

# PIPER J-3 CUB



## INSTRUCTION MANUAL

### WARRANTY

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

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

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

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



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

Your Great Planes Piper J-3 Cub 60 is not a toy, but rather a sophisticated, working model that functions very much like an actual airplane.

Because of its realistic performance, the Cub 60, if not assembled and operated correctly, could possibly cause injury to yourself or spectators and damage property.

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

You can also contact the national Academy of Model Aeronautics (AMA), which has more than 2,300 chartered clubs across the country. Through any one of them, instructor training programs and insured newcomer training **are** available.

Contact the AMA at the address or toll-free phone number below.



**Academy of Model Aeronautics**  
5151 East Memorial Drive  
Muncie, IN 47302-9252  
Tele. (800) 435-9262  
Fax (317) 741-0057

## INTRODUCTION

Congratulations! Thank you for purchasing the Great Planes **Piper J-3 CUB 60!**

This **J-3 CUB** is a 1/47 scale model of the full-size version. It's easy to build and fly, predictable, fairly aerobatic, and has no "bad habits" making it a great sport-scale airplane. Although the model is sufficiently close to scale that it can place well in sport-scale competition, traditional Great Planes quality and ruggedness is evident throughout, making this an airplane you'll want to take along every time you go to the flying field. Its 90" wingspan makes it International Miniature Aircraft Association\* (IMAA) legal (as is the 83" clipped wing version).

\*IMAA is an organization that promotes non-competitive flying of giant scale models.

### IMAA

International Miniature Aircraft Association  
205 S Hilldale Road  
Salina, KS 67401

**This is not a beginner's airplane! While the J-3 CUB 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 a good **basic trainer** 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 "trainer" airplane, the **J-3 CUB** is an excellent choice to improve your skills and learn new maneuvers.

To compliment the nostalgic looks and stable flight characteristics displayed by the Piper Cub, Great Planes has *something extra* modelers are sure to enjoy. Designed specially for the 90" Great Planes Cub are 60 size Sport Floats which are perfect for *any* model of this size as well. The full size J-3 featured aluminum floats, so why not go all the way and prepare your model for water takeoffs and landings at the lake side! All balsa and ply construction, wire struts, water rudder and highly detailed instructions are included.

**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 model, please call us at (217) 398-8970 and we'll be glad to help. If you are calling for replacement parts, please look up the part numbers and the kit identification number (stamped on the end of the carton) and have them ready when calling.**

## PRECAUTIONS

- 1 You must build the plane **according to the plans and instructions**. Do not alter or modify the model, as doing so may result in an unsafe or unflyable model. In a few cases the plans and instructions may differ slightly from the photos. In those instances you should assume the plans and written instructions are correct.
2. You must take time to **build** straight, true and strong
- 3 You must use a proper R/C **radio** that is in first class condition, the correct sized **engine** and correct **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 the first and each successive flight to insure that all equipment is operating and you must make certain that the model has remained structurally sound. Be sure to check the nylon clevises often, and replace if they show signs of wear.
6. **You must fly the model only with the help of a competent, experienced R/C pilot** if you are not already an experienced and knowledgeable R/C pilot at this time.

**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.**

## DECISIONS YOU MUST MAKE

### Engine And Mount

The recommended engine size range is as follows:  
.60 - .90 cubic inch displacement **2-stroke**  
.70 - .91 cubic inch displacement **4-stroke**

**NOTE:** If you install a 2-stroke engine, we recommend using a muffler that can be completely enclosed inside the cowl. The Top Flite® In-Cowl muffler and header is ideal for the Cub 60 if the engine is mounted inverted. A Pitts-style muffler may be used with a side-mounted 2-stroke engine.

Top Flite Header for SuperTigre™ .60 to .90 - (TOPQ7925)  
Top Flite Header for O.S.® .61 FP and SF - (TOPQ7920)  
Top Flite In Cowl Muffler - (TOPQ7915)

### Engine And Mount (Cont.)

This kit includes a Great Planes **EM60120** engine mount that fits nearly all 2-stroke or 4-stroke engines in the recommended range. If you prefer, you may purchase a **custom** engine mount for your engine, or you may choose to install shock-absorbing rubber-cushioned mounts.

### Wing Configuration

The Great Planes Cub 60 may be built with either the standard 90" wing or the shorter 83" clipped wing. The only differences in construction are one less rib in each wing panel and shorter spars and trailing edges, which are taken care of during building. No extra parts or special construction is required and full details are provided. The Cub 60 will be more aerobatic with the shorter wing yet still retain the gentle, relaxing flight characteristics of a J-3 Cub. No need to make a decision until you begin wing construction.

## PREPARATIONS

### Accessories & Additional Items

- D Four-channel radio with 5 servos
- D "Y" Harness (Futaba J HCAM2500, Airtronics HCAM2520, JR HCAM2530)\*  
-or-
- D Dual Servo Extension (Futaba J FUTM4130)
- D 6" Servo extension cords (3) (Futaba J HCAM2000, Airtronics HCAM2020, JR HCAM2030)
- D Propellers (see engine instructions for recommended size)
- D 12 to 16 oz Fuel Tank (12 oz. GPMQ4105, 14 oz. GPMQ4106, 16 oz GPMQ4107)
- D 1-1/2" Tail Wheel (GPMQ4243)
- D 4" Cub Wheels (GPMQ4230 3-3/8" Piper Cub Wheels suitable)
- D 3/16" Wheel Collars (4) (GPMQ4308, pkg of 4)
- D 3/32" Wheel Collars (2) (GPMQ4302, pkg of 4)
- D 3/16" Bolt on Axle Shafts (GPMQ4278)
- D 25 foot roll model covering (Top Flite Cub **Yellow** MonoKote Covering TOPQ1220)
- D 1/8" black striping tape (GPMQ1480)
- D Medium silicone Fuel Tubing (GPMQ4131)
- D 1/2" thick Latex Foam Rubber Padding (HCAQ1050)
- D Flexible Cable throttle pushrod (opt'l) (GPMQ3700)
- D Screw-Lock Pushrod Connectors (opt'l) (GPMQ3870)
- D Switch & Charge Jack Mount (optional) (GPMM1000)
- D Fuel filter (optional) (GPMQ4150)
- D Fueling Valve (GPMQ4160)
- D Fuelproof paint (see "Painting" section of instructions on page 44)
- D 3" scale pilot (optional) - (Williams Bros. WBRQ2626)

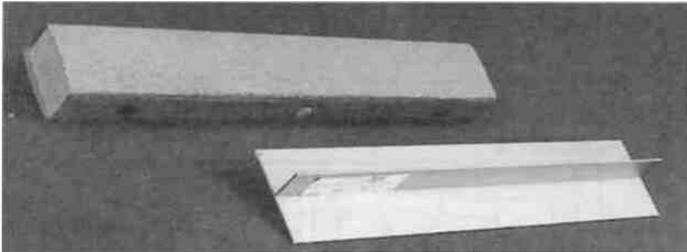
\*Items in parenthesis (GPMQ4130) are suggested part numbers recognized by distributors and hobby shops and are listed for your convenience Our own brand has been provided where possible **GPM** is the Great Planes brand, **HCA** is the Hobbico brand, **TOP** is Top Flite

## Building Supplies and Tools

- D 2 oz Thin CA Adhesive - (GPMR6015)
- D 2 oz Medium CA Adhesive - (GPMR6009)
- D 2 oz Thick CA Adhesive - (GPMR6003)
- D CA accelerator (optional) - (HCAR3750)
- D CA applicator tips (optional) - (HCAR3780)
- D 6-Minute Epoxy - (GPMR6045)
- D 30-Minute Epoxy - (GPMR6047)
- D Pacer Z-560 (optional) - for **gluing windscreen and** side windows (PAAR3300)
- D Silver Solder (recommended) - (GPMR8070 w/flux)
- D Hand or Electric Drill
- D Drill Bits 1/16", 3/32", 7/64" or #35, 1/8", #29 or 9/64", 11/64", 3/16", #10 or 13/64", 7/32", 15/64", 17/64" and 1/4"
- D Sealing Iron - (TOPR2100)
- D Hot Sock (optional) - (TOPR2175)
- D Heat Gun (optional) - (TOPR2000)
- D Razor Saw
- D #1 knife handle - (XACR4305)
- D #11 Blades - (XACR3121 pkg of 5)
- D Common pliers
- D Screwdrivers (phillips and flat)
- D T-Pins - (HCAR5100 small, HCAR5150 medium, HCAR5200 large)
- D Straightedge - (Fourmost Non Slip FORR2149)
- D Masking Tape
- D Sandpaper (coarse, medium, fine grit)
- D T-Bar or sanding block
- D Waxed Paper
- D Lightweight Balsa Filler - (HCAR3401)
- D 5/32" brass tube (optional)
- D 1/8" brass tube (optional)
- D Tap Wrench
- D 1/4-20 Tap - (GPMR8105 w/dnll bit)
- D 8-32 tap - (GPMR8103 w/dnll bit)
- D 6-32 tap - (GPMR8102 w/dnll bit)
- D Isopropyl Rubbing Alcohol (70%)
- D Dremel Moto Tool or similar w/sanding drum, cutting burr (optional)
- D 9/64" ball end hex wrench - (GPMR8004)
- D Kyosho" Curved Scissors (optional) - (KYOR1010)

## EXPERT TIP

On our workbench, we have four 11" T-Bar sanders, equipped with #50, #80, #150 and #220-grit sandpaper. This setup is all that is required for almost any sanding task. Custom sanding blocks can be made from balsa for sanding hard to reach spots. We also keep some #320-grit wet-or-dry sandpaper handy for finish sanding before covering.



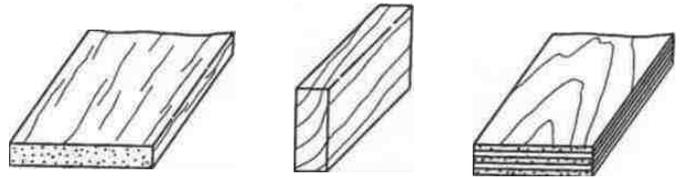
**T-Bar sanding tools** are made from lightweight extruded aluminum and can be found at most hobby shops. A 2" x 11" strip of sandpaper is attached to the T-Bar by gluing it on with rubber cement. Apply the rubber cement to both the bottom of the T-Bar and the back of the sandpaper. When both surfaces are dry, press the sandpaper firmly onto the T-Bar. Spray adhesive can be used for this purpose but it's harder to remove the sandpaper when you need to replace it.

**Wooden sanding blocks** can be made from 11" lengths of 1" x 2" scrap lumber. Start on one side, then wrap a sheet of sandpaper completely around the wood, ending on the same side as the one you started on. Push 3 or 4 thumbtacks into this edge, then trim off the excess material.

## Common Abbreviations

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

## Types of Wood



Balsa

Basswood

Plywood

## What About Adhesives ?

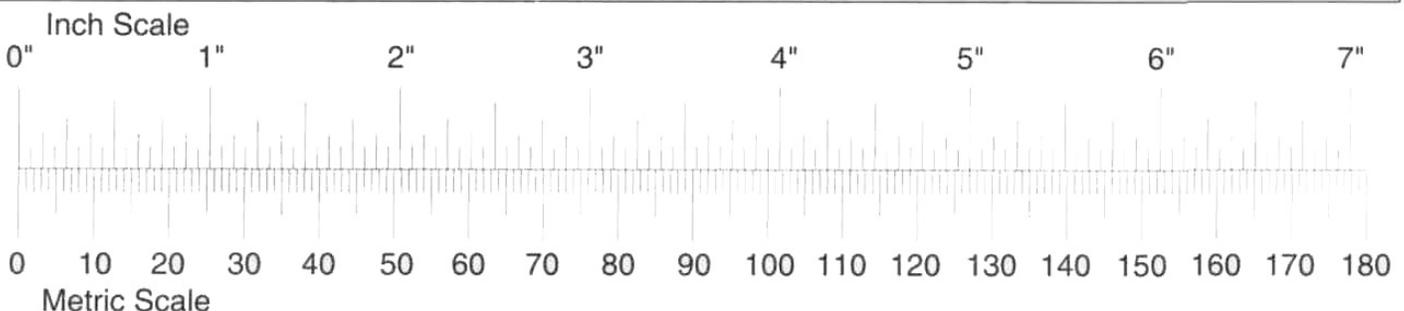
We understand that the caliber of modelers likely to build the Great Planes Cub 60 may be rather high. You may already know all about the types of adhesives you like to use. However, due to its stability and easy building features, many first time or second time builders may try their hand at the Great Planes Cub 60. For those modelers (experts may read along), we have provided some explanation about the variety of adhesives used during construction of a model.

**Cyanoacrylate** or CA glue has changed the way models are built more than any other advance in modeling technology. In the good ol' days, model cement like Ambroid, Duco, Comet and Siment were the glues of choice. They all had a strong odor that could cause dizziness, dried slowly (compared to CA) and became brittle with age. CA, on the other hand, is stronger, works almost instantly and is bottled in three different viscosities (thicknesses). CA is used for most glue joints, except where epoxy is specified. CA does emit rather strong fumes (some say it's like tear gas) as it cures, so rule number one is to **work in a well ventilated area. All CA glues work best if the joints are smooth and fit well.**

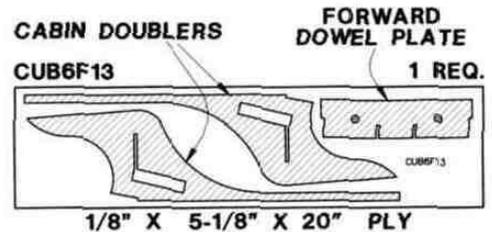
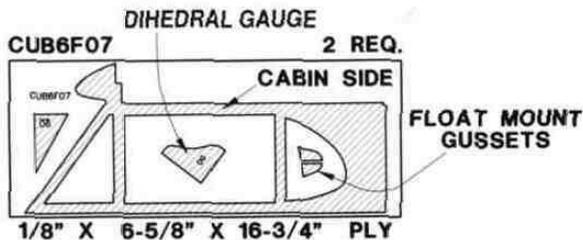
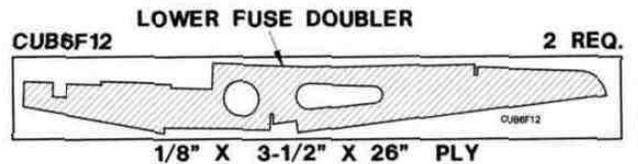
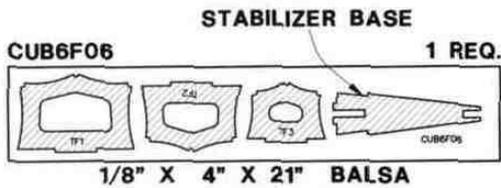
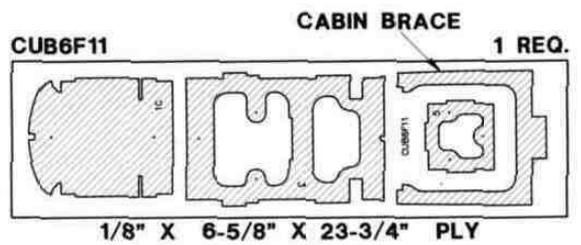
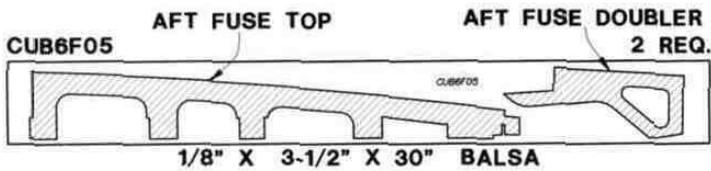
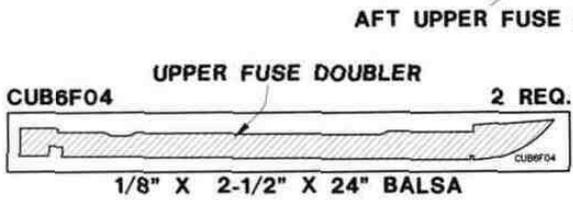
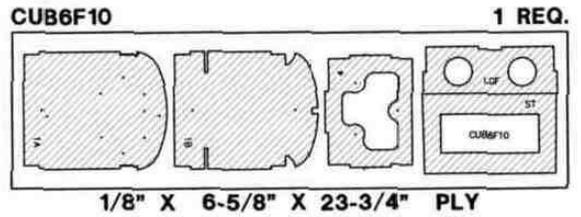
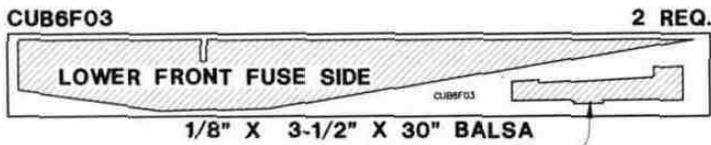
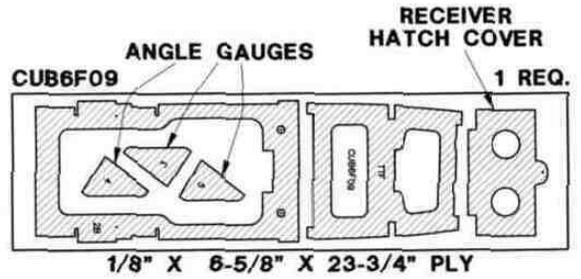
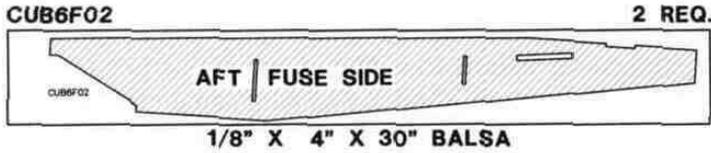
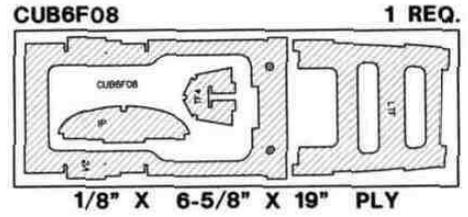
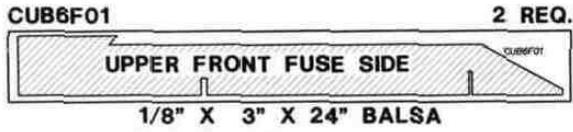


Thin **CA** is also known simply as **CA**. This is the adhesive that has revolutionized model building because it allows you to assemble the parts first, then apply the adhesive. The thin formulation flows or "wicks" into the joints and sets almost instantly, eliminating the need to hold things together while the glue dries. You will often use Thin CA for the initial bond, then follow with medium or thick CA for extra strength, especially when gluing plywood or hardwood. (Continued on page 8)

## Metric Conversions

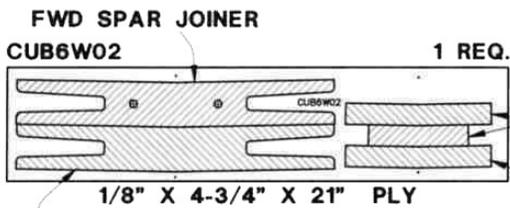
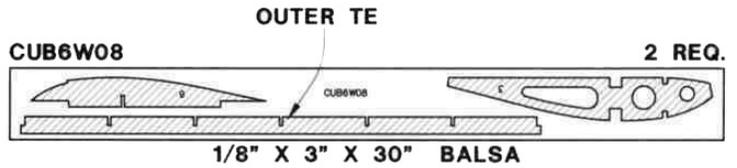
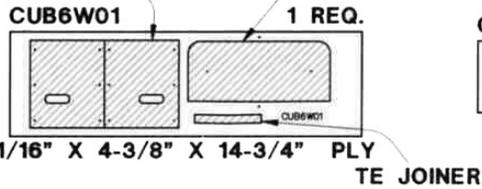


# DIE-CUT PATTERNS

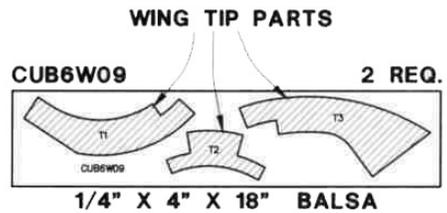


# DIE-CUT PATTERNS

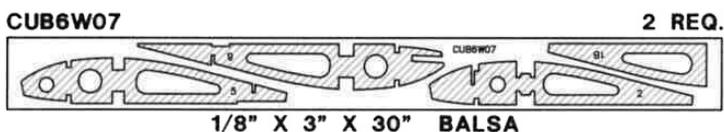
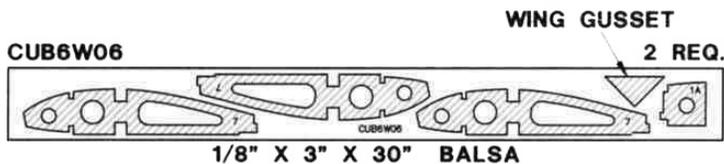
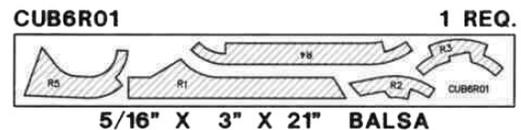
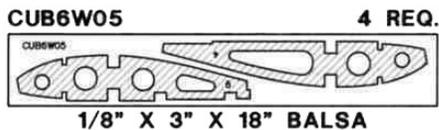
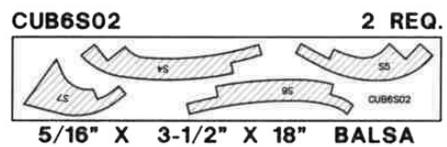
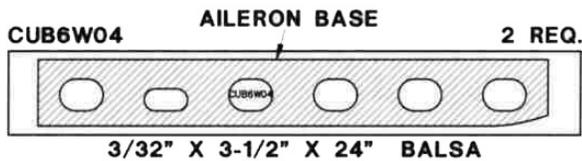
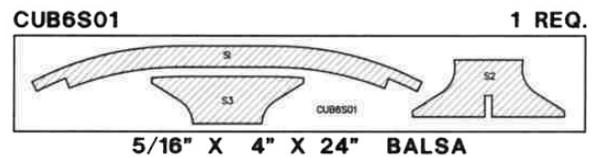
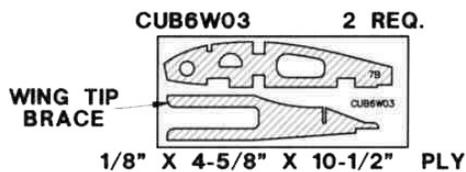
WING BOLT PLATE  
AILERON SERVO HATCH



(A)  
DIHEDRAL  
BRACES  
(B)



AFT SPAR JOINER





**CA+** is also known as **medium** or **gap filling CA**. **CA+** is used for surface gluing, filling small gaps between poorly matched parts and for general purpose applications. It cures slower than thin CA, allowing you to apply a bead to two or three parts before assembly. Curing time without accelerator is 20-30 seconds.



**CA-** or thick CA is used when extra positioning time is needed. CA- is a great gap filler and is also used to make fillets when a little extra strength is required. Curing time is about 1-2 minutes.



**Accelerator** is a liquid chemical that comes in a spray bottle for use in speeding up the cure time of all CA types. It should be misted on, not sprayed heavily on the joint. Accelerator may cause exposed CA to bubble and sometimes change color. If accelerator is sprayed on too heavily it may weaken the glue joint, so use it sparingly.

**A word about CA safety!**

After applying CA, to avoid the puff of strong vapors, don't stand directly over the work. All CA glues will bond skin almost immediately. If this should happen, CA Debonder (available from your hobby dealer) or acetone fingernail polish remover will dissolve the CA if allowed to soak into the bond for a few minutes. Don't use vigorous means to separate a skin bond. **Never, never** point the CA applicator tip toward your face! Be especially careful when opening a clogged tip. In case of eye contact, flush thoroughly with water, then seek medical attention, **but don't panic. Please, keep CA (and all other modeling chemicals) out of the reach of children!**

**Epoxy**

Great Planes has two epoxy formulations available for the modeler. Both offer exceptional strength and convenient working times. Use epoxy when the joint requires exceptional strength, such as when installing the firewall, when joining the wing panels, and when installing wing

hold-down blocks. As with most epoxies you mix equal parts of resin and hardener, stir well, then apply a thin film to each part. Parts should be clamped, pinned, taped or weighted in place until fully cured. Before the epoxy cures, clean off any excess with a paper towel. A word of caution about mixing epoxy-don't **use extra hardener** in the hopes of making the mixture harder or work faster. Just about all epoxies work best with **exactly** a 50/50 mix. When you increase the amount of hardener you run the risk of causing the cured epoxy to become either brittle or rubbery-neither being as strong as a properly mixed batch.



**6-Minute epoxy** is used for simple, small gluing applications-where elaborate alignment is not required. Working time (before it's too goeey to use) is about 5 minutes, handling time 15 minutes and it's fully cured in about 1 hour.



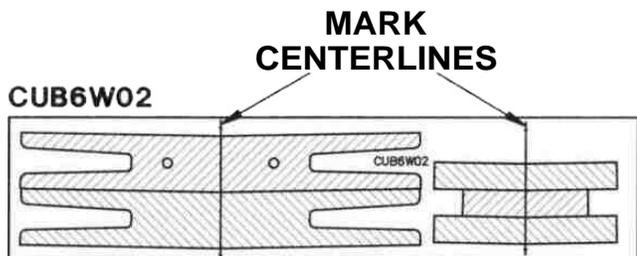
**30-minute epoxy** is used for extra strength (because it can penetrate longer) and where several parts must be aligned and checked before it cures. Working time is about 25 minutes, handling time 2 hours, and it's fully cured in 8 hours.

**Great Planes Pro" Wood Glue** is an Aliphatic resin glue that works well on all types of wood. It is non-toxic, virtually odorless and dries clear. Some people are sensitive to CA and epoxy fumes, so this is a good alternative for general modeling use. Its only drawback is that it is slow to cure, requiring the parts to be securely clamped, pinned or taped while the glue dries.

Okay, you've got your work space ready, your tools are at hand, and you know how to choose and use the right glue for the job. Let's get started!

## Get Ready to Build

D 1 Unroll the plan sheets. Reroll the plan inside out to make them lie flat.



D 2 Locate the die-cut 1/16" plywood sheet **W01** and the die-cut 1/8" plywood sheet **W02**. Draw centerlines on the dihedral braces, wing joiners and wing bolt plate by connecting the punch marks.

D 3 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 ball point pen, lightly write the part **name** or **size** on each piece to avoid confusion later. Use the die-cut patterns shown on pages 7 and 8 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 punch out, do not force them! Instead, cut around the parts with a hobby knife. After punching out the die-cut parts, use your T-Bar sander or sanding block to **lightly** sand the edges to remove any die-cutting irregularities.

D 4 As you identify and mark the parts, separate them into groups, such as **fuse** (fuselage), **wing**, **fin**, **stab** (stabilizer) and **hardware**.



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

## BUILD THE TAIL SURFACES

### Build the Rudder

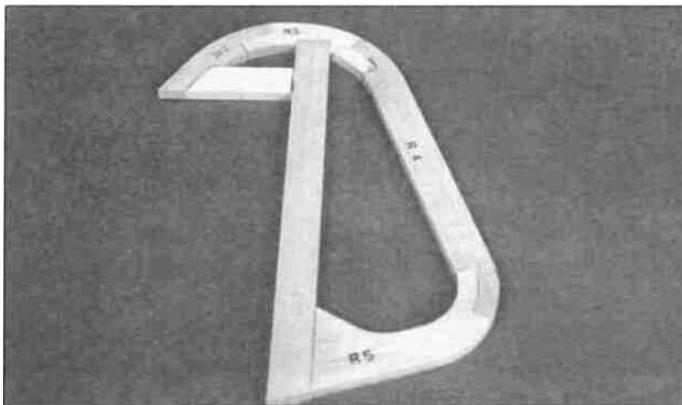
Before beginning construction of each individual tail surface, tape **waxed paper** over the drawing when it is time to build that piece. Begin with the rudder.

D 1 Place the die-cut 5/16" balsa **rudder** parts **R2**, **R3**, **R4** and **R5** over the plan in their locations. Check each joint for a good fit and make adjustments if necessary. Pin the parts to the building board but do not use glue at this time.

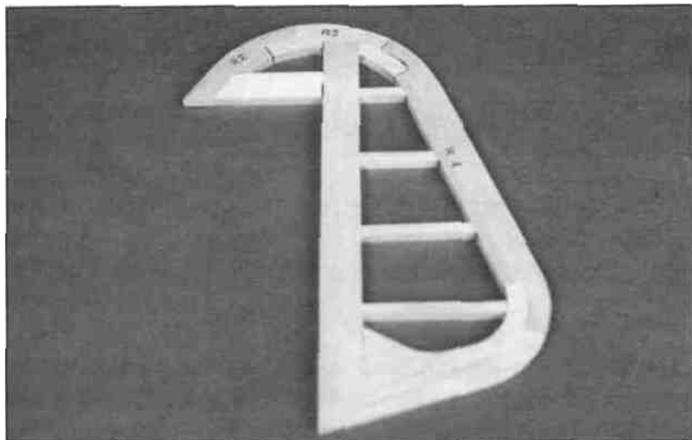
**NOTE:** The purpose for checking each joint for a good fit is to be sure the **finished shape** of the assembly matches that of the drawing on the plan. Every joint may not be an exact fit due to the technical nature of die-cutting such thick wood (5/16"). If you're a very discriminating builder, you are likely to spend a few extra moments perfecting the fit of each and every joint before reaching for the CA. Simply filling in the small gap where noticeable with thick CA is an alternate method to custom fitting each part and will yield a secure, strong glue joint.

D 2 Select the *straightest* piece of 5/16" x 7/8" x 24" balsa stick. Set this piece aside for use later on the stabilizer trailing edge.

D 3 Cut the rudder **leading edge** from another 5/16" x 7/8" x 24" balsa stick. Check for a good fit, then pin the LE to the building board over its location. Cut the horizontal frame section from the remaining piece of balsa and pin into position.



D 4 Remove the parts from the plan, then one at a time, pin each piece back into position using **thick CA** to securely glue the parts together. Wipe away excess glue with a paper towel before it cures - sanding will be easier later.



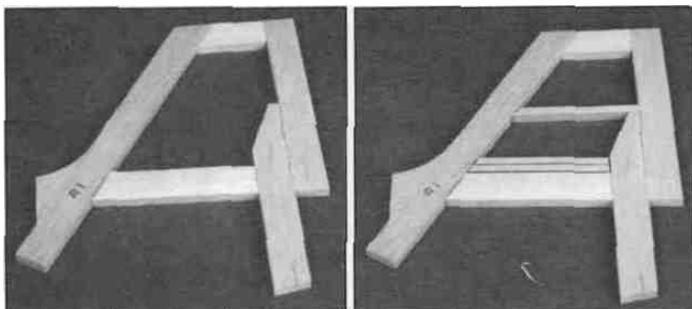
D 5 Cut the **ribs** from the 5/16" x 5/16" x 30" balsa stick. Position the ribs in the rudder frame and securely glue them in place with thick CA.

