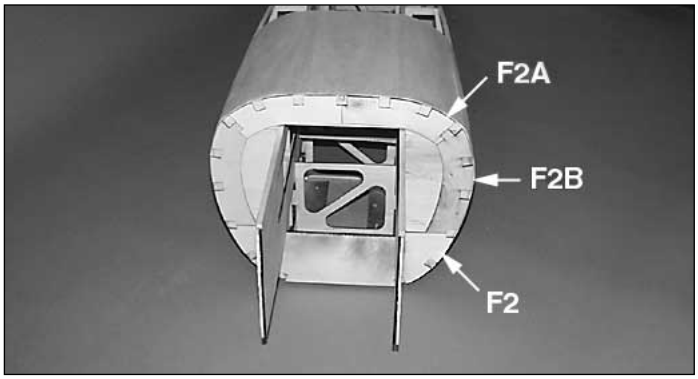
❏ 8. Position the sheet flat across the top of the front deck and gently wrap the sheet to the left side outer shell sheeting. Angle the edge of the front deck sheet until it matches the angle of the shell sheeting. Glue the deck sheet to the shell sheeting and to the gluing stringer.

❏ 9. Wet the outside of the deck sheet liberally with a water/ammonia mix to help it bend. Allow the sheet to hang over the front deck for several minutes to help it conform to shape. **HINT:** A damp, heavy towel will drape over the sheeting and help hold it in place and keep it wet as it conforms to the deck shape.

❏ 10. Test wrap the sheet over the front deck several times until you can comfortably get it tight along the formers and running along the outer shell sheet. When you are confident that you have a good, tight fit and the sheeting isn't going to split, trim the right side of the sheet until it mates up to the outer shell sheeting and the gluing stringer as the left side does. **HINT:** We recommend trimming a small amount at a time until you get a perfect fit. The sheeting MUST be tight across the formers AND have a good glue joint to the gluing stringer and outer shell sheeting.

❏ 11. Carefully roll the top deck sheet back from the stringers and formers. Coat the formers and stringers with medium CA where they make contact with the sheet. Working from the left side, smoothly roll the front deck sheet over the formers and stringers, being careful to hold it tight to the stringers and formers along the way. Hold in place until the CA has fully cured. **NOTE:** Do NOT attempt the accelerator approach here. You will have accelerator kicking off the CA before the sheeting is in contact.

❏ 12. Trim and sand the front deck and outer shell sheeting flush with SF1, FD1 and FD3.



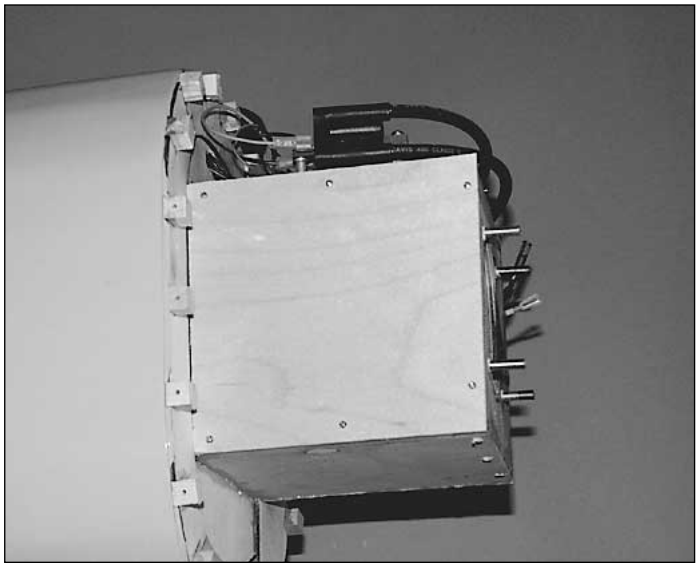
Note: Firewall removed from this photo for clarity.

❏ 13. Position and glue the die-cut 1/8" ply formers **F2, F2A and F2B**, being sure to leave an equal gap all the way around for the cowling to fit flush against the upper deck sheet. Refer to the F2 cross section on the plan as needed.

❏ 14. Select seventeen of the 1/2" x 1/2" x 1/2" basswood **cowl mounting blocks**. Test fit the blocks into the notches in the F2 ring, rounding the blocks slightly to match the shape of F2. When satisfied with the fits, glue them in place.

❏ 15. Select the two pre-cut 1/8" x 6" x 6-9/16" light ply pieces, the **firewall box bottom (FBB) and access hatch (FBA)**. Align one as the box bottom FBB flush against F2, and mark on FBB where it meets the leading edge of the firewall. Trim FBB at the line, and glue FBB to the formers, forward box sides, basswood longerons and firewall.

❏ 16. Position the access hatch FBA flush against F2A and F2B and mark the firewall location as you did for FBB. Trim FBA. Select the remaining four 1/2" x 1/2" x 1/2" basswood **hatch mounting blocks** and position and glue them flush with the upper bass longerons as shown on the plan.



❏ 17. Using a 3/32" drill bit, drill pilot holes through FBA and four mounting blocks, and also two holes equally spaced across the front of the firewall. Using six of the #4x1/2" screws, attach the access hatch to the mounting blocks and to the firewall. Remove the screws and hatch and harden the threads with thin CA.

Mount the Cowl

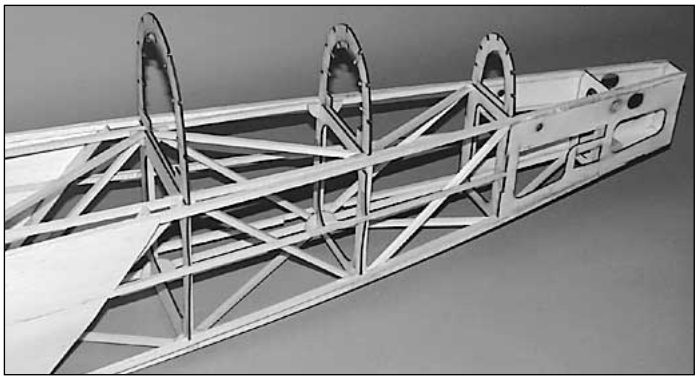
❏ 1. Bolt the engine to the firewall.

❏ 2. Trim the bottom of the cowl as shown on the plan and the air inlet from the front of the cowl. Note that you may need to trim this air outlet larger to accommodate your exhaust. Do NOT decrease the size of the air outlet any smaller than shown on the plan, but cutting it larger as needed for your engine application is fine.

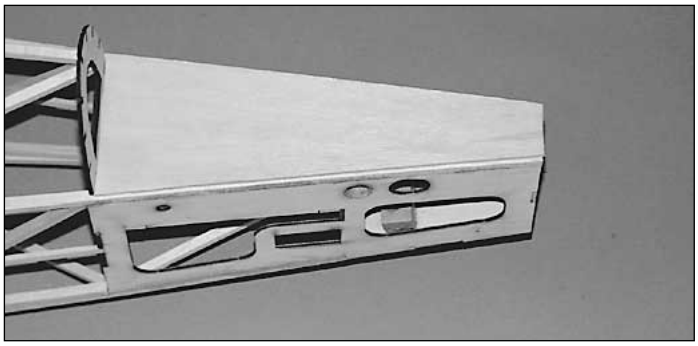
❏ 3. Fit the cowl in place on the fuselage, making sure that the spinner will fit without rubbing the cowl. When you can fit the cowl confidently, confirm the cowl is square on the fuselage, and drill a 3/32" hole through the top of the cowl and the top center cowl block and screw the cowl in position with a #4 x 1/2" screw. Confirming at each step that the cowl is still straight and square, drill each mounting block hole and screw the cowl to each mounting block.

❏ 4. Remove the cowl and engine and set them aside. Harden the threads in each cowl mounting block with thin CA.

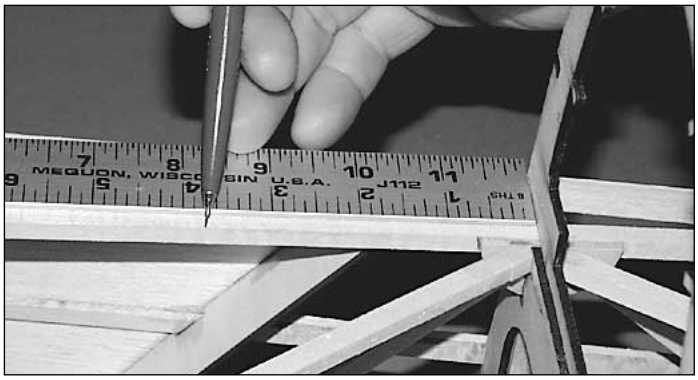
Build the Turtle Deck



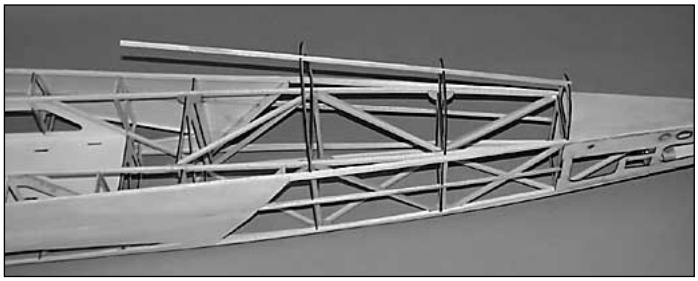
❏ 1. Position and glue the die-cut 1/8" ply formers **TD4, TD3 and TD2** vertically against the trailing edge of formers F9, F8 and F7 respectively, centering the parts side-to-side.



❏ 2. Position and glue the die-cut 1/8" ply **fin plate (FP)** flush against the trailing edge of TD4 and centered side-to-side.



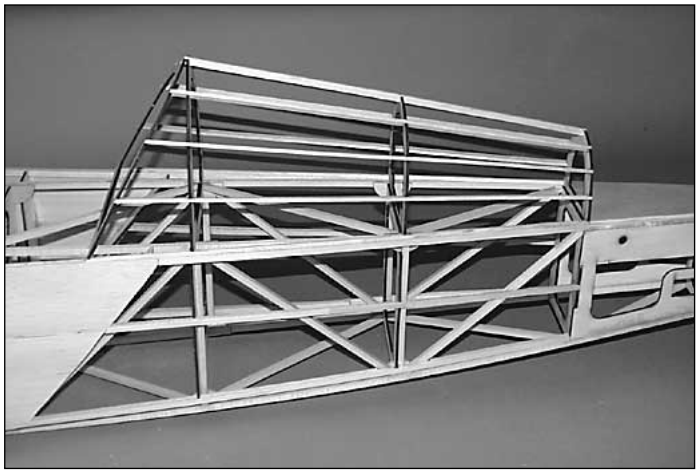
❏ 3. Measure 3-3/4" forward of the leading edge of TD2 and make marks on both of the inner box longerons at that location. This will be the trailing edge of TD1.



❏ 4. Select one of the 1/8" x 1/4" x 26" balsa sticks left over from the front deck. Position and glue this **turtle deck center stringer** into the notches in TD4 then, TD3 and then, TD2, leaving the excess overhanging past TD2. **NOTE:** Be careful to keep the formers vertical.

