

F-4 PHANTOM II

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

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

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



P.O. Box 788 Urbana, IL 61803 (217) 398-8970

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**PROTECT YOUR MODEL, YOURSELF
& OTHERS...FOLLOW THIS
IMPORTANT SAFETY PRECAUTION**

Your F-4 Phantom is not a toy, but rather a sophisticated, working model that functions very much like a full size airplane. Because of its realistic performance, the F-4 Phantom, if not assembled and operated correctly, could possibly cause injury to yourself or spectators and damage property.

If this is your first low wing sport model, we recommend that you get help from an experienced, knowledgeable modeler with your first flights. You'll learn faster and avoid risking your model before you're ready to take the controls for yourself.

For information on flying clubs in your area, you can contact the national Academy of Model Aeronautics (AMA), which has more than 2,300 chartered clubs across the country. Contact AMA at the address or toll-free phone number below:



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

Or via the internet at: <http://www.modelaircraft.org>

INTRODUCTION

The Great Planes **F-4 Phantom** is a high performance propeller-driven sport airplane that closely resembles the full size F-4 Phantom. In the air, the prop is invisible, adding to the realism. The smoothness and speed of this airplane allow you to experience the thrills of flying a jet-like airplane without the complexity and high cost of a ducted fan model. The F-4 Phantom is very stable and forgiving, allowing even intermediate skill level pilots to enjoy it.

This is not a beginner's airplane! While the F-4 is easy to build and flies great, we must discourage you from selecting this kit as your **first** R/C airplane. It lacks the self-recovery characteristics of good basic trainers such as the Great Planes PT" Series. On the other hand, if you have already learned the basics of R/C flying, and you are able to safely handle a .60-size low wing airplane, the F-4 Phantom is an excellent choice to try your skills at flying a jet.

PRECAUTIONS

1. You must assemble the model according to the instructions. Do not alter or modify the model, as doing so may result in an unsafe or unflyable model. In a few cases the instructions may differ slightly from the photos. In those instances the plans and written instructions should be considered as 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 engine and components (fuel tank, wheels, etc.) throughout your building process.

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

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

NOTE: We, as the kit manufacturer, can 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. 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.

DECISIONS YOU MUST MAKE

Engine Selection

There are several engines that will work well in your F-4 Phantom, but for unlimited performance we recommend a hot 2-stroke such as an O.S. .61FX or SuperTigre™ G61. The engine you select will determine how you build the fuselage nose section, so it is important that you have the engine close at hand while building. Because of the size limitations and the nature of this model, 4-stroke engines are more difficult to install and balance and therefore are **not recommended**.

Wheel Selection

Large wheels look unrealistic on a model of this type, so try to keep the wheels as small as possible. If you will be flying from a concrete or asphalt runway, we recommend 2-1/2" main wheels and a 1-3/4" nose wheel. For grass fields, larger wheels will be required, such as 2-3/4" main wheels and a 2" to 2-1/4" nose wheel.

PREPARATIONS

Required Accessories

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

- Four-channel radio with five servos (seven if mechanical retracts are used)
- Engine - See **Engine Selection** above
- Propeller (Top Flite Power Point™); Refer to your engine's instructions for proper size
- Fuel tank 10oz.- 12oz. (GPMQ4104 and GPMQ 4105)
- Medium fuel tubing (GPMQ4131)
- 2-1/2" Main wheels (GPMQ4223)
- 2" Nose wheel (GPMQ4221)
- Top Flite MonoKote' (Approximately 3 rolls)

- 1-1/2" pilot figure (Williams Bros. #171)
- Latex foam rubber padding (HCAQ1050)
- Switch and charge jack (GPMM1000)
- Top Flite LustreKote" Paint - See **Painting** (page 42)
- 1/16" wing seating tape (GPMQ4422)
- Silver solder (GPMR8070)
- 6" servo extension
- 3" Black spinner (GPMQ4531)
- 5/32" wheel collars (GPMQ4306)
- 3/16" wheel collars (GPMQ4309)

Optional Flaperons

- Standard Servo
- Mixer

Optional Retracts

(Requires one set of Mains and Nose Gear.)

Pneumatic Retracts

- Robart 605HD Pneumatic Retract Mains
- Robart 607 Pneumatic Retractable Nose Gear
- Robart 188 Air Control Kit
- 3/16" Adjustable Axles for the Main Retracts (GPMQ4282)
- 5/32" Adjustable Axles for the Nose Gear (GPMQ4281)
- 3/16" Wheel collars (GPMQ4308)
- 5/32" Wheel collars (GPMQ4306)
- Mini or Micro servo

Robart Mechanical Retracts

- Robart 608HD Mechanical Retract Mains
- Robart 610 Mechanical Retract Nose Gear
- 3/16" Adjustable Axles for the Main Retracts (GPMQ4282)
- 5/32" Adjustable Axles for the Nose Gear (GPMQ4281)
- 3/16" Wheel collars (GPMQ4308)
- 5/32" Wheel collars (GPMQ4306)
- Retract servo and Standard servo
- 48" Nylon pushrod
- Screw-Lock Pushrod Connectors (GPMQ3871)

Building Supplies and Tools

These are the building tools that are required. We recommend **Great Planes Pro" CA and Epoxy glue.**

- 2 oz. Pro CA (Thin, GPMR6003)
- 2 oz.** Pro CA+ (Medium, GPMR6009)
- 1 oz. Pro CA- (Thick, GPMR6014)
- 6-Minute Pro Epoxy (GPMR6045)
- 30-Minute Pro Epoxy (GPMR6047)
- Hand or electric drill
- Sealing iron (TOPR2100)
- Heat gun (TOPR2000)
- Hobby saw
- Hobby knife, #11 Blades
- Razor plane (Master Airscrew®)
- Pliers (Common and Needle Nose)
- Screwdrivers (Phillips and flat tip)
- T-pins(HCAR5150)
- 60" Retractable Tape Measure (HCAR0478)
- Straightedge with scale
- Masking tape (TOPR8018)
- Sandpaper (coarse, medium, fine grit)
- Easy-Touch" Bar Sander (or similar)
- Plan Protector (GPMR6167)
- Lightweight balsa filler such as Hobbico® HobbyLite" (HCAR3400)
- 1/4-20 Tap and Drill (GPMR8105)
- Isopropyl rubbing alcohol (70%)
- White body putty (Squadron SQR1500)
- Ballpoint pen
- 90° Building square (HCAR0480)
- Micro balloons (TOPR1090)
- Canopy glue
- Drill bits: 1/16", 1/8", 3/16" (Long Bit), 5/64", 9/64", 13/64", 3/32", 5/32", 1/4", 7/64", 3/16"

Optional Supplies and Tools

- CA Applicator Tips (HCAR3780)
- Epoxy brushes (GPMR8060)
- Epoxy mixing sticks (GPMR8055)
- CA Debonder (GPMR6039)
- HotSock"(TOPR2175)
- Single-edge razor blades (HCAR0312)
- Duratrax Curved Scissors for trimming plastic parts (DTXR1150)
- 4 oz. Pro Wood Glue (GPMR6161)
- Milled fiberglass (GPMR6165)

EXPERT TIP

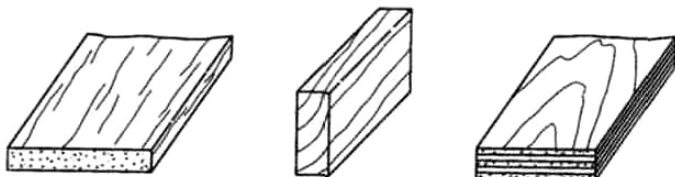
On our workbench, we have three 11" **Great Planes Easy-Touch Bar Sanders**, equipped with 80, 150 and 220-grit sandpaper. This setup is all that is required for almost any sanding task. We also keep some 320-grit wet-or-dry sandpaper handy for finish sanding before covering.



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; and 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), 180-grit (GPMR6184) 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.

Types of Wood



Balsa

Basswood

Plywood

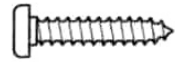
Common Abbreviations

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

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"



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



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** and then slightly modify or sand the part as necessary for the best fit.

Whenever the instructions tell you to **glue** pieces together, CA or epoxy may be used. When a **specific** type of glue is required, the instructions will state the type of glue that is **highly recommended**. When 30-minute epoxy is specified, it is highly recommended that you use only 30-minute (or slower) epoxy because you will need either the working time or the additional strength.

Several times during construction we refer to the "top" or "bottom" of the model or a part of the model. For example, during wing construction we tell you to "glue the top main spar" or "trim the bottom of the former." 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. (i.e. the "top" main spar is always the "top" main spar, even when the wing is being built upside down).

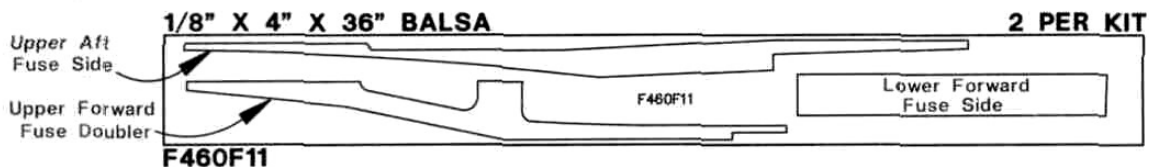
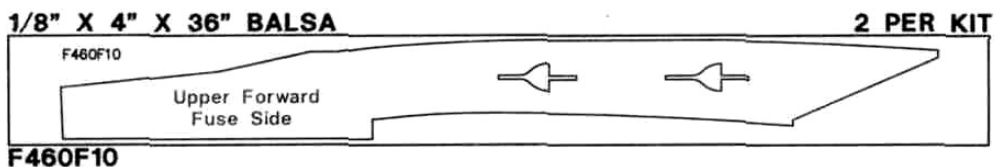
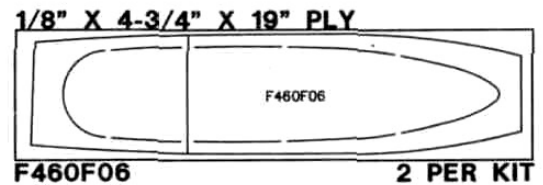
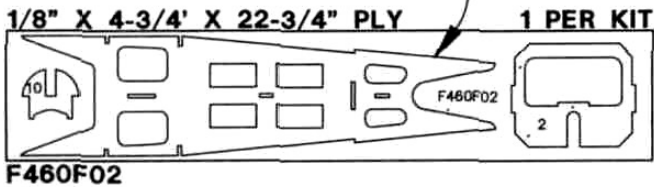
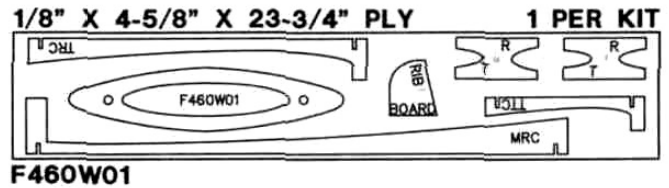
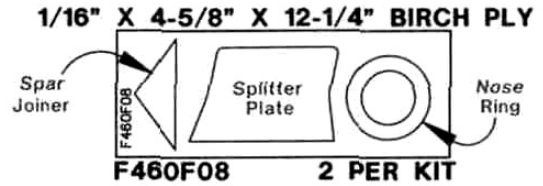
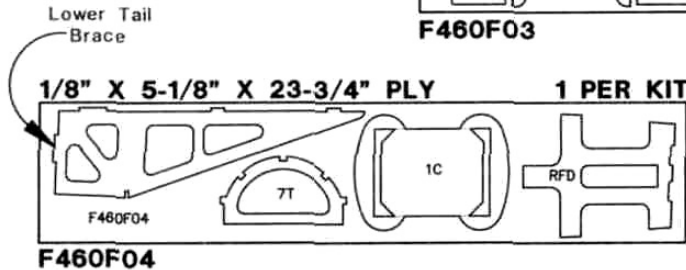
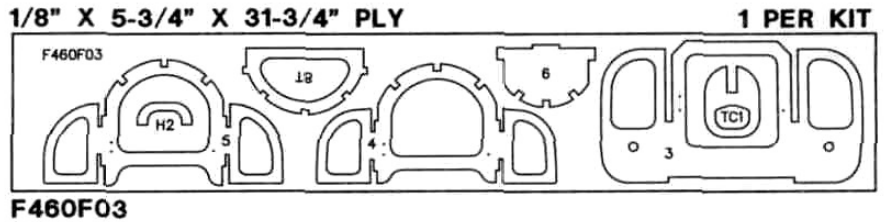
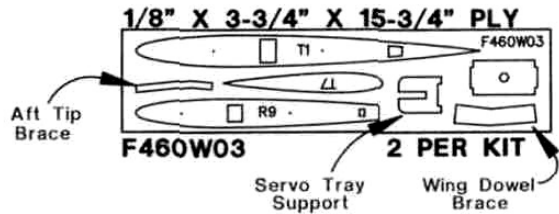
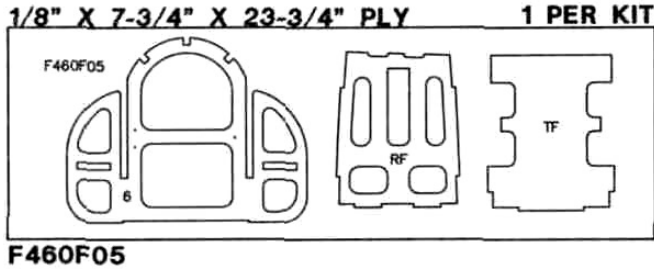
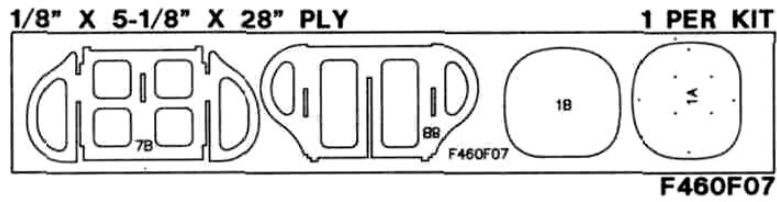
Get Ready to Build

1. Unroll the plan sheets. Reroll the plan sheets inside out to make them lie flat. The two-part plan will need to be cut along the dashed line and taped together. Place wax paper or Great Planes Plan Protector over the plan to prevent glue from sticking to the plan.

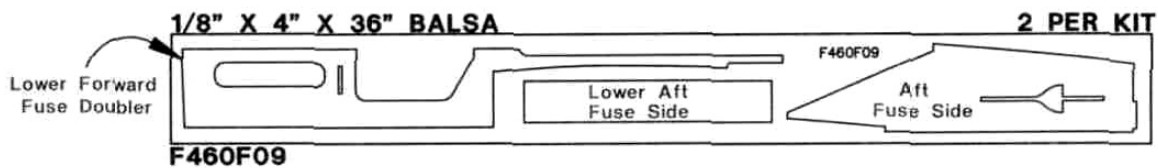
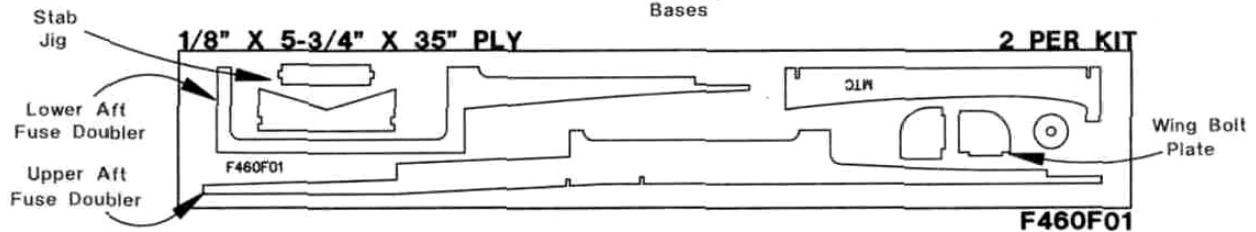
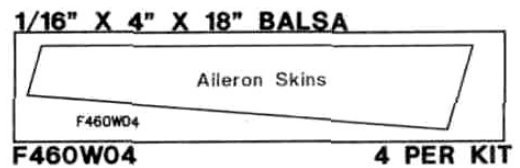
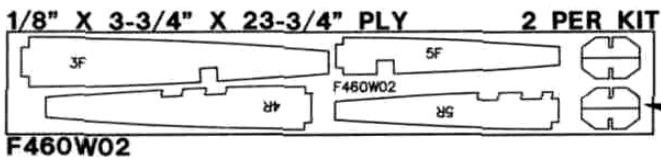
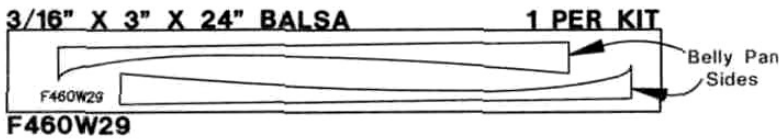
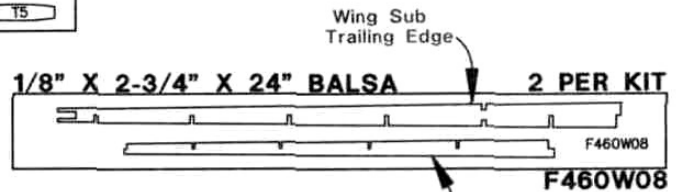
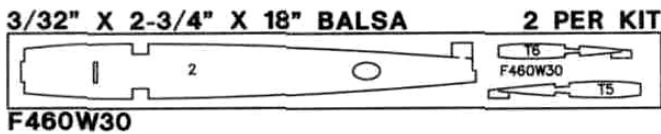
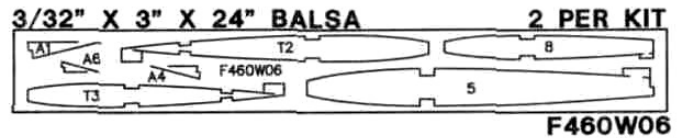
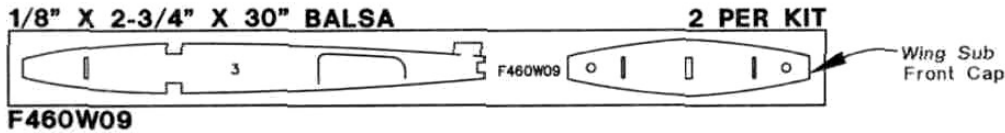
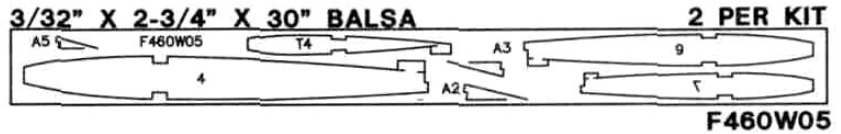
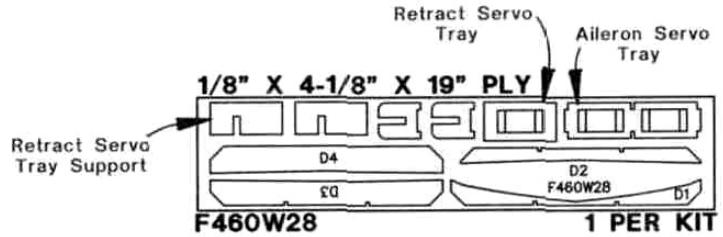
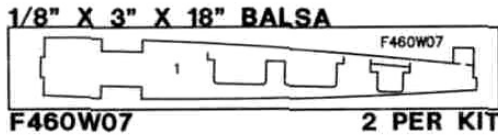
2. Remove all parts from the box. As you do, determine the **name** of each part by comparing it with the **plan** and the **parts list** included with this kit. Using a felt-tip or ballpoint pen, lightly write the part **name** or **size** on each piece to avoid confusion later. Use the die-cut patterns shown on pages 6 and 7 to identify the die-cut parts and mark them **before** removing them from the sheet. **Save all scraps**. If any of the die-cut parts are difficult to remove, do not force them! Instead, cut around the parts. Use your Easy-Touch Bar Sander or 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**. Resealable food storage bags are handy to store parts in as you sort, identify and separate them into subassemblies.

DIE-CUT PATTERNS

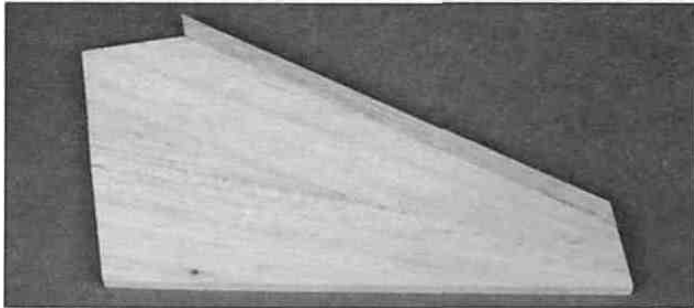


DIE-CUT PATTERNS



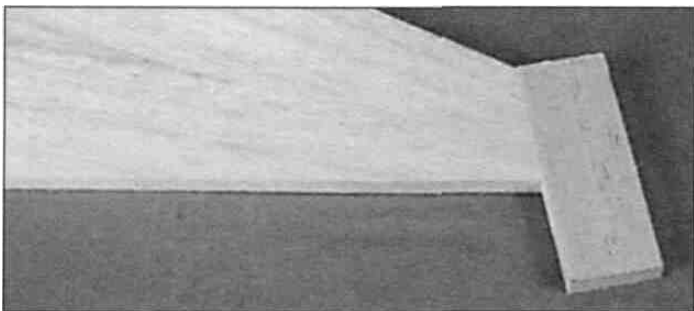
BUILD THE TAIL SURFACES

Build the Stabilizers

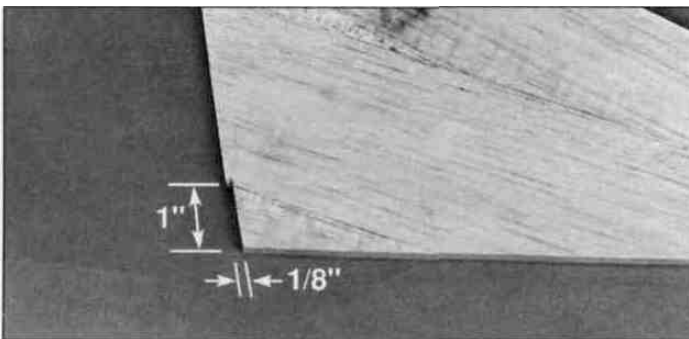


1. Glue the shaped 3/8" balsa forward and aft stab together over the plan. Make the stab LE from a 3/8" x 1/2" x 24" balsa stick. Glue the stab LE to the forward stab.

Note: Refrain from using excessive accelerator. Hours after it's sprayed on, residual accelerator can prematurely and unexpectedly cure the CA you use later, on nearby glue joints. Unless you must handle or remove the part from your building board right away, we recommend using no accelerator at all.



2. Cut the stab tip from the 3/8" x 1-3/8" x 15" balsa stick and glue it to the end of the stab.

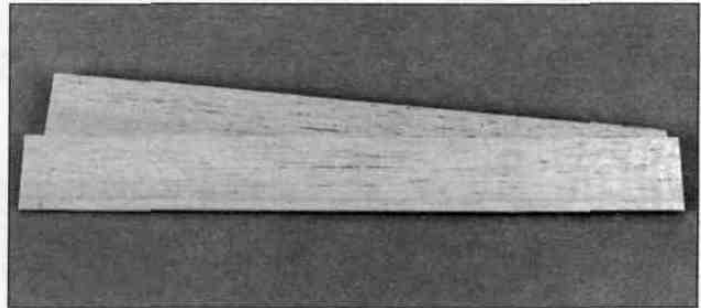


3. Cut a 1/8" x 1" notch in the **root** of the stab, as shown on the plan.

4. Sand a radius on the corner of the stab tip as shown on the plan. Use your bar sander to sand the entire

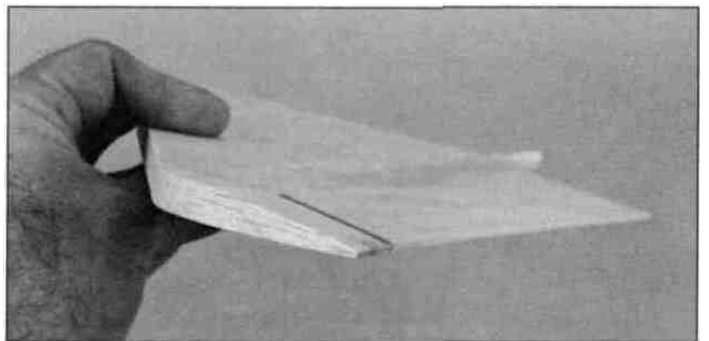
top and bottom surface of the stab until it is flat and even. Be careful not to sand any area of the stab too thin.

Build the Elevator



1. Cut a 10-1/2" long piece from the shaped 3/8" x 1-1/4" x 30" balsa elevator TE. Glue the shaped 3/8" balsa elevator LE to the 10-1/2" long TE.

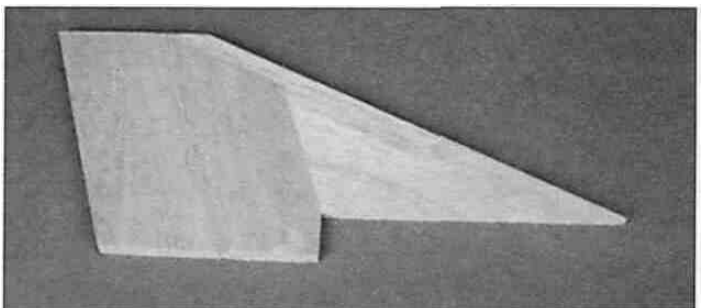
2. Trim the ends of the elevator TE to match the plan and sand the top and bottom to the shape shown on the elevator cross-section.



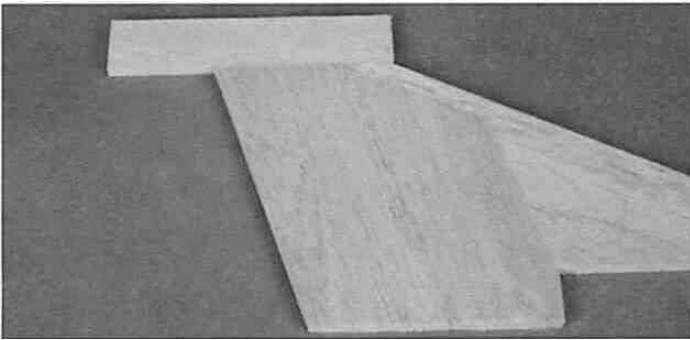
3. Tape the LE of the elevator to the TE of the stab. Sand the stab tip to match the angle of the elevator.

4. Go back to step 1 of *Build the Stabilizers* and build the second stab and elevator following the same procedure.

Build the Fin

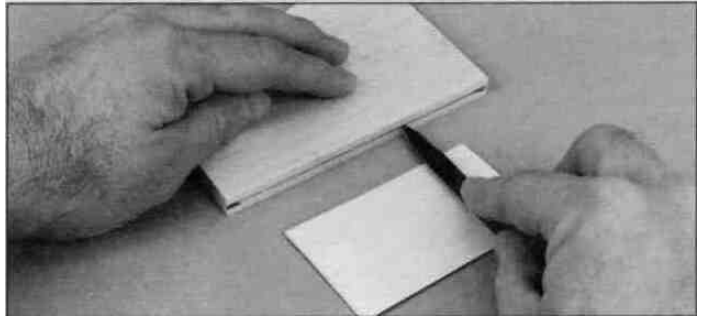


1. Glue the shaped 3/8" aft, forward and dorsal fin together over the plan. Make the fin LE from a 3/8" x 1/2" balsa stick. Glue the fin LE to the dorsal and forward fin.



❑ 2. Cut the fin tip from the remaining 3/8" x 1-3/8" balsa stick. Glue the fin tip to the top of the fin.

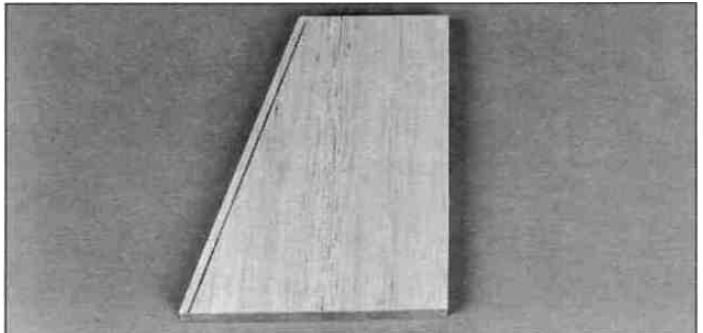
❑ 3. Sand a radius on the corner of the fin tip as shown on the plan. Sand both sides of the fin until they are flat and even. Be careful not to sand any area of the fin too thin.



C. Use playing cards or business cards to adjust the height of the pen until you can mark the centerline.

Build the Rudder

❑ 1. Glue the shaped 3/8" balsa rudder LE to the tapered 3/8" balsa TE. Trim and sand the TE to the same length as the LE. Draw a centerline on the LE of the shaped 3/8" balsa rudder (see the expert tip below).