D 6 Remove the **rudder** from the building board and inspect all the glue joints. Add thin CA to all the tight-fitting joints and thick CA to any open joints. Large gaps may be filled with balsa dust and thin CA.

### Build the Fin

D 1. Locate the die-cut 5/16" balsa **fin leading edge R1** and pin it in place on the plan.

D 2. **Cut the fin top, fin base, and the inner and outer fin trailing edges** from the remaining 5/16" x 7/8" balsa strip. Pin the parts in place and make sure all the joints fit well. Remove the parts and securely glue each joint with thick CA as you pin them back into position.



D 3 Cut the **ribs** from the remaining 5/16" x 5/16" balsa stick. Glue them in place with thick CA.

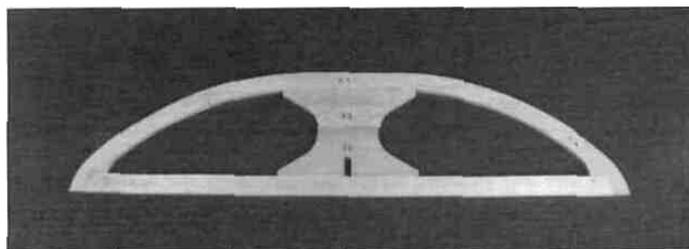
D 4. Remove the **Fin** from the building board and inspect all the glue joints. Apply thick or thin CA where necessary.

### Build the Stabilizer

D 1. Securely glue the die-cut 5/16" balsa stabilizer parts **S2** and **S3** together over the plan.

D 2 Position **S1** and the two **S4's** over their locations on the plan. Check the fit of the joints, make adjustments if necessary, then pin them in place.

D 3. Cut the **stabilizer trailing edge** from a 5/16" x 7/8" balsa stick. Fit the **trailing edge** between the **S4's**.



D 4 When satisfied with all joints, remove the assembly from the building board. Reinstall each part on the building board with pins, gluing them together with thick CA as you proceed.

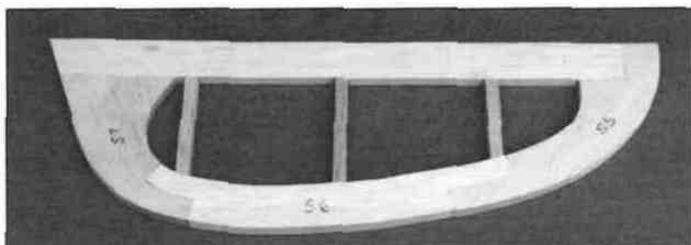
D 5. Cut the ribs from the 5/16" x 5/16" x 24" balsa stick and glue them in place with thick CA.

D 6 Remove the stabilizer from the building board and inspect all the glue joints. Apply thick or thin CA where necessary.

### Build the Elevators

D D 1. Pin the die-cut 5/16" balsa elevator parts **S5**, **S6** and **S7** on the plan, making adjustments for any poor-fitting glue joints.

D D 2 Cut the **elevator leading edge** from a 5/16" x 7/8" balsa strip. Fit the LE in place on the plan and pin it in place. Glue all of the joints with thick CA, in the same manner as described previously.

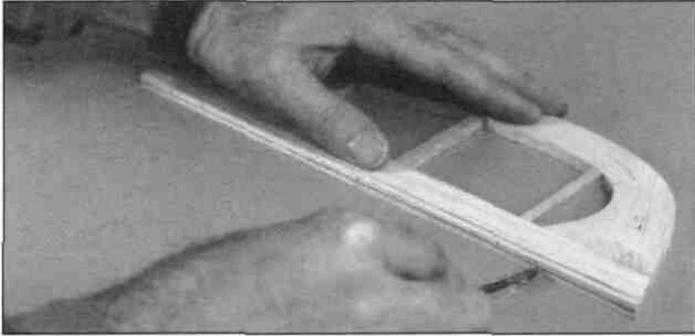


D D 3. Cut the elevator **ribs** from the 5/16" x 5/16" balsa stick and glue in position with thick CA.

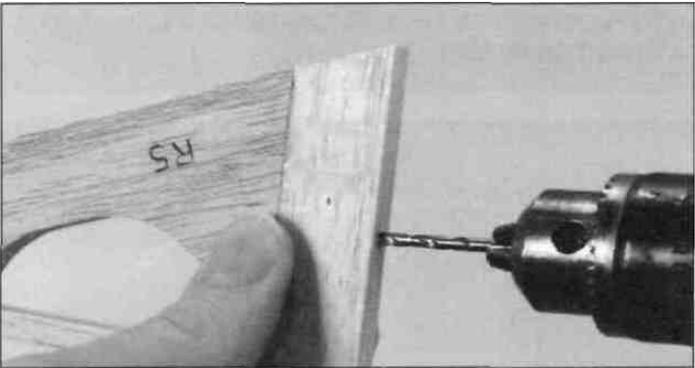
D D 4. Remove the elevator from the building board and inspect all the glue joints. Add CA where necessary. Build the other elevator.

## Finish the Tail Surfaces

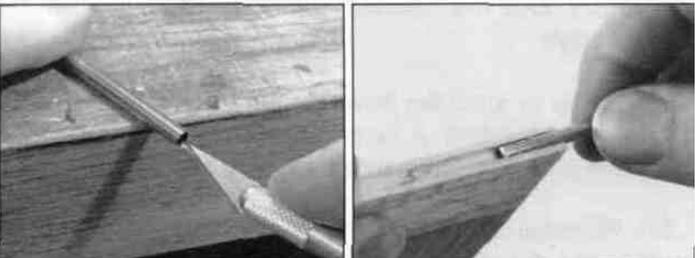
D 1. Carefully sand all the tail surfaces flat with 150-grit sandpaper and a large sanding block or T-bar. Remove as little material as possible and don't get carried away - inspect your work as you proceed. It's easy to sand a low spot into the ribs or trailing edges.



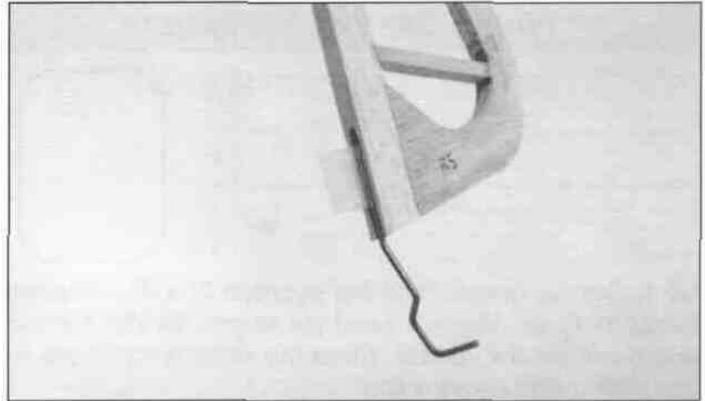
D 2. Centerlines must be drawn where the hinges are to be inserted. Start with an elevator. A Bic ball point pen lines up with the center of the 5/16" thick balsa (double check this - the height may vary due to the extent of your sanding or different pens. Adjust the height of the pen or the elevator as necessary to draw a centered line). Lay the elevator and the pen on a flat table and draw a line on the edge. Draw centerlines on the leading edges of the rudder and elevators, and on the trailing edges of the stabilizer and fin.



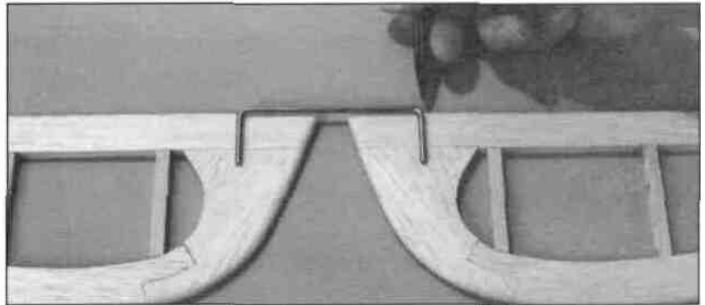
D 3. From the bottom of the rudder measure 1-5/8" along the leading edge. Then drill a 7/64" hole, 3/4" deep, where the tail wheel wire fits into the rudder.



D 4. Groove the rudder to clear the hinge bearing. A sharpened piece of 5/32" brass tubing works well as a tool to cut the groove.



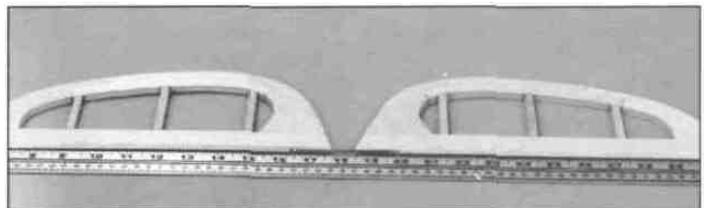
D 5. Trial fit the tail gear wire in the rudder. Make adjustments if necessary.



D 6. Position the elevators on the plan and center the elevator joiner wire over the elevators. Transfer the location of the joiner wire to the elevators. Make the marks lightly so they may be sanded off easily.

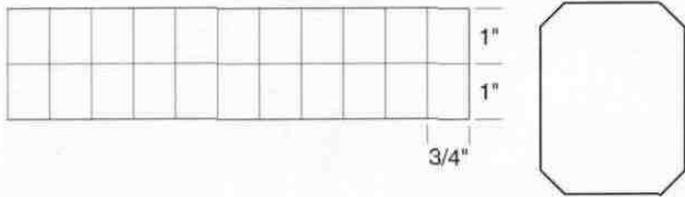
D 7. Accurately drill a 9/64" (or #29) hole into each elevator leading edge approximately 1" deep. The hole must be perpendicular to the elevator leading edge.

D 8. Cut a groove in the leading edge of the elevators to accept the elevator joiner wire. A sharpened piece of 1/8" brass tube works well to cut the groove just as you did the rudder.



D 9. Test fit (do not glue yet) the joiner in the elevators. With the joiner inserted, the elevators must lie flat and the leading edges must line up with a straightedge. If the elevators both don't lie flat on a table top, you may make slight adjustments by carefully twisting the joiner wire. If the leading edges don't match up with a straight edge, you may slightly enlarge the holes drilled into the elevator leading edges to allow slight repositioning.

## Hinge the Tail Surfaces



D 1 Cut the hinges from the supplied 2" x 9" composite hinge material. You will need six hinges for the elevator and three for the rudder. Store the remaining hinges for use later during construction.

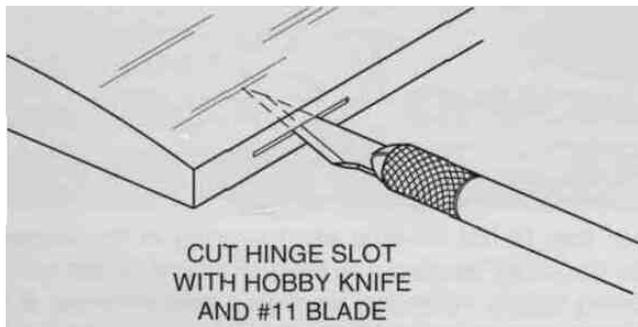
D 2 Use the plan as a guide to *lightly* mark the locations of the hinges. Refer to the Expert Tip that follows, then cut matching hinge slots in all four parts.



### Expert tip for using CA hinges

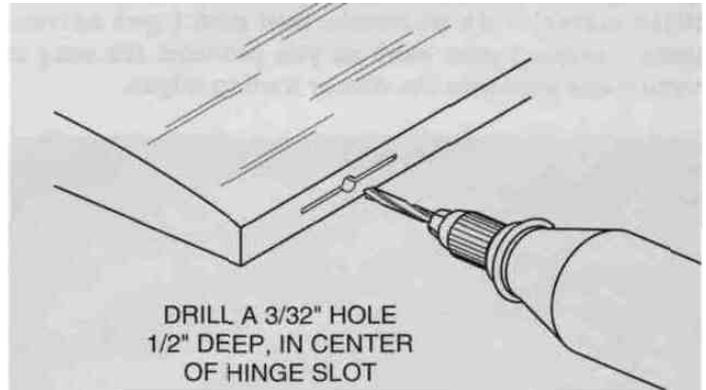
The hinge material supplied in this kit consists of a 3-layer lamination of mylar and polyester. It is specially made for the purpose of hinging model airplane control surfaces. Properly installed, this type of hinge provides the best combination of strength, durability and ease of installation. We trust even our best show models to these hinges, but **it is essential to install them correctly**. Please follow the instructions 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 permanently 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.



A. Cut the hinge slot using a #11 blade in a standard #1 knife handle. The CA hinges provided have a thickness that fits this type of slot very well. Trial fit the hinge into

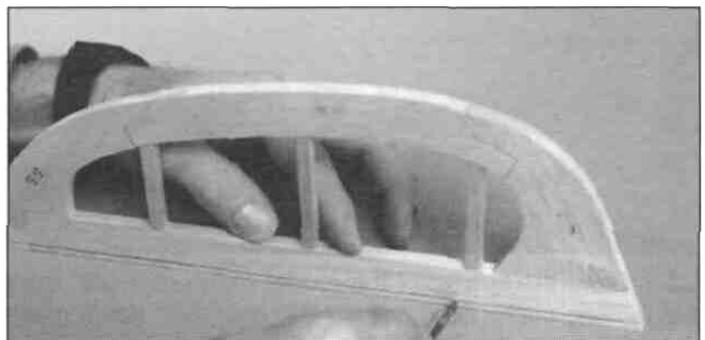
the slot. If the hinge does not slide in easily, work the knife blade back and forth in the slot a few times to provide more clearance (it is really the **back edge** of the blade that does the work here in widening the slot).



B **Drill a 3/32" hole, 1/2" deep, in the center of the hinge slot.** If you use a Dremel Moto-TooF for this task, it will result in a cleaner hole than if you use a slower speed power or hand 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.

C Trial fit the hinges into the slots and, **without using any glue**, temporarily attach the control surface, to verify the fit.

**STOP! DO NOT GLUE THE HINGES IN PLACE UNTIL AFTER THE MODEL IS COVERED!**



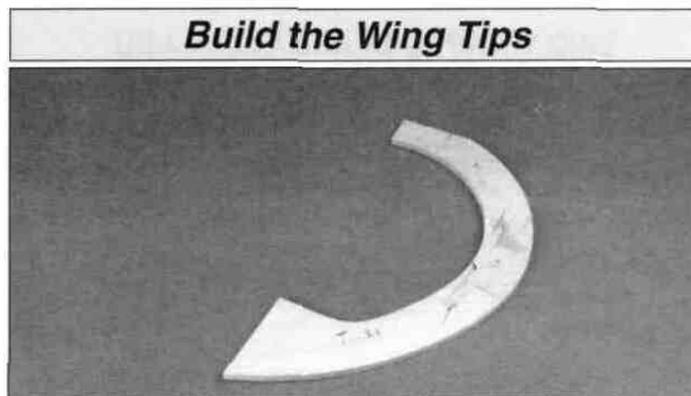
D 3 Bevel the leading edges of the elevator and rudder. Draw the "bevel to" lines on the leading edges of the elevators and the rudder. Refer to the plan for the correct angle.

D 4. Carve or sand the bevel on the leading edges of the rudder and elevators. A razor plane allows you to rough-in the bevel before finishing with a sanding block.

D 5 Reinstall the hinges and test fit the operation of the rudder and the elevators. Make adjustments in the hinge slots if necessary. Now would be a good time to designate a *top* and *bottom* of the elevators and stabilizer - just in case one side looks a little better than the other.

D 6 Sand the leading edges of the stabilizer, fin and the trailing edges of the rudder and elevators to a rounded shape, as shown in the cross-sections on the plan.

D 7. Sand the elevator joiner with 150-grit sandpaper for good glue adhesion then liberally pack the holes in the elevators with 30-minute epoxy. Insert the joiner and wipe away epoxy before it cures.

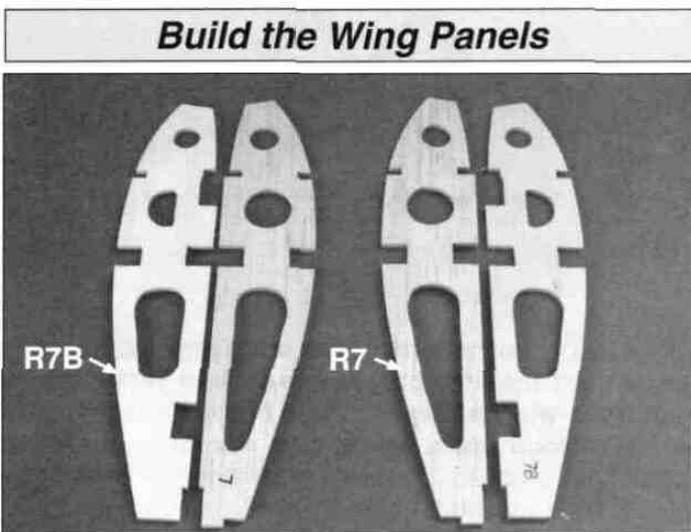


D D 1. Place the die-cut 1/4" balsa **wing tip** parts **T1**, **T2** and **T3** over the plan and check all joints for proper fit. Make adjustments if necessary. Pin the parts over the plan, gluing with thick CA as you proceed.

D D 2 Remove the wing tip from the building board and inspect all the glue joints. Add thin CA to all tight joints and thick CA to all open joints.

D D 3 Place the wing tip on your work surface and lightly sand both sides flat and smooth with a sanding block and 150-grit sandpaper.

D 4. Return to step 1 and build the other wing tip.



D 1 Carefully punch out all the die-cut 1/8" balsa **R8 wing ribs** and the die-cut 1/8" plywood **rib doublers R7B**. Sand the edges **slightly** to remove any die-cutting irregularities. Use **thick CA** to laminate the **R7Bs** to ribs **R7**. **Don't forget to make a RIGHT and a LEFT.**

## BUILD THE WING

### Preparation

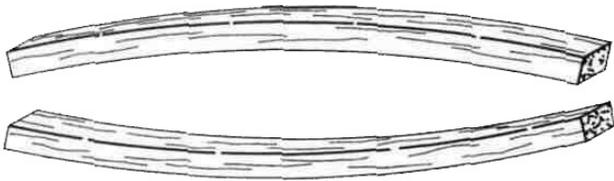
**IMPORTANT:** For an airplane to fly well with no unexpected tendencies, all good modelers understand that each assembly - especially the wing - must be built on a flat surface. This is important advice for new builders. Also, a relatively soft, flat building board that you can stick "T" pins into is required. This is for pinning down individual parts that make up the completed assembly. A suitable building board is a sheet of ceiling tile or "Celotex" used in home construction. This material may be found at hardware or home improvement stores. If the building board is not flat, it must be clamped to your flat building table. Now we're ready to begin!

**NOTE:** The plan shows the two different wing types which may be built from this kit. You may choose the **standard wing** or the **clipped wing** version. Generally, the clipped wing will be more aerobatic than the standard wing. If you decide to build the **clipped wing**, cut the plan on the dashed line between the two R4 ribs. Overlap the plan towards the center of the wing and match the registration marks as indicated. Keep the plan straight, then tape it together when you have the registration marks aligned. Check the alignment with a straightedge. No change is necessary for the standard wing.

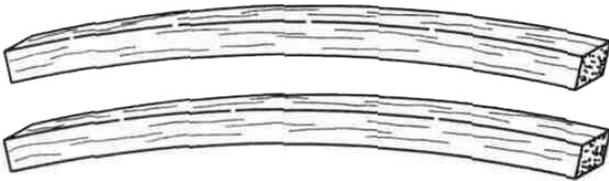
**NOTE:** One R4 rib is eliminated from each wing panel if building the clipped wing.

Build one wing "half" or panel at a time. You may cut each wing panel from the plan sheet to place on your building board. Tape the right wing plan to your flat work surface, and cover it with waxed paper.

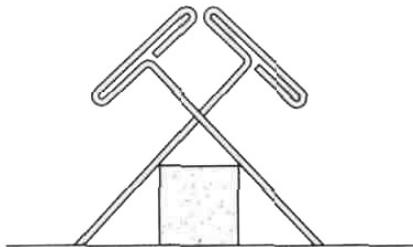
**TWO WARPED SPARS INSTALLED  
THIS WAY WILL RESULT IN A  
STRAIGHT WING**



**TWO WARPED SPARS INSTALLED  
THIS WAY WILL RESULT IN A  
WARPED WING**



D D 2 Locate all four 1/2" x 1/2" x 40" **basswood spars**. Examine them carefully for possible imperfections. Look for knots, soft spots, diagonal grain and any other imperfections. If possible, position each spar so the imperfections are on the **outer** half of the wing panel (toward the tip) where they will be least affected by high stress. If the spars are warped slightly, try to "balance them out" by installing the warped spars in opposite directions (see sketch).



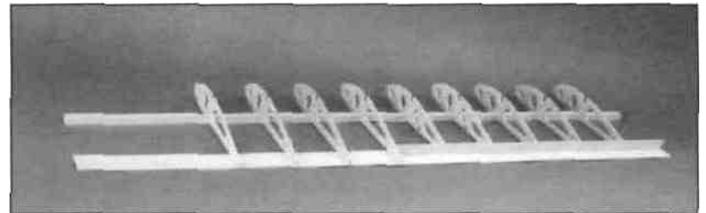
D D 3. Do not use any glue until step 15. For now, we're just making preparations and familiarizing ourselves with the layout. Place one of the 1/2" x 1/2" x 40" **basswood spars** on the wing plan and pin the spar down with crossed T-pins as shown in the sketch. We recommend crossed T-pins at every rib bay (the space between the ribs). **NOTE:** Align the end of the spar with the **outboard edge of wing rib R8** at the wing tip.

D D 4. Locate a 3/32" x 2" x 40" balsa **trailing edge sheet**. It is supplied slightly wide so you may trim it to straighten any bowed edges. Using a straightedge, trim the piece to 1-29/32". Set the trailing edge sheet aside for now.

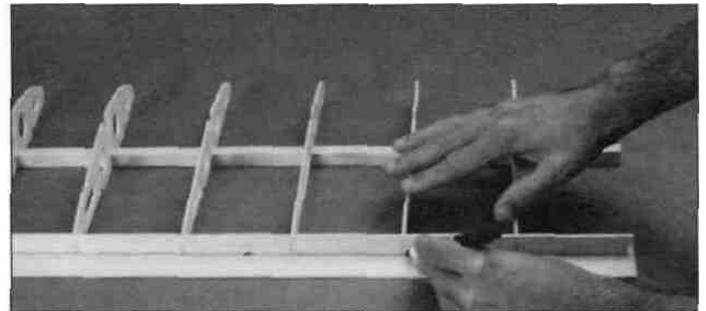
D D 5. **Without gluing**, place ribs **R3** through **R7** and the laminated **R7/R7B** (but not **R2** or **R8**) on the spar in their locations as shown on the plan. If building the clipped wing version, discard one of the **R4** ribs.

**NOTE:** Rib 3 does not contact the plan since the center section will be sheeted later.

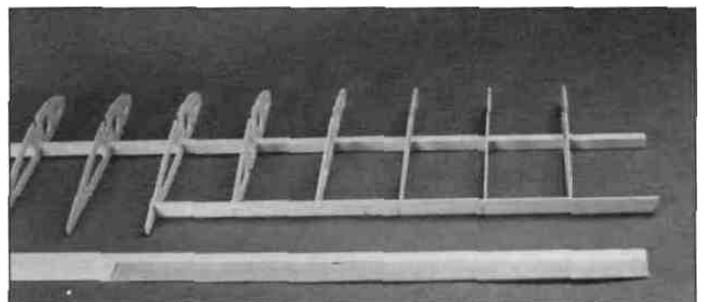
D D 6. Slide the trailing edge sheet against the notches in the bottom of the ribs. The outer tip of the sheet should match the plan and the "overhang" should be at the center section.



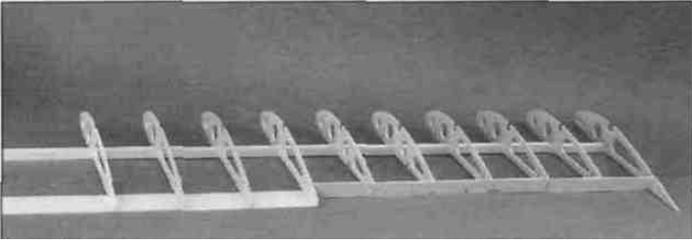
D D 7. Position the die-cut 1/8" **balsa outer trailing edge** at the rear of ribs **R5** through **R7**.



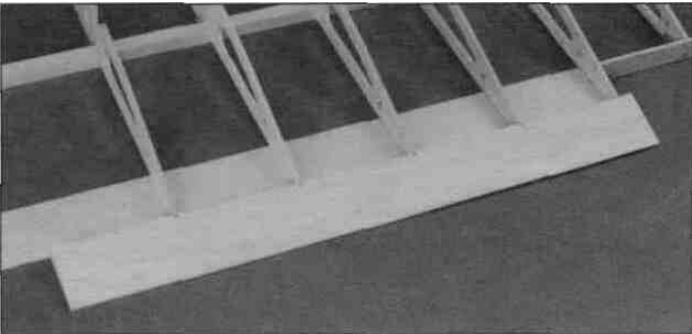
D D 8. Mark a line on the trailing edge sheet against the entire length of the outside of the outer trailing edge and rib **R5**. As you mark the line, make sure all ribs and the outer trailing edge are lying flat on the sheet.



D D 9. Remove the sheet and use a straightedge and knife to cut along the line. Save the scrap piece.



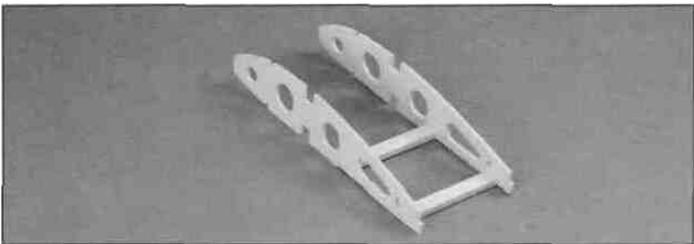
D D 10 Slide the finished trailing edge sheet into position. Don't reach for the glue yet Add rib R8.



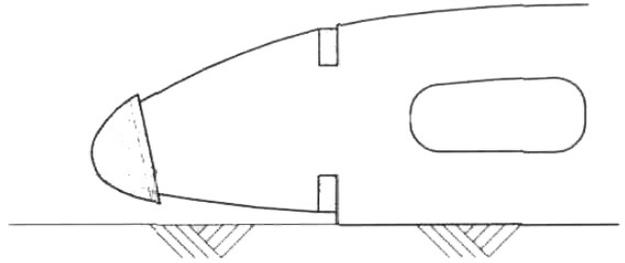
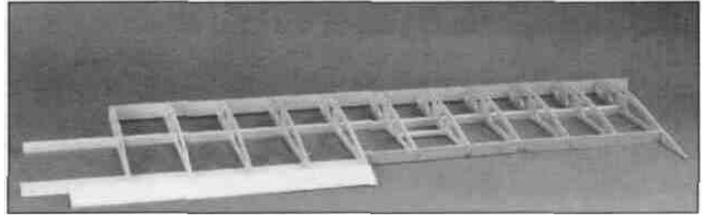
D D 11 Locate the tapered balsa **inner trailing edge** If you are building the clipped wing version, be sure the rib notches line up with the rib locations on the plan **before cutting**. Pin the inner trailing edge in position with the ribs in the notches, then cut the outboard tip of the inner trailing edge flush with the outboard edge of rib R5.

D D 12. Fit the ribs into the notches on the inner trailing edge, then push it as far forward as it will go until the ribs are fully seated Pull the sheet back until it is tight against the trailing edge Pin the inner trailing edge and the trailing edge sheet to the plan Install rib R2.

**NOTE:** Rib 2 will not contact the plan since the center section will be sheeted later.



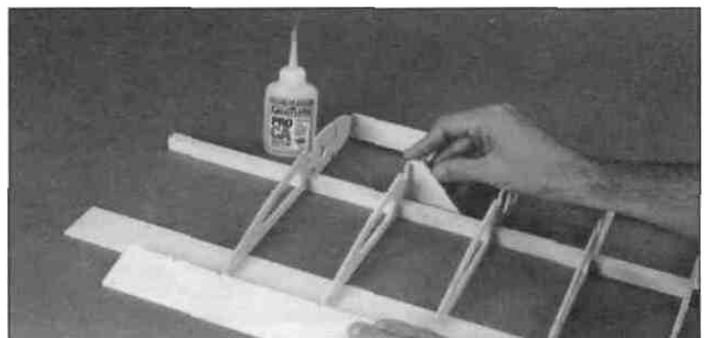
D D 13 Cut the 1/4" x 1/2" x 18" balsa **aileron servo rail stick** into four pieces, 3-3/4" each Remove both R6 ribs Install both **servo rails** Refer to the cross-section drawing - be sure both servo rails are **fully** seated into their notches The ends of the servo rails must be flush with the ribs Reinstall the assembly over the spar and into the outer trailing edge (*I promise we'll be gluing soon*).



D D 14 Match the notches in the 42" shaped balsa **leading edge** with the plan Add the leading edge to the ribs (still no glue) making sure each rib is fitted into its respective notch Center the leading edge so there is an equal amount of space above and below each rib Cut the leading edge flush with rib R2.

Double check your work **Make sure all ribs are contacting the trailing edge sheet and fit all the way onto the basswood spar**. Confirm that each rib meets the spar exactly at its intended location over the plan After all the fitting and Jiggling of parts, now is the time to be sure the spar is still securely pinned to your *flat* building board. Repin or add more pins if necessary

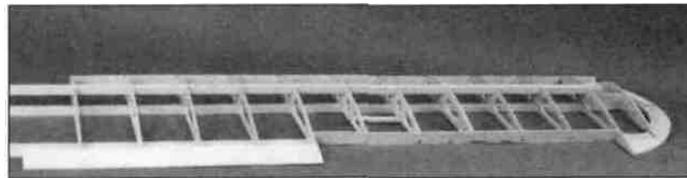
## Let's start gluing!



D D 15 Beginning with rib **R3**, use the die-cut 1/8" plywood **90 degree triangle** (indicated as "90") to make sure the rib is vertical while you add a few drops of thin CA where the rib meets the spar **Don't glue rib R2 to the spar until instructed to do so**. Be sure the bottom rear of each rib is contacting the trailing edge sheet Don't add too much CA - we're just "tack gluing" now Add a few drops of CA to R2 where it contacts the trailing edge sheet Glue the remaining ribs to the spar and trailing edge sheet (don't glue R2 to the main spar) **making sure each rib is vertical and contacting the trailing edge sheeting**.