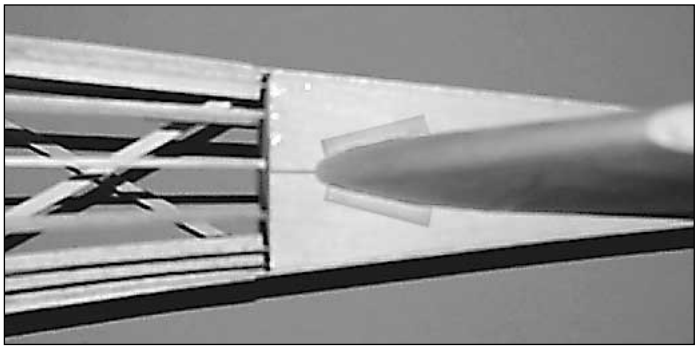
❏ 5. Position the die-cut 1/8" ply **turtle deck former TD1** in place, centering it side-to-side and positioning its trailing edge at the marks you made in step 3. Angle the former back until the center stringer locks nicely into the notch in TD1. Glue TD1 to the center stringer, center box longerons and outer shell stringers.

❏ 6. Using the remaining five 26" long balsa sticks and one 1/8" x 1/4" x 36" balsa stick, position and glue the six **turtle deck outer stringers** into position in the notches in the turtle deck formers. Trim all 7 stringers flush with the leading edge of TD1 and the trailing edge of TD4.



❏ 7. Using two 1/8" x 1/8" x 36" balsa sticks, fit and glue two turtle deck gluing stringers in the bottom notches of the formers. Trim the excess flush with the leading edge of TD1 and the trailing edge of TD4. **NOTE:** Be sure the gluing stringer is tight in the notches and not flush with the outer shell stringers or your sheeting won't fit properly.

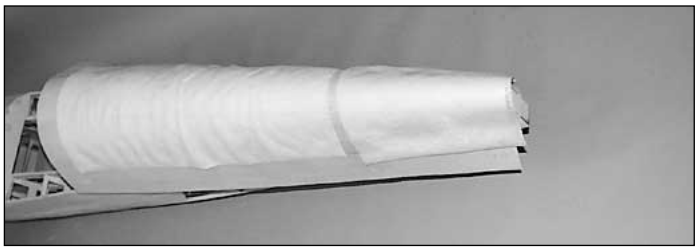
❏ 8. Draw a centerline down the length of the fin plate. Temporarily position the fin in place, first aligning the fin post centered onto the trailing edge of the fuse, and then aligning the leading edge of the fin on the centerline you just drew.



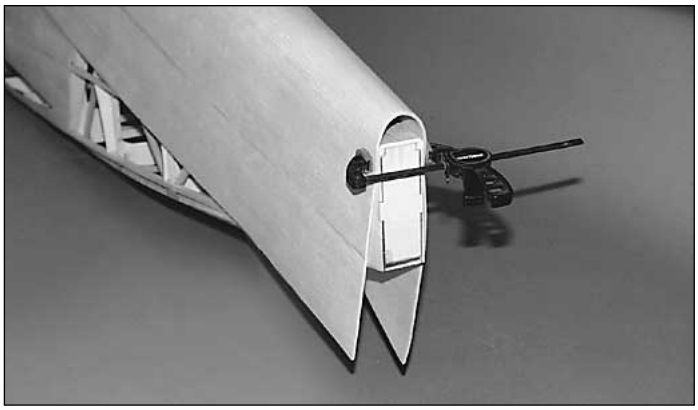
❏ 9. From leftover 1/4" x 1/4" balsa, cut two 2" long **fin locators**. Glue the two locators as shown in the photo, being careful **not to glue the fin in place.** Remove the fin and set it aside. **NOTE:** These fin locators will be used to properly position your fin later.

❏ 10. Select the five 3/32" x 4" x 36" long sheets, and carefully inspect all 5 sheets. Select the softest sheet for the center piece. Edge glue the 5 sheets, creating the **turtle deck sheeting**. **NOTE:** The center sheet has to do a sharp bend. It is important that you use the softest sheet to minimize the chance of it splitting.

❏ 11. Wet one side of the sheet liberally. This will be the outside of the turtle deck sheeting. Let the sheet set flat for 5 minutes to allow the water to soak into the sheeting.



❏ 12. Position the sheet over the turtle deck with the center sheet centered on the top stringer and a small amount of excess hanging behind the trailing edge of the fin plate (do **not** end the sheeting at TD4). Lay very wet paper towels along the center sheet and allow gravity to start to curve the sheet for approximately an hour. Respray the entire sheet and the paper towels and gradually pull the sheeting down. Repeat this process until the sheeting hangs easily over the deck.



❏ 13. When the sheeting has curved enough, clamp the sides to the fuse bottom on both sides and clamp the rear of the sheeting across the rear of the fuse. Allow the sheeting to dry completely overnight. **NOTE:** This is probably the most time consuming step of the entire kit. Take your time and be patient, being careful not to split the sheeting. If you are patient and allow the water and gravity to work together, the sheeting will bend smoothly and cleanly and you'll get a great looking turtle deck. If you try to rush it you will likely split the sheet and have to start over again.

❏ 14. Double check that the sheeting is completely dry before continuing. While the sheeting is still clamped in place, lay the fuselage on its side. Using a straight edge, trim the left side of the sheeting flush with the top of the outer box longeron. Trim the right side of the sheeting 1/4" below the outer box longeron.

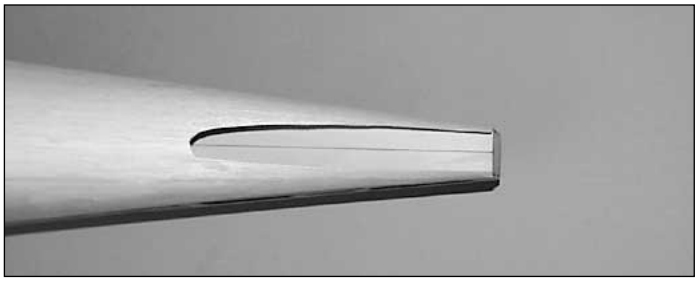
❏ 15. Using medium CA, glue the turtle deck sheet to the left side gluing stringer and longeron.

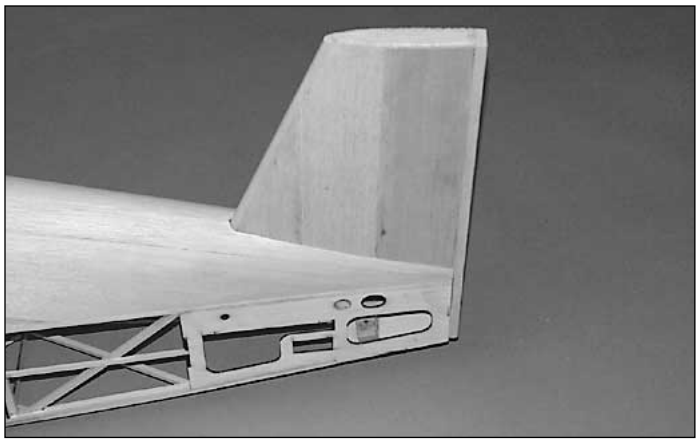
❏ 16. Confirm that the sheet is tight against the formers, and trim the right side a little at a time until it mates to the gluing stringer and longeron.

❏ 17. Roll the sheeting back, on and off the stringers a few times until you can position it easily. Make sure it has good contact with the stringers and formers along the whole length of the turtle deck. When you are confident fitting it, lay a bead of medium CA along all the turtle deck stringers, formers, and the right side gluing stringer and longeron. Position the sheeting in place and hold firmly along the stringers and formers until the CA has fully cured. **NOTE:** It is not as important that you get glue on every joint as it is that the sheeting makes good contact with all the stringers and formers along the whole length of the deck. **This sheeting is a critical structural component of your aircraft and must be well fitted**. In the next step you can catch any places where you did not get a good coating of CA, but only if you made good contact in this step.

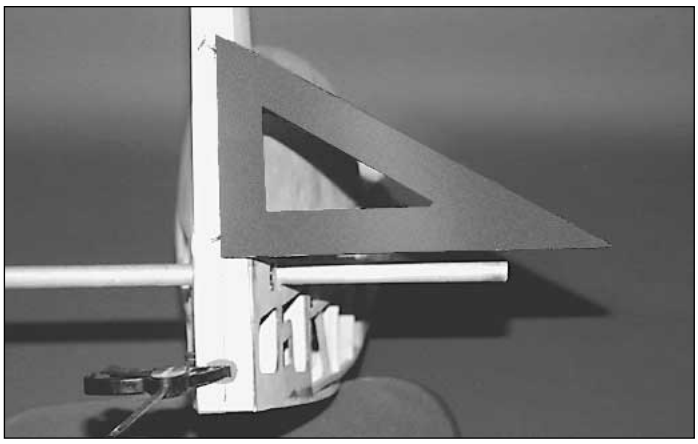
❏ 18. Once the CA has dried, turn the fuselage upside down and use thin CA to back up any places where the sheet did not get adequately glued, but only if the sheet is already making good contact. If it is not and you attempt to force it now, you will likely split your sheeting and have to cut it off and start over.

❏ 19. Trim and sand the sheeting flush with former TD1.





❏ 20. Rough cut a slot for the fin approximately 8-5/8" long, 3/4" wide at the trailing edge. Removing a little material at a time, cut the slot in the turtle deck sheeting until it properly fits the fin. **Note:** Take your time and be patient, fitting the fin as you go.



❏ 21. Draw a centerline down the TE of the fin. Fit the stab tube in place. Fit the fin in place against the fin locators installed in step 9. Use a triangle to check that the center line of the fin is perpendicular to the stab tube. Remove the fin and use 6-minute epoxy to glue the fin to the fin base and the TE of the fuse. Do not disturb for at least ½ hour to allow the epoxy to fully and properly cure.

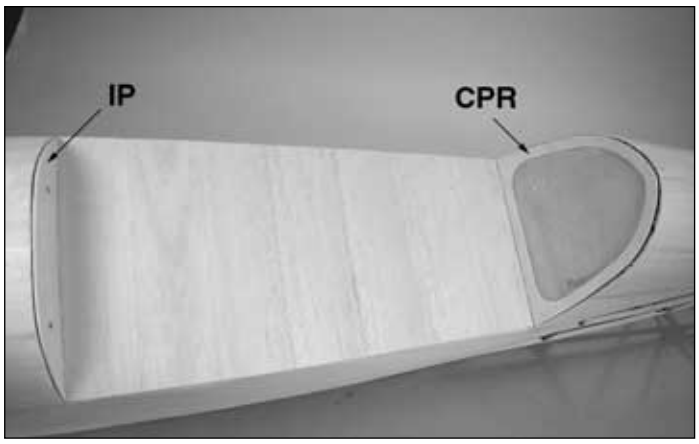
❏ 22. Using a piece of leftover 3/8" x 5/8" balsa, cut a 1-1/2" long hinge block. Using the plan as a reference, locate the lowest hinge block in the rudder, and glue the hinge block you just made into the fuse against the F11 at that location.