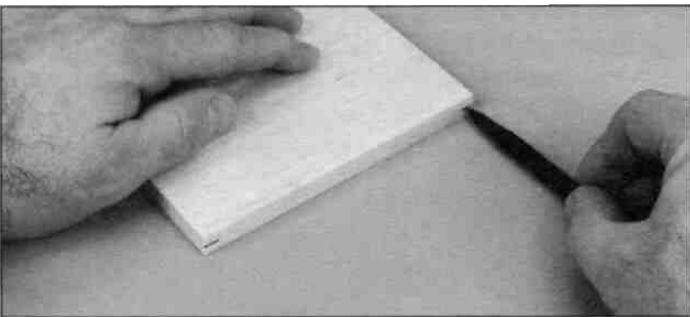


❑ 2. Set the rudder on its LE and use the parallel line method to draw a line 5/32" from the LE, on the sides of the rudder.



HOW TO MARK PARALLEL LINES

It's important that the centerlines and "bevel to" lines are parallel to the edge of the part.



A. Position the rudder and a ballpoint pen on a flat surface. Mark a "test line" on the LE of the rudder.

B. Flip the rudder over and mark another line in the same location as the first. If you see only one line, then it is on center. Proceed and mark the centerline on the LE. If you see two lines, you will have to adjust the height of the pen until you can mark the centerline.

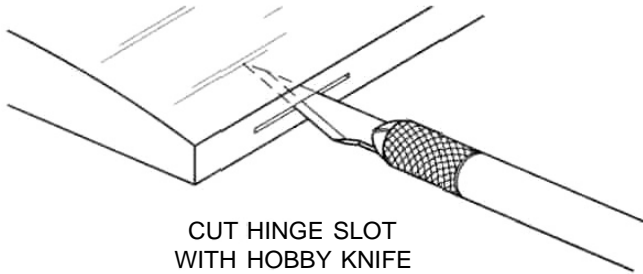
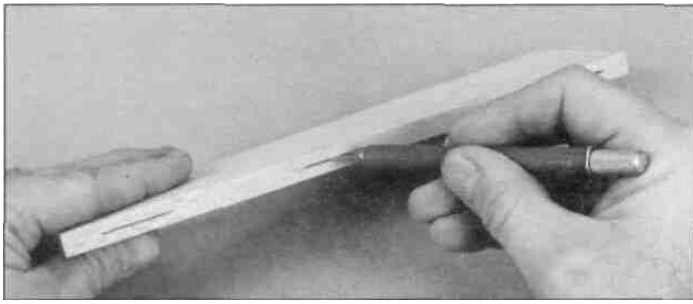
❑ 3. Sand a taper on both sides of the rudder as shown on the rudder cross-section.

❑ 4. Tape the rudder in position on the TE of the fin. Sand a taper on the fin tip to match the taper on the rudder.

Hinge the Tail Surfaces

❑ 1. Place the stab and elevator over their locations on the plan and lightly mark the hinge locations on the TE of the stab and LE of the elevator.

❑ 2. Mark the centerline of the hinges on the stab's TE and elevator's LE using the parallel lines method described in the previous expert tip.



CUT HINGE SLOT
WITH HOBBY KNIFE
AND #11 BLADE

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

❑ 4. Cut the hinges for the elevators and rudder from the supplied 2" x 9" hinge material. Use the hinge drawing on the fuse plan as a guide. Trim off the corners and **temporarily** join the elevators to the stabs with the hinges, adjusting any hinge slots if necessary. **Do not glue in the hinges until you are instructed to do so.**

❑ 5. Return to step 1 and use the same procedure to hinge the rudder and fin.

Finish the Tail Surfaces

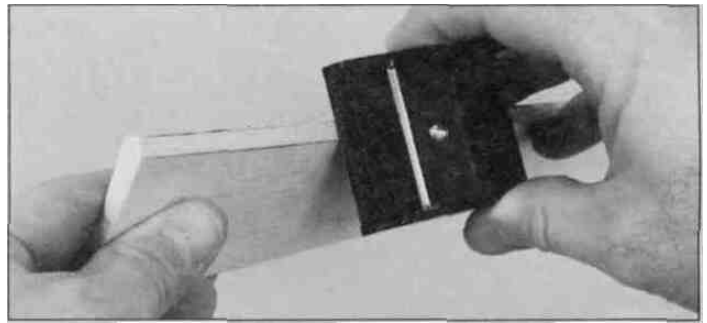
❑ 1. Refer to the Expert Tip that follows and shape the LE of the elevators and rudder to a "V" shape as shown on the plan.



HOW TO BEVEL THE LEADING EDGE

A. Place the leading edge of one of the elevators on your work surface and use your ballpoint pen to mark a "bevel to" line on both sides about 1/8" high.

Note: You will probably have to adjust the height of the elevator with card stock (as you did while marking the centerline) so your "bevel to" line is not too high - making too sharp of a "V."



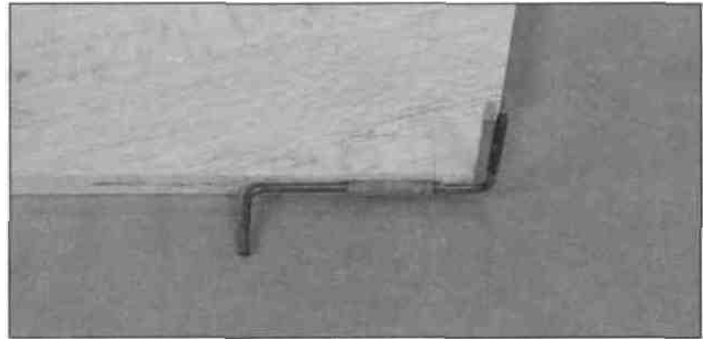
B. Using the bevel to lines and the centerline as a guide, make the "V" on the leading edge of the elevators with a razor plane or your bar sander.

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

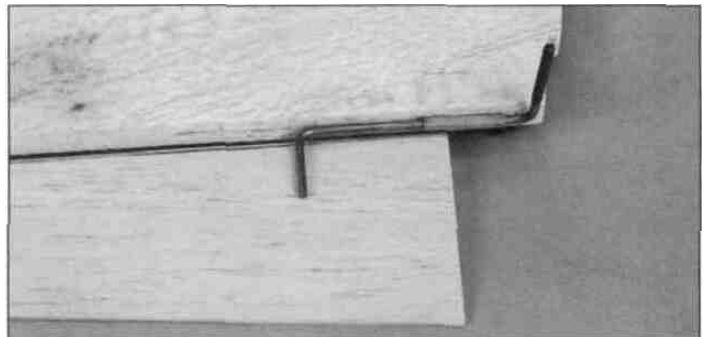
❑ 3. Draw a centerline on the LE and tip of the stabs, and on the fin's LE and tip. Sand a radius on the edges as shown on the plan using the centerline as a guide to keep the radius symmetrical. **Do not** round the TE of the stab or fin.

Fit the Torque Rods

❑ 1. Position the stabs over the fuselage top view. Mark the location of the torque rod bearings on the stabs.



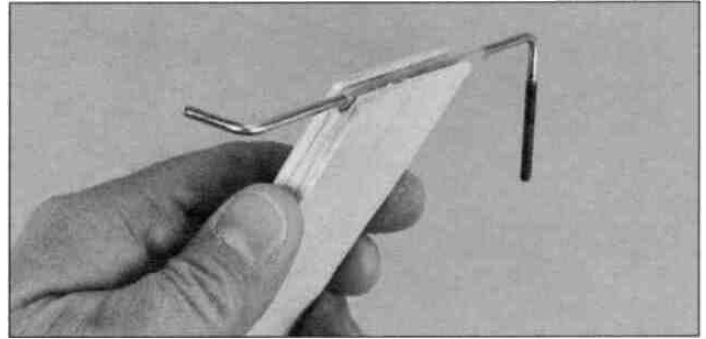
❑ 2. Cut a slot in the TE of the stabs for the tab on the torque rod bearings. Temporarily install the torque rods in the stabs.



❑ 3. With the stabs positioned on the plan, **align** the elevators and mark the location of the torque rods.

❑ 4. Drill a 3/32" pilot hole, into the elevator LE, at the centerline and torque rod mark. As you drill the holes keep the drill aligned with the top and bottom surfaces of the elevator. Enlarge the holes with a 1/8" drill.

❑ 5. Cut a 1/8" groove in the leading edge of both elevators to recess the joiner wire (see expert tip that follows).

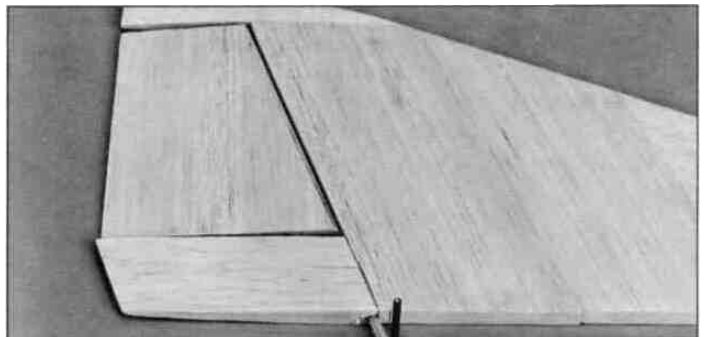


❑ 7. Mark the centerline on the LE of the shaped 3/8" balsa **lower fin extension**. Cut a groove along the centerline for the rudder torque rod bearing. The groove must be deep enough to encase the torque rod bearing.

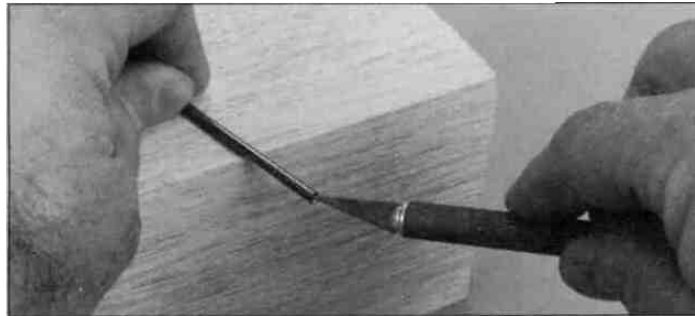
❑ 8. Roughen the torque rod bearing with 80-grit sandpaper. Insert the bearing in the groove in the LE of the lower fin extension and glue the extension to the TE of the fin, as shown on the plan.

❑ 9. Position the fin and rudder over the plan and mark the location of the rudder torque rod.

❑ 10. Drill and groove the rudder LE for the rudder torque rod, following the same procedure used previously **for** the elevator.

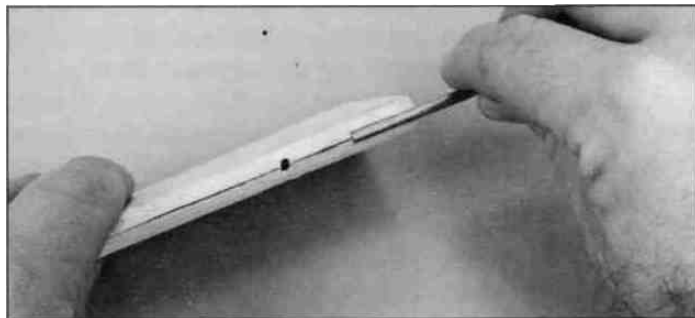


❑ 11. Sand a taper on the lower fin extension using the rudder as a guide.

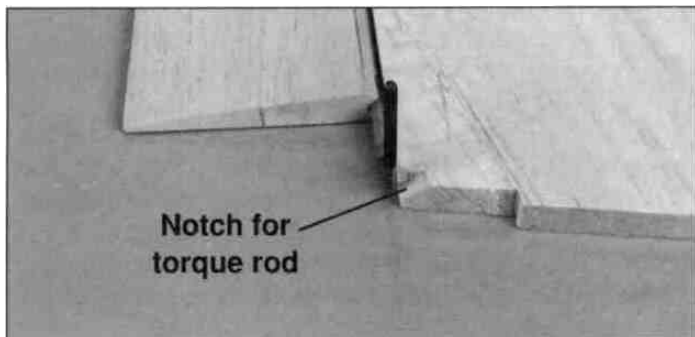


HOW TO CUT A GROOVE FOR A TORQUE ROD

A. Use a hobby knife to sharpen the inside of a piece of 1/8" brass tube. Roll the tube as you carve the end.



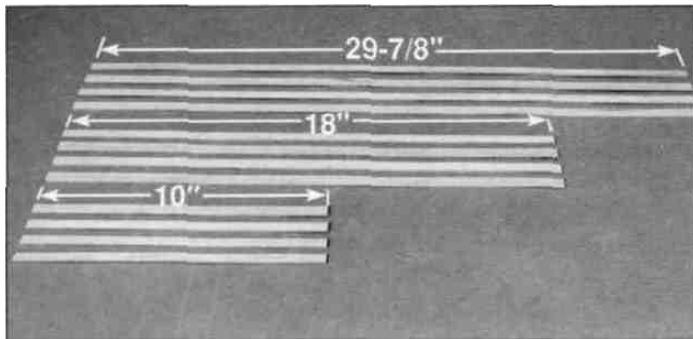
B. Use the sharpened tube to carefully gouge the leading edge. You'll have to make a few cuts to make the recess deep enough for the torque rod.



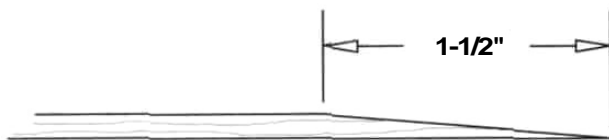
❑ 6. Cut a notch in the stab TE to allow the torque rod to pivot freely.

BUILD THE WING

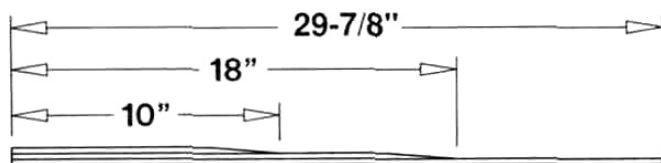
Wing Preassembly



- ❑ 1. Cut **four** of the 1/8" x 3/8" x 29-7/8" basswood **spars** to 18" long **sub spars**. From the remaining 1/8" x 3/8" x 29-7/8" basswood spars cut **four**, 10" long **sub spars**. Save the leftover spar material for use later.

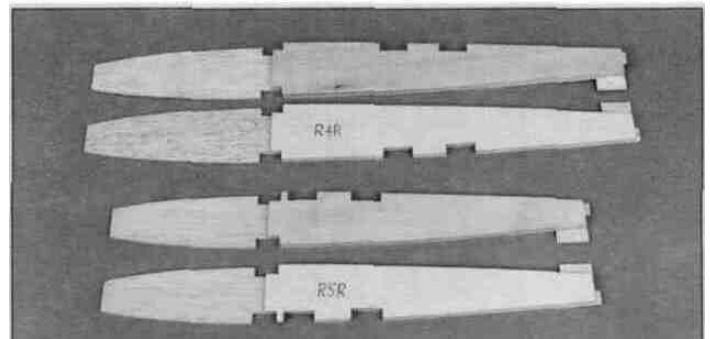


- ❑ 2. Sand a 1-1/2" long taper on one end of each 10" and 18" long sub spar.



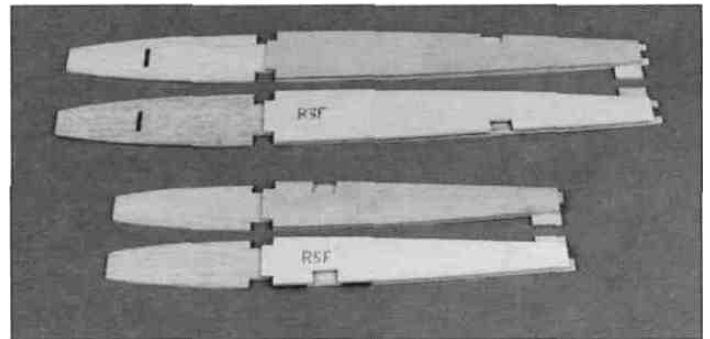
- ❑ 3. Make four **main spars** by gluing a 29-7/8", 18" and 10" sub spar together with medium or thick CA. Make sure the sides and square ends are flush.

Note: Be sure the spars are flat and straight.

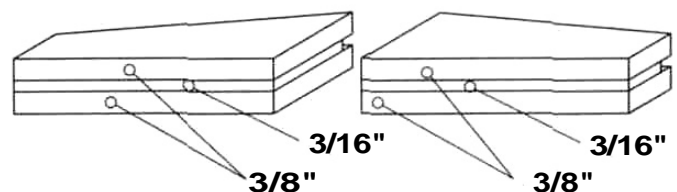


Retract Gear

- ❑ 4. Skip to **step 5** if you are **not installing** retracts. If you chose to install retracts, use 30-minute epoxy to glue the die-cut 1/8" plywood **rib doublers R-4R** to the die-cut 1/8" balsa **ribs R-4** and the die-cut 1/8" plywood **rib doublers R-5R** to the die-cut 1/8" balsa **ribs R-5**. **Be sure to make a right and left of each rib assembly.**



- ❑ 5. **Skip this step if installing retracts.** Use 30-minute epoxy to glue the die-cut 1/8" ply **rib doublers R-3F** to the die-cut 1/8" balsa **ribs R-3** and the die-cut 1/8" ply **rib doublers R-5F** to the die-cut 1/8" balsa **ribs R-5**. **Be sure to make a right and left of each rib assembly.**
- ❑ 6. Cut notches in the balsa ribs to match the notches in the plywood rib doublers. If installing the fixed landing gear, also cut the notch at the TE of R-3.
- ❑ 7. Use 30-minute epoxy to glue the die-cut 1/8" balsa **ribs R-1** together.

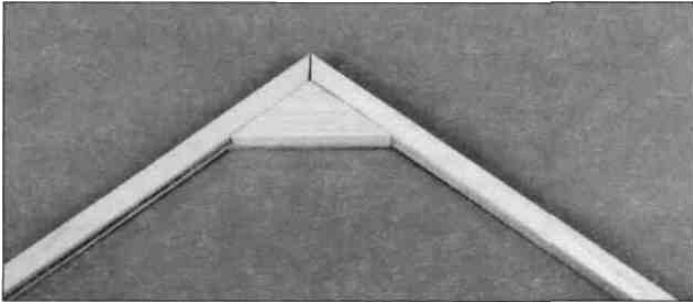


- ❑ 8. Make the center TE plates by using 30-minute epoxy to glue a shaped 3/16" balsa **center plate** between a shaped 3/8" and 1/2" balsa **top and bottom center plate**. Make sure to align the ends and the long straight edge. This will produce a notch at the front for the aileron torque **rods**. Make two center TE plates.

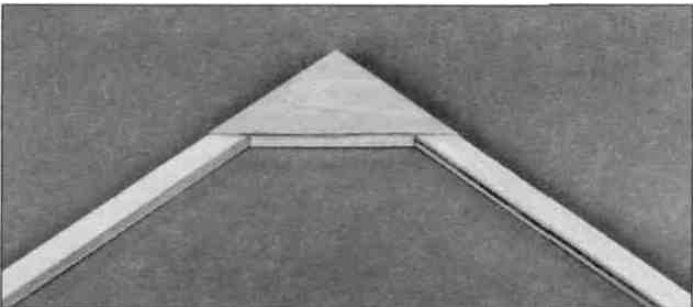
Build the Main Wing Panel

The main wing is built as one assembly, upside down over the wing plan.

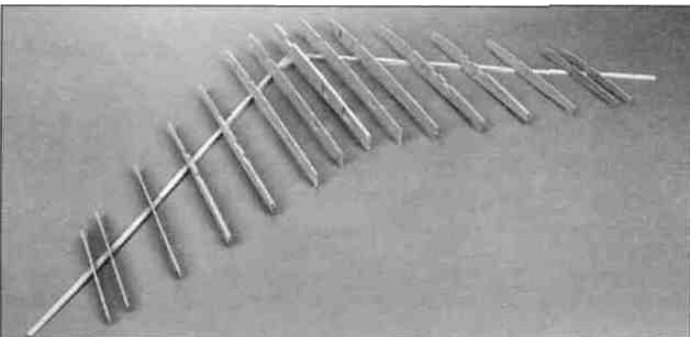
1. Cover the wing plan with wax paper or Great Planes Plan Protector. Trim the 3/8" x 3/8" end of two main spars to the angle shown on the plan. Use 6-minute epoxy to glue the ends of two of the main spars together. Pin the main spars (longest spar against the building board) over the wing plan.



2. Glue the shaped 3/8" balsa **spar joiner** to both main spars with 30-minute epoxy.

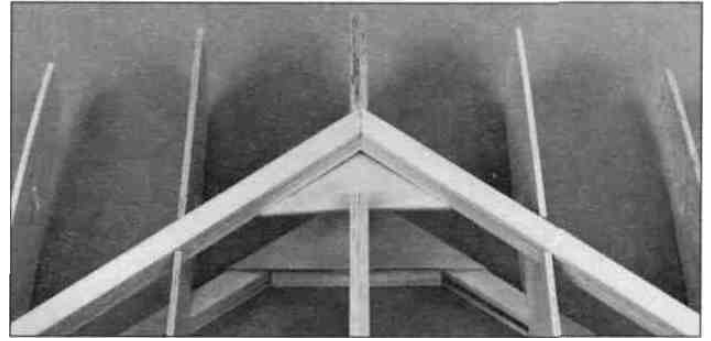


3. Use 30-minute epoxy to glue the die-cut 1/16" plywood **center plate** over the main spars and the spar joiner.



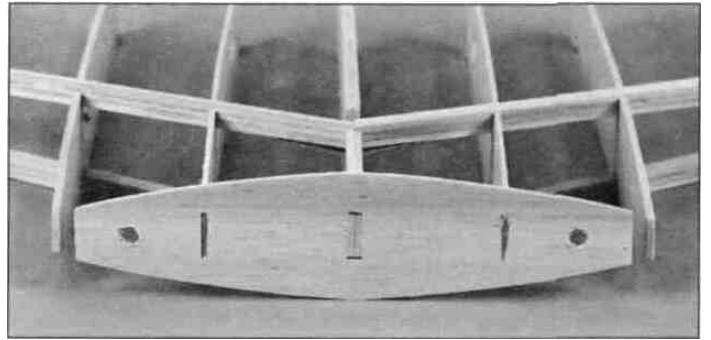
4. Pin the die-cut wing ribs **R-1, R-2, R-3, R-4, R-5, R-6, R-7** and **R-8** in position over the main spar, perpendicular to the building board. The notches in the ply rib doublers will need to be enlarge slightly to allow the main spars to fit. **Do not** glue the ribs until instructed to do so.

Note: The jig tabs should be contacting the plan. Use **small** T-pins to pin the **aft jig tabs** to the building board over their location on the plan.

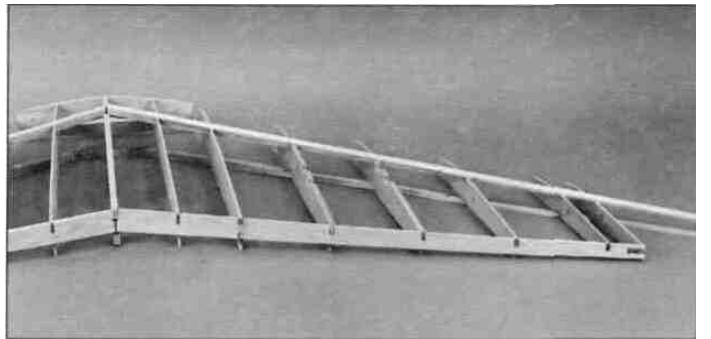


5. Insert the 1/16" plywood center plate in the notch in rib R-1. Trim the 3/8" x 3/8" end of the two remaining main spars, at an angle, so they fit against each other similar to the top spars (remember the wing is built upside down). Also, check that the spar is flush with the bottom edge of the wing ribs.

6. Fit the balsa spar joiner between the bottom main spars, in the notch of ribs R-1.



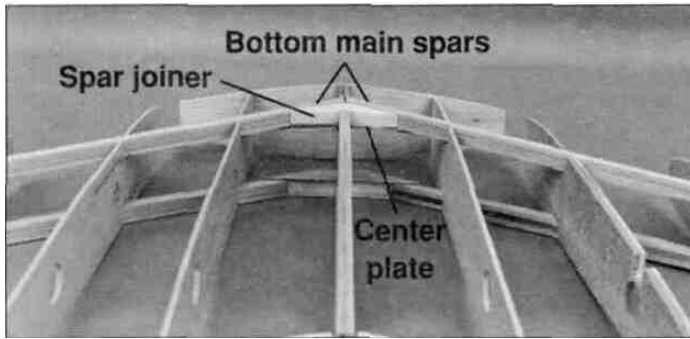
7. Test fit the die-cut 1/8" balsa **sub front cap** to the front of ribs R-1 and R-2.



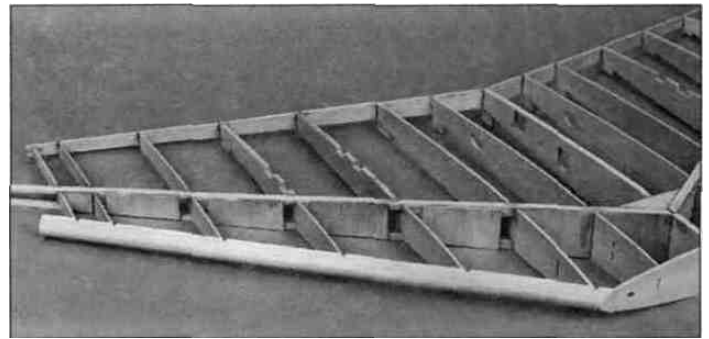
8. Test fit the die-cut 1/8" balsa **sub trailing edge** to the aft end of the ribs. The root end of the sub TEs will need to be beveled for a good butt joint.

9. Make sure the top main spar, wing ribs and jig tabs are securely pinned to your building board. Glue the ribs perpendicular to the top main spar.

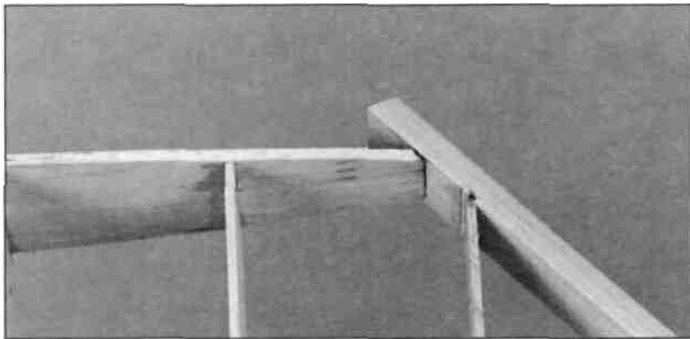
10. Use a straightedge and building square to keep the parts straight and perpendicular as you glue the balsa sub front cap to the front and the sub trailing edge to the aft end of the ribs.



11. Use 30-minute epoxy to glue the center plate in the notch of rib R-1, bottom main spars and spar joiner. Place a piece of wax paper over the assembly at rib R-1 and weight the bottom main spars down. While the epoxy is still wet, use thin CA to glue the bottom main spars to the ribs starting at rib R-8 and working toward R-2. The bottom main spar should be flush with the bottom of the wing ribs, and the center plate will be bent down slightly on each side of ribs R-1.

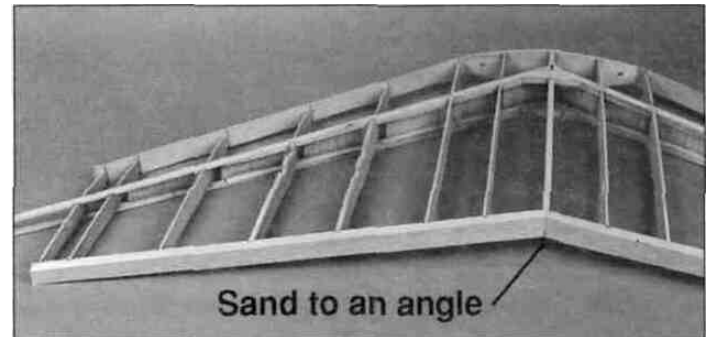


15. Trim and glue $3/32" \times 2-1/4" \times 3"$ balsa **shear webs**, perpendicular to the front of the main spars. The shear webs must be glued securely to the main spars.



12. Sand the ends of the balsa sub front cap to match the sweep of the wing. Test fit the shaped balsa **leading edge** on the front of the wing ribs. The sub front cap will need to be sanded an additional $1/16"$ to compensate for the ribs in the notches of the LE. Make sure that the LE is straight.

16. Sand the aft end of the wing ribs flush with the sub TE.



17. Sand the larger ends of the shaped balsa **trailing edges** to match the angle at ribs F-1. Glue the trailing edges flush with the top and bottom of the sub TE.