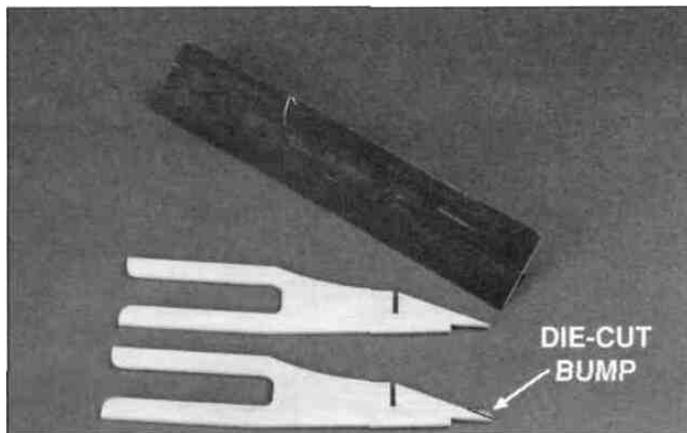
D D 16. Wick thin CA along the joint where the outer trailing edge contacts the sheet and also to each rib. Glue both servo rails to the R6 ribs and glue the aft servo rail to the sheeting. Wick thin CA into the notches in the inner trailing edge at each rib and glue the inner trailing edge to the trailing edge sheet.

D D 17. Confirm that the leading edge is still centered and each rib is tightly fitted into the notches. Refer to the sketch at step 14 to see how the leading edge matches the ribs; the leading edge is tilted downward somewhat. Wick thin CA into each joint.



D D 18. Install the **top** 1/2" x 1/2" x 40" basswood spar. Confirm that the top of the spar is flush with the top of each rib and make sure the ribs are vertical (90°). The outer tip of the spar should be flush with rib R8, just like the bottom spar. Glue the spar in place with thin CA.

### Add the Wing Tips



D D 1. Locate the die-cut 1/8" plywood **wing tip brace**, the die-cut 1/8" balsa **wing tip rib R9** and your previously assembled outer wing tip. Sand off the "die-cut bump" from the wing tip brace.

D D 2. Fit the wing tip rib R9 into the plywood wing tip brace and slide the assembly into the ribs along the spars. Slide the previously prepared outer wing tip into position. Refer to the following Expert Tip to bevel the leading edge of the wing tip.

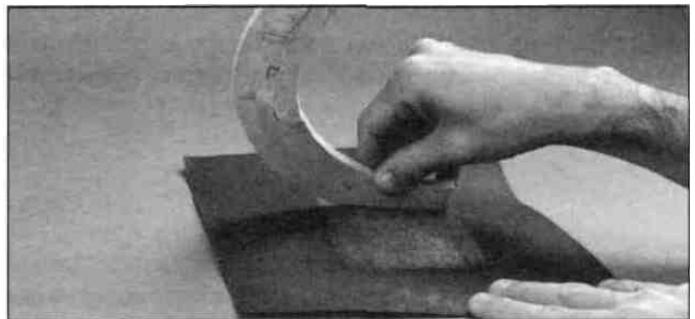


### HOW TO MAKE A BEVEL

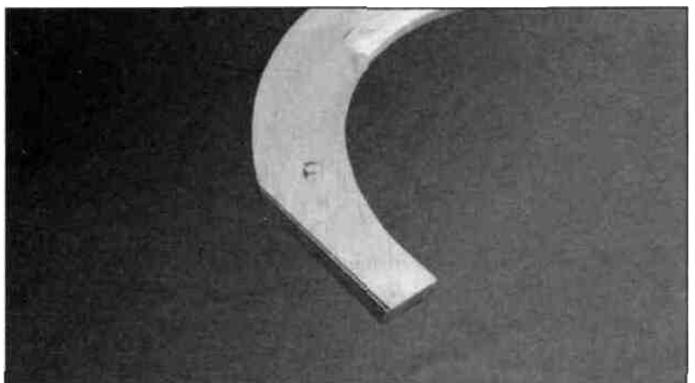
The following process will help you create a bevel that is right the first time.



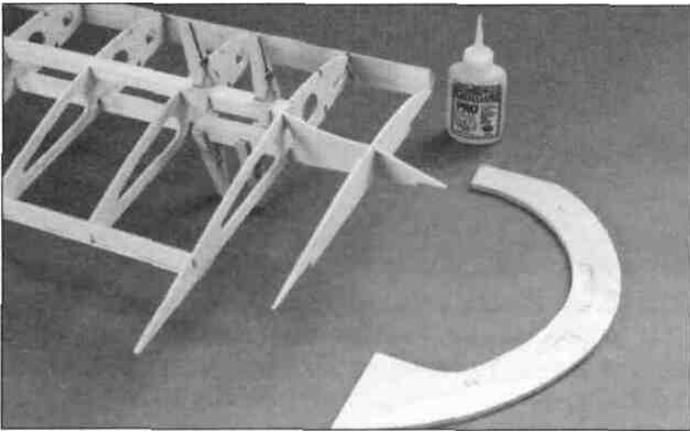
A) First, you need a fresh, full sheet of 220-grit sandpaper. Draw the *bevel* lines and *reference* lines on the part. The bevel lines are the lines that you *sand* to. The reference lines are lines slightly over the size of the bevel that you use as a reference in order to keep the bevel *parallel*.



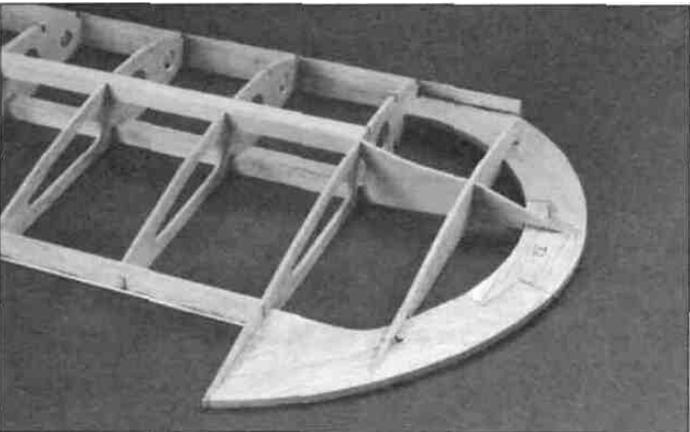
B) Sand to the bevel lines. The method of sanding is important. Sand only in one direction - usually "dragging" the part is best as it keeps it from "chattering" and creating the unwanted rounded bevel. It helps to *imagine* the angle of the bevel required as you begin to sand. Just take a little off at a time and mind your border lines.



C) After careful sanding and frequently inspecting your work as you go, you will have a sharp, accurate bevel. The bevel is parallel to the reference lines.

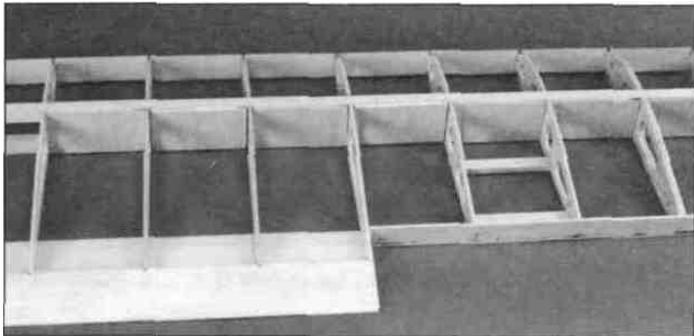


D D 3. Install only the tip brace and glue it to the spars  
**Hint: apply thick CA to the spars first, then slide the tip brace into place.** Install rib R9 but don't glue it yet.



D D 4 Install the tip and glue it at the leading edge first, then glue it to the rib R8 Let the tip take its natural position - slightly slanting upward towards the leading edge. Glue tip rib R9 to complete the wing tip assembly.

#### Proceed with wing panel construction

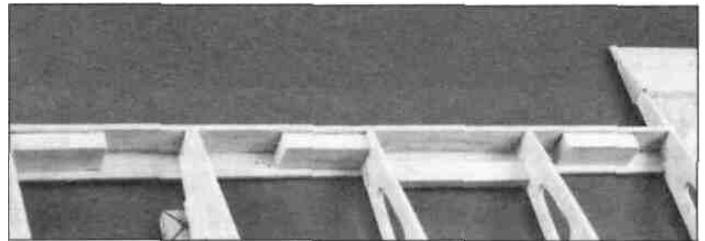


D D 1 Glue eight (seven for the clipped wing) 1/8" x 3-1/2" x 1-3/4" pre cut balsa vertical grain **aft shear webs** to the rear of the basswood spars, starting between ribs R3 & R4 and ending between the last R7 ribs No shear webs are installed between R2 & R3 and the last R7 & R8 ribs at this time. The shear webs are provided slightly "not tall enough" so they may be positioned without protruding above or below the top and bottom spars It's not necessary to glue the shear webs to the ribs - **but it is important to glue the shear webs securely to the spars**

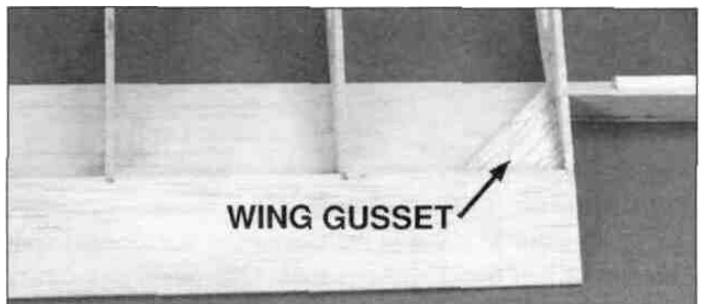
**NOTE:** At this point the wing should still be pinned to the work surface Of course, we cannot add shear webs if the crossed T-pins are in position, so just take out the T-pins as you go Replace the T-pins through the shear webs in order to keep the wing flat on your building board - or, use weights on top of the wing instead of the T-pins to hold the wing flat as you glue the shear webs in position. You only need to **replace** T pins at every other rib bay

D D 2 Install three shear webs in front of the spars between ribs R3-R4, R4-R4 and R4-R5 If building the clipped wing version, only two front shear webs are required between ribs R3-R4 and R4-R5.

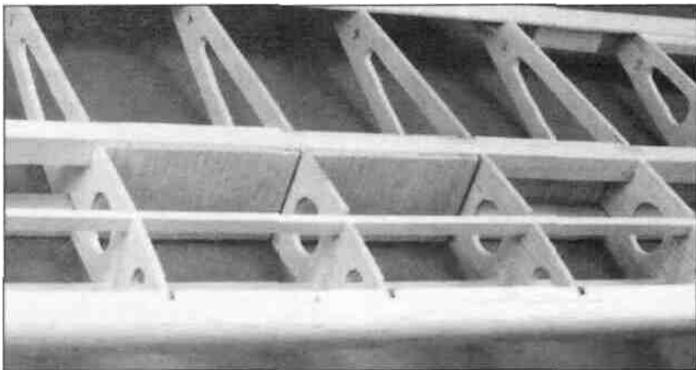
D D 3 Locate the 3/16" x 1/4" x 40" basswood **top forward spar** Before gluing it into position, cut off two 1" pieces to be used later Glue the spar in the forward rib notches The "overhang" is at the root end past rib R2, and the tip of the spar should be flush with rib R8.



D D 4 Cut **eight** 3/8" x 5/8" x 1-3/4" **hinge blocks** from the 3/8" x 5/8" x 15" balsa stick Position four hinge blocks against the outboard trailing edge on the bottom trailing edge sheeting Glue the blocks with thick CA. Refer to the other wing plan for the exact position of the hinge blocks. Save the remaining four hinge blocks for the other wing panel

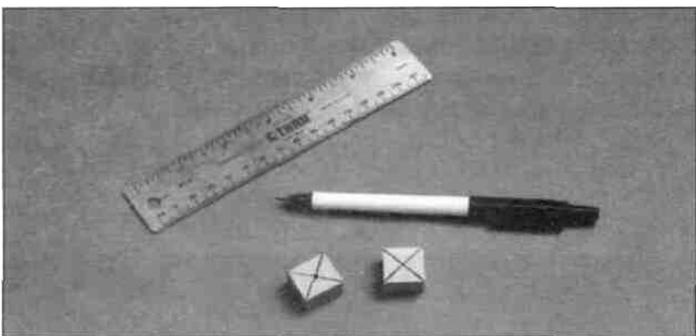


D D 5 Glue the die-cut 1/8" balsa **wing gusset** centered vertically on the rib at the corner of rib R5 and the notched inboard trailing edge.

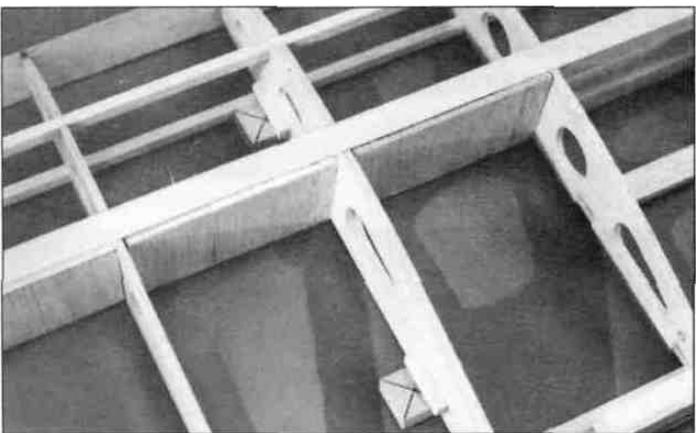


D D 6. Temporarily remove the wing from your building board. Glue the 3/16" x 1/4" x 40" basswood **bottom forward spar** in the notches in the ribs. There is no need to remove the 2" from this spar.

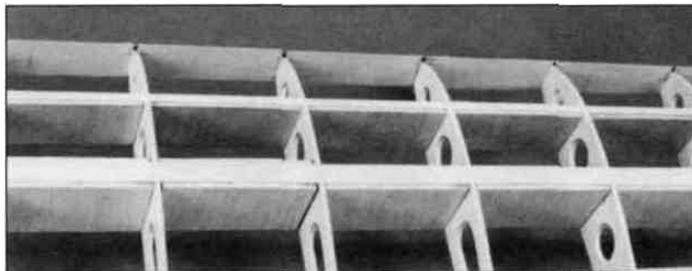
Replace the wing on the flat building surface and pin it to the board.



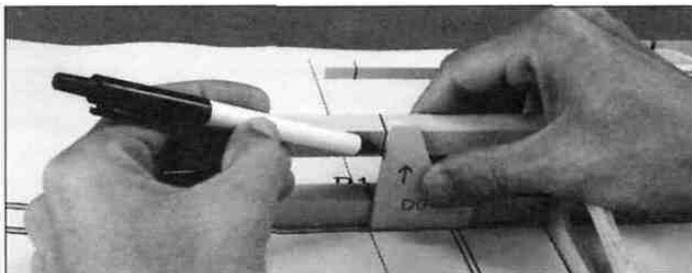
D D 7. Mark the center of the 3/8" x 3/4" x 3/4" basswood **wing strut blocks**. Drill a hole in the center of each block with a 1/8" drill bit. Glue the block to ribs R7 & R7B where shown on the plan, with the grain running parallel with the spars.



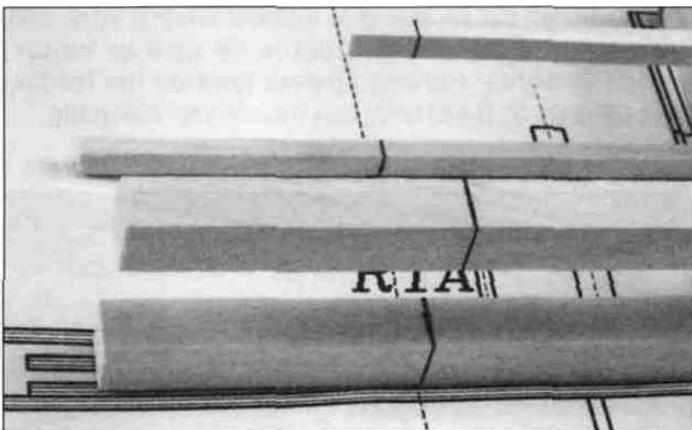
D D 8. Cut the 2" piece of the basswood top forward spar from step 3 into two 1" long pieces. Use 30-minute epoxy to glue the strut blocks into position with the grain direction parallel with the spars. A 1" basswood "gusset" is also glued to the side of the rib doubler R7B and to the top of each block.



D D 9. Add ten (nine for the clipped wing version) 3/32" x 3-1/2" x 1-9/16" pre-cut vertical grain balsa **forward shear webs** to the **rear** of the forward spars between each rib bay. The shear web between R7/R7B and R7 will have to be shortened to clear the **strut block**.



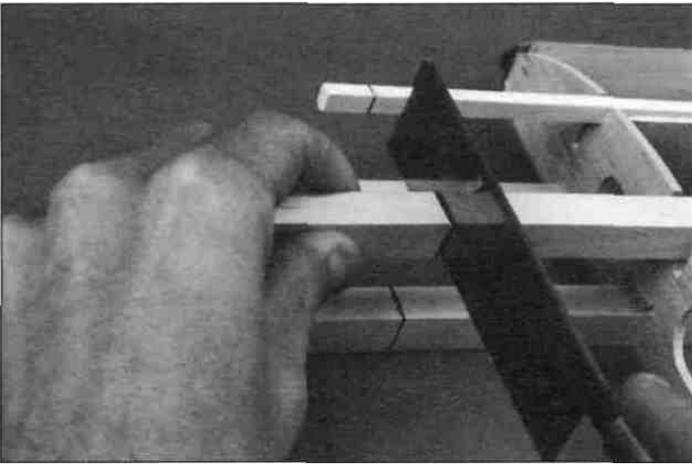
D D 10. Locate the die-cut 1/8" plywood **dihedral gauge**. Hold the gauge next to the main spar with the corner of the gauge at the dashed centerline on the plan. Mark both sides of the main spar along the front edge of the gauge.



DD 11. Connect both lines by drawing a line across the top of each spar.

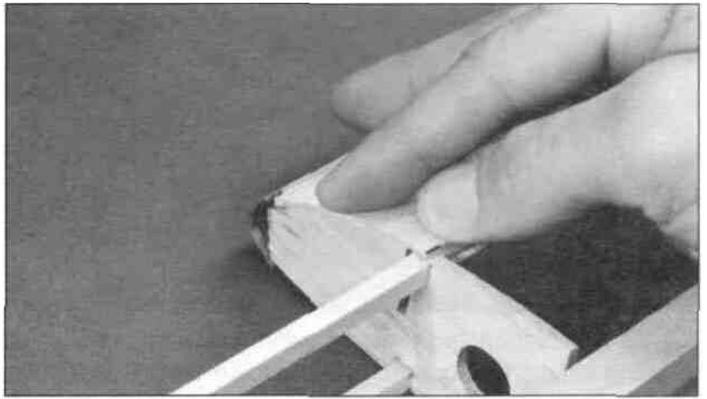
D D 12. Follow the same procedure as steps 10 and 11 to mark the forward spars.

D D 13. With the wing panel still pinned to the plan, transfer the wing's centerline from the plan onto the bottom sheet and the notched trailing edge.



D D 14. Accurately cut both front spars, both main spars, the balsa bottom sheet and trailing edge.

D D 15. From the excess 1/2" x 1/2" main spar, cut off a 1" piece to be used later for the receiver hatch block.

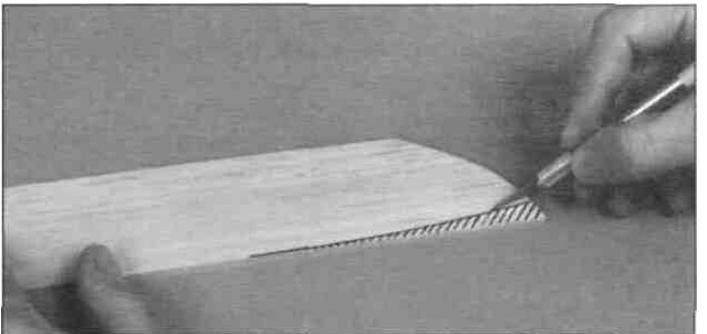


D D 3. Replace the sheet on the wing and mark the rear edge of the sheet so it ends about 1/16" ahead of the aft edge of the **forward** spar. Trim the rear of the sheet to this mark.

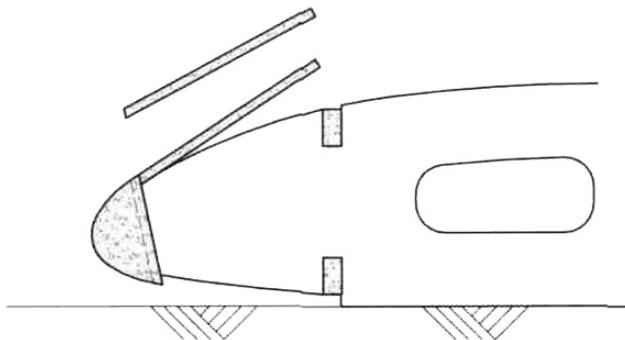
D D 4. **Before attempting to bend the sheet so it may reach the outer wing tip, the sheet must be thoroughly wetted from R8 outward.** Use a spray bottle or a sponge to liberally apply water to the tip area of the sheet outboard of rib R8. Some *experienced modelers add alcohol or ammonia to the water in order to help penetrate the wood fibers. About a 50/50 mix will do the job.* Carefully "work" the sheet with your fingers by bending and twisting it in the direction required to meet the wing tip. Replace the sheet on the wing and test bending the sheet into position. **Don't force the sheet - add more water if necessary.**

### Install Top & Bottom LE Sheeting

D D 1. Use a T-bar sander or flat sanding block with 150-grit sandpaper to carefully sand the top edges of the ribs to smoothly blend them to the main spar. Remove any glue bumps or other irregularities.



D D 5. When you position the sheet on the wing and attempt to bend it down toward the wing tip, you will notice that as the sheet bends, it also naturally twists rearward. However, in this area the sheet is supposed to maintain a straight line parallel to the spar. Trim a "curved wedge" from the sheet starting at rib R8. Trim and test fit the sheet until it conforms to the desired straight line.

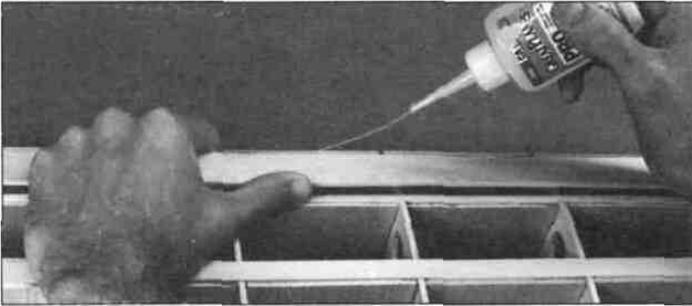


D D 2. Custom fit a 3/32" x 2-3/4" x 42" balsa **wing LE sheet**. Use a straightedge to true the front edge of the sheet and cut a slight bevel to match the angle of the slanted leading edge.

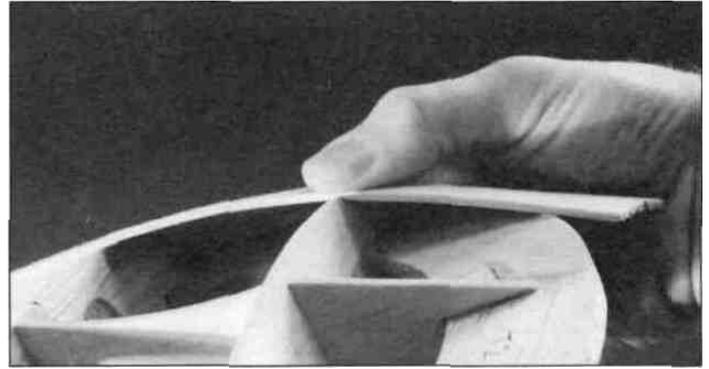


### OUTER WING TIP

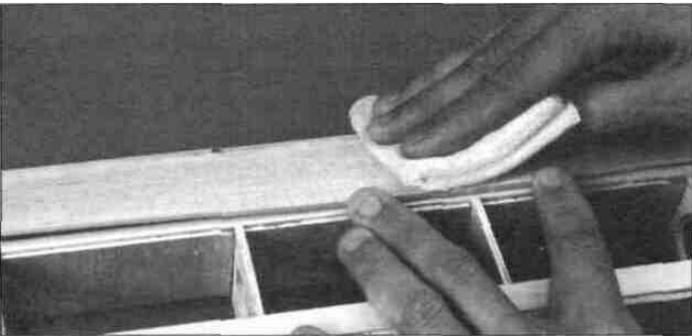
D D 6. To provide gluing surfaces for the sheeting, carve a bevel on both sides of the tip where the top and bottom sheet will join the tip.



D D 7. Position the leading edge sheeting against the leading edge. Using thin CA, glue the front edge of the sheet to the leading edge. Do not glue the sheet to the leading edge past the last rib R8.

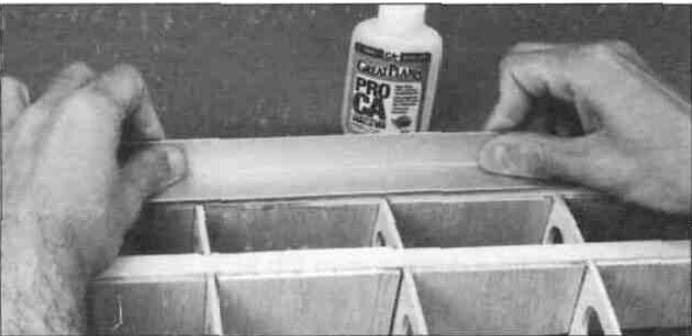


D D 11. Because the sheet tends to bow upwards between tip rib R8 and the outer tip, it may not be contacting the tip rib R9. Don't necessarily glue the sheet all the way down to the last tip rib R9. Instead, pull the sheet to a position on the rib that will help *distribute* the bowing upward effect of the sheet. Add a fillet of thick CA to rib R9 while holding the sheet in the position desired. *We'll perfect the top sheeting of the wing tip later.*

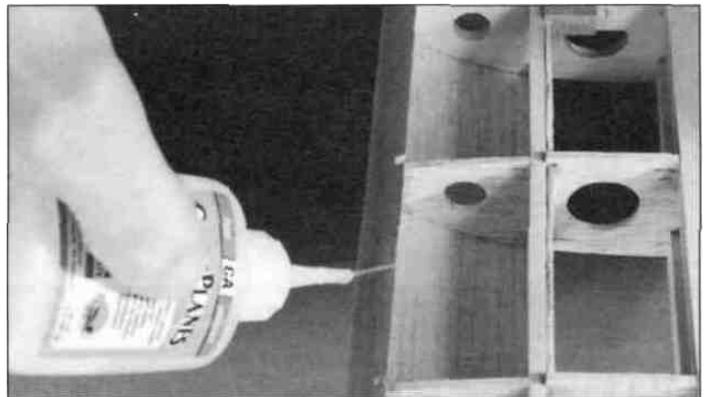


D D 8. Slightly wet the *entire sheet* to bend it to the spar.

D D 12. Fill the small seam between the leading edge and the front of the sheet between ribs R8 and R9 with a scrap piece of balsa.



D D 9. Apply a generous bead of thick CA to the forward spar. Working quickly, bend the sheeting to the spar, holding it down with something flat like a T-bar sander or flat block of wood until the glue cures. Remove the wing from the building board.



D D 13. Glue the ribs to the sheet with thin CA. Inspect all glue joints and add CA where necessary.

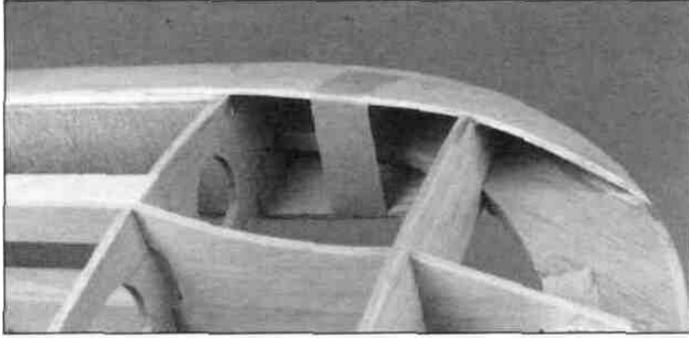
D D 14. Remove the extra sheeting from the end of the wing tip.

D D 10. Wet the sheet one more time in the tip area - the water may have evaporated from the balsa. Test bend the sheet to the tip. Make last minute adjustments if necessary. Apply thick CA where the sheet will contact the outer tip, but **don't add CA to the last tip rib R9 at this time**. Bend the sheeting to the outer tip rib and firmly hold it in position until the CA cures.

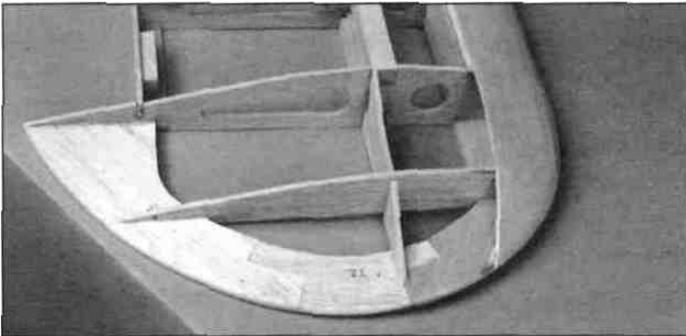


D D 15. Install the 3/32" x 2-3/4" x 42" bottom leading edge sheet **almost** the same way you installed the top - this time apply thick CA to the ribs **before** you add the sheet.

D D 16 Trim the excess bottom sheet and blend the leading edge to the wing tip. Refer to the plan for the correct shape.



D D 17 *Back to the top sheet for a moment* If the sheet still bows upward too much between rib R8 and tip rib R9, wet the balsa in this area and pull it down with masking tape until all the water has evaporated from the wood. Nearly all the excess bow will be eliminated. The rest can be sanded out.



D D 18 Rough sand the completed wing tip with 150-grit sandpaper, carefully rounding the edges and blending the tip sheet to the outer tip. Blend the leading edge to the sheeting all along the wing panel. A razor plane works well to cleanly remove material until you get close enough to use sandpaper. **Be careful with the razor plane — it's a fun tool to use but shave a little off at a time.** Fill the rib notches with filler.