❏ 23. Using the cross sections on the plan as a reference, **bevel the trailing edge of the fin post to match the shape of the fuselage** and to allow for full rudder throw. Bevel the leading edge of the rudder to match the angle shown on the plan.

Install the Cockpit & Canopy

❏ 1. Select the four pieces of 3/32" x 3" x 24" hard balsa **cockpit floor sheeting**. Cut them in half and edge glue seven pieces, making a 12" x 21" balsa sheet. Position one 12" edge against FD3 and trim the length so the trailing edge is flush with TD1.

❏ 2. Using a pen, mark where the fuse makes contact with the underside of the cockpit floor sheeting on each fuse side. Trim the floor sheeting 1/16" inside of the lines you marked.



❏ 3. Position and test fit the die-cut 1/8" ply **instrument panel (IP) and cockpit rear (CPR)** to the cockpit floor sheeting, making sure the sheeting is properly positioned and confirming that IP and CPR are both also 1/16" inside

the perimeter of the front and rear deck sheeting just as you did with the floor sheeting. Sand the formers as needed. When you are comfortable with the fit and positioning, glue IP and CPR to the floor sheeting, being careful not to glue any of the cockpit components to the fuselage.

❏ 4. Confirm that IP is properly positioned and hold the cockpit in place as you drill 5/16" holes through the holes in IP and through FD3. Remove the cockpit.

❏ 5. From the leftover 5/16" dowel, cut two 1/2" lengths. Round one end of each of the two dowels.

❏ 6. Insert the dowels into the holes in FD3 so 1/4" of each rounded end is left extending into the cockpit area. Put medium CA on one of the die-cut 1/8" ply **dowel doublers (DD)** and reach up inside the fuse and slide the doubler onto one of the dowels, locking the dowel in place and the doubler tight against FD3. Install the second dowel doubler the same way. **NOTE**: You need to use enough medium CA so that it glues the dowel in place as well as the doubler.

❏ 7. Finish your cockpit as desired.

EXPERT TIP

On the prototypes we chose to cover the cockpit floor with charcoal MonoKote®. For a scale appearance, you may want to make instrument panels in front of the pilot (in the back seat) and the passenger position. We recommend doing so from leftover sheeting. Cover them with the same covering you used for the cockpit floor. We have provided a single, scale dash panel decal for in front of your pilot. Scale documentation packages such as those available from Scale Model Research in California often include good photos of the instrument panel which can be xeroxed, shrunk down, and glued to these instrument panels. We selected DGA 1/3 scale pilots for their light weight and realistic appearance. We glued a light balsa bottom into the pilot to maintain his shape, and glued the balsa bottom right onto the MonoKote covering of the cockpit floor.

For painting the pilot we have discovered that acrylic water base paints such as the types found at craft stores work great. The acrylic paints look realistic on the pilot because they are not glossy and, best of all, they clean up with water.

❏ 8. Place the cockpit back on the fuselage, sliding the IP over the dowels.

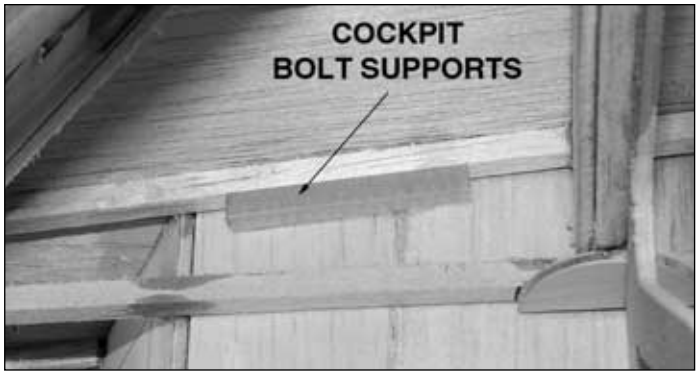
❏ 9. Trim off just the excess from the canopy ends so that the canopy is open at its leading and trailing edges and set the canopy onto the fuselage. Center the canopy side-to-side and position the canopy as far aft as possible. Using two pieces of tape, lightly tape the canopy to the fuselage at the leading and trailing edges.

❏ 10. Use a marker to mark where the canopy needs to be trimmed along the entire perimeter of the cockpit frame. Lift the canopy off the fuselage and trim slightly outside the pen marks. Fit and trim the canopy in small amounts until your canopy fits perfectly to the cockpit. Be careful to work slowly and not over trim!

❏ 11. Lift the canopy and cockpit off the fuselage. Lay Plan Protector inside the cockpit saddle to ensure you don't glue it to the fuselage and reposition the cockpit back on the fuselage. Make sure your cockpit interior is complete; this is your last chance to make changes easily!

❏ 12. Clean the entire canopy with window cleaner, particularly the interior of the canopy. Be sure your hands are very clean and not at all oily. The CA fumes will find the oils from your fingers and any other dust, dirt or smudges and permanently scar your canopy, so be SURE it's clean before you glue it!

❏ 13. Confirm that you can confidently position the canopy on the cockpit. Use MEDIUM CA to glue the canopy to the cockpit. Hold it in place until fully cured.
NOTE: We intentionally call for medium CA. DO NOT USE ACCELERATOR. It will smoke the canopy. Thin CA will also smoke the canopy. "Canopy glues" do not provide as tight and permanent a bond as CA and you risk the chance of the canopy coming off in flight. This could be catastrophic on an aircraft of this size and type.

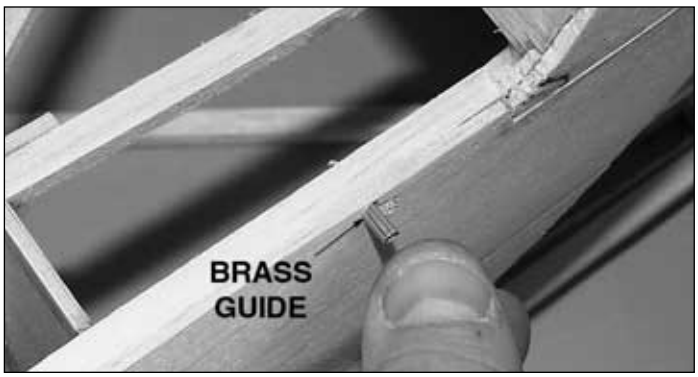


❏ 14. Position the fuselage upside down in a stand. Confirm that the cockpit is still properly positioned on the aircraft.

From leftover 1/4" x 1/4" basswood, cut two 2" long **cockpit bolt supports**. Reach in through the fuselage and glue the bolt supports to the aft end of the bottom of the cockpit floor, flush against, but not glued to, the insides of the upper outer shell stringers.

❏ 15. Centered vertically on the upper outer shell stringer and centered horizontally on the cockpit bolt support you just installed, drill a 1/16" hole through the sheeting, the stringer and the bolt support. Repeat on the other side of the fuselage.

❏ 16. Turn the aircraft right-side-up and remove the cockpit. Enlarge the hole to 1/8" through the balsa upper outer shell stringers ONLY, being careful not to enlarge the holes in the bolt supports.



❏ 17. Insert the provided 1/8" x 3/8" brass **cockpit bolt guides** in the 1/8" holes you just drilled so that the guide is flush with the inboard edge of the upper outer shell stringers. Sand the brass flush with the balsa sheeting.

❏ 18. Position the cockpit on the aircraft. Insert the provided 2-56" x 1" screws through the brass guides, screwed through the bass supports and install blind nuts on the back side of the bass supports. Secure the blind nuts to the bass with thin CA.

NOTE: You may need to grind a little off one edge of the blind nut to get the blind nut to fit against the cockpit floor. This will not affect the functionality of the blind nut at all.

❏ 19. Remove the cockpit and turn it upside down. Harden the balsa cockpit floor around the bass cockpit supports with thin CA.

Mount the Wheels & Wheel Pants

❏ There are a variety of ways to mount wheel pants. On the prototype we selected DuBro™ 3/16" long axles. We glued a 1/8" x 1-1/2" x 1-1/2" square of leftover ply to the inside of each wheel pant. We then drilled a hole through the wheel pant and ply large enough to accept the head of the axle. We fit the wheel pant over the axle and aligned it. We drilled a 5/32" hole through the wheel pant, using the hole in the landing gear as a guide and mounted the wheel pant with a 6-32x1/2" allen bolt and blind nut.

FINISH THE MODEL

Balance the Model Laterally

Do not confuse this procedure with "checking the C.G.", which will be discussed later in the manual.

A model which is not laterally balanced properly may exhibit a variety of unpleasant tendencies, ranging from uncharacteristic tip stalls to problems with spin entries. This aircraft, when balanced properly, has NO such bad tendencies. Be sure to check the lateral balance carefully as described to help ensure that the model exhibits the same exceptional handling qualities of our prototypes.

❏ 1. With the wing level and attached to the model and the canopy off (and the engine and muffler installed), have one person lift the model by the prop shaft and the other lift it by the top of the rudder.

❏ 2. Lay a level across the fuselage where the cockpit sets and add weight to the high tip until the model hangs perfectly level.

Prepare the Model for Covering

❏ 1. Remove all the hinges, servos, and control horns from the ailerons, elevators, and rudder. Remove the engine and any other hardware you may have installed.

❏ 2. Most of the model should be rough-sanded by now, with all the tabs and rough edges sanded even. Fill all dents, seams, low spots, and notches with Hobby Lite Balsa Colored Filler.

❏ 3. After the filler has dried, use progressively finer grades of sandpaper to even all the edges and seams and smooth all surfaces. Remove all balsa dust from the model with compressed air or a vacuum with a brush and a tack cloth.

Cover with MonoKote Film

Cover the model with **Top Flite MonoKote Film**. Here are a few recommendations to help you cover your giant Extra.

Before you cover the fuselage, first apply 1/4" wide strips of MonoKote film in the corners of the fin and the fuse joint, then proceed to cover the fin with pre-cut pieces that meet in the corners and overlap the 1/4" strips. **Never cut the covering on the fin after it has been applied except around the leading and trailing edges and at the tips.** Modelers who cut covering on top of the wood structure may cut through the covering and into the stab or fin. This will weaken the structure to a point where it may fail during flight. Since the tips of the wings, ailerons, fin, rudder, elevators and stab are squared off, it is easiest to cover the tips before you cover the tops and bottoms.

Paint the Model

After the model is covered, you must fuel-proof all exposed wood. You may do so with fuel-proof model paint, 30-minute epoxy thinned with alcohol, or finishing resin.

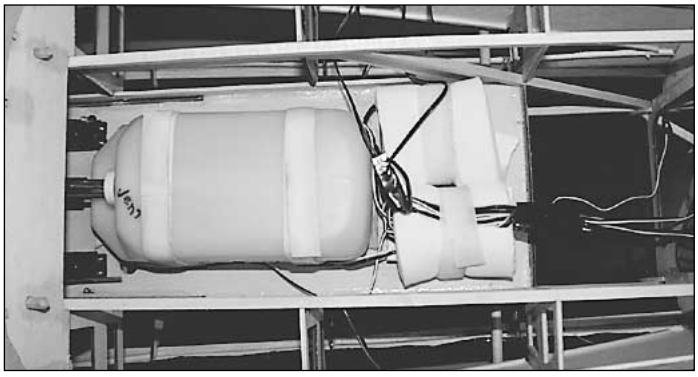
Top Flite LustreKote® fuel-proof paint is recommended for painting all the parts. (The wheel pants should be removed from the landing gear prior to painting.) Apply one coat of LustreKote primer to fill all the small scratches left from sanding as well as small pin holes in any filler and in the fiberglass. Wet sand between coats with 400-grit sandpaper and apply additional coats of primer if necessary. If the parts are primed properly, a few light coats of color will quickly provide you with a beautiful match to the MonoKote.