13. Glue the LE, centered on the front of the ribs. Start by gluing at rib R-8 working toward R-3.

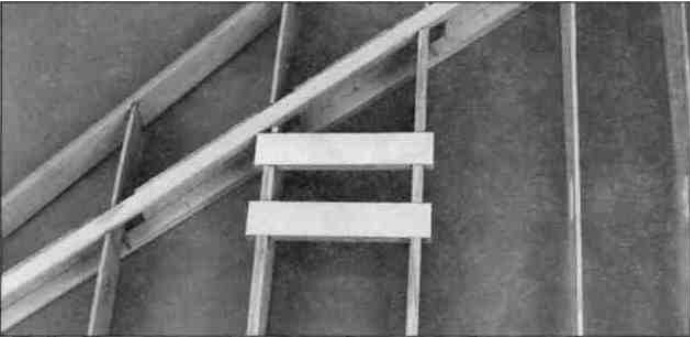
14. Sand the LE flush with the front of the sub cap.



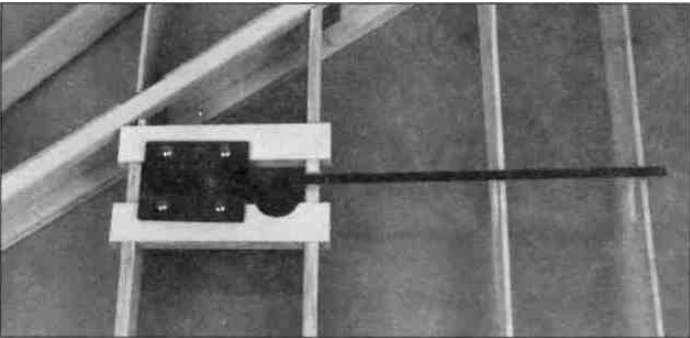
18. Use 6-minute epoxy to glue the die-cut $1/8"$ plywood **wing dowel braces** into the slot in ribs R-2 and R-3.

Install the Landing Gear Blocks

Perform steps 1 and 2 only if installing retracts

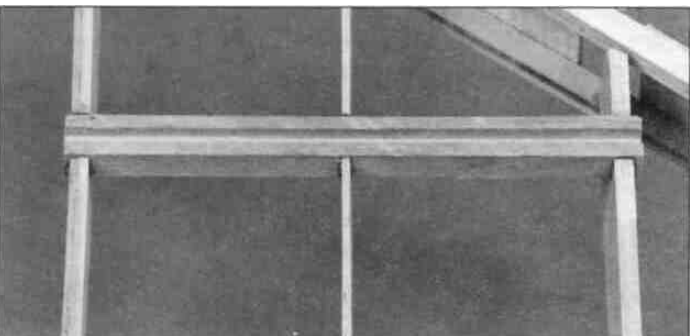


- ❑ 1. Use 30-minute epoxy to glue the 1/4" x 3/4" x 3-5/8" plywood **retract mounting plates** into the notches in ribs R-4 and R-5. Before the epoxy cures, glue the 5/8" hardwood landing gear gussets under the front mounting plates against ribs R-4 and R-5.

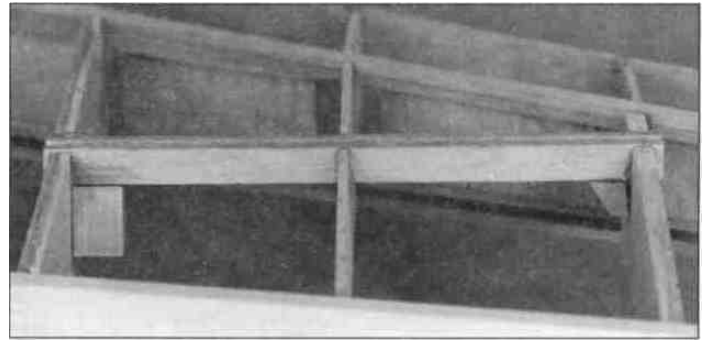


- ❑ 2. Fit the retract mechanism in place, trimming the plywood mounting plates as required to allow the retract to operate properly. Drill 3/32" pilot holes for the retract mounting screws and temporarily mount the retracts on the plywood mounting plates with four #4 x 3/8" sheet metal screws (not included).

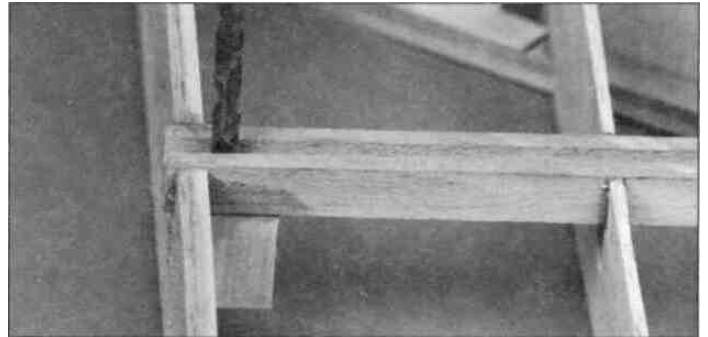
Perform steps 3 though 6 only if installing fixed gear



- ❑ 3. Place the 3/8" x 5/8" x 7-3/8" hardwood **main landing gear blocks** in the notches in ribs R-3 and R-5. Mark and cut a notch in ribs R-4. Use 30-minute epoxy to glue the main landing gear blocks into the notches, with the groove facing **away** from the building board.



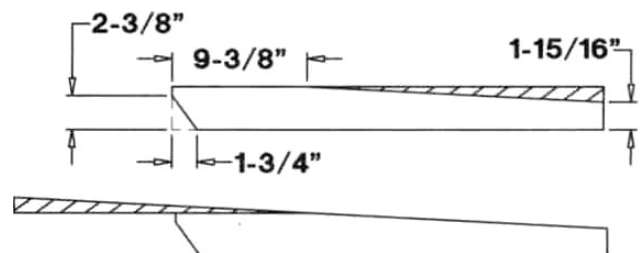
- ❑ 4. Use 30-minute epoxy to glue the 1/2" x 5/8" x 3/4" hardwood landing gear **torque blocks** to the top side of the main blocks and the plywood sides of rib R-3. Glue the 5/8" hardwood **landing gear gussets** to the main block and the plywood sides of rib R-5.



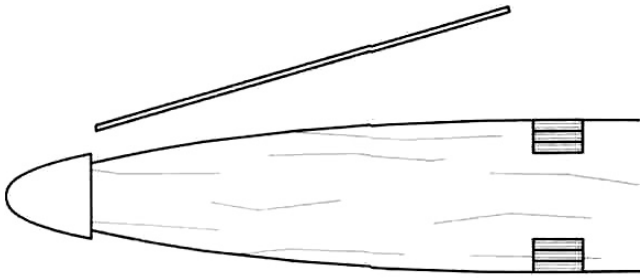
- ❑ 5. Drill a 13/64" hole through the main landing gear blocks and torque blocks as shown on the plan. This hole must be drilled perpendicular to the main landing gear blocks.
- ❑ 6. Fit the 3/16" main landing gear **struts** into the blocks and fill the unused portion of the slot at each end of the main landing gear blocks with leftover balsa. Remove the strut.

Sheet the Bottom of the Wing

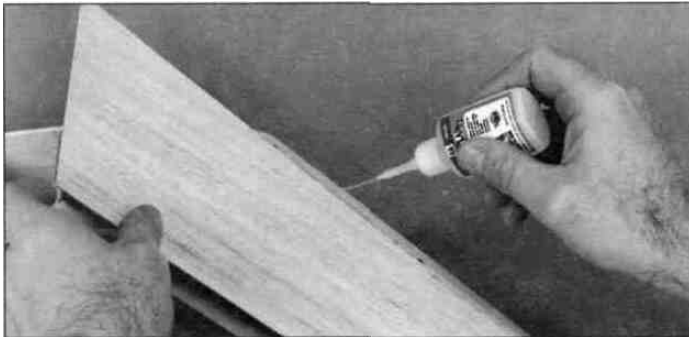
- ❑ 1. Check all of the glue joints, adding glue where needed.
- ❑ 2. Sand the bottom of the wing ribs, shear webs, main spars and TE flush.



- ❑ 3. Cut and glue four 1/16" x 4" x 30" balsa sheets, as shown in the sketch, to make the **top** and **bottom LE sheets**.



❑ 4. Test fit the LE wing sheet on the wing. Sand a slight bevel on the front of the sheet. The aft edge of the sheet should cover the forward half of the main spar and the root end should cover one of the R-1 ribs.

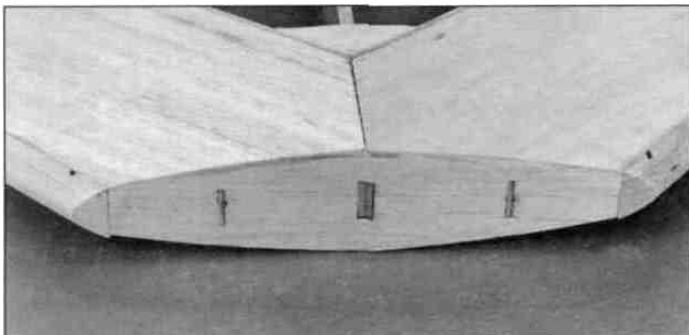


❑ 5. Remove any pins that are holding the wing to the building board in front of the main spar. You may need to set weight on the wing to keep the main spars flat against the building board. Position the front of the LE sheet against the LE and glue it in position with thin CA.

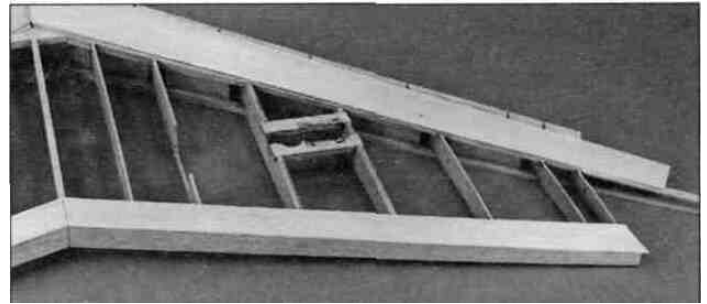
❑ 6. Carefully lift the sheet away from the ribs and apply a bead of medium or thick CA to the top of the ribs. Working quickly, pull the sheet back toward the main spar as you press it down against the ribs and the main spar.

❑ 7. Use thin CA to glue the sheet to the main spar and sub front cap.

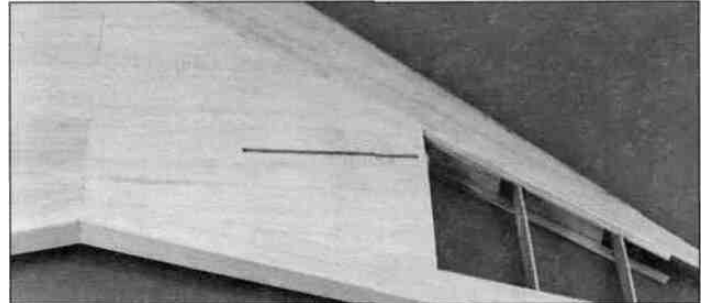
❑ 8. Fit and glue the second LE sheet to the other wing panel, following the same procedure.



❑ 9. Trim and sand the LE sheet flush with the front of the sub front cap.



❑ 10. Sand the TE to match the angle of the ribs. Glue two 1/16" x 1-1/2" x 24" **TE sheets** to the TE, sub TE and the bottom of the ribs.

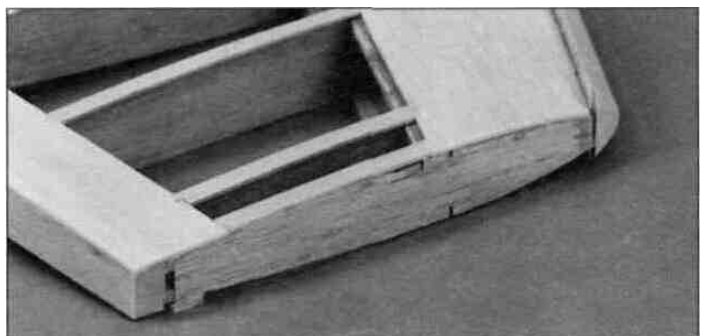


❑ 11. Sheet the bottom center section of the wing, from the center of ribs R-1 to R-5, using 1/16" x 3" x 30" balsa sheets. Repeat the process to sheet the center section on the other half of the wing bottom.



❑ 12. From the 1/16" x 3/8" x 30" balsa stick, cut and glue **cap strips** to the bottom of ribs R-6, R-7 and R-8. The edge of the cap strip on R-8 should be flush with the side of the rib.

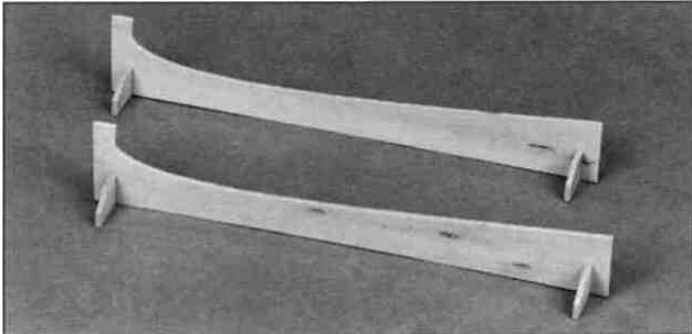
Hint: A single-edge razor works well for this type of cutting.



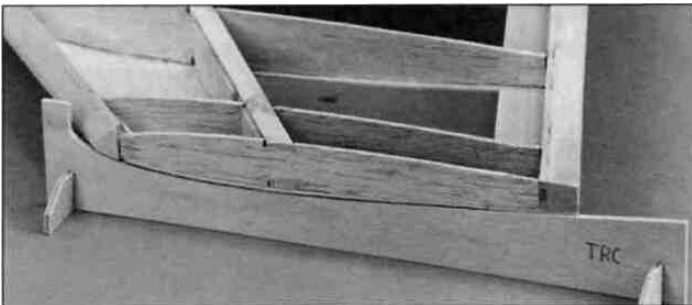
❑ 13. Remove the wing from your building board. Cut and sand the LE, TE, main spars and bottom sheeting flush with the side of rib R-8.

Sheet the Top of the Wing

- ❑ 1. Use a hobby knife and sanding bar to remove the jig tabs on the top of the ribs. Sand the TE, main spars, shear webs and the top of the ribs flush. Sand the LE flush with the bottom forward wing sheeting at rib R-8 **only**.



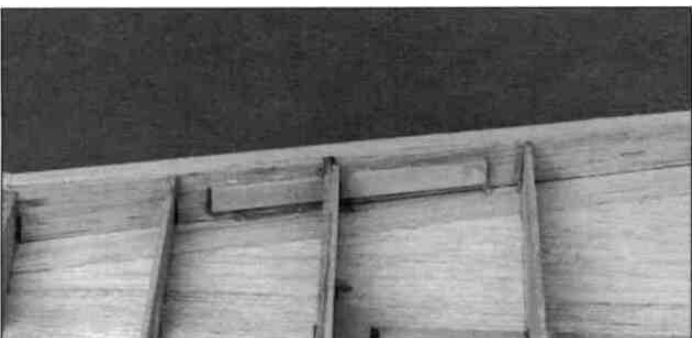
- ❑ 2. Assemble the two die-cut 1/8" plywood wing crutches by inserting the **crutch bases** in the slots in the **main tip crutches (MTC)**.



- ❑ 3. Position the wing on your building board with the main tip crutches under the wing tips at ribs R-8.

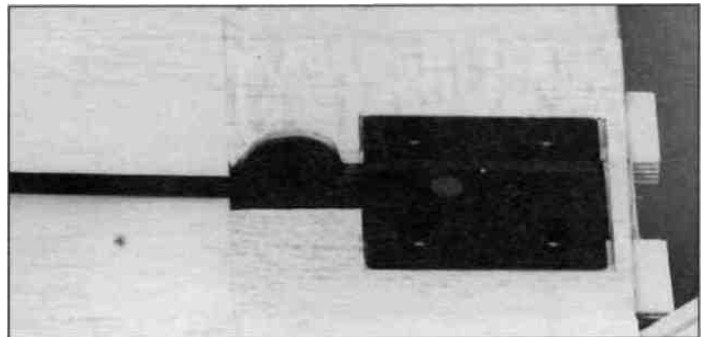
- ❑ 4. Place enough weight on the wing to keep the main spars in contact with the building board at rib R-1 and ribs R-8 seated in the crutch. Glue the top LE sheeting in position following the same procedure used for the bottom LE sheeting. **Remember**, you previously made the LE sheeting when you sheeted the bottom of the wing.

- ❑ 5. Trim and sand the LE sheeting flush with the front of the sub front cap.

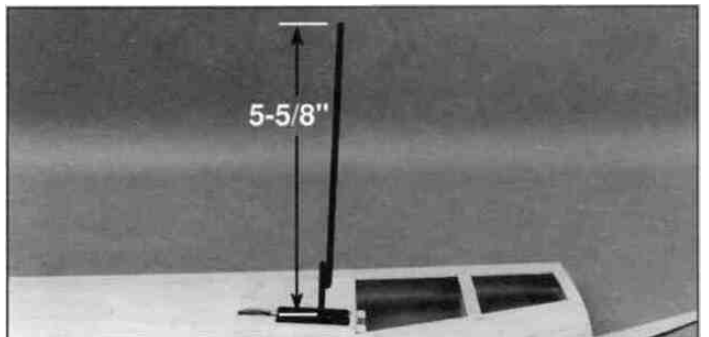


- ❑ 6. Make the two sub TE reinforcements from the leftover 1/8" x 3/8" main spars. Use 6-minute epoxy to glue the reinforcements in the slot in rib R-3 and the sub TE.

Perform steps 7 through 14 only if installing retracts

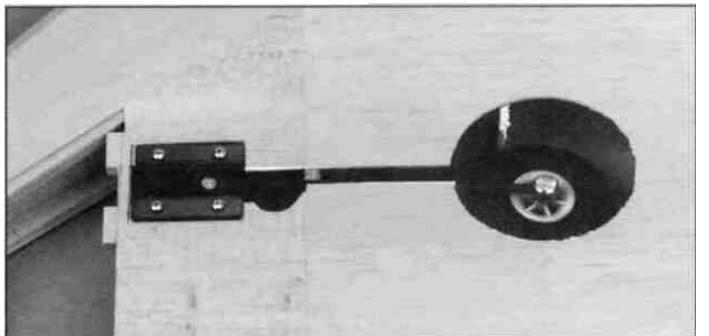


- ❑ 7. From the top of the wing, use T-pins to locate the main gear retract blocks. Trim the sheeting to fit around the retracts.

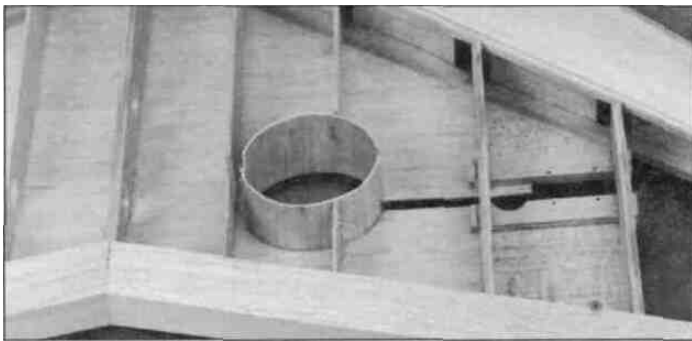


- ❑ 8. Measure and cut the main retract struts **5-5/8" long** (measured from the surface of the wing).

- ❑ 9. Mount the retracts in the wing with #4 x 1/2" sheet metal screws (not included). If you are using Robert Retracts, install a 1-1/4" x 3/16" adjustable axle (not included, GPMQ4282), 2-1/2" main wheel (not included, GPMQ4223) and 3/16" wheel collars (not included, GPMQ4308). The use of various brands of retracts may require different or additional hardware. Before tightening the set screws, check that there is no toe-in or toe-out when the retracts are extended.



- ❑ 10. Slowly retract each strut and wheel, cutting away the bottom sheeting and ribs for clearance. Enlarge the wheel well to 3", keeping the hole **centered** on the wheel.



❑ 11. The wheel well liners can be made from foam or paper cups of the proper size, or from vertical grain 1/16" balsa sheeting wrapped around an appropriately sized glass jar and glued to form a cylinder. Glue the wheel wells in place and sand the edges flush with the top of the ribs and the bottom sheeting.

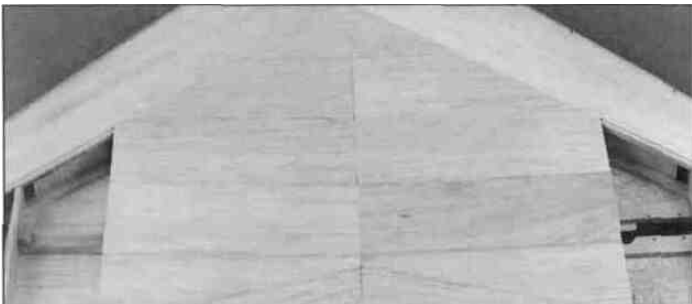
❑ 12. Cut a groove in rib R-2 and the wheel well liner for the retract actuating rod to pass through. Thread a **nylon clevis** (not included, GPMQ3800) 13 turns onto the end of a 2-56 x 12" wire **pushrod** (not included, GPMQ3750).



❑ 13. Connect the clevis to the retract. Bend the retract pushrod to clear the wheel and be below the top of the ribs. Avoid making **sharp bends**. Remember, the pushrod will need to be installed after the top sheeting is installed.

❑ 14. Remove the retracts from the wing.

❑ 15. Fit and glue the 1/16" x 1-1/2" x 24" TE sheet to the TE, sub TE and the top of the ribs.

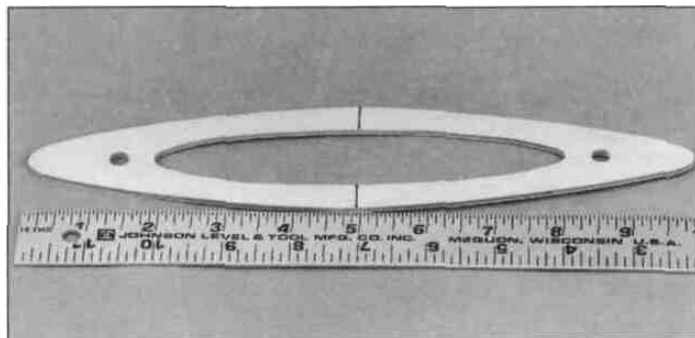


❑ 16. Sheet the right top center section of the wing from the center of ribs R-1 to R-4 using 1/16" x 3" x 30" balsa sheets. Before sheeting the top left center section, mark the location for the aileron and retract servo trays on the top right center sheeting.

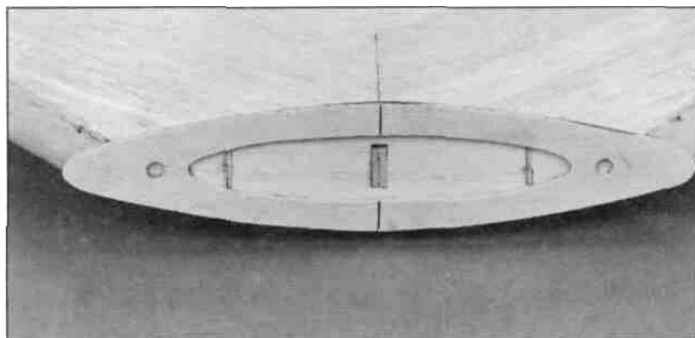
❑ 17. From the 1/16" x 3/8" x 30" balsa stick, cut and glue cap strips to the top of ribs R-5, R-6, R-7 and R-8. The edge of the cap strip on R-8 should be flush with the side of the rib.

❑ 18. Trim and sand the LE and TE sheeting flush with the side of rib R-8.

Complete the Wing Middle Section



❑ 1. Draw a centerline on the die-cut 1/8" plywood **front cap**.

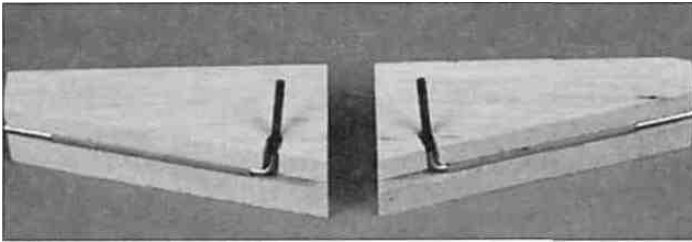


❑ 2. Use 30-minute epoxy to glue the front cap to the front sub cap. Use the centerlines on the front cap as guides to center it on the front sub cap.



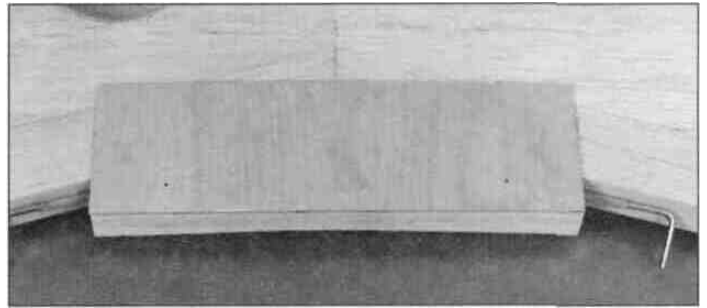
❑ 3. Use 30-minute epoxy to glue the die-cut 1/8" plywood

❑ 4. Sand all the edges even on the center TE plate and the TE of the wing.

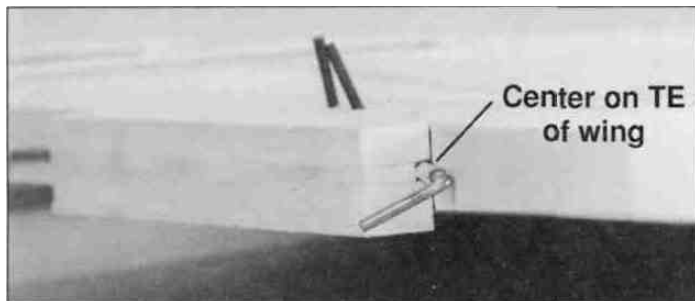


❑ 5. Check the fit of the **aileron torque rods** in the slot at the front of the center TE plate. Position the plates over the wing plan. Mark and cut notches in the 3/8" center plate, to allow the torque rods to pivot. Test fit the center TE plates on the TE of the wing. Sand an angle at the joint between the two plates so that the plates align with the wing.

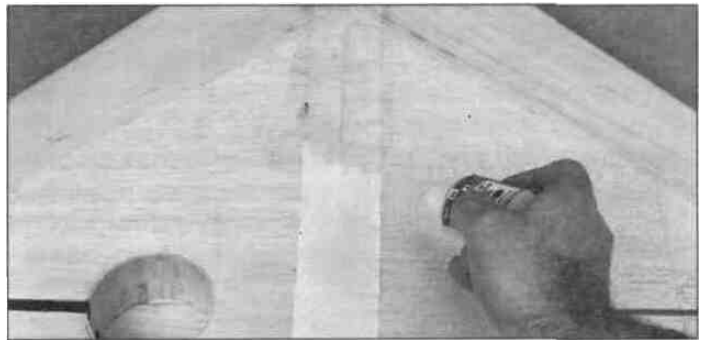
❑ 10. Give the wing an overall rough sanding to blend the sheeting and cap strips together.



❑ 11. Use 30-minute epoxy to glue the die-cut 1/16" plywood **wing bolt plate** to the bottom of the wing, flush with the aft end and sides of the center TE plate. Use clamps or weight to hold the bolt plate tight against the wing.

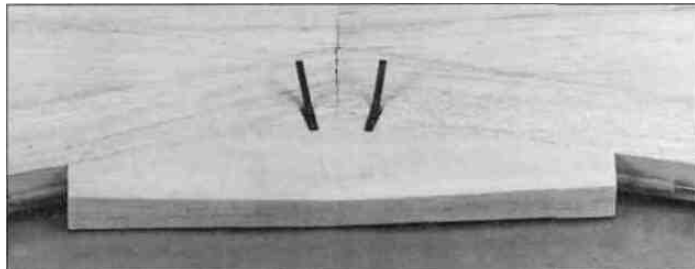


❑ 6. Roughen both torque rod tubes and apply a dab of petroleum jelly to the exposed wire. Use **6-minute epoxy** to glue the torque rod tubes in the slot at the front of the center TE plates. Before the epoxy cures, glue the center TE plates to the TE of the wing with the torque rods centered on the TE of the wing.



❑ 7. Extend the torque rod exit slots into the TE of the wing.

❑ 12. Apply 2" wide fiberglass cloth to the top and bottom center of the wing. We prefer to adhere the cloth with thin CA to save weight, but resin or thinned epoxy will work well. Read the following Expert Tip on applying fiberglass cloth.



❑ 8. Trim and sand the center TE plate flush with the top and bottom TE sheeting.



Applying Fiberglass Cloth



❑ 9. Use the die-cut 1/8" plywood **wing LE gauge** to sand the LE to shape. The gauge is held against the LE parallel to the ribs. Note that the gauge has a root and a tip shape.

A. Center one end of the fiberglass cloth on the LE of the wing. Apply several drops of thin CA to hold the cloth in place.

