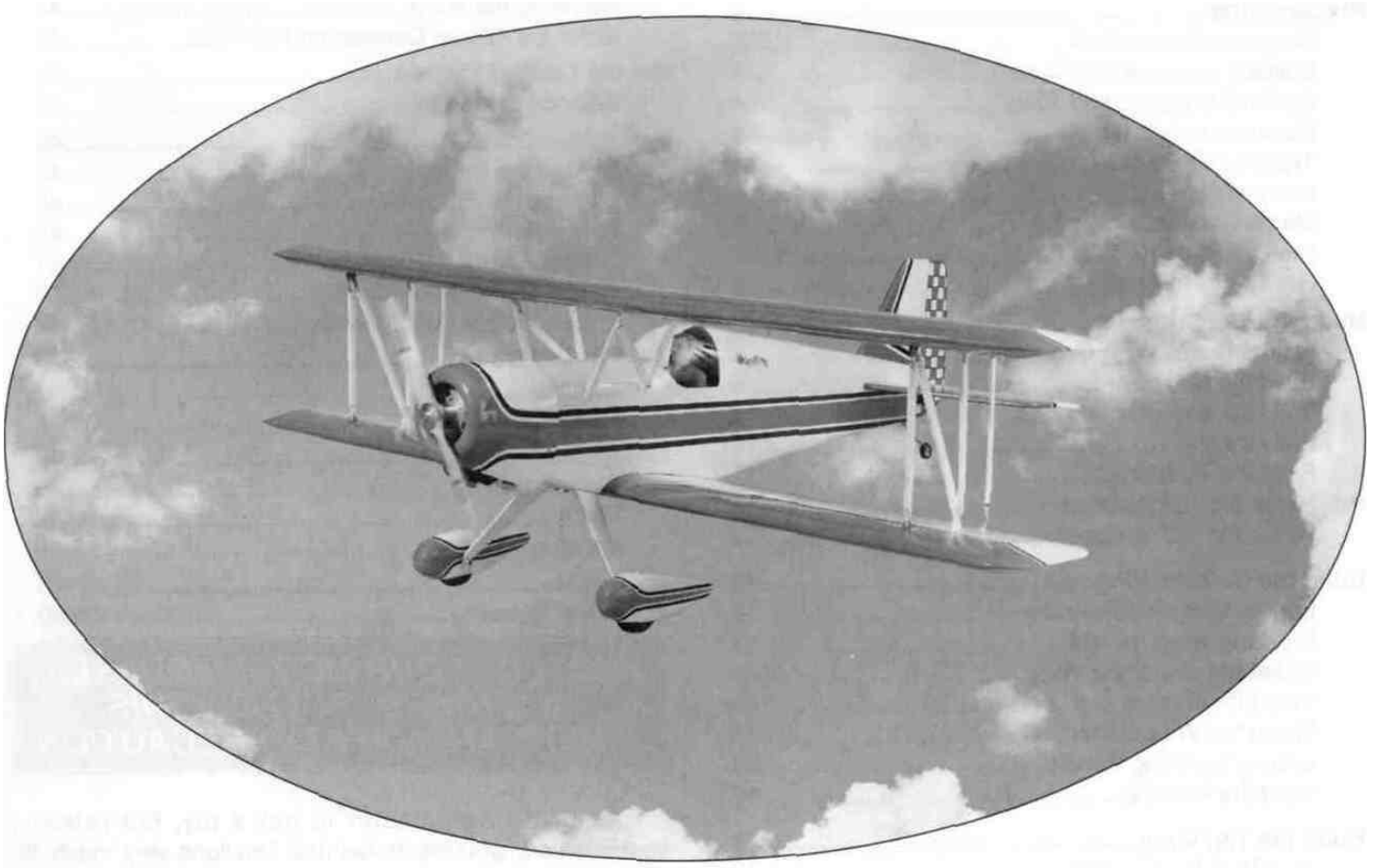
Giant Aeromaster™



INSTRUCTION MANUAL

WARRANTY

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

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

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

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

GREAT PLANES® MODEL MANUFACTURING COMPANY

P.O. Box 788 Urbana, IL 61801 (217) 398-8970

GAROP04 10/96 V1 0

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

Your Giant Aeromaster is not a toy, but rather a sophisticated, working model that functions very much like an actual airplane

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

We recommend that you have at least built and flown a .60 size low wing taildragger before attempting to fly the Giant Aeromaster Even though the Aeromaster is easy to build and fly, it will not recover like most trainers. If you are an experianced pilot you will find the Giant Aeromaster a real pleasure to fly

For information on flying clubs in your area you can contact the national Academy of Model Aeronautics (AMA), which has more than 2,300 chartered clubs across the country.

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

AMA SINCE 1936

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

Or via the internet at: http://www.modelaircraft.com

INTRODUCTION

Congratulations' Thank you for purchasing the Great Planes **Giant Aeromaster!**

This aircraft is a large scale vesion of the Great Planes 60-size Super Aeromaster It's easy to build, extremely aerobatic and has no "bad habits," making it a great airplane for hot-dogging Its 73" wingspan makes it International Miniature Aircraft Association* (IMAA) legal

*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 **Aeromaster** is easy to build and flies great, we must discourage you from selecting this kit as your **first** R/C airplane It lacks the self-recovery characteristics of good **basic trainers** such as the Great Planes **PT" Series** On the other hand, if you have already learned the basics of R/C flying, and you are able to safely handle a 60-size low wing taildragger, the **Giant Aeromaster** is an excellent choice to improve your skills and get into giant scale.

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

2 Take time to build straight, true and strong.

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

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

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

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

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

Please inspect all parts carefully before starting to build. If any parts are missing, broken or defective, or if you have any questions about building or flying this model, please give us a call at (217) 398-8970 and we'll be glad to help.

DECISIONS YOU MUST MAKE

Engine Selection:

The recommended engine size range is as follows:
30 - 45cc displacement **Glow Engine**
30 - 60cc displacement **Gasoline Engine**

We strongly recommend the use of a soft engine mount of some kind, to relieve the stresses on the airframe and radio system, and to make your aircraft quieter J-Tec and Soundmaster both produce soft mounts for large engines.

NOTE: If you are using a gasoline engine, you will need to make sure that your fuel lines and tank are made specifically to handle gasoline

Radio System Requirements:

The Great Planes Giant Aeromaster requires a minimum of six servos Eight servos are required if you prefer to use a servo for each aileron Our prototype models flew great with only six servos

Due to the large scale of this aircraft the Giant Aeromaster requires high torque servos to control the split elevator (2 required), rudder (1 required) and ailerons (2 required) (If you prefer a servo for each aileron four servos are required.) A standard servo may be used on the throttle only

On our prototypes we used Y-connectors on the elevator and aileron servos.

PREPARATIONS

Required Accessories

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

D US Engines" 41cc (USEG0041)
D Four-channel radio with six servos
(five high torque and one standard for throttle)
D Y-Connector (2)
D 24" Servo extension (2)
D Propeller (Top Flite Power Point"")
D 16 - 24oz Fuel tank of your choice
D Gas or glow fuel tubing depending on fuel used
D 4" Main wheels (2)
D 1-1/2" Tail wheel (1) (GPMQ4243)
D Covering film (5) rolls (Top Flite MonoKote®)
D 3" Pilot figure (WBRQ2626)
D 1/4" Latex Foam Rubber Padding (HCAQ1000)
D Easy Fueler" fuel fill valve for gas (GPMQ4161)
glow(GPMQ4160)
D Switch and Charge Jack (GPMM1000)
D Fuelproof paint for cowl and wheel pants
(Top Flite LustreKote paint)
D Heavy duty hinges (28)
D 3/16" Axle (2)
D 3/16" Wheel collars (4) (GPMQ4308)

For Mounting the US Engines 41cc
Standard mounting system'
D 1/4-20 x 1-1/4" Flat Head Bolt (4 req)
D 10-32 x 1-1/4" Sockethead Bolt (4 req)
D #10 Washer (4 req)
D 10-32 Blind Nut (4 req.)

Soft mounting system
D J-Tec Snuf-Vibe engine mount (JT-1420SV)
D 1/4-20x2" Sockethead bolts (4 required)

Building Supplies and Tools

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

D 2 oz Pro CA (thin, GPMR6003)
D 2 oz Pro CA+ (medium GPMR6009)
D 1 oz Pro CA- (thick, GPMR6014)
D 6-Minute Pro Epoxy (GPMR6045)
D 30-Minute Pro Epoxy (GPMR6047)
D 4oz Pro Wood Glue (GPMR6161)
D Hand or electric drill
D Sealing iron (TOPR2100)
D Heat gun (TOPR2000)
D Hobby saw (X-Acto razor saw)
D Hobby knife #11 Blades
D Razor plane (Master Airscrew"'MASR1510)
D Pliers
D Screw drivers (Phillips and flat blade)
D Tpins(HCAQ5150)
D String
D Straightedge with scale
D Masking tape (required for construction)
D Sandpaper (coarse medium fine grit)*
D Easy-Touch Bar Sander (or similar)*
D Wax paper
D Balsa filler such as Hobbico" HobbyLite™
(Hobbico #HCAR3400)
D 1/4-20 Tap and tap wrench
D Isopropyl rubbing alcohol (70%)
D White body putty (Squadron #SQUR1500)
D 90° Building square
D Ballpoint pen
D Felt-tip pen
D Round file
D Micro balloons (TOPR1090)
D Canopy glue
Drill bits
D 1/16" D 1/8" D 3/16" **(Long Bit)**
D 5/64" D 9/64" D 13/64"
D 3/32" D 5/32" D 1/4"
D 7/64" D 3/16"

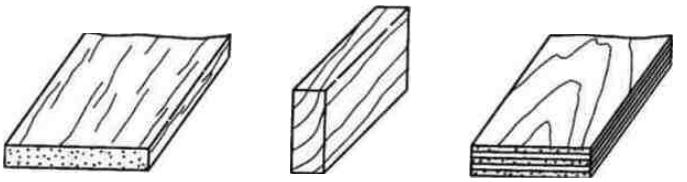
Optional Supplies And Tools

D CA Applicator Tips (HCAR3780)
D Epoxy Brushes (GPMR8060)
D Epoxy Mixing Sticks (GPMR8055)
D CA Debonder (GPMR6039)
D Hot Sock (TOPR2175)
D Single edge Razor Blades (HCAR0312)

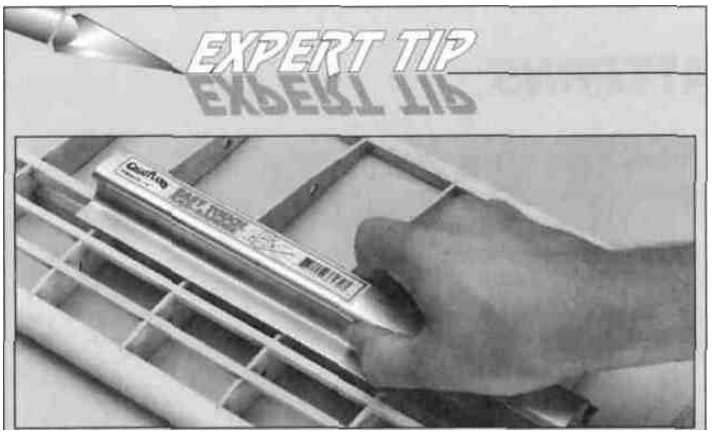
Common Abbreviations

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**



In our busy workshop we use the Great Planes **Easy-Touch Bar Sanders** equipped with Great Planes #80, #150 and #220-grit **Easy-Touch Adhesive-Backed Sandpaper** Great Planes Easy-Touch Bar Sanders are made from lightweight, rigid, extruded aluminum and can be found at most hobby shops They are available in five sizes - 5-1/2" (GPMR6169), 11" (GPMR6170) for most general purpose sanding, 22" (GPMR6172), 33" (GPMR6174) and 44" (GPMR6176) for long surfaces such as wing leading edges. The Easy-Touch Adhesive-Backed Sandpaper comes in 2" x 12' rolls of 80-grit (GPMR6180), 150-grit (GPMR6183) and 220-grit (GPMR6185) and an assortment to 5-1/2" long strips (GPMR6189) for the short bar sander. The adhesive-backed sandpaper is easy to apply and remove from your sanding bar when it's time for replacement.

This setup is all that is required for almost any sanding task. Custom sanding blocks can be made from balsa or hardwood blocks and sticks for sanding difficult to reach spots. We also keep some #320-grit wet-or-dry sandpaper for finish sanding just before covering.

BUILDING NOTES

There are two types of screws used in this kit
Sheet metal screws are designated by a number **and** a length.

For example #6 x 3/4" 

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

For example 4-40 x 3/4" 

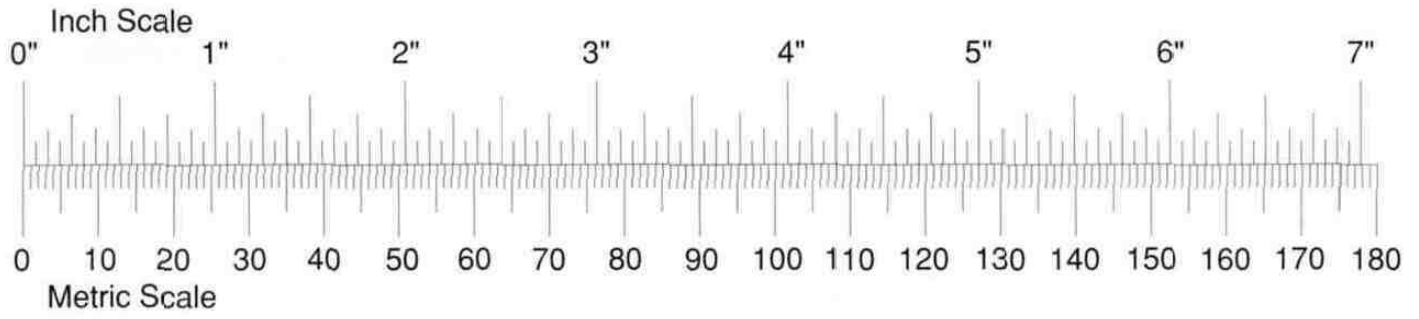
When you see the term **"test fit"** in the instructions, it means you should first position the part on the assembly **without using any glue,** then slightly modify the part as necessary for the best fit.

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

Several times during construction we refer to the "top" or 'bottom" of the model or a part of the model For example, during wing construction we tell you to "glue the top main spar" or "trim the bottom of the former ' It is understood that the "top" or "bottom" of the model is as it would be when the airplane is right side up and will be refered to as the "top" even if the model is being worked on upside down. i e the "top" main spar is always the "top" main spar, even when the wing is being built upside down.

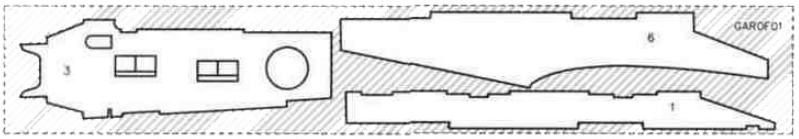
METRIC CONVERSIONS

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



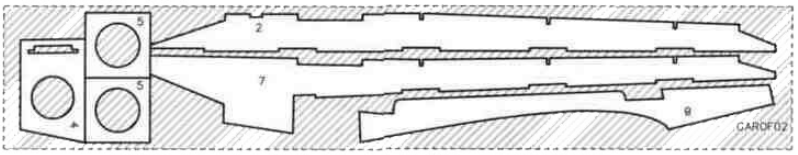
DIE-CUT PATTERNS

GAROF01 **2 REQ**



1/8" X 5-1/8" X 31-3/4" PLYWOOD

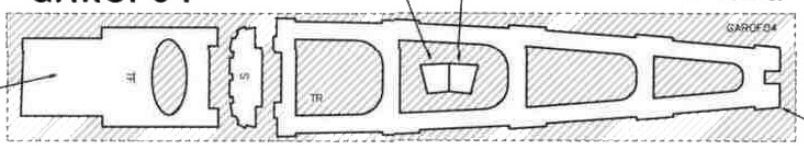
GAROF02 **2 REQ**



1/8" X 5-3/4" X 31-3/4" PLYWOOD

GAROF04 Wheel Pant Mount **1 REQ**

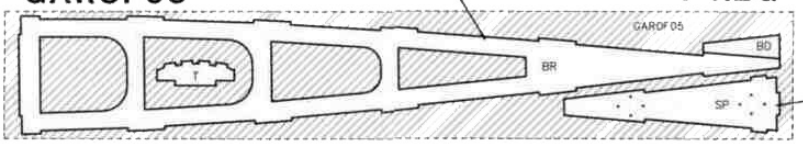
Tank Floor



Fuse Top Rear

1/8" X 5-1/8" X 31-3/4" PLYWOOD

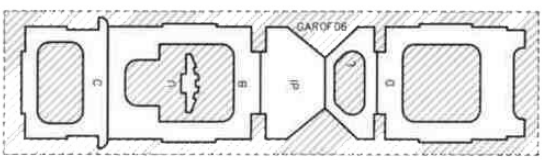
GAROF05 Fuse Bottom Rear **1 REQ**



Stab Plate

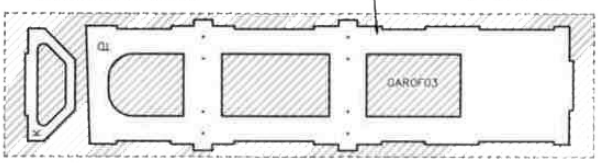
1/8" X 5-1/8" X 31-3/4" PLYWOOD

GAROF06 **1 REQ**



1/8" X 5-3/4" X 21" PLYWOOD

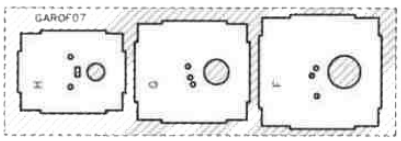
GAROF03 Top Deck **1 REQ**



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

GAROF07 **1 REQ**

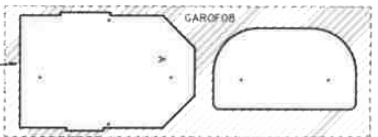
Fuse Formers



1/8" X 5-1/8" X 15-3/4" PLYWOOD

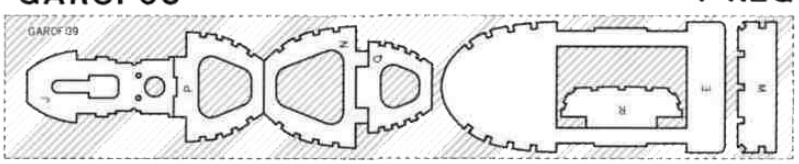
GAROF08 **1 REQ**

Firewall



1/8" X 5-1/2" X 14-3/4" PLYWOOD

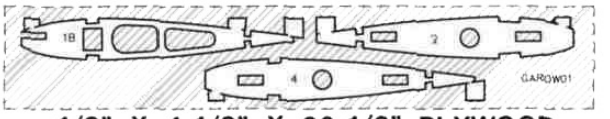
GAROF09 **1 REQ**



1/8" X 5-3/4" X 31-3/4" PLYWOOD

DIE-CUT PATTERNS

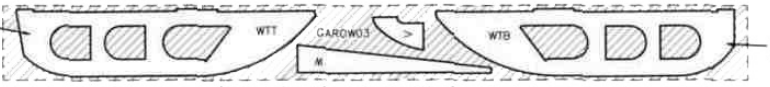
GAROW01 **2 REQ**



1/8" X 4-1/8" X 23-1/2" PLYWOOD

GAROW03 **2 REQ**

Top Wing Tip



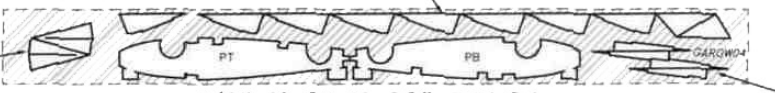
Bottom Wing Tip

1/8" X 3" X 30" BALSA

GAROW04 **2 REQ**

Wing Tip Formers

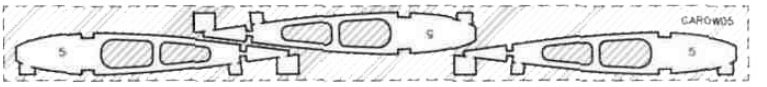
Rib Caps



Aft Wing Tip Former

1/8" X 3" X 30" BALSA

GAROW05 **4 REQ**



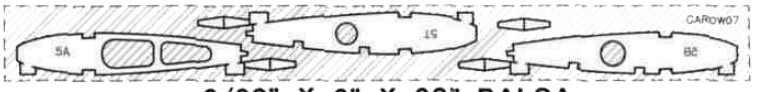
3/32" X 3" X 30" BALSA

GAROW06 **2 REQ**

Aileron Ribs

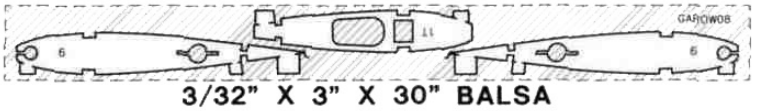
3/32" X 3" X 30" BALSA

GAROW07 **2 REQ**



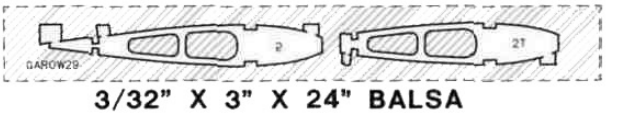
3/32" X 3" X 30" BALSA

GAROW08 **2 REQ**



3/32" X 3" X 30" BALSA

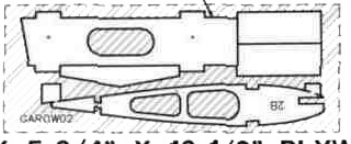
GAROW29 **2 REQ**



3/32" X 3" X 24" BALSA

Cabane Mounting Plate

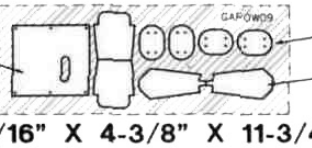
GAROW02 **2 REQ**



1/8" X 5-3/4" X 13-1/2" PLYWOOD

GAROW09 **4 REQ**

Aileron Hatch



STRUT TABS

Rib Doubler

1/16" X 4-3/8" X 11-3/4"

GET READY TO BUILD

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

D 2. Remove all parts from the box. As you do, determine the name of each part by comparing it with the plans and the **parts list** included with this kit. Using a felt-tip or ballpoint pen, lightly write the part **name** or **size** on each piece to avoid confusion later. Use the die-cut patterns shown on pages 6 & 7 to identify the die-cut parts and mark them **before** removing them from the sheet. **Save all scraps.** If any of the die-cut parts are difficult to remove, do not force them! Instead, cut around the parts. Use your Easy-Touch Bar Sander or sanding block to **lightly** sand the edges to remove any die-cutting irregularities.

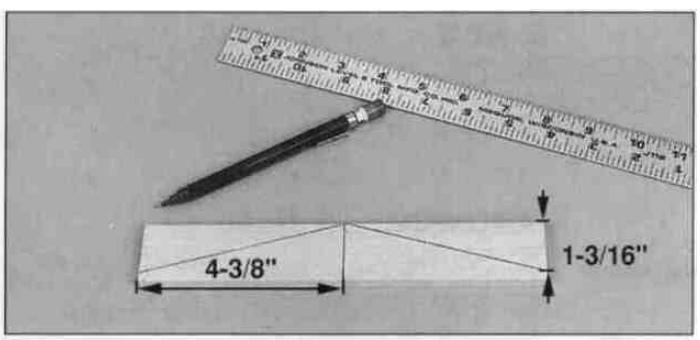
D 3. As you identify and mark the parts, separate them into groups, such as **fuse** (fuselage), **wing, fin, stab** (stabilizer) and **hardware.** Zipper-top food storage bags are handy to store your parts as you sort, identify and separate them into subassemblies.

BUILD THE TAIL SURFACES

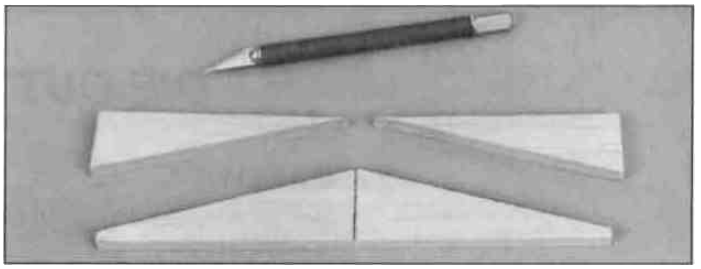
Make The Stabilizer Center

D 1. Begin making the **stab LE joiner** by accurately cutting the 3/8" x 1-1/2" x 11-7/8" balsa sheet so it is 8-3/4" long and 1 -3/8" wide.