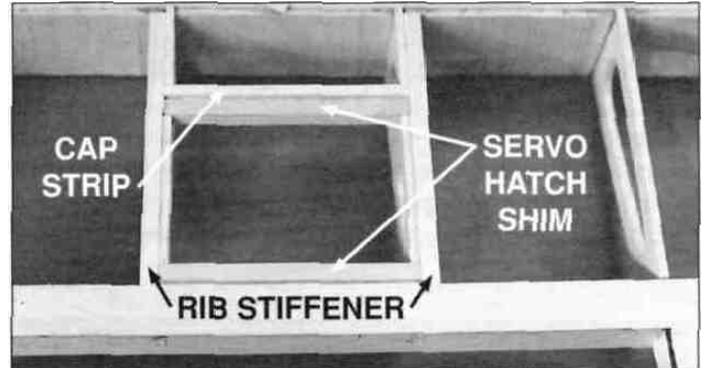
### **Build the Aileron Servo Hatch Compartment**

- D 1. Gather the parts you'll need right away .
- 2 pc die-cut 1/16" plywood **aileron servo hatch**
  - 1 pc. 1/4" x 1/4" x 36" **balsa rib stiffener**
  - 1 pc 1/32" x 1/4" x 16" **plywood aileron servo hatch shim**
  - 1 pc. 3/32" x 1/4" x 24" **cap strip**

D D 2 Cut two pieces from the 36" **rib stiffener** to fit between the 1/8" shear web and the trailing edge sheet. The top of these stiffeners must be flush with the top edge of the ribs, and blend with the TE sheet. Glue them into position with medium CA. Add a piece of 1/8" **scrap** between the stiffener and the main spar.

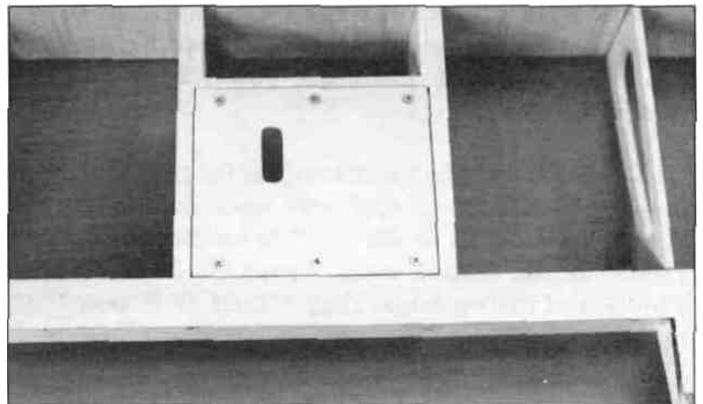
D D 3 From the 1/32" x 1/4" x 16" **aileron servo hatch shim**, cut two strips to fit on top of the servo rails between the 1/4" square stiffeners. Using medium CA, glue the shims into position flush with the inner edges of the servo rails. (See photo at Step 5 below.)

D D 4. Position the hatch. The rear edge of the hatch should meet the front edge of the TE sheet. Leave a small gap to allow for the thickness of the covering.



D D 5. Cut a length of cap strip to fit in front of the hatch, and between the 1/4" square hatch compartment stiffeners. It will have to be sanded to a width that allows the hatch to fit (remember to leave a gap for your covering). Glue the strip to the servo rails with medium **CA**.

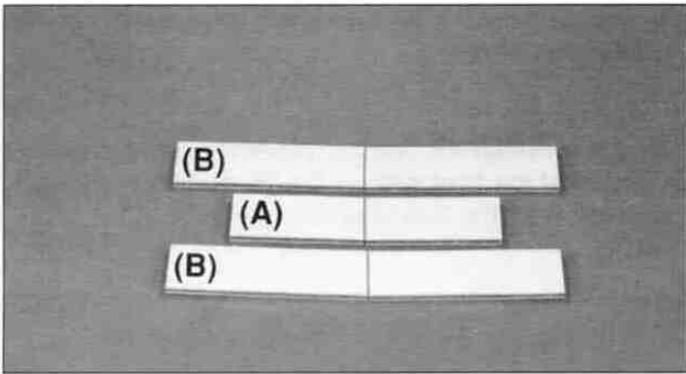
D D 6 Drill six 1/16" holes through the punch marks in the die-cut 1/16" plywood **aileron servo hatch**. Place the hatch cover in the aileron hatch compartment so the servo arm hole is toward the *front* and *outboard* edge of the hatch. Transfer the position of the holes in the hatch to the rails and drill 1/16" holes in the servo hatch rails.



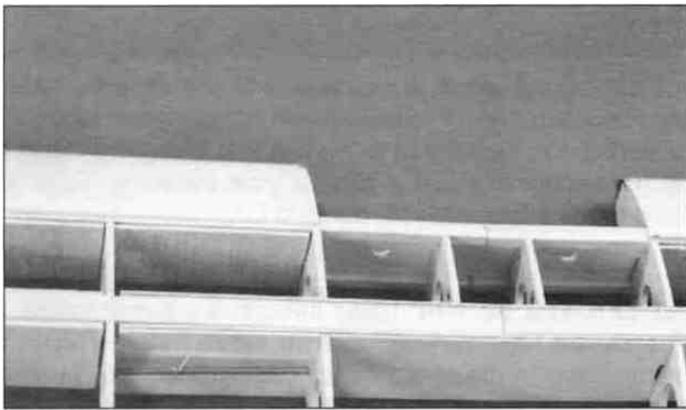
D D 7 Enlarge the holes in the **hatch only** to 3/32". Countersink the holes for the six #2 x 3/8" **flat head sheet metal screws** by using a countersink bit or carefully use a 7/32" drill bit to drill *part way* into the hatch. Don't drill all the way through! Temporarily mount the hatch to the wing.

D Return to step 2 on page 14, and build the other wing panel.

## Join the Wing Panels



D 1. Locate the die-cut 1/8" birch plywood **dihedral brace (A)** and the two die-cut 1/8" birch plywood **dihedral braces (B)**. With **(A)** in the middle, use the centerlines to align the parts and glue them together with 30-minute epoxy. While the epoxy is curing, proceed to the next step.

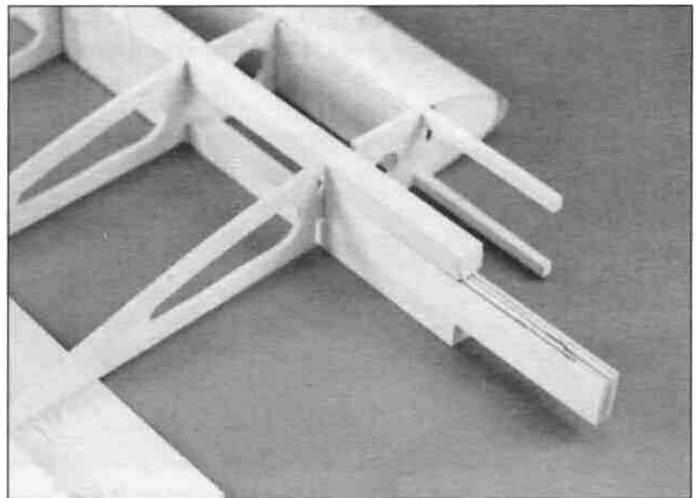


D 2. Test join the wing panels with the die-cut 1/8" plywood **forward dowel plate, forward spar joiner** and **aft spar joiner**. This is just a test fit - **do not glue at this time**. Make adjustments if necessary. It is typical to trim 1/16" from the ends of the spar joiners to allow the spars to come together and it may be necessary to deepen the notches in the ribs. Test fit both die-cut 1/8" balsa **sub ribs R1A**

D 3. Refer to the dihedral drawing on the plan. With one of the wing panels flat on your work table, prop up the main spar at the other tip rib **R8** 1-3/8" to set the dihedral angle (1-1/4" for the clipped wing). Check the fit of the spars, joiners and trailing edge. They should all fit evenly with no gaps.

D 4. Chamfer both ends of the 5/16" x 2-1/2" hardwood **wing dowels** and test fit. If you have to make adjustments **don't modify the forward dowel plate but adjust the position of the forward spar joiner instead**.

D 5. Make sure you have not built any "sweep" into the wing by cutting the spars or trailing edge too long or too short. Make adjustments if necessary.



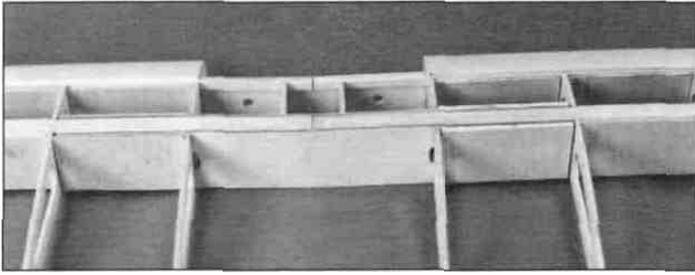
D 6. After the epoxy on the dihedral brace laminations from step 1 has cured, trial fit it between the main spars. The brace should fit between the spars without forcing them apart. Make adjustments to the brace if necessary.

**NOTE:** Before performing the following next **two steps** with glue, "dry fit" the entire assembly to become familiar with the procedure and decide where you will fasten your clamps.

D 7. Prepare to permanently join the wing halves with the laminated dihedral brace, front and rear main spar joiners, the forward dowel plate, and the two R1A ribs. 30-Minute epoxy must be used for this step. Place waxed paper on your work surface and mix up a batch of epoxy. The 1A ribs must be in position but no glue need be applied at this time - you can add CA to them later. Apply epoxy liberally to all mating surfaces. Slide the parts together and wipe off any excess epoxy. A paper towel easily removes uncured epoxy. *Immediately* proceed to the next step.

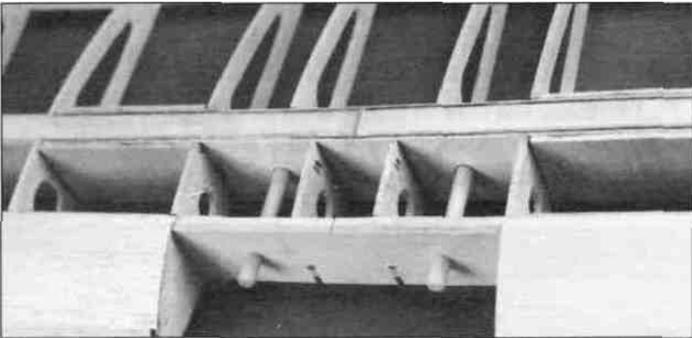
D 8. Make sure the dihedral angle is set as described in step 3. Align the spars and trailing edge of the panels, being careful not to build in any twist. Clamp the spar joiners and the forward dowel plate to the wing. Small C-clamps work well for this. Wipe away excess epoxy that oozes out. **Allow the epoxy to fully cure before disturbing the wing and removing the clamps.**

D 9. Remove the wing from the building board and take off all the clamps. Sand off any excess epoxy that may interfere with installation of the wing sheeting and shear webs.



D 10. Add the four remaining 1/8" balsa vertical grain shear webs - one centered on each side of the joiner between ribs **R2** and **R3**.

D 11. Use thick CA to glue both die-cut 1/8" balsa **R1B sub ribs** in position and glue the previously installed R1A sub ribs if you have not already done so.



D 12. Install both wing dowels and glue them in place with 30-minute epoxy. The dowels will be easier to insert if you chamfer the ends slightly.

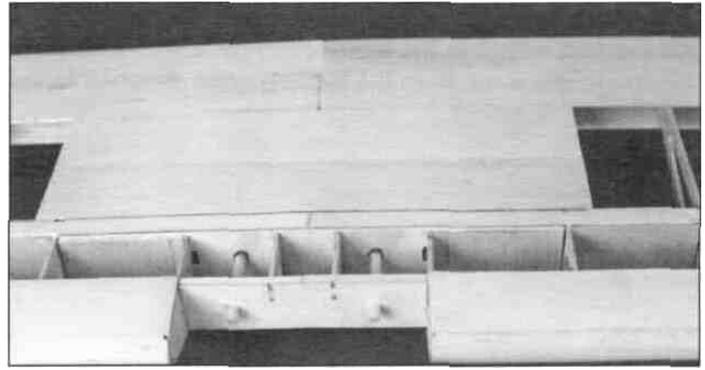
D 13. Use thick CA to glue the die-cut 1/16" plywood **trailing edge joiner** in place between the R1B sub ribs.

### Complete the Wing Sheeting

D 1. Cut the remaining two 3/32" x 2" x 42" **top trailing edge wing sheets** to exact size. The sheet is supplied slightly wide so it may be trued.

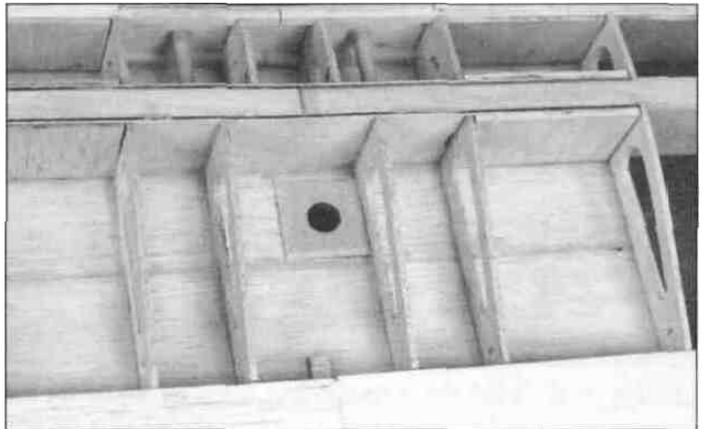
D 2. Remember the section of sheet you removed (and saved) while preparing the bottom TE sheet? Locate this piece and use it as a template to remove the same size section from the top sheet. Glue the top trailing edge sheets to the wing with medium CA.

D 3. Locate the three 3/32" x 2-3/4" x 30" balsa **center section wing sheets**. Cut each piece into two, making six pieces 15" long. It will be helpful to mark the centerline of the sheets to aid in alignment on the wing.



D 4. Sheet the *bottom* of the wing first. Begin with the **rear** sheet, then add the middle section, then the front.

D 5. After sheeting the bottom of the wing, add a 3/8" wide strip of 3/32" balsa over the forward spars and plywood leading edge joiner.

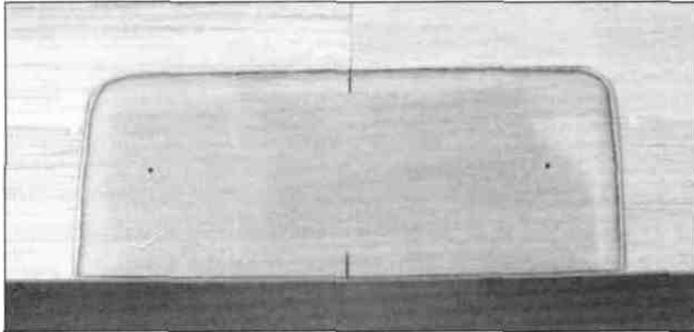


D 6. Laminate a piece of cross-grain scrap balsa to the *inside* of the sheet so it doesn't split. Cut a 1/2" hole in the bottom sheeting to pass the aileron servo wire extensions through. No particular location is required. We cut the hole next to a rib to maintain a little rigidity in the sheeting.

D 7. Sheet the **top** center section. Add the rear sheet first, then the center, then the front. The seam between the front and center section sheeting should be over the main spar. Add a 3/8" wide strip of 3/32" sheet over the forward spars and plywood leading edge joiner.

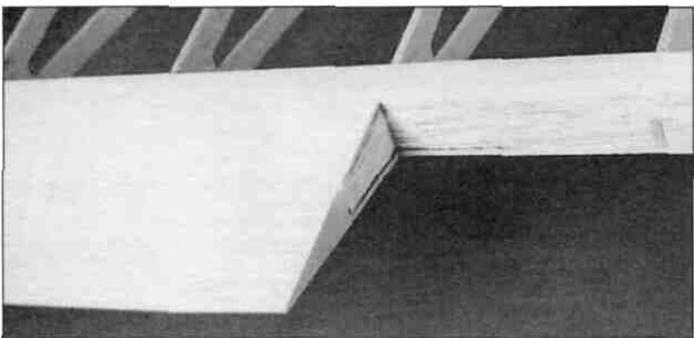
D 8. After the top and bottom sheeting is installed, use a sanding block to true-up the edges of the sheeting. Each section of sheet should end about 1/4" past the ribs.

D 9. From the 3/32" x 1/4" x 24" balsa sticks, cut, then glue the **cap strips** to the top of each rib with medium CA. These cap strips run from the leading edge sheeting to the trailing edge sheeting.



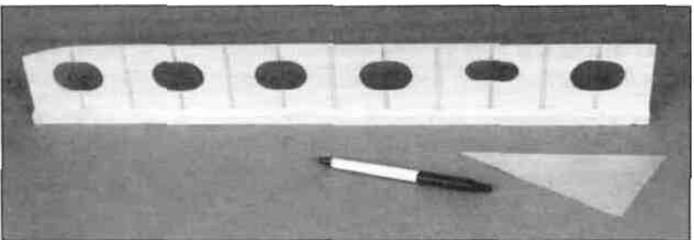
D 10. Bevel three of the *top* edges of the die-cut 1/16" plywood **wing bolt plate** leaving the trailing edge square. The top of the wing bolt plate has the punch marks on it. Align the centerlines with the centerline of the wing and securely glue the wing bolt plate to the **top** of the wing.

### Build the Ailerons

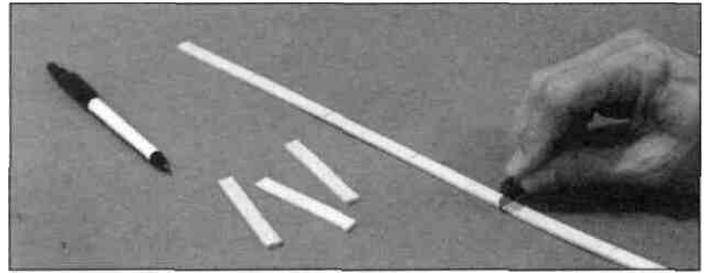


D D 1. "Clean up" the outer trailing edge by squaring the corners made by the outer trailing edge, rib R8 and rib R5. Use a sanding block to trim the excess sheet above and below the outer trailing edge.

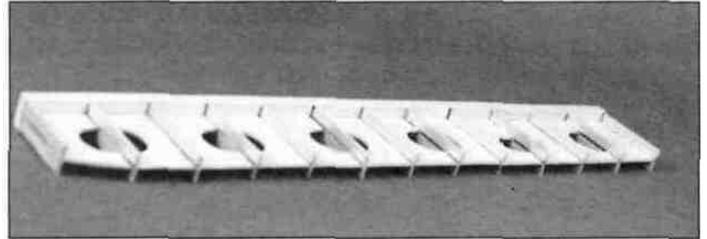
D D 2. Place the die-cut 3/32" balsa **aileron base** over the plan and mark the rib locations on **both** sides. Avoid using a felt tip pen - the CA and accelerator will make the ink "bleed" and this will be seen through the yellow covering.



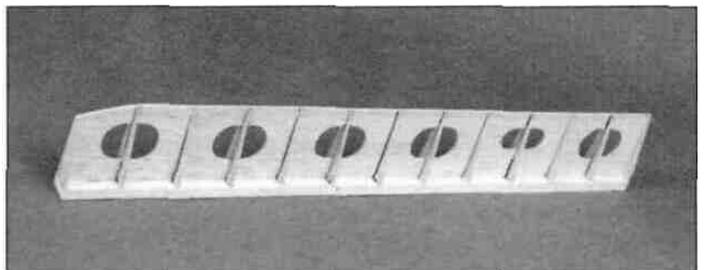
D D 3. Cut the 7/8" x 13/32" x 24" grooved balsa **aileron leading edge** to exact length according to the plan. Insert the aileron base into the aileron leading edge and glue it in place with **thin** CA. Make sure the base is *perpendicular* to the leading edge.



D D 4. Cut 26 **aileron ribs** 2-5/8" long from the 3/32" x 3/8" x 30" sticks. Make sure each cut is square to assure that the grooved leading edge will remain perpendicular to the base when gluing the ribs into position.



D D 5. Glue the ribs to both sides of the aileron base with medium CA. Make sure the front edge of the ribs are against the leading edge.



D D 6. Trim the ribs to their tapered shape. If you have a razor plane this works well. First cut (or plane) the ribs, then final sand with a flat sanding block and 150-grit sandpaper. Refer to the cross-section for details. Work carefully here — remove small amounts of material at a time and inspect your work as you go. Be careful not to sand the ribs to a concave shape.

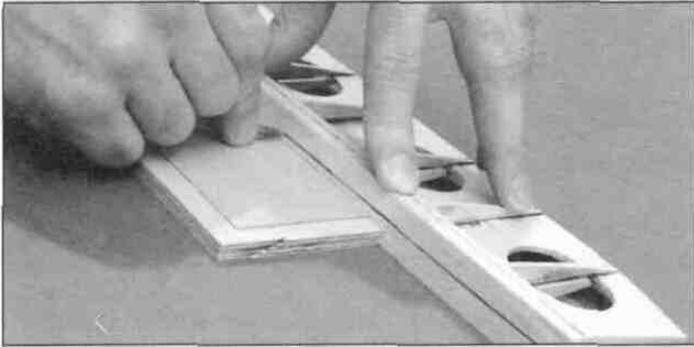
D 7. Repeat steps 1 through 6 to build the other aileron.

D 8. Now that you have two nearly completed ailerons, match them to the wing and decide which one will be "right" and which one will be "left."

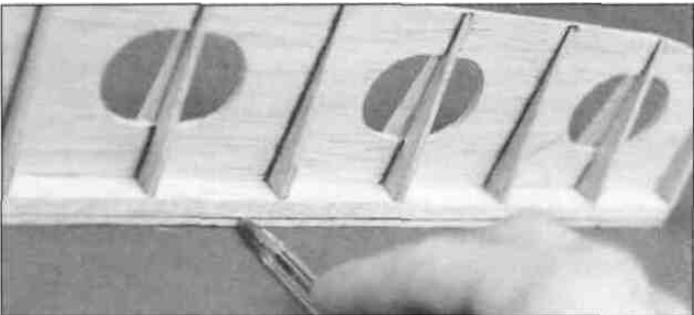
D 9. Referring to the following *Expert Tip* and the aileron cross-section on the plan, draw a centerline on the *front* of the aileron leading edge and draw the "bevel to" lines on the *top and bottom* of the aileron leading edge. The line to bevel to on the **top** of the aileron should be about 1/8" away from the **front** of the aileron leading edge. The line on the **bottom** of the aileron leading edge should be about 1/8" from the **rear** of the aileron leading edge. Don't forget, you've designated a right and a left aileron. **Don't build two rights or two lefts by carving the same bevel on both ailerons.**



### How to bevel the ailerons.



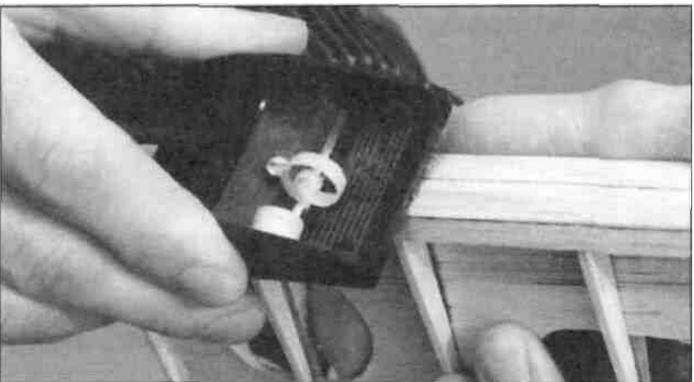
A. Draw a centerline on the front of the leading edge. It happens that a Bic ball point pen placed on a piece of 1/4" plywood and a piece of 1/32" plywood will add up to the centerline. Confirm this and add cardstock shims (playing cards work well) if necessary.



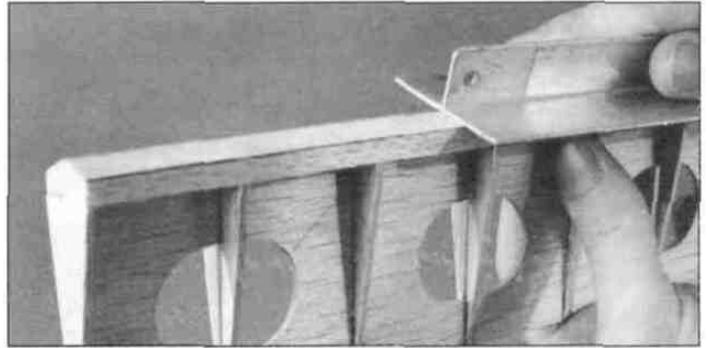
B. Draw a bevel guideline on the **top** of the aileron. The Bic pen with no shim at all will draw a line close to 1/8" high.

C. Draw the **bottom** bevel line on the aileron. This time, shim the pen with a piece of 3/32" scrap balsa. Check the plans before cutting the bevel.

D. Cut the hinge slots in the wing and the ailerons.



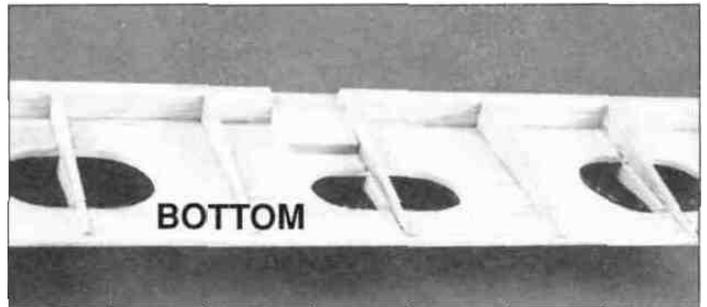
E. Carve the bevel to the guide lines. A razor plane works best but a hobby knife will do the job too. Remove a little material at a time and frequently inspect **your** work as you proceed.



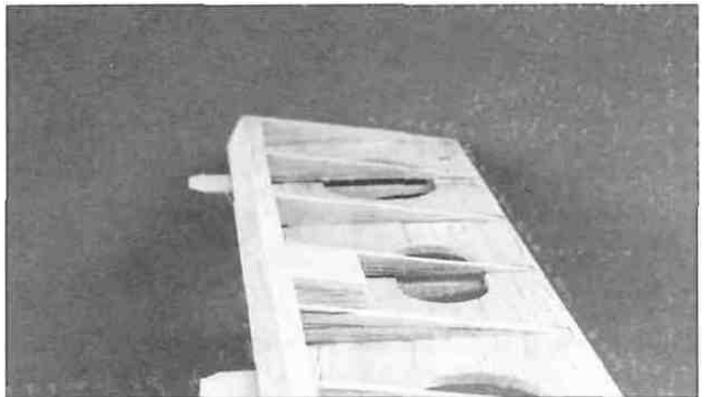
F. Final sand the bevel to the guide lines with a sanding block and 150-grit sandpaper.

D 10. Cut the hinge slots and trial fit the ailerons to the wing, but **do not glue in the hinges until after the wing is covered.**

D 11. Cut a 1/8" deep x 7/8" wide notch in the **bottom** of each aileron leading edge to accept the 1/8" x 7/8" x 1" plywood **horn mounting plate.**



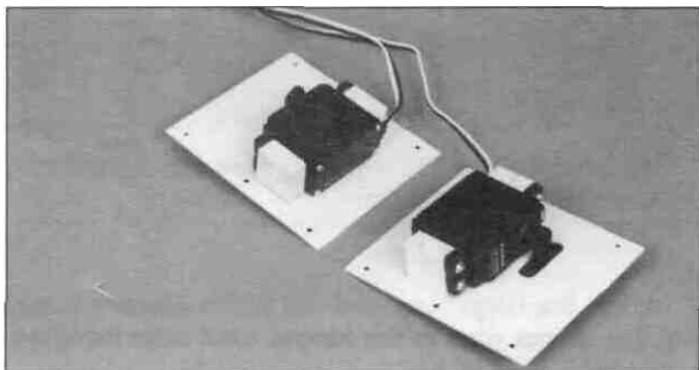
D 12. Trial fit the 1/4" x 7/8" x 3/4" balsa **horn mounting block** to the bottom of the aileron in the location indicated on the plan. Bevel the block until the plywood control horn mount will be flush with the adjacent rib when the mount is placed on top of the block.



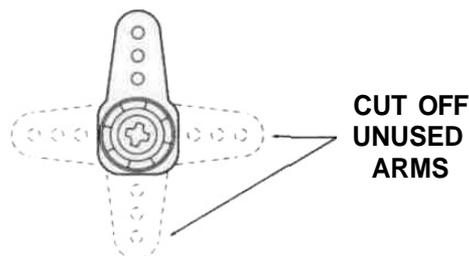
D 13. Using thick CA, glue the balsa mounting block to the aileron base, then the plywood plate on top of the block. Bevel the edge of the plywood plate to match the bevel of the leading edge of the aileron.

## Mount the Aileron Servos

D 1 Use 30-minute epoxy to glue two 5/16" x 3/4" x 7/8" basswood **servo mount blocks** to each aileron servo hatch. Position the blocks to accommodate your servos.

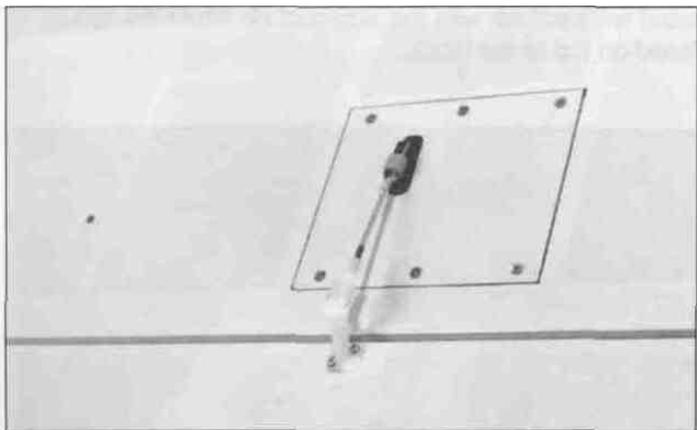


D 2 When the epoxy has fully cured, fit a 1/32" or 1/16" temporary shim between the servo and the plywood hatch, then mount the servos to the blocks. Remove the shim



D 3 Trim cross-style servo horns as shown, then install them on the servos.

## Install Aileron Linkage



D 4 Install and adjust the aileron linkages. Two .074" x 4" **threaded end rods** are provided to make the aileron pushrods. Use a **nylon clevis** on one end and a **solder clevis** on the other end. Silver solder is highly recommended. See the following Expert Tip. Mark and drill 1/16" pilot holes, then attach the **small aileron control horn** with two #2 x 3/8" **sheet metal screws**. Refer to the

*Control Throws* section for recommended **throws** upon final radio set-up. The cross-section on the wing plan shows the correct neutral position of the servo arm to produce differential throw.



### How to silver solder.

Use this process when soldering metal to metal such as brass tube to wire, or pushrod ends to wire.

A. Thoroughly clean the items to be soldered with alcohol or degreasing solvent. Pay special attention to the **inside** of the Threaded Brass Couplers.

B. Roughen the area to be soldered with fine sandpaper, then clean again.

C. Assemble the items to be soldered.

D. Apply a small amount of soldering flux. Acid based liquid flux works best when one or more of the items is steel.

E. Heat the metal with a soldering gun or iron, and apply solder to the metal. The metal must get hot enough to melt the solder and the solder must flow freely into the joint.