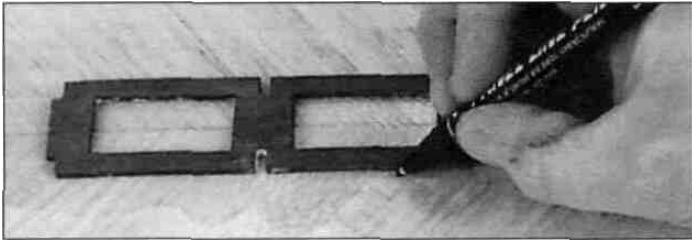
B. Roll the loose end on a pencil. Use the pencil as a handle to stretch the cloth over the wing toward the TE. Apply a few drops of thin CA to hold the cloth tightly in position.

C. Make a squeegee by wrapping a 2" wide piece of stiff cardboard with a plastic sandwich bag or similar material.

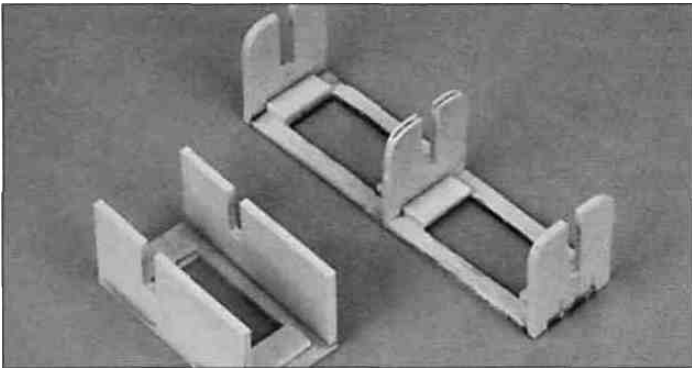
Perform the following operation in a well ventilated area with a fan directing the air flow away from you.

D. Starting at the LE, **flow** thin CA into the cloth. Smooth the cloth down with the squeegee as you work toward the TE. Avoid standing directly over the work, as the CA fumes can be quite irritating to your eyes and nose.

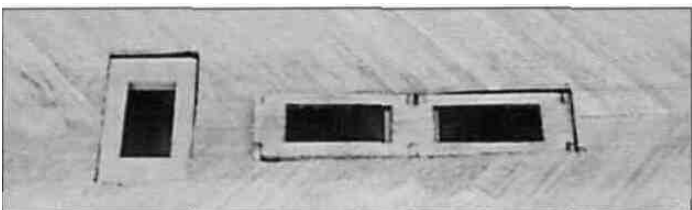
E. Allow the CA to cure naturally **without using any accelerator**. When thoroughly cured, lightly sand the edges with 150-grit sandpaper to remove any edges.



13. Place the die-cut 1/8" plywood **aileron servo tray** on top of the marks you made in step 16 of **Sheet The Top Of The Wing**. Mark the outside perimeter of the tray and cut the wing sheeting from inside the lines. If you are installing mechanical retracts, perform the same procedure for the retract servo tray. If you are installing pneumatic retracts, the control valve and mini servo are installed in the fuselage.



14. Glue the die-cut 1/8" plywood **aileron servo tray supports** to the middle and ends of the aileron servo tray. Make sure the supports are perpendicular to the tray. Glue the servo tray doublers against the supports. If installing retracts, glue the die-cut 1/8" **plywood retract servo tray supports** to the side of the die-cut 1/8" **plywood retract servo tray**. Glue the servo tray doublers flush with the end of the servo cut-out.

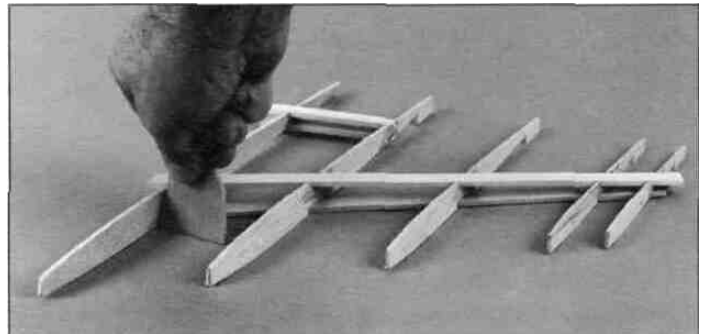


15. Trim the balsa from over the servo locations in ribs R-1. Glue the servo trays to the ribs.

Build the Wing Tips

1. From a 1/8" x 3/8" x 23-7/8" balsa spar cut the **forward** and **aft bottom main spars** slightly longer than the lengths shown on the wing tip plan. Use the cross-pinning technique to pin the root of the forward main spar over the wing plan. Place a leftover piece of 1/16" balsa sheet under the tip of the main spar to raise the spar to meet the notch in the rib. Pin the spar to the building board. Use leftover balsa to raise the aft spar to meet the notches in the rib. Pin the aft spar to the building board.

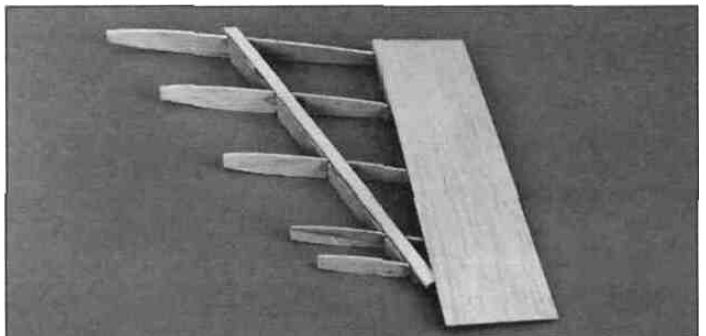
2. Pin the die-cut 3/32" balsa **ribs T-3** through **T-6** over the plan, perpendicular to the building board.



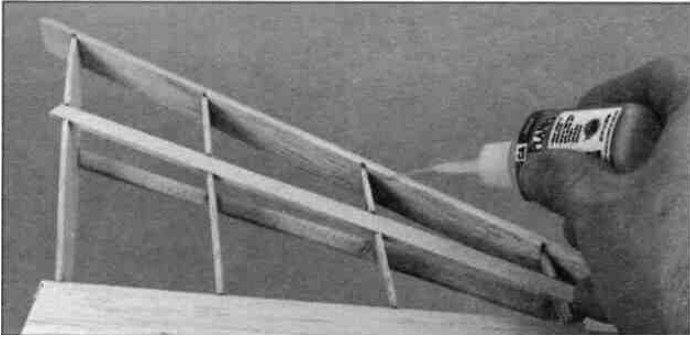
3. Cut the **forward** and **aft top spars** from a second 1/8" x 3/8" x 23-7/8" balsa stick. Position the forward spar on the ribs. Use the die-cut 1/8" plywood **rib gauge** to set the angle of rib T-2. Place the gauge between ribs T-2 and T-3 with the base against the bottom of rib T-2. With the remaining ribs perpendicular to the building board and the spars seated in the notches, glue the top and bottom spars to the ribs.

4. Trim and glue the 3/32" x 2-1/4" x 3" balsa **shear webs**, perpendicular, to the front of the forward main spars.

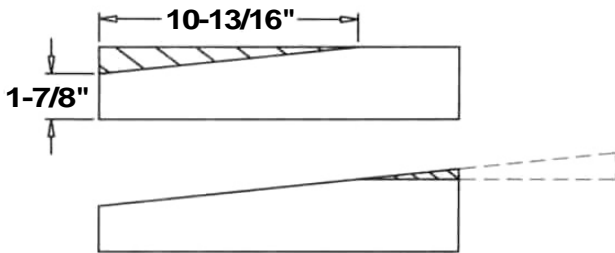
5. Move any pins from behind the aft main spars to in front of the aft main spars to hold the jig tabs against the building board.



6. From a 1/16" x 3" x 30" balsa sheet, cut a 12" long **TE sheet**. Glue the TE sheet to the aft end of the wing tip, starting at the front of the aft main sub spar.

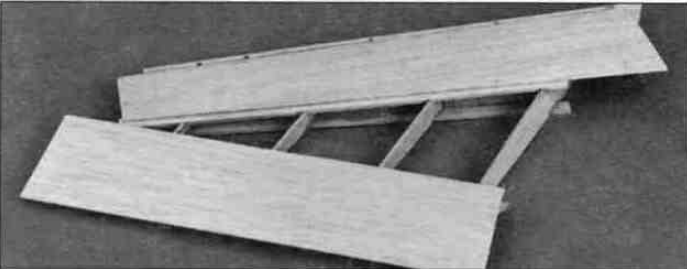


- □ 7. Remove the wing tip from the building board. Glue the shaped balsa LE, centered on the front of the ribs. The notch for rib T-2 will need to be modified to match the angle of T-2. Be careful not to twist the wing tip.

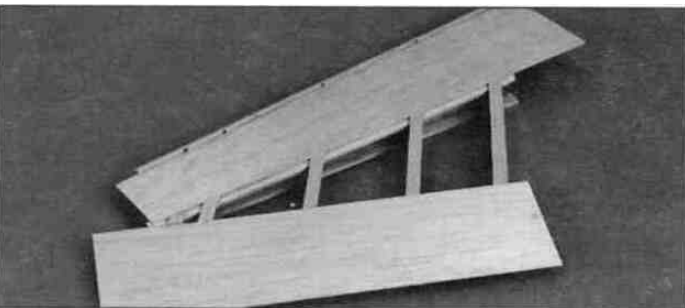


- □ 8. Cut a 1/16" x 3" x 29-7/8" balsa sheet in half. Follow the sketch to make a top and bottom LE sheet out of each half.

- □ 9. Sand a slight bevel on the front of the LE tip sheet. Trim the aft edge of the sheet so that it covers the forward half of the forward main spar. Position the front of the sheet against the LE and glue it in position with thin CA.



- □ 10. Carefully lift the sheet away from the ribs **and** apply a bead of medium or thick CA to the top of the ribs. Working quickly, pull the sheet back toward the forward main spar as you press it down against the ribs and glue it to the forward main spar.



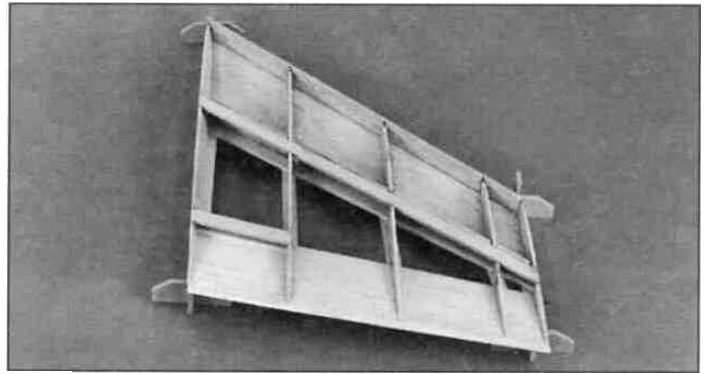
- □ 11. From a 1/16" x 3/8" x 30" balsa stick, cut and glue cap strips on the top of the ribs from the LE to the TE

sheet. The cap strips on ribs T-2 and T-6 are flush with the outside of the ribs.

- □ 12. Trim the LE, LE sheet, spars and TE sheet close to the sides of ribs T-2 and T-6. Sand the LE flush with the top LE sheet.

- □ 13. Remove the crutch bases from the main tip crutches. Install the crutch bases on the die-cut 1/8" plywood **tip root crutch (TRC)** and **tip tip crutch (TTC)**.

Note: The forward crutch base on the TTC will need to be trimmed to allow the wing tip to seat against the crutch without touching the base.



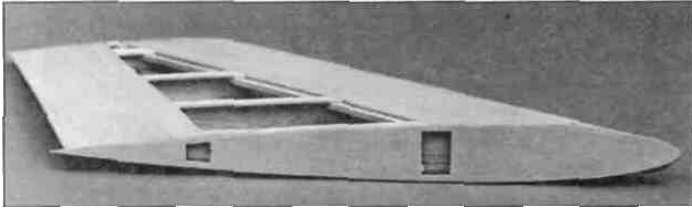
- □ 14. Remove the jig tabs from the bottom of the ribs. Sand the ribs and spars flush. Sand the TE sheet that extends past the ribs to the same angle as the ribs. **Do not** sand the LE.

- □ 15. Position the wing tip in its crutch with the bottom of the wing tip facing up. Weight the wing tip down and follow the same procedure to glue the LE sheet, as in step 10, to the wing tip.

- □ 16. From the remaining 1/16" x 3" x 30" balsa sheet, cut a 12" long piece to make the TE sheet. Glue the TE sheet to the aft end of the wing tip ribs and bottom TE sheet, starting at the front of the aft main sub spar.

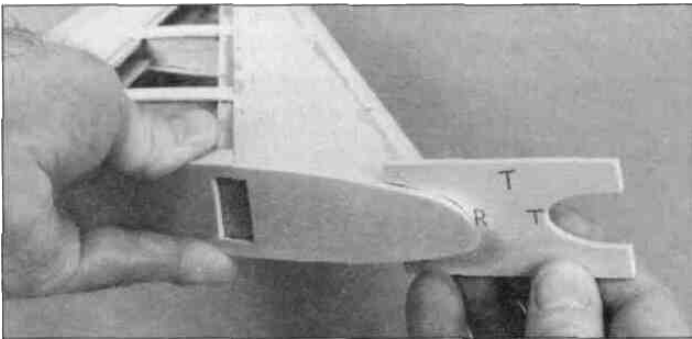
- □ 17. From the remaining 1/16" x 3/8" x 30" balsa stick, cut and glue cap strips on the top of the ribs from the LE to the TE sheet. As before, the cap strips on ribs T-2 and T-6 are flush with the outside of the ribs.

- □ 18. Sand the LE, LE sheet, spars and TE sheet flush with the sides of ribs T-2 and T-6.



19. Use 30-minute epoxy to glue the die-cut 1/8" plywood ribs **T-1** to **T-2** and **T-7** to **T-6**. Position the ribs so that they **overhang** slightly at the LE and TE. The overhang will allow the ribs to be sanded flush with the LE and TE.

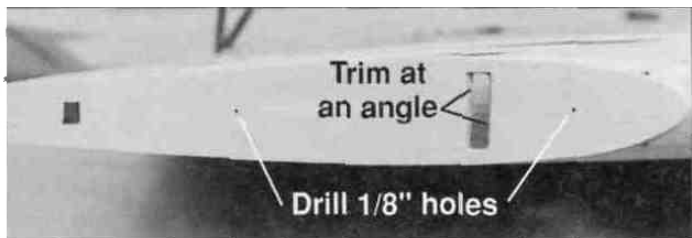
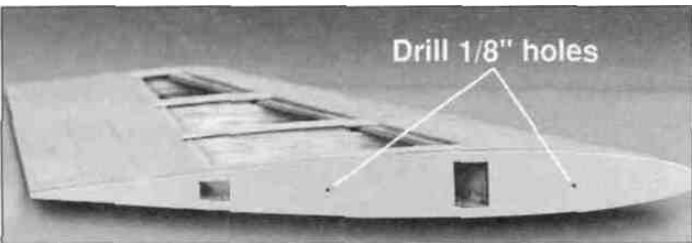
20. While you are waiting for the epoxy to cure, go back to step 1 and build the other wing tip. Make sure to build it over the **opposite** wing tip plan.



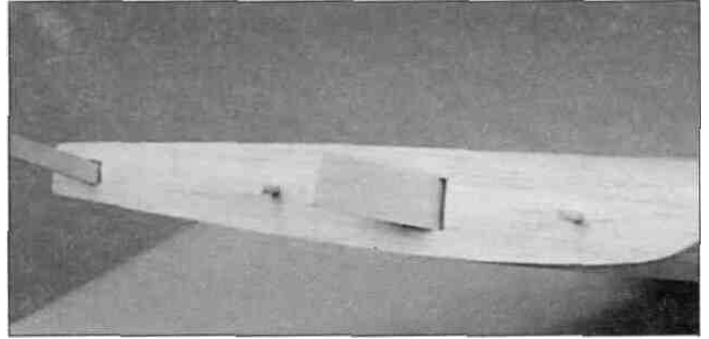
21. Sand ribs **T-1** and **T-7** flush with the LE and the top and bottom sheeting. Use the die-cut 1/8" plywood **wing tip LE gauge** to sand the LE to shape. The gauge is held against the LE parallel to the ribs.

Note: The gauge has a root and a tip shape.

Join the Wing Tips to the Wing



1. Use a sharp hobby knife to cut out the joiner openings in the wing tips and wing. The sides of the **forward** openings in the wing need to be trimmed at an angle to allow the die-cut 1/8" plywood **forward wing joiner** to fit between the wing spars. Drill 1/8" holes at the punch marks.



2. Test fit the forward wing joiner and the die-cut 1/8" plywood **aft wing joiner** in the wing. The **widest** end of the forward wing joiner is inserted in the wing. The aft wing joiner fits in the groove in the sub TE.

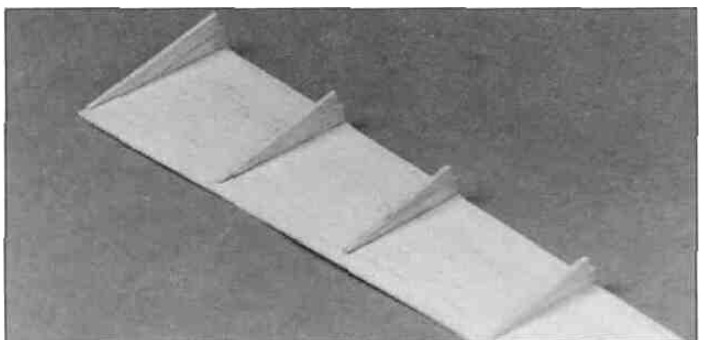


3. Check the fit of the wing tip on the wing. Sand the wing or wing tip so the joint between the wing and wing tip is tight and smooth.

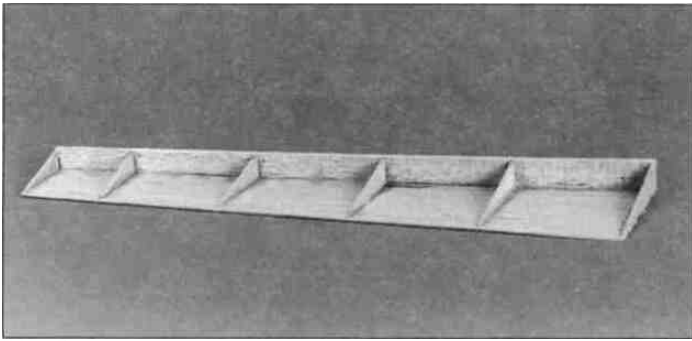
4. Wait until after the wing is covered to glue the wing tip to the wing.

BUILD THE AILERONS

1. Pin the die-cut 1/16" balsa **aileron sheet** over the wing plan with the LE of the sheet aligned with the front of the die-cut 1/8" balsa **aileron sub LE**.

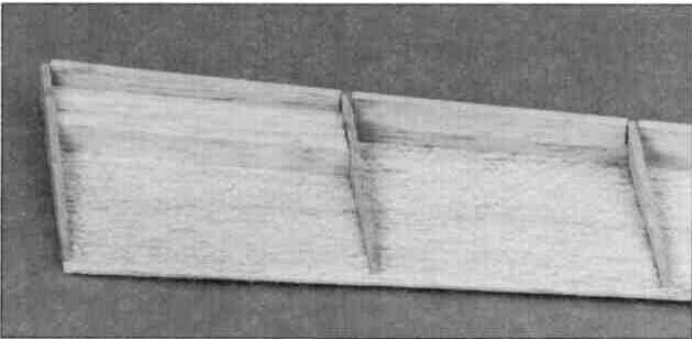


2. Place the die-cut 3/32" balsa ribs **A-1** through **A-6** on the aileron sheet with the front of the ribs flush with the front of the sheet.

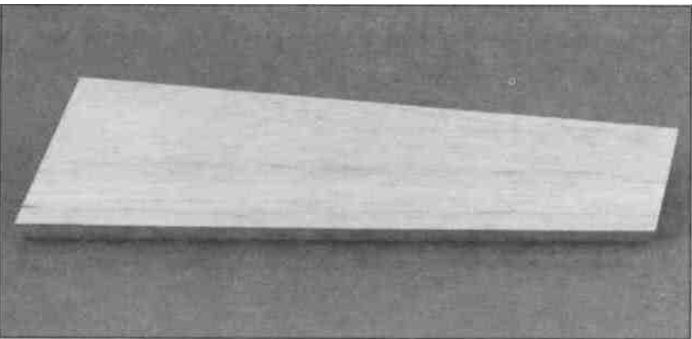


- ☐☐ 3. Slide the die-cut 1/8" balsa **aileron sub LE** over the ribs and glue the ribs and aileron sub LE to the aileron sheet.

Note: The sub LE angles aft slightly.



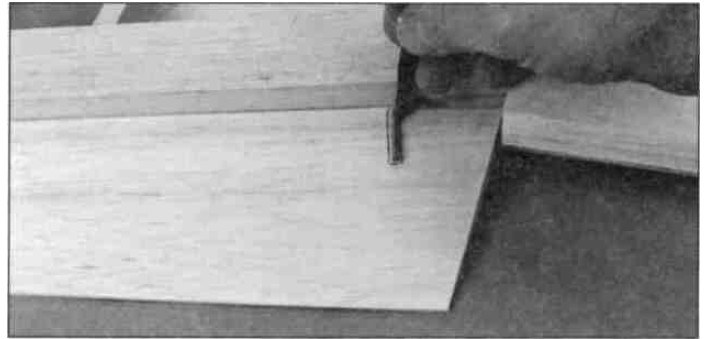
- ☐☐ 4. Cut a **torque rod block** from the 3/8" x 3/4" x 8" balsa stick. Glue the block in the corner between ribs A-1 and A-2.
- ☐☐ 5. Sand the TE of the aileron sheet to match the angle of the aileron ribs.
- ☐☐ 6. Glue the second die-cut 1/16" balsa aileron sheet to the top of the aileron ribs, sub LE and bottom aileron sheet.
- ☐☐ 7. Sand the aileron sub LE and the top and bottom sheet flush.



- ☐☐ 8. Glue the 3/8" x 7/8" x 13-1/2" balsa **aileron LE** onto the front of the aileron sub LE. Sand the LE flush with the top and bottom aileron sheet and ribs A-1 and A-6.
- ☐ 9. Go back to step one of this section and build the opposite aileron.

Install the Ailerons

- ☐ 1. Check the fit of the ailerons between the wing tips and the wing center TE plate. A gap of 1/32" to 1/16" at each end is large enough to allow for covering without binding.



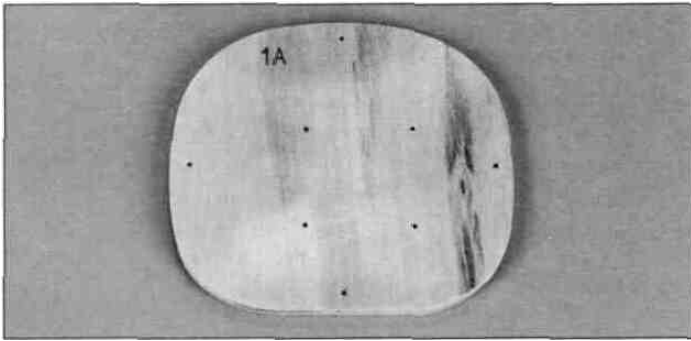
- ☐☐ 2. Place the left aileron on the trailing edge of the wing and mark the location of the torque rod.
- ☐☐ 3. Draw a centerline on the LE of the aileron.
- ☐☐ 4. Drill a 1/8" hole on the centerline for the aileron torque rod. Use sharpened 1/8" and 3/16" brass tubes to cut a groove in the LE for the aileron torque rod.
- ☐☐ 5. From the leftover hinge material, cut three aileron hinges.
- ☐☐ 6. Mark the location for the hinges on the aileron and wing. Cut the hinge slots, and without using glue, test fit the aileron onto the wing.
- ☐☐ 7. Remove the aileron from the wing. Mark the "bevel to" lines and trim the LE of the aileron to a "V" as shown on the plan.
- ☐ 8. Perform steps 2 through 7 to fit the right aileron onto the wing.

Great looking wing! Now the only section left is the easy-building fuselage.

BUILD THE FUSELAGE

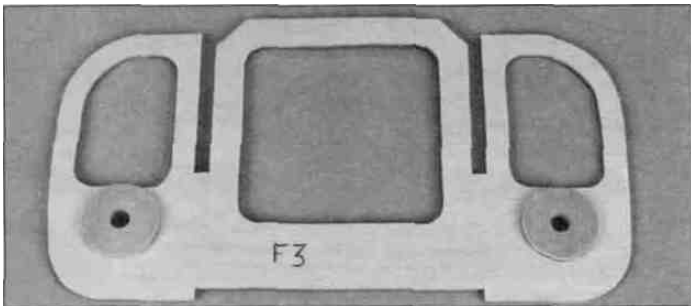
Fuselage Preassembly

Completely read this section on *Fuselage Preassembly* and test fit all the parts. These parts require the strength and working time of **30-minute** epoxy glue. This extra working time will allow you to assemble most of the parts at once.

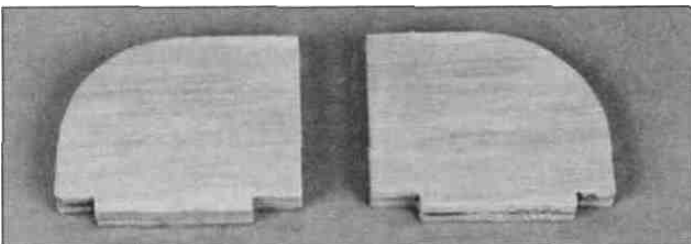


1. Glue the die-cut 1/8" ply firewall former **F-1B** to the back of **F-1A**. Make sure that the embossed label on each former is facing **forward** and the edges are aligned. Wipe off any excess epoxy before it cures.

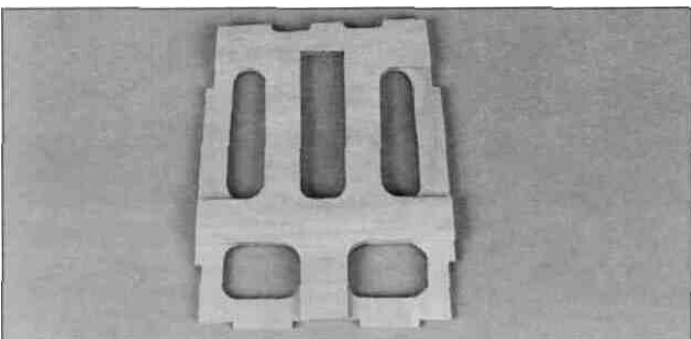
Note: If the formers are warped, clamping them together will not remove the warp. It is best to clamp them to a flat table or board.



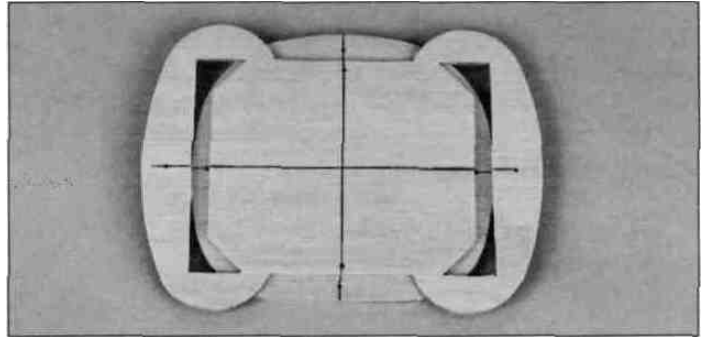
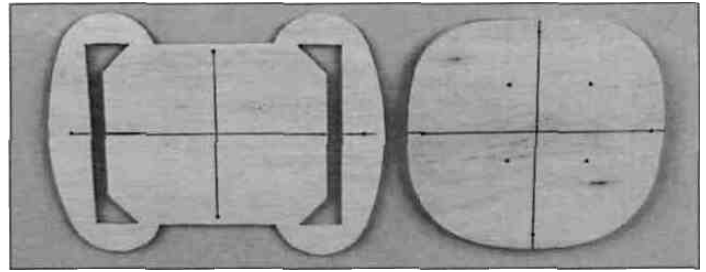
2. Glue the die-cut 1/8" ply **F-3 ring doublers** to the front of the die-cut 1/8" ply former **F-3**. Make sure the holes in F-3 and the ring doublers are aligned.



3. The four die-cut 1/8" ply **wing mounting plates** are cut with the grain running in opposite directions. Make two 1/4" thick plates by gluing together two plates with the grain running in the opposite direction.



4. Glue the die-cut 1/8" ply **retract plate doubler (RFD)** to the bottom (side opposite the embossed lettering) of the die-cut 1/8" ply **retract plate (RF)**.