D 2. Use a ballpoint pen and a model building square to accurately mark the centerline of the stab LE joiner (4-3/8" from the end). Use your pen to mark another line on both ends of the stab LE joiner 1-3/16" from one edge. The following photo shows the locations of these marks.

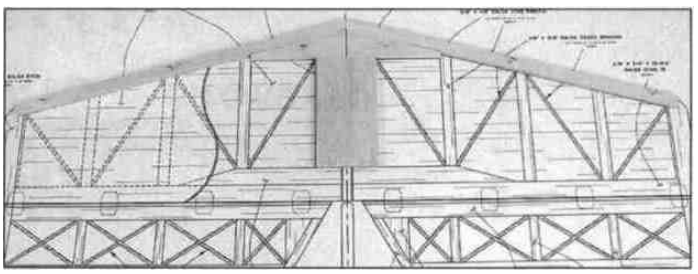


D 3. Use a straightedge to draw a line connecting the **centerline of the stab LE joiner with the marks on the ends.**



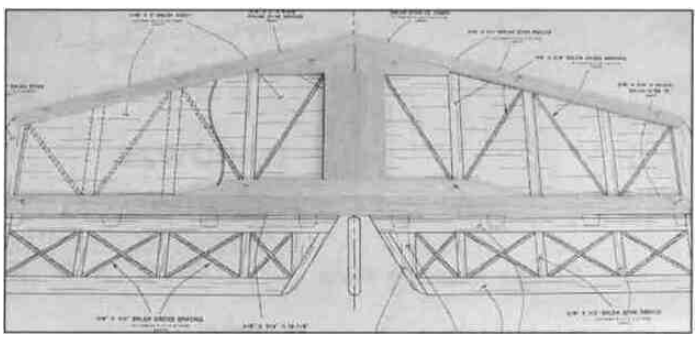
D 4. Use a hobby knife with a sharp #11 blade or razor saw to cut along the lines you drew. If necessary, use a bar sander to true the leading edges you just cut.

Build The Stabilizer

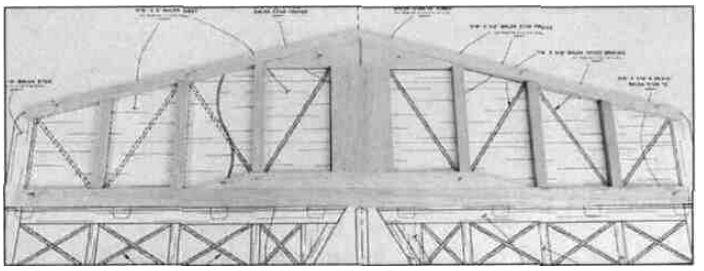


D 1. Place a piece of wax paper over the stab plan so the glue won't stick to it. Pin the stab LE joiner in position over the plan. Glue the 3/8" x 2-3/4" x 5-1/8" balsa **stab center** to the stab LE joiner. Cut two 3/8" x 1/2" x 30" balsa sticks 15-3/4" long to make the **stab leading edges.** Sand an angle on one end of both sticks to match the centerline of the stab. Don't cut the **tips** of the LE'S yet. Cut and square them with the end of the stab after you remove it from the plan at step 5. Glue the stab LE'S to the stab LE joiner with medium CA and pin them in position over the plan.

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

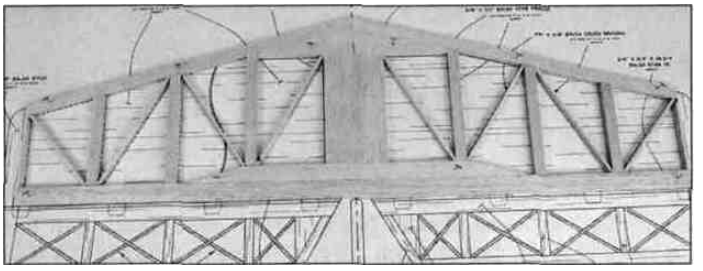


D 2. Cut and sand the angle at both ends of the 3/8" x 3/4" x 14-7/8" balsa **stab sub TE.** Glue the stab sub TE to the stab center and pin it in position over the plan. Glue the 3/8" x 3/4" x 30" balsa **stab TE** to the stab sub TE and pin it in position over the plan. Use the plans or a straightedge as a guide to make sure the stab TE is **straight** as you glue and pin it in position.



D 3. Make the 3/8" **stab ribs** from a 3/8" x 1/2" x 30" balsa stick, then glue them in position. **Hint:** Use a sharp, single-edge razor blade to cut the stab ribs.

D 4. From a 1/8" x 3/8" x 30" balsa stick, make the 1/8" **cross bracing.** Glue them in position between the stab ribs. We recommend cutting these cross braces with a single-edge razor blade, too.



D 5. Remove the stab from your building board. Inspect all the glue joints and add CA to any joints that don't look strong. Cut the ends of the leading and trailing edges so they extend past the end of the stab about 1/16". Use your bar sander to finish the job by sanding the ends of the LE'S and TE so they are flush with the end of the stab. Use your bar sander or a large sanding block and 220-grit sandpaper to sand the entire top and bottom surface of the stab until it is flat and even. Be careful that you don't sand any area of the stab too **thin** or gouge the stab cross bracing and ribs by snagging the sandpaper on them.

How to Make Stab Skins:

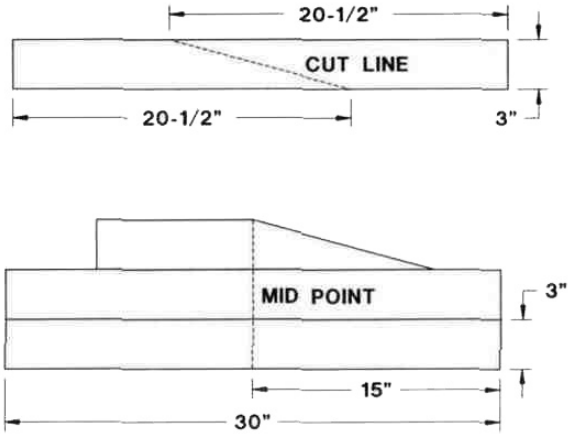
- Wherever practical, prejoin the balsa sheets to make a "skin" before attaching them to the structure.
- Many modelers like to sort the wood so they can put the **best** wood with the most even grain structure on the top of the stab.
- Make your skin larger than needed to allow for misalignment. On the stab we suggest leaving 1/4" extra.
- **To** make skins, the following steps are suggested:

1. True up the edges of the sheets with a metal straightedge and a sharp hobby knife or a long Easy-Touch Bar Sander.

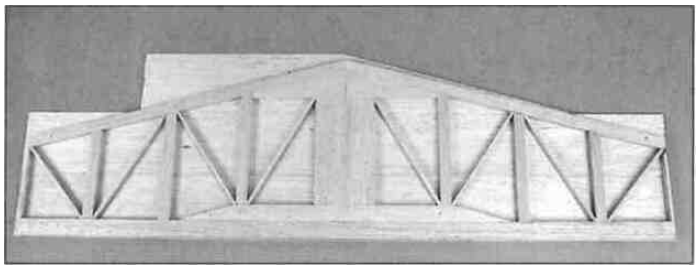
2. Test fit the sheets together to make sure they match well.

3. Method "A": The fastest method for gluing the sheets together is with thin CA over a flat surface covered with wax paper. A quick wipe of the joint with a fresh paper towel will remove most of the excess glue and make sanding easier. Mark the poorest surface with an "I" as the inside of the sheet.

Method "B": An alternate method for gluing the pieces that make up the skin is to glue them together with aliphatic resin (wood glue). Aliphatic resin sands much easier than CA so your skins won't get too thin from over sanding. Wipe off the excess glue with a damp paper towel. Use masking tape to hold the sheets together until the glue cures - usually in about thirty minutes.



D 6. Make the skins for the stab by using five 1/16" x 3" x 30" balsa sheets. Cut one 1/16" x 3" x 30" as shown in the the top sketch. Make a pair of skins by edge-gluing two 1/16" x 3" x 30" balsa sheets together. Center and glue the cut sheet on the edge of the glued sheets. Use your bar sander or a large sanding block and 220-grit sandpaper to sand the entire top and bottom of the skin flat.



D 7. Place one of the stab skins on your building board. Apply an even bead of medium or thick CA to one side of the stab framework. Place the framework in its proper position on the skin and press it down firmly until the glue has set. Repeat this step for the other side of the stab.

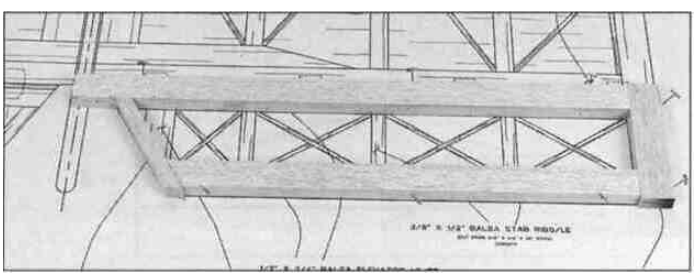
D 8. After the glue has cured, remove the stab from the building board and trim the sheeting close to the framework. Use a bar sander or large sanding block and 220-grit sandpaper to sand the top and bottom skins flush with the stab framework. Cut the **tips** from the 1/2" x 7/8" x 24" balsa stick. Glue the tips onto the end of the stab and sand a radius on the corner of the LE.

Build The Elevator

D D 1. Place a piece of wax paper over the elevator plan. Cut the 1/2" x 7/8" x 24" balsa stick 3-5/8" long to make an **elevator tip.** Pin the elevator tip to the plan, allowing the tip to overhang by 1/16" at the LE and TE.

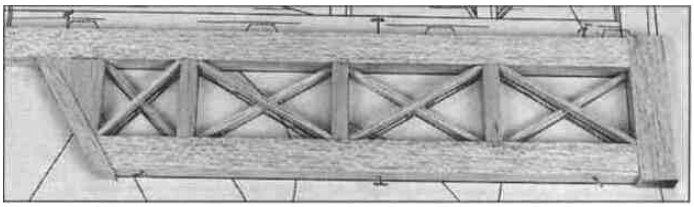
D D 2. Cut a 1/2" x 3/4" x 30" balsa stick in half to make the **elevator leading edge** and **elevator trailing edge.** Use the plan or a straightedge as a guide to make sure the elevator LE is **straight** as you glue and pin it in position.

D D 3. Cut and sand the end of the elevator TE to match the plan. Again, use the plan or a straightedge as a guide to make sure the elevator TE is **straight** as you glue and pin it in position.



D D 4. From the 3/8" x 1/2" x 30" balsa stick, cut and glue the elevator root to the LE and TE. Leave an overhang of 1/16" at the TE. This will be sanded off after the elevator is removed from the building board.

D D 5. Make the 3/8" **elevator ribs** from the 3/8" x 1/2" x 30" balsa stick. Then glue them in position. From the 1/2" x 3" x 3-1/2" balsa block, cut the **elevator horn block** and glue it in position.

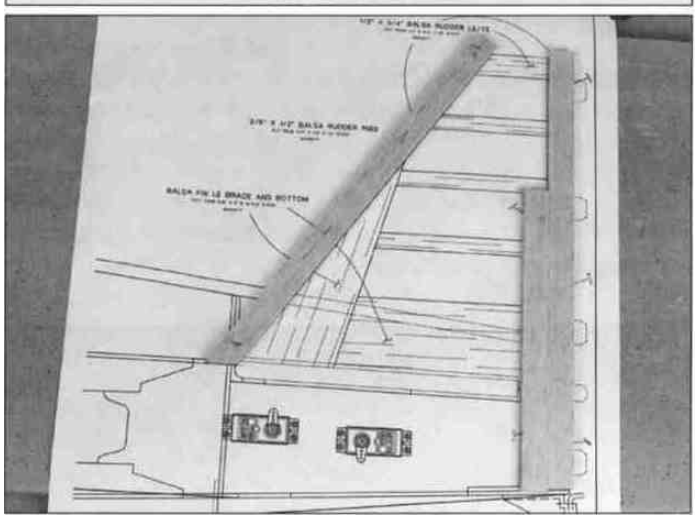


D D 6. Make the 1/8" **cross bracing** from a 1/8" x 1/4" x 30" balsa stick. Note that the cross bracing overlaps. The bottom bracing should be flush with the bottom of the elevator and the top bracing should be flush with the top of the elevator. Glue the cross bracing in position. We recommend cutting these cross braces with a single-edge razor blade.

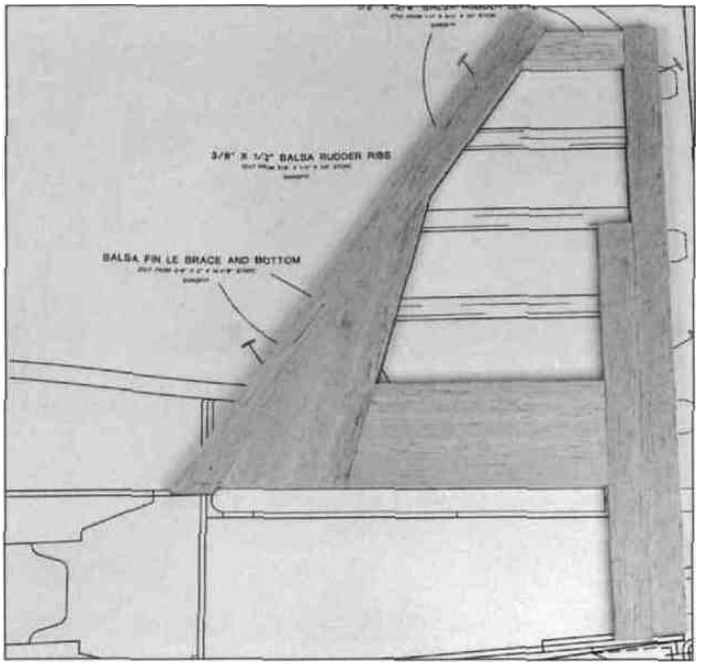
D D 7. Remove the elevator from your building board. Inspect all the glue joints and add CA to any joints that don't look strong. Cut the end of the leading edge so that it extends past the end of the elevator about 1/16". Use your bar sander to finish the job by sanding the ends of the LE and elevator tip so they are flush. On the end of the elevator root, sand a radius to match the plan. Sand the entire top and bottom surface of the elevator until it is flat and even. Be careful that you do not sand any particular area of the elevator too thin or gouge the elevator cross bracing and ribs by snagging them on the sandpaper.

D 8. Go back to step 1 and build the second elevator following the same procedure.

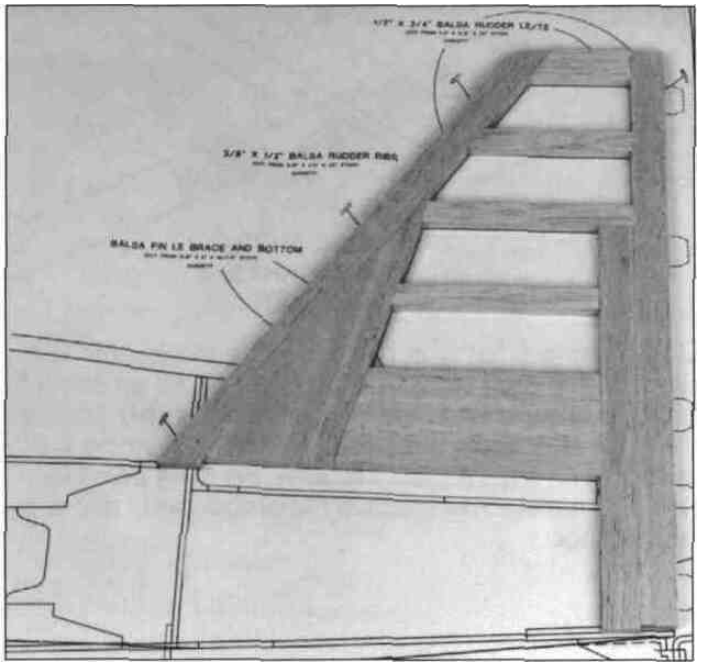
Build The Fin



D 1. Place a piece of wax paper over the fin plan. Cut the 3/8" x 3/4" x 24" balsa stick 13-3/4" long to make a **fin TE.** Pin the fin TE to the plan, allowing the TE to overhang the top by 1/16". Cut the remaining 3/8" x 3/4" balsa stick 9-1/8" long to make a **fin TE doubler.** Glue the fin TE doubler to the fin TE so that the top end of the TE doubler is positioned correctly over the plan and the bottom end overhangs. Cut the second 3/8" x 3/4" x 24" balsa stick to make the fin LE. Trim one end of the fin LE to the angle shown on the plan and allow the other end to overhang the top slightly. Use the plan or a straightedge as a guide to make sure the fin TE and LE are **straight** as you pin them in position.

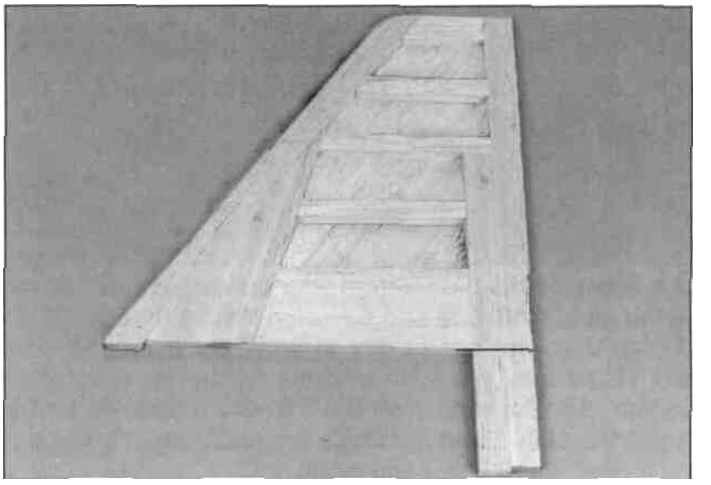


D 2. To make the **fin tip,** cut the remaining short piece of 3/8" x 3/4" balsa stick to fit between the fin LE and TE. When satisfied with the fit, glue the fin tip to the LE and TE. Cut the 3/8" x 3" x 14-7/8" balsa block to make the **fin LE brace** and **fin bottom.** Cut two notches in the fin bottom for the #8x1" screws that secure the stabilizer to the fuselage. Glue and pin them in position.



D 3. From the 3/8" x 1/2" x 30" balsa stick, make the fin **ribs.** Then glue them in position. Remove the fin from your building board. Inspect all the glue joints and add CA to any joints that don't look strong. Use your bar sander to sand the top of the LE and TE so they are flush with the fin tip. Sand a radius on the end of the LE to match the plan. Sand the entire top and bottom surface of the fin until it is flat and even. Be careful that you do not sand any particular area of the fin too thin or gouge the fin cross bracing and ribs by snagging them on the sandpaper.

D 4. Make the skins for the fin by using three 1/16" x 3" x 30" balsa sheets. Cut each sheet in half. Make a skin by edge gluing three sheets together. Use your bar sander or large sanding block and 220-grit sandpaper to sand the entire top and bottom of the skin flat.

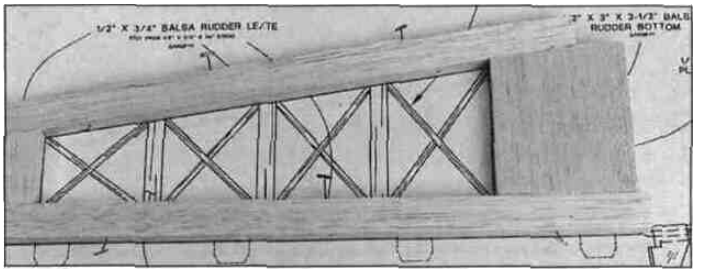


D 5. Pin one of the fin skins down on the building board. Apply an even bead of medium or thick CA to one side of the fin framework. Place the framework in its proper position on the skin so that the LE of the fin is flush with the edge of the 15" balsa sheet and press it down firmly until the glue has cured. Repeat this step for the other side of the fin. Do not apply the 1/16" skin to the fin post.

D 6. After the glue has cured, remove the fin from the building board. Use your bar sander or a large sanding block and 220-grit sandpaper to sand the edges of the top and bottom skins flush with the fin framework.

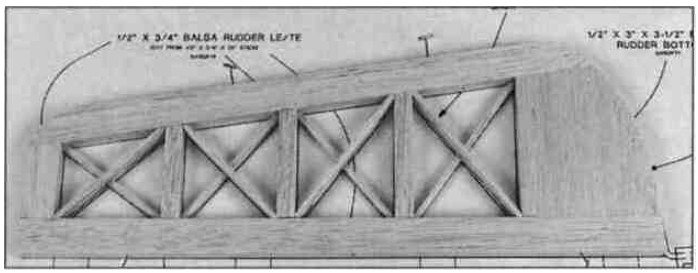
Build The Rudder

D 1. Place a piece of wax paper over the rudder plan. Cut the 1/2" x 3/4" x 30" balsa stick 14" long to make a **rudder LE.** Cut the remaining 1/2" x 3/4" balsa stick 12-3/4" long to make a **rudder TE.** Pin the rudder LE and TE to the plan, allowing the ends to overhang the top and bottom of the rudder by 1/16". Use the plan or a straightedge as a guide to make sure the rudder TE and LE are **straight** as you pin them in position.



D 2. Make the **rudder tip** by cutting the remaining short piece of 1/2" x 7/8" balsa stick to fit between the rudder LE and TE. When satisfied with the fit, glue the rudder tip to the LE and TE. Cut the 1/2" x 3" x 3-1/2" balsa block to make the rudder bottom. Glue and pin the rudder bottom in position.

D 3. Make the **rudder ribs** from the 3/8" x 1/2" x 30" balsa stick, then glue them in position. Make the 1/8" **cross bracing** from a 1/8" x 1/4" x 30" balsa stick. Note that the cross bracing overlaps the same as on the elevator. Glue the cross bracing in position.



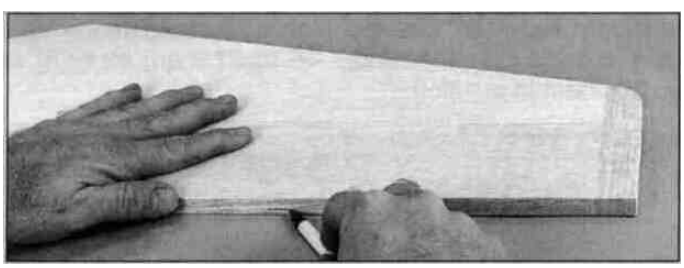
D 4. Remove the rudder from your building board. Inspect all the glue joints and add CA to any joints that don't look strong. Use your bar sander to sand the ends of the LE and TE so they are flush with the rudder tip and rudder bottom. Sand a radius on the TE and rudder bottom to match the plan. Sand the entire top and bottom surface of the rudder until it is flat and even.

Hinge The Tail Surfaces

D 1. Place the stab and elevator over their locations on the plan and lightly mark the **hinge locations** on the TE of the stab and LE of the elevator with a ballpoint pen.

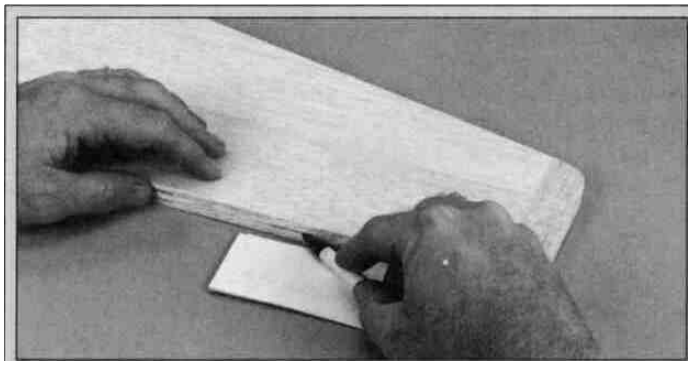
D 2. Refer to the Expert Tip that follows. Then mark the centerline of the hinges on the stab and elevators.

How to mark hinge slots
It's important that the hinges are centered and parallel to the part you are hinging. The best way to start is by accurately marking the hinge centerline. We'll start with the stabilizer.