Install the Hardware

❏ 1. Reinstall the wing and stab anti-rotation dowels, being sure to center them in the fuse. Glue in place with medium CA. **Note:** These dowels take a lot of the load of the plane. Make sure these are securely glued in place.

❏ 2. Permanently attach the control surfaces. Start with the elevators and stab. Cut the covering from the hinge slots. Install your hinges per the manufacturer's instructions. If you are using Robart's Giant Scale Pin Hinges as we did on the prototypes, we recommend coating the pivot point of the hinge with petroleum jelly prior to epoxying the hinges in place.

❏ 3. Attach the rudder and ailerons as you did the elevators.



❏ 4. Assemble and install your tank, being sure to use the appropriate type of tank, fuel fittings, etc for your fuel type. (Note that the recommended Great Planes 24 oz. tank and its included hardware are compatible with both gas and glow fuels.) Glue a 2" long piece of leftover 1/4" x 1/4" balsa at the leading and trailing edges of the tank. Secure the tank to the tank/servo tray with Velcro™ straps to allow easy removal and service. **NOTE:** This location is ideal as it mounts the tank over the CG and eliminates any CG changes as fuel burns off. Most gasoline engines have pumped carbs and will have no problem drawing fuel from here. However, if your engine is not pumped or you are unsure of its ability to draw this far, you will want to mount your tank up against the firewall. You will need to build a tray for it and secure it in that location.

❏ 5. Install any fuel filling equipment you choose to use. We recommend mounting it into the fuse side just behind the cowl. Note that it may be necessary to support the sheeting with a piece of leftover ply.

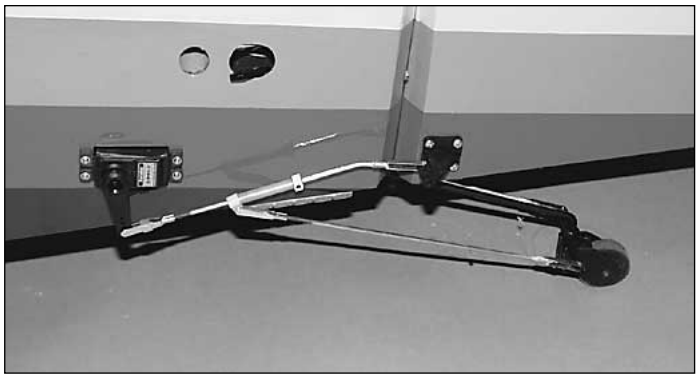
❏ 6. Reinstall the engine to the mount and the muffler to the engine. Connect the fuel lines to the carb and exhaust. Follow your engine manufacturer's recommendations for installing any ignition or other equipment required for your particular engine.

❏ 7. Reinstall the main gear, tail gear, wheels, wheel pants and tail wheel. **HINT:** Even after the servo tray gets glued in place you can still access the main gear nuts by reaching in through the wing opening.

Final Servo & Receiver Installation

❏ 1. Reattach all control horns.

❏ 2. Mount all servos in the aircraft and fuselage servo tray, being sure to secure all servo lead/extension joints with heatshrink, tape or other protective covering to avoid an accidental disconnect. Note that the servo lead/extension connection at the wing/fuse joints and stab/fuse joints do not get permanently secured in this manner. The servo tray will not get glued in until all radio gear has been installed for easy handling and set up. **HINT:** With removable flying surfaces such as the Extra's wings and stab, it is easiest to do pushrod set up with the surfaces off the aircraft and the receiver and receiver battery outside the aircraft.



❏ 3. Build your pushrods and hook up the servos to the control surfaces, being sure to properly center the servos and check direction on all controls. On the prototype we used Dubro® giant scale control horns, steel clevises and 4-40 rod threaded on one end and soldered on the other for all except the throttle and kill switches.

IMPORTANT NOTE: NEVER use threaded clevises on both ends of any pushrod, as vibration may unscrew the pushrod from both clevises!

NOTE: We strongly recommend using non-metal flexible pushrods (GPMQ3710) and nylon clevises (GPMQ3800) for all pushrods going to any gasoline engine or servo operated kill switch as a precaution against "noise" traveling back to the radio equipment and causing radio inconsistencies or interference.

EXPERT TIP

One of the advantages of a gasoline engine is the ability to shut it off by terminating power to the ignition. This is an added safety feature in the event of an in-flight or ground emergency such as a throttle servo failure, stuck carburetor, etc. We STRONGLY recommend you take advantage of this safety feature by having not only an external kill switch on the exterior of the aircraft to shut off the ignition but also an onboard kill switch (such as GPMG2150) so that your engine's ignition can be shut off by simply flipping a switch on your transmitter.

❏ 4. Wrap the battery pack in at least 1/4" of foam rubber, secure to the servo/tank tray (we prefer Velcro straps for this task for easy removal).

❏ 5. Wrap and mount the receiver as you did the receiver battery.

❏ 6. Mount the receiver switch in a convenient location that will not interfere with the servos and pushrods inside the fuselage.

❏ 7. Route your antenna. Be sure to use a strain relief to protect the antenna from an accidental hard pull.

❏ 8. Glue the servo/tank tray in place with medium CA.

Set the Control Throws

We recommend the following control surface throws

	High Rate	Low Rate
ELEVATOR:	2" up 2" down	1/2" up 1/2" down
RUDDER:	6-1/4" left 6-1/4" right	3-1/4" left 3-1/4" right
AILERONS:	1-7/8" up 1-7/8" down	3/4" up 3/4" down

The throws are measured at the **widest part** of the elevators, rudder, and ailerons. Adjust the position of the pushrods at the control/servo horns to control the amount of throw. You may also use the ATV's if the transmitter has them but the mechanical linkages should still be set so the ATV's are near 100% for maximum servo power and the best servo resolution (smoothest, most proportional movement).
Please read the Great Planes booklet: "A Look at Aerobatics" for more information.

NOTE: If the radio does not have dual rates, then set the elevator and rudder control surfaces to low rate throws and the ailerons at 1-1/4" deflection each way.

HINT: The Extra has been specifically designed for exceptional performance at the recommended throws. For truly hands-off knife edge flight the model will require a mix of roughly 3-4% positive elevator to rudder. If set up as described, the model has no roll couple on rudder application.

NOTE: The balance and control throws for the Extra 330L have been extensively tested. We are confident that they represent the settings at which the Extra 330L flies best. Please set up your model to the specifications listed above. If, after you become comfortable with your Extra 330L, you would like to adjust the throws to suit your tastes, that's fine. Too much throw can force the plane into a stall, so remember, "more is not better."

Install the Cowl

Install the cowl, then mount the spinner backplate, prop, prop washer, and prop nut. Install the spinner.

Balance Your Model

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

❏ 1. Accurately mark the balance point on the **top** of the wing on both sides of the fuselage. Use thin strips of tape or a felt tip pen to make the marks.

The balance point (**CG**) is located **6-7/16" back from the leading edge where the wing meets the fuse** as shown in the sketch and on the wing plan. This CG can also be checked at the wing tip. **The CG is located at 4-7/64" back from the leading edge of the wing at the wingtip.**

Hint: Reference the full size wing plan to help you locate the proper balance point. This is the balance point at which the model should balance for your first flights. After initial trim flights and when you become more acquainted with your Extra 330L, you may wish to experiment by shifting the balance up to **5/8" forward or 5/16" back** to change the flying characteristics. Moving the balance **forward** may improve the smoothness and stability but the model may then require more speed for takeoff and make it more difficult to slow for landing. Moving the balance **aft** makes the model **more agile** with a lighter, snappier "feel" and often improves knife-edge capabilities. In any case, **please start at the location we recommend and do not at any time balance your model outside the recommended range.**

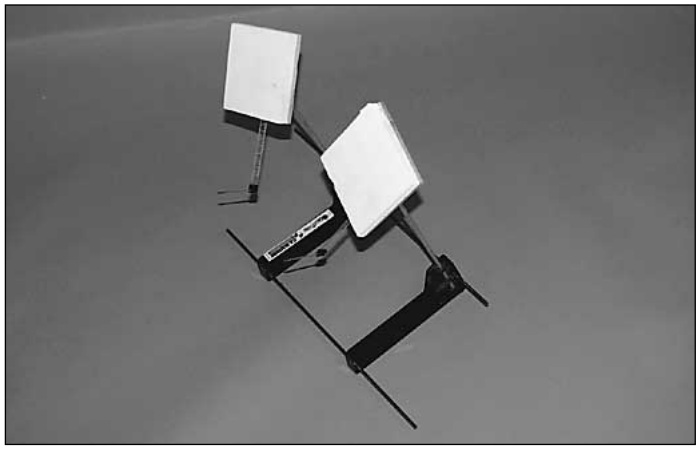
❏ 2. With the wing attached to the fuselage, all parts of the model installed (ready to fly) and an **empty** fuel tank, hold the model **upside-down** with the stabilizer level. **NOTE:** If you are using the CG Machine™ as described in the Expert Tip below, we strongly recommend having the model upside-down. If you are checking the CG by hand, the CG can be checked right-side-up, although upside down is always preferable for better accuracy on a low wing model such as this.

❏ 3. Lift the model at the balance point. If the **tail** drops when you lift, the model is "tail heavy" and you must add weight***** to the nose to balance the model. If the **nose** drops, it is "nose heavy" and you must add weight***** to the tail to balance the model. **NOTE:** Nose weight may be easily installed by using a "spinner weight" or gluing lead weights to the firewall. Tail weight may be added by using Great Planes (GPMQ4485) "stick-on" lead weights or by adding the optional second rudder servo.

***** *If possible, first attempt to balance the model by changing the position of the receiver battery and receiver. If you are unable to obtain good balance by doing so, then it will be necessary to add weight to the nose or tail to achieve the proper balance point.*

EXPERT TIP

Using a Great Planes CG Machine to balance the Giant Extra



To use the standard CG Machine on a model this large, you'll need to screw pieces of leftover 1/8" x 4" x 4" plywood to the top of the balance pads. Attach foam to the top of the plywood. Use two pieces of 3/16" x18" piano wire to replace the base rods so the stand is wide enough to fit the Extra's fuse.

ASSEMBLY & MAINTENANCE

Assembly of the Giant Extra

❏ 1. Slide the wing tube, with its already installed first panel and 6-32 x 3/4" bolt, through the fuselage, plugging in the servo leads as you do so. Slide on the second wing panel and plug in the servo leads. Thread in the second panel bolt.