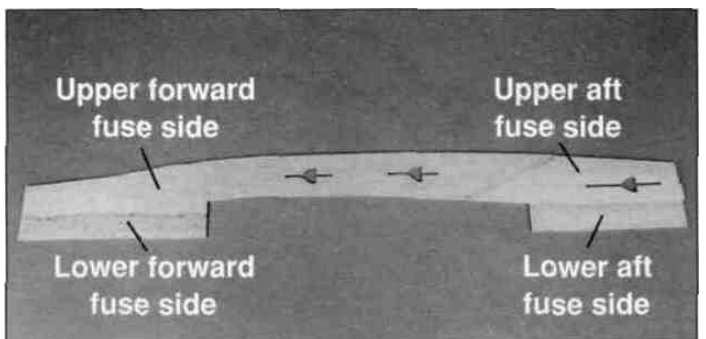


5. Drill a 1/16" hole at each punch mark on the die-cut 1/8" plywood firewall F-1C and F-1A. Draw centerlines connecting the punch marks on both sides of F-1C and F-1A/B. Apply 30-minute epoxy to the **front** of F-1C and clamp it to the back of F-1 B, aligning the centerlines.

6. After the epoxy has cured, drill 5/32" holes at the four engine mount punch marks. If you will be using an engine mount other than the Great Planes engine mount, use the centerlines to align your engine mount on the firewall. Drill 5/32" holes at the appropriate locations.

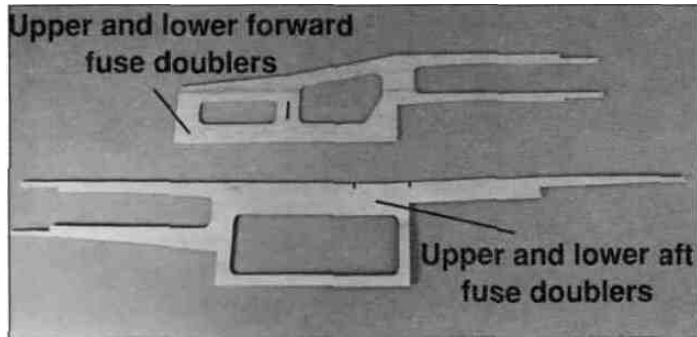
7. Press four **6-32 blind nuts** into the holes from the back of the firewall. Tap the blind nuts with a hammer to fully seat them. Apply a few drops of thin CA around each blind nut to secure them in position. Avoid getting CA on the threads of the blind nuts.

Assemble the Fuselage Sides

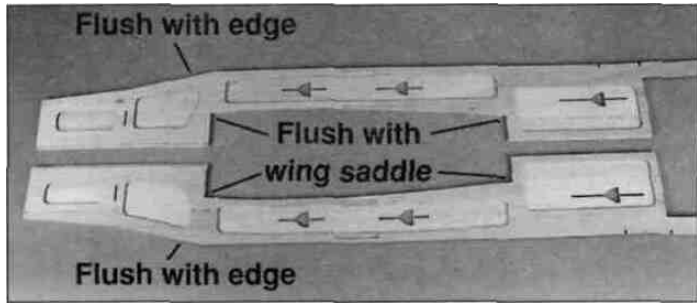


1. Build two fuselage sides by gluing together the 1/8" x 1-1/2" x 11-7/16" balsa **lower forward fuse side**, the 1/8" x 1-1/2" x 9-1/8" balsa **lower aft fuse side**, the die-cut 1/8" balsa **upper forward** and the **upper aft fuse sides**.

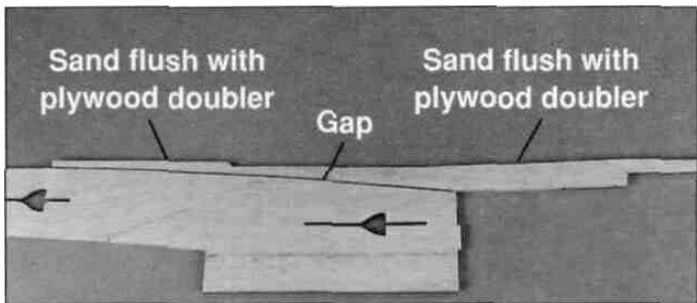
2. Sand the fuse sides smooth.



3. Build a pair of fuse doublers by gluing together the die-cut 1/8" balsa **upper** and **lower forward fuse doublers** together. Glue the die-cut 1/8" ply **upper** and **lower aft fuse doublers** together.

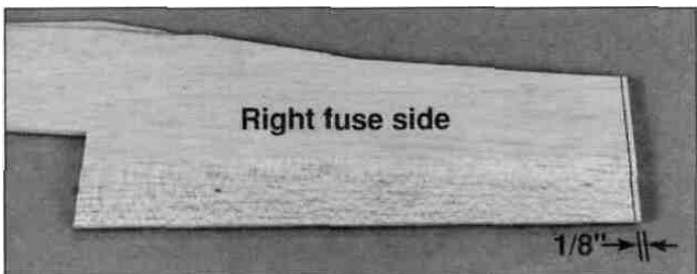


4. Position the fuse sides next to each other as shown. Glue the forward fuse doublers to the fuse sides, aligning the edges of the **wing saddle** and the **forward top edges only**. Glue the aft fuse doublers to the fuse sides, aligning with only the **wing saddle**.



5. Glue the die-cut 1/8" balsa **tail fuse side** to the fuse doubler. Align the **top edges only**. This will create a gap between the upper aft fuse side and the tail fuse side.

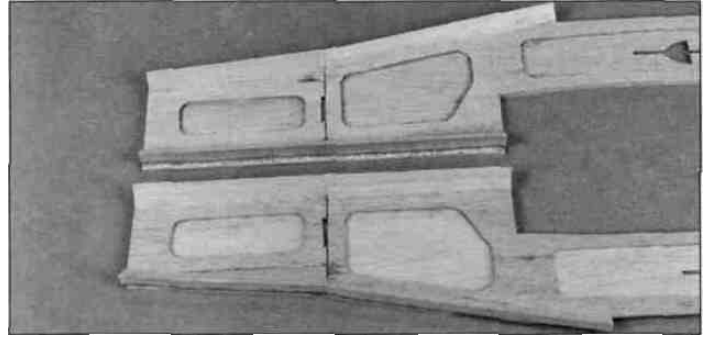
6. Sand off the forward tail fuse side flush with the aft fuse doubler (see photo above).



7. Trim 1/8" from the front of the **right** fuse side only. This will set right thrust for the firewall.

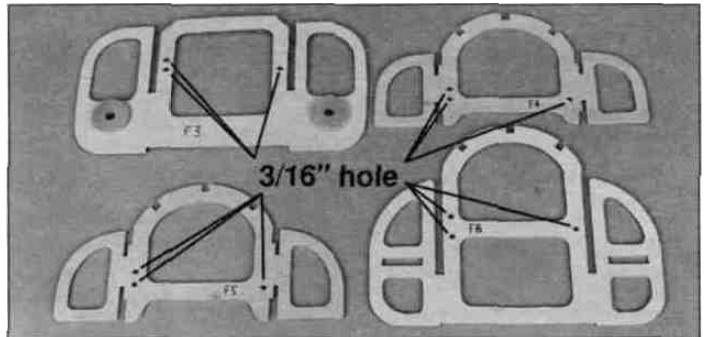
Install the Formers

Important: Install all the plywood formers with the **embossed lettering facing the front** of the plane.

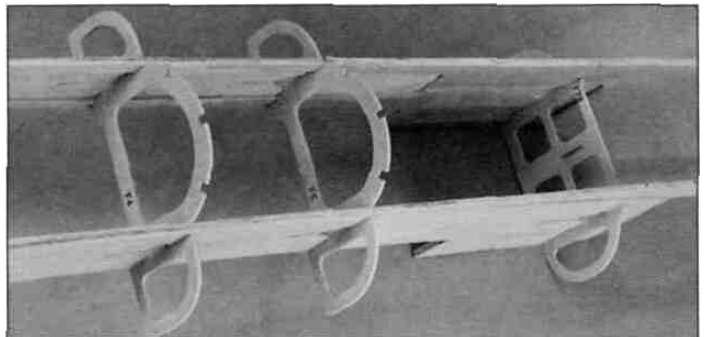


1. Glue 1/2" balsa **triangle sticks**, flush with the top and bottom of the doubler, from the front edge of the fuse side to the wing saddle on the bottom and past the edge of the doubler on the top.

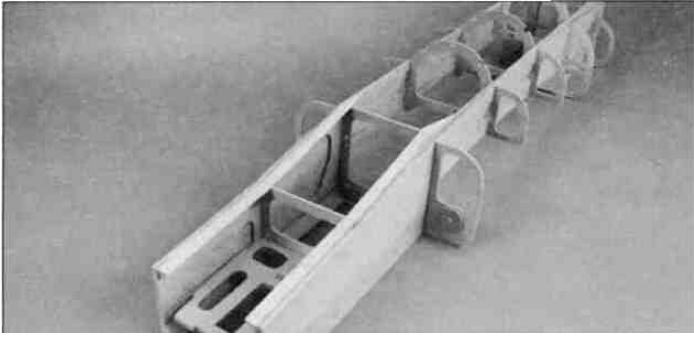
2. Sand the aft ends of the triangle sticks flush with the fuse sides.



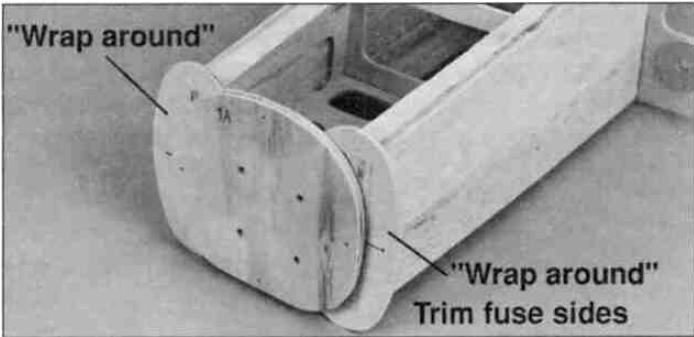
3. Drill 3/16" holes at the punch marks on the die-cut 1/8" ply **formers F-3, F-4, F-5 and F-6**.



4. Insert formers F-4, F-5 and F-7 into their appropriate slots in the fuse sides. Carefully rotate the formers in the slots to lock them in place. **Do not** glue the formers yet.



- ❑ 5. Slide formers F-6, F-3, F-2 and the retract plate in position, in that order.



- ❑ 6. Trim the fuse side below the forward lower doubler, 1/8" back from the front edge. Insert the fuse sides into the slots in F-1 C and tack glue F-1 C in place.

- ❑ 7. Align the fuse over the fuse plan top view with the firewall hanging over the edge of the table. With the formers perpendicular to your building board, glue only formers F-3 thru F-7 to the fuse sides. **Do not** glue F-2 at this time.

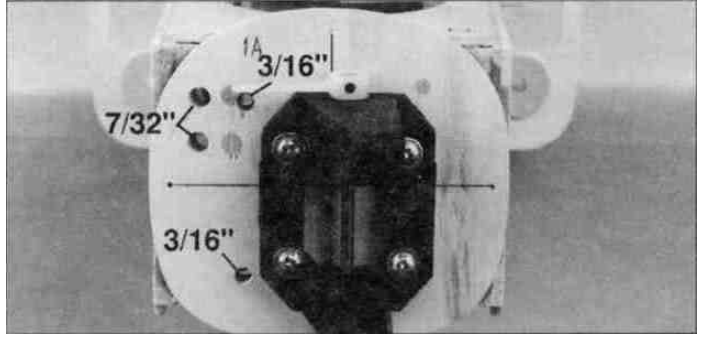
- ❑ 8. Cut the "spreader bar" from the supplied Great Planes engine mount and trim off any flashing. Slide the two halves together.

- ❑ 9. Temporarily mount the engine mount to the firewall with four 6-32 x 1" Phillips head machine screws and #6 washers. Do not tighten the screws completely.

- ❑ 10. Place your engine on the engine mount and adjust the mount until the engine fits.

- ❑ 11. Mark the throttle pushrod, fuel line and pressure line exit holes on the firewall.

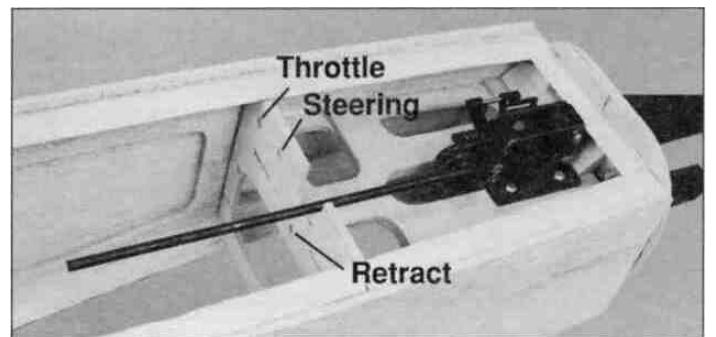
- ❑ 12. If you will be using the fixed landing gear, install a Screw-Lock Pushrod Connector in the outer hole of the steering arm. Insert the nose gear through the engine mount. Install the steering arm on the nose gear, on top of the engine mount. Mark the steering pushrod exit hole aligned with the pushrod connector.



- ❑ 13. Drill 3/16" holes at the marks for the throttle and steering pushrod exits. Drill 7/32" holes for the fuel and pressure lines.

- ❑ 14. If you will be using retracts, mount the retractable nose gear to the bottom of the retract plate, as far forward as possible.

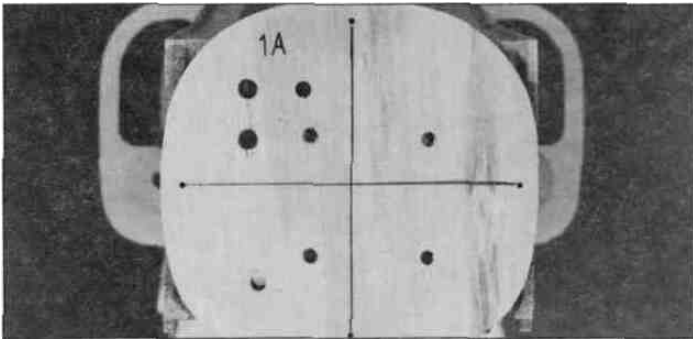
Note: If you will be using another brand of retracts, the retract plate may need to be raised to allow the nose wheel to retract below the edge of the fuse side doublers. On some mechanical retracts the nose wheel strut can be bent slightly. On some pneumatic retracts the nose wheel strut cannot be bent due to the air cylinder.



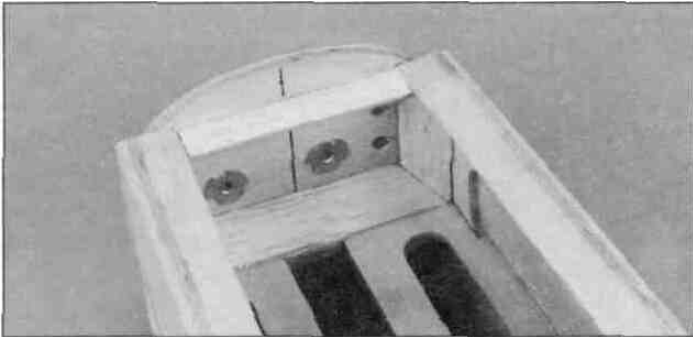
- ❑ 15. Mark former F-2 for the throttle, steering and retract (if used) outer pushrods. Remove the former and drill a 3/16" hole at each mark.

- ❑ 16. Reinstall the retract plate and the firewall. Position the fuse over the top fuse plan and use 30-minute epoxy to glue the firewall to the fuse sides. **Do not** glue the "wrap around" of F-1 to the fuse sides.

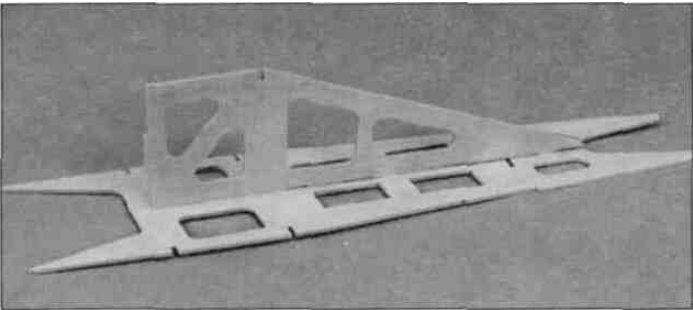
- ❑ 17. After the epoxy cures, glue the retract plate and former F-2 to the fuse sides and the firewall.



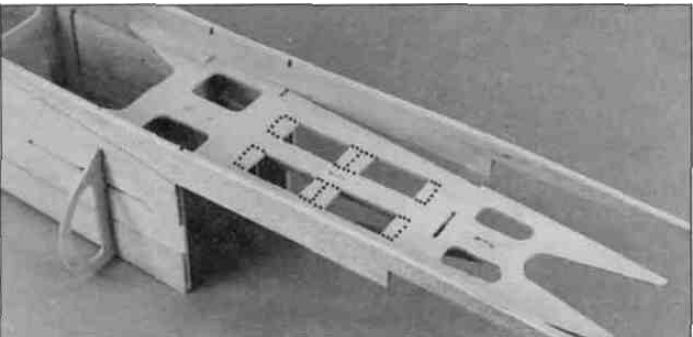
18. Remove the "wrap around" clamps from F-1C.



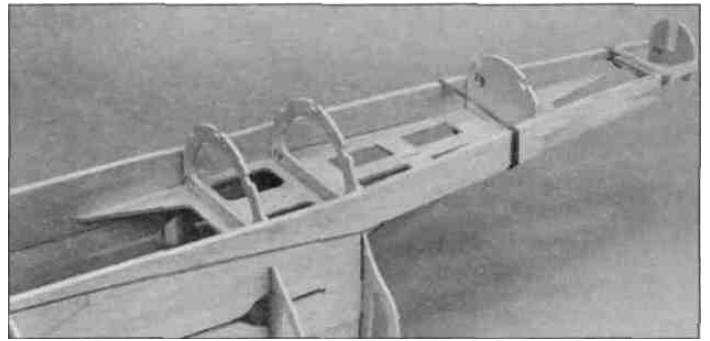
19. Use 30-minute epoxy to glue 1/2" balsa triangle sticks to the joint between the fuse sides and the firewall, the top of the retract plate and the firewall, and across the top of F-1.



20. Glue the die-cut 1/8" ply lower tail brace on the die-cut 1/8" ply **radio tray**, perpendicular to the tray. Glue the die-cut 1/8" plywood **servo tray doublers** (removed from the servo opening) on the opposite side of the tail brace, at the ends of each servo opening. This will provide more wood to hold the servo mounting screws.



21. Slide the radio tray assembly between the fuse sides and tack glue it to former F-7.

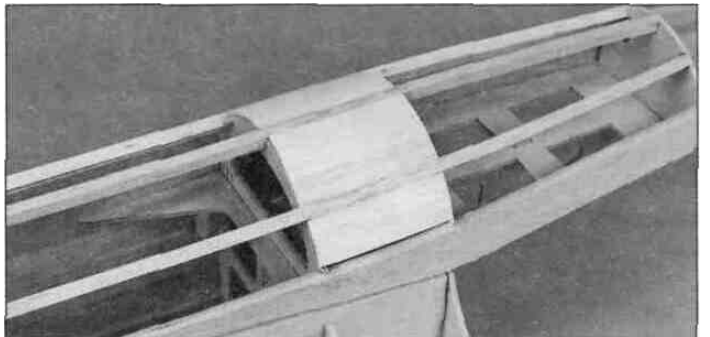


22. Thoroughly wet the outside of the fuse behind former F-7B. Insert the die-cut 1/8" ply formers **F-7T, F- 8B, F-8T, F-9** and **F-10** in place. Use rubber bands around the aft end of the fuse to hold it in position.

23. Place the fuse over the top fuse plan and check that the tail is aligned with the plan. Glue all formers, **except F-10**, to the fuse sides, perpendicular to the radio tray. Temporarily tack glue F-10 to the fuse side. It will need to be removed later to install the stabilizer.

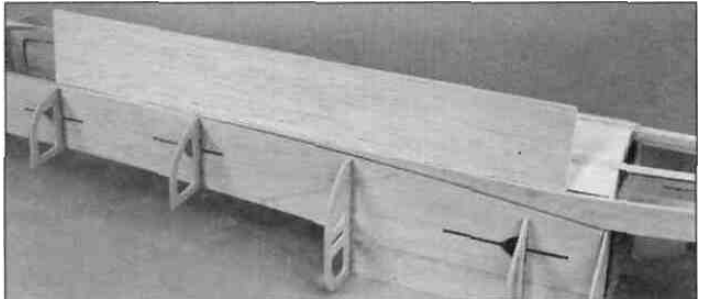
24. Glue 1/4" x 1/4" x 30" balsa **stringers** in the notches from former F-4 through F-9. Trim the stringers flush with the front of former F-4 and the back of former F-9.

Sheet the Turtle Deck

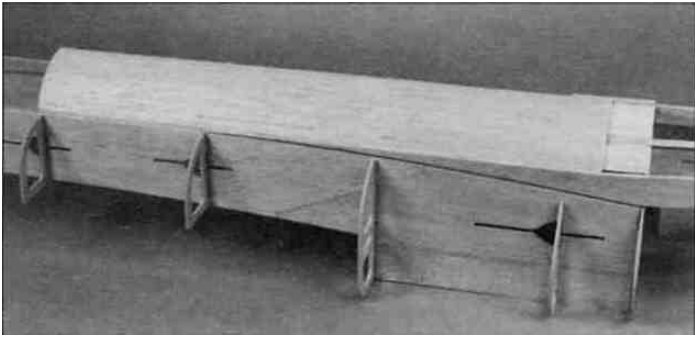


1. From the 3/32" x 3" x 24" balsa sheet, cut and glue **fillers** to fit between the stringers, from former F-7T to F-8T. Sand the fillers flush with the stringers.

2. Cut two 3/32" x 3" x 24" balsa sheets 20-1/2" long.

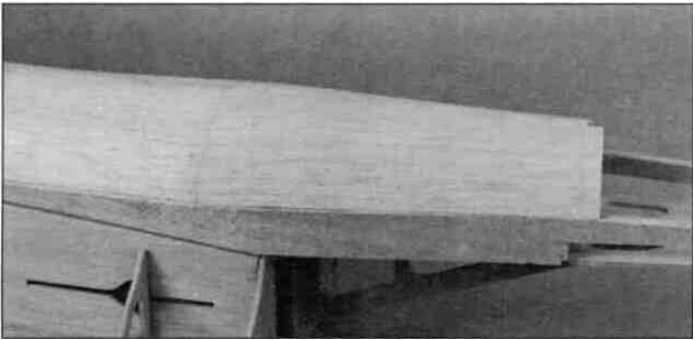


3. Glue one of the sheets to the top of the fuse side from the **middle** of the **filler** to former F-3. Allow the sheet to overhang F-3 slightly.



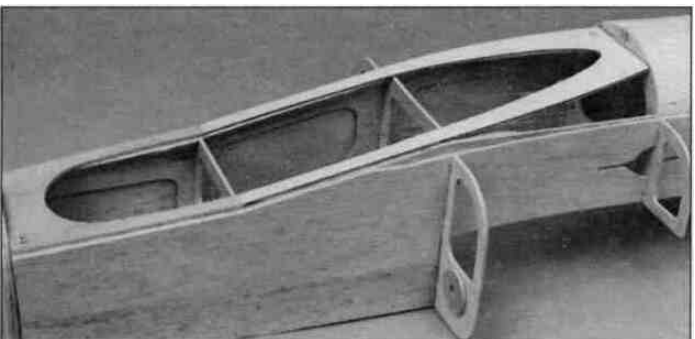
❑ 4. Wet the outside of the sheet and wrap it around the formers. Trim the edge of the sheet so that it comes to the **middle** of the center stringer. Glue the sheet to the stringers, formers and filler.

❑ 5. Glue the second sheet to the other side of the fuse following the same procedure to complete the forward turtle deck.

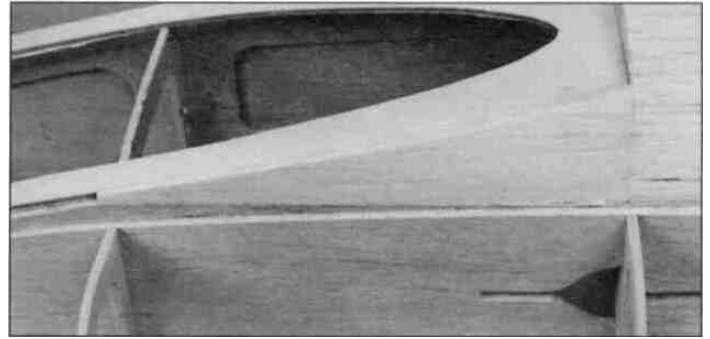


❑ 6. Sheet the rear turtledeck from the filler to former F-9.

❑ 7. After the turtle deck sheathing has dried, sand the fuse sides to blend into the turtle deck sheathing from former F-5 to F-9. **Do not** blend the fuse sides into the turtle deck sheathing in front of former F-5. Sand the ends of the turtle deck sheathing flush with formers F-4 and F-9.

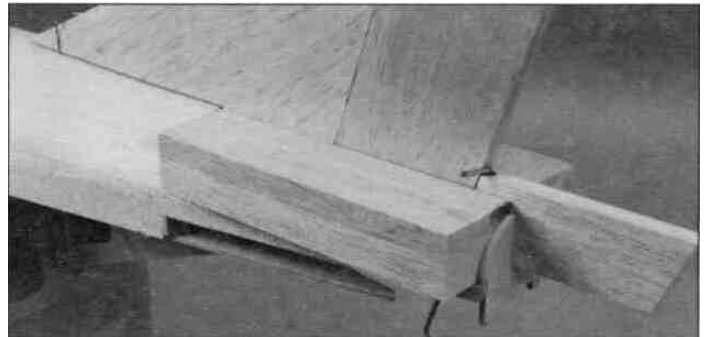


❑ 8. Finish cutting out the center portion of the die-cut 1/8" plywood forward **cockpit former** (C-1) and the **aft cockpit former** (C-2). Glue the cockpit formers centered on top of the forward fuse side doublers. Bend the aft end of C-2 down and glue it to former F-4. The second set of cockpit formers will be used later for the cockpit floor.

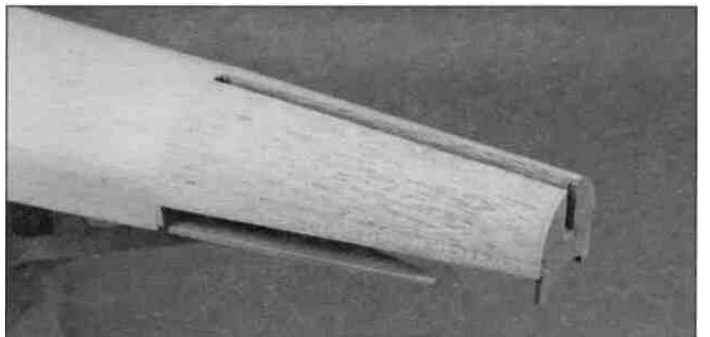


❑ 9. From the leftover 3/32" balsa sheet used for filler, cut and glue turtle deck sheathing to fit from former F-4 to the joint between C-2 and the fuse side. Sand the sheathing flush with the top of C-1.

❑ 10. Lightly draw a centerline along the top of the fuse. use the top center stringer locations at formers F-4 and F-9 for reference.



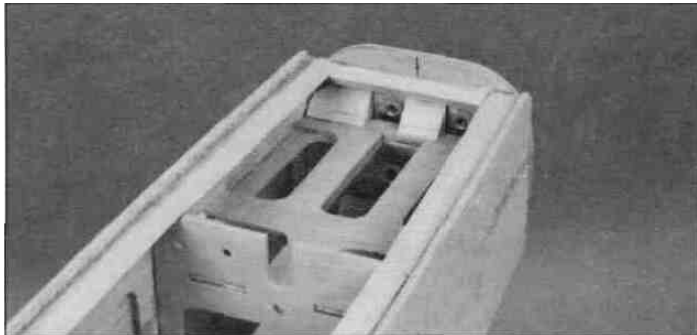
❑ 11. Temporarily pin the fin in place along the centerline of the fuse. Carefully tack glue the 1-1/4" x 1-3/4" x 7" balsa **blocks** to formers F-9 and the fuse sides. **Do not** glue the blocks to the fin or F-10.



❑ 12. Remove the fin and finish gluing the blocks to the fuse. Trim and sand the two blocks flush with the turtle deck and former F-10.

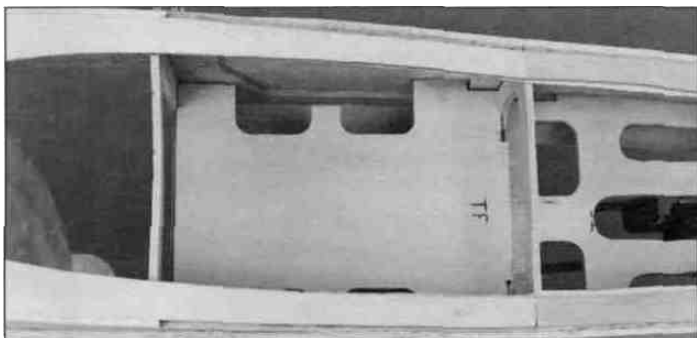
Finish the Fuselage Bottom

- ❑ 1. Place the fuse upside down in a cradle to prevent damage to the turtle deck while finishing the bottom of the fuse.