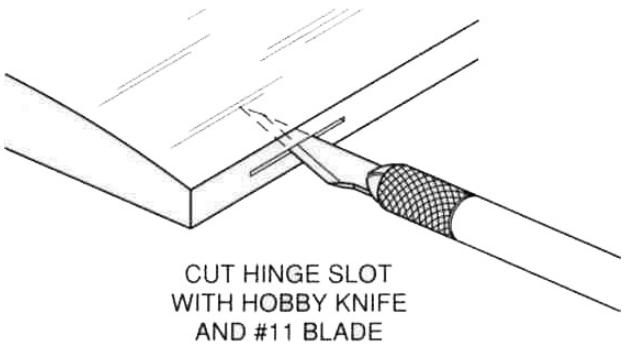
A. Lay the stabilizer and a ballpoint pen on a flat surface. Mark a "test line" on the trailing edge of the stab away from the hinge locations you marked earlier.

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



C. Use playing cards or business cards to adjust the height of the pen until you can mark the centerline. Mark the hinge centerline at each hinge location.

D. Use the same technique to mark the centerline along the entire length of both elevators.



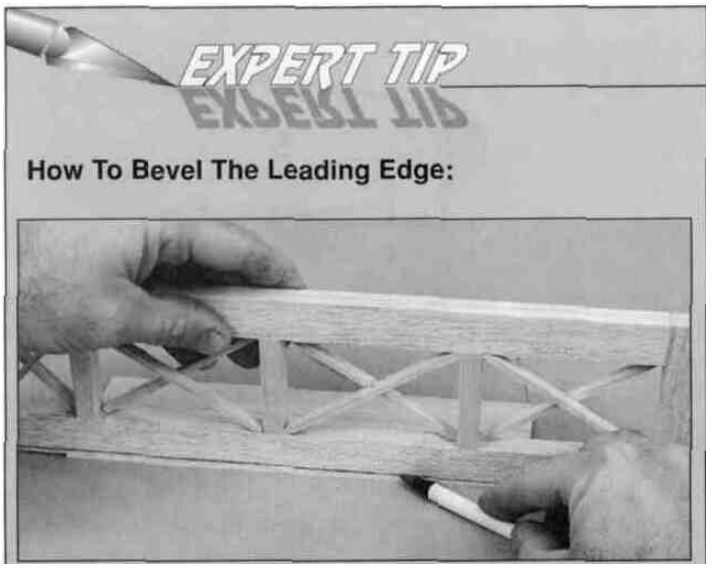
CUT HINGE SLOT
WITH HOBBY KNIFE
AND #11 BLADE

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

D 4. Follow the same procedures to hinge the rudder and fin.

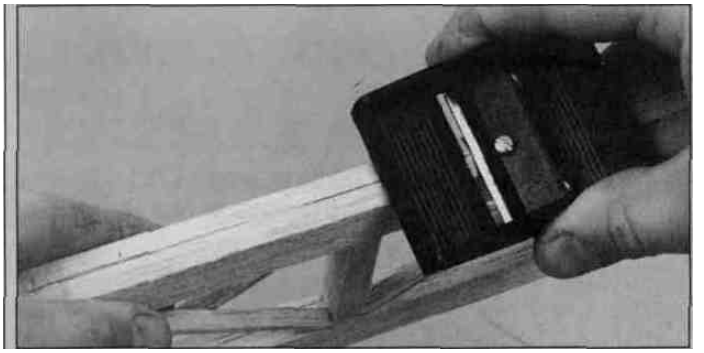
Finish The Tail Surfaces

D 1. Refer to the Expert Tip that follows and shape the leading edge of the elevators to a "V" as shown on the plans.



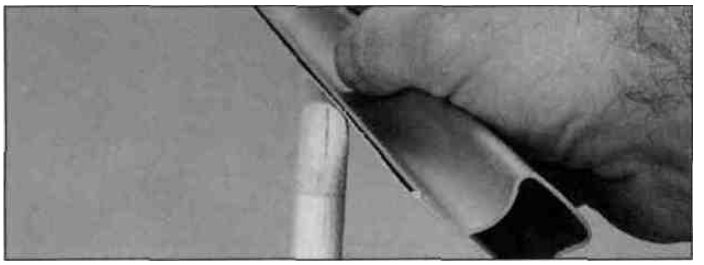
A. Place the leading edge of one of the elevators **on** your work surface and use your ballpoint pen to mark a "bevel to" line on both sides about 3/16" high.

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



D. Using the bevel to lines and the centerline as a guide, make the "V" on the leading edge of the elevators with a razor plane or your bar sander loaded with 150-grit sandpaper.

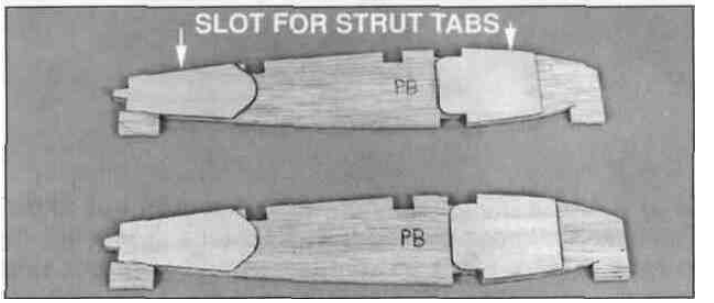
D 2. Use the same procedure to bevel the leading edge of the rudder.



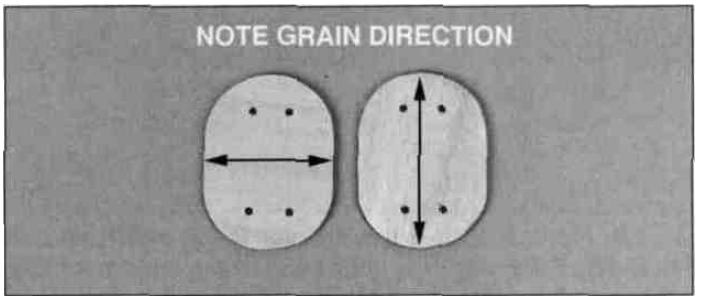
D 3. Draw a centerline on the stab LE, stab tips, elevator tips, elevator TE'S, fin LE, fin tip, rudder tip and rudder TE. Use you bar sander and 150-grit sandpaper to round the edges as shown on the plan. Use the centerline as a guide to keep the radius symmetrical. **Do not** round the TE of the stab.

BUILD THE BOTTOM WING

Bottom Wing Preassembly



D 1. Use 30-minute epoxy to glue the four forward and four aft die-cut 1/16" ply **rib doublers** to both sides of the two die-cut 1/8" balsa **R-PB ribs.** Take extra care to not get epoxy in the slots for the **strut tabs.**

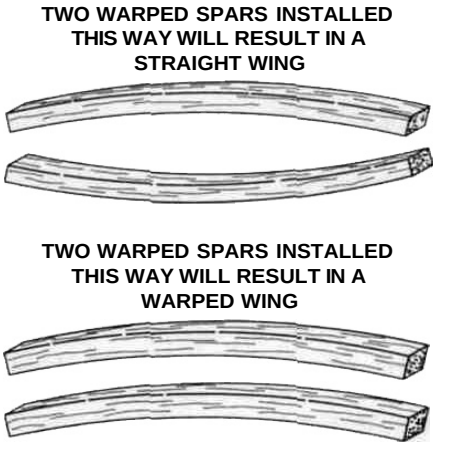


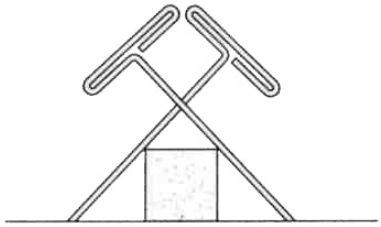
D 2. Use 30-minute epoxy to glue the sixteen die-cut 1/16" ply **strut tabs** together to make eight pairs. **Note:** The die-cut 1/16" ply strut tabs have been cut with the wood grain running in opposite directions. Glue together **one of each** to make 1/8" plywood strut tabs. Also make sure that the punch marks can be seen.

D 3. After the epoxy has cured, drill a **1/16"** hole through the strut tabs, at each of the punch marks.

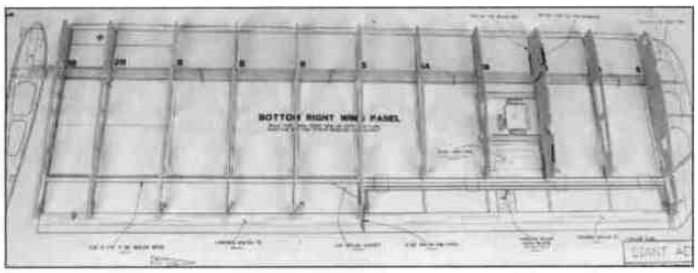
Build The Wing Panels

*Start by building the bottom right wing panel right side up over the right wing panel plan. Match together sets **of** spars so any warps will counteract each other.*





D D 1. Cover the bottom right wing plan with wax paper. Then use the cross-pinning technique (see sketch above) to pin a 3/16" x 1/2" x 36" **hardwood main bottom spar** over the wing plan. The spar should be **flush** with the outside face of rib R-6.

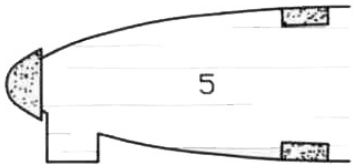


D D 2. Place the die-cut wing ribs **R-1B, R-2B, R-5, R-5A, R-5B, R-PB** and **R-6** on the top of the spar, over their locations on the plan.

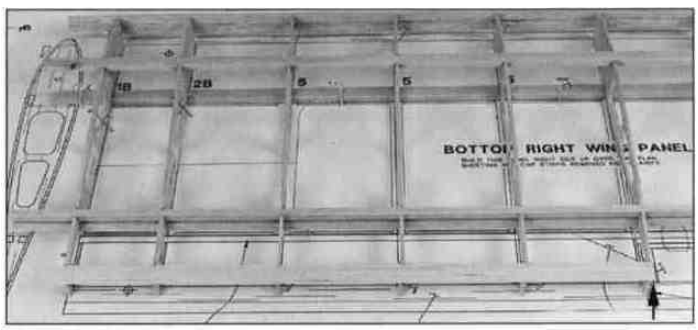
Note: While the jig tabs should be contacting the plan, you should check rib alignment with a straightedge. Shim the forward or aft jig tabs with paper to raise any ribs that are low. Use small T-pins to pin the forward and aft jig tabs to the building board over their location on the plan. On the aft jig tabs, insert the T-pins at an angle from the rear so they can be removed after the TE and sheet is glued in position.

D D 3. Place the 3/16" x 1/2" x 36" hardwood **main top spar** in the notches of the ribs. The end of the spar should be flush with the outside face of rib R-6 and with the top of the ribs. With the ribs perpendicular to the building board, glue the ribs to the top and bottom spars with thin CA.

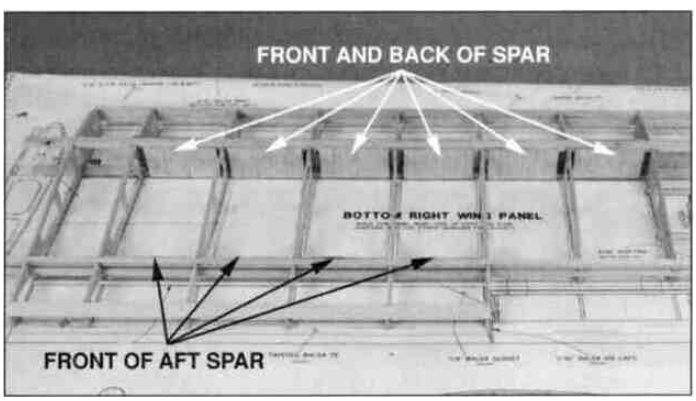
D D 4. Insert the 1/4" x 1/4" *x* 36" balsa aft **spars** in the notches in the aft end of the ribs. The end of the spar should be flush with the outside face of rib R-6 and with the edges of the ribs. As you are gluing the spars to the ribs with thin CA, check that the ribs are perpendicular to the building board and the jig tabs are against the building board. *(See note above.)*



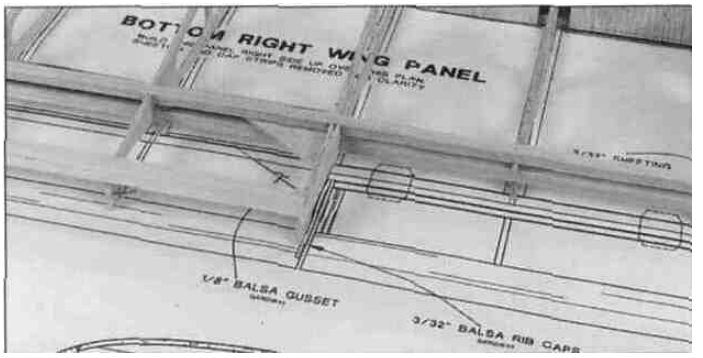
D D 5. Position the 36" shaped balsa **leading edge** (LE) on the front of the ribs. The LE should be centered on all ribs and the tip end should extend past rib R-6 by at least 1-5/8". Make sure all the jig tabs are contacting the building board, then use thin CA to glue the LE to the front of the ribs.



D D 6. Cut the 36" balsa **trailing edge** (TE) 17" long. Use thin CA, to glue the TE to the ends of ribs R-1B, R-2B and R-5.

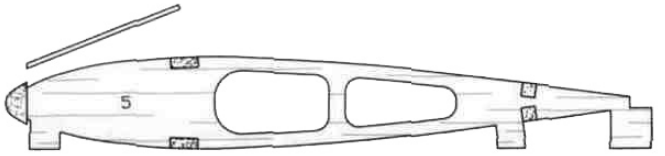


D D 7. From the 3/32" x 3" x 24" balsa sheets, make **shear webs** to fit on the **front** of the main spar starting at rib **R-2B** to **R-6,** behind the main spar from rib **R-2B** to **R-5B** and to the front of the aft spar from rib **R-2B** to the **aileron bay.** The grain of the shear webs runs perpendicular to the spars and the shear webs must be glued securely to the spars.



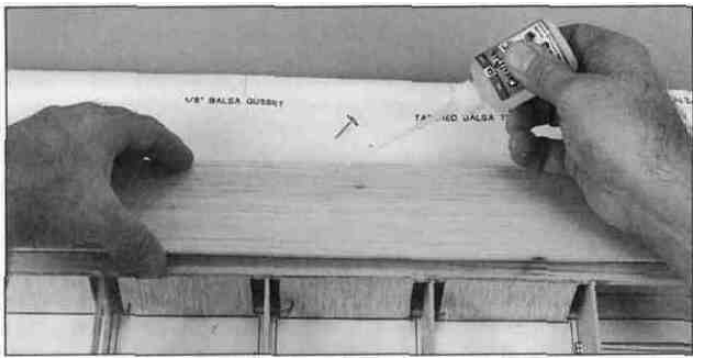
D D 8 Use medium CA to glue the die-cut 1/8" balsa **gusset** to rib R-5 and the shear web Sand the TE flush with rib R-5 Then glue the die-cut 1/8" balsa **rib caps** to ribs R-5 and R-6.

Sheet The Top Of The Wing

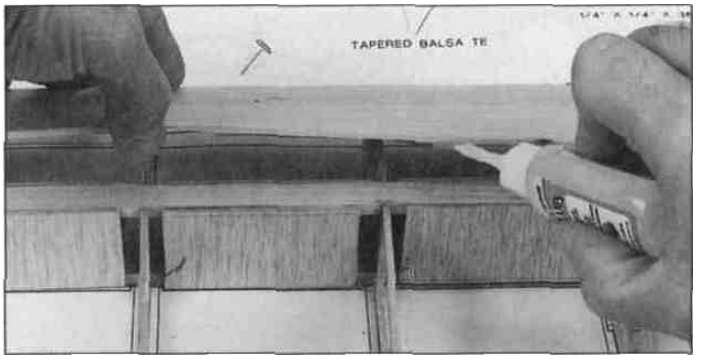


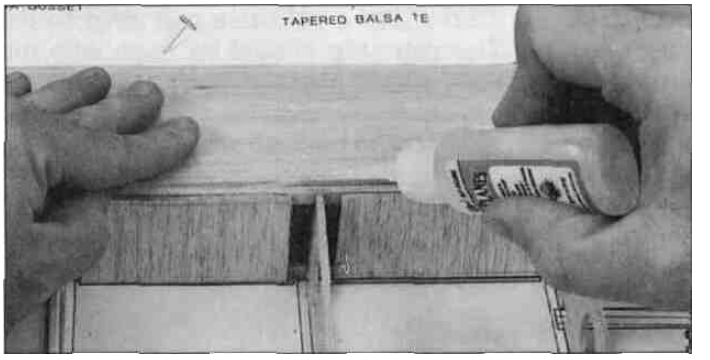
D D 1 Fit a 3/32" x 3" x 36" balsa sheet to the top of the wing panel by first sanding a bevel on the front edge of the sheet to match the angle of the leading edge of the wing Before you glue the LE sheet in position, remove the T-pins from the **front** jig tabs Reinstall the T-pins through the ribs right behind the bottom main spar

Note: Save all leftover 3/32" sheeting for use on the fuselage.

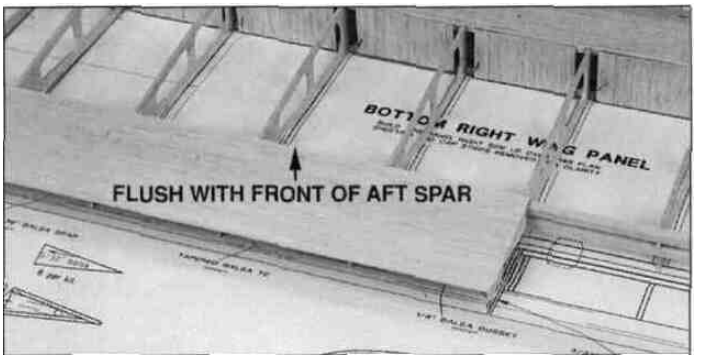


D D 2 Wet the outside of the LE sheet so it will bend more easily **Hint:** A 50/50 mix of water and either alcohol or ammonia helps soften the wood fibers so the sheet is even easier to bend Position the front of the sheet against the LE and flush with the side of rib R-6 Glue it in position with thin **CA.**

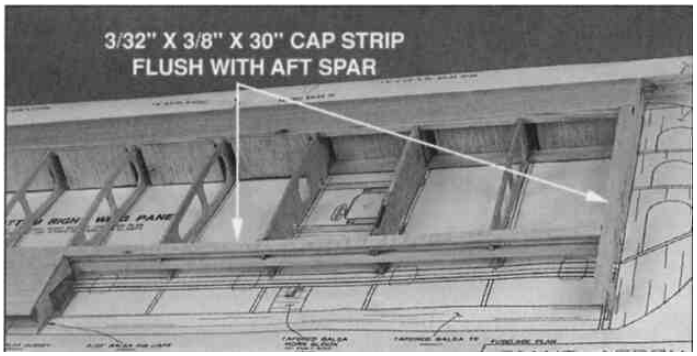




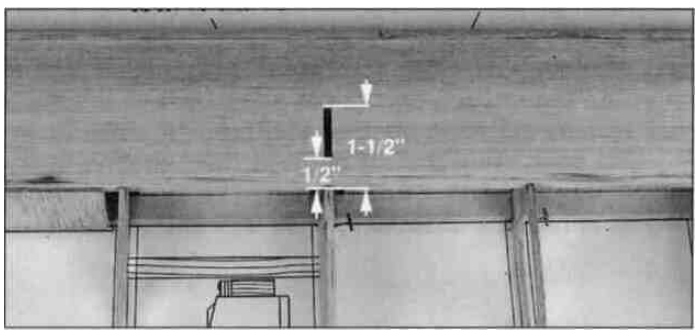
D D 3 Wet the sheet once more Carefully lift the sheet away from the ribs Then apply a bead of medium or thick CA to the top of each rib Working quickly, pull the sheet back toward the main spar as you press it down to the ribs and spar Glue the aft edge of the sheeting to the main spar with thin CA Use masking tape T-pins or weights to hold the sheet to the ribs until the CA cures



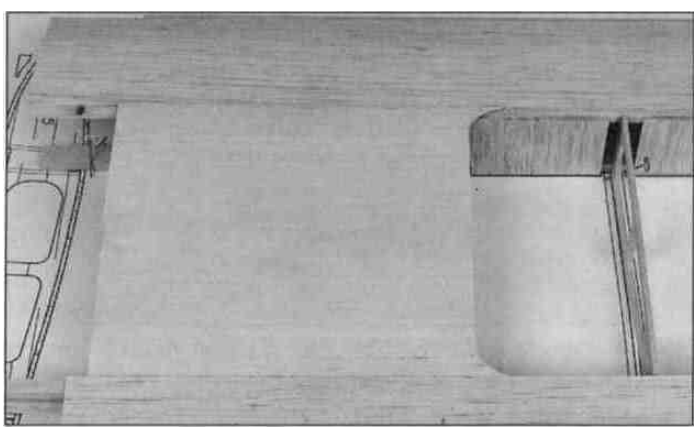
D D 4 Lightly sand the TE area so that the TE and aft balsa spar are flush with the top of the ribs From a 3/32" x 3" x 36" balsa sheet, cut a TE sheet 17-1/4" long Save the cut off piece for the bottom TE Glue the sheet to the TE and ribs so that it overhangs the balsa rib cap, at rib R-5, by 1/32" and is flush with the front edge of the aft balsa spar **Do not** trim the sheet at the TE.



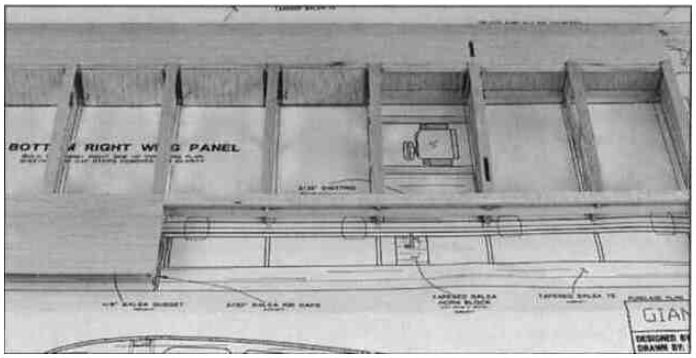
D D 5. Glue a 3/32" x 3/8" x 30" balsa **cap strip** on the top of rib R-6. The cap strip should be flush with the outside of the rib and extend past the TE by 1/2". Use the leftover cap strip to cover the aft balsa spar from rib R-5 to R-6. The cap strip should be flush with the front of the aft balsa spar.



D D 6. To locate the slot for the strut tab in rib R-PB, place a mark 1/2" and 1-1/2" from the aft edge of the top main spar. Use the side of rib R-PB as a guide to mark the sides of the slot. Using a **sharp** hobby knife, trim the LE sheet from over the slot.



D D 7. Use a 3/32" x 3" x 30" balsa sheet to make the **center sheeting** between the LE sheet and the TE sheet. Before you glue the center sheeting in position, remove the T-pins from ribs R-1B, R-2B and R-5.

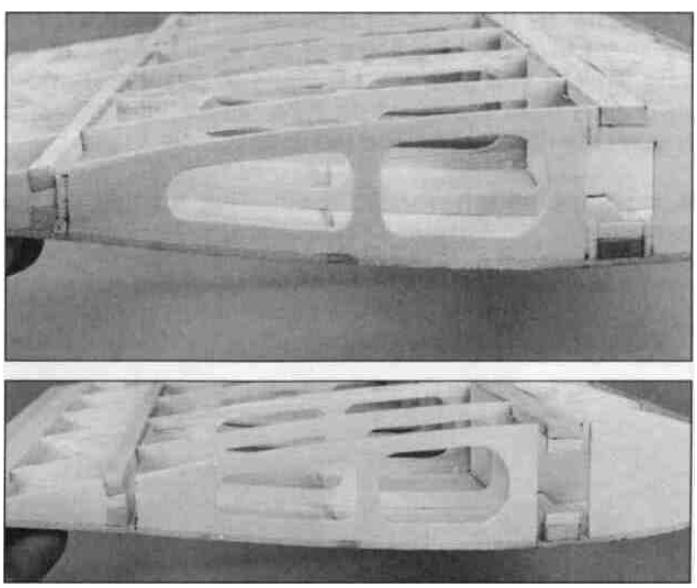


D D 8. From the 3/32" x 3/8" x 30" balsa sticks, cut **cap strips.** Use medium CA to glue them to the tops of the ribs. Be sure to cut an opening for the strut slot in the cap strip on rib R-PB.