NOTE ON INSTALLING YOUR WING: *When you fit the Extra's wing to the tube, you will find it is a snug fit that requires some force. When putting your aircraft together to fly, it is helpful to have someone put light pressure against the first wing tip or to butt the tip against a car tire, then push the wing onto the tube from the other side. To remove the wing from the aircraft, stand with the fuselage resting against the back of your legs and pull the wing away from the fuselage. Always handle the wing by the leading and trailing edges and be careful not to put your hand through either the wings' or fuselage's sheeting.*

❏ 2. Attach the stab to the fuselage as you did the wing.

Maintenance of the Giant Extra

Proper maintenance of your Giant Extra is important to its longevity. Be sure to check these and all components regularly.

❏ 1. The phenolic tube sockets will gradually wear and feel loose when you're assembling your model to fly. When they do, apply a small amount of thin CA to a paper towel and wipe it inside the sockets in the fuse (be SURE there is no accelerator on your hands or in the air!). Allow to cure completely before completing assembly.

❏ 2. Tighten the landing gear bolts.

❏ 3. If you have the tube secured into one panel and always unscrew the other, check the secured side's bolt to be sure it's not vibrating loose.

❏ 4. Confirm that the anti-rotation dowels are tight in the fuse and do not wiggle, rotate or slide, including checking the canopy dowels.

❏ 5. It is not necessary to remove the canopy to assemble the aircraft; however, do so occasionally to check the structure of the model for any damage.

❏ 6. Check that the cowl screws, engine mounting bolts and exhaust bolts are tight.

❏ 7. Regularly inspect all ignition wires of your gasoline engine for chaffing.

PREFLIGHT

At this time check all connections including servo arm screws, clevises and servo wires. Make sure you have installed the **silicone retainers** on all the clevises.

Charge the Batteries

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

Balance the Propeller

Balance the propeller carefully before flying. An unbalanced prop is the single most significant cause of vibration. Not only may engine mounting screws vibrate out, possibly with disastrous effect, but vibration may also damage the structure, radio receiver and battery. Vibration may cause the fuel to foam, which will, in turn, cause your engine to run lean or quit.

Find a Safe Place to Fly

Since you have chosen the Extra 330L we assume that you are an experienced modeler. Therefore, you should already know about AMA chartered flying fields and other safe places to fly. If for some reason you are a relatively inexperienced modeler, and have not been informed, we strongly suggest that the best place to fly is an AMA chartered club field. Ask the AMA or your local hobby shop dealer if there is a club in your area and join. Club fields are set up for R/C flying and that makes your outing safer and more enjoyable. The AMA address and telephone number is in the front of this manual.

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

Ground Check the Model

If you are not thoroughly familiar with the operation of R/C models, ask an experienced modeler to inspect your radio installation and confirm that all the control surfaces respond correctly to transmitter inputs. The engine operation must also be checked by confirming that the engine idles reliably and transitions smoothly and rapidly to full power, and maintains full power indefinitely. The engine must be "broken-in" on the ground by running it for at least two tanks of fuel. **Follow the engine manufacturer's recommendations for break-in.** Make sure all screws remain tight, that the hinges are secure and that the prop is on tight.

Range Check Your Radio

Whenever you go to the flying field, check the operational range of the radio before the first flight of the day. First, make sure no one else is on your frequency (channel). With your 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. While you work the controls, have a helper holding your model and tell you what the control surfaces are doing.

Repeat this test **with the engine running** at various speeds with a helper holding the model. If the control surfaces are not always responding correctly, **do not fly!** Find and correct the problem first. Look for loose servo connections or corrosion, loose bolts that may cause vibration, a defective on/off switch, low battery voltage or a defective cell, a damaged receiver antenna, or a receiver crystal that may have been damaged from a previous crash.

Engine Safety Precautions

NOTE: 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. Remember that the engine exhaust gives off a great deal of deadly carbon monoxide. **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 ALL items away from the prop, including: radio neck straps, loose clothing, shirt sleeves, ties, scarfs, long hair or loose objects such as pencils and screwdrivers that may fall out of shirt or jacket pockets into the prop.

When using a “chicken stick” or electric starter, follow instructions supplied with the starter or stick. 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 after operation. Make sure fuel lines are in good condition so fuel will not leak onto a hot engine causing a fire.

To stop the engine, use your gas engine’s kill switch or cut off the fuel supply by closing off the fuel line or follow the engine manufacturer’s recommendations. Do not use hands, fingers or any body part to try to stop the engine. Do not throw anything into the prop of a running engine.

AMA SAFETY CODE (excerpts)

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.

FLYING

The Great Planes Extra 330L is a great flying semi-scale sport model that flies smoothly and predictably, yet is highly aerobatic. The Extra does not, however, possess the self-recovery characteristics of a primary R/C trainer and should only be flown by experienced RC pilots. This plane is fully capable of performing a wide range of aerobatics — from simple rolls to impressive knife edge loops. The Extra 330L is limited only by your abilities and imagination. Have Fun!!

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 the airplane, any time you detect flutter you must **immediately** cut the throttle and land the airplane! Check all servo grommets for deterioration and servos for damaged gears (this may indicate which surface fluttered), and make sure all pushrod linkages are slop-free. If it fluttered once, it will probably flutter again under similar circumstances unless you can eliminate the slop or flexing in the linkages. Here are some things which can result in flutter: Excessive hinge gap; Not mounting control horns solidly; Sloppy fit of clevis pin in horn; Elasticity present in flexible plastic pushrods; Side-play of pushrod in guide tube caused by tight bends; Sloppy fit of Z-bend in servo arm; Excessive flexing of aileron, caused by using too soft balsa; Excessive “play” or “backlash” in servo gears; and Insecure servo mounting.

Special Note about Flutter and Aerobatic Aircraft

Highly specialized aerobatic models such as the Extra 330L have very large control surfaces designed specifically for performance at low air speeds. Aerobatic models such as this ARE NOT INTENDED for high speed passes and dives. Selection of a prop in the 10 pitch range or lower is strongly recommended for its braking effect, which keeps your aerobatic aircraft from excessive speeds. (An added benefit is that it will provide you increased vertical performance.) Even with excellent control linkages, perfect glue joints, etc, an aerobatic model such as this may well flutter due to excessive airspeed, caused by full throttle application when accelerating in a dive, especially while using high speed props with a pitch over 10. This is NOT a flaw of the aircraft, but rather a by-product of the desirable high performance aerobatic capabilities of this model. We recommend the use of 10 or lower pitch props and appropriate throttle modulation, especially while diving, to help you preserve your aerobatic aircraft.

Takeoff

Takeoff on “low” rates if you have dual rates on your transmitter–even if you are taking off in a crosswind. For all models it is good practice to gain as much speed as the length of the runway will permit before lifting off. This will give you a safety margin in case the engine quits. When you initially advance the throttle and the tail begins to lift, the Extra will begin to turn to the left (due to the torque of the engine–a characteristic of all taildraggers). Be prepared for this by applying sufficient right rudder to keep the Extra running straight down the middle of the runway (or flying field). The left turning tendency will decrease as the plane picks up speed. Be sure to allow the tail to rise off the ground before lifting the model into the air. Depending on the surface you are taking off from, you will need to apply little or no up elevator until flying speed is reached. Don’t hold the tail on the ground with too much up elevator, as the Extra will become airborne prematurely and may stall. When the plane has gained enough flying speed to safely lift off, gradually and smoothly apply up elevator and allow the model to climb at a shallow angle (do not yank the model off the ground into a steep climb!)

Flight

We recommend that you take it easy with your Extra 330L for the first several flights, gradually “getting acquainted” with this great sport model as your engine gets fully broken-in. If you feel as though you have your hands full, keep this one thing in mind: **pull back on the throttle stick to slow the model down**. This will make everything happen a little slower and allow yourself time to think and react. Add and practice one maneuver at a time, learning how the Extra behaves in each. For smooth flying and normal maneuvers, use the low rate settings as listed on page 45. This low rate elevator setting is intentionally very soft and smooth, and was selected specifically to provide clean snaps and loops and a smooth, fluid flight performance overall. High rate elevator was selected specifically for low-speed aerobatic maneuvers such as torque rolls. High rate aileron and/or rudder may be required for crisp snap rolls and spins. For good knife-edge performance, including gorgeous knife edge loops, high rate rudder and sufficient flight speed are the keys.

Sometime well before it’s time to land you should climb your Extra to a safe altitude and cut the throttle to an idle and check out the model’s low speed characteristics. Do this a few times so you know what to expect upon landing.

Landing

When it’s time to land, fly a normal landing pattern and approach. Keep a few clicks of power on until you are over the runway threshold. For the first few landings, plan to land slightly faster than stall speed and on the main wheels, as this is the easiest way to land your Extra. Later, with a little practice you will find you can make slow 3-point landings.

Have a ball! But always remember to think about your next move and plan each maneuver before you do it. Impulsively “jamming the sticks” without any thought is what gets most fliers in trouble rather than lack of flying skill.

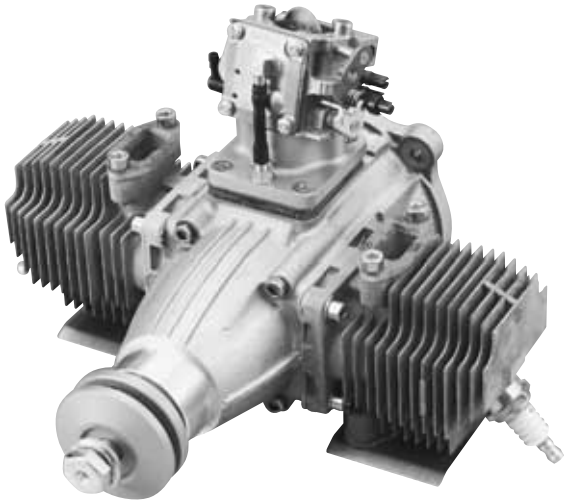
MacMinarelli™

AVIOmac™ Giant-Scale Gasoline Engines

Easy starts...ultra-smooth performance...unequalled value!

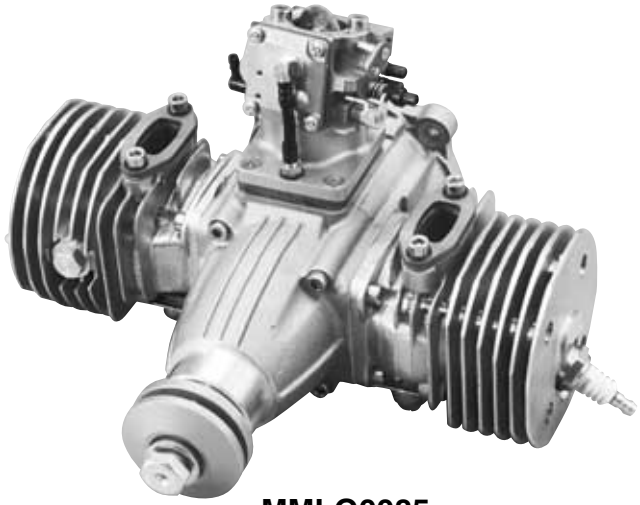
• Superior power PLUS exceptional economy for 1/3 and 1/4 scale R/C aircraft.