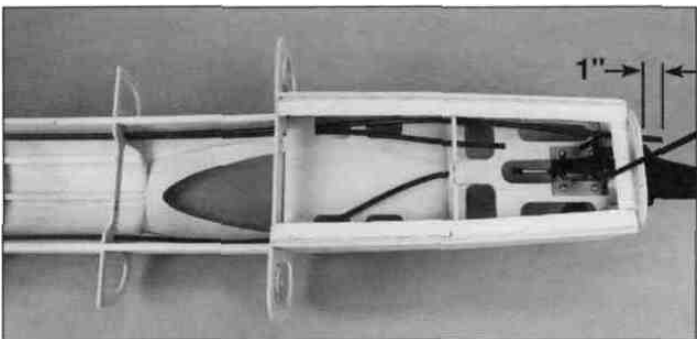


- ❑ 2. Use 30-minute epoxy to glue 1/2" triangle sticks along the bottom front of the retract plate and flush with the bottom of F-1. **Do not** cover the blind nuts with the triangle sticks.

- ❑ 3. If you are using a nose gear retract, mount it on the bottom of the retract plate. You may need to lengthen the slot in the retract plate for the actuator arm and widen the slot for the nose gear strut in former **F-2**.



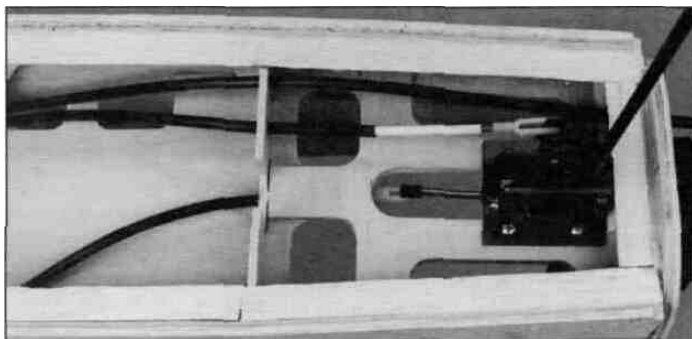
- ❑ 4. Glue the 1/8" die-cut plywood **tank floor (TF)** between formers F-2 and F-3 with the tab on the tank floor resting on former F-2.



- ❑ 5. Roughen the 48" **outer pushrod tubes** (the pushrods for the retracts are **not** included). Install the throttle, steering and retract (if retracts will be used) outer pushrod tubes through the firewall and formers to the servo tray in the tail. The throttle outer pushrod tube should protrude 1" from the front of the firewall.

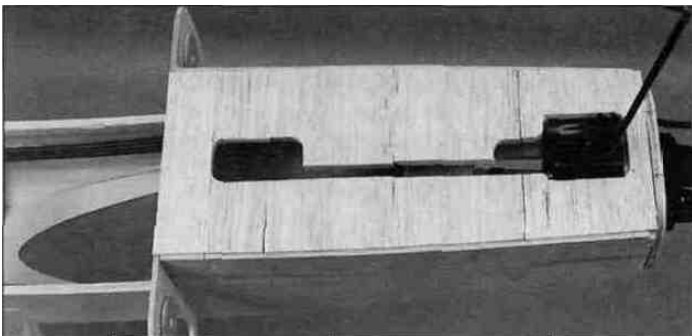
- ❑ 6. Insert the 48" inner pushrods into the outer pushrod tubes. Check for any binding of the pushrods. The outer pushrod tube holes in the formers may need to be adjusted.

- ❑ 7. Once the inner pushrods move smoothly, glue the outer pushrods to the formers and firewall.

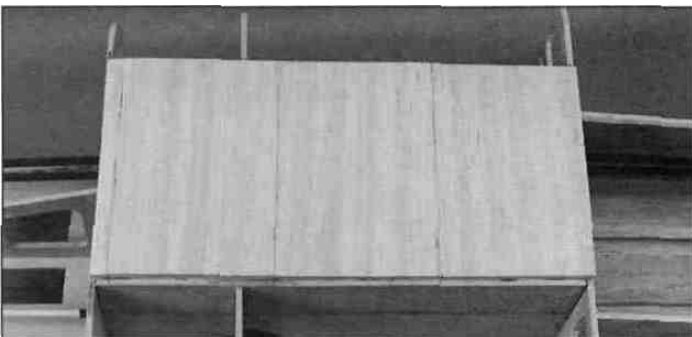


- ❑ 8. If you are using retracts, thread 2-56 x 1" **threaded studs** (not included) 1/2" into the end of the steering inner pushrod and the retract inner pushrod. Thread a nylon clevis (not included) 13 turns onto each stud. Connect the clevises to the retract and test its operation.

- ❑ 9. If you are using retracts, mount a 2" nose wheel on the nose gear strut at the location shown on the plan. Cut off the excess nose gear strut.



- ❑ 10. Cover the forward bottom fuse from the firewall to former F-3 with the 1/4" x 3" x 24" balsa sheet. Glue the sheeting (crossgrain) to the fuse side doublers, formers and the triangle sticks only. If using a nose gear retract, cut a clearance hole for the retract mechanism, strut and wheel. Sand the sheeting flush with the back of former F-3.



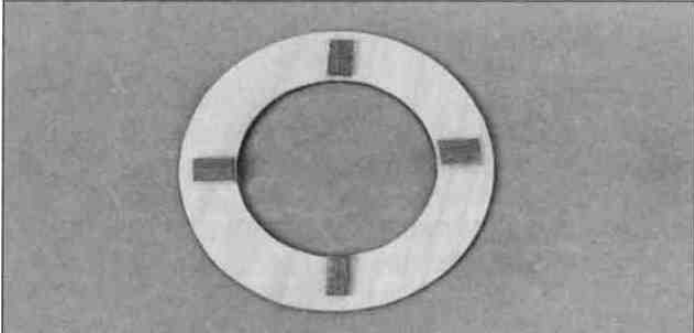
- ❑ 11. Cover the rear fuse bottom from former F-6 to F-8 with 1/8" x 3" x 24" balsa sheet. Glue the sheeting (crossgrain) to the fuse side doublers, formers and the

triangle sticks only. Sand the sheeting flush with the front of former F-6 and the back of F-8.

❑ 12. Disconnect and remove the steering and retract inner pushrod.

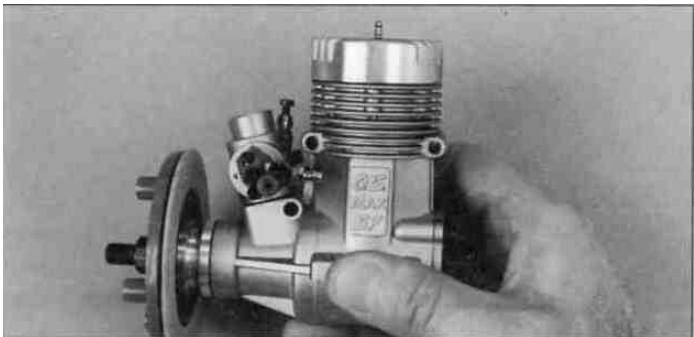
Mount the Engine

❑ 1. Place your engine on the engine mount, adjusting the mount to fit the engine. When the engine mount is adjusted, tighten the mounting screws.

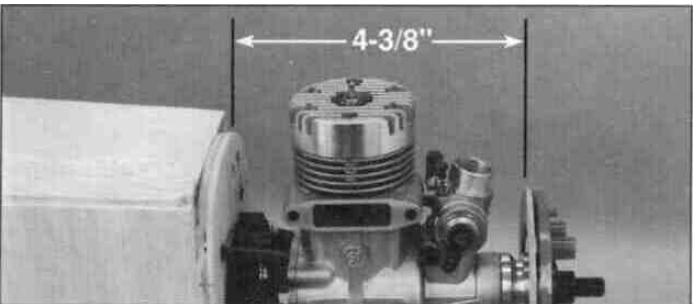


❑ 2. From a leftover piece of 1/16" plywood, cut four small spacers and tack glue them to the die-cut 1/16" plywood spinner ring.

❑ 3. Center your Great Planes 3" spinner backplate over the spinner ring and tack glue it to the plywood spacers.



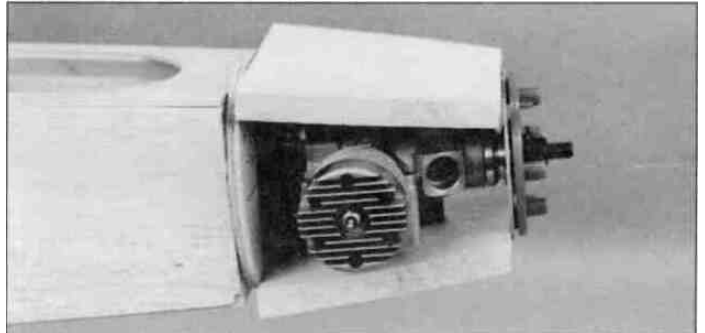
❑ 4. Slide the spinner ring/backplate on the engine crankshaft and secure it with a couple of washers and the prop nut.



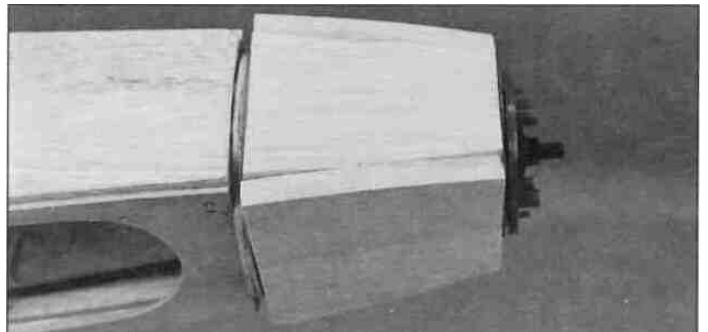
❑ 5. Position the engine on the engine mount with the back of the spinner ring 4-3/8" from the front of the firewall. Carefully mark the engine mounting holes on the rails.

❑ 6. Remove the engine from the engine mount. Drill a hole at each mark with a 7/64" drill bit. If you have access to a drill press, it is the best tool for the job. However, if you are using a hand held electric drill, try to keep the bit perpendicular to the rails.

❑ 7. Install the engine on the engine mount with four #6 x 3/4" sheet metal screws.



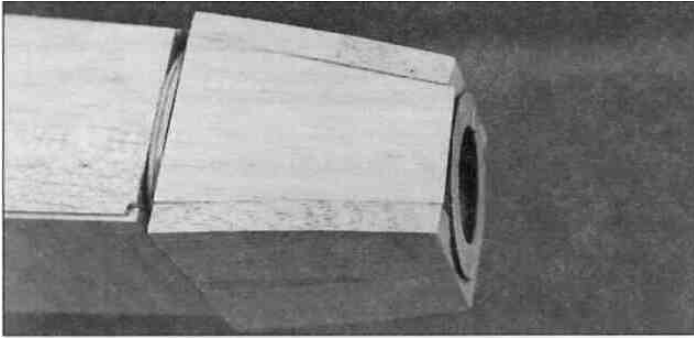
❑ 8. Glue the shaped 1/2" balsa top and bottom nose blocks to the firewall and the spinner ring. Make sure the edges of the blocks are aligned with the fuse sides.



❑ 9. The shaped 3/8" balsa side nose blocks come as two pieces. Glue the pieces together over the fuse plan to make a left and right side nose block. Glue the left side nose block to the left side of the top and bottom nose blocks, firewall and spinner ring.

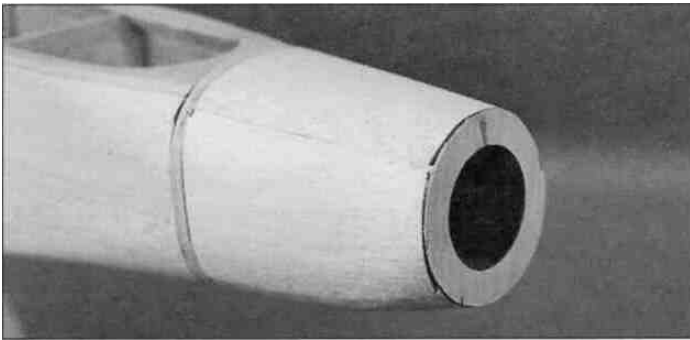
❑ 10. Carefully remove the spinner backplate from the spinner ring and the engine from the engine mount.

❑ 11. Glue 1/2" balsa triangle sticks in the corners between the top and bottom nose blocks and the left side nose block.



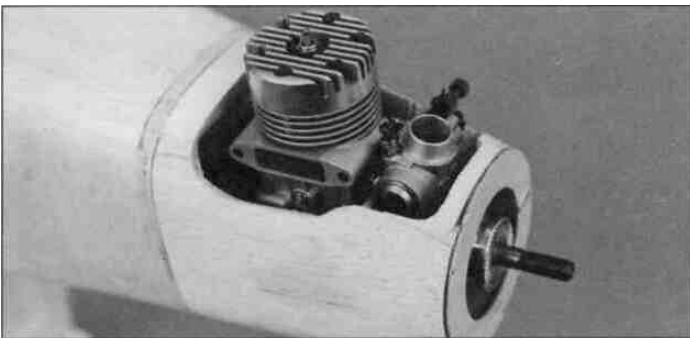
❑ 12. Trim and glue the second shaped 3/8" balsa side nose block to the right side of the top and bottom nose blocks, spinner ring and firewall.

❑ 13. Glue 1/2" balsa triangle sticks in the corners between the top and bottom nose blocks and the right side nose block by inserting them through the spinner ring.



❑ 14. Using a hobby knife, razor plane and a sanding bar, shape the forward fuse and nose blocks flush with the firewall and spinner ring. Also, use the fuse cross-section on the fuse plan as a guide.

Note: The bottom nose block bulges out slightly in front of the firewall.



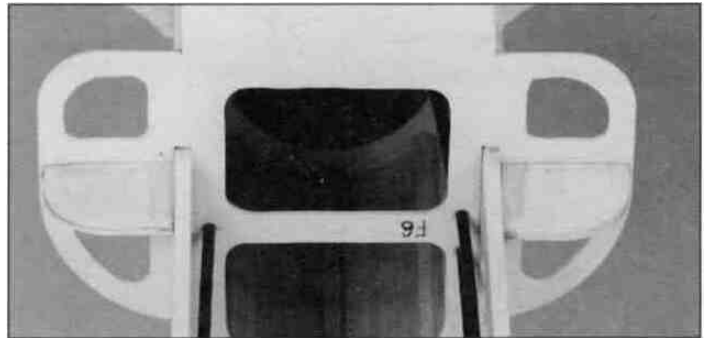
❑ 15. Cut a small hole in the center of the right side nose block. Locate the engine mount and gradually enlarge the hole to accommodate your engine. Carve the nose blocks so that there is at least a 1/4" clearance around the engine.



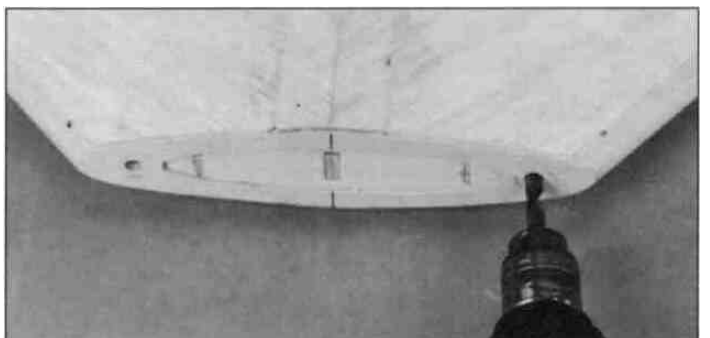
❑ 16. Install the engine on the engine mount and attach the spinner to the engine. Cover the carburetor, exhaust opening and fuel inlet to prevent dust from entering the engine. Wrap the spinner at the aft end with a couple of layers of masking tape.

❑ 17. Finish sanding the nose blocks and spinner ring to match the spinner.

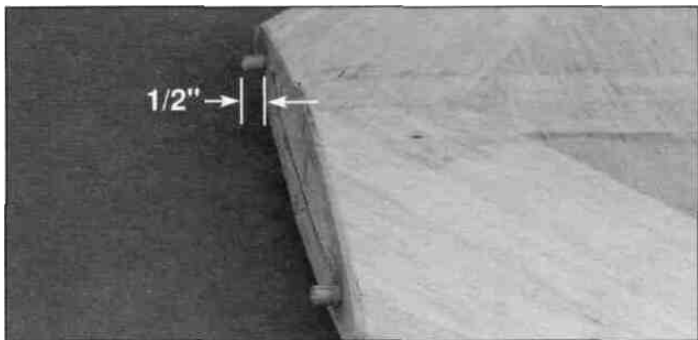
Mount the Wing



❑ 1. Use 30-minute epoxy to glue the preassembled **wing mounting plates** to former F-6 and the fuselage sides. Before the epoxy cures, glue 1/4" balsa triangle sticks on top and bottom of the mounting plate at the joints.

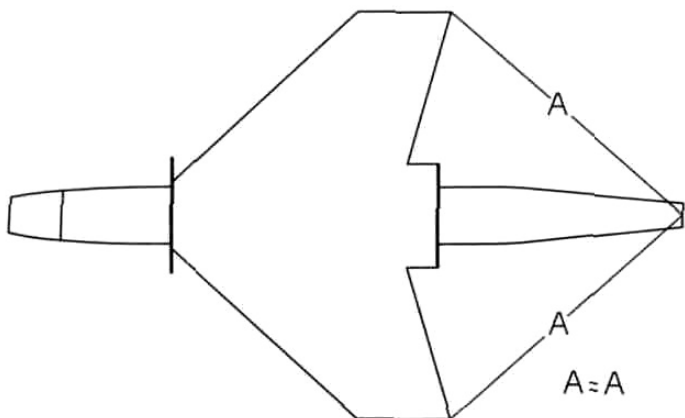


❑ 2. Use a 5/16" drill bit to clean up the holes through the plywood front cap, balsa sub front cap and plywood wing dowel braces.

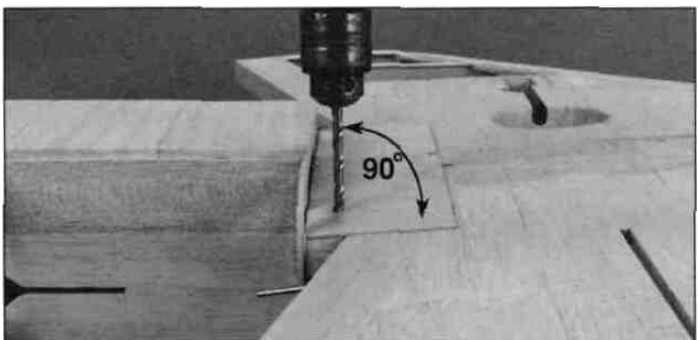


3. Slightly round one end of both 5/16" x 3-3/4" **wing dowels**. Use 6-minute epoxy to glue the wing dowels in position so that the rounded ends are facing forward and protruding 1/2".

4. With the fuselage upside down in a foam cradle, fit the wing in the wing saddle. The wing dowels should slide easily into the holes in F-3. Carefully sand the wing saddle to eliminate any gaps between the wing and fuse.



5. Check that the wing tips measure the same distance from the center of the tail. Mark the center of the TE and F-6 as a guide for the next step.

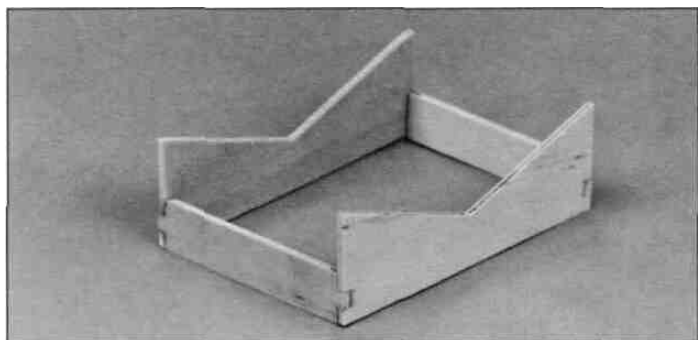


6. Hold the wing in position and drill a 13/64" hole at each punch mark on the wing bolt plate. The hole must extend through the wing and wing mounting plates, perpendicular to the surface of the wing. **Do not** allow the wing to move out of position while drilling these holes.

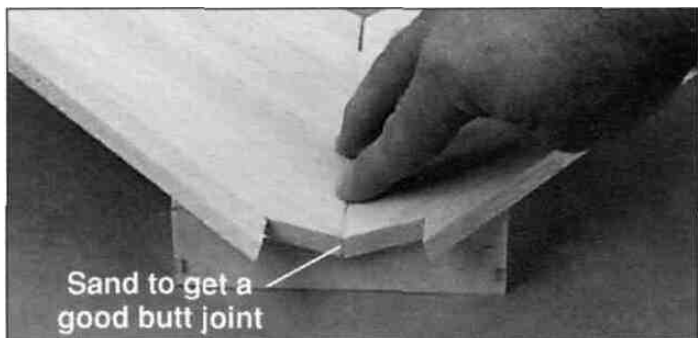
7. Remove the wing and enlarge the holes in the **wing** only with a 1/4" drill.

8. Tap the holes in the wing mounting plates with a 1/4-20 tap. Apply a few drops of thin CA to the threads in the wing mounting plates. After the CA cures, run the tap through them again.

Install the Stabilizer



1. On a flat surface, glue the die-cut 1/8" plywood **stabilizer jig sides** to the die-cut 1/8" plywood **stabilizer jig ends**. It's important that the sides are perpendicular to the building board and the corners are square.

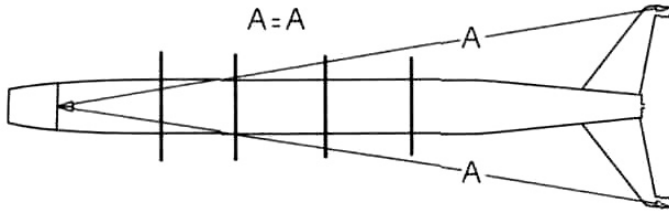
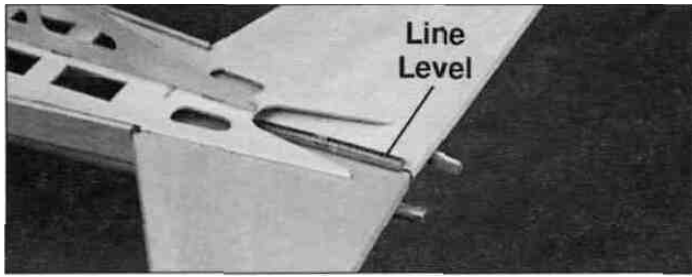


2. Place the stabs on the stab jig and note the root angle. Sand the root of both stabs to create a good butt joint.

3. Place a piece of wax paper over the stab jig. Apply 30-minute epoxy on the root of each stab. Place the stabs on the jig and press them together. Place a second piece of wax paper over the stabs. Hold the stabs in place with weights until the epoxy cures.

Note: We recommend that the TE of the stab be covered with a strip of MonoKote covering before the stab is glued to the fuselage. This will allow the elevator torque rods to be glued in before the fuselage is covered. See the Covering section on page 41.

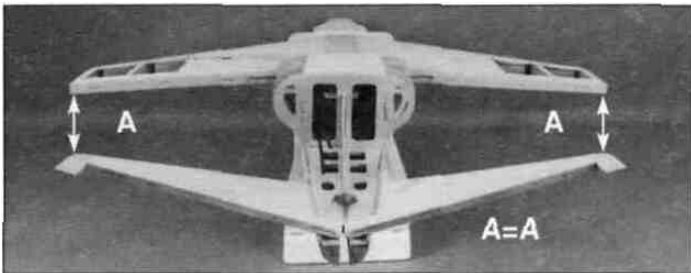
4. Remove former F-10 that was **temporarily** installed earlier on the fuselage.



- ❑ 5. Mount the wing on the fuselage. **Without gluing**, insert the stab in the slot between the fuse sides and radio tray, centering it visually. Carefully trim the LE so that the stab contacts former F-9, fuse sides and radio tray. Use a string or measuring tape to measure the distance from each stab tip to a pin centered in the bottom of F-1. The distance to the pin **must** be equal from each stab tip.

Important: Position the plane on an airplane stand so that the incidence of the wing is at 0%. Set a level at the centerline of the stab to check that the stab incidence is 0%. A line level found at most hardware stores works great for this.

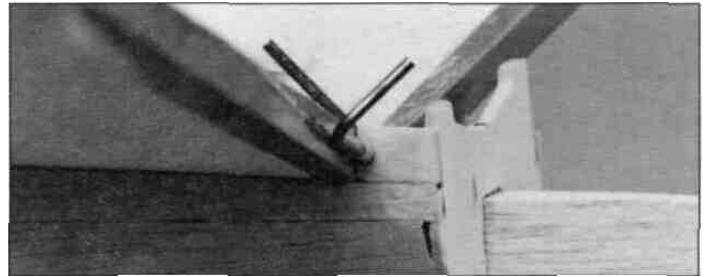
- ❑ 6. Mark reference lines on both sides of the stab bottom.



- ❑ 7. Position the model so that you can sight it several feet away from the front and rear. Check the distance from the stab tips and the bottom of the wing. The distance **must be equal**. If not, sand the high side of the slot slightly to correct the situation. Recheck the incidence and when satisfied, remove the stab.

- ❑ 8. We recommend a mixture of 30-minute epoxy and milled fiberglass (for additional strength) to glue the stab to the fuse. If you do not have milled fiberglass, 30-minute epoxy will work fine alone. Glue the stab to the fuse sides, F-9 and the radio tray. Before the epoxy cures, recheck the alignment from all points of reference.

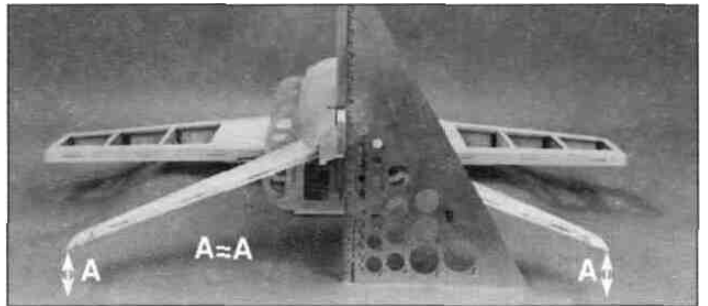
- ❑ 9. Apply petroleum jelly on the **elevator torque rods** where they exit the nylon torque rod bushings. This will prevent the torque rods from becoming glued to the bushings. Use epoxy to glue the elevator torque rods in the TE of the stab.



- ❑ 10. Fill the gap between the stabilizer and former F-10 with leftover pieces of 3/16" die-sheet from the belly pan sides. Sand the filler flush with the fuse sides, the bottom of the stab and former F-10.

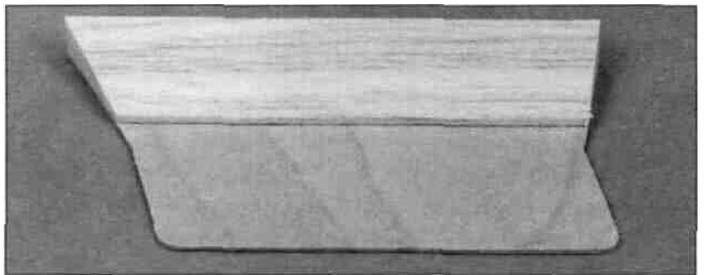
Install the Fin

- ❑ 1. Permanently glue former F-10 in position.
- ❑ 2. Final sand the fin and test fit it in position. You may need to widen the slot in the TE of the stab for the rudder torque rod. Check that the fin contacts the turtledeck. If not, lightly sand the bottom of the fin.



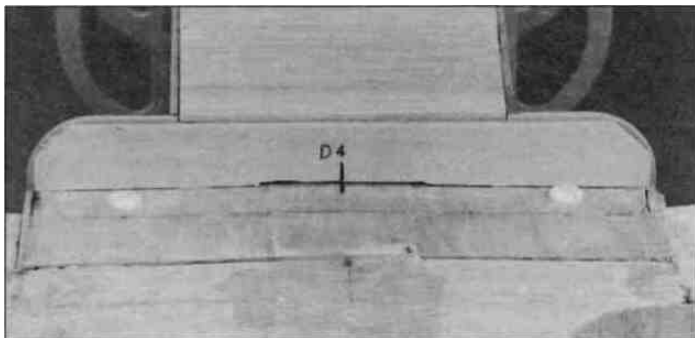
- ❑ 3. Place the model on your building board and place shims under the fuselage until both stab tips are an equal distance from the building board. Use a 90-degree building triangle to set the fin perpendicular to the building board, sanding the slot as necessary.
- ❑ 4. Use 30-minute epoxy to glue the fin in the fin slot, the top of the stab and the top of the turtledeck. Check that the fin is perpendicular to the building board once again before the epoxy cures.