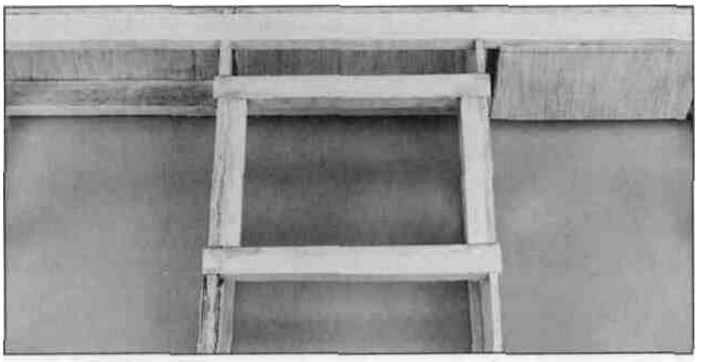
D D 9. Remove the T-pins and take the wing off your building board. Carefully remove the jig tabs. Using a sanding bar with 150-grit sandpaper, sand the ribs flush with the bottom main spar and aft balsa spar. Sand the TE sheet aft of the TE to match the angle of the TE and ribs.

Sheet The Bottom Of The Wing

D D 1. Use a razor saw and sanding bar to accurately cut the spars, LE, TE and top sheet flush with rib R-1B.



D D 2. On rib R-1B use a straightedge to draw lines connecting the front of the aft balsa spars, and the corner of the notch in front of the aft balsa spar. Also, draw lines connecting the front and aft corners of the top and bottom main spars. Then draw lines continuing the sides of the die-cut rectangle. Use a razor saw to cut slots in front of the aft balsa spar and in front and behind the main spar.



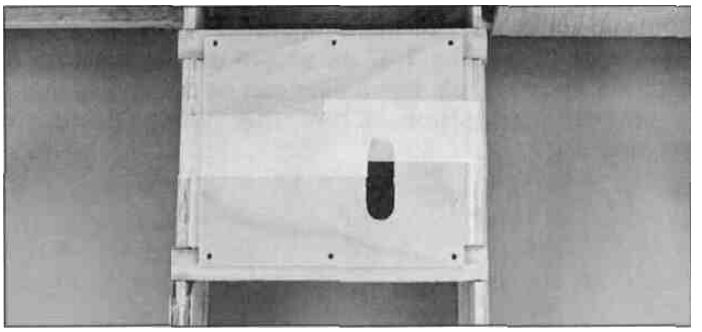
D D 3. Use 6-minute epoxy to glue the 1/4" x 3/8" x 3-3/4" hardwood **hatch blocks** into the notches in ribs R-5B and R-PB. After the epoxy has cured, cut **hatch guides** from 1/4" x 1/4" x 30" balsa stick. The guides fit between the hatch blocks and are flush with the top of rib R-5B and R-PB. Glue in place with thin CA.

D D 4. Fit a 3/32" x 3" x 36" balsa sheet to the bottom of the wing panel by first sanding a bevel on the front edge of the sheet so it matches the leading edge of the wing. Install the bottom LE sheet following the same procedure used to install the top LE sheet.

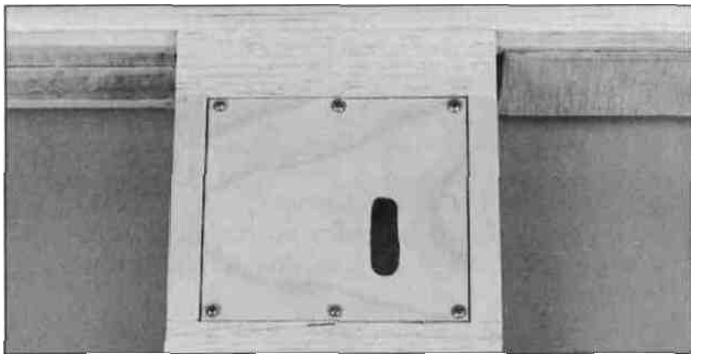
D D 5. From the 3/32" x 3" x 36" balsa sheet leftover from the top TE, sheet the bottom TE from rib R-1B to R-5 following the same procedure.

D D 6. Glue a 3/32" x 3/8" x 30" balsa **cap strip** on the bottom of rib R-6. The cap strip should be flush with the outside of the rib. Use the left over cap strip to sheet the aft balsa spar from rib R-5 to R-6. The cap strip should be flush with the front of the aft balsa spar.

D D 7. Use a 3/32" x 3" x 30" balsa sheet to sheet the center of the wing panel between the LE and TE sheets. There may be a slight gap between the sheets. Use thick CA to fill the gap, wipe off the excess then spray the area with accelerator to harden the joint.



D D 8. Center the die-cut 1/16" birch ply **aileron servo hatch** over the opening for the aileron servo. Tape the hatch in place and drill six 1/16" pilot holes at the punch marks on the aileron hatch and into the hatch blocks. Remove the hatch and place a drop of thin CA in each hole in the hatch block. Wipe off the excess CA. Enlarge the holes to 1/8". Reinstall the hatch. Secure the hatch to the hatch blocks with six #2 x 3/8" flat head screws (SCRW024).

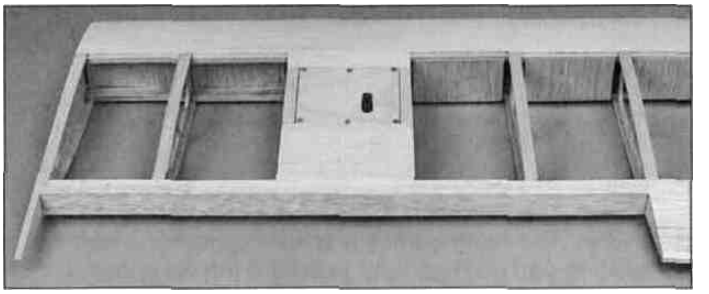


D D 9. Use medium CA to glue 3/32" balsa cap strips to the ribs at the side of the aileron servo hatch. From a 3/32" x 3" x 24" balsa sheet, fill the gap between the hatch and the LE sheet and the hatch and the TE sheet. Leave a 1/32" gap around the hatch to allow for the thickness of the covering. Save the leftover sheet for use around the hatch on the other wing panels.

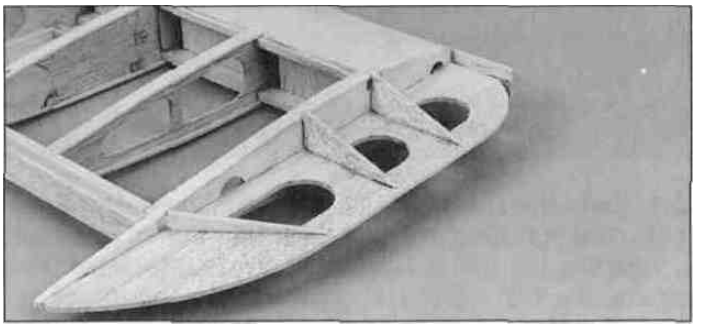
D D 10. From the 3/32" x 3/8" x 30" balsa sticks, cut cap strips for the remaining ribs. Use medium CA to glue them to the bottom of the ribs.

Finish The Wing Panel

D D 1. Use a razor saw and sanding bar with 150-grit sandpaper to trim the bottom sheeting flush with rib R-1B. Also, sand the sheeting in the aileron bay flush with the aft balsa spars and the balsa rib caps.



D D 2. From the 5/16" x 15/16" x 18" balsa stick make **a sub TE** to fit between the rib caps, against the aft balsa spars. Glue the sub TE centered on the aft balsa spars and rib caps. Use a sanding bar to sand the edges of the sub TE flush the the wing sheeting.

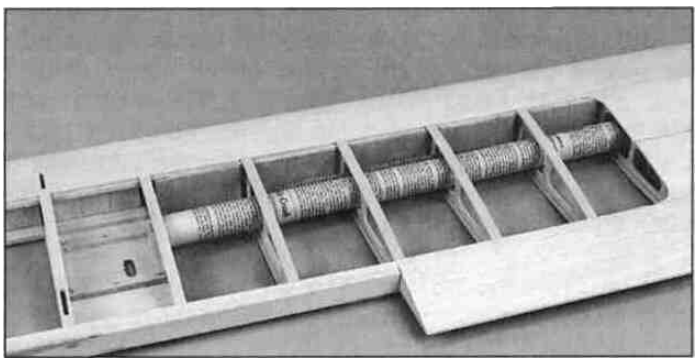


D D 3. Use medium CA to glue the die-cut 1/8" balsa **wing tip** perpendicular to rib R-6. Glue the die-cut 1/8" balsa **wing tip formers** to the top and bottom of the wing tip. Sand the tip of the formers flush with rib R-6.

EXPERT TIP

How To Make Servo Lead Tubes:

When the aileron servos are mounted out in the wing, it can be difficult to run the servo wires through the ribs to the wing root. An easy solution is to make servo wire tubes.

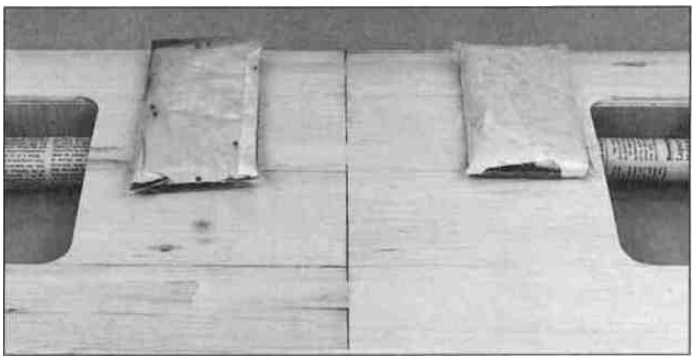


A. Cut a piece of newspaper slightly longer than the length needed to reach from the aileron servo bay to the wing root.

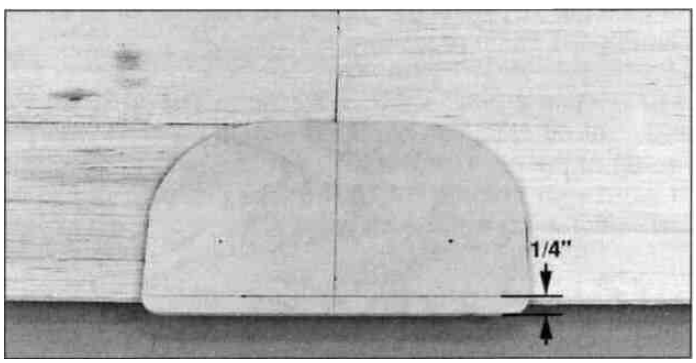
B. Roll the newspaper into a tube slightly smaller than the holes in the wing ribs. Use a couple of pieces of tape to hold the tube together.

C. Insert the tube into the wing aligning the holes with the tube. Tack glue the tube to the ribs with CA.

D 4. Give the wing panel a quick sanding. Then set it aside while you go back and build the left wing panel.



D 2. After you are satisfied with the fit, take the wing joiners and bolt plate out of the wing panels. Mix approximately 1 oz. of 30-minute epoxy. Use plenty of epoxy to coat the main and aft spars, the slot in ribs R-1B and R-2B, the wing joiners, bolt plate and the face of ribs R-1B. Insert the wing joiners and bolt plate in the wing panel and press the wing panels together. Wipe off any excess epoxy with rubbing alcohol and a paper towel. Tape the two wing panels together and weight them down on a flat surface. Check that the LE is straight and the wing panels are flat against the surface.



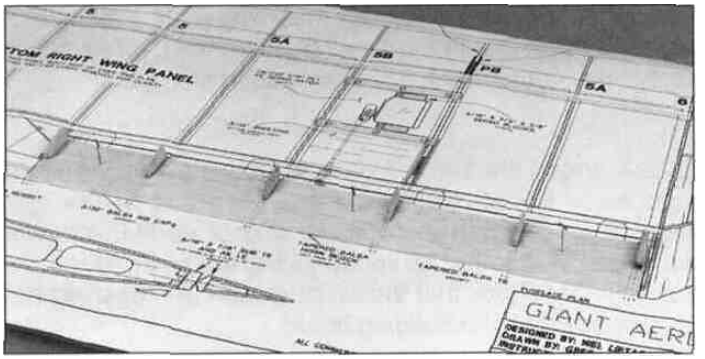
D 3. Use a sanding bar to sand the bottom center section smooth and the TE straight. Draw a centerline on the top of the die-cut 1/8" plywood **wing plate.** Also, draw a line 1/4" from the aft edge. Sand a taper on the edges of the wing plate. Use 6-minute epoxy to glue the wing plate, centered on the TE of the wing. **Note:** The wing plate overhangs the TE by 1/4" as shown on the wing plan. After the epoxy cures, balsa filler can be applied to make a smooth transition from the wing plate to the wing.

Joining The Wing Panels

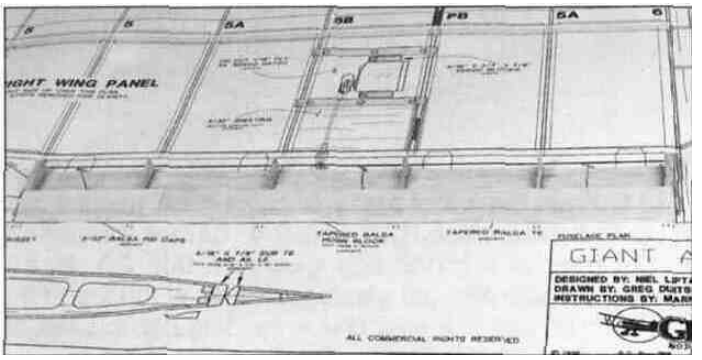
D 1. Sand the spars, LE, TE and sheeting flush with rib R-1B. Without using any glue, test **join the wing panels** by inserting the 1/8" x 1-5/8" x 5" plywood **forward wing joiners,** the 1/8" x 5/8" x 5" plywood **aft wing joiner** and the 1/4" x 1" x 12" plywood **wing bolt plate** into the right wing panel. Join the left wing panel to the right wing panel. Set the wing on a flat surface and use a straight-edge to check that the LE is straight. If not, use a sanding bar to sand the wing root and test fit again.

Build The Ailerons

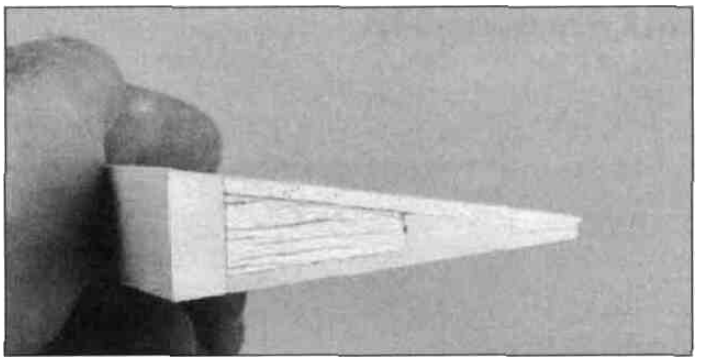
D D 1. Lay a piece of wax paper over the right aileron plan. Cut a 3/32" x 3" x 36" balsa sheet in half. Trim both sheets to 2-1/8" wide to make the **top** and **bottom aileron sheeting.** Pin one of the sheets in position over the plan.



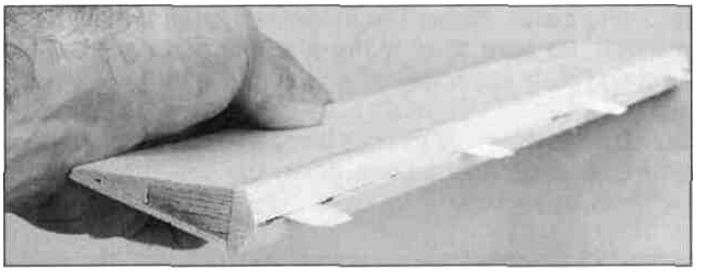
D D 2. Draw lines on the sheet using the alignment marks on the plan as a guide Align the die-cut 3/32" balsa **aileron ribs** with the marks on the sheet Use thin CA to glue the aileron ribs perpendicular to the bottom sheet and flush with the LE.



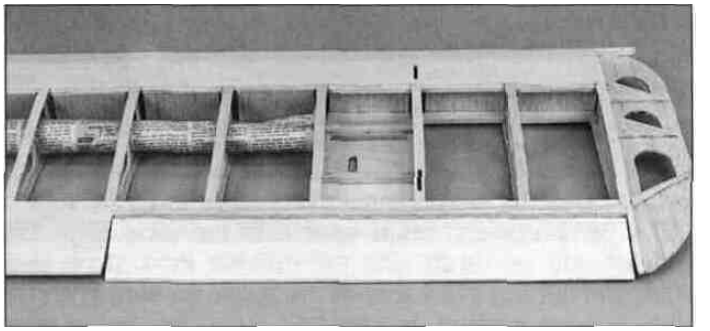
D D 3 Use the leftover balsa TE from the wing panel to make the TE on the aileron Glue it in position against the aft end of the aileron ribs with medium CA Remove the aileron from the building board and using a sanding bar, sand an angle on the bottom sheet to match the angle of the ribs and TE



D D 4 Cut the 4" **tapered balsa horn block** into four 1" long pieces Use medium CA to glue the tapered balsa horn block in position Then use medium CA to glue the 3/32" balsa top sheet to the TE , bottom sheet and flush to the LE of the ribs Use a sanding bar to sand the LE smooth Mark the balsa horn block location on the aileron sheeting with a piece of masking tape Glue a 5/16" x 15/16" x 18" balsa stick to the front of the sheeting and the aileron ribs to make the **aileron LE** Sand the LE to the same angle as the sheeting Sand the sheeting and LE flush with the end ribs.



D D 5 As described in the Building The Stabilizer section, draw a centerline on the aileron LE Then draw a line 1/4" back on both sides of the aileron LE Mark the hinge locations and cut the slots for the hinges Using a razor plane and a sanding bar, bevel the LE as shown on the wing plans.



D U 6 Draw a centerline on the sub TE of each aileron bay on the wing Mark the hinge locations and cut the slots for the hinges Test fit the ailerons to the wing.

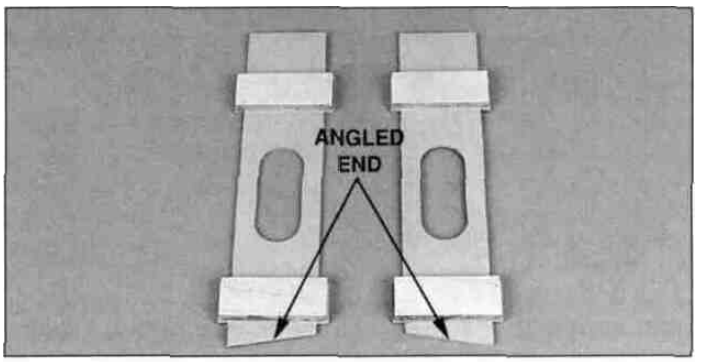
It's time to clean off your building table and take a break before starting the top wing

BUILD THE TOP WING

Top Wing Pre-assembly

D 1 Use 30-minute epoxy to glue the four forward and four aft die-cut 1/16" ply **rib doublers** to both sides of the two die-cut 1/8" balsa **R-PT ribs** Take extra care not to get epoxy in the slots for the **strut tabs.**

D 2 Drill a 1/8" hole through each of the punch marks on the die-cut 1/8" plywood **cabane mounting plates.**



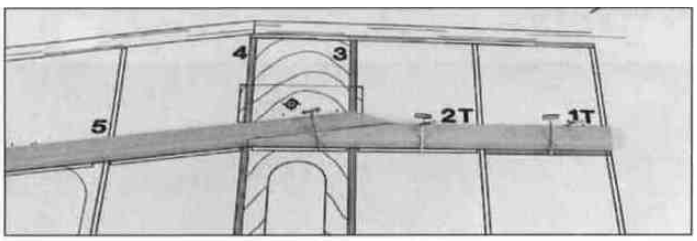
D 3 Use 6-minute epoxy to glue the 1/4" x 1" x 2-3/8" plywood **cabane mounting plate doublers** to the cabane

mounting plates. **Note:** The mounting plates are angled at one end. Be sure to to **make a left and a right** cabane mounting plate assembly.

D 4. Drill a #10 (13/64") hole through each of the cabane mounting plate assemblies using the previously drilled 1/8" hole as a guide.

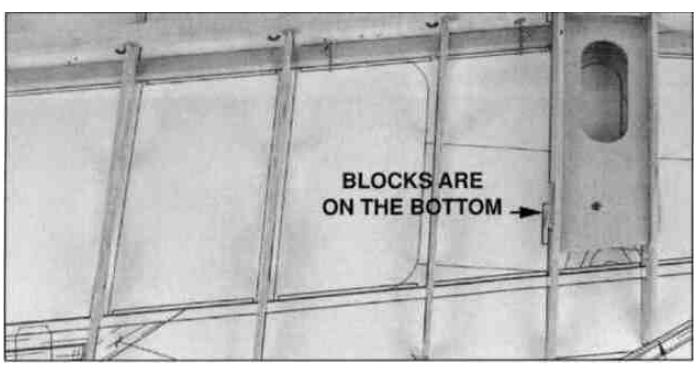
Build The Wing Panels

Start by building the right top wing panel, upside down, over the left wing panel plan.



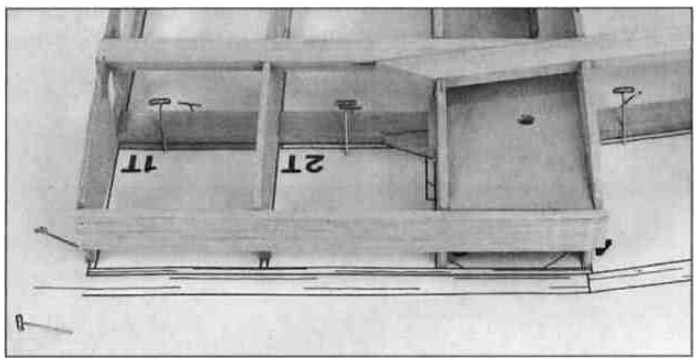
D D 1. Use the cross-pinning technique to pin a 3/16" x 1/2" x 36" hardwood **main spar** over the wing plan. The spar should be **flush** with the outside face of rib R-6. Mark and cut the main spar at the splice as shown on the plan. From a second 3/16" x 1/2" x 36" hardwood main spar, cut the 3/16" x 1/2" x 7" hardwood **main center spar.** Save the excess for the other main spars. Glue the two spars together with 6-minute epoxy. After the epoxy has cured, remove the spar and splice the second spar together over the plan. **Don't forget to cover the plans with wax paper.**

D D 2. Fit the cabane mounting plate assembly into the slots in ribs R-3 and R-4. Place the die-cut wing ribs **R-1T, R-2T, R-3, R-4, R-5, R-5A, R-5T, R-PT** and **R-6** on the top of the spar, over their locations on the plan.
Note: The jig tabs should be contacting the plan. Use small T-pins to pin the **forward** and **aft jig tabs** to the building board over their location on the plan. On the aft jig tabs, insert the T-pins at an angle from the rear so they can be removed after the TE and sheeting are glued in position.



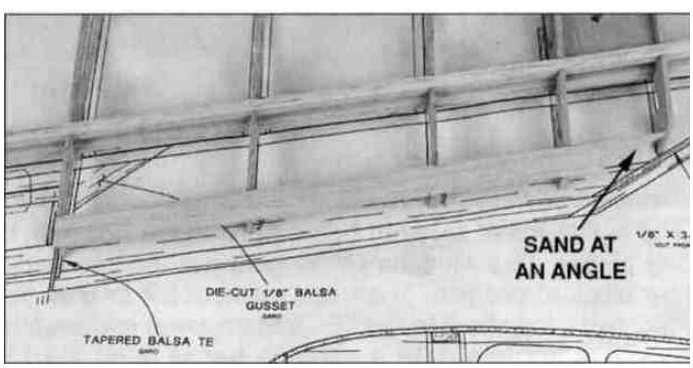
D D 3. Place the second 3/16" x 1/2" x 36" hardwood **main spar** in the notches of the ribs. The end of the spar should be flush with the outside face of rib R-6 and with the top of the ribs. With the ribs perpendicular to the building board, glue the ribs to the top and bottom spars with thin CA. Glue the cabane mounting plate assembly to ribs R-3 and R-4 with medium CA. After the CA has cured, apply thick CA to make a fillet for added strength.

D D 4. Insert the 1/4" x 1/4" x 36" balsa **aft spars** in the notches in the aft slot in the ribs. The end of the spar should be flush with the outside face of rib R-6 and with the edges of the ribs. As you're gluing the spars to the ribs with thin CA. check that the building tabs are touching and perpendicular to the building board.