• Includes clearly written instructions, exploded parts diagrams AND 3-year warranty protection.



MMLG0070

70 Twin
Bore: 1.46 in
Stroke: 1.22 in
Displacement: 4.06 cu in
Weight: 6.28 lb
Includes spark plugs; requires muffler & prop
Starter control box requires 8 "AA" batteries
Recommended props: 20x12; 22x10; 24x10
Performance with 22x12 prop (indicative): 5600 rpm



MMLG0085

85 Twin
Bore: 1.65 in
Stroke: 1.22 in
Displacement: 5.24 cu in
Weight: 6.73 lb
Includes spark plugs; requires muffler & prop
Starter control box requires 8 "AA" batteries
Recommended props: 24x10; 24x12; 26x8; 26x10
Performance with 22x14 prop (indicative): 6300 rpm

Italy's Mac Minarelli, known for competition-winning racing kart engines, also uses its CNC machine equipped facilities to produce AVIOmac *70 Twin* and *85 Twin* gasoline-powered R/C engines. If you're looking for muscular, easy-starting, extraordinarily smooth power for your 1/3 or 1/4 scale aircraft, THIS is where to look -- and where you'll save hundreds of dollars!

Because these are "boxer-style" twins with cylinders designed to fire simultaneously, they're incredibly smooth. Others alternate from right to left, throwing the engines' force from side to side and causing tremendous vibration. Roller bearing connecting rods and bearing-supported crankshafts reduce friction to the minimum. An impeccable fit between the cylinders and dual ringed pistons produces maximum power. Cylinder heads offer generous cooling fin area. Heavy-duty, single bolt prop mounts eliminate the need for adapters.

You'll enjoy the fastest, simplest starts imaginable: AvioMac engines include a magneto-style, capacitive discharge ignition system with an easy-to-use control box (powered by 8 "AA" batteries, not included). Attach the box, push a single button once, and it fires the supplied, standard-size plugs until the engine springs to life. Then just disconnect the box and take off!

AVIOmac engines include clear instructions, complete with exploded parts diagrams. And a generous warranty protects your investment for three long years!

Futaba®

Futaba 9-Channel "Z-Series" PCM Radios

The choice of the world's best pilots!

The ultimate in performance and versatility.

FUTJ93 - FUTJ9550**

SYSTEM	FUTJ93** 9ZAW	FUTJ9550 9ZAWS
RECEIVER	R129DP	R309DPS
SERVO (QTY)	S9101 (4)	S9101 (4)

At the sharpest point of technology's cutting edge, you'll find the Futaba 9Z Series...9-channel systems that represent the absolute finest in radio control. Whether you fly airplanes, sailplanes or helicopters, you'll enjoy unprecedented flexibility. They can be customized to the "nth" degree. All offer the smooth, swift response of stepless 1024 PCM control, and features that include: a fuel mixture control to improve carburetor and throttle response; a dual-mode gyro that permits two sensitivity settings within one flight condition; plus improved tach and ATL limit functions. F3A/F3B/F3C software and programmable features allow modifications for personal styles and aircraft, and settings storage in 10-model memory. The *9ZAW PCM* airplane radio adds a programmable alarm and mutual mixing. A frequency synthesizer on the *9ZAWS* expands your edge, by allowing you to compete on any unused 72MHz frequency -- without changing crystals! 50 & 72 MHz. 1-year warranty.

Futaba 8UAPS 8-Channel Radios

Advanced features like audible trims let you hear the superiority of Futaba design!

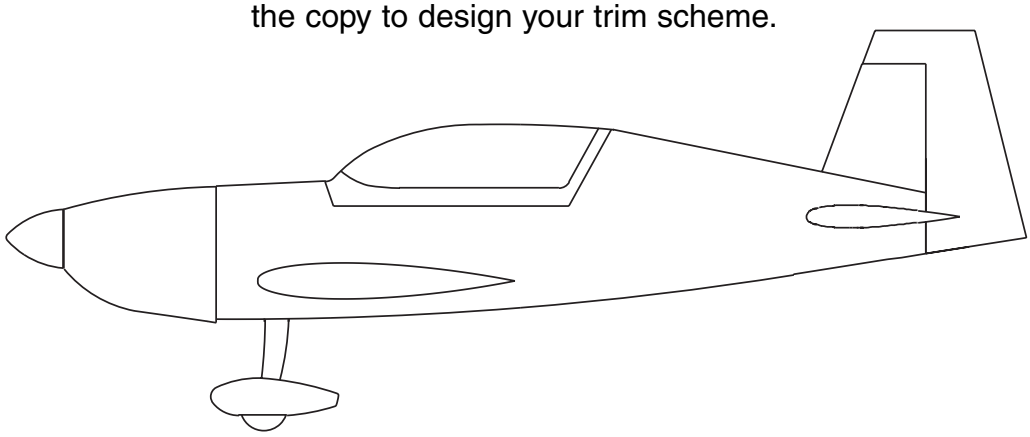
FUTJ81**

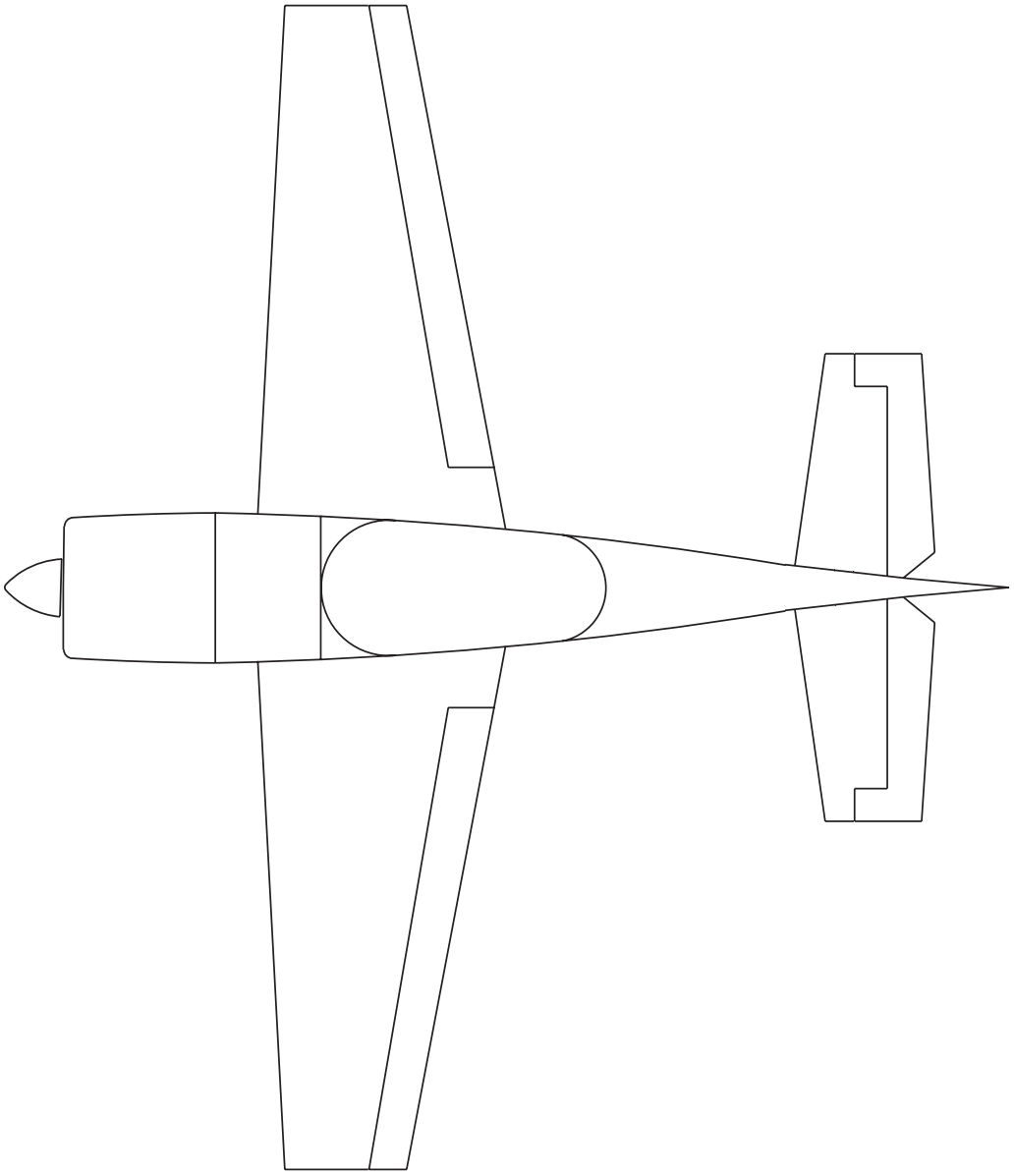
SYSTEM	8UAPS
RECEIVER	R148DP
SERVO (QTY)	S3001 (4)

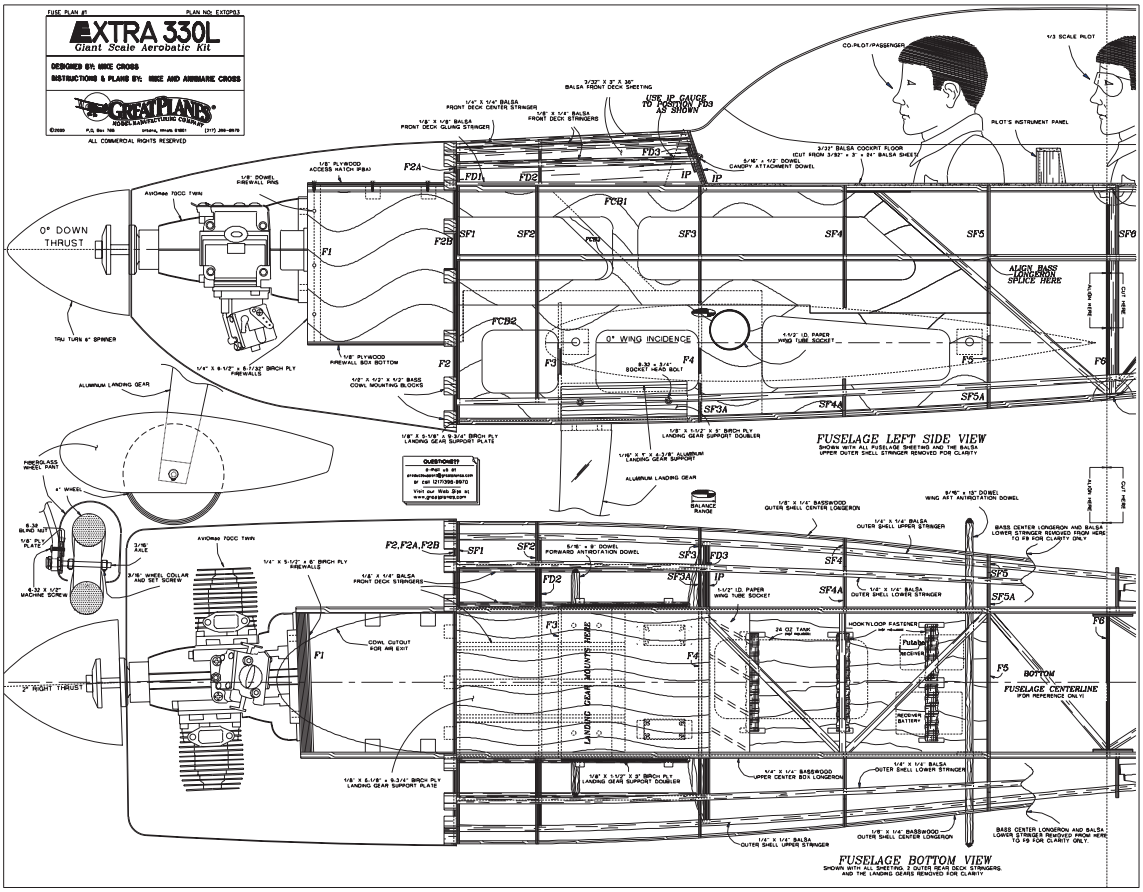
Adjust trims in-flight? Sure. Since Futaba knows your eyes can't leave your plane, all trims beep as they pass neutral, so you can trim your plane by ear. But that's only a small part of what the 8UAPS PCM can offer. Add to that: 8 model memory (more with optional CAMPac modules); data copy; a large LCD screen for programming ease; programmable mixing for aerobatic airplanes, sailplanes and helis; dual rates; side to-side adjustable exponential; all-channel servo reversing and sub-trims on all models and all-channel failsafe; digital trims and automatic trim memory; Direct Servo Control; programmable switch location and trainer function; full NiCds and charger; flight timer and 60-minute stopwatch; and just about everything a contest pilot could want. 72MHz. One-year warranty.