Assemble the Splitter Plates



- ❑ 1. Cut and glue a piece of leftover 3/8" x 1-1/4" balsa elevator TE to the aft side of the die-cut 1/16" plywood **splitter plates**. Sand the ends of the TE flush with the edges of the splitter plate.

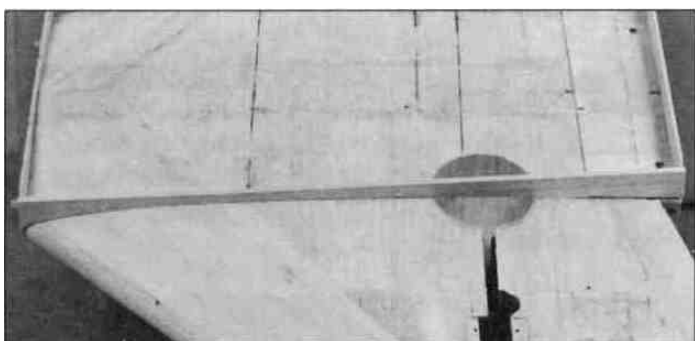
Build the Belly Pan



1. Use a leftover piece of 1/16" balsa sheet to space the die-cut 1/8" plywood **belly pan former D-4** away from former F-6. Draw a centerline on D-4 and on the plywood wing bolt plate. Glue D-4 to the wing bolt plate.

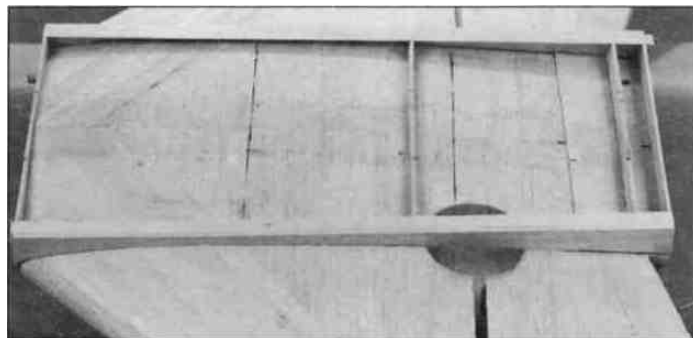
2. Follow the same procedure to install the die-cut 1/8" plywood **belly pan former D-1** to the LE of the wing. You may need to sand the bottom of the former for a good fit against the wing. The top of the former must be 1/16" to 3/32" below the top of former F-3.

3. Use a straightedge to draw lines from the edge of **D-1** to **D-4**.



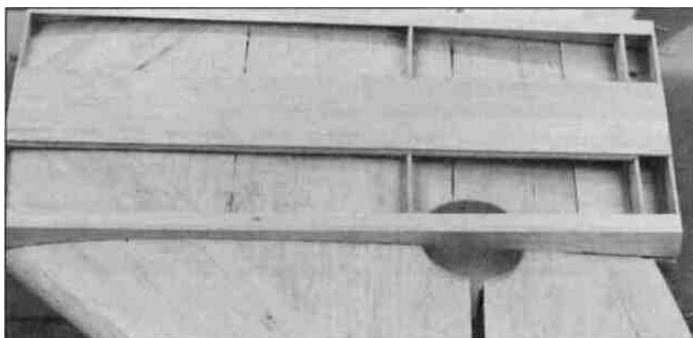
4. Glue the die-cut 3/16" balsa **belly pan sides** to the bottom wing sheeting and formers **D-1** and **D-4**. Use the line between the formers as a guide.

5. Draw two lines 1" and 7-1/4" forward of **D-4**. Place the die-cut 1/8" plywood **belly pan former D-2** on the 7-1/4" line and the die-cut 1/8" plywood **belly pan former D-3** on the 1" line. Place a straightedge on top of the formers. Sand the bottom of **D-2** and **D-3** so that they fit tightly against the wing sheeting and are flush with the bottom of the straightedge. When satisfied with the fit, glue the formers in place.



6. Glue 1/2" balsa **triangle** sticks between **D-1** and **D-4**, flush with the top of the belly pan sides. The triangles will need to be trimmed to fit against the wing bottom, between **D-1** and **D-2**. Use a long bar sander to sand the belly pan sides, formers and triangles flat.

7. Glue 1/8" x 24" basswood **stringers** in the notches from **D-1** to **D-4**.

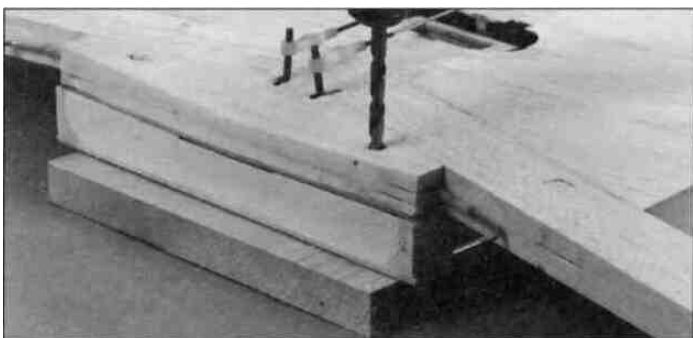


8. Cut and glue a 3/32" x 3" x 24" balsa sheet on the center of the belly pan formers and stringers.

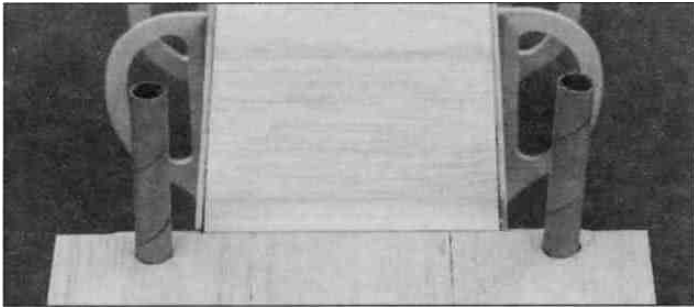
9. Make sure the wing bolts are removed before gluing a 3/32" x 3" x 24" balsa sheet on each side of the center sheet.

Note: The sheeting at the front will not cover the triangle sticks completely.

10. Sand the 1/2" triangle and 3/32" balsa sheeting flush with the sides of **D-1** and **D-4**.



11. Turn the wing over and place a block of wood under the belly pan in the area of the wing bolt holes. Use the wing bolt holes as a guide to drill 1/4" holes through the belly pan. The block under the belly pan will prevent the wood from splitting



❑ 12. Enlarge the holes in the belly pan to 1/2". Reattach the wing to the fuse. Cut the 1/2" diameter paper tube in half and slide the halves into the bolt holes, pushing the tube over the head of the bolts. The holes may need to be enlarged slightly to allow the tubes to slide in.

❑ 13. Carefully glue the paper tube to the belly pan with thick CA. Be careful and use only a couple of drops of CA to prevent gluing the wing bolts in place.

❑ 14. Remove the wing bolts and finish gluing the tube to the belly pan and wing bolt plate. Cut off the excess tube and sand it flush with the belly pan.

❑ 15. Harden the paper tubes by soaking them with thin CA.

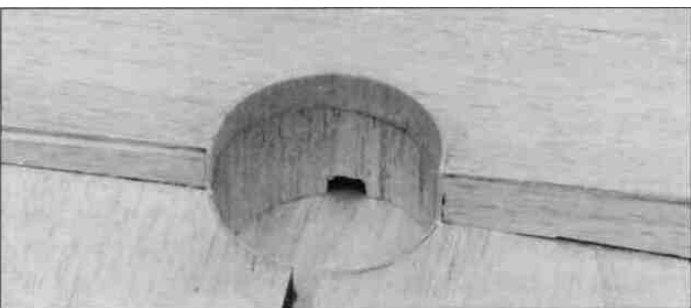
Cut the Wheel Wells

Skip to **ASSEMBLE THE PLASTIC PARTS** if retracts are not used.



❑ 1. Carefully cut the wheel well opening in the belly pan 1/16" larger than the wheel well in the wing. A Dremel' tool with a sanding drum works great for this.

❑ 2. Cut out a wheel well liner from a leftover piece of 1/16" balsa wing sheeting. Wet the liner and glue it to the belly pan and the bottom wing sheeting.

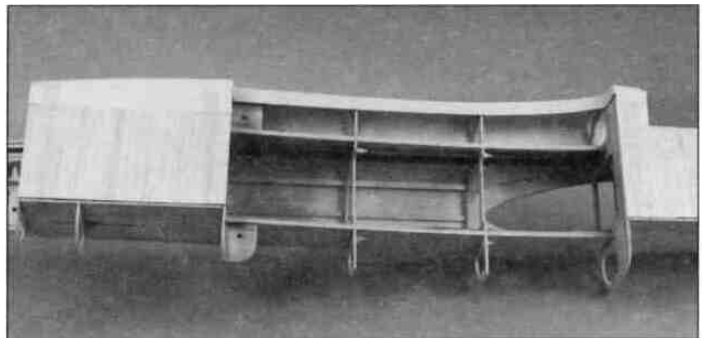
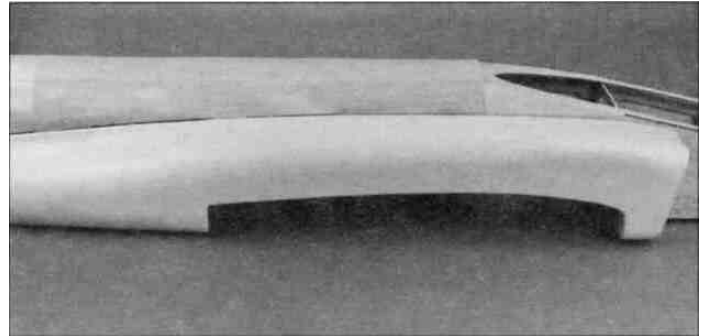


❑ 3. Sand the wheel well liners flush with the belly pan.

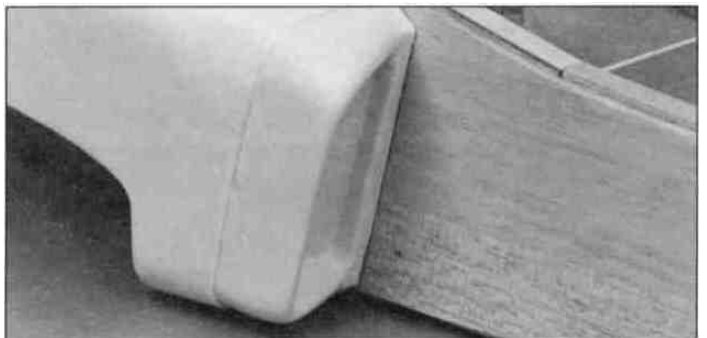
ASSEMBLE THE PLASTIC PARTS

Assemble the Nacelles

We **highly recommend** that all plastic joints and screw holes be strengthened with fiberglass cloth and thin CA on the **inside** of the joint.



❑ 1. Trim the plastic **nacelles** along the embossed cut lines. You can use a hobby knife to carefully score along the cut lines and flex the plastic until the excess breaks free, or use small scissors to cut along the cut line. Kyosho curved Lexan scissors (KYOR1010) work extremely well. Test fit the nacelles to the side of the model. The top of the nacelles fit in the groove between the fuse sides and turtledeck. When satisfied with the fit, tape the nacelles to the fuselage.

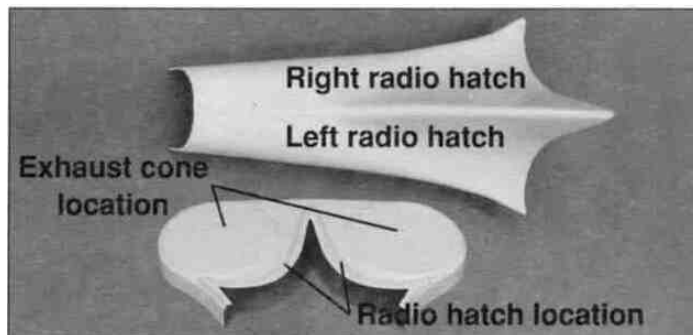


❑ 2. Trim the plastic **inlets** along the embossed cut lines. Fit the inlets on the front of the nacelles and against the fuse sides. When satisfied with the fit, sand the inside edge of the inlets and the lip on the nacelles and glue them together with thin CA.

❑ 3. Before painting the nacelles, fill the seams and other imperfections with filler such as Squadron White Putty, **or** resin filler such as Bondo. We use Bondo most of the time. It cures quickly and is easy to sand. Squadron putty works well, but it takes several hours to cure.

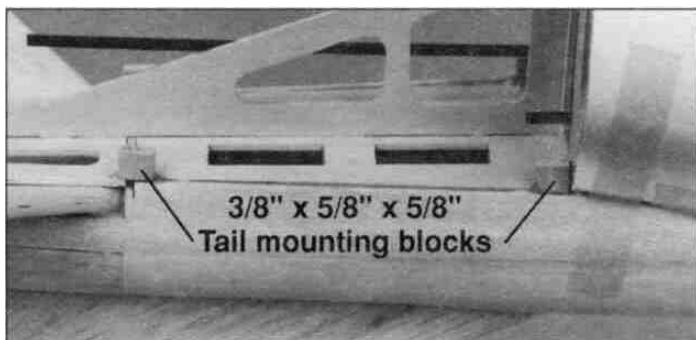
❑ 4. After the filler cures, wet sand the entire nacelles with 400-grit sandpaper in preparation for primer.

❑ 5. Temporarily attach the nacelles to the fuse with masking tape.



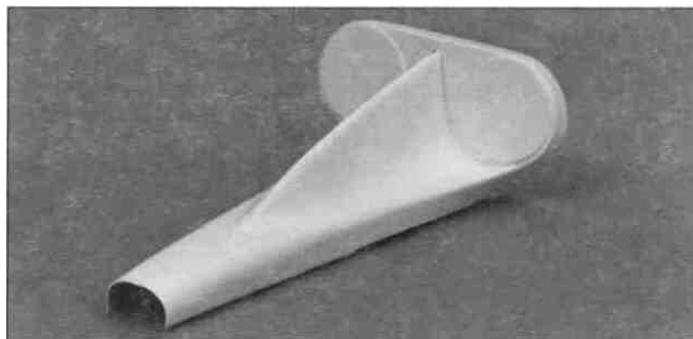
❑ 5. Trim the **left** and **right** plastic **radio hatches** and the **hatch front** along the embossed cut lines. Tape the radio hatches together and test fit them on the hatch front. Note the raised area on the hatch front for the radio hatch. When satisfied with the fit, roughen the lip and inside edges of the left and right radio hatch and the raised area on the hatch front. Glue the left and right radio hatches together.

Assemble the Radio Hatch

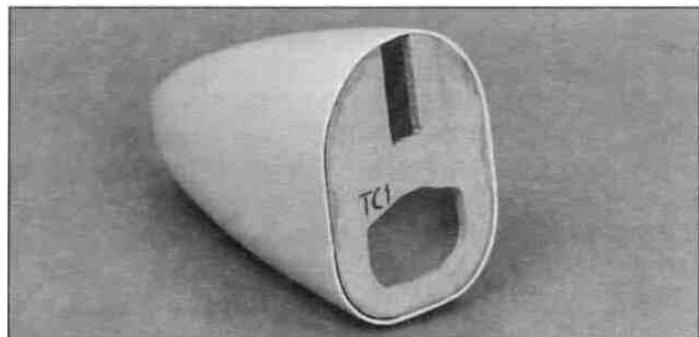


❑ 1. Use epoxy to glue the 3/8" x 5/8" x 5/8" hardwood **tail mounting blocks** in position inset 1/16" from the fuselage sides.

❑ 2. Cut two 3/8" wide pieces of balsa from a leftover 3/32" die-sheet. Trim and glue the balsa pieces between the tail mounting blocks, 1/16" from the fuse sides.



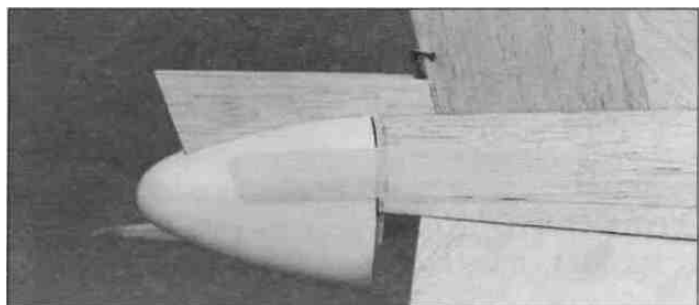
❑ 6. Glue the radio hatch to the raised area on the hatch front.



❑ 3. Trim the plastic **tail cone** along the embossed cut lines and sand the inside edges. Glue the die-cut 1/8" **tail cone former** to the inside of the tail cone.

❑ 7. Trim the two **plastic exhaust cones** along the embossed cut lines. Sand the inside lips of the cones and glue them to the raised area on the hatch front.

❑ 8. Use filler to fill the seams and blend the radio hatch into the hatch front. Sand the filler smooth after it dries and give the radio hatch assembly an overall sanding with 400-grit sandpaper.



❑ 4. Cut a slot in the top of the tail cone to allow it to slide over the lower fin extension. Tape the cone in position.

❑ 9. Position the radio hatch over the radio tray. Drill 1/16" pilot holes through the radio hatch and tail mounting blocks. Attach the radio hatch to the fuselage with #2 x 3/8" sheet metal screws and #2 washers.

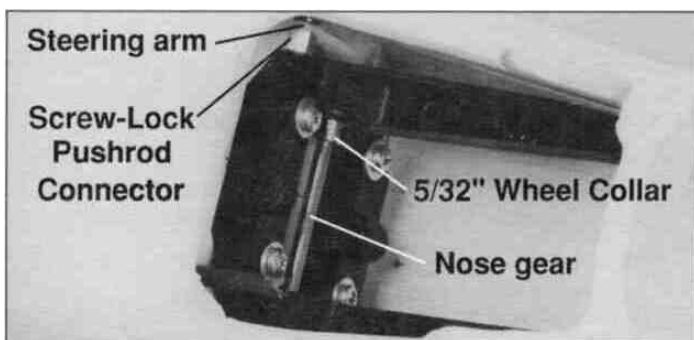
❑ 10. At this stage, give the entire model a rough sanding. Refer to the cross-section views often while sanding. The bottom of the fuselage should be sanded flush with the nacelles.

RADIO INSTALLATION

Install the Rudder, Elevator & Throttle Servos

Some modelers prefer to install the pushrods and radio system **after** the model is covered. If this is your preference, skip ahead to **Covering**. Return to this section after you have covered the model and installed the control surfaces.

If installing retracts, skip to step 6.



1. Install a Screw-Lock Pushrod Connector in the hole 1/2" from the center of a straight servo horn. Thread a 4-40 x 1/8" socket head cap screw into the pushrod connector. Slide the fixed nose gear through the fuse bottom and through the first beam of the engine mount. Slide a 5/32" wheel collar on the nose gear. Insert the nose gear through the second beam and secure the steering arm on the end of the nose gear with a 6-32 x 1/4" machine screw. Slide the wheel collar against the second beam and secure it to the nose gear with a 6-32 set screw.

2. Cut off all the outer pushrod tubes, 1/2" aft of the F-8 former,

3. Cut a 48" inner pushrod, 40" long. Cut off 1/2" of the threads of a 2-56 x 4" and 2-56 x 12" threaded pushrod. Thread the 12" pushrod 1/2" into one end of the inner pushrod. Insert the end without the pushrod into the steering outer pushrod tube.

4. At the end that protrudes from the firewall, thread the cut 4" threaded pushrod 1/2" into the inner pushrod.

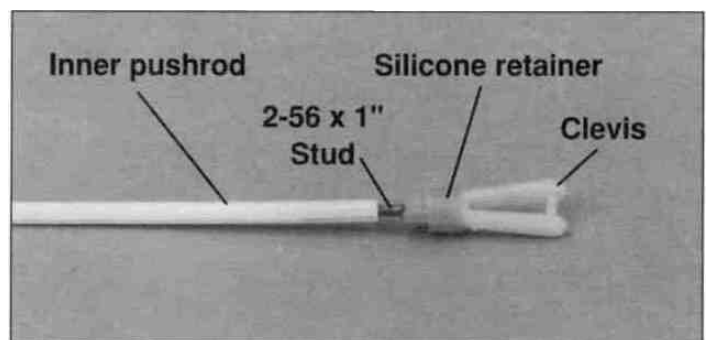
5. Slide the threaded pushrod through the pushrod connector until the pushrod connector contacts the inner pushrod tube. Tighten the 4-40 x 1/8" socket head cap screw in the pushrod connector and cut off the excess pushrod.

Perform steps 6 through 8 for retracts only.

6. Trim off all the outer pushrod tubes, 1/2" aft of former F-8.

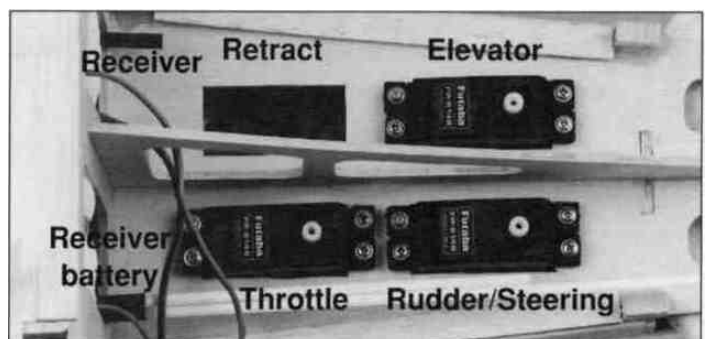
7. Cut the 48" inner steering pushrod, removed in step 12 of **Finish The Bottom Of The Fuse**, to 35" long. From the retract end, insert the inner pushrods (end without the clevis) into the outer steering and retract pushrod tubes.

8. Cut off 1/2" of the threads on two 2-56 x 12" threaded pushrods. Thread the 12" pushrods 1/2" into the inner pushrods at the servo end. You may need to temporarily remove the clevises to allow enough inner pushrod to exit at the servo end.



9. Thread a 2-56 x 1" stud half way into the end of a 48" inner pushrod. Slide a silicone clevis retainer over the stud and thread a nylon clevis 13 turns onto the stud.

10. Insert the inner pushrod tube in the throttle outer pushrod tube. Place the engine on the engine mount and attach the clevis to the throttle arm of the carburetor. Attach the engine to the engine mount.

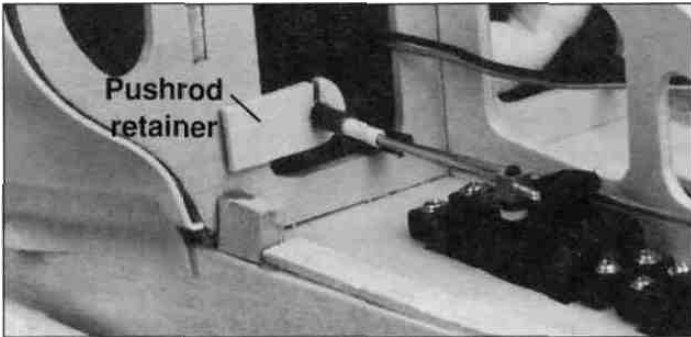


11. Install the rudder, elevator, throttle and retract servos (if retracts are used) in the radio tray. Route the servo wires through F-8 and plug them into the receiver. Plug the receiver battery into the receiver switch and the receiver switch into the receiver. Wrap the receiver and receiver battery in foam and place them in front of F-8.

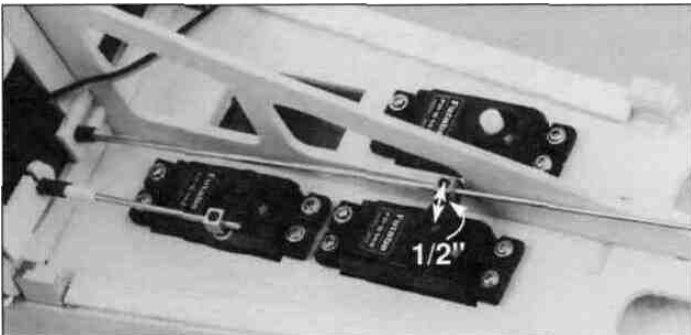
Note: On our test models, we installed a **Great Planes Switch and Charge Jack Mount** in the back of the exhaust cone after the cone was painted.

❑ 12. Cut off the inner throttle pushrod tube, 1/2" aft of the outer pushrod. Cut off 1/2" of the threads on a 2-56 x 4" threaded pushrod and thread the pushrod 1/2" into the end of the throttle inner pushrod.

❑ 13. Install a **Screw-Lock Pushrod Connector** on the throttle servo horn. **Do not** use the locking washer until after the control throws are adjusted. Adjust the throttle control on your radio and the throttle arm on the carburetor to full open. Insert the throttle pushrod through the pushrod connector and install the servo horn on the servo. Tighten the 4-40 x 1/8" socket head cap screw in the pushrod connector and check the operation of the throttle. It should open and close fully without stalling the throttle servo. When satisfied, cut off the excess pushrod from behind the pushrod connector and install the locking washer on the pushrod connector.



❑ 14. Make an outer pushrod retainer out of leftover plywood. Glue the retainer to F-8 and the outer throttle pushrod tube to secure it in line with the servo horn.

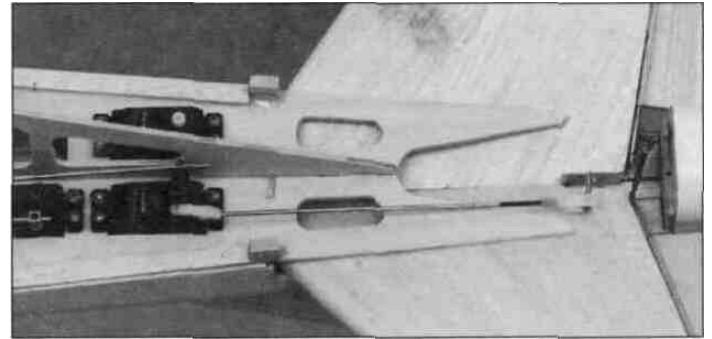


❑ 15. Remove two of the arms on a "cross" servo horn to make a straight horn. Install a Screw-Lock Pushrod Connector approximately 1/2" from the center of the servo horn. **Do not** use the locking washer until after the control throws are adjusted. Slide the steering pushrod through the pushrod connector. Center the rudder servo and install the servo horn on the servo, perpendicular to the centerline of the servo. Secure the outer steering pushrod to F-8 with a second pushrod retainer.

❑ 16. Thread a nylon **swivel** on the rudder torque rod so that it is 5/8" from the bend. Thread a nylon **swivel clevis** 13 turns onto a 2-56 x 12" threaded rod. Attach the swivel clevis to the swivel.

❑ 17. Center the rudder and mark the threaded rod where it crosses the servo horn (on the opposite side of the steering pushrod). Make a 90-degree bend at the mark and cut off the excess wire 3/8" above the bend.

❑ 18. Enlarge the servo horn holes with a 5/64" drill bit.

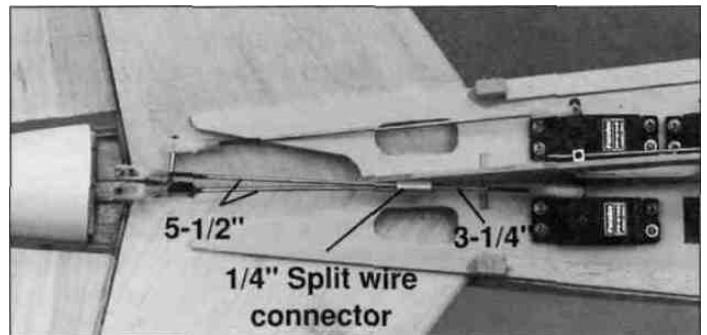


❑ 19. Insert the pushrod into the servo horn and secure it with a nylon Faslink™ connector. With the servo horn centered, adjust the nose gear so that it is straight. Tighten the 4-40 x 1/8" socket head cap screw in the pushrod connector and cut off the excess pushrod. Check the operation of the rudder and steering making sure there is no binding. If it operates freely, install the locking washer on the steering pushrod connector.

❑ 20. Thread a nylon swivel halfway onto each elevator torque rod.

❑ 21. Thread nylon **swivel clevises** 13 turns onto two 2-56 x 12" threaded rods. Thread a nylon **clevis** 13 turns onto a 2-56 x 4" threaded rod.

❑ 22. Cut the 12" threaded rods to 5-1/2" long, measured from the swivel clevis pin hole. Cut the 4" threaded rod to 3-1/4" long, measured from the clevis pin.



❑ 23. Attach the swivel clevises to the swivels. Slide the 1/4" split wire coupler over the two pushrods. Slide the 3-1/4" long pushrod into the split coupler from the other end. Install the elevator servo horn, perpendicular to the centerline of the servo. Attach the clevis to the servo horn.

❑ 24. Hold onto the split wire connector and operate the elevators to check for any interference with the movement of the pushrods.