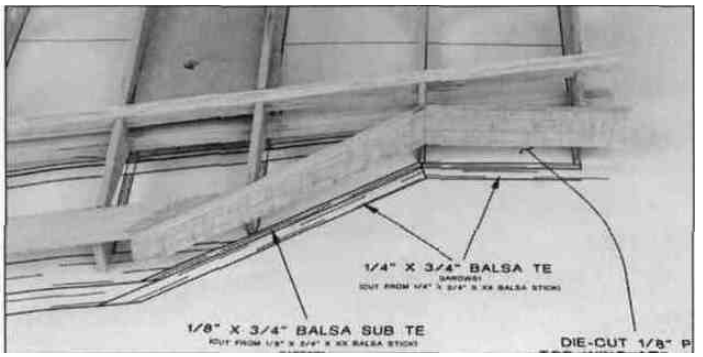


D D 5. From the 1/8" x 3/4" x 8" balsa stick, make a **sub LE** to fit between ribs R-1T and R-4. **Center** the sub LE on the front of the ribs and glue with thin CA. Use a sanding bar with 220-grit sandpaper to sand the top of the sub LE flush with the ribs. Use a sanding bar to sand an angle on the sub LE at rib R-4 for the LE to attach to.

D D 6. Position the 30" shaped balsa **leading edge (LE)** on the front of the ribs. The LE should be centered on ribs R-4 through R-6 and the tip end should extend past rib R-6 by at least 1-5/8". Make sure all the jig tabs are contacting the building board. Then use thin CA to glue the LE to the front of the ribs.



D D 7. Cut the 36" balsa **trailing edge** (TE) 12" long. Use thin CA to glue the TE to the ends of ribs R-4 and R-5 so that 1/16" extends past rib R-5 into the aileron bay. Use a sanding bar to sand the end of the TE flush with rib R-5. Sand the other end of the TE at the angle shown on the plan.

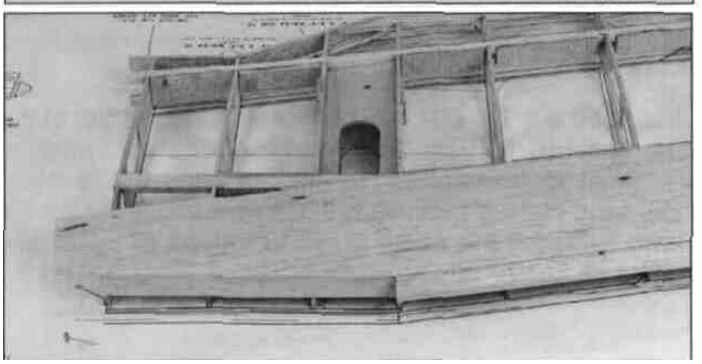


D D 8. From the 1/8" x 3/4" x 8" balsa stick, make a **sub TE** to fit between ribs R-1T and the just installed in step 7. **Center** the sub TE on the aft end of the ribs and the balsa TE and glue with thin CA. Use a sanding bar with 220-grit sandpaper to sand the top of the sub TE flush with the ribs and the TE.

D D 9. From the 3/32" x 3" x 24" balsa sheets, make **shear webs** to fit on the front and back of the main spar between ribs **R-2T** and **R-3** and from ribs **R-4** to **R-5T.** The front shear webs extend to rib R-6. Also, glue shear webs to the front of the aft balsa spars from ribs R-1T to R-5. The grain of the shear webs runs perpendicular to the spars and must be securely glued to the spars.

D D 10. Use medium CA to glue the die-cut 1/8" balsa **gusset** to rib R-5 and the shear web. Sand the TE flush with rib R-5. Then glue the die-cut 3/32" balsa **rib caps** to ribs R-5 and R-6.

Sheet The Bottom Of The Wing



D D 1. Fit a 3/32" x 3" x 36" balsa sheet to the bottom of the wing panel by first sanding a bevel on the front edge of the sheet so it matches the leading edge of the wing. Before you glue the LE sheet in position, remove the T-pins from the **front** jig tabs in the wing ribs. Reinstall the T-pins through the ribs right behind the main spar. Position the front of the sheet against the LE and flush with the side of rib R-6. Glue it in position with thin CA. Wet the sheet so it will bend easier. Then, carefully lift the sheet away from the ribs and apply a bead of medium or thick CA to the top of each rib. Working quickly, pull the sheet back toward the main spar as you press it down to the ribs and spar. Then glue the aft edge of the sheet to the main spar with thin CA. Use masking tape, T-pins or weights to hold the sheet to the ribs until the CA cures. Using a hobby knife and a sanding bar, trim the sheet flush with the sub LE.

D D 2. Lightly sand the TE area so that the TE and aft balsa spar are flush with the top of the ribs. From a 3/32" x 3" x 36" balsa sheet, cut a TE sheet in half. Save the other half for the top TE. Glue the sheet to the TE and ribs so that the forward edge is flush with the forward edge of the aft balsa spar. The sheet overhangs the balsa rib cap, at rib R-5, by 1/32". **Do not** trim the sheet at the TE. Using a hobby knife and a sanding bar, trim the sheet flush with the balsa rib cap at R-5.

D D 3. Glue a 3/32" x 3/8" x 30" balsa **cap strip** on the top of rib R-6. The cap strip should be flush with the outside of the rib and extend past the TE by 1/2". Use the leftover cap strip to sheet the aft balsa spar from rib R-5 to R-6. The cap strip should be flush with the front of the aft balsa spar.

OPTIONAL AILERON SERVOS IN THE TOP WING

On our test models, the Giant Aeromaster flew great with aileron servos in the lower wing only. But, if you would prefer to have aileron servos in both wings, the aileron servo hatch is installed following the same procedure as the bottom wing.

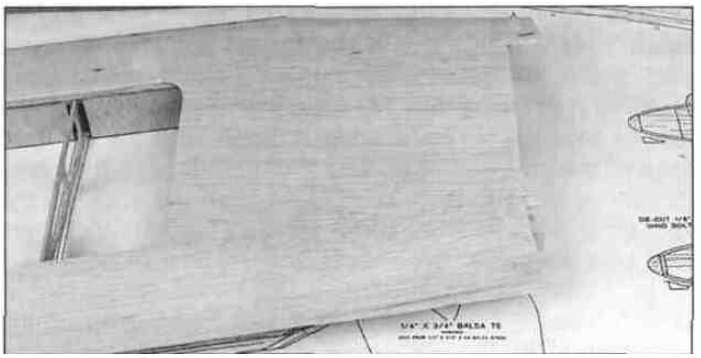
1. Use 6-minute epoxy to glue the 1/4" x 3/8" x 3-3/4" hardwood **hatch blocks** into the notches in ribs R-5T and R-PT. After the epoxy has cured, cut **hatch guides** from 1/4" x 1/4" x 30" balsa stick. The guides fit between the hatch blocks and are flush with the top of rib R-5T and R-PT.

2. Center the die-cut 1/16" birch ply **aileron servo hatch** over the opening for the aileron. Tape the hatch in place and drill six 1/16" pilot holes at the embossed marks on the aileron hatch and into the hatch blocks. Remove the hatch and place a drop of thin CA in each hole in the hatch block. Wipe off the excess CA and after the CA has cured, reinstall the hatch. Secure the hatch to the wing with six #2 x 3/8" flat head screws.

3. Use medium CA to glue 3/32" balsa cap strips to the ribs at the side of the aileron servo hatch. Mark the rear location of the strut slot on the side of rib R-PT. From the leftover 3/32" x 3" x 36" balsa sheet used on the lower wing aileron servo hatch, fill the gap between the hatch and the LE sheet and the hatch and the TE sheet. Leave a 1/32" gap around the hatch to allow for the thickness of the covering. Save the leftover sheet for use around the hatch on the other wing panel.

4. Use the marks you placed on the side of rib R-PT to locate the rear strut slot. Use a sharp hobby knife to trim the sheet from over the slot.

D D 4. To locate the slot for the front strut tab in rib R-PT, place a mark 1/2" and 1-1/2" from the aft edge of the main spar. Use the side of rib R-PT as a guide to mark the sides of the slot. Using a **sharp** hobby knife trim the sheet from over the slot.



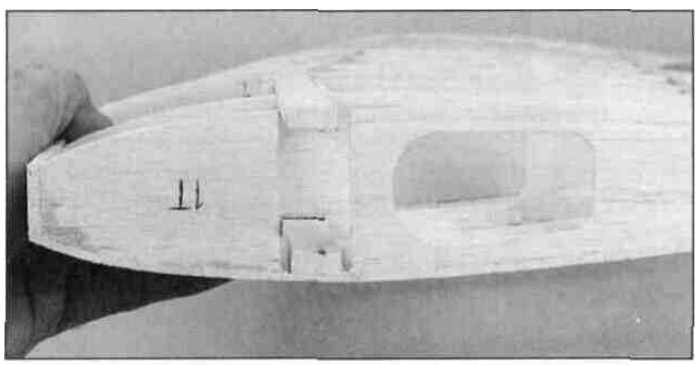
D D 5. Use a 3/32" x 3" x 24" balsa sheet to make the **center sheeting** that fits between the LE sheet and the TE sheet. Position the sheeting so that it is perpendicular to the ribs. Before you glue the center sheeting in position, remove the T-pins from ribs R-1T through R-5. **Note:** The grain direction of the center sheeting should be perpendicular to the ribs as shown.

D D 6. From the 3/32" x 3/8" x 30" balsa sticks cut cap strips, then use medium CA to glue them to the tops of the ribs. Be sure to cut an opening for the strut slot in the cap strip on rib R-PT.

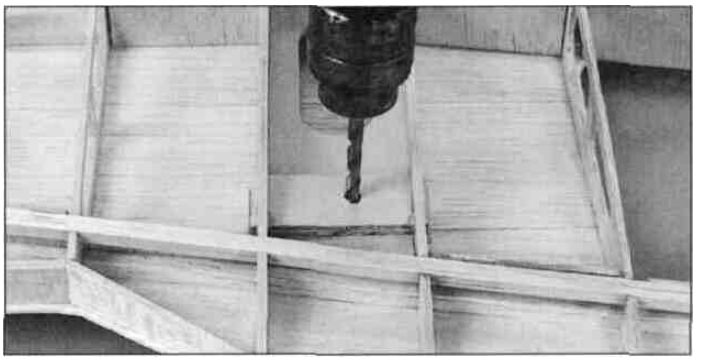
D D 7. Remove the T-pins. Take the wing off your building board. Carefully remove the jig tabs and use a sanding bar with 150-grit sandpaper to sand the ribs flush with the bottom main spar and aft balsa spar. Sand the TE sheet, aft of the TE and the sub TE, to match the angle of the ribs.

Sheet The Top Of The Wing

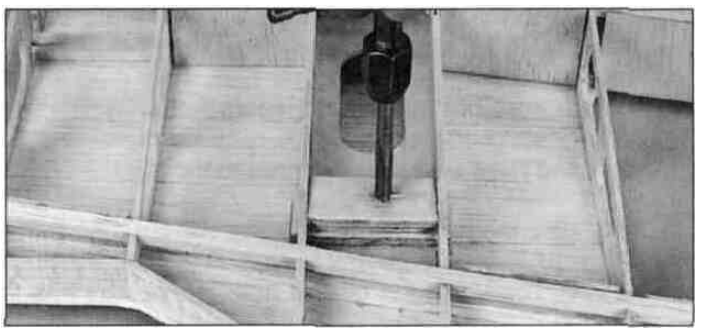
D D 1. Use a razor saw and sanding bar to accurately cut the spars, LE, TE and top sheet flush with rib R-1T.



D D 2. On rib R-1T use a straightedge to draw a line from the front edge of the top main spar to the front edge of the bottom main spar. Draw a line from the back edge of the top main spar to the back edge of the bottom main spar. Draw lines continuing the sides of the die-cut rectangle. Use a razor saw to cut a slot in front and behind the main spar.



D D 3. Use the holes in the cabane mounting plate as a guide to drill a #10 (13/64") hole through the bottom sheeting. To prevent the balsa sheeting from splitting, place a wood block behind the sheeting while drilling though it.



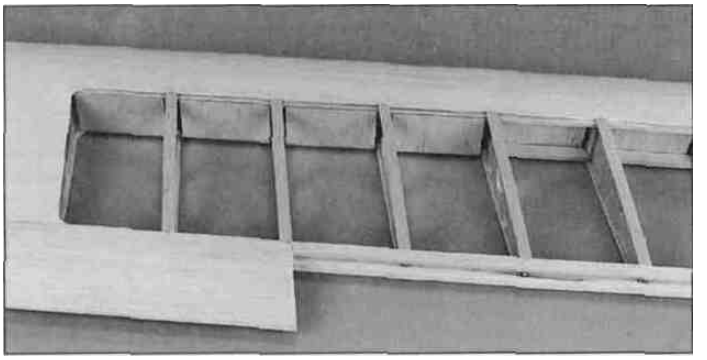
D D 4. Tap the holes with a 1/4-20 tap. Add a couple **of** drops of thin CA to the holes to harden the threads. Then retap the holes after the CA has fully cured.

D D 5. Fit a 3/32" x 3" x 36" balsa sheet to the top of the wing panel by first sanding a bevel on the front edge of the sheet so it matches the leading edge of the wing. Also, sand the sub LE flush with the ribs. Install the top LE sheet following the same procedure used to install the bottom LE sheet.

D D 6. From the remaining 3/32" x 3" x 36" balsa sheet used to sheet the bottom TE, sheet the top TE from rib R-1T to R-5 following the same procedure.

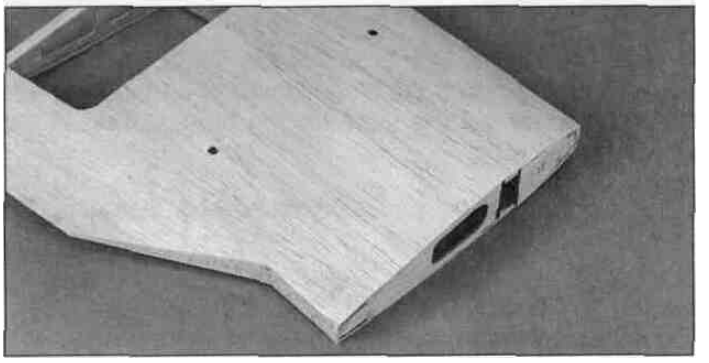
D D 7. Glue a 3/32" x 3/8" x 30" balsa **cap strip** on the top of rib R-6. The cap strip should be flush with the outside of the rib. Use the leftover cap strip to sheet the aft balsa spar from rib R-5 to R-6. The cap strip should be flush with the front of the aft balsa spar.

D D 8. Use a 3/32" x 3" x 24" balsa sheet to make the center sheeting between the LE and TE sheet on the top of the wing.



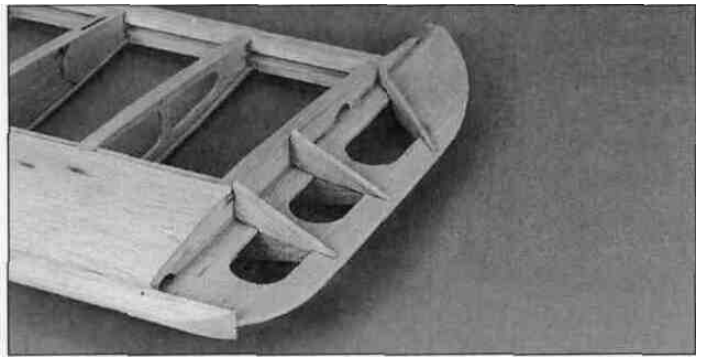
D D 9. From the 3/32" x 3/8" x 30" balsa sticks, cut cap strips, and then use medium CA to glue them to the bottom of the ribs.

Finish The Wing Panel



D D 1. Use a razor saw and sanding bar with 150-grit sandpaper to trim the top sheeting flush with rib R-1T and the sub LE and TE. Also sand the sheeting, in the aileron bay area, flush with the aft balsa spars and the balsa rib caps.

D D 2. From the 5/16" x 15/16" x 18" balsa stick, cut a **sub TE** to fit between the rib caps, against the aft balsa spars in the aileron bay. Glue the sub TE to the aft balsa spars and use a sanding bar to sand the edges flush with the wing sheeting.

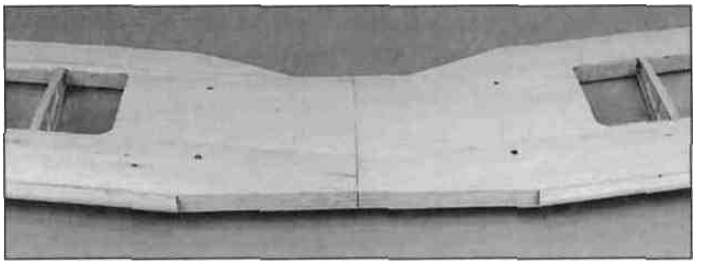


D D 3. Use medium CA to glue the die-cut 1/8" balsa **wing tip** (TTW) perpendicular to rib R-6. Glue the die-cut 1/8" balsa **wing tip formers** to the top and bottom of the wing tip. Sand the tip of the formers flush with rib R-6.

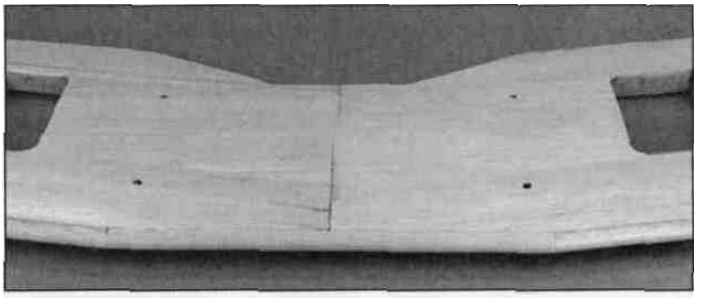
D 4. Give the entire wing panel a rough sanding and set it aside while you go back and build the left wing panel.

Joining The Wing Panels

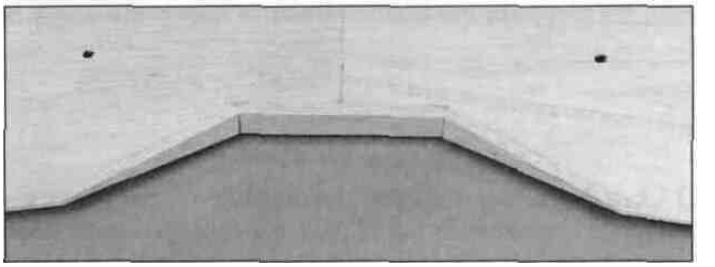
D 1. Sand the spars, LE, TE and sheeting flush with rib R-1T. Sand the wing tip ribs flush with the top and bottom sheeting. Using a razor saw, cut the 1/8" x 1-5/8" x 5" plywood **forward wing joiners** 4-13/16" long. Without using any glue, test join the wing panels by inserting the **forward wing joiners** and the two die-cut 1/8" plywood **aft wing joiners** into the right wing panel. Join the left wing panel to the right wing panel and set the wing on a flat surface. Use a straightedge along the sub LE to check that the LE is straight.



D 2. After you are satisfied with the fit, take the wing joiners out of the wing panels. Mix approximately 1 oz. of 30-minute epoxy. Use plenty of epoxy to coat the main and aft spars, the wing joiners and the face of ribs R-1T. Insert the wing joiners in the wing panel and press the wing panels together. Wipe off any excess epoxy with rubbing alcohol and a paper towel. Tape the two wing panels together and weight them down on a flat surface. Check that the sub LE is straight and the wing panels are flat against the surface.



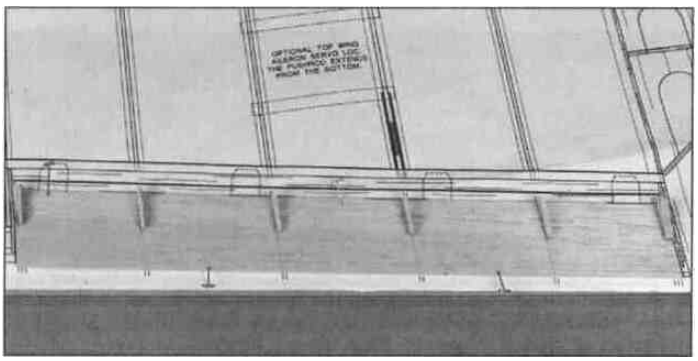
D 3. Use a sanding bar and 220-grit sandpaper to sand the sub LE flat. Cut the 30" balsa LE to fit on the sub LE between the previously installed LE'S. When satisfied with the fit glue the LE to the sub LE with medium **CA.**



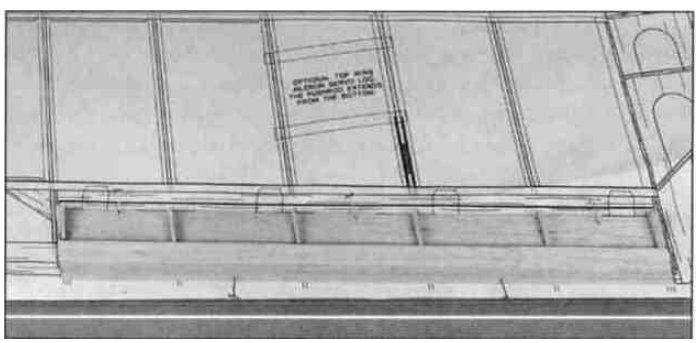
D 4. From the 5/16" x 15/16" x 18" balsa stick make the **center trailing edge.** Use medium CA to glue the TE centered on the sub TE. With a razor plane and a sanding bar, sand the TE flush with the top and bottom sheeting. Then sand a radius on the three TE pieces you just installed.

Build The Ailerons

D D 1. Position a piece of wax paper over the right aileron plan. Trim a 3/32" x 3" x 36" balsa sheet 2-1/8" wide. From the narrowed balsa sheet, make a **top** and **bottom aileron sheet.** Cut the sheet 1/16" longer than the plan. Pin one of the sheets in position over the plan.

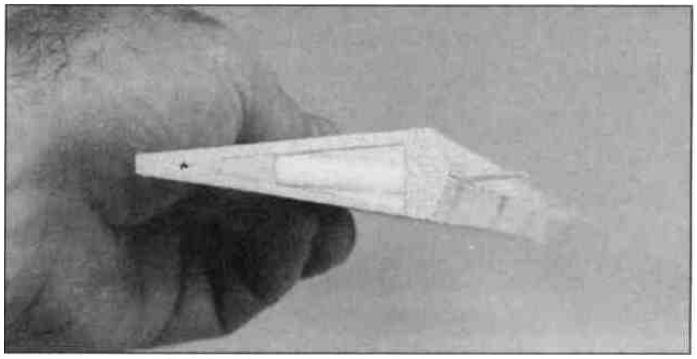


D D 2. Use thin CA to glue the eight die-cut 3/32" balsa **aileron ribs** perpendicular to the bottom sheet and flush with the LE. Use the marks on the plan to align the ribs.



D D 3. Use the leftover balsa TE from the wing panel to make the TE on the aileron. Glue it in position against the aft end of the aileron ribs with medium CA. Remove the aileron from the building board and using a sanding bar, sand an angle on the bottom sheet to match the angle **of** the ribs and TE.

D D 4. If you are installing optional aileron servos in the top wing, use medium CA to glue the **tapered balsa horn block** in position. For both versions use medium CA to glue the 3/32" balsa top sheet to the TE, bottom sheet and flush to the LE of the ribs. Use a sanding bar to sand the LE smooth. Use a piece of masking tape to mark the balsa horn block, if installed. Use the leftover 5/16" x 1" x 36" balsa stick from the wing panel to make the **aileron LE.** Sand the LE to the same angle as the sheeting and flush with the end ribs.



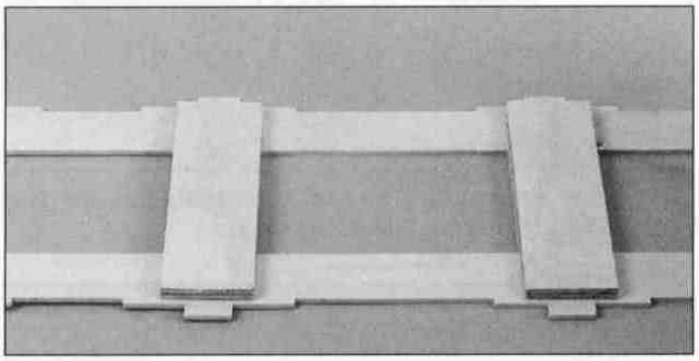
D D 5. As described in the *Building The Stabilizer* section, draw a centerline on the aileron LE. Then draw a line 1/4" back on both sides of the aileron LE. Mark the hinge locations and cut the slots for the hinges. Using a razor plane and a sanding bar, bevel the LE as shown on the wing cross-section.