F. Do not move the parts until the solder has cooled.

G. Test the joint by pulling hard.

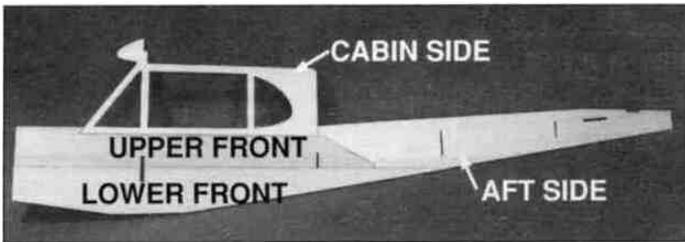
H. Clean off the excess flux with alcohol or solvent. Coat the parts with a fine film of oil.

Inspect all glue joints in the wing and apply CA where necessary. Set the wing aside for now.

## BUILD THE FUSELAGE

### Build the Fuselage Sides

D D 1 Pin or tape the fuselage side plan to a flat surface and cover it with waxed paper. Trial fit a die-cut 1/8" balsa **upper front fuselage side, lower front fuselage side, and aft fuselage side**. Sand as necessary to achieve a good fit and glue together with *thin* CA. Wipe off excess glue with a paper towel before the CA cures. (See photo at step 2.)

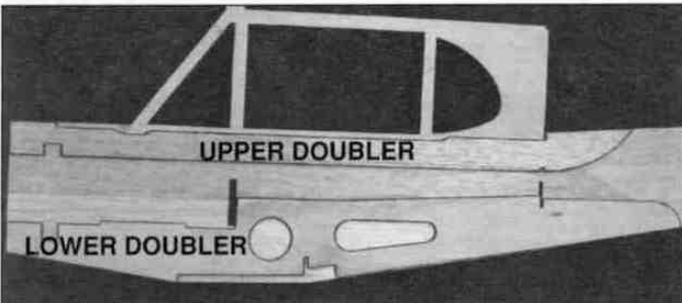


D D 2. Glue a die-cut 1/8" plywood **cabin side** to the fuselage side.

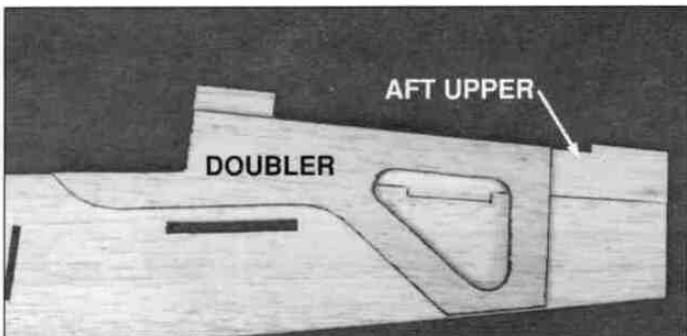
D D 3. Remove the fuselage side from the plan and inspect the glue joints for gaps, filling where necessary with *thick* CA.

D 4. Repeat steps 1-3 for the other fuselage side. When completed, place both sides together and sand the edges to make the pieces identical. Designate a **right** fuselage side and a **left** fuselage side at this time. Mark the sides to avoid building two "rights" or two "lefts" in the proceeding steps. Rough sand the inside and outside of both fuselage sides with 150-grit sandpaper.

D D 5. Use thick CA to glue a die-cut 1/8" plywood **lower fuselage doubler** to the **inside** of one of the fuselage sides. It must align at the front and bottom edges.

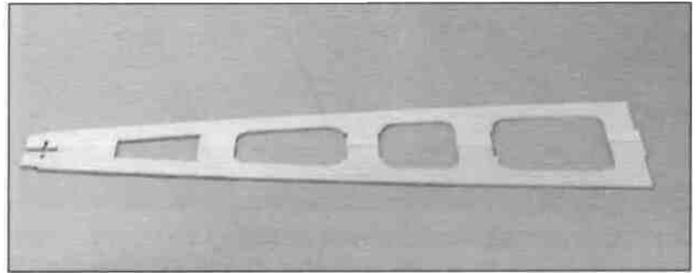


D D 6. Use thick CA to glue the die-cut 1/8" balsa **upper fuselage doubler** to the same fuselage side. The front and top edges of the doubler should be flush with the edges of the balsa fuselage sides.

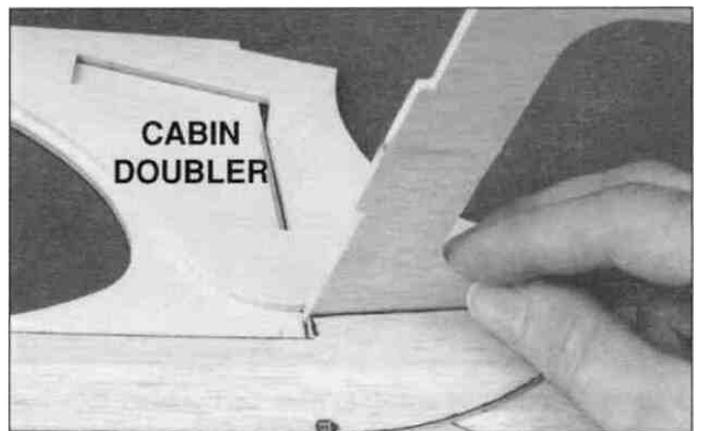


D D 7. Use thick CA to glue a die-cut 1/8" balsa **aft upper fuselage side**, then the **aft fuselage doubler** in place. The doubler should match up with the corner made by the aft fuselage side and the aft upper fuselage side, and line up with the top edge of the aft upper fuselage side.

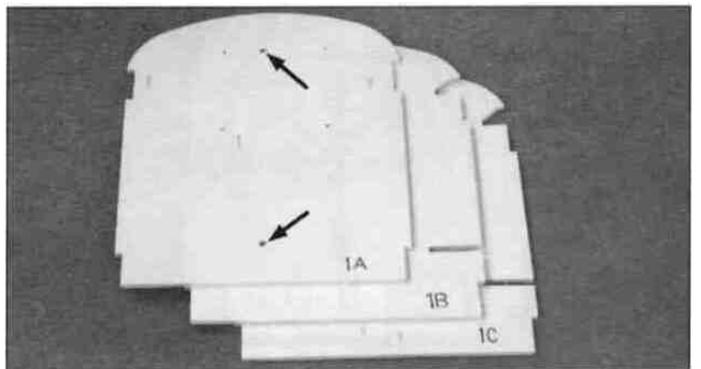
D 8. Return to step 5 and add the doublers to the **inside** of the other fuselage side. **Be sure to make a right and a left side!**



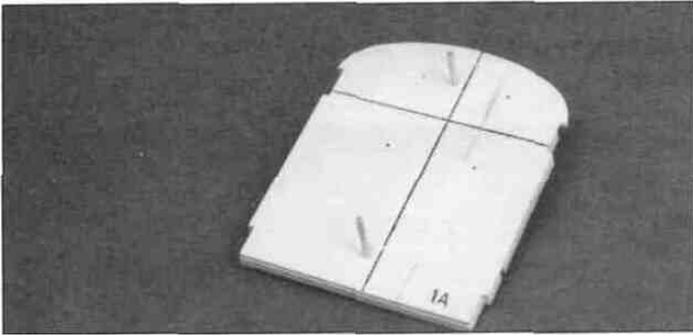
D 9. Test fit the two die-cut 1/8" balsa **aft fuselage tops** together. Sand them if necessary to achieve a good fit, then glue them together with medium CA.



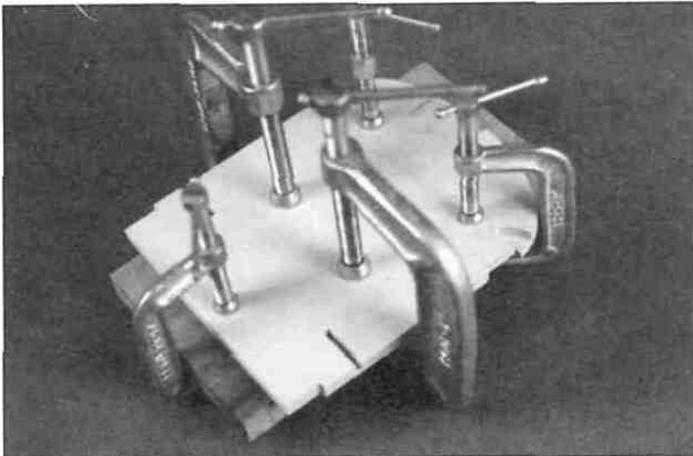
D 10. Use the aft fuselage top as a gauge to position the die-cut 1/8" plywood **cabin doublers**. The bottom of the doubler should be above the fuselage side by the thickness of the aft fuselage top. The aft edge of the vertical slot in the cabin doubler should be even with the aft edge of the cabin, and the top edge must be flush with the top of the cabin side. Once you have determined its exact location, trace a line around the doubler so you can accurately position it after you have applied **thick** CA. Glue a doubler to both fuselage sides. **Don't apply any CA to the area of the doubler aft of the cabin side.**



D 11. Remove any die-cutting irregularities from the die-cut 1/8" plywood **firewall formers 1A, 1B and 1C**. Separately, drill two 1/8" holes through the punch marks in each firewall doubler for the 1/8" x 1" **firewall alignment dowels**.

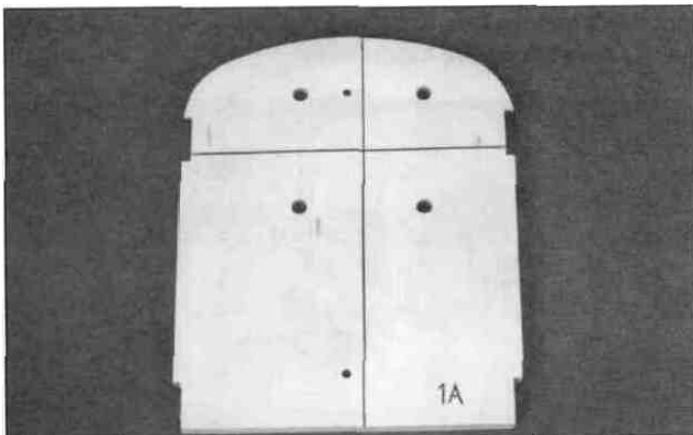


D 12 Cut the alignment dowel in half. Trial fit the three firewall formers together with the alignment dowels in the holes.



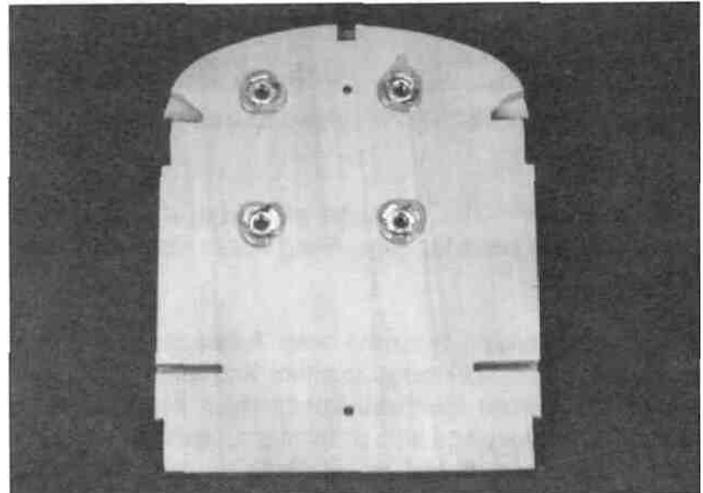
D 13 Use 30-minute epoxy to glue the doublers together with the alignment dowels inserted. Refer to the note below. Make sure all the punch marks and the embossed numbers are **facing the same direction**.

**NOTE:** If the three firewall doublers are slightly warped, the assembly may not flatten when clamped together. To avoid a warped firewall, clamp the three pieces to a flat table or other rigid, **flat** board. Before it cures, remove excess epoxy from the notches where other parts are to fit.



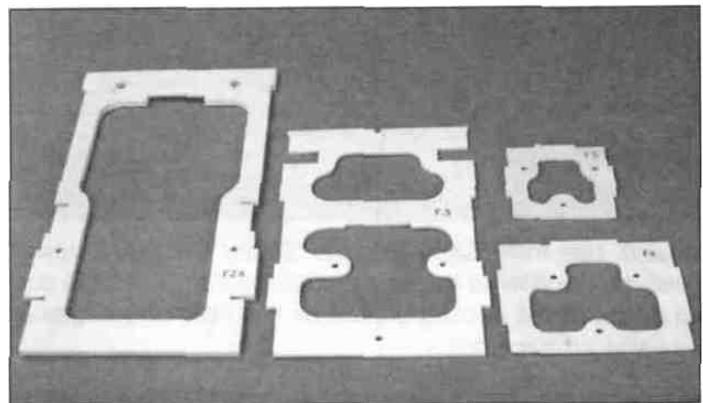
D 14 If you are going to use the engine mount supplied with the kit, drill a 15/64" hole through the firewall at each of the four punched locations for the 8-32 **blind nuts**. If you are using a different engine mount, draw horizontal and vertical centerlines through the provided punch marks,

center your mount over those lines, then mark and drill the mounting holes for your alternate mount. Notice that the vertical "centerline" is offset to allow for the engine's right thrust.



D 15 Lightly tap the blind nuts into the holes from the rear of the engine mount. Apply CA or 5-minute epoxy around the flange on the blind nuts to glue them to the firewall.

D 16. Glue the die-cut 1/8" plywood **formers F2A** and **F2B** together. Line up the wing dowel holes accurately. You may use *thick* CA to join these two pieces. From now on the F2A/F2B assembly will be referred to as "F2". Drill a 3/16" hole at each of the three punch marks for the pushrod tubes.

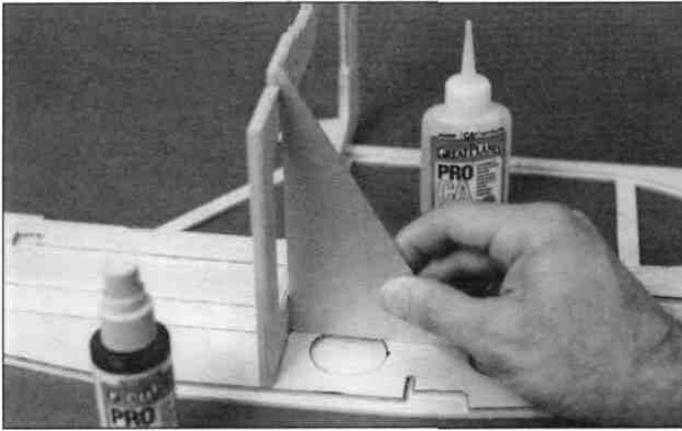


D 17 Drill 3/16" holes in the die-cut 1/8" plywood **formers F3, F4** and **F5** at the punched locations.

**Join the Fuselage Sides**

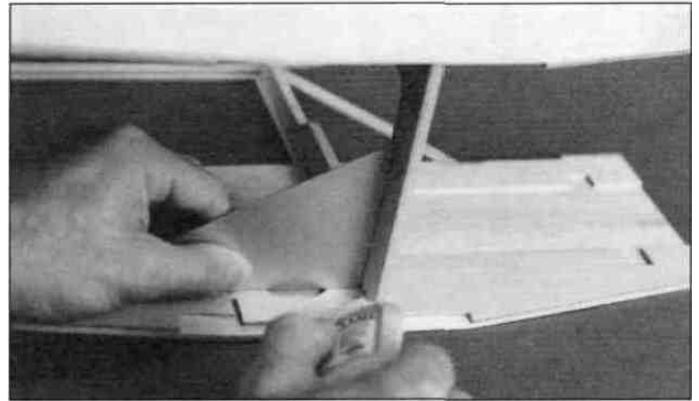
**NOTE:** Die stamped numbers on all formers must face **forward**.

D 1 Test fit formers F2, F3, F4 and F5 in the left fuse side. Make adjustments if necessary. Test fit the same formers in the right fuse side.

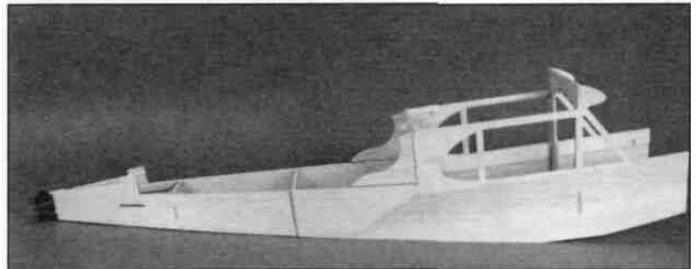


D 2. Place former F2 on the right fuselage side, with **F2A** toward the front. A slight sanding down of the tabs on the formers may be required to allow the formers to fully contact the fuselage sides before the tabs contact the workbench. Using a draftsman's triangle or carpenter's square, hold the former perpendicular to the fuse side as shown in the photo. Apply a few drops of thin CA to hold the former in place, and recheck its alignment as the CA hardens. Follow with a small bead of medium or thick CA to add strength to the joint. We recommend this gluing procedure for all formers.

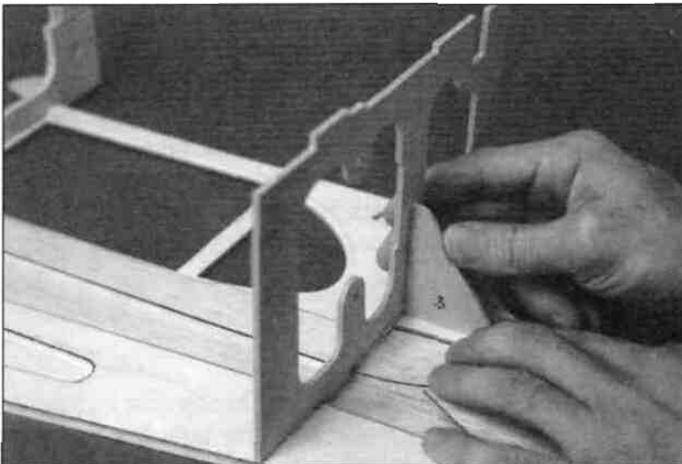
**NOTE:** Former F2 is the **only former** that is installed **perpendicular** (at right angles) to the fuse side. Formers F3, F4 and F5 will be set at the correct angle using the die-cut angle gauges provided.



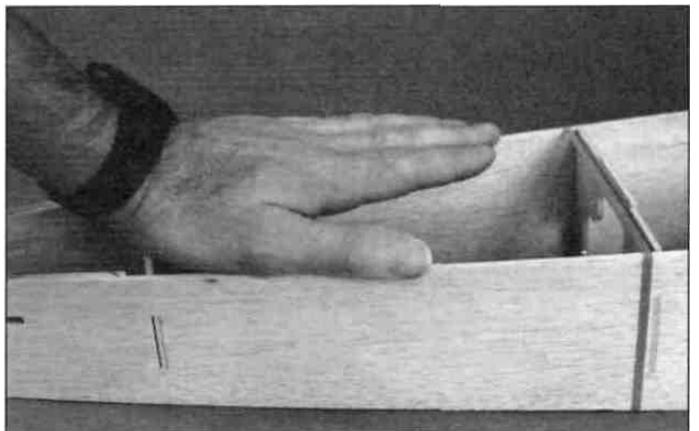
D 5. Join the left fuselage side to the right. Key **only** former F2 to the fuselage side and do not join the other formers to the left fuselage side yet. Lay the fuselage on its left side and glue F2 to the left side of the fuselage. Again, F2 must be *perpendicular* to the fuselage side. It is helpful to prop up the aft end of the right fuse side while performing this step.



D 6. Key the rest of the formers to the left fuselage side. **Don't use any glue until told to do so.** Place a #64 rubber band around the fuselage at former F4. Clamp the rear of the fuselage sides together.



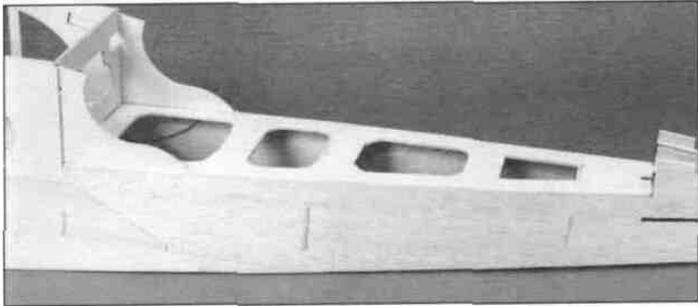
D 3. Glue former F3 to the right fuse side **using the "3" angle gauge**, as shown in the photo.



D 4. Glue formers F4 and F5 to the right fuse side using the "4" and "5" angle gauges.

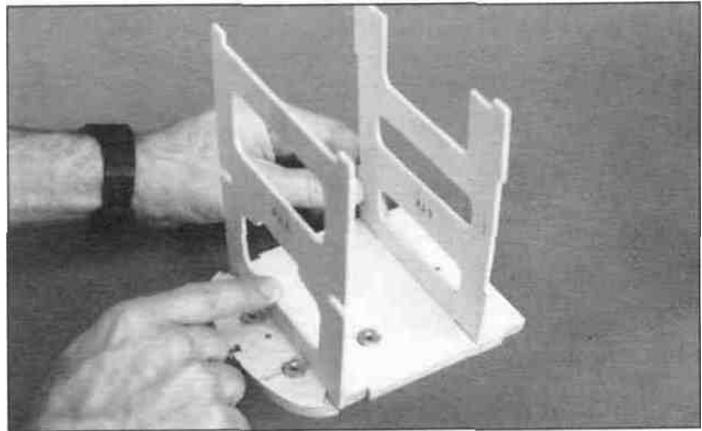
D 7. Lay the fuselage over the top view of the plan. Push the sides down against your flat work surface to make sure they are parallel to each other. Make sure the sides are matched at the rear where you have clamped them together.

D 8. Using the fuselage top view plan as a reference, **confirm that the fuselage is straight.** Securely glue formers F3, F4, and F5 to the left fuselage side. **Do not glue the fuselage sides together at the rear.** Remove the clamp and rubber bands after the glue has set.

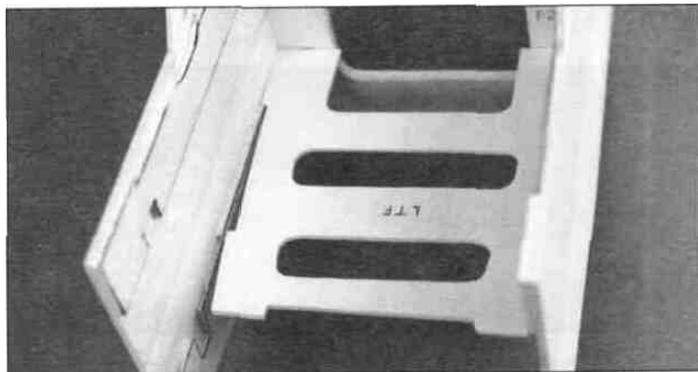


D 9. Slide the previously assembled **aft fuselage top** into position so the formers key into the slots. Glue the aft fuselage top to the formers and fuselage sides.

D 10. Glue the cabin doubler to the aft fuselage top. The cabin doublers may have to be slightly *bent inward* to conform to the shape of the fuselage.

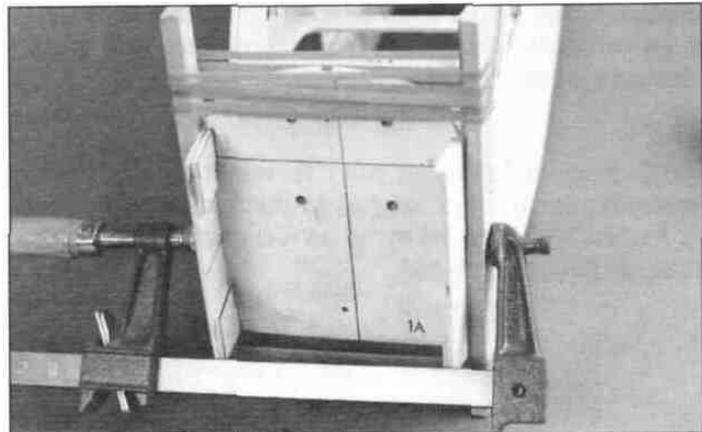


D 14. Remove all three pieces and trial fit the LTF and TTF in the back of the firewall. It is important that the front edge of the LTF and TTF **fully contact** the back of the firewall.



**D 11. Do not use any glue until instructed to do so.** Trial fit the die-cut 1/8" plywood **lower tank floor (LTF)** in the fuselage making sure the embossed designation "LTF" is facing upward - this sets the thrust angle of the firewall.

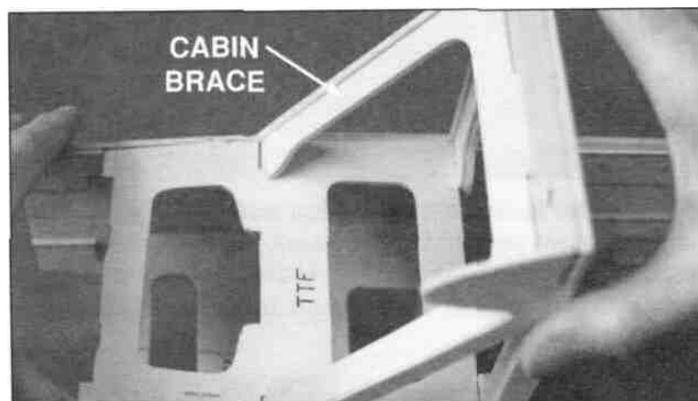
D 12. While the LTF is in position, trial fit the die-cut 1/8" plywood **top tank floor (TTF)** facing upward. The notch in the left upper fuselage doubler will have to be enlarged to accept the TTF because the fuselage doublers are identical although right thrust must be built in.



D 15. Reinstall LTF, TTF, cabin brace and the firewall into the fuselage. Practice clamping the fuselage sides together around the firewall and tank floors, making sure the firewall fits into its notches. Use hardwood sticks, or similar, to evenly distribute the force of the clamps on the fuselage sides. Clamp the sticks together with masking tape, lots of rubber bands or clamps. Once satisfied with the fit of all parts, securely glue them together with 30-minute epoxy.

D 16. While you still have an open, accessible structure, inspect all glue joints to make sure the tank floors, cabin brace, and all formers are securely bonded. Apply fillets of thick CA where required. Sand the tab at the top of the cabin doubler flush with the back of F2.

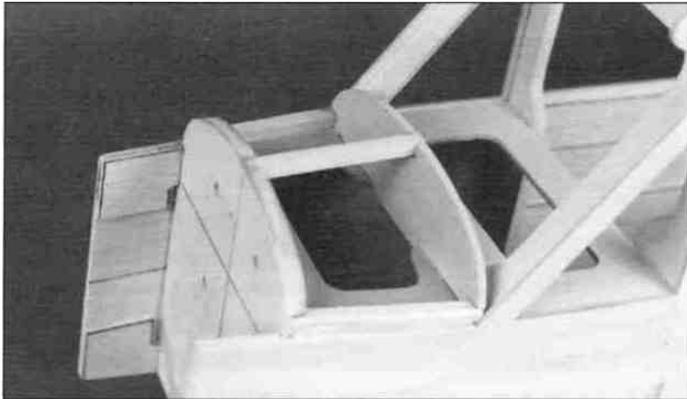
D 17. Before we continue, now is a good time to fuel proof the fuel tank compartment. We recommend brushing on one of the following: 30-minute epoxy thinned with a little alcohol, polyester resin or K&B paint or dope.



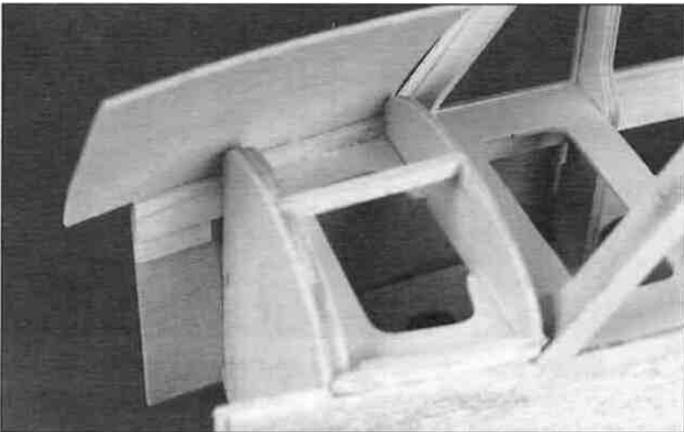
D 13. Trial fit the die-cut 1/8" plywood **cabin brace** with the TTF. You may have to remove the TTF, insert the cabin brace in the TTF, then reinstall the two pieces simultaneously.

## Sheet the Fuselage Deck

D 1. Glue the die-cut 1/8" plywood **instrument panel** to TTF. It should be perpendicular to TTF.



D 2. Cut three stringers from the 1/4" x 1/4" x 36" balsa stick to fit between the firewall and the instrument panel. Refer to the cross-section for the exact positioning of the two bottom stringers. Notice they are slightly angled inward. Glue the stringers in position with medium CA.

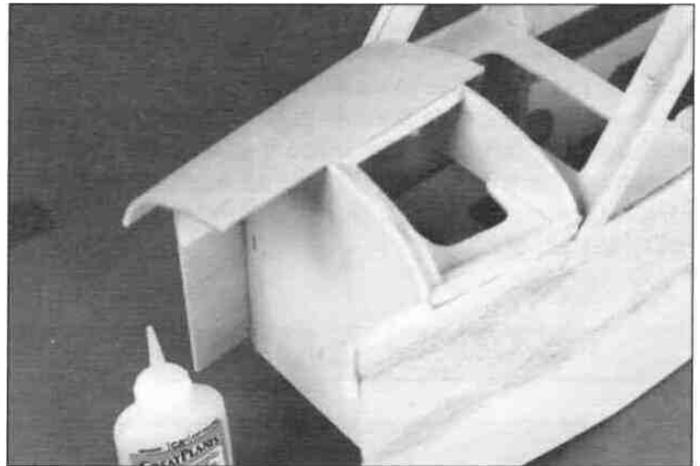


D 3. Cut two 5-1/2" lengths from the 3/32" x 4" x 12" balsa sheet to make the **forward fuse deck sheeting**. The rear corner of the sheet will have to be beveled where it contacts the cabin side. With medium CA, glue one piece to the right fuselage side and bottom stringer only.

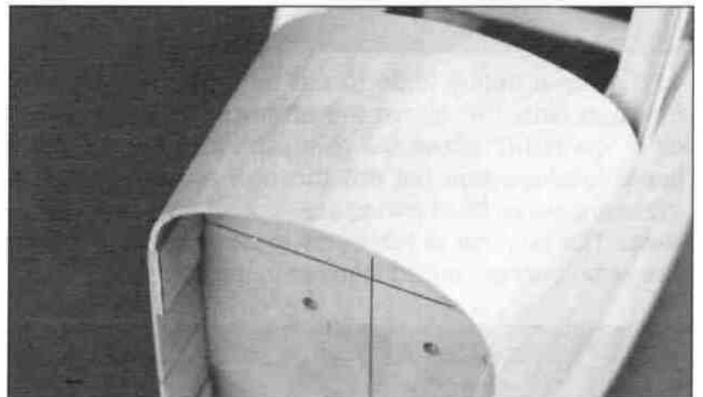


D 4. Wet the outside of the sheet with water and let it soak in for a few minutes. Firmly, yet carefully, pull the sheet

around the firewall and instrument panel and mark where it crosses the centerline of the 1/4" square stringer. Cut the sheet on the line you marked.