- 25. Adjust the elevators so that they are in the neutral position and the split coupler is centered on the overlapping pushrods. Use **silver solder** to tack the three pushrods and coupler together, being careful not to melt the clevis.

Hint: A pair of hemostats, or a small pair of locking pliers clamped to the pushrod between the coupler and the clevis, will act as a heatsink to help prevent the clevis from melting.



How To Achieve A Good Solder Joint

- A. Roughen the area to be soldered with fine sandpaper. Thoroughly clean the area with rubbing alcohol.
- B. Assemble the items to be soldered.
- C. Apply a small drop of soldering flux.
- D. Heat the area to be soldered. Apply solder to the heated area. The metal must get hot enough to melt the solder and the solder must flow into the joint. Do not melt the solder by touching it to the soldering iron.
- E. Do not move the parts until the solder has cooled.
- F. Clean off the excess flux with alcohol.
- G. Test the joint by pulling on it.

- 26. Remove the clevis and swivel clevises from the pushrods and securely solder the pushrods and coupler together.

- 27. Allow the pushrods to cool before reinstalling the swivel clevises on the 5-1/2" pushrods. Install a silicone retainer and the clevis on the 3-1/4" pushrod. Reattach the clevises to the swivels and servo horn and check the elevator's movement.

Perform steps 28 through 31 if using mechanical retracts in your model.

- 28. Cut off 1/2" of thread from a 4" threaded pushrod (not included).

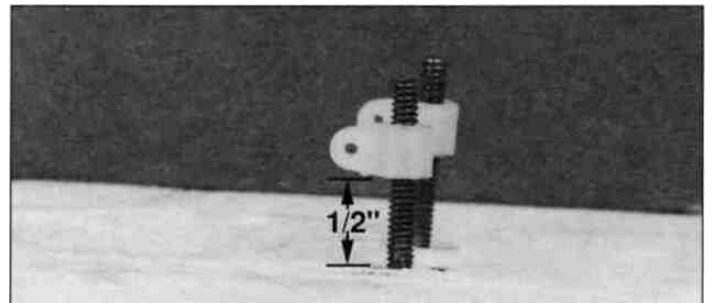
- 29. Retract the nose gear and adjust the retract servo to the proper position. Mark the 4" pushrod where it crosses the servo horn. Make a 90-degree bend at the mark and cut off the excess wire 3/8" above the bend.

- 30. Enlarge the servo horn holes with a 5/64" drill bit.

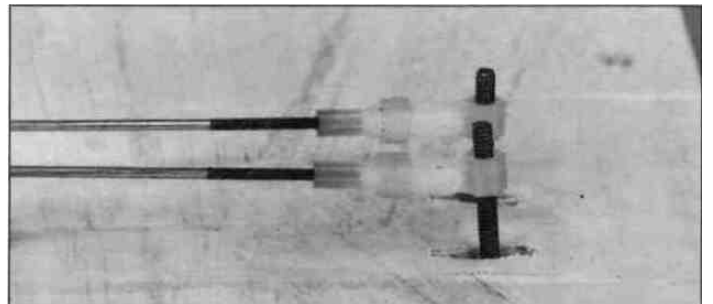
- 31. Insert the pushrod into the servo horn and secure it with a nylon Faslink connector (not included). Check the operation of the retract, making sure that the servo does not stall when the retract is raised and lowered.

Install the Aileron Servo

- 1. If you will be using flaperons install the aileron servos in the aileron servo tray and route the wires out the side of the tray. Connect the servos to the electronic mixer and the mixer to the receiver. If you are **not** using flaperons install only one aileron servo in the aft servo mounting hole and connect it to the receiver.



- 2. Thread a **nylon torque rod horn** onto each aileron torque rod until the bottom of the horn is 1/2" above the surface of the wing.

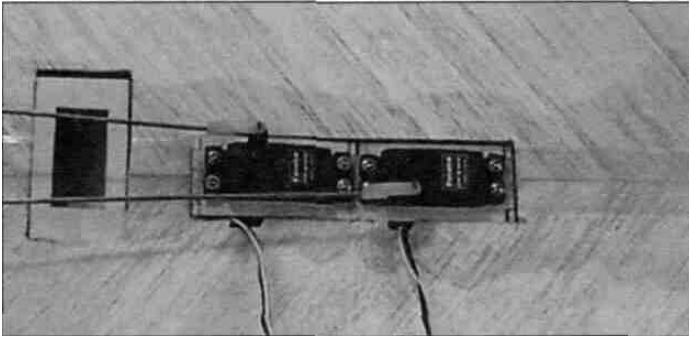


- 3. Thread nylon clevises, 13 turns, onto two 2-56 x 12" threaded rods. Slide a silicone retainer over each pushrod and connect the clevises to the torque rod horns, securing them with a retainer.

- 4. Connect the aileron servos to the receiver and adjust the servos to the neutral position. Trim two servo horns so that each horn has one arm. Install the servo horn on the left side of the forward aileron servo and on the right side of the aft aileron servo. The horn must be installed perpendicular to the centerline of the servo.

- 5. Center the ailerons and mark the pushrods where they cross the servo horn holes.

6. Enlarge the servo horn holes with a 5/64" drill bit.



7. Make a 90-degree bend in both pushrods at the marks and cut off the excess rod 3/8" above the bend. Insert the pushrods in the servo horn and secure them with nylon Faslink connectors.

BALANCE THE MODEL Laterally

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

Now that the model is nearly completed, you should to balance it laterally (side-to-side). An airplane that is laterally balanced will track better during aerobatic maneuvers. Here's how:

1. With the wing level and attached to the model, lift the model by the propeller shaft and the fin. This will require an assistant. Do this several times.
2. The wing that consistently drops indicates the heavy side. Balance the model by adding weight to the other wing tip.

COVERING

Prepare the Surface

1. If you've hooked up the radio system before covering the model, disconnect and remove all the control rods, hinges and control horns. Remove the engine, landing gear, plastic parts and any other hardware you may have installed.
2. Most of the model should be rough-sanded by now, with all the rough edges sanded and rounded following the cross-section views on the plans. Fill all dents, seams, low spots and notches with HobbyLite balsa colored filler.



Here is an easy method to remove minor dents in wood where the wood grain has not been broken.

- A. Wet the area of the dent with water.
- B. Carefully rub a hot sealing iron over the dent.
- C. As the wet wood is heated, the wood grain will swell up.
- D. Allow the wood to dry before sanding smooth.

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

Covering Technique

Cover the model with Top Flite MonoKote film, using the suggested covering sequence that follows. Before you cover the fuselage, apply 1/4" wide strips of MonoKote film in the corners where the stab meets the fuselage and the fin meets the fuselage. Then, proceed to cover the fin and stab with pre-cut pieces that meet in the corners and overlap the 1/4" strips. Never cut the covering on the stab and fin after it has been applied except around the leading and trailing edges and the tips. Modelers who do this may cut through the covering and into the stab and fin. This will weaken the structure to a point where it may fail during flight.

Some modelers prefer to cover the top and bottom of the ailerons with one strip of MonoKote film. This is done by covering the bottom first, then wrapping the MonoKote film up over the leading edge.

We used Top Flite MonoKote Tan for the top surfaces and Dove Gray for the bottom surfaces.

Suggested Covering Sequence

Fuselage

1. 1/4" strips at fin and stab as described
2. Aft fuselage bottom
3. Forward fuselage bottom
4. Fuselage right side up to the top center of the turtle deck and center of nose
5. Fuselage left side up to the top center of the turtle deck and center of nose, overlapping by 1/8"
6. Fin tip, followed by stab tip

7. Stab bottom, followed by top
8. Fin right side, followed by the left side
9. Elevator tips and root ends
10. Elevator bottoms, followed by the top
11. Rudder tips, right side followed by the left side
12. Splitters

Wing

1. Tips of main wing
2. Trailing edges of wing
3. Bottom right, followed by the left panel of the wing
4. Top right, followed by the left panel of the wing
5. Root of the wing tip, followed by the tip
6. Trailing edge of the wing tip
7. Bottom of the right wing tip, followed by the left
8. Top of the right wing tip, followed by the left
9. Aileron tips, followed by the bottom and top of the aileron

PAINTING

After the model is covered, use fuelproof model paint, 30-minute epoxy thinned with alcohol or finishing resin to coat areas that may be exposed to raw fuel or exhaust residue. These are areas such as the engine and fuel tank compartment, wing saddle and wheel wells.

Top Flite LustreKote fuelproof paint is recommended for painting all ABS plastic parts. At least one coat of LustreKote primer is highly recommended to fill in small scratches left from sanding as well as small pin holes in the filler. Wet sand between coats with 400-grit sandpaper and apply a second coat of primer if necessary.

We primed the plastic parts and wet sanded them to fill any scratches. The ducts were then painted with LustreKote Tan Paint (TOPR7216). We then glued the ducts to the fuselage with Pacer Formula 560 Canopy Glue. After the glue dried, we mixed 30-minute epoxy and micro balloons in equal parts and applied the mixture along the seam, between the ducts and the fuselage. After the epoxy mixture cured, we lightly sanded the seam and painted it tan.

We cut out templates for the camouflage shapes from file folders. The templates can be held near the model as the paint is sprayed. The MonoKote film was scuffed with 400-grit sandpaper before being painted with LustreKote Olive Drab (TOPR7210) and Testors Dark Green (FS34079). The radio hatch and tail cone area are painted with LustreKote Aluminum (TOPR7205) and Black (TOPR7209). After the model was completely painted and allowed to dry, it was given several light coats of LustreKote Clear Flat (TOPR7199).

Before painting the canopy, use scissors or a hobby knife to trim along the molded cut lines. True the edges with your bar sander and 220-grit sandpaper. Use 400-grit sandpaper to scuff the frame portion of the canopy so the paint will stick. We recommend you paint the canopy frame

with Pactra Formula-U or Chevron Perfect Paint. Use masking tape or frisket film to cover the portion of the canopy that is not to be painted. If you are not sure that the paint is compatible with the clear canopy, test the paint on a leftover piece of canopy material.

For painting the pilots, 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 pilots because they are flat. Best of all, they clean up with water.

We covered the cockpit floor with 600-grit sandpaper glued in place with 3M 77 spray adhesive.

FINAL HOOKUPS & CHECKS

Install the Hinges

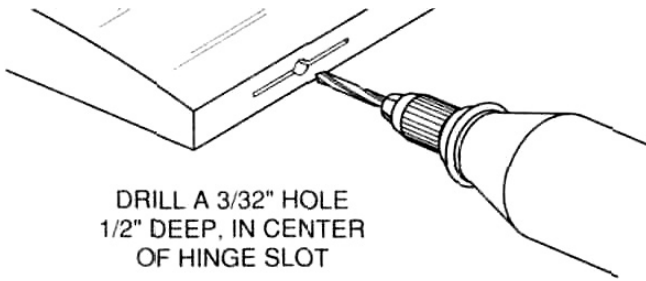
1. Starting with the elevators and stab, cut the covering from the hinge slots.



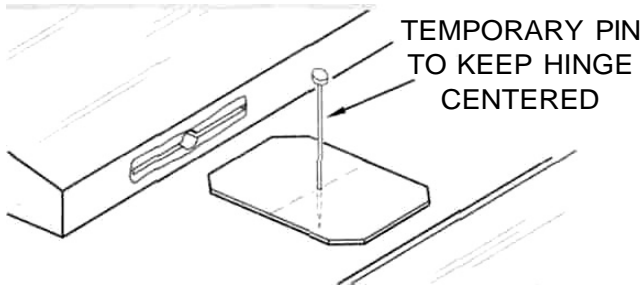
Installing CA Hinges

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

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

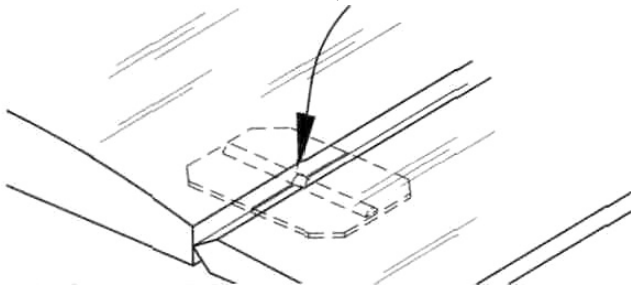


Drill a 3/32" hole, 1/2" deep, in the center of the hinge slot. If you use a Dremel® MultiPro™ for this task, it will result in a cleaner hole than if you use a slower speed drill. Drilling the hole will twist some of the wood fibers into the slot, making it difficult to insert the hinge, so you should reinsert the knife blade, working it back and forth a few times to clean out the slot.



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

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



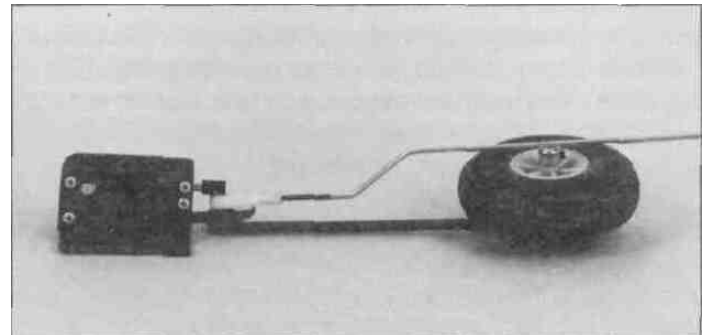
2. Install the elevators on the stab and apply 6 drops of thin CA adhesive to both sides of each hinge. Allow a few seconds between drops for the CA to wick into the slot. Repeat the process to install the rudder.

3. Pack each of the torque rod holes in the ailerons with 30-minute epoxy (a toothpick works well for this). Install the ailerons with their hinges. Repeat the gluing technique described previously and allow the epoxy to cure.

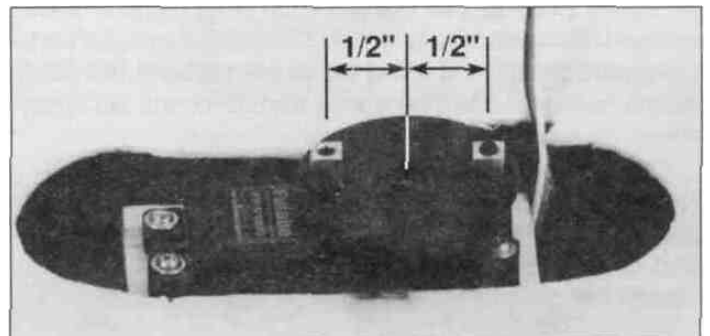
4. If you have not yet installed and connected the elevators, rudder, throttle, steering and aileron pushrods, return to "Radio Installation" on page 38 for instructions.

Install the Main Retract Servo

Perform steps 1 through 6 if using mechanical retracts. Skip to the next section, *Attaching The Wing Tips*, if using fixed landing gear.

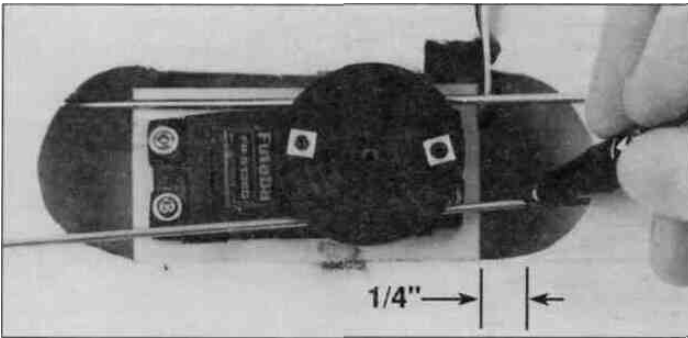


1. Reassemble the main retracts and retract pushrods that were removed from the wing during wing completion. Install the main gear retract servo.

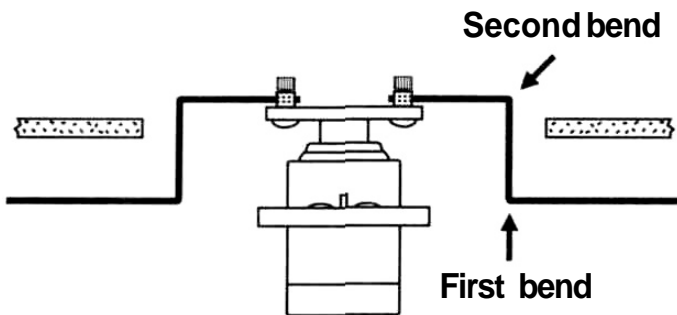


2. A large, round servo horn with holes drilled 1/2" (12.7mm) from the center will work for most mechanical retracts. Install Screw-Lock Pushrod Connectors (not included, GPMQ3870) onto the horn as shown and install the servo horn on the servo.

3. With the retract pushrods attached to the retracts, insert the pushrods through the clearance holes toward the servo. Mount the retracts to the retract blocks.



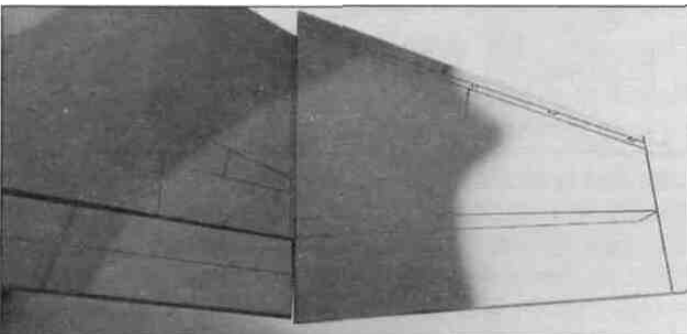
- 4. Pull the retract pushrods to the stops. This will lock the gear in the down position. Mark the pushrods about 1/4" short of the servo tray. Make a 90-degree bend in the pushrods, away from the wing.



- 5. Make another bend in each pushrod about 5/16" above the first. Point the pushrods toward the pushrod connectors on the servo.
- 6. Hook up and cycle the retracts a few times to make sure that there is no interference or binding in the linkage. Make minor adjustments as required. Trim off the excess pushrod wire at the servo once you are satisfied with the retract operation.

Attach the Wing Tips

- 1. Temporarily install the wing tip joiners in the main wing and slide the wing tips onto the joiners.
- 2. Mark the outline of the main wing on the wing tip.
- 3. Remove the covering 1/16" inside the outline.

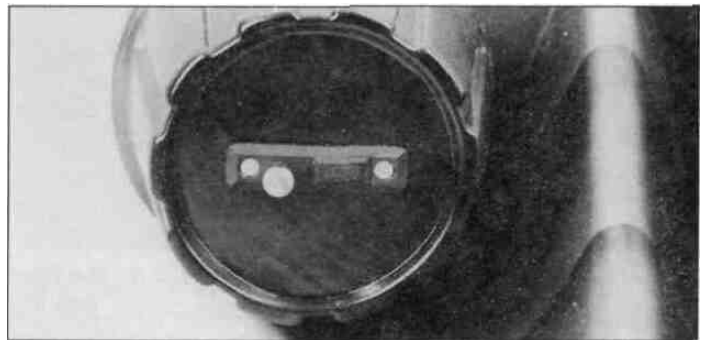


- 4. Use 30-minute epoxy to glue the wing tip joiners in the main wing. Before the epoxy cures, apply epoxy to the

root of the wing tip and the tip of the main wing. Join the wing tip to the main wing, holding it in place with masking tape. Wipe off the excess epoxy with rubbing alcohol before the epoxy cures.

Install the Hardware

- 1. Assemble the fuel tank per the manufacturer's instructions. Place 1/4" foam padding (not included) on the tank floor and secure the tank to the floor with rubber bands (not included) hooked over the extensions on the tank floor. Insert two 12" pieces of fuel tubing (not included) through the firewall. Connect one of the fuel tubes to the fuel pick-up fitting and the other to the pressure fitting.
- 2. Reinstall the nose landing gear, engine mount and engine. Apply thread lock to the bolts holding the engine to the firewall. Shorten and connect the fuel pick-up line to the carburetor. Connect the pressure line to the muffler.
- 3. Install the fixed main landing gear in the landing gear rails, securing them with nylon landing gear straps and #2 x 5/8" sheet metal screws.
- 4. Install a 3/16" wheel collar (not included) on the main landing gear and a 5/32" wheel collar (not included) on the nose landing gear. Install the wheels (not included) and secure them to the landing gear with a second wheel collar. If retracts are used, install the appropriate size wheel collars for the axles.
- 5. Reinstall the radio system. Make sure the receiver and receiver battery are wrapped in foam padding and secured in the tail section.



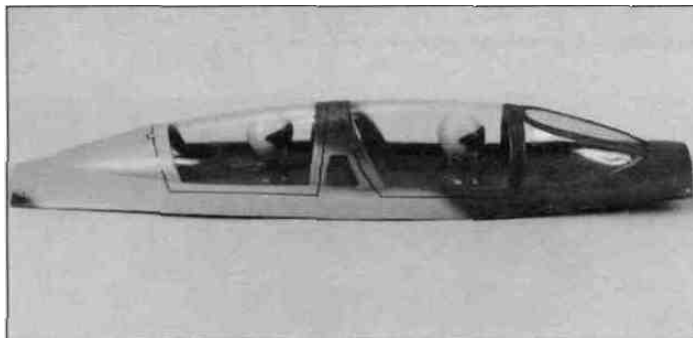
- 6. Mount the receiver switch in a convenient location. We used a Great Planes Switch and Charge Jack mounted in the back of one of the tail cones.
- 7. Switch on the radio system and center the servos. Reinstall the servo horns and pushrods.
- 8. Fasten the receiver antenna along the inside of the fuselage, toward the front of the model. We used leftover outer pushrod tubing, cut into 1/4" long pieces, glued to the fuselage sides as guides.
- 9. Apply 1/16" foam wing seating tape (not included) on the wing saddle of the fuselage (optional).

Attach the Canopy & Splitter Plates

1. Before permanently installing the canopy, securely glue your pilots in place on the cockpit floor. For the most security, in addition to glue, screw the base of the pilot to the cockpit floor with #4 sheet metal screws (not included) from the underside of the cockpit floor.

2. Test fit the cockpit floor in the canopy. The edges will need to be sanded at an angle to match the angle of the canopy.

3. Wipe the inside of the canopy clean. Glue the canopy to the cockpit floor using masking tape to hold it in position until the glue dries. We recommend a glue specifically formulated for attaching canopies, such as Pacer "Formula 560" canopy glue. Formula 560 is like regular white glue (aliphatic resin) in that it dries clear and cleans up with water but bonds extremely well to butyrate and dries overnight (to allow for accurate positioning).



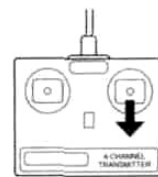
4. After the canopy glue has cured, place it on the fuse and drill four 1/16" pilot holes, one in each corner, into the firewall and former F-4. Install the canopy on the fuselage with four #2 x 3/8" sheet metal screws and #2 washers.

5. Position the splitter plates against the fuselage in front of the nacelles. Mark the area of contact and remove the covering from inside the area.

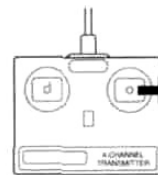
6. Use epoxy to glue the splitters to the fuse sides. Hold them in position with masking tape.

SET THE CONTROL THROWS

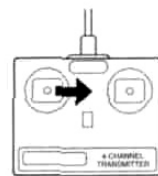
4-CHANNEL RADIO SETUP (STANDARD MODE 2)



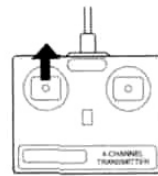
ELEVATOR MOVES UP



RIGHT AILERON MOVES UP
LEFT AILERON MOVES DOWN



RUDDER MOVES RIGHT



CARBURETOR WIDE OPEN

The throws are measured at the widest part of the elevators, rudder and ailerons. Adjust the position of the pushrods at the servo horns to control the amount of throw. You may also use the ATV's if your transmitter has them but the mechanical linkages should still be set so the ATV's are near 100% for the best servo resolution (smoothest, most proportional movement).

We recommend the following control surface throws:

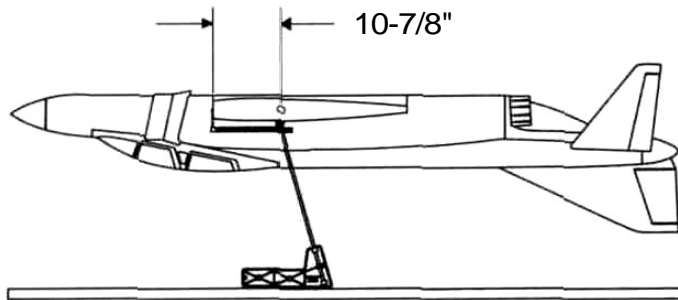
	<u>LOW</u>	<u>HIGH</u>
Elevator:	3/4" up & down	1" up & down
Rudder:	1-1/2" left & right	1-1/2" left & right
Ailerons:	1" up & down	1-1/4" up & down
Flaperons:	5/8" down w/1/8" up elevator mixed	

Note: If your radio does not have dual rates, set the control surfaces to move between the high rate and low rate.

Note: The balance and control throws for the F-4 Phantom have been extensively tested. This chart indicates the settings at which the F-4 flies best. Please set up your model to the specifications listed above. If, after you become comfortable with your F-4, you would like to adjust the throws to suit your tastes, that's fine. Too much throw can force the plane into a stall or snap roll, so remember, "more is not always better."

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. The **balance point** (C.G.) is located 10-7/8" back from the leading edge of the wing, next to the fuse sides as shown in the sketch and on the fuselage plan. 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.

Hint: Reference the full-size fuse plan to help you locate the proper balance point. This is the balance point at which your model should balance for your first flights. After initial trim flights and when you become more acquainted with your F-4, you may wish to experiment by shifting the balance up to 5/16" forward or backward to change its flying characteristics. Moving the balance forward may improve the smoothness and stability, but the model may then require more speed for takeoff and may become 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. 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. The Great Planes CG Machine" (GPMR2400) works great for balancing the model.

3. Place the model on the balancer at the balance point. If the tail drops, 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: 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. 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. Later, if the balance is O.K., you can glue the weights to the radio tray permanently.

PREFLIGHT

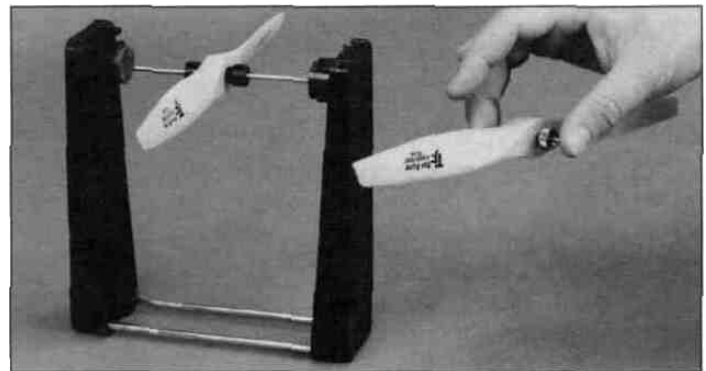
At this time check all connections including servo horn screws, clevises, servo cords and extensions. Make sure you have installed the nylon retainers on the Screw-Lock Pushrod Connectors and the silicone retainers on all the clevises.

Charge the Batteries

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

Balance the Propeller

Carefully balance your propellers 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 your radio receiver and battery. Vibration may cause your fuel to foam, which will, in turn, cause your engine to run lean or quit.



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

Find a Safe Place to Fly

Since you have chosen the F-4 Phantom, 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

Inspect your radio installation and confirm that all the control surfaces respond correctly to the transmitter inputs. The engine operation must also be checked by confirming that the engine idles reliably, 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 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 stand by 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 receiver battery, 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; and 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 these items away from the prop: loose clothing, shirt sleeves, ties, scarfs, long hair or loose objects such as pencils or screwdrivers that may fall out of shirt or Jacket pockets into the prop.

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

Make all engine adjustments from behind the rotating propeller.

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

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

AMA SAFETY CODE (EXCERPT)

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

General

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

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 or 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

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 or your airplane, any time you detect flutter you must immediately cut the throttle and land the airplane! Check all servo grommets for deterioration (this may indicate which surface fluttered) and make sure all pushrod linkages are 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 control rods in servo horns; Insufficient glue used when gluing in torque rods; Excessive flexing of aileron, caused by using too soft balsa; Excessive "play" or "backlash" in servo gears; and insecure servo mounting.

The Great Planes F-4 Phantom is a great-flying sport model that flies smoothly and predictably. The F-4 does not, however, possess the self-recovery characteristics of a primary R/C trainer and should only be flown by experienced RC Pilots.

Takeoff

Takeoff on "high" rates if you have dual rates on your transmitter - especially if you are taking off into 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 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 F-4** Phantom for the first several flights, gradually "getting acquainted" with this great model as your engine gets fully broken in. If you feel as though you have your hands full, keep this 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 F-4 behaves in each. For smooth flying and normal maneuvers, use the low rate settings as listed on page 46.

Before it's time to land, you should climb your F-4 Phantom to a safe altitude, reduce 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 and how the Phantom handles stalls.

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 your first few landings, plan to land slightly faster than stall speed.

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. Happy Landings!

TWO VIEW

Photocopy this drawing and use the copies to design your trim scheme.