D D 6. Draw a centerline on the sub TE of each aileron bay on the wing. Mark the hinge locations on the wing and the aileron and cut the slots for the hinges. Test fit the ailerons to the wing.

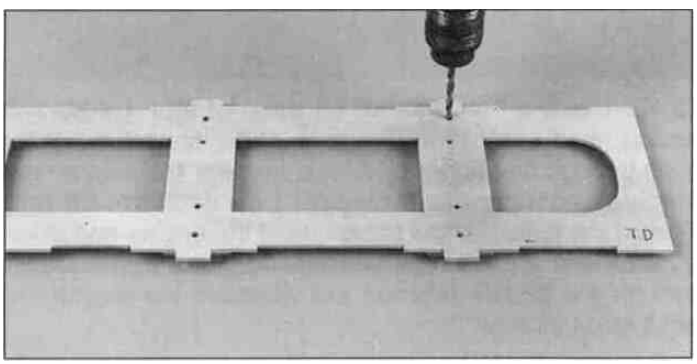
D 7. Go back to step 1 and build the second aileron.

BUILD THE FUSELAGE

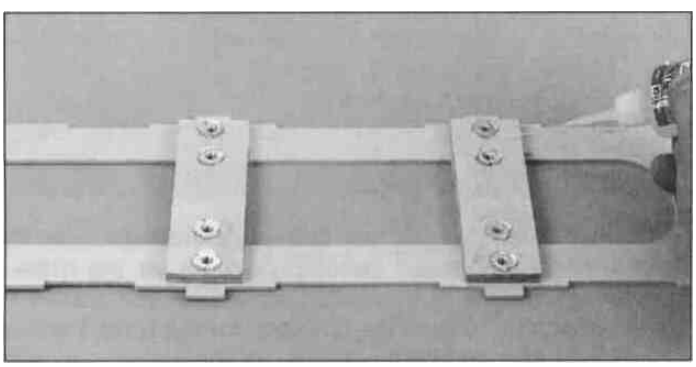
Fuselage Preassembly



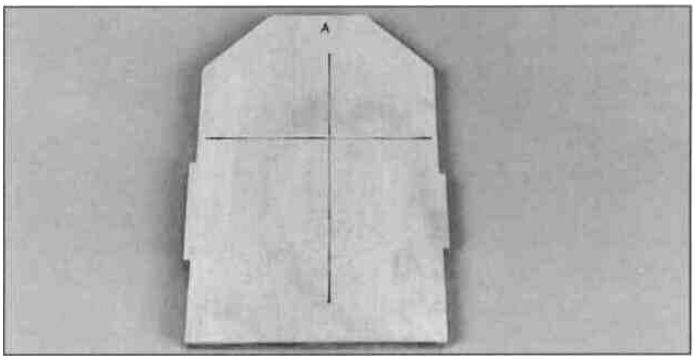
D 1. Use 6-minute epoxy to glue the shaped 1/4" x 1-1/2" x 4-1/2" ply cabane doublers to the top of the die-cut 1/8" ply **top deck** (TD) centered between the tabs and the die-cut holes. **Note:** The bottom side of the top deck features an embossed (TD).



D 2. Drill a 5/32" hole at each punch mark through the top deck and cabane doublers.



D 3. Press a **6-32 blind nut** into each hole. Use a 6-32 x 5/8" socket head bolt and #6 washer installed through the cabanes to pull the blind nuts into the cabane. This will ensure proper alignment of the cabanes and the blind nuts. Add a few drops of thin CA around each blind nut flange to secure them.

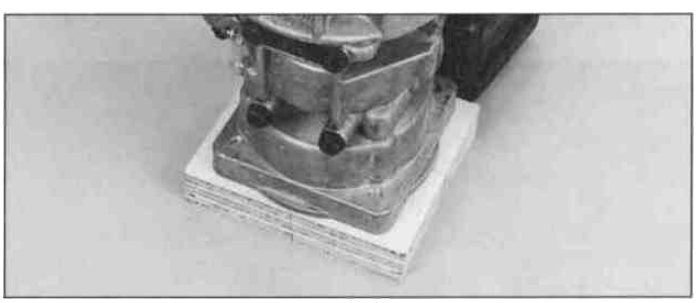


D 4. Draw centerlines connecting the punch marks on the front of the die-cut 1/8" ply **firewall (A).** Use 30-minute epoxy to glue firewall (A) to the shaped 1/4" ply **firewall doubler.** Make sure the lines you previously drew are facing **forward** and the bottom and edges of firewall (A) and the firewall doubler are aligned. Wipe off the excess epoxy before it cures.

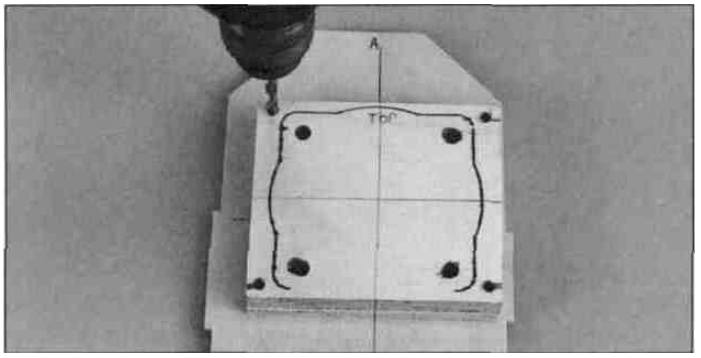
Note: If firewall (A) and the firewall doubler are warped, simply clamping them together may not "cancel out" the warp. It is best to clamp the assembly to a table or a flat board.

Important: We strongly recommend that any engine used on the Giant Aeromaster be installed on an isolated shock absorbing engine mount. The use of this type engine mount will help prevent damage to the radio system and the airplane frame due to engine vibration.

D 5. Skip ahead to step 10 if you will be installing the recommended **U.S. Engines 41cc** engine and J'TEC isolated engine mount on your Giant Aeromaster. If you are not installing the isolated engine mount, use 30-minute epoxy to laminate the three 1/4" x 3-1/4" x 3-3/4" ply **engine spacers** together. If you will be installing a different engine, center the engine on the firewall. The distance from the firewall to the front of the drive washer needs to be 7-1/8" for the cowl to fit properly. **Note:** The following instructions are based on the installation of the U.S. Engines 41cc engine. Installation of your specific engine may differ slightly.



D 6. Use a ballpoint pen to draw centerlines on the engine spacers. Extend the lines down the side of the spacers. Center the engine on the spacers and mark the bolt hole locations. The engine spacer is mounted with the shorter dimension vertical. Drill and countersink a 1/4" hole at each mark. Mount the engine to the spacer with **1/4-20 x 1-1/4" flat head bolts** (not included). During final assembly use thread lock on the bolts to prevent loosening from vibration.

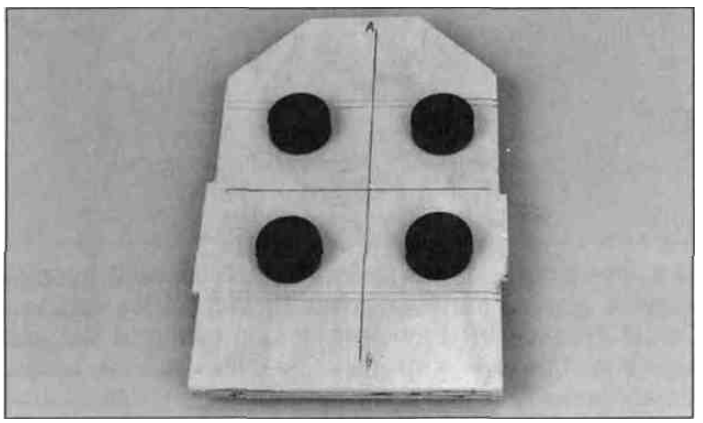


D 7. With the engine mounted on the engine spacer, trace around the engine backplate. Mark the **top** of the engine spacer (the edge opposite the engine head). Remove the engine from the engine spacer. Clamp the engine spacer to the firewall with the centerlines on the engine spacer aligned with the centerlines on the firewall. Make sure the top of the engine spacer is to the top of the firewall (the angled end). Use a 3/16" drill bit to drill a hole in each corner of the engine spacer, outside the engine outline, through the engine spacer and firewall. Remove the engine spacer and enlarge the holes in only the firewall with a 1/4" drill bit.

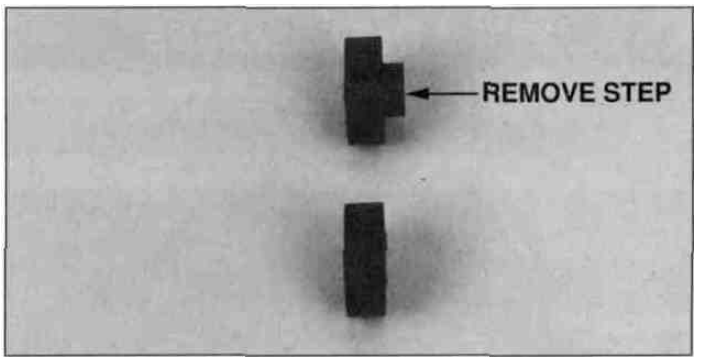
D 8. Install **10-32 blind nuts** (not included) in the back of the firewall. Gently tap the blind nuts in with a hammer. Apply a few drops of thin CA around each blind nut flange to secure it.

D 9. Mount the engine to the engine spacer. Then mount the engine spacer to the firewall with four 10-32 x 1-1/4" socket head bolts and **#10 washers** (not included). Place a mark on the firewall in line with the throttle arm. *If not installing an isolated engine mount, proceed to "Assemble The Fuselage Sides."*

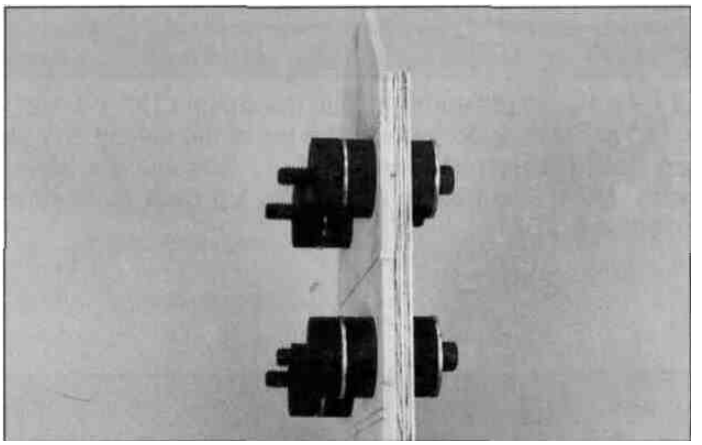
D 10. To install the J'TEC isolated engine mount, remove the muffler and center the engine on the firewall using the lines on the firewall as a guide. Mark the bolt hole locations and drill a 1/2" hole at each mark.



D 11. Insert a rubber step bushing in the front and rear of each hole. **Note:** The rubber bushings with attached blind nuts are **not** used in this engine installation.

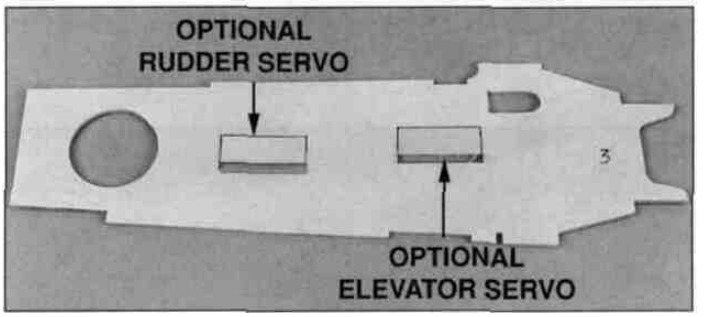


D 12. Use a sharp hobby knife to carefully trim the step from the four remaining rubber bushings.

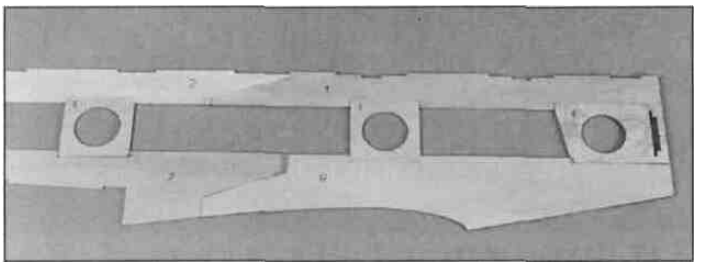


D 13. Place a 1/4" washer on each of four 1/4-20 x 2" socket head bolts. From the back of the firewall insert the bolts through the rubber bushings. Install a 1/4" washer and stepless bushing (from step 12,) on each 1/4-20 bolt. Thread the bolts into the backplate of the engine and check for fit. Place a mark on the firewall in line with the throttle arm for the throttle pushrod exit. Remove the engine and set it aside for now.

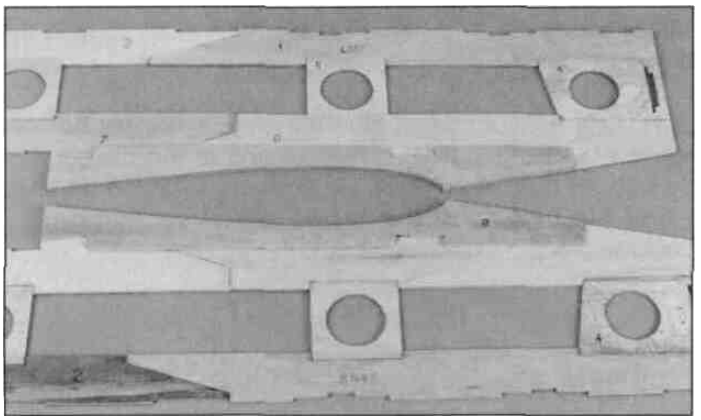
Assemble The Fuselage Sides



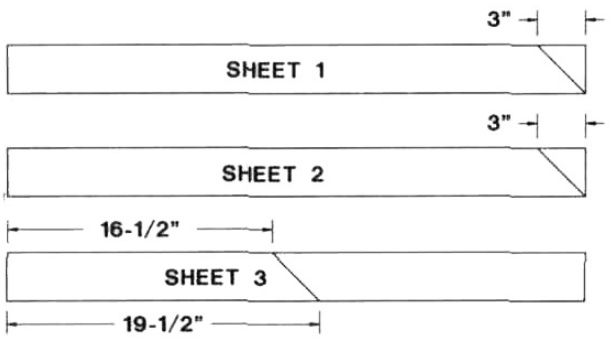
D 1. On the die-cut 1/8" ply **fuselage side doubler** #3 there are two embossed optional cut-outs for the rudder and elevator servos. If you prefer to mount your servos in the tail, punch out one of the cut-outs, for the rudder servo, in one piece only and both cut-outs, for the elevator, in both pieces. Use the punched out pieces glued to the back of the doubler as doublers for the servo screws. If you prefer to mount the servos in the standard location inside the fuselage, punch out the narrow slots only. Glue the servo cut-outs in place with thin CA. The slot in the fourth cut-out may be used as an optional antenna exit.



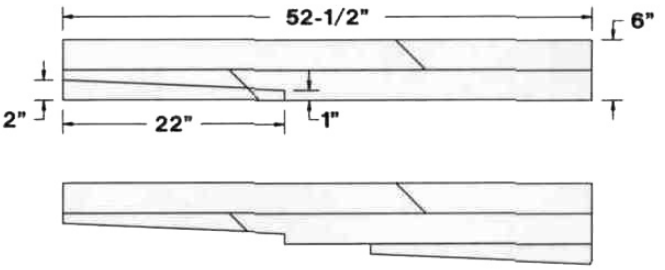
D 2. Cover the fuselage side plan with wax paper. Pin the die-cut 1/8" ply **fuselage side doublers** #1 through #7 in position over the fuselage side plan and use thin CA to glue the doublers together. Use medium CA to fill in any gaps in the joints. Build two fuselage side doublers.



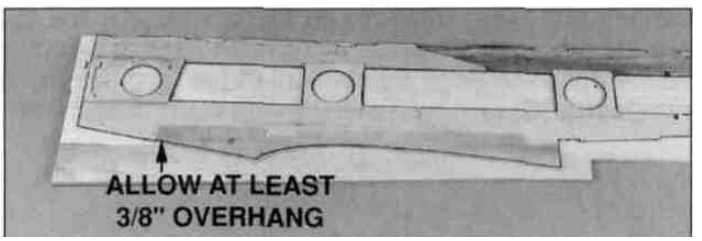
D 3. Use a sanding bar to sand the fuselage side doublers smooth. Position the fuselage side doublers next to each other as shown. At this point you need to determine on which side the throttle pushrod will be installed in the fuselage. With the engine held upside-down and viewed from the rear, note on which side the throttle arm is located. This will be the same side the rudder pushrod exits the fuselage. Label the doubler with the rudder slot punched out the same as the side the throttle arm is on. If the throttle arm is on the right side, mark the doubler right side. It is important that you position the fuselage side doublers as shown above to ensure that you build a right and left side. Use medium CA to glue a die-cut 1/8" ply **wing saddle doubler** #8 to each fuselage side doubler. Make sure the wing saddle doubler is aligned with the fuselage side doubler at the wing saddle.



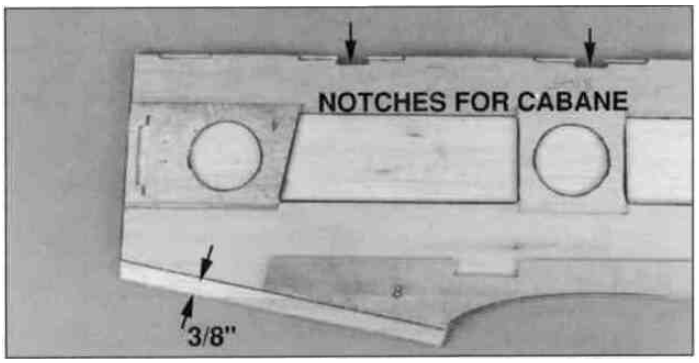
D 4. On four of the 1/4" x 3" x 36" balsa sheets make a mark 3" from one end. Make a diagonal cut from the mark to the corner. On the remaining two 1/4" x 3" x 36" balsa sheets place a mark on one edge 16-1/2" from the end and on the other edge 19-1/2" from the end. Make a diagonal cut from the 16-1/2" mark to the 19-1/2" mark.

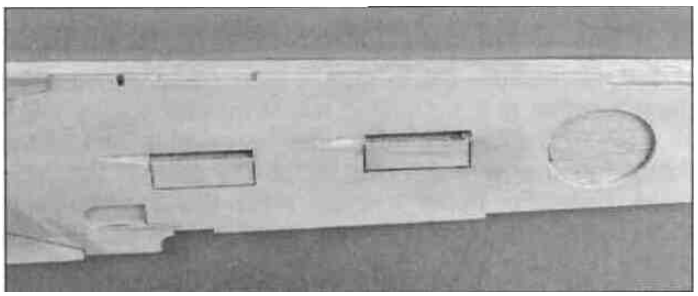


D 5. Use medium CA to glue a long sheet and a short sheet together at the diagonal cut. Make four sheets 1/4" x 3" x 52-1*12".* After the CA cures, edge glue two of the sheets together to make two 1/4" x 6" x 52-1/2" **fuselage sides. Note:** For better strength, place the diagonal joints at opposite ends of the fuselage sheet. At one end place a mark 2" from the edge. Then, place a mark 22" from the 2" mark. At this mark measure in 1" from the edge of the sheet and place a mark. Cut the fuselage side from the 2" mark to the 1" mark and then to the edge. Use medium CA to edge glue this piece at the other end of the fuselage side as shown in the drawing above.

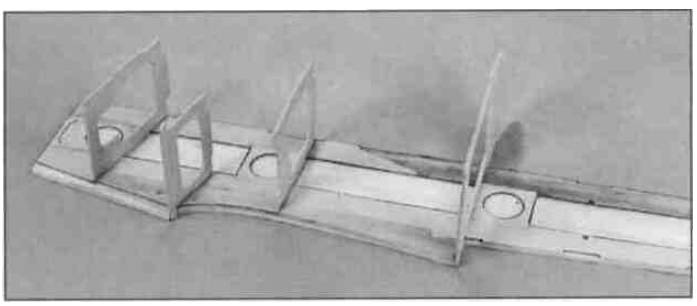


D 6. Position the fuselage side doubler on the 1/4" balsa fuselage side with the top edge of the doubler flush with the edge of the fuselage side. Allow the fuselage side to overhang the ends. Position the doubler so that the fuselage side extends past the doubler by 3/8" in front of the wing saddle and past the aft end of the doubler by 1-1/2". While working on a flat building board, use medium CA to glue the doublers to the fuselage sides



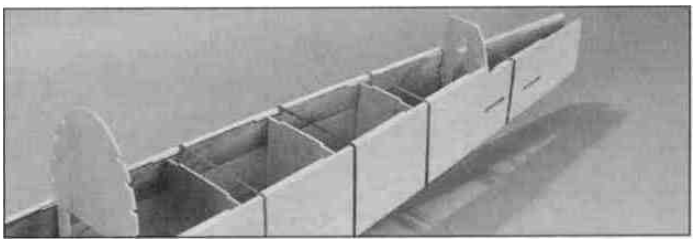


D 7 Draw a line 3/8" from the edge of the fuselage side doubler in front of the wing saddle Using a hobby knife (or razor plane and sanding bar), trim the fuselage sides to this line Trim and sand the remainder of the fuselage side flush with the outer edge of the fuselage doubler Cut-out the notches for the cabanes Cut the slots for the pushrod exits at the aft end of the fuselage and use a round file to bevel the ply doubler at the front of the notch.



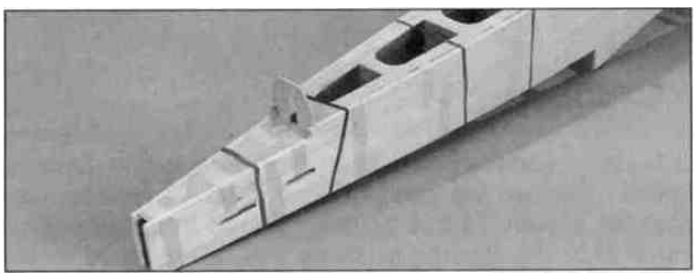
D 8 Use thin CA to glue the die-cut 1/8" ply **formers** (B), (C), (D) and (E) into position perpendicular to the right fuselage side The large tabs on formers (B), (C) and (D) face the **top** of the fuselage A notch will need to be cut in the 1/4" balsa fuselage side in front of the wing saddle, to allow former (C) to fit flush with the front of the wing saddle

D 9. Position the right fuselage side over the top fuselage plan Attach the left fuselage side to the formers and align both fuselage sides with the plan Wood clamps work great for holding the fuselage together while checking the alignment When aligned, use thin CA to glue the formers perpendicular to the left fuselage sides



D 10 Without using any glue, insert the die cut 1/8" ply **formers** (F), (G), (H) and (J) in their locations with the large round hole in the former on the bottom Formers (H) and (J) are installed with the embossed letters facing forward Formers (F) and (G) are installed so that the small single hole that is off center is on the opposite side From the rudder pushrod exit hole in the fuselage side Use rubber bands placed around the fuselage sides to hold the formers in place

D 11 Use medium CA to glue the die-cut 1/8" ply **bottom rear plate doubler (BD)** to the aft end of the die-cut 1/8" ply **bottom rear plate (BR)** Refer to die GARF05 on page 6 and the bottom of the fuselage tail section on the fuselage plan

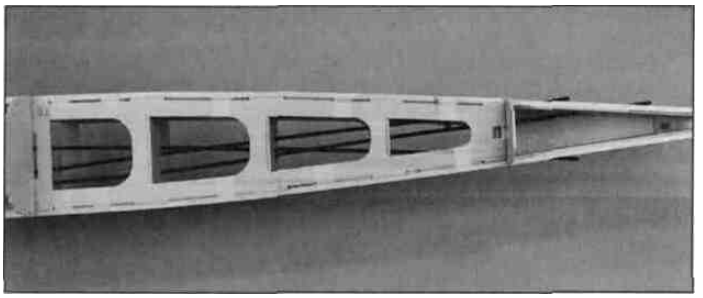


D 12 Install the die-cut 1/8" ply **top rear plate** (TR), the bottom rear plate (BR) and then the **stab plate** (SP) between the fuselage sides **Note:** The tabs on the top rear plate may require trimming for a perfect fit in the fuselage doublers Use masking tape to hold the fuselage sides to the top, bottom and stab plates

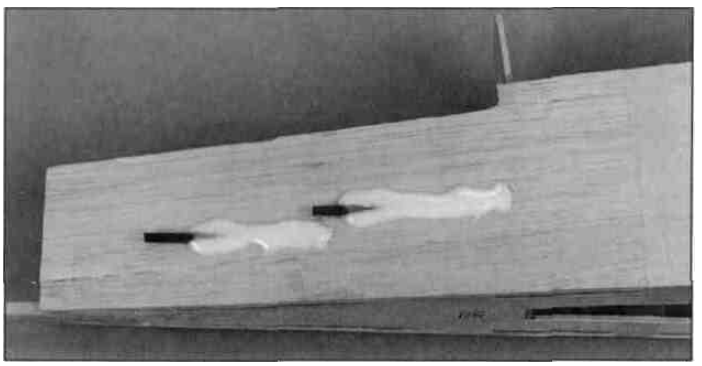
D 13. With the aft end of the fuselage flat against your building board, use thin CA to begin tack gluing the following pieces checking alignment as you go Glue the top rear plate to the fuselage sides Then glue formers (E), (F), (G), (H) and (J) to the fuselage sides, top rear plate and bottom rear plate Glue the bottom rear plate to the sides **Do not** glue the stab plate at this time

D 14 Remove the stab plate */ hope you didn't glue it in'* Use a round file or a hobby knife to bevel the pushrod exit holes to allow the guide tubes to slide through Carefully sand the outside of the 36" **outer pushrod guide tubes** with coarse sandpaper so the glue will adhere better.