2-View

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






FUSE PLAN #1
PLAN NO: EXTOP03
EXTRA 330L
Giant Scale Aerobatic Kit
DESIGNED BY: MIKE CROSS
INSTRUCTIONS & PLANS BY: MIKE AND ANNMARIE CROSS
GREAT PLANS
MODEL MANUFACTURING COMPANY
P.O. Box 705 Urbana, Illinois 61801 (217) 398-8970
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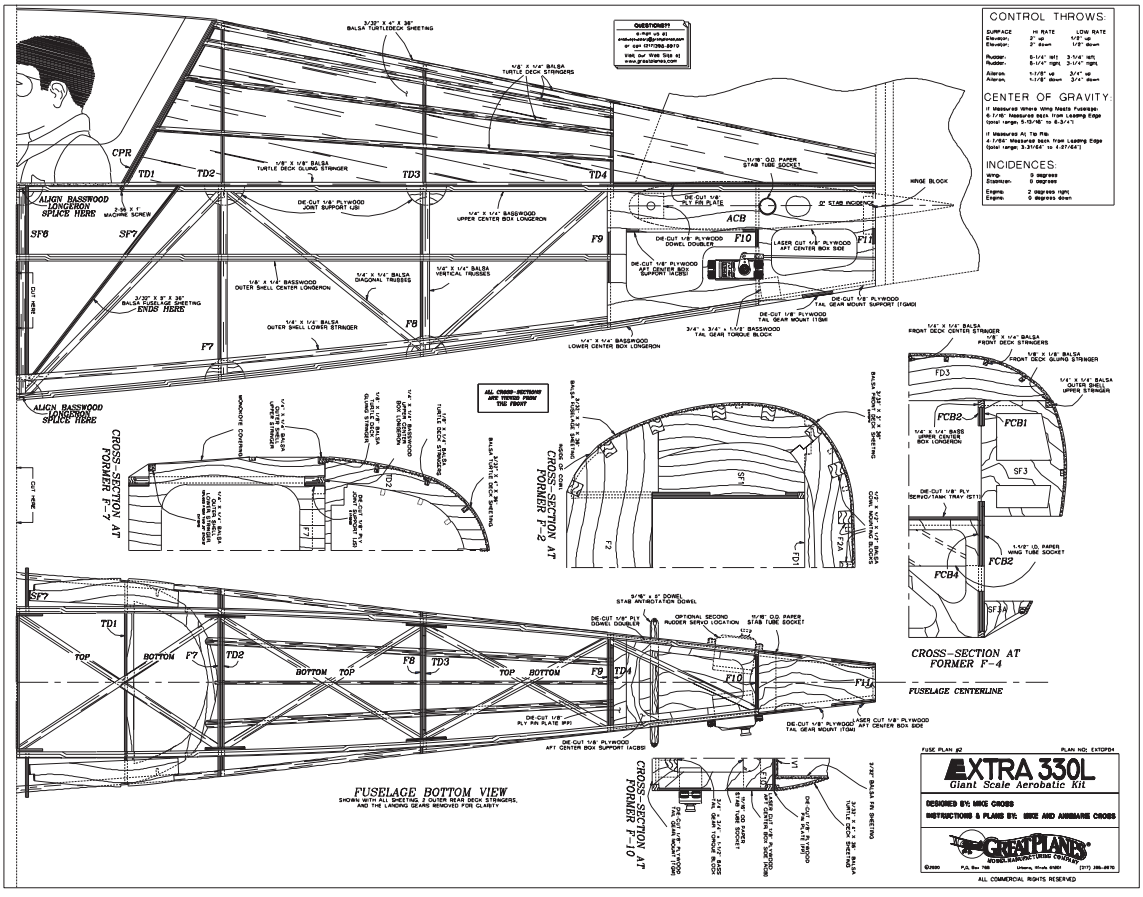
CO-PILOT/PASSENGER
1/3 SCALE PILOT
PILOT'S INSTRUMENT PANEL
USE IP GAUGE TO POSITION FD3 AS SHOWN
3/32" X 3" X 36" BALSA FRONT DECK SHEETING
1/4" X 1/4" BALSA FRONT DECK CENTER STRINGER
1/8" X 1/2" BALSA FRONT DECK GLUING STRINGER
1/8" X 1/4" BALSA FRONT DECK STRINGERS
3/32" BALSA COCKPIT FLOOR (CUT FROM 3/32" X 3" X 24" BALSA SHEET)
5/16" X 1/2" DOWEL CANOPY ATTACHMENT DOWEL
1/8" PLYWOOD ACCESS HATCH (FB3)
1/8" DOWEL FIREWALL PINS
AVIOmas 70CC TWIN
0° DOWN THRUST
TRU TURN 6" SPINNER
1/8" PLYWOOD FIREWALL BOX BOTTOM
1/4" X 8-1/2" x 8-1/2" BIRCH PLY FIREWALLS
1/2" X 1/2" X 1/2" BASS COWL MOUNTING BLOCKS
ALUMINUM LANDING GEAR
0° WING INCIDENCE
8-32 X 2" SOCKET HEAD BOLT
1-1/2" I.D. PAPER WING TUBE SOCKET
ALIGN BASS LONGERON SPLICE HERE
CUT HERE
1/8" X 5-1/8" x 9-3/4" BIRCH PLY LANDING GEAR SUPPORT PLATE
1/8" X 1-1/2" X 3" BIRCH PLY LANDING GEAR SUPPORT DOUBLER
1/16" X 1" X 4-3/8" ALUMINUM LANDING GEAR SUPPORT
FIBERGLASS WHEEL PANT
6" WHEEL
6-32 BLIND NUT
1/8" AXLE
3/16" WHEEL COLLAR AND SET SCREW
6-32 X 1/2" MACHINE SCREW
2° RIGHT THRUST
CONFIGURATION
E-Mail us at:
or call (217)398-8970
Visit our Web Site at:
www.greatplanes.com
FUSELAGE LEFT SIDE VIEW
SHOWN WITH ALL FUSELAGE SHEETING AND THE BALSA UPPER OUTER SHELL STRINGER REMOVED FOR CLARITY
BALANCE RANGE
5/16" X 12" DOWEL WING ART ANTIROTATION DOWEL
1/2" X 1/4" BASSWOOD OUTER SHELL CENTER LONGERON
1/4" X 1/4" BALSA OUTER SHELL UPPER STRINGER
BASS CENTER LONGERON AND BALSA LOWER STRINGER REMOVED FROM HERE TO FB FOR CLARITY ONLY
5/8" X 8" DOWEL FORWARD ANTIROTATION DOWEL
1/4" X 1/4" BALSA OUTER SHELL LOWER STRINGER
HOOK'N LOOP FASTENER
24 OZ TANK
Futaba RECEIVER
RECEIVER BATTERY
BOTTOM
FUSELAGE CENTERLINE
(FOR REFERENCE ONLY)
CONVENIENT WING MOUNT HOLE
CONVENIENT WING MOUNT HOLE
COWL CUTOUT FOR AIR EXIT
1/8" X 5-1/8" x 9-3/4" BIRCH PLY LANDING GEAR SUPPORT PLATE
1/8" X 1-1/2" X 3" BIRCH PLY LANDING GEAR SUPPORT DOUBLER
1/4" X 1/4" BASSWOOD UPPER CENTER BOX LONGERON
1/4" X 1/4" BALSA OUTER SHELL LOWER STRINGER
1/8" X 1/4" BASSWOOD OUTER SHELL CENTER LONGERON
BASS CENTER LONGERON AND BALSA LOWER STRINGER REMOVED FROM HERE TO FB FOR CLARITY ONLY
1/4" X 1/4" BALSA OUTER SHELL UPPER STRINGER
FUSELAGE BOTTOM VIEW
SHOWN WITH ALL SHEETING, 2 OUTER REAR DECK STRINGERS, AND THE LANDING GEARS REMOVED FOR CLARITY