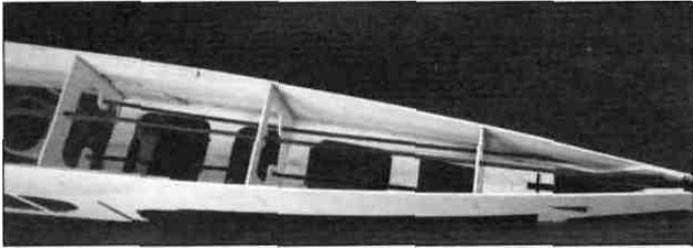
D 5. Pull the sheet back into position and glue it in place.



D 6. Apply the other sheet in the same manner as described above. Trim the sheeting flush with the back of the instrument panel and the front of the fuselage sides.

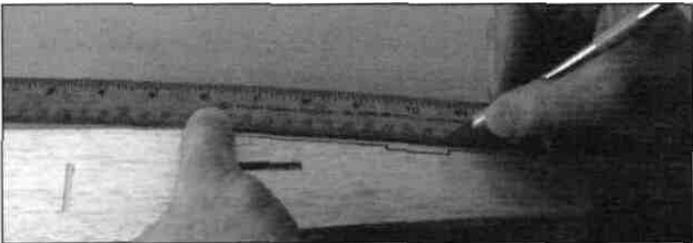
## Install the Pushrod Tubes

D 1. Slide two 36" long **pushrod tubes** through the slots in the rear of fuselage, then through formers F5, F4, and F3. Cut and position the tubes so they extend past the aft edge of the slots 1/4" and approximately 5" past the front of former F3 to allow for trimming later. Remove and scuff the outside of the tubes with 150-grit sandpaper so the glue will adhere to them. Reinstall the tubes and securely glue them in position to each former and the fuselage sides.



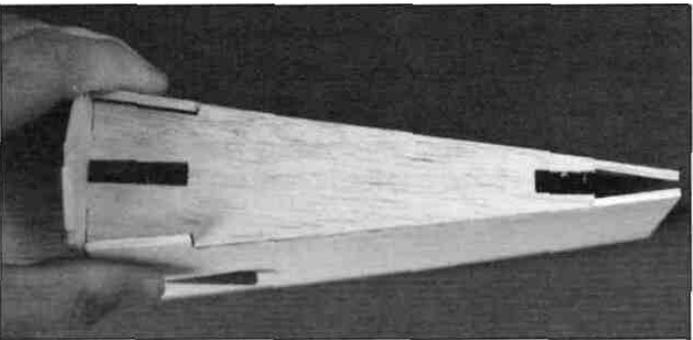
D 2. If you would like to install a tube to route the receiver antenna through, slide another pushrod tube (not included) through the holes at the bottom of each former. The antenna tube should extend to the aft edge of the fuselage sides. Glue the antenna tube to the formers only, and cut it off 6" in front of F3.

### Install the Stabilizer Base



D 1. Use a hobby knife to cut through each aft upper fuselage side 1/8" above the aft lower fuselage side (in other words, 1/8" above the glue joint). Cut through the aft upper fuselage side but **not through the doubler**. Later the seam will be filled with epoxy.

**Note:** The purpose of this cut is to allow the fuse sides to flex when they are pulled together in the next step.



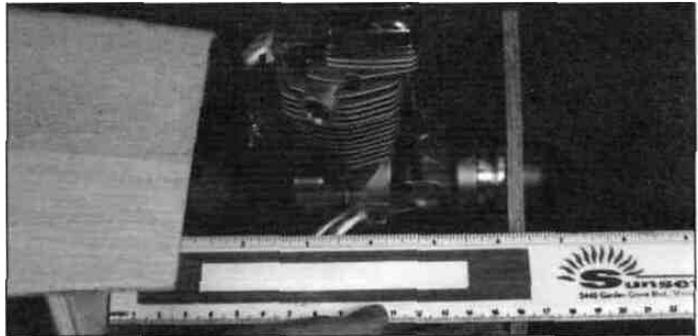
L1 2. Trial fit the die-cut 1/8" balsa **stabilizer base** and the die-cut 1/8" plywood **top deck former TF4** to the fuselage sides. Squeeze the fuse sides together, making sure that the fuselage sides and the aft fuselage doubler contact the top deck former. Use medium CA to glue only the **stabilizer base** into position — not the former.

D 3. Remove former **TF4** and securely glue the stabilizer base from the inside of the fuselage. **Do not glue the rear of the fuselage sides together.**

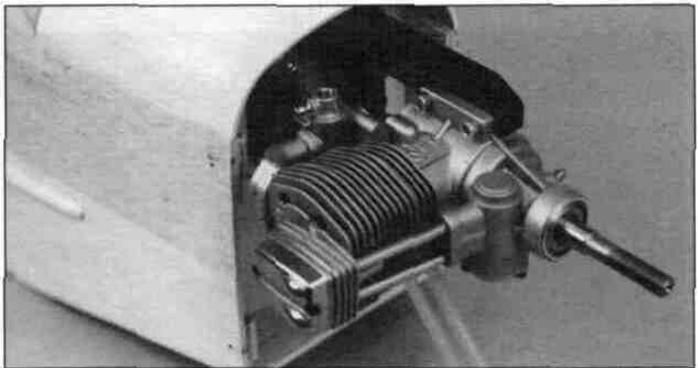
D 4. Inspect all glue joints and apply thick CA where necessary. Fill the seam that you cut in Step 1 with 30-minute epoxy. Force epoxy **all the way** into the gap.

### Install the Engine & Mount

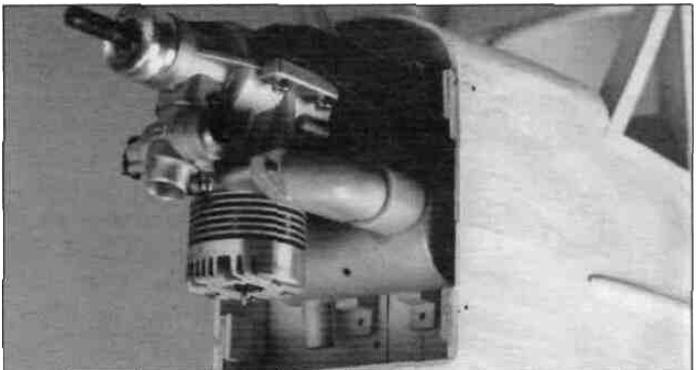
D 1. Attach the **engine mount** to the firewall using the **8-32 x 1-1/4" socket head cap screws** and **#8 washers and lock washers** provided.



D 2. Locate the engine on the mount so the distance between the firewall and the front of the drive washer is 6-3/16" (157mm). Mark the bolt locations on the engine mount, then drill four #29 or 9/64" holes. Tap the threads into the engine mount with an 8-32 tap.



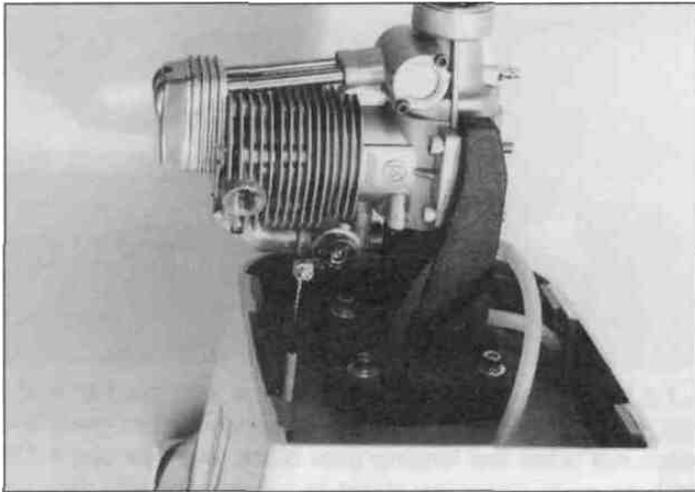
D 3. Mount the engine mount and engine on the firewall. Line up the molded marks on the engine mount with the horizontal centerline on the firewall. If the marks are separated (as is the case with the O.S. 91 4-stroke), "split the difference," placing the centerline of the firewall between the two marks of the engine mount.



The photo shows the optional inverted 2-stroke engine mounting. The Top Flite In-Cowl Muffler and Header simplify installation (see the *Engine And Mount Selection* at the beginning of the manual).

## Install the Fuel Tank & Throttle Cable

D 1. With the engine mounted, determine where the fuel lines will pass through the firewall and mark the locations.



D 2. Determine the location of the throttle linkage. Throttle linkage is not provided in this kit. To enable the throttle linkage to clear the fuel tank, we've rotated the carburetor on the O.S. .91 180 degrees.

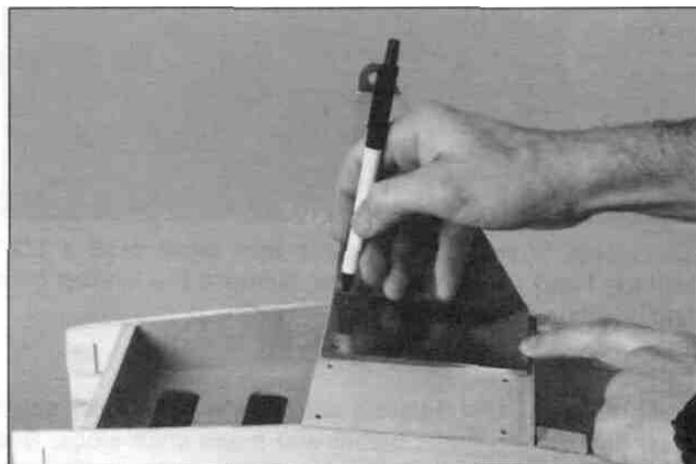
D 3. Drill the fuel line and throttle linkage holes. For standard, medium size silicone fuel line, a 1/4" (15/64" for a perfect fit) hole is the correct size.

D 4. Install a 12 oz. to 16 oz. fuel tank and temporarily connect the fuel lines. Be sure the throttle linkage will clear the fuel tank in the fuel tank compartment. Our prototype uses a 14 oz. Great Planes fuel tank with the 90-degree nipple and 1/2" foam on the top and bottom of the tank. Mount the foam rubber to the tank floors with double-sided tape or thick CA. Foam rubber should also be placed between the tank and the firewall.

**blocks** in the notches in the lower fuselage doublers. The wing strut blocks protrude 1/8" below the fuselage bottom of the fuselage sides. The LG mount plate and the edge of the LG former are flush with the bottom of the fuselage sides.

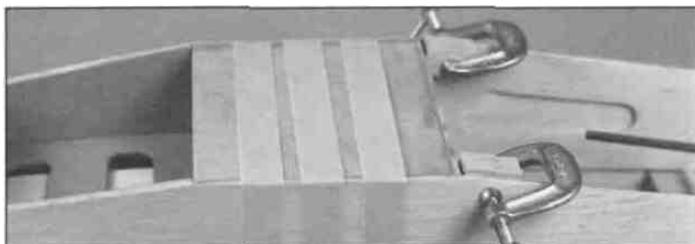
D 2. If you are planning to install the optional Great Planes Sport Floats, now is the time to add the **float mount gussets** (included in this kit), and the 1/8" birch ply **aft float mounting plate** (included with the floats). See the plan for their locations. Even if you don't plan to install floats, it is easier to install the gussets at this time rather than retro-fit them later. We strongly encourage you to put your Cub on floats someday - it's a thing of beauty!

D 3. Draw a centerline on the landing gear block from front to rear.

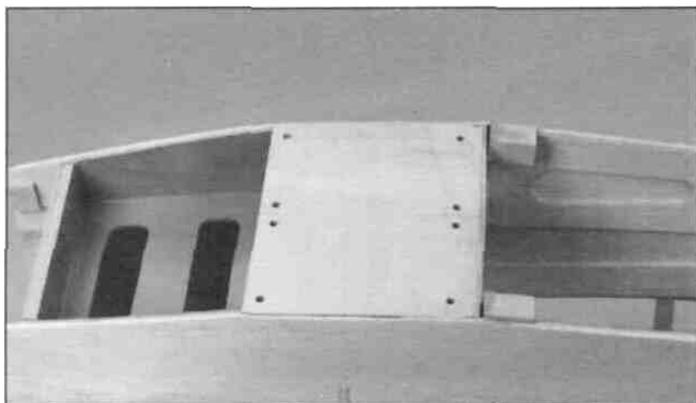


D 4. Align the **main landing gear** halves with the centerline so the two will not quite touch (approx. 1/16" spacing). The gear halves should be evenly spaced fore and aft. Mark the hole locations.

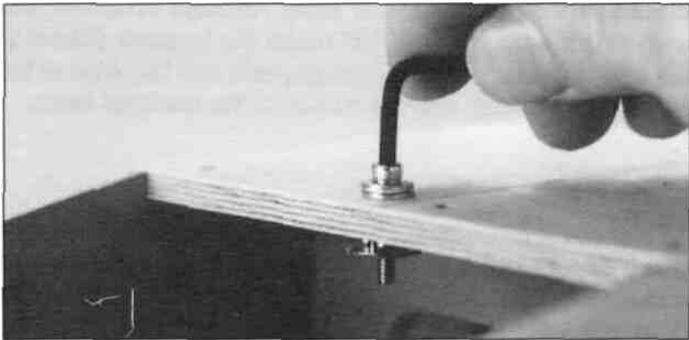
## Mount the Landing Gear



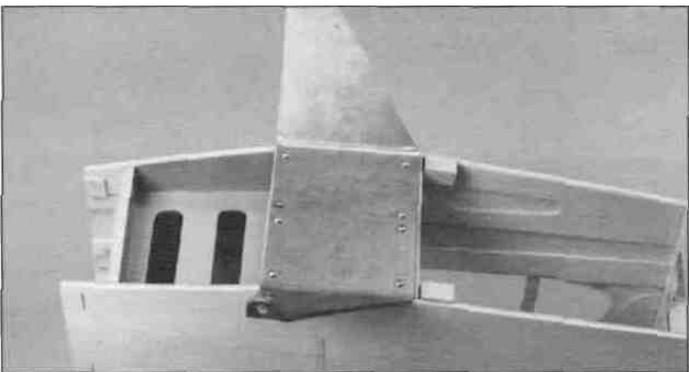
D 1. Test fit, then use 30-minute epoxy to glue the 1/4" plywood **LG mount plate** the die-cut 1/8" plywood **LG former** and the 5/8" x 5/8" x 1" basswood **wing strut**



D 5. Drill the landing gear block with an 11/64" drill.



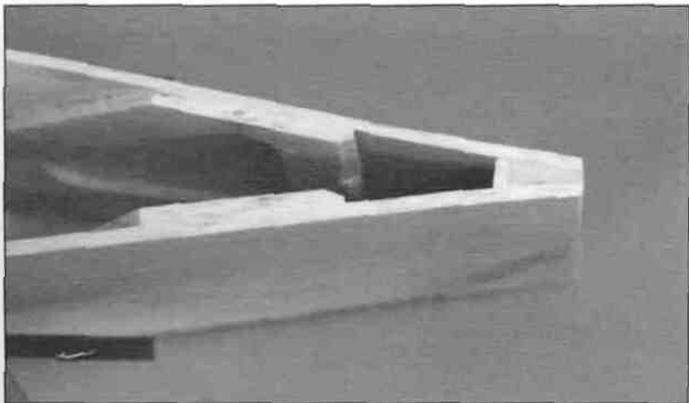
D 6. Install eight 6-32 blind nuts on the inside of the landing gear block. Use 6-minute epoxy to hold the blind nuts permanently. Hint: Pull the blind nuts into the LG block by tightening them with a screw and washer inserted from the outside of the LG block. **Do not** over-tighten.



D 7. Test fit the landing gear with eight **6-32 x 1/2" Phillips head machine screws**. Remove the landing gear and continue construction.

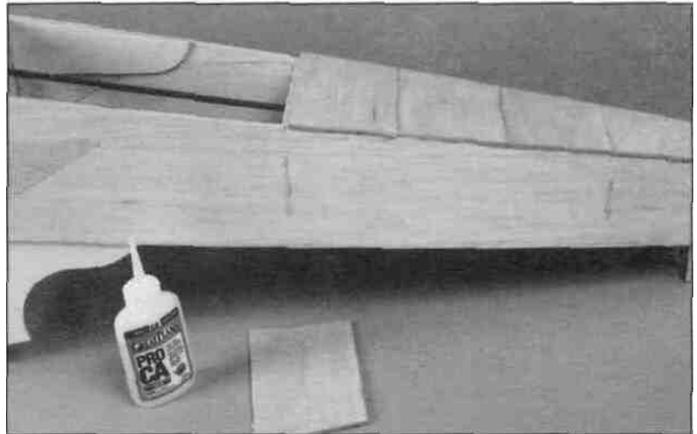
Our prototype Cub 60 uses scale landing gear shock struts constructed from brass tubing and brass shim stock. See the "**Scale Details**" section for more information.

### Sheet the bottom of the Fuselage



D 1. Using medium CA, glue the tapered balsa **tail wedge** in position where the rear fuselage sides meet.

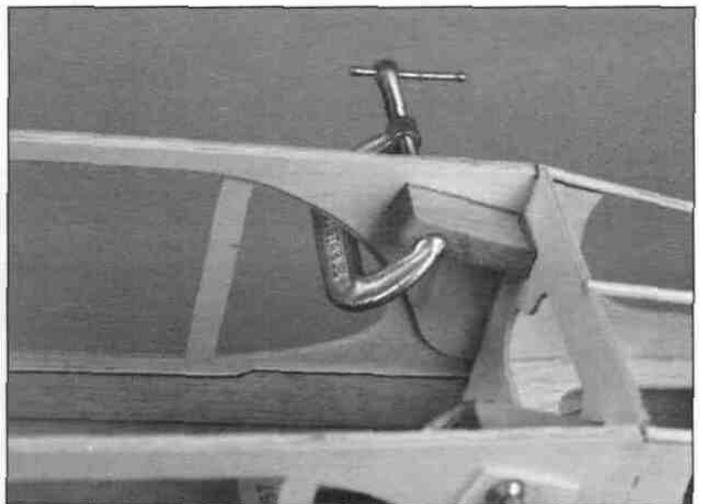
D 2. Use a sanding block to sand the bottom of the fuselage flat to make it ready to accept the bottom sheeting.



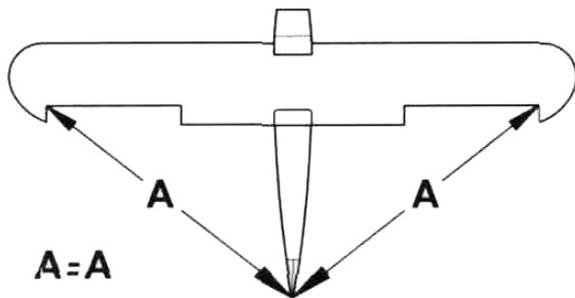
D 3. Sheet the bottom of the fuselage with the 1/8" x 3" x 36" balsa sheet. The sheeting is applied cross-grain and does not cover the landing gear block, but overlaps it 1/8" at both ends. After the sheet has been applied, trim and sand the edges per the cross-section, slightly rounding the corners. Add 1/8" x 1/8" pieces of balsa at the front and sides of the strut blocks.

D 4. If you have installed an internal antenna tube, apply balsa filler where the antenna tube exits the sheeting at the rear and sand the tube flush with the fuselage bottom.

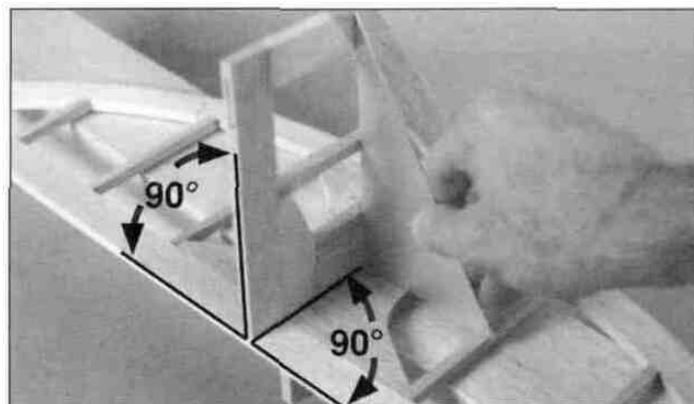
### Mount the Wing



D 1. Test fit and glue the 1/2" x 1" x 2-1/4" maple **wing bolt blocks** in the fuselage with 30-minute epoxy. Use plenty of epoxy for a very secure installation.

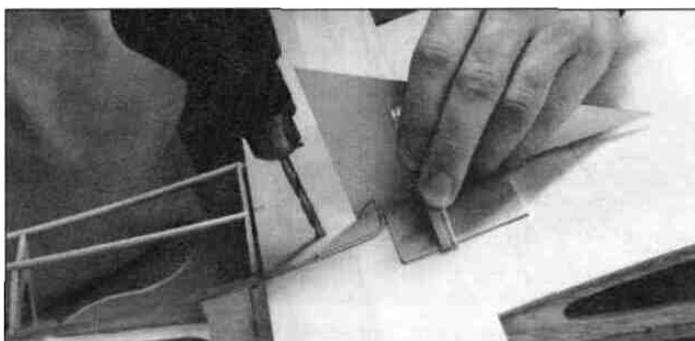


## Mount the stabilizer & Fin



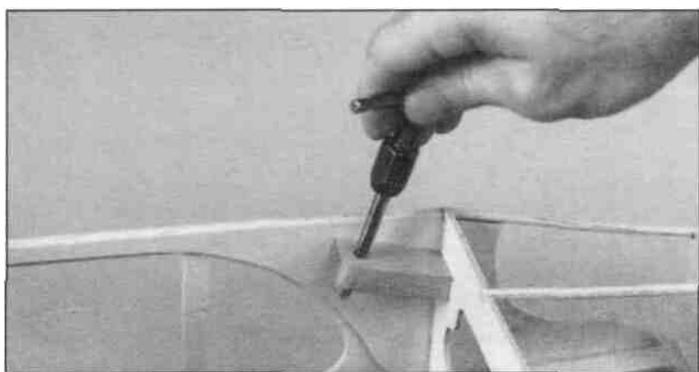
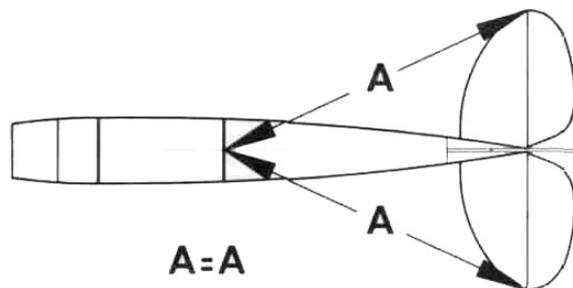
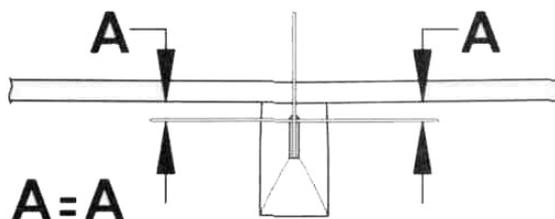
D 2. Lightly sand the wing saddle area of the fuselage to remove any glue bumps or slivers of wood. If you elect to use wing seating foam tape (this is an option, our Cub 60 uses none) take this into account while mounting your wing to the fuselage. Place the wing in the saddle and carefully align it by measuring from the corners of the aileron bays to the aft edge of the fuselage. Adjust the wing until both measurements are equal. When the wing is perfectly aligned, make reference marks on the wing trailing edge and former F3 to help keep the parts aligned during the next step.

D 1. Slide the fin post through the slot in the stabilizer and make sure that the fin base will meet the stab. You may cut a notch in the back edge of the **fin** leading edge to get it to fit - do not cut a notch in the **stabilizer** leading edge. Use a 90-degree triangle to keep the fin perpendicular to the stabilizer and stabilizer trailing edge. Securely glue the fin to the stabilizer with 30-minute epoxy.



D 3. While holding the wing securely in position (you should use tape,) use a #10 (or 13/64") drill bit to drill through the wing bolt plate, the wing, and the wing bolt blocks in the fuselage. Two small 90-degree triangles help you to align the drill perpendicular to the top surface of the wing. **IMPORTANT: Do not allow the wing to shift during this procedure.**

D 2. Test fit the fin/stab into the fuselage. Lengthen the slots in the fuselage if needed to get the stab to fit down onto the stabilizer base.

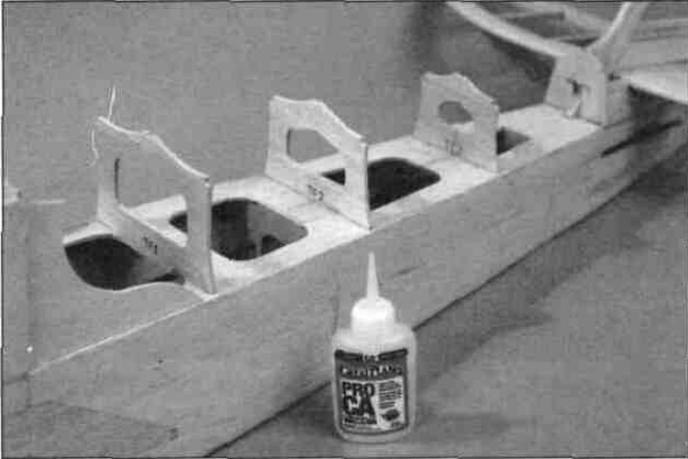


D 3. Mount the wing to the fuselage. Verify that the stab is aligned with the wing and the fin is aligned with the centerline of the fuselage. When this is achieved, securely glue the stab and fin to the fuselage with 30-minute epoxy. Double-check this alignment while the epoxy is curing.

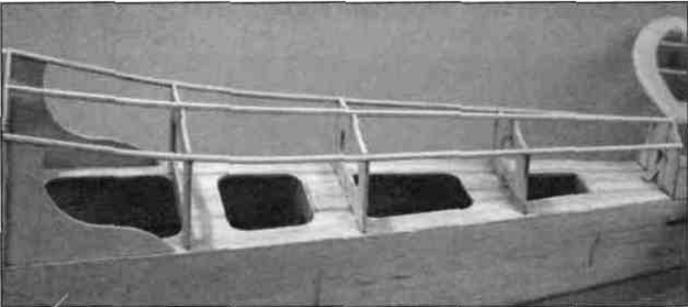
D 4. Remove the wing and use a 1/4-20 tap to cut threads into the wing bolt blocks.

D 5. Enlarge the holes in **only the wing** with a 17/64" drill bit.

D 4. The R1 fin leading edge must be securely glued to the aft fuselage deck and the stabilizer deck. Add thick CA where necessary, then glue the **top deck former TF4** in position.

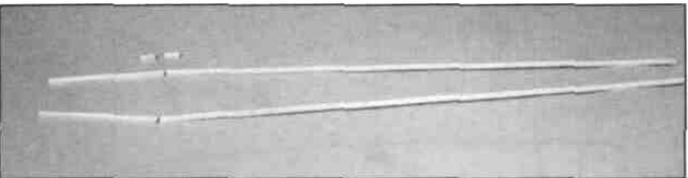


D 5. Glue the remaining die-cut 1/8" balsa TF3, TF2 and TF1 **turtle deck formers** to the aft fuselage top.



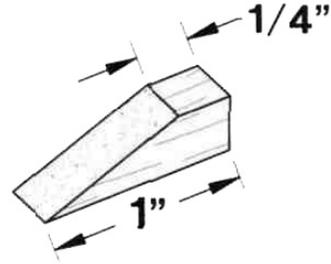
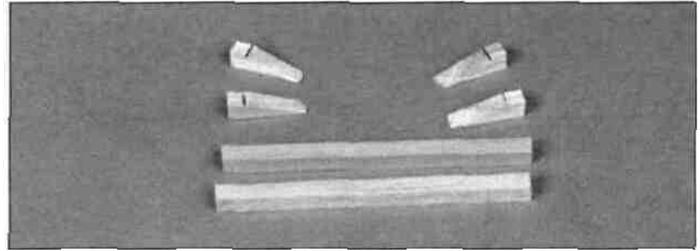
D 6. Cut the 3/16" x 22" **hardwood dowels** to fit from the front edge of former F3 to the aft edge of former TF4, then glue them in place.

### Build the Side Stringers

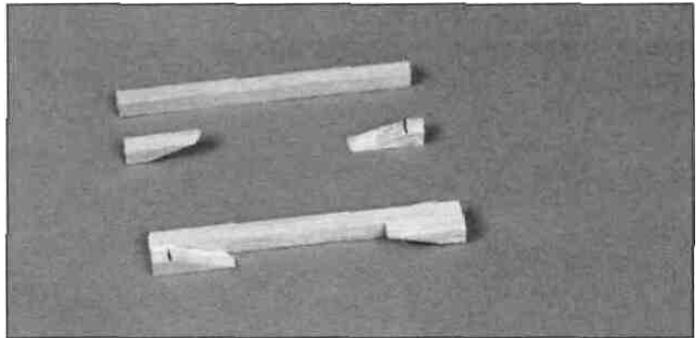


D 1. From two 1/4" x 1/4" x 36" balsa sticks, cut two 34-1/4" **aft fuselage side stringers** and two 1" **sticks**. Cut two 7-1/4" **forward fuselage side stringers** from the remainder of the 1/4" x 1/4" x 36" balsa stick used earlier for the nose deck stringers.

D 2. Use a straightedge to mark a line along the fuselage sides where the side stringers are to be located, taking measurements from the plan.

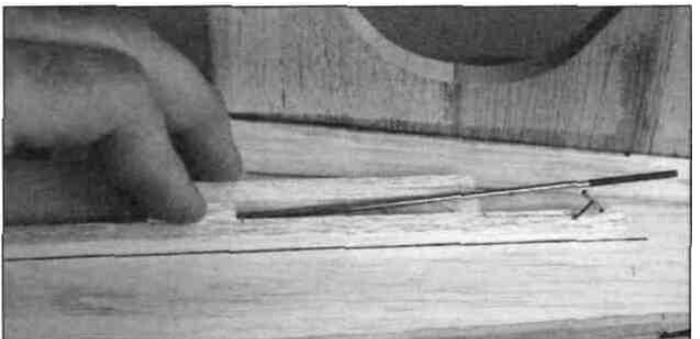


D 3. From the remaining 1/4" square stock, cut two more 1" pieces and two 4" pieces. On each of the four one inch pieces, put a mark 1/4" from each end and cut a bevel as shown in the sketch.