D 15. Install two of the guide tubes in the forward pushrod exit holes The guide tubes pass through the outer holes in former (H) through the middle holes in former (G) and cross each other before passing through the middle holes of former (F) (see photo at step 16) Approximately 1" of the guide tubes should protrude past the exit holes in the fuselage sides Insert a **4-40 x 36" pushrod** into each tube Check that they slide smoothly through the tube without any restrictions.

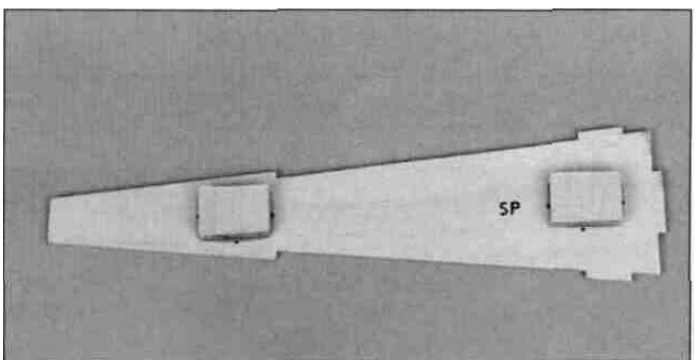


D 16. Insert the third outer pushrod guide tube in the rudder exit hole, through the middle hole in former (H) and the off center hole in formers (G) and (F). Approximately 1" of guide tube should protrude past the exit hole. Use a 4-40 pushrod to check for any restriction. An **optional** fourth guide tube (not included), used for routing the antenna through the fuselage, can be inserted in the extra pushrod exit hole and through the hole in former (J) then through the large holes in the other formers.



D 17. Glue the pushrod guide tubes to the formers with medium CA. Then glue the pushrod guide tubes to the exit slots with a 50/50 mixture of microballoons and epoxy. Completely fill the slot with the microballoons and epoxy so it can be sanded flush later. **Note:** Talcum powder may be substituted for microballoons.

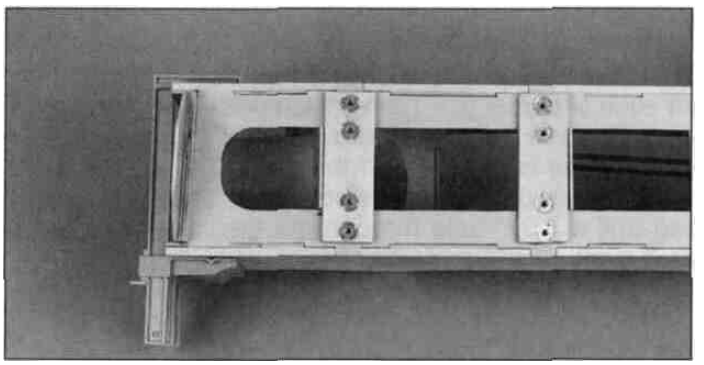
D 18. After the epoxy has cured use your bar sander and 150-grit sandpaper to sand the pushrod guide tubes and epoxy filler flush with the fuselage sides.



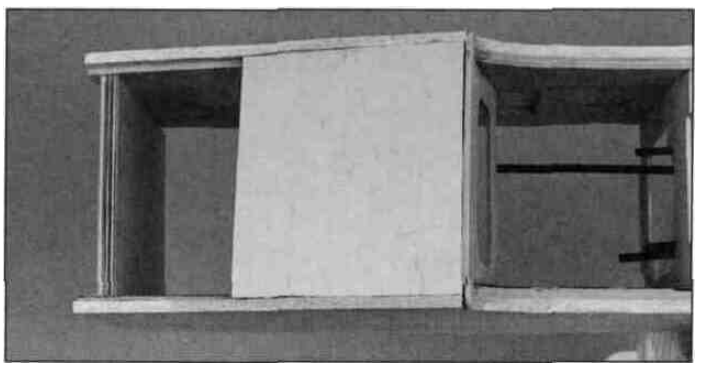
D 19. Use 6-minute epoxy to glue the 1/4" x 3/4" x 1" birch ply **stab mounting blocks,** between the embossed punch marks, on the stab plate.

D 20. Use 30-minute epoxy to glue the stab plate to the fuselage, with the stab mounting blocks facing the inside of the fuselage.

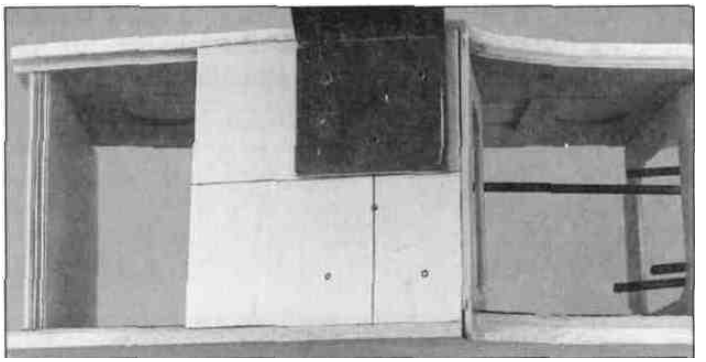
D 21. After the epoxy cures, go back and apply medium CA to reinforce the joints between the formers, top rear plate, bottom rear plate and fuselage sides. After the **CA** cures remove the masking tape.



D 22. Insert the right side of the firewall into the slot in the front of the right fuselage side. Spread the front of the fuselage apart slightly and insert the left side of firewall into the slot in the left fuselage side. Test fit the die-cut 1/8" ply **tank floor** and the top deck between the fuselage sides. Note that the front of the tank floor and the top deck are angled. This angle sets the firewall at the proper right thrust. Depending on the engine mounting method you may need to cut notches in the top deck and the tank floor to clear the blind nuts or rubber bushings. Cut two gussets from the 1/4" x 1/4" x 16" hardwood stick to fit in the joint between the fuselage sides and the back of the firewall. After checking the fit of the parts, glue the firewall to the fuselage and the gussets to the firewall and fuselage sides with 30-minute epoxy. Use masking tape or clamps to hold the firewall until the epoxy cures.

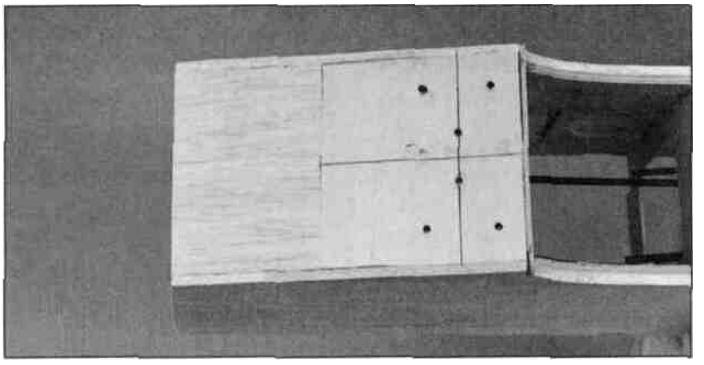


D 23. Use 30-minute epoxy to glue the 3/8" x 4-3/8" x 4-3/4" ply **landing gear plate** between the fuselage sides and to formers (B) and (C). Use masking tape or clamps between the fuselage sides. Fit and glue the **landing gear plate gussets** made from 1/4" x 1/4" x 16" hardwood around the joint between the landing gear plate and the fuselage sides and formers on the inside of the fuselage.

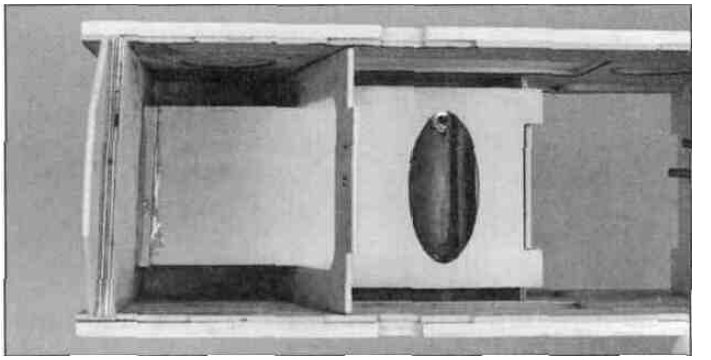


D 24. Draw a line on the landing gear plate 1-1/2" from the **aft** edge of former (C). Then draw a centerline from front to rear. Position the **aluminum landing gear** so that the square edge is aligned with the centerline and the 1-1/2" line is centered in the middle hole. Mark each hole location and drill a 5/32" hole through the landing gear plate at each mark.

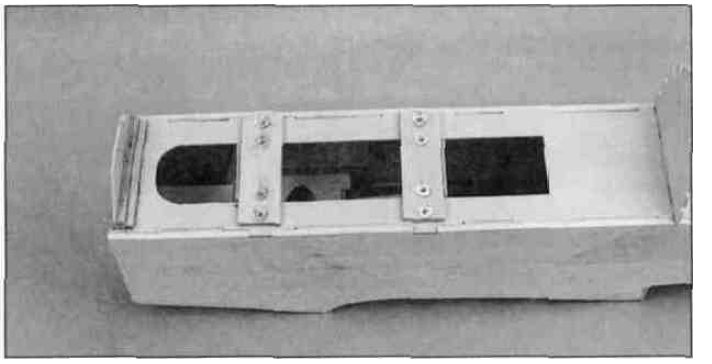
D 25. Install six 6-32 blind nuts from inside the fuselage. Use **6-32 x 5/8" socket head bolts** and #6 **flat washers** inserted through the landing gear and threaded into the blind nuts. Tighten the bolts to seat the blind nuts in the holes. Add a few drops of thin CA around each blind nut to secure it.



D 26. Use medium CA to glue the 3/8" x 2-9/16" x 4" balsa blocks to the **bottom front** of the fuselage between the firewall and the landing gear plate. From a 1/4" x 1/4" x 16" hardwood stick, epoxy two gussets inside the fuselage at the joint between the bottom front blocks and former (B) and between the bottom front blocks and the firewall. After the epoxy cures sand the front of the blocks flush with the fuselage sides.



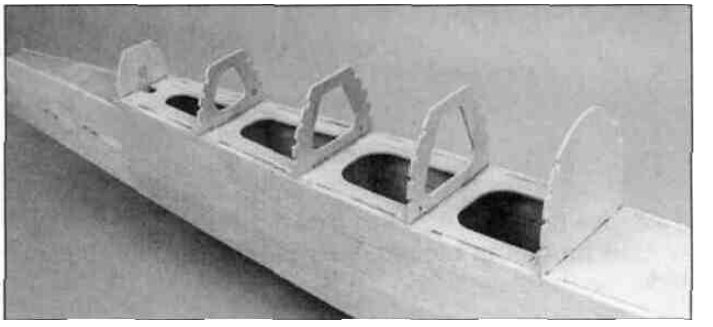
D 27. Place the tank floor in position. From the 1/4" x 1/4" x 16" hardwood stick, cut a gusset to fit in the joint between the tank floor and the firewall. Use 6-minute epoxy to glue the tank floor and the gusset in the fuselage.



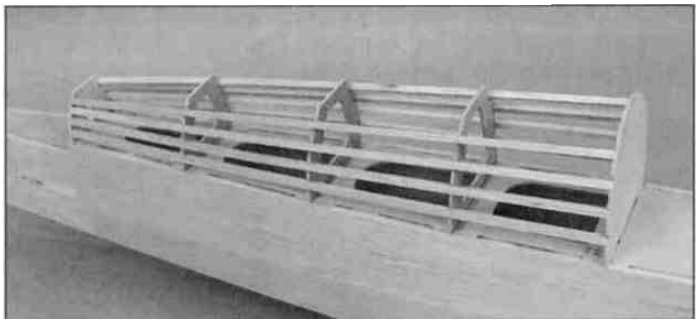
D 28. Fit the top deck in position. From the 1/4" x 1/4" x 16" hardwood stick, cut gussets to fit in the joints, on the top and bottom, between the top deck and the firewall. Use 30-minute epoxy to glue the top deck and gussets in position.

D 29. Drill a 3/16" hole through the firewall and former (B) at the mark for the throttle pushrod exit. Use 150-grit sandpaper to roughen up the 36" **outer tubing.** Insert the outer tubing through the firewall and slide it up to former (E). Trim the tubing flush with the firewall. Drill two 5/16" fuel line exit holes through the firewall aligned with the fuel inlet on the carburetor.

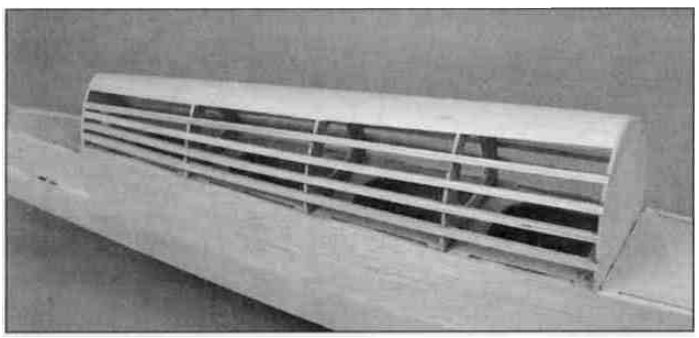
Build The Turtle Deck



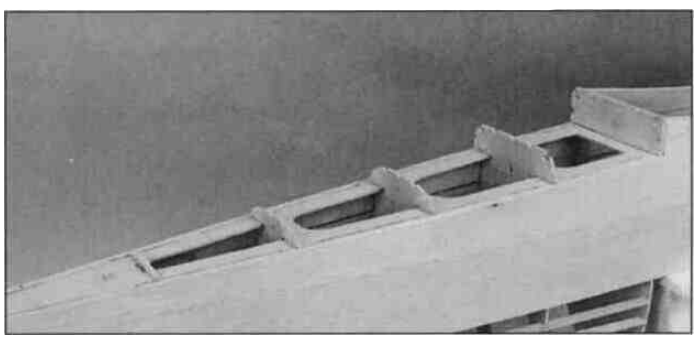
D 1. Use thin CA to glue the die-cut 1/8" plywood **formers** (N), (P) and (Q) in position perpendicular to the top rear plate.



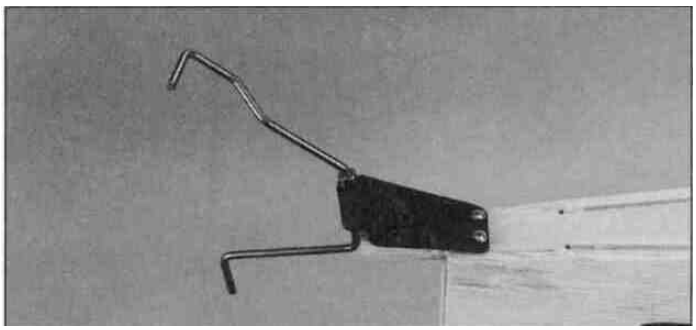
D 2. From the 1/4" x 1/4" x 24" balsa sticks, cut **stringers** to fit from former (E) to former (J). Use medium CA to glue the stringers into the slots of formers (E), (N), (P) and (Q). Be sure they are flush with the outside edge of former (J). Use a sanding bar to sand the end of the stringers flush with the front of former (E).



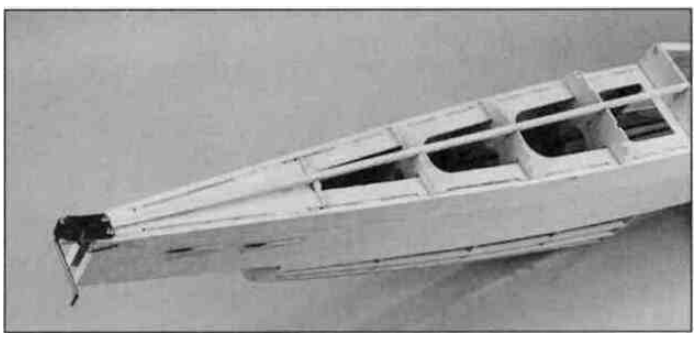
D 3. Center the 3/8" x 2-1/4" x 24" balsa **turtledeck top** on top of formers (N), (P), (Q) and (J) and against the back of former (E). Glue in place. Use a sanding bar to sand the turtledeck top flush with the aft side of former (J). Use a razor plane and a long sanding bar to shape the turtledeck top flush with the edges of formers (N), (P) and (Q).



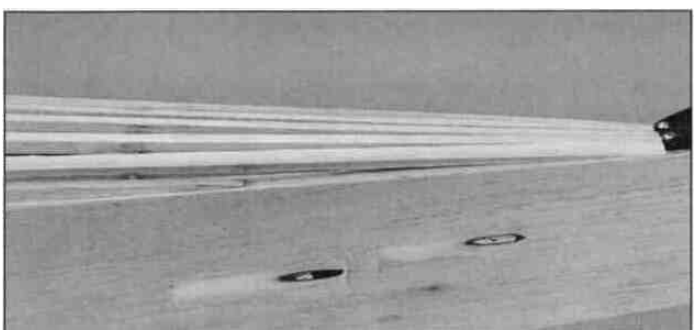
D 4. Position the die-cut 1/8" plywood **formers** (D), (R), **(S),** (T) and (U) perpendicular to the bottom rear plate. Glue in place with thin CA.



D 5. Center the **tail wheel bracket** on the aft end of the bottom rear plate. The tail gear wire should be spaced 1/32" away from the rear plate. Mark the three mounting holes and drill a 5/64" pilot hole at each mark. Attach the tail gear to the rear plate with three #6 x 1/2" sheet metal screws.

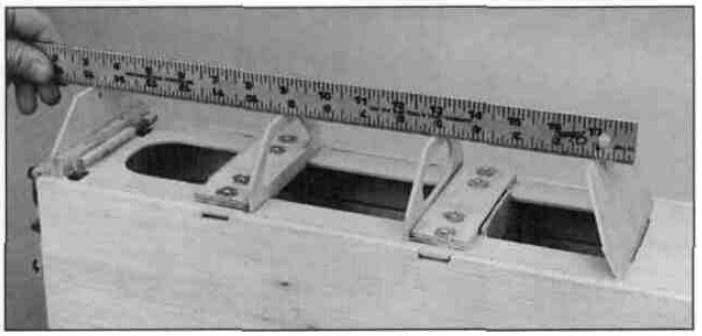


D 6. From a 1/4" x 1/4" x 36" balsa stick, cut a **stringer** to fit in the **center** notch of the formers that run from former (D) to the tail wheel bracket. Sand the bottom of the stringer at an angle so that it is at the same height as the tail wheel bracket base. Use thin CA to glue the stringer to the formers and the bottom rear deck. Save the pieces you cut from the 36" balsa stringer.

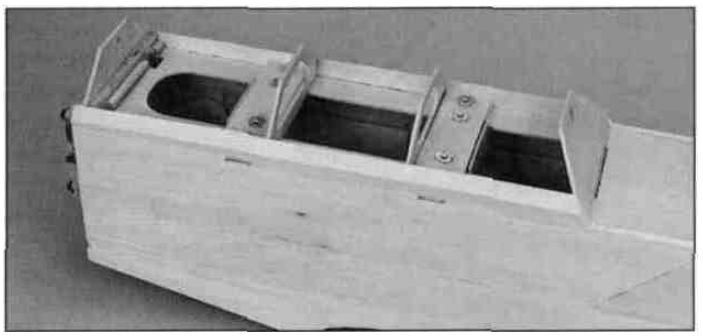


U 7. Use thin CA to glue 1/4" x 1/4" x 36" balsa stringers into the notches on each side of the center stringer. Sand the bottom of the stringers at an angle so that they are at the same height as the tail wheel bracket base. Use thin CA to glue the stringer to the formers and the bottom rear deck. Glue 1/4" x 1/4" x 30" basswood stringers in the corners of the formers with thin CA. Use 1/4" x 1/4" x 24" balsa sticks for the bottom **stringer** on each side. Blend this stringer into the bottom rear deck just past former (U).

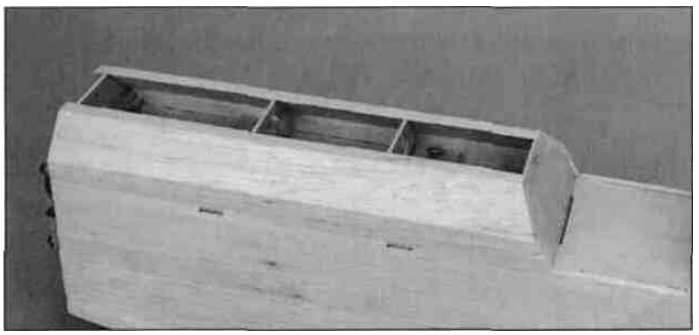
D 8. Remove the tail wheel bracket. Cut a strip of 320-grit sandpaper 2" wide x 11" long. Hold the ends of the sandpaper on each side of the fuselage and work it back and forth over the stringers to remove the sharp edges. Do **not** oversand the stingers - just remove the sharp edges.



D 9. Position the die-cut 1/8" plywood formers (K) and (L) perpendicular to the top deck. Glue in position with thin CA. Place a straightedge along the tops of the firewall, (K) and (L). Place the instrument panel (IP) in position angled so the top edge touches the straightedge. Glue in **place** with thin CA.

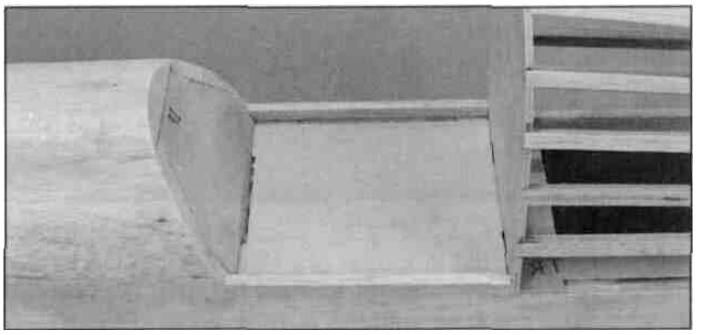


D 10. Use medium CA to glue 3/8" x 7/8" x 16" balsa **front top side sheet** to the top of the fuselage and to the sides of formers (A), (K), (L) and (IP). The forward end of the sheet should be flush with the front of the fuselage sides. After the CA cures, sand the top edge to match the angle of the former and the aft edge flush with the instrument panel.

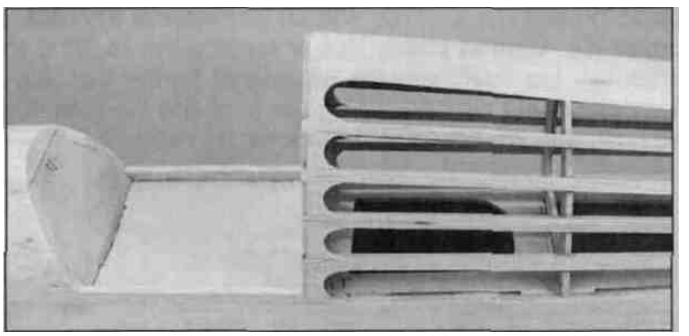


D 11. Use medium CA to glue 3/8" x 2-3/8" x 16" balsa **front top angled sheet** to the top of the side sheet and the angled side of formers (A), (K), (L) and (IP). The forward end of the angled sheet should be flush with the front of the fuselage sides. After the CA cures, sand the top edge flush with the top of the formers and the aft edge flush with the instrument panel.