3/32" X 3" X 36" BALSA TURTLEDECK SHEETING
1/2" X 1/4" BALSA TURTLE DECK STRINGERS
QUESTIONS??
E-Mail us at:
or call (217)398-8970
Visit our Web Site at:
www.greatplanes.com
CONTROL THROWS:
SURFACE HI RATE LOW RATE
Elevator: 2" up 1/2" up
Elevator: 2" down 1/2" down
Rudder: 5-1/4" left 2-1/4" left
Rudder: 5-1/4" right 2-1/4" right
Aileron: 1-1/8" up 3/4" up
Aileron: 1-1/8" down 3/4" down
CENTER OF GRAVITY:
If Measured Where Wing Meets Fuselage: 6-1/16" Measured Back from Leading Edge (total range: 5-15/16" to 6-3/4")
If Measured At Tip Rib: 4-7/8" Measured Back from Leading Edge (total range: 3-31/64" to 4-27/64")
INCIDENCES:
Wing: 0 degrees
Elevator: 0 degrees
Engine: 2 degrees right
Engine: 0 degrees down
CPR
TD1
TD2
TD3
TD4
1/2" X 1/4" BALSA TURTLE DECK GLUING STRINGER
1/2" I.D. PAPER STAB TUBE SOCKET
HINGE BLOCK
DIE-CUT 1/8" PLY FIN PLATE
2° STAB INCIDENCE
ACB
DIE-CUT 1/8" PLYWOOD DOWEL DOUBLER
LASER CUT 1/8" PLYWOOD AFT CENTER BOX SIDE
DIE-CUT 1/8" PLYWOOD AFT CENTER BOX SUPPORT (ACBS)
DIE-CUT 1/8" PLYWOOD TAIL GEAR MOUNT (TGMD)
3/4" X 3/4" x 1-1/2" BASSWOOD TAIL GEAR TORQUE BLOCK
1/4" X 1/4" BASSWOOD LOWER CENTER BOX LONGERON
ALIGN BASSWOOD LONGERON SPLICE HERE
3-48 X 1" MACHINE SCREW
1/4" X 1/4" BASSWOOD OUTER SHELL CENTER LONGERON
1/4" X 1/4" BALSA DIAGONAL TRUSSES
1/4" X 1/4" BALSA VERTICAL TRUSSES
3/32" X 3" X 36" BALSA FUSELAGE SHEETING ENDS HERE
1/4" X 1/2" BALSA OUTER SHELL LOWER STRINGER
SF6
SF7
F6
F7
F8
F9
F10
F11
CUT HERE
ALL CROSS-SECTIONS ARE VIEWED FROM THE FRONT
CROSS-SECTION AT FORMER F-7
CROSS-SECTION AT FORMER F-9
CROSS-SECTION AT FORMER F-10
CROSS-SECTION AT FORMER F-4
FUSELAGE CENTERLINE
1/2" X 1/4" BALSA FRONT DECK CENTER STRINGER
1/8" X 1/4" BALSA FRONT DECK GLUING STRINGER
1/4" X 1/4" BALSA OUTER SHELL UPPER STRINGER
1/4" X 1/4" BASS UPPER CENTER BOX LONGERON
DIE-CUT 1/8" PLY SERVO/TANK TRAY (ST1)
1-1/2" I.D. PAPER WING TUBE SOCKET
FCB1
FCB2
FCB3
FCB4
FD3
SF3
SF4
1/2" X 1/2" BALSA COWL MOUNT BLOCKS
3/8" X 5" DOWEL STAB ANTIROTATION DOWEL
DIE-CUT 1/8" PLY DOWEL DOUBLER
OPTIONAL SECOND RUDDER SERVO LOCATION
11/16" O.D. PAPER STAB TUBE SOCKET
1/2" I.D. PAPER WING TUBE SOCKET
DIE-CUT 1/8" PLY FIN PLATE (FP)
DIE-CUT 1/8" PLYWOOD AFT CENTER BOX SUPPORT (ACBS)
DIE-CUT 1/8" PLYWOOD TAIL GEAR MOUNT (TGM)
LASER CUT 1/8" PLYWOOD AFT CENTER BOX SIDE
FUSELAGE BOTTOM VIEW
SHOWN WITH ALL SHEETING, 2 OUTER REAR DECK STRINGERS, AND THE LANDING GEARS REMOVED FOR CLARITY
FUSE PLAN #2
PLAN NO: EXTOP04
EXTRA 330L
Giant Scale Aerobatic Kit
DESIGNED BY: MIKE CROSS
INSTRUCTIONS & PLANS BY: MIKE AND ANNMARIE CROSS
GREAT PLANS
MODEL MANUFACTURING COMPANY
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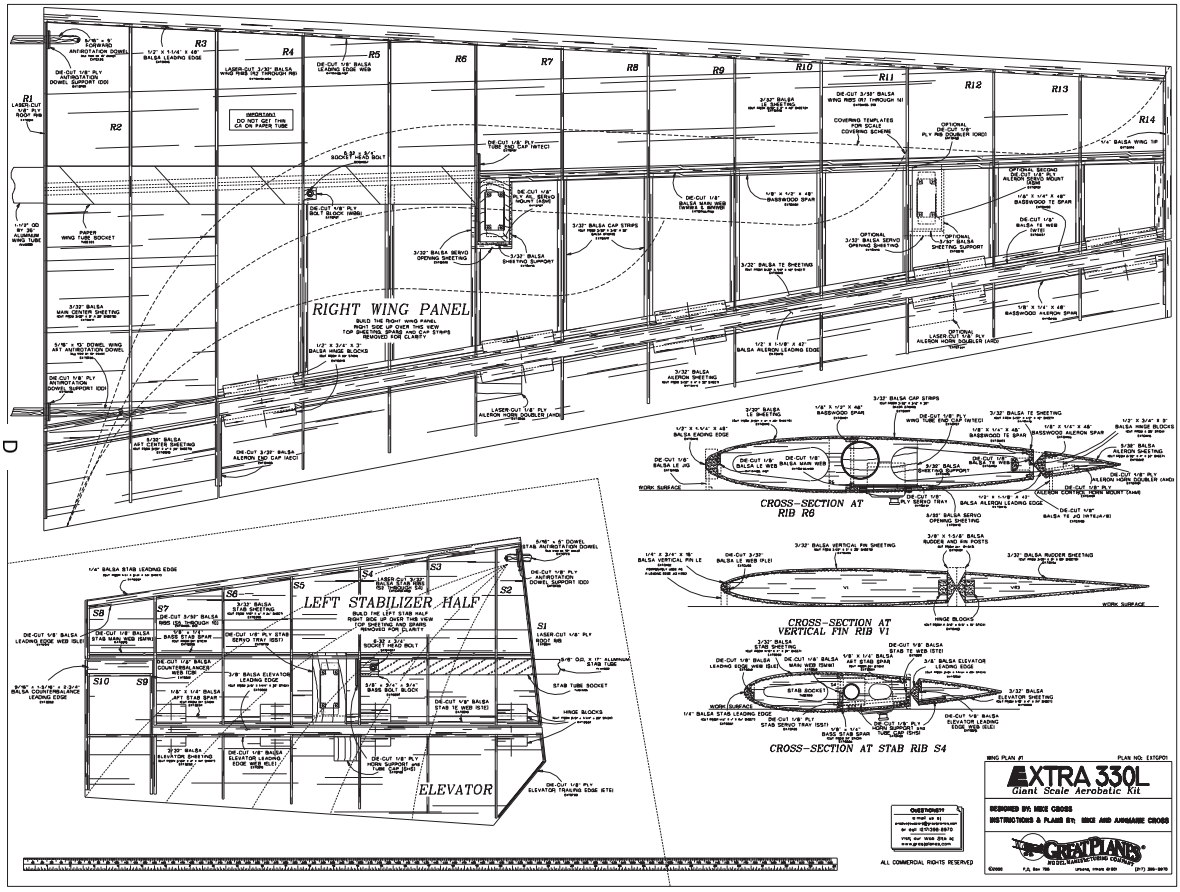
RIGHT WING PANEL
BUILD THE RIGHT WING PANEL RIGHT SIDE UP OVER THIS VIEW TOP SHEETING, BRACE AND CAP STRIPS REMOVED FOR CLARITY
CROSS-SECTION AT RIB R6
LEFT STABILIZER HALF
BUILD THE LEFT STAB HALF RIGHT SIDE UP OVER THIS VIEW (TOP SHEETING REMOVED FOR CLARITY)
ELEVATOR
CROSS-SECTION AT VERTICAL FIN RIB V1
CROSS-SECTION AT STAB RIB S4
WING PLAN #1
PLAN NO. EXTGP01
EXTRA 330L
Giant Scale Aerobatic Kit
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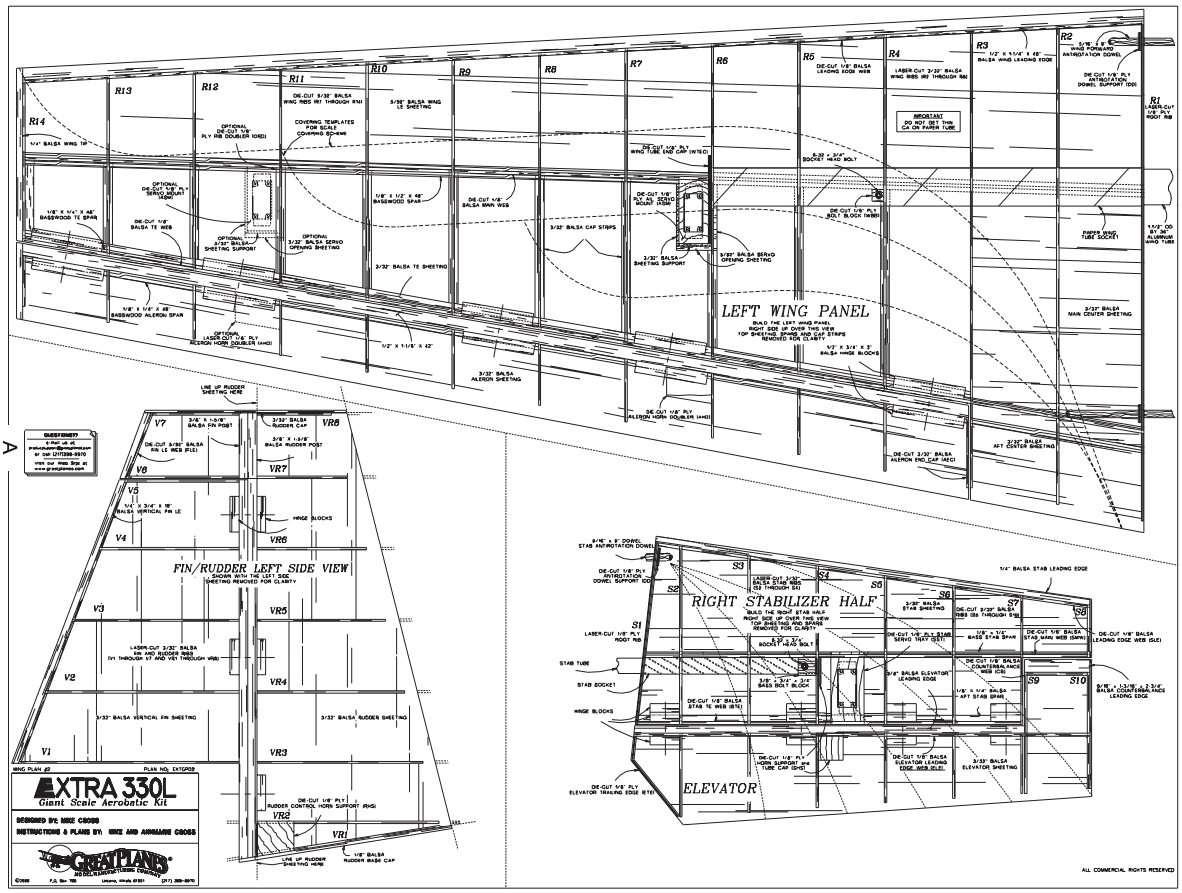
LEFT WING PANEL
BUILD THE LEFT WING PANEL RIGHT SIDE UP OVER THIS VIEW TOP SHEETING, BRACE AND CAP STRIPS REMOVED FOR CLARITY
FIN/RUDDER LEFT SIDE VIEW
SHOWN WITH THE LEFT SIDE SHEETING REMOVED FOR CLARITY
RIGHT STABILIZER HALF
BUILD THE RIGHT STAB HALF RIGHT SIDE UP OVER THIS VIEW (SHEETING REMOVED FOR CLARITY)
ELEVATOR
WING PLAN #2
PLAN NO. EXTGP02
EXTRA 330L
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