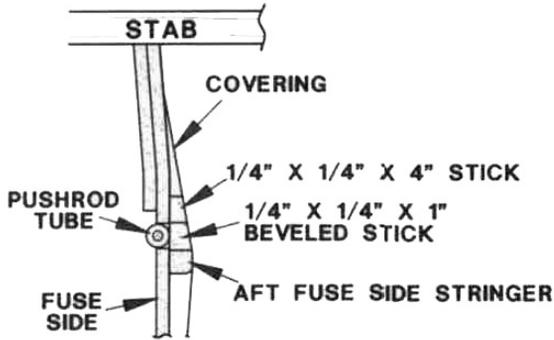
D 4. Glue two diagonally cut sticks on each 4" stringer. Be sure to make a *right* and a *left* side. These **pushrod exits** will support the covering.

D 5. Slide a 4-40 x 36" **threaded end pushrod wire** into the pushrod tubes with three inches protruding outside the pushrod tubes.



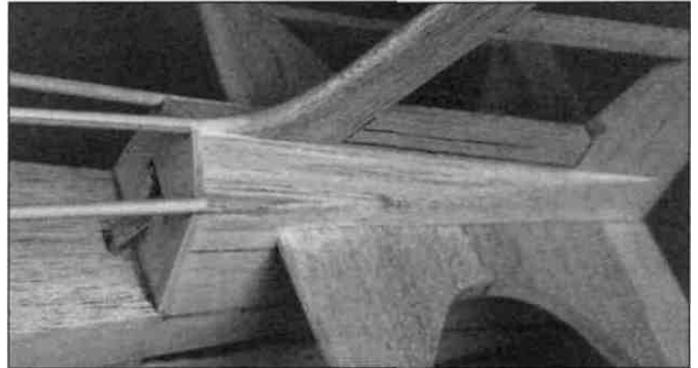
D 6. Temporarily pin a stringer to the fuselage side and position the previously constructed pushrod exit on the stringer, centered on the pushrod. Glue the pushrod exit to the stringer but not to the fuselage. Build a pushrod exit for the other side.

D 7. Remove the stringer/pushrod exit from the fuselage and round the **outer** corners of the stringer so it will resemble a "tube." Sand the bevel at the rear of the long stringers and the front of the short stringers. Glue the front and rear stringers to the fuselage along the line you previously marked.



D 8. Sand the pushrod exit to the same angle that will be formed by the covering when stretched from the stringer to the fuse side under the stabilizer.

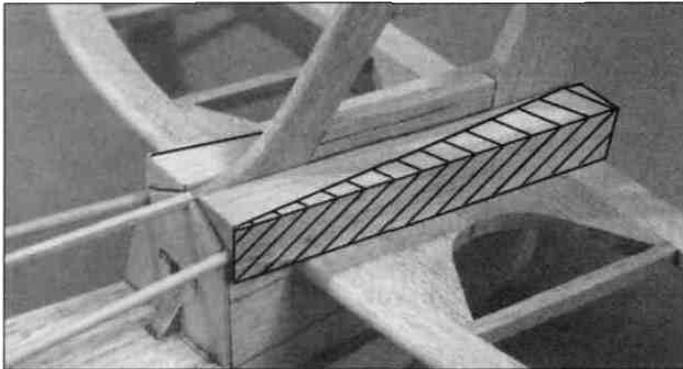
D 4. On the front face of each block, trace the outline made by former TF4 and the stringers. Remove the blocks and carve them to conform to the correct shape. Notice that the shape of the dowels is carried onto the balsa tail fairing blocks.



D 5. Glue the blocks into position and final sand to match top deck former TF4 and the dowels. Fill any gaps with HobbyLite filler.

### Add the Tail Fairing Blocks

D 1. Trial fit each 1" x 1-1/8" x 7-1/2" balsa tail fairing block at the corner junction between the stabilizer and fin. Sand the front face of the blocks to butt against the turtle deck former TF4.



D 2. With the tail fairing blocks on the stabilizer, mark a line on the **top** of each block from the outside edge of TF4 to where the block meets the trailing edge of the fin.

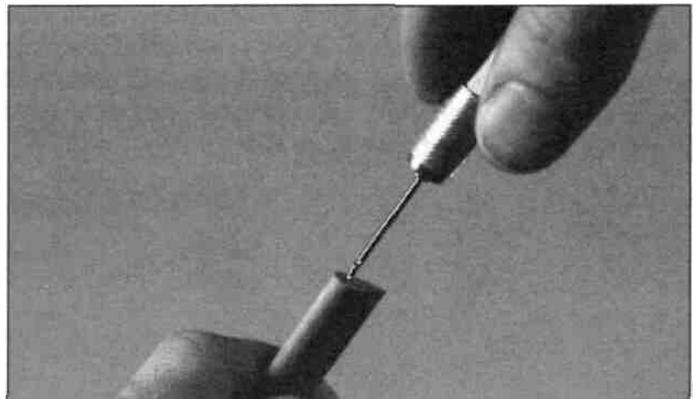


D 3. Remove the blocks and cut them to a wedge shape with a razor saw.

## FINISHING

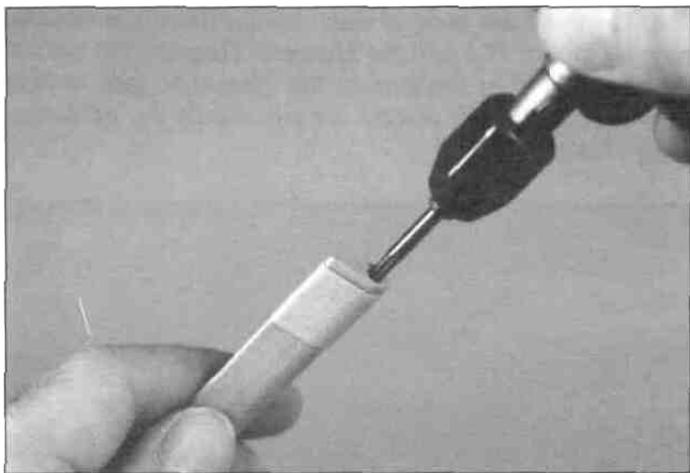
### Build the Wing Struts

**IMPORTANT NOTE:** The wing is designed to be very strong without the wing struts and will probably not fail if flown in a slow, scale-like manner. However, **the wing struts are required for high speed flight and when performing non-scale maneuvers that involve high stresses.** We have developed special new strut end attachments to make strut mounting easier than ever and we recommend that you use the struts at all times.



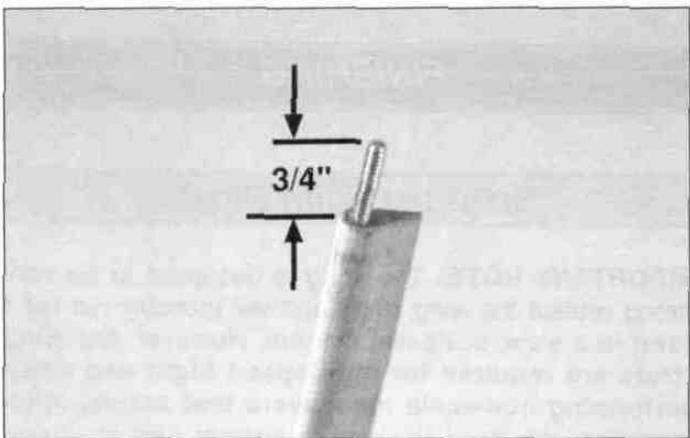
D D 1. Drill a 1/16" pilot hole, about 1" deep at **one end** of each **wing strut**. Drill the hole centered in the thickest portion of the wing strut.

D D 2. Use a #35 (or 7/64") bit to drill 1" deep into the pilot holes.



D D 3. As a precaution, *tightly wrap* the end of each strut with masking tape to help prevent the wood from splitting while tapping the threads or inserting the studs with epoxy. **Thread** the holes with a 6-32 tap.

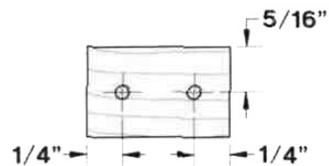
D D 4. Use music wire or a toothpick to force 30-minute epoxy into the holes. Proceed to the next step immediately.



D D 5. Apply epoxy to one end of four **6-32 strut attachment studs** and thread them in so 3/4" is exposed. If you have done a thorough job of filling the holes with epoxy, the wood may split while threading in the 6-32 studs. This is why we have *tightly wrapped* the struts with masking tape. A small crack or a split in the wood presents no danger as the studs are inserted in the strut ends until 3/4" sticks out and are held with epoxy — *they're in there to stay!* Skip to the next section while the epoxy cures.



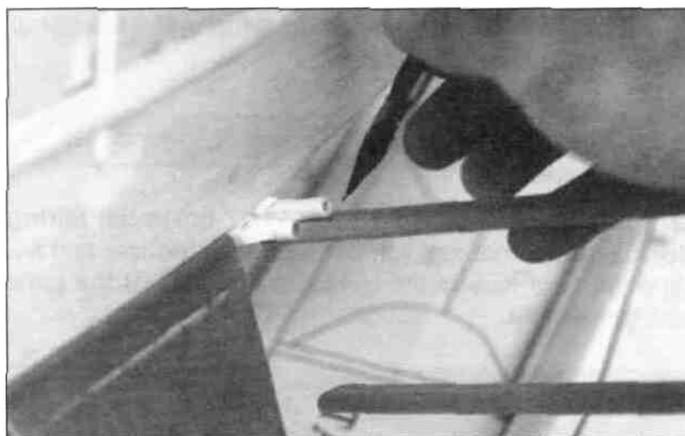
D D 6. After the epoxy has **fully** cured, thread four **strut end attachments** 7/16" onto the studs.



D D 7. Drill 1/8" holes in the strut blocks in the fuselage for the #8 x 3/4" **sheet metal screws**. The hole locations in the strut blocks in the wing have been previously drilled. See the sketch above for the hole locations in the fuselage strut blocks.

D D 8. Temporarily mount the remaining four strut end attachments to the fuselage with four #8 x 3/4" sheet metal screws.

D D 9. Bolt the wing to the fuselage. Install the struts on the wing with four #8 x 3/4" sheet metal screws.



D D 10. Match each wing strut with its prospective strut attachment mounted to the fuselage. Mark where the strut meets the strut attachment.

D D 11. Remove the wing struts and cut each one 1/4" shorter than the mark. Repeat steps 1 through 6 for the other end of each wing strut.

D D 12. Cut a bevel on the bottom (fuselage end) of only the front right and left wing struts as shown in the plan.

D D 13. Reinstall the wing struts on the airplane. Make final adjustments to the length of each wing strut by turning the strut end attachments in or out (it's helpful to support the model **upside-down** for this operation).

**Note:** After covering your Cub 60 you will check for wing twists using an incidence meter and you will twist the wing panels and reheat the covering to remove any twist. After doing this you must repeat Step 13, readjusting the strut end attachments to lock the wing in its straight, untwisted position. If you fail to do this, you may inadvertently twist the wing when attaching the struts.

D D 14. The wing struts may be finished by any of several methods. MonoKote covering was applied to the wing struts on our prototype Cub 60. 3/4 oz. Glass cloth with resin and paint is another highly recommended method.

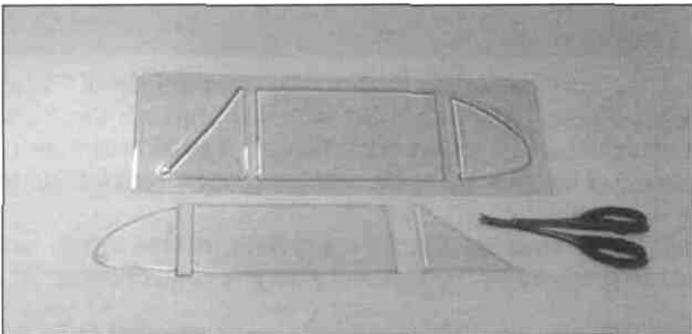
## Fit the Windshield & Side Windows

D 1 Using scissors, carefully cut the **front windshield** along the trim line Kyosho Lexan Scissors (KYOR1010) work extremely well.



D 2 **Do not glue the windshield in place until after the fuselage has been covered** With the wing on the fuselage, install the windshield Cut the 1/8" x 2" x 2-1/4" **wing root shim** into two 1-1/8" long pieces Trial fit the shims, sanding them down until they fit between the canopy and the wing Leave clearance for paint on the canopy and covering on the wing Use medium CA to glue the shims to ribs R2 on both sides of the canopy, then sand them to match the shape of the wing

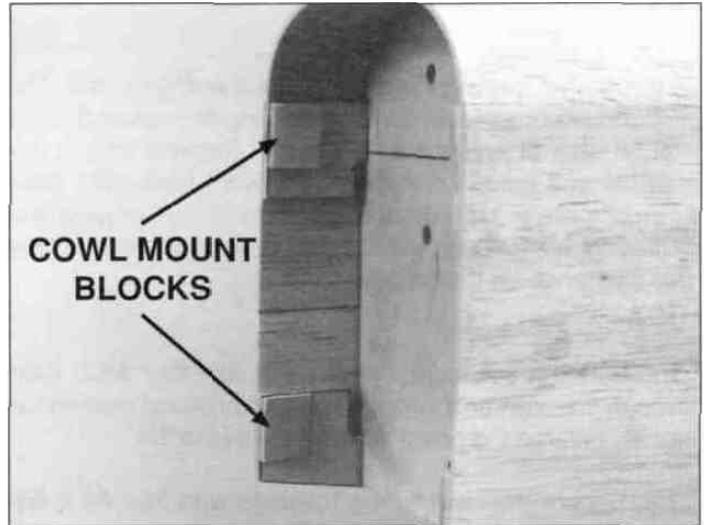
D 3 Cut the 3/16" x 13" hardwood dowel in half for the scale **cabin braces** Trial fit and glue the braces in position You can see the cabin braces on page 44 at the windshield installation



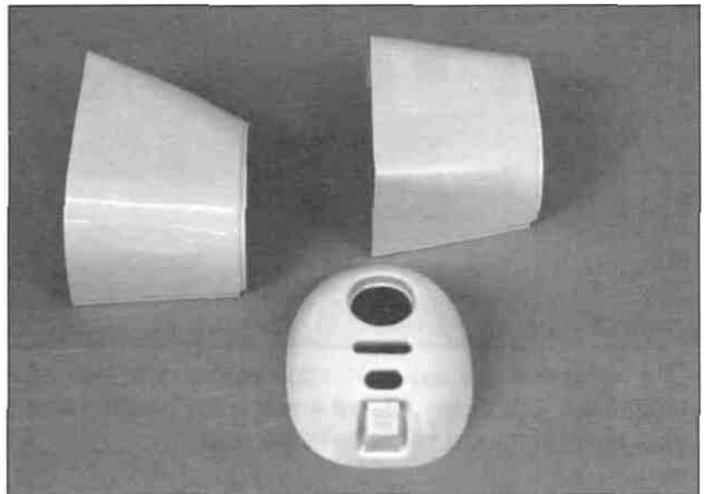
D 4 Separate the front 'triangle' windows from the other two windows and trim it to 1/16" around the edges Leave the other windows connected and trim them to 1/8" around the edges

D 5. Trial fit the side windows but **do not glue them in place until after the fuselage has been covered** Make adjustments in the cabin frame for a proper fit.

## Assemble the Cowl



D 1 Use 6-minute epoxy to glue four 1/8" x 5/8" x 3/4" plywood **cowl mount blocks** to the fuselage sides inside the engine compartment, in the locations shown on the plan



D 2 Using a hobby knife and #11 blade, or Lexan® scissors, cut the front, left and right cowl sections along the *cut lines* which are visible from the inside Cut accurately along the lines where the pieces are to be glued but leave the *aft edge* of the right and left halves about 1/8" long Cut the openings for the air intakes and crankshaft in the front cowl section.

D 3 Use a sanding block to clean up the edges and make adjustments for a proper fit Roughen the mating surfaces of the glue joints with sandpaper, then fit the three parts together and secure with tape Carefully wick thin CA into the joints Do not use accelerator, as this may permanently weaken or soften the plastic.

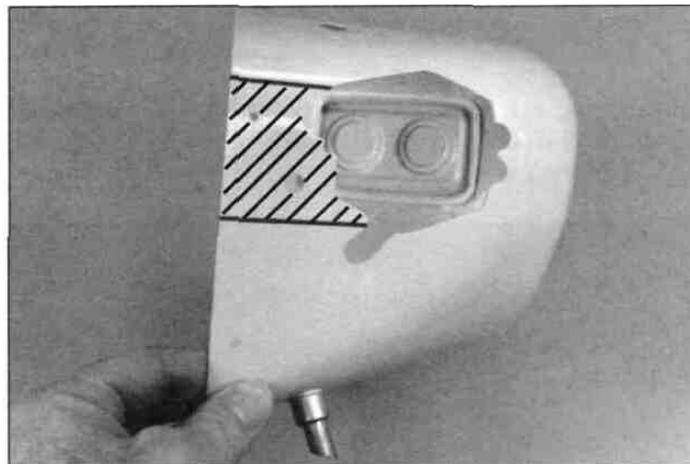
D 4 Remove the tape, inspect the seams and add thin CA where necessary.

D 5. Trim the aft edge of the cowl along the cut lines. Make final adjustments with a sanding block and 150-grit sandpaper.

D 6. Cut the openings in the cowl for the engine only. This step requires patience, so with the engine installed, cut a little bit, test fit and cut a little more. Remove only a little material at a time and inspect your work frequently. Allow approximately 1/8" clearance around the engine and muffler for air flow and position the cowl so there is at least 1/8" clearance for the propeller.

D 7. With the cowl taped in position, drill four 3/32" holes *through* the cowl and through the 1/8" plywood cowl mount blocks. Enlarge the holes in only the cowl to 1/8".

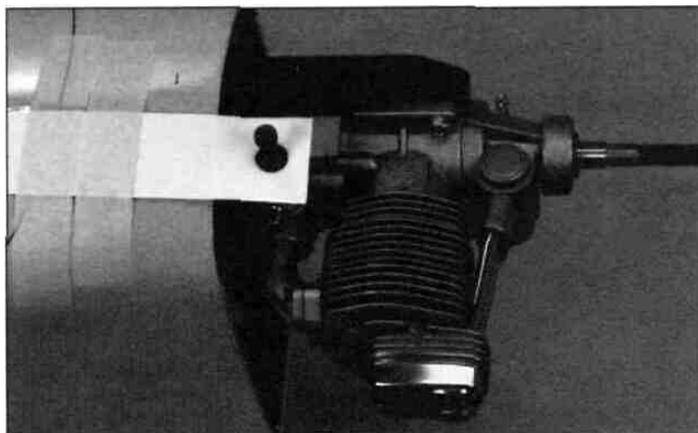
D 8. Secure the cowl to the fuselage with four #4 x 5/8" wood screws and washers.



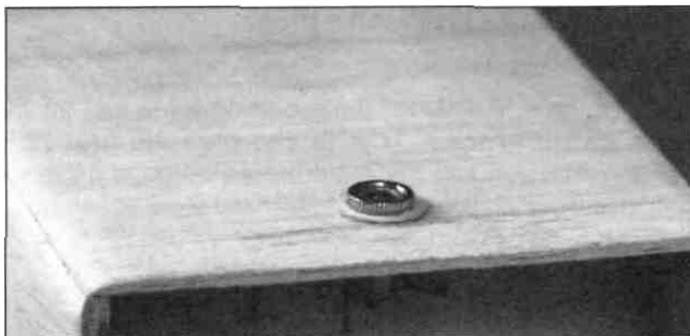
D 11. For easier installation, you may remove a section of cowl from behind the engine or cut a slit and use a fifth screw (one on each side of the slit) to secure the cowl. This will require installing additional plywood cowl mount blocks inside the engine compartment.

D 12. If you will be installing the dummy engine, cut along the molded outlines and remove the section of cowl that allows the dummy engine protrude out the side.

D 13. Use 30-minute epoxy to glue 1"-wide fiberglass cloth to all seams on the **inside** of the cowl. For the best glue bond, the seams must be thoroughly sanded. **If installing the dummy engine provided with this kit, do not add the fiberglass cloth until after the engine is installed.**



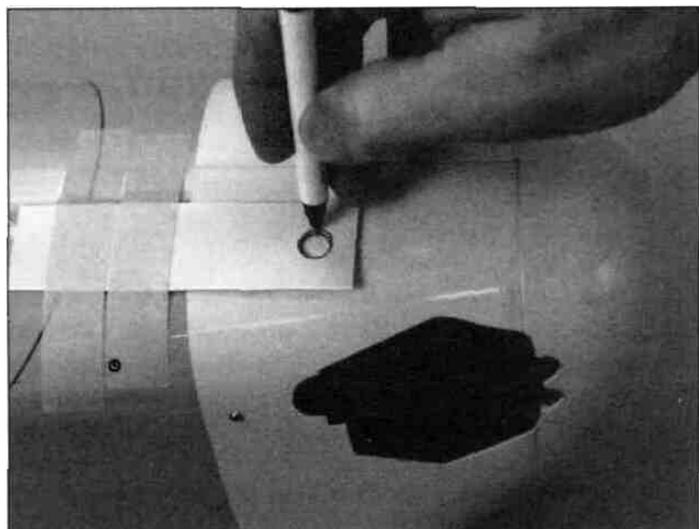
D 9. Now that the **exact** location of the cowl has been determined, use a template for locating the needle valve or other holes that must be made in the cowl.



D 14. Install a fueling system. We used the Great Planes Easy Fueler™ (GPMQ4160) mounted through the balsa bottom sheet just ahead of the firewall. A small area must be cut out of the aft edge of the cowl to accommodate the fueler.

D 15. Remove the fuel tank and lines, engine mount, **and** other accessories. Fuelproof the engine compartment.

**IMPORTANT: If you are mounting your engine inverted, and the cylinder head does not protrude outside the cowl, hot air generated by the engine MUST be expelled from inside the cowl or your engine will overheat.** While the bottom of the cowl does extend past the bottom of the fuselage creating a small hot air exit, a section of the bottom of the cowl will have to be removed to increase this air flow. This will not be a problem for side mounted engine installations where the cylinder head is well outside the cowl and in the air stream.



D 10. Use the template to transfer the location of the needle valve hole or other holes to the cowl. Cut the holes.

D 16 Fill the seams on the outside of the cowl Bondo® or similar automotive filler works well. Decide if you will be using the dummy engine mounted on the cowl. See the "scale details" section of the manual (page 41). Otherwise, the cowl is ready for priming and painting.

### Final Sanding

Fill any scuffs, dings, or scratches with balsa filler. Sand the wing, fuselage and tail surfaces with progressively finer sandpaper, ending with 320 to 400 grit.

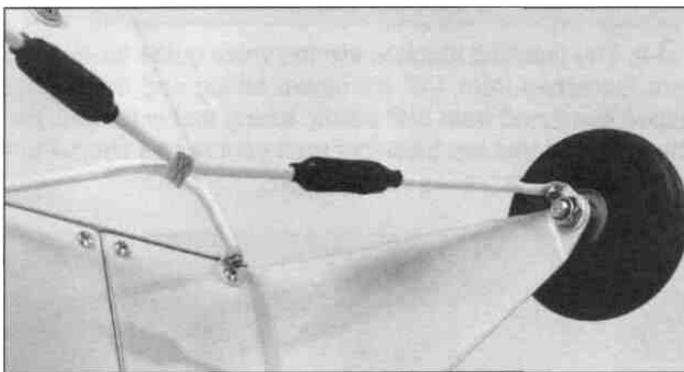


Many smaller "dings" or dents in the balsa wood may easily be removed. Before reaching for the filler, try dabbling a little water on the dent. Use a sponge or wet your finger. The balsa will swell, thus eliminating the dent. After the area has dried, final sand

### SCALE DETAILS

The Great Planes Cub 60 was not designed to be a "Top Gun" Expert Scale qualifier. And frankly, the full size Piper Cub itself doesn't have many intricate details. However, with a little extra time and effort (building is fun, right?) you can duplicate a few key details on *your* Great Planes Cub 60 that will really finish the job and restore the nostalgic feeling of the Piper Cub from days gone by (I need a tissue).

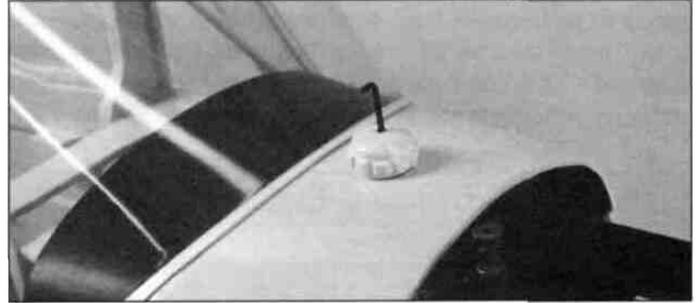
### Landing Gear Struts



The full size J-3 Cub had landing gear struts with a "bungee cord" that served as a shock absorber. The bungee cord was covered with a "boot." You can make your landing gear struts functional, or just for display. Our landing gear struts were fashioned from 5/32" brass tube, .032" (1/32") brass sheet, 1/8" music wire and 4-40 nuts and bolts. See the wing plan for details and templates of the brass **attachment brackets**. The 5/32" tubing is silver soldered to the music

wire and pinched at the end. Then a hole is drilled for **the** 4-40 bolts. The struts and suspension attachment brackets are then primed and painted Cub Yellow before the simulated bungee cord and boots are added. To represent the bungee cord covered with the boot, we added balsa pieces to the struts. Carve the balsa to an irregular shape, then cover them with black heat shrink tubing.

### Gas Cap



The gas cap was carved from a dowel, primed, then painted Cub Yellow. The fuel gauge is simply a piece of 1/16" music wire bent and inserted in a hole drilled through the middle of the gas cap (yup, that's what they looked like).

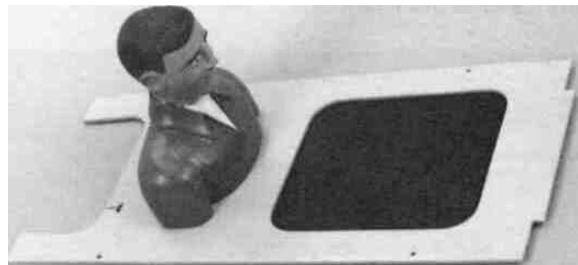
### Wire Step

The step for the cabin door is simply a piece of 1/16" or .074 wire bent to shape, then glued into two holes drilled through the fuselage sheet. Be sure the wire clears the wing strut attachments.

### Propeller Hub

This was turned on a lathe from an aluminum spinner nut, primed, then painted with Cub Yellow epoxy paint.

### Pilot and False Floor



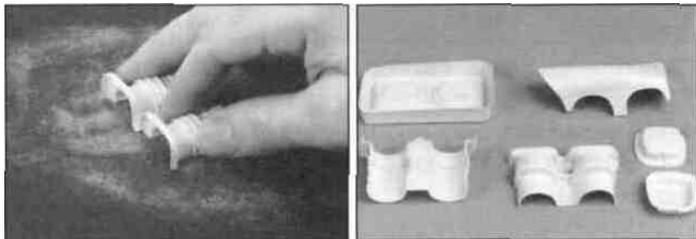
D 1 The false cabin floor was made from 1/8" lite-ply (not supplied) and the template on the plan. Make four cabin floor support blocks from scrap hardwood and glue them to the fuselage sides against the upper fuselage side doubler. Shim the blocks with 1/8" balsa to raise the false floor. Use #2 x 3/8" S/M screws to hold the floor to the support blocks.

D 2. If necessary, raise the height of the pilot by gluing it to a 1/2" thick block of balsa and carve the balsa to conform to his body. A few coats of primer are brushed over the balsa to fill the grain, then the pilot is painted with Testers® enamel brush-on paint.

### Exhaust Outlet

Our scale exhaust was fashioned from two telescoping pieces of brass tubing 1/2" and 17/32" outside diameter. A piece of heat shrink tube was placed over the larger outer tube, then shrunk to create the effect of yet a larger diameter. Then the parts were painted. Epoxy the scale exhaust into a hole cut in the bottom of the cowl.

### Dummy Engine



D 1. Cut a T (top) and a B (bottom) cylinder half, air scoop, engine base and two valve covers along the outlines. Make a **left** engine base by cutting along the **solid** outline or a right engine base by cutting along the **dashed** outline. Sand the edges of the cylinder halves and the valve covers flat for a perfect fit.



D 2. Remove the "flashing" from the parts - especially from the cooling fins on the cylinders. Glue the cylinder halves together by matching up the fins and applying thin CA from inside the cylinders.

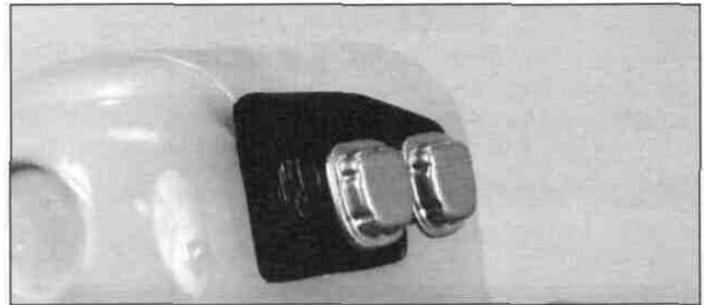


D 3. Sand the "heads" flat until only a thin plastic sheet remains and sand the base of the cylinders, leaving 1/8" of material below the first cooling fin. By sanding and trimming, adjust the shape of the tops of the "heads" until the valve covers fit. **Do not glue the valve covers to the cylinders yet.**

D 4. Confirm the position of the engine base in the cowl. Then trial fit the cylinders to the engine base. The side of the cylinder with the "taller fins" is the top. Glue the cylinders to the engine base by applying a **few drops** of thin CA from inside the cylinders.

D 5. Trial fit the engine base and cylinders to the cowl. View the cylinders from the front and make sure they are level. Make adjustments to the engine base if required.

D 6. Paint the engine base, air scoop and cylinders flat black. After the paint has dried, scuff the edges of the cooling fins for a well worn, scale effect. Paint the valve covers silver.



D 7. Carefully glue the engine base with cylinders to the **inside** of the cowl with a few drops of thin CA, then a bead of thick CA. Glue the air scoop, then the valve covers, in position with thin **CA**.



D 8. The finishing touches are the valve guide tubes which are fashioned from 1/8" aluminum tubing and the exhaust pipes fashioned from 1/4" plastic tubing that is heated, then bent. Both items are available from your hobby shop. Paint, then glue these pieces into position.



D 9. If you are installing a dummy engine on the right side, build another engine in the same manner. The side of the cylinders with the "taller fins" is still the top.

## Balance the Airplane Laterally

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

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

- 1 Temporarily attach the wing and engine (with muffler) to the fuselage
- 2 With the wing level, lift the model by the engine propeller shaft and the bottom of the rudder (this may require an assistant) Do this several times
- 3 If one wing consistently drops when you lift, it indicates that side is heavy Balance the airplane by gluing weight to the inside of the other wing tip **NOTE: An airplane that has been laterally balanced will track better in loops and other maneuvers.**

## COVERING

Our prototype Cub 60 was covered with Top Flite MonoKote film Some painting is required for the cowl, landing gear and various scale parts See the "Painting" and "Scale Details" section in this manual (pages 44 & 41) It is assumed that you have had some previous model building experience so we won't go into detail regarding the covering procedure **Follow the instructions included with your covering material.**

**NOTE:** When it's time to cover the fin and stab, begin by applying 1/4"-wide strips of covering in the corners between the fin and tail fairing, the stab and tail fairing, and (on the bottom of the stab) between the stab and the fuse sides Next cover the stab and fin with precut pieces that have a straight edge to overlap (1/8"+ overlap) the strips you previously applied **DO NOT, under any circumstances, attempt to cut the covering material after it has been applied to the fin and stab, except around the leading and trailing edges and at the tip.** Modelers who do this have cut through the covering and partway into the balsa stab This can weaken the stab to the point where it may fail in flight!

## Special Notes for Covering the Cub 60 Fuse

The idea is to make the Great Planes Cub 60 appear to have an "open structure" like the full-size Piper Cub. Therefore, the covering is not bonded to, or touching much of the fuselage structure On the fuselage *sides*, the only areas where the covering is bonded to the frame are along the bottom edge, the side stringer and pushrod exits, from the fuselage front to about 1/2" aft, stringers on turtledeck, wing saddle, cabin window frame *comers*, tail fairing block, a 1/4" wide strip along the bottom of the stabilizer, and fuselage rear Bond the MonoKote film to these areas but use a heat gun to shrink the covering over the rest of the structure Use a piece of masking tape to lift the covering anywhere it was accidentally stuck down

The covering on the fuselage *should be* bonded to the entire fuselage bottom and upper front deck Be sure to use a Hot Sock when ironing down the covering to sheeted surfaces.

## Suggested Covering Sequence

### Fuselage

- D 1 Strips as described in above note
- D 2 Rudder left side
- D 3 Rudder right side
- D 4 Bottom of elevators
- D 5 Top of elevators
- D 6 Tail fin block right side
- D 7 Tail fin block left side
- D 8 Stab bottom
- D 9 Stab top
- D 10 Fin right side
- D 11 Fin leftside
- D 12 Fuse bottom
- D 13 Fuse sides
- D 14 Fuse top over stringers
- D 15 Forward fuse deck

### Wing

**Do not forget to install aileron servo extension cords in the wing before you begin covering. Confirm that the extension cords will be accessible for connecting to the aileron servos in the wing and connecting to the "Y" connector for the receiver.**

- D 1 Ends of ailerons
- D 2 Bottom of ailerons
- D 3 Top of ailerons
- D 4 Wing bolt plate
- D 5 Front wing joiner/cabin area
- D 6 Aileron openings in wing
- D 7 Bottom of left wing panel
- D 8 Bottom of right wing panel
- D 9 Top of left wing panel
- D 10. Top of right wing panel

## Painting

There are several parts of varying materials such as wood, plastic or metal on the Cub 60 that require painting. Two-part epoxy paints such as K & B or HobbyPoxy are highly recommended where durability and fuel resistance are important. The cowl, landing gear and wing struts (if not covered with MonoKote covering) are such parts. However, on our prototype Cub 60 we painted many parts including the landing gear struts, wing strut attachments, aluminum spinner nut, windshield and the scale fuel cap with HobbyPoxy Cub yellow applied from a spray gun. We brush painted the cabin interior and false cockpit floor with the same paint. These parts must be primed with a compatible primer for the best appearance and paint adhesion. Also, Top Flite LustreKote" spray paint matches MonoKote covering.

Highly detailed scale effects such as the pilot and scale engine may be painted with enamel such as Testers®. However, Testers is not fuelproof, so either use a clear top coat or don't allow model fuel or exhaust to contact these parts.

### Special notes on painting the windshield

Several "out of the can" spray or brush-on paints are compatible with the clear windshield material but always test the paint on a sample of scrap plastic before applying paint to your finished windshield. We used two-part K & B epoxy primer applied with a spray gun. Then, HobbyPoxy Cub Yellow was applied over the primer. Priming the windshield frame is important as it provides a good base for the paint to adhere as well as an opaque background to give the Cub Yellow a uniform color. Examine the photos on the box to determine which portions of the windshield are to be painted.

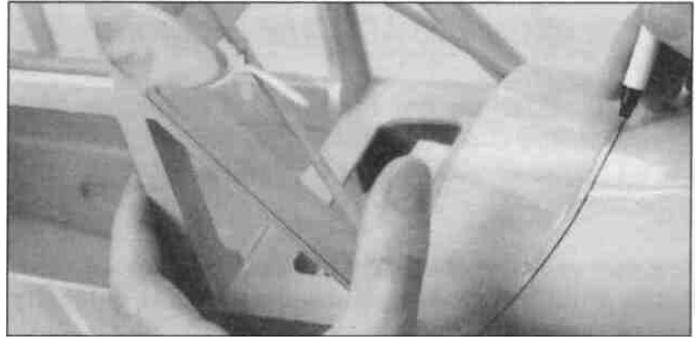
## FINAL ASSEMBLY

### Install the Wheels

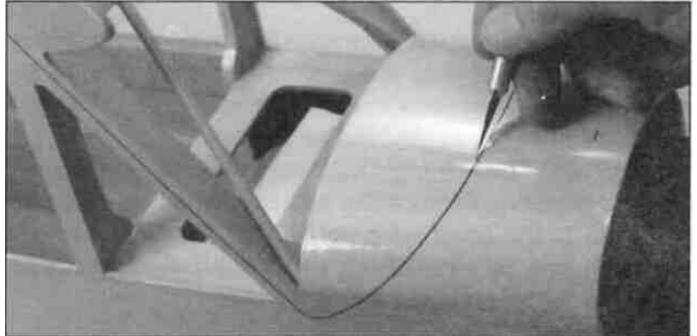
Install the axle shafts (GPMQ4278) on the main landing gear. Then fasten the wheels to the axles with 3/16" wheel collars (GPMQ4308). Refer to the "Scale Details" section if you will be installing landing gear struts. Fasten the 1-1/2" tail wheel (GPMQ4243) to the tail wheel wire with 3/32" wheel collars (GPMR4302).

### Install the Windows

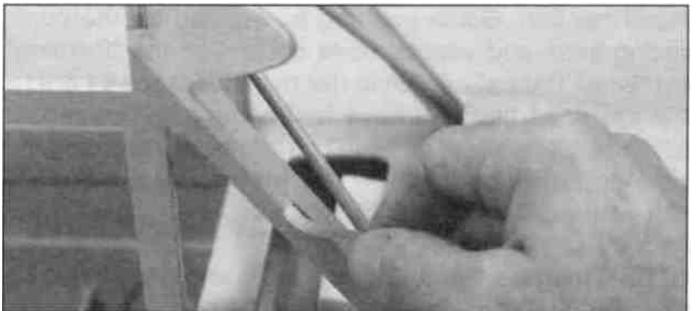
D 1. Painting the cabin interior is optional. It was not uncommon for many full-size Piper Cubs to have yellow painted interiors. Besides the finished, scale appearance, a benefit of painting the cabin interior is fuelproofing. Brush-on paint is the easiest method and will require two coats.



D 2. Hold the windshield in position. Use a felt tip pen to trace a line directly onto the covering around the windshield.



D 3. Remove the windshield and use a **sharp** #11 blade to cut *just inside* the line you drew. A **sharp** blade is important so you don't have to use much pressure. It will allow you to cut *only* the covering and *not* the underlying wood. Read through step 6 and decide how you are going to treat the front deck behind the windshield. One option is to leave the yellow covering in place and paint it flat black - if this is your plan, then just remove a 3/16"-wide strip of covering in the area where the windshield will be glued to the front deck. If you want to recover this area with black MonoKote film, then you should remove the yellow covering behind the cut that you make in this step and recover this area, leaving a 3/16" strip uncovered.



D 4. Use alcohol to wipe away the ink, then remove the covering inside the windshield area.

D 5. Paint or use MonoKote film to cover the front deck behind the windshield. Flat black should be the color. You can scuff black MonoKote with 600-grit sandpaper or steel wool for the anti-glare effect.

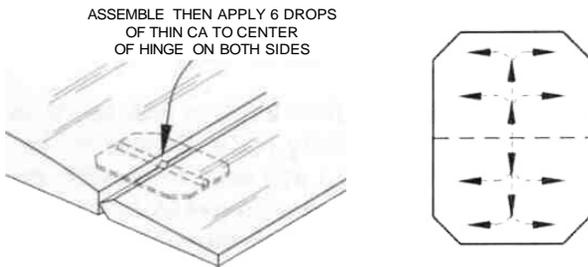
D 6. Use R/C 56 or similar type adhesive to glue the windshield and side windows to the fuselage. We do not recommend CA, as it may fog the plastic.

## Hinging

D 1 Cut a slit in the tapered tail wedge for the tail wheel wire bearing. Test fit the rudder with the tail wheel wire assembly to the fuselage and fin. Make adjustments if required.

D 2 Apply a dab of petroleum jelly to the top of the rudder bearing where the wire enters to keep the epoxy out. Glue the tail gear wire into the rudder with 30-minute epoxy. Wipe away excess epoxy that oozes out of the rudder. **Do not glue the plastic tail gear bearing to the rudder.** When permanently hinging the rudder, refer to the hinging technique below but use 30-minute epoxy to glue the tail wheel wire hinge bearing into the fuselage.

D 3 Cut a slit in the covering where each hinge slot is located. Insert the hinges and install the control surface. Adjust the hinge gap to  $1/32$ " or less. It is best to leave a *slight* hinge gap, rather than closing it up tight. This prevents the CA from wicking along the hinge line. Make sure the control surface 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 to keep the hinge centered while installing the control surface. Remove the pins before proceeding.

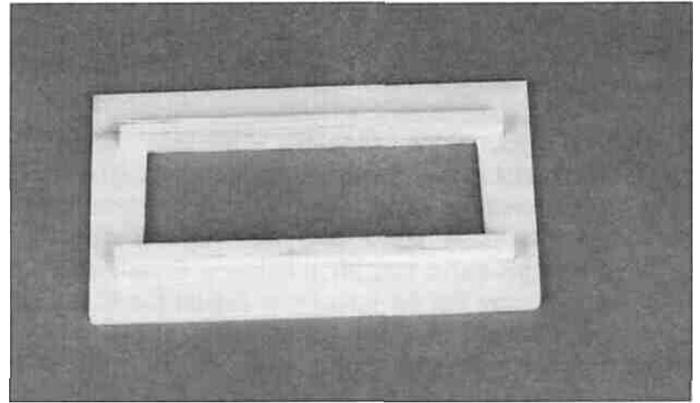


D 4 Apply 6 drops of *thin* CA adhesive to **both sides** of each hinge, allowing a few seconds between drops for the CA to wick into the slot. **NOTE** that the small "tunnels" you created by drilling the  $3/32$ " holes allow the CA to freely travel in to the entire surface of the hinge, producing an extremely secure bond.

## 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.

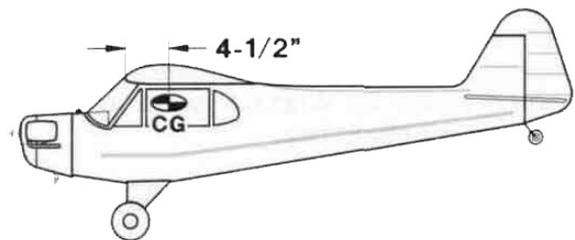
Our Cub 60 required the servo tray to be positioned 2- $3/8$ " ahead of former F3. No additional weight was required to adjust the C G. Final checking of the C G and positioning of the servo tray will be done after the model is covered and all systems installed (engine, receiver, battery).



D 1 Trial fit your servos in the die-cut  $1/8$ " plywood **servo tray** and make adjustments if required. From the remainder of the  $1/4$ " x  $1/4$ " x 36" stick used earlier for the rib stiffeners, cut two more sticks 5" in length and glue them to the bottom of the servo tray for the servo mounting screws.

D 2 "Mock up" the completed model in order to closely represent the finished weight distribution. Install the engine, landing gear, wheels, cowl, control pushrods, fuel tank, propeller, etc. Each of these items may be temporarily installed if they are not ready for final installation - we are just approximating final weight distribution.

D 3 Install the servo tray, receiver, and battery. The recommended location for the battery is beneath the fuel tank just ahead of former F2. For now it is not necessary to permanently mount the battery and receiver - just place them in the locations for estimated weight distribution.



D 4 Accurately mark the balance point on the bottom of the wing on both sides of the fuselage. The balance point is shown on the plan (CG), and is located approximately 4- $1/2$ " back from the leading edge. This is the balance point at which your model should balance for your first flights. Later, you may experiment by shifting the balance up to  $3/8$ " **forward or back** to change the flying characteristics. Moving the balance forward results in a model that tends to resist stalls and spins but may act sluggish and require more speed for takeoff and landing. Moving the balance aft makes the model more agile with a lighter and snappier "feel". In any case, **do not balance your model outside the recommended range.**

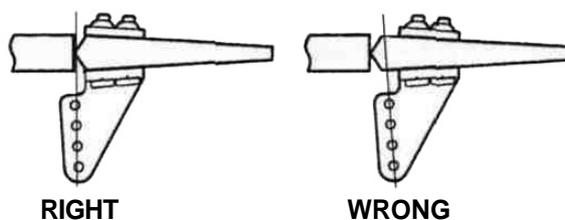
**Note:** The best balance point for a Cub 60 **on floats** is 4- $1/4$ " back from the leading edge.

D 5 With the wing attached to the fuselage, all parts of the model installed (ready to fly), and an **empty** fuel tank, block up the tail as necessary to **level** the stab.

D 6. Lift the model at the CG marks. If the tail drops when you lift, the model is "tail heavy" and you must add weight to the nose or *shift the servo tray forward* to balance. If the nose drops, it is "nose heavy" and you must add weight to the tail or shift the servo tray aft to balance. Simply shifting the servo tray may not be enough to adjust the C G, so some added weight may still be required. **NOTE:** Nose weight may be added by gluing strips of lead onto the firewall under the engine or by using a *Heavy Hub* propeller nut. Tail weight may be added by using "stick-on" lead weights, and later if the balance proves to be OK you can open the fuse bottom and glue these in permanently.

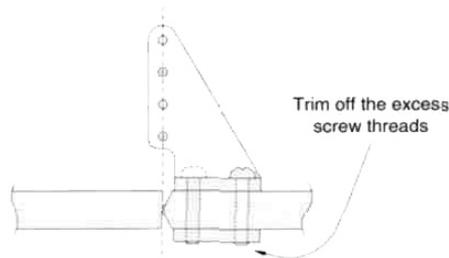
D 7. After the model has been balanced, permanently glue **in** the servo tray.

D 4 Connect all servos switch, cords and the battery according to the manufacturer's instructions. Turn on the radio system and center the servos.

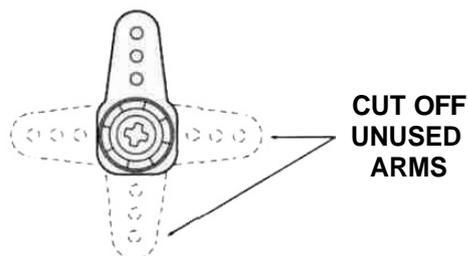


D 5 Insert the pushrods into the tubes in the fuse. Fasten a metal 4-40 clevis and large control horn to the elevator and rudder pushrods. Hold a horn in position on either the elevator or rudder (see sketch above for correct alignment). The pushrod should not be bent and should slide easily in the tube.

D 6 Mark the location for the horn screws on the control surface. Drill the 3/32" horn screw holes through the control surface, then prick a few pin holes into the wood under the horn's location. Apply a drop or two of thin CA to the pin holes to strengthen the wood.



D 7 When cured, screw the horn in place with two 2-56 machine screws and the backing plate. Repeat for the other control surface. **NOTE:** If you wish to shorten the screws for better appearance, use a Dremel Moto Tool and a cut-off wheel to cut the screws. **Remove the screws from the airplane before cutting.**



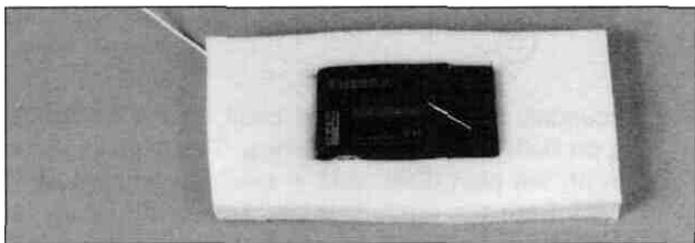
D 8 Install the servo wheels or arms on the servos. We use the Futaba *four arm* servo arms with three of the arms cut off.

D 3 Mount the switch in a location that will not be exposed to engine exhaust. Our Cub 60 utilizes the Great Planes Switch & Charge Jack Mounting Set (GPMM1000) which we positioned on the left side of the fuselage through the bottom sheeting. Allow enough clearance between the switch and the fuselage side.

D 9 With the servos centered and the pushrods connected to the elevator and rudder, determine the length of the pushrods. This depends on the method for fastening the pushrods to the servos. Included with the Cub 60 are two solder clevises which are what we used on our prototype. Silver solder (GPMR8070) is highly recommended.

### Final Radio Installation & Control Hookup

D 1 The battery pack may be installed nearly anywhere in the cabin area that allows for correct balance. The *recommended* battery location is underneath the fuel tank just ahead of former F2. Wrap the battery in foam rubber then enclose it in a plastic bag.

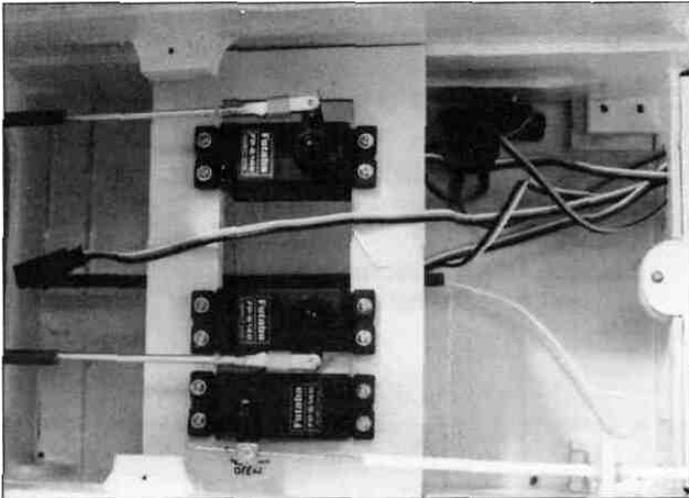


D 2 Install the receiver wrapped with foam in the receiver compartment between former F2 and the landing gear former with foam rubber. Route the receiver antenna through the antenna tube.

## Control Surface Throws

**We recommend the following Control Surface Throws:**

**NOTE:** Throws are measured at the **widest part** of the elevator and rudder. Make sure the control surfaces move in the proper direction as illustrated below.



D 10. Mark and cut the pushrods to length and install the connectors. Connect the pushrods to the servos and hook up the throttle linkage. (Not included)

D 11. Mount the aileron servos to the hatches for each wing panel. Connect the servos to the extension cords and "Y" connector previously installed in the wing before covering (if you accidentally forgot to route the servo extensions through the wing before covering it, don't worry - you can "play doctor" and route a thin length of wire into the servo compartment, through the ribs, and out the hole you made in the bottom of the wing center section sheet).

D 12. Place the wing next to the fuselage and connect the aileron extension to the receiver. Turn on the radio and center the aileron servos. Hook up your previously made aileron pushrods.

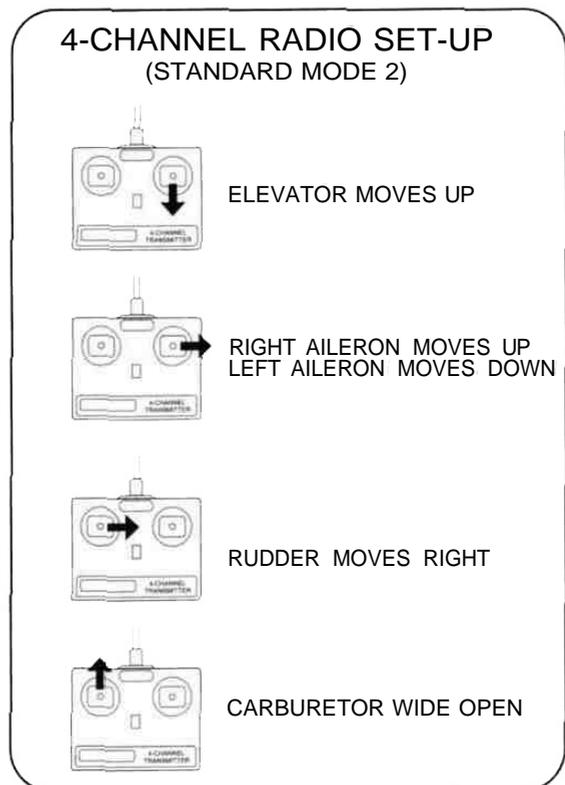
D 13. Refer to the *Control Throws* section that follows while setting the throws to make sure the servo horns do not interfere with the plywood hatch. Enlarge the clearance hole if necessary.

D 14. Glue the 1" x 1/2" x 1/2" basswood **servo hatch block** (saved from the excess 1/2" x 1/2" main spar) to the rear of former F2 flush with the base of the notch.



D 15. Drill a 3/32" hole through the tab in the die-cut plywood **receiver hatch cover** and a 1/16" hole through the hatch block for the #2 x 3/8" **sheet metal screw**. Add a piece of foam between the receiver and the hatch cover, then secure the hatch.

	High Rates	Low Rates
ELEVATOR:	1-1/8" up 1-1/8" down	3/4" up 3/4" down
RUDDER:	1-3/4" right 1-3/4" left	1-1/4" right 1-1/4" left
*AILERONS: (See Below)	1 up" 7/8" down	9/16" up 1/2" down



These control surface "throws" are approximate and provide a good starting point for the first flights with your Cub 60. You may wish to change the throws slightly to provide the smoothness or quickness that you prefer.

**\*Differential Throw:** Ailerons that are set up to deflect more in the upward direction than downward are said to have "Differential Throw." The purpose is to counteract "Adverse Yaw."

**\*Adverse yaw:** The tendency of an airplane to yaw in the opposite direction of the roll. For instance, when right aileron is applied, the airplane yaws to the left, thus opposing the turn. Adverse yaw is common in high wing, flat bottom airplanes, and is most noticeable at slow speeds and high angles of attack, such as during takeoffs and when

stretching a landing approach. Caused by the unequal drag of the upward and downward deflecting ailerons, this undesirable trait can be minimized by setting up the ailerons with "Differential Throw," or by "coordinating" the turns, using aileron and rudder control simultaneously.

## Apply Decals & Trim

**NOTE:** The decal sheet gives you everything you need to completely trim your model.

D 1 Study the plan and the photos on the box to determine where to place the decals.

D 2. Thoroughly clean your airplane before applying decals.

D 3 Cut out the individual decal items and apply them in the locations shown on the plan. Certain non-scale decals are provided which you may use at your discretion.

**HINT:** To apply decals accurately, peel only a small portion of backing from one end, cut off the backing with a scissors, position the decal carefully, press down the exposed portion of the decal, peel off the rest of the backing, then (working from the already stuck down end) carefully press down the rest of the decal.

D 4. **From** chrome trim sheet material or MonoKote covering, cut out and apply a 2" x 4-1/2" rectangle to the top of the wing to represent the top window.

## FINAL HOOKUPS & CHECKS

### Check for Wing Twist

**NOTE:** Even if you have built your wing on a perfectly flat surface and used utmost care, it is possible that your wing may have a twist due to uneven shrinking of the covering material. **You must check for this condition and correct it before the first flight.**

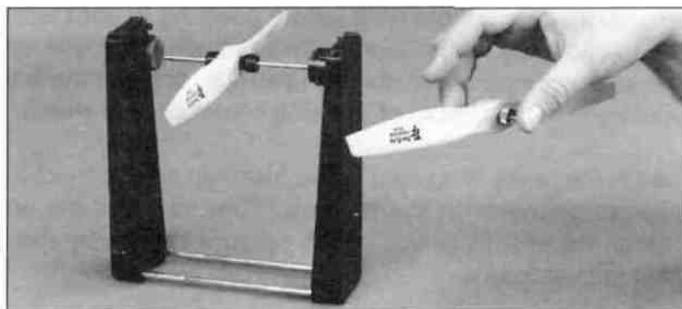
If you do not own a **wing incidence meter**, we recommend that you purchase one from your local hobby dealer or borrow one from another modeler. With the wing mounted to the fuselage, use the incidence meter to check the angle of your wing at the root and at the tips. If the incidence meter reveals a wing twist of more than 1/4 degree, you must grasp the wing at the tip and twist it slightly, while reheating the covering material. Keep checking, twisting and reheating until the wing twist is removed. Readjust the wing strut attachments so they will not twist the wing when they are installed. **NOTE:** If you have corrected a wing twist by this method, you should periodically recheck to make sure the correction has held.

Following is a checklist of some other items you'll want to consider before your first flight with this model.

- D Record weight
- D Check all screws
- D Adjust tail gear for straight roll
- D Adjust throttle pushrod linkage
- D Oil axles
- D Place AMA I D sticker inside
- D Take photographs'

## Balance the Propeller

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



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

## Preflight

D 1 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.

D 2 Ground check the model. If you are not thoroughly familiar with the operation of R/C models, ask an experienced modeler to check to see that you have the radio installed correctly and that all the control surfaces do what they are supposed to. The engine operation must also be checked and the engine "broken in" on the ground by running the engine for at least two tanks of fuel. **Follow the engine manufacturer's recommendations for break-in.** Check to make sure all screws remain tight, that the hinges are secure and that the prop is on tight.

## Range Check Your Radio

D 1 Wherever you do fly, you need to check the operation of the radio before every time you fly. This means with the transmitter antenna collapsed and the receiver and transmitter on, you should be able to walk at least 100 feet away from the model and still have control. Have someone help you. Have them stand by your model and, while you work the controls, tell you what the various control surfaces are doing.

D 2 Repeat this test **with the engine running** at various speeds with an assistant holding the model. If the control surfaces are not acting correctly at all times, **do not fly!** Find and correct the problem first.

## Engine Safety Precautions

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

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

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

Use safety glasses when starting or running engines.

Do not run the engine in an area of loose gravel or sand, as 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 items such as these away from the prop: loose clothing, shirt sleeves, ties, scarfs, long hair or loose objects (pencils, screw drivers) that may fall out of shirt or jacket pockets into the prop.

Use a "chicken stick" device or electric starter, follow instructions supplied with the starter or stick. Make certain the glow plug clip or connector is secure so that it will not pop off or otherwise get into the running propeller.

Make **all** engine adjustments (no matter how slight) from **behind** the rotating propeller.

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

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

## AMA Safety Code (excerpt)

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

### General

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

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

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

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

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

### Radio control

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

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

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

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

### Find a Safe Place to Fly

The best place to fly your R/C model is an AMA (Academy of Model Aeronautics) chartered club field. Ask your hobby shop dealer if there is such a club in your area and join. Club fields are set up for R/C flying which makes your outing safer and more enjoyable. The AMA can also tell you the name of a club in your area. We recommend that you join AMA and a local club so you can have a safe place to fly and also have insurance to cover you in case of a flying accident. (The AMA address is listed in the front of this instruction book.)

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



The J-3 CUB is a great-looking scale airplane and a great-flying sport airplane. Like its full-size counterpart, the Great Planes Cub 60 is capable of graceful aerobatics. It does **not** have the clean lines and smoothness of a "pattern ship" nor the self-recovery characteristics of a primary trainer. Therefore you must either have mastered the basics of R/C flying or obtained the assistance of a competent R/C pilot to help you with your first flights.

### Takeoff

Do a low speed taxi test before your first takeoff. If the plane does not track straight, bend the tail gear with two pliers. **Don't adjust the ground steering with the rudder trim!** Although the **J-3 CUB** has good low speed flight characteristics, you should not lift the model into the air until it has built up sufficient air speed, as this will give you a safety margin in case of a "flame-out". As the model rolls down the runway with the tail off the ground, continue to build up speed and gently apply up elevator. Throttle must also be added **smoothly** in order to avoid a torque induced roll to the left upon takeoff. Just climb out gradually and let it gain some airspeed before hunting for the clouds. For safety's sake, always remember to make your first turn **away** from the pit area.



We recommend that you take it easy with your **J-3 CUB** for the first several flights and gradually "get acquainted" with its flying characteristics as your engine gets fully broken-in. Work on trimming the airplane for straight and level flight with the transmitter trims at neutral, adjusting the clevises after each flight, as necessary. Also, take note of the responsiveness of the elevator, ailerons and rudder, and adjust their throws to your preference. Add and practice one maneuver at a time, learning how it behaves in each one. The Cub is a surprisingly lively model - especially with a 91 4-stroke. You will rarely use more than 1/2 throttle and the airplane is happiest cruising around at scale speeds. While there are maneuvers where full throttle is required, avoid "boring holes in the sky" and try to stay within a sensible and realistic scale-like flight envelope. With a model of this size, high speed dives that can lead to flutter and structural failure should be avoided. We don't know of any maneuver that this airplane is not capable of performing. The roll rate is authoritative yet easy to keep up with due to the large wingspan. Inverted flight requires little elevator to maintain straight and level. **Full-throttle snaps are not recommended**, due to the extremely high stresses they place on the airframe.

#### CAUTION (THIS APPLIES TO ALL R/C AIRPLANES)

If, while flying, you notice any unusual sounds, such as a low-pitched "buzz," this may be an indication of control surface "flutter." Because flutter can quickly destroy components of your airplane, any time you detect flutter you must **immediately** cut the throttle and land the airplane. Check all servo grommets for deterioration (this will indicate which surface fluttered), and make sure all pushrod linkages are slop-free. If it fluttered once, it will probably flutter again under similar circumstances unless you can eliminate the slop or flexing in the linkages. Here are some things which can result in flutter: Excessive hinge gap, Not mounting control horns solidly, Sloppy fit of clevis pin in horn, Elasticity present in flexible plastic pushrods, Side-play of pushrod in guide tube caused by tight bends, Sloppy fit of Z-bend in servo arm, Insufficient glue used when gluing in the elevator joiner wire or aileron torque rod, Excessive flexing of aileron, caused by using too soft balsa aileron, Excessive "play" or "backlash" in servo gears, and Insecure servo mounting.



## 2-VIEW DRAWING

Photocopy this two-view drawing and use the copy to plan your trim scheme.