D 12. Use medium CA to glue a 3/8" x 3" x 15" balsa front **top sheet** to the angled sheet and the top of formers (A), (K), (L) and (IP). The forward end of the top sheet should be flush with the front of the fuselage sides. After the CA cures, sand the edges flush with the top angled sheet and the aft edge flush with the instrument panel. Use a ballpoint pen to draw a centerline on the front top sheet. Use a razor plane and a sanding bar to round the front top sheets and blend them into the fuselage sides.



D 13. From two of the leftover 1/4" x 1/4" balsa stringers make cockpit sides to fit between the instrument panel and former (E).

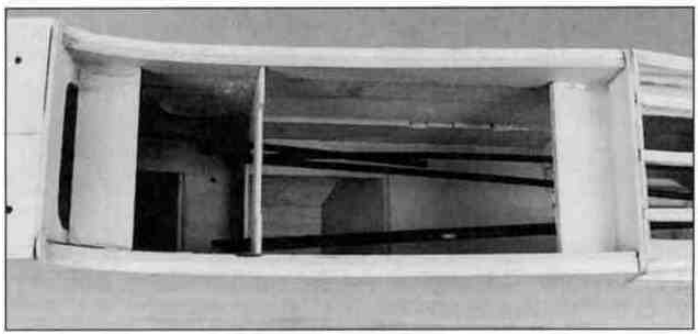


To provide a larger area to attach the covering, we made scallops between the stringers on the turtle deck and former (E).

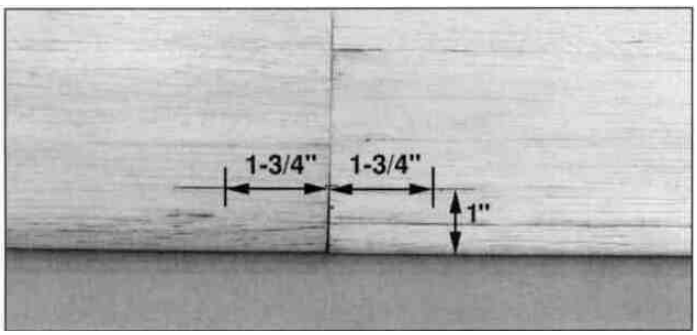
* Make the scallops from leftover 3/32" wing sheeting.
* Cut the sheeting 3/4" wide. Fit the sheeting between the stringers.
* Glue the scallops to the stringers and former (E).
* Use a hobby knife and sandpaper wrapped around a dowel to cut a radius at the aft end of the scallop.

After all the scallops are installed, sand the scallops flush with the stringers and former (E).

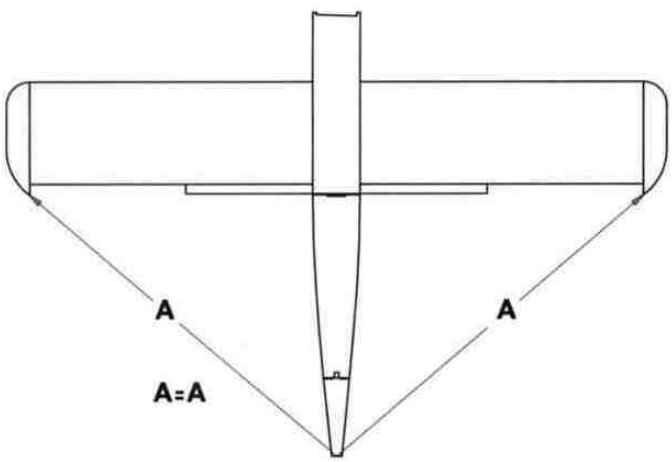
Attach The Bottom Wing



D 1. Use 30-minute epoxy to glue the 1/4" x 1-3/8" x 4-1/2" ply forward and aft **wing mounting plates** in the notches of the wing saddle doubler



D 2 On the **bottom** of the lower wing, draw a line 1" back from the LE On this line, place marks 1-3/4" on each side of the center of the wing At the marks, cut a 5/8" hole through the sheeting only.

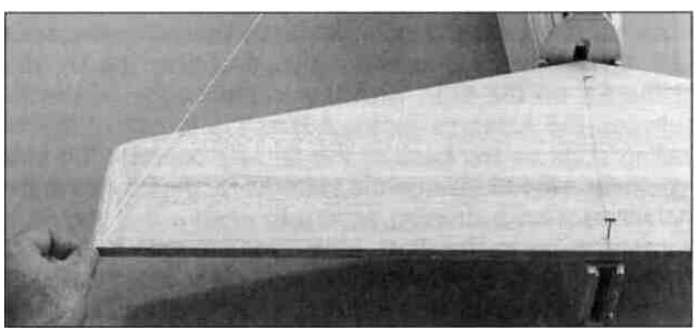


D 3. Seat the wing in the wing saddle and visually center it on the fuselage Pin a string to the center of bottom rear deck at the aft end Then extend it out to a wing tip Put a piece of tape on the string to mark the intersection of the string and the wing tip Swing the string over to the other tip and see if the distance is the same (see diagram) Make slight adjustments to the angle of the wing until the distance from the tail to the wing tips is equal.

D 4 Tape the wing in position At both marks on the wing plate use a **13/64"** (or a #7 drill bit) to drill a hole through the wing and wing mounting plate, **perpendicular** to the wing plate At the front of the wing use a 13/64" (or a #7 drill bit) to drill a hole through the wing bolt plate and wing mounting plate **perpendicular** to the wing bolt plate Remove the wing and enlarge the holes in the **wing** with a **1/4"** drill bit Cut threads in each wing mounting plate with a 1/4-20 tap Put a couple of drops of thin CA on the threads After it has fully cured, run the tap back through the holes to clean up the threads Bolt the wing to the fuselage with four nylon 1/4-20 wing bolts and leave it in place for the next few steps

Attach The Stabilizer And Fin

D 1. Draw an accurate centerline on the top of the stab, perpendicular to the stab TE.

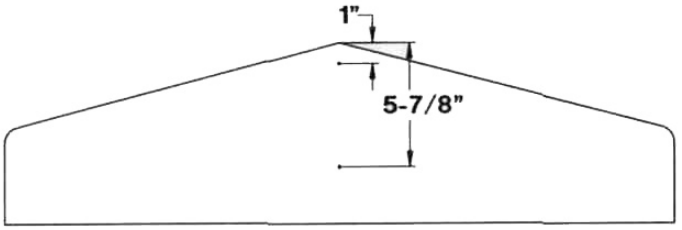


D 2 Center the stab on the stab plate using the centerline you drew in step #1 Study the aft end of the structure from 8-10 feet back If the stab tips are not equidistant **above** the wing, carefully sand the **high** side of the stab plate until the stab is aligned Using the pin and string technique" accurately align the stab with the fuselage Once the stab is accurately aligned, pin the stab to the stab plate

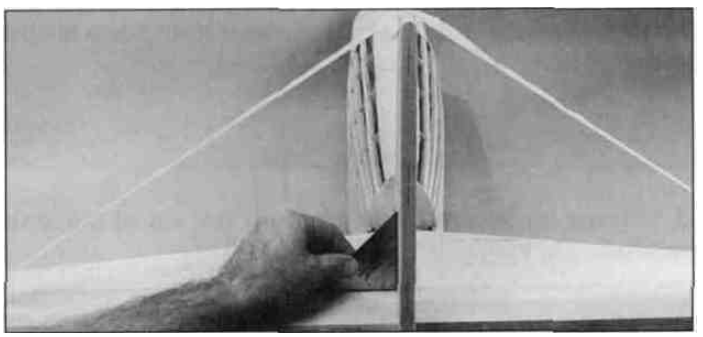
D 3 Carefully use a ballpoint pen to **lightly** mark where both of the fuselage sides contact the bottom of the stab.

D 4 Remove the stab from the stab plate but leave the T-pins in the stab Apply a film of 30-minute epoxy to the stab plate and the stab between the lines you made in step 3

D 5 Reposition the stab on the stab plate and insert the T-pins into the same holes Use the pin and string to confirm the stab alignment then use weights, more T-pins or clamps to hold the stab in position Wipe away excess epoxy before it cures, then recheck alignment Do not disturb the model until the epoxy cures.

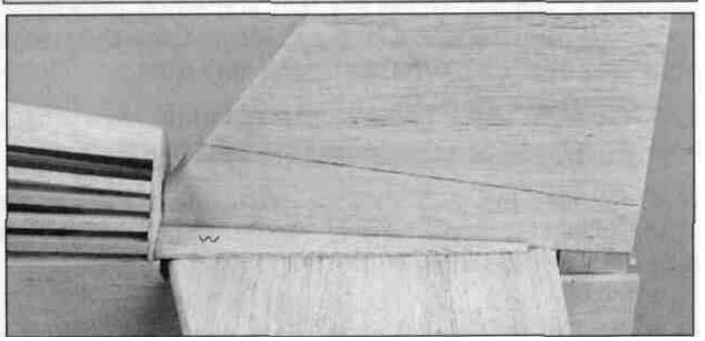


D 6. On the centerline of the stab, make marks at 1" and 5-7/8" aft of former (J). At each mark, drill a 3/32" hole through the stab, the stab plate and the stab mounting blocks. Place **3/4" flat washers** on the **#8 x 1" sheet metal screws.** Apply 6-minute epoxy to the threads. Thread the screws into the stab, stab plate and stab mounting blocks. Be careful not to overtighten the screws and crush the sheeting on the stab.

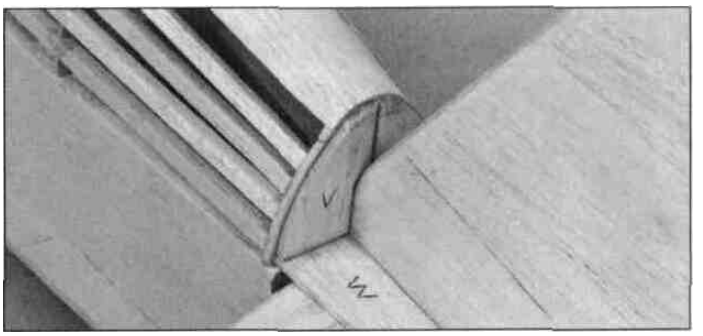


D 7. If you haven't already done so, final sand the fin. Test fit the fin on the stab with the trailing edge of the fin between the fuselage sides. Adjust the length of the fin trailing edge so the base of the fin fully contacts the stab (you may need to enlarge the cut-outs for the screws in the stabilizer). Use a drafting square to ensure that the fin is perpendicular to the stab. Make adjustments if needed. Then glue the fin to the stab, fuselage sides and the bottom rear deck with 30-minute epoxy. Use a square to keep the fin perpendicular to the stab. Use masking tape to hold the fin in position until the epoxy cures.

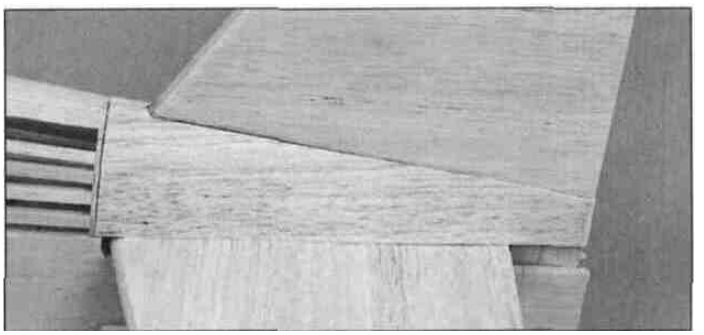
Finish The Turtle Deck



D 1. Hold a straightedge along the top of the turtledeck and against the side of the fin. Use a ballpoint pen to draw a line on both sides of the fin, matching the angle of the turtledeck. Use thin CA to glue the die-cut 1/8" balsa fin **backing** (W) flat on the stab and against the fin and former (J).



D 2. Use thin CA to glue the die-cut 1/8" balsa **doublers** (V) to the back of former (J) and against the fin.

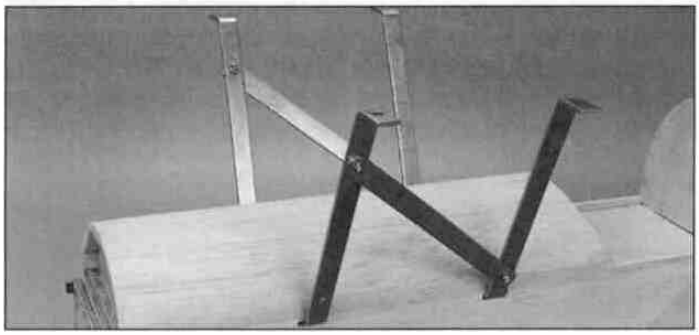


D 3. From the 3/32" x 3" x 24" balsa sheet, make two **rear turtledeck** sheets by cutting the sheet in half. Use the **template** on the fuselage plan as a guide to trim the sheets. Use thin CA to glue the sheets to the fin backing (W) and the stabilizer; be sure the forward edge is against former (J). Wet the outside of the balsa sheets and let them soak for a few minutes. Apply a thin bead of medium CA along the edge of former (V). Carefully pull each sheet in place. Hold the top of the sheet against the fin, and apply thin CA along the joint.

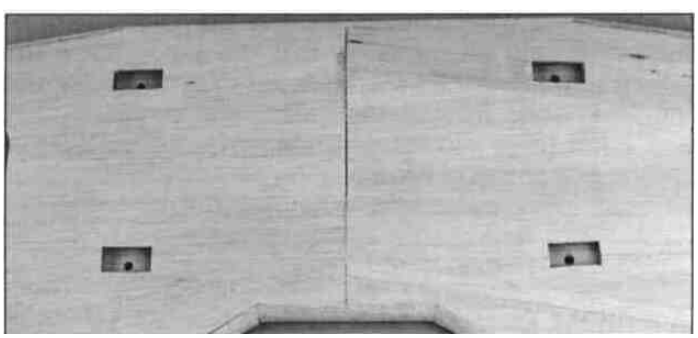
D 4. After the rear turtledeck sheet dries, sand the sheet flush with former (J) and the TE of the fin. Balsa filler can be applied to the joints and sanded to make fillets between the sheet and the fin and stab.

D 5. Use leftover 1/4" balsa sheet from the fuselage sides to fill the gap between the lower aft end of the rear turtledeck sheet and the fuselage side. Carefully sand to blend the sheet to the fuselage side. Also, sand the fuselage side and the filler pieces flush with the TE of the fin.

Attach The Top Wing

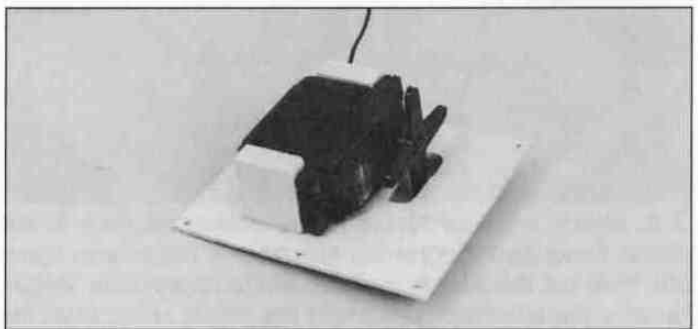


D 1. Insert the cabanes into the slots in the front of the fuselage. Secure them with **6-32 x 5/8" socket head bolts** and **#6 washers.** Use **6-32 x 1/2" socket head bolts,** #6 washers and **6-32 lock nuts** to attach the cabane cross braces to the **outside** of the cabanes.



D 2. Cut four of the **1/4-20 nylon bolts** to a length of 5/8". Use them to mount the top wing to the cabanes. Tighten the bolts just enough to hold the wing on, then trace around the cabanes on the wing sheeting. Using a sharp hobby knife, trim the wing sheeting to allow the cabane to seat against the cabane mounting plate.

Install The Aileron Servos And The Control Horns



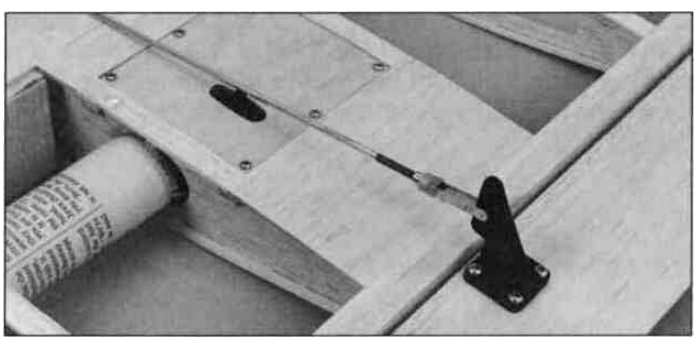
D 1. Remove the aileron servo hatch from the bottom wing. Position the aileron servo on the hatch so that the servo arm is centered in the hatch opening. Use 30-minute epoxy to glue two 5/16" x 3/4" x 7/8" basswood **servo mounting blocks** to the aileron servo hatch.

Note: Secure these blocks by first drilling several 1/16" holes about 3/16" deep into the gluing surface. Roughen the ply hatch where the epoxy will be applied. Pack epoxy into the 1/16" holes before clamping the blocks in position.

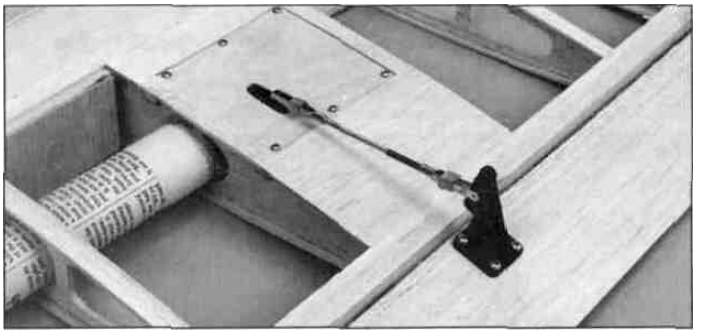
D 2. When the epoxy has fully cured, fit a 1/32" **to** 1/16" temporary shim between the servo and the plywood hatch. Drill 1/16" pilot holes and mount the servo to the mounting **blocks.** Then remove the shims.

D 3. Trim three of the four arms from a "cross" servo horn. Install it on the servo. Reinstall the aileron servo hatch in the bottom wing.

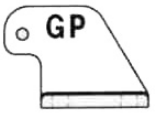
D 4. Thread two 4-40 metal clevises thirteen complete turns onto two 4-40 x 12" threaded rods. Slide a silicone clevis retainer over each clevis.

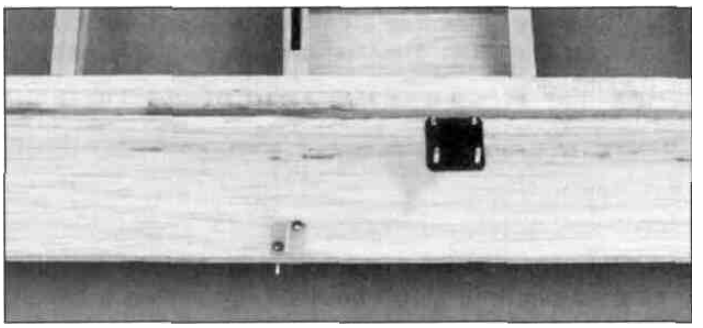


D 5. Attach a heavy duty control horn to the clevis. With the pushrod aligned with the servo arm, position the control horn on the aileron so that the clevis holes are aligned with the aft part of the bevel. Mark the mounting holes and drill 7/64" holes through the aileron, then prick a few holes into the wood under the horn's location. Apply a drop or two of thin CA to the pin holes to strengthen the wood. When cured, attach the control horn to the aileron with four 4-40 x 1" machine screws and the backing plate.



D 6. Attach a solder clevis to the outermost hole in the aileron servo arm. Center the aileron and the aileron servo arm, then cut the aileron pushrod to the appropriate length. Remove the aileron pushrod and the solder clevis from the wing. Slide a silicone retainer on the pushrod then solder the clevis on the end of the pushrod. Silver solder is highly recommended. Reinstall the pushrod on the aileron servo arm and the aileron control horn.





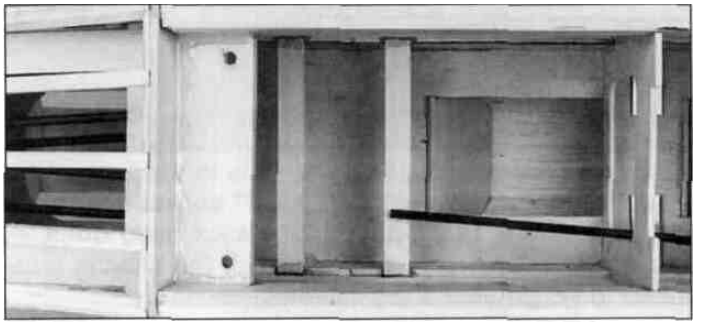
D 7. Use a hobby knife to remove the area above the bottom hole on two of the small **control horns** (as shown in the drawing above). Use **2-56 x 5/8" screws** and **backing plate** to mount the control horn on the top TE of the aileron and aligned with the slots for the strut tabs.

D 8. Repeat the process for the aileron in the other wing half.

D 9. If you are installing aileron servos in the top wing, repeat the procedure for installing the aileron servos. If not, use a hobby knife to trim two more of the small control horns as before. Use 2-56 x 5/8" screws and backing plate to mount the control horn at the TE of the aileron and aligned with the slots for the strut tabs, on the top wing.

Install The Rudder And Elevator Servos

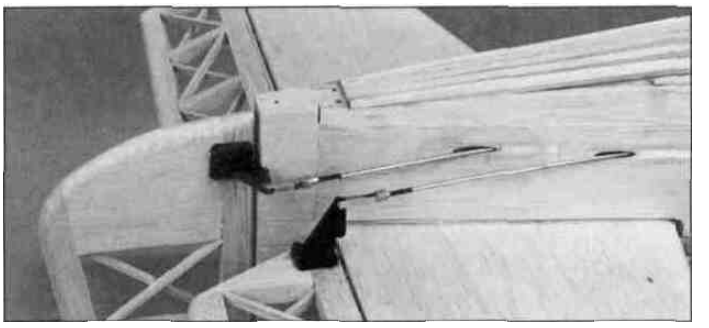
Some modelers prefer to install the pushrods and control horns **after** the model is covered. If this is your preference skip ahead to ***Assemble the Wheel Pants.*** Return to this section after you have covered the model and joined the control surfaces to the model with hinges.



D 1. Cut the 1/4" x 1/2" x 10" basswood stick in half to make the servo rails. Test fit the servo rails in the slots in the fuselage doublers. Check that your servos will fit between the rails. If not, slightly trim the slots in the fuselage doubler. Use 6-minute epoxy to glue the servo rails in the slots.

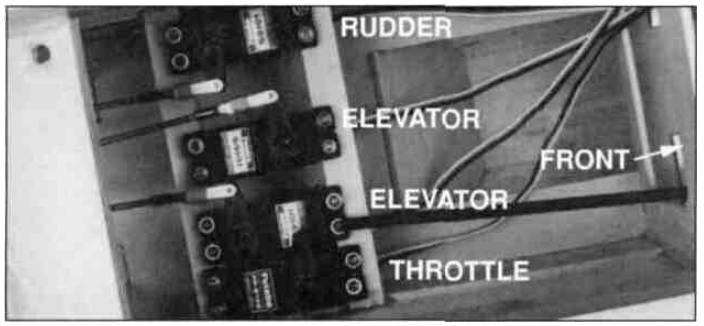
D 2. After the epoxy cures, cut the outer pushrod tubes so that they are 1-1/2" back from the aft servo rail.

D 3. Thread three 4-40 nuts and metal clevises thirteen complete turns onto three 4-40 x 36" threaded rods. Slide a silicone clevis retainer over each clevis.



D 4. Attach a heavy duty control horn on each clevis. Insert the pushrods into the rudder and elevator pushrod outer tubes installed in the fuselage. Position the control horns on the rudder and elevators so that the clevis holes are aligned with the hinge joint. Mark the mounting holes and drill 7/64" holes through the rudder and elevators, then prick a few 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. When cured, attach the control horns with 4-40 x 1" machine screws and the backing plate.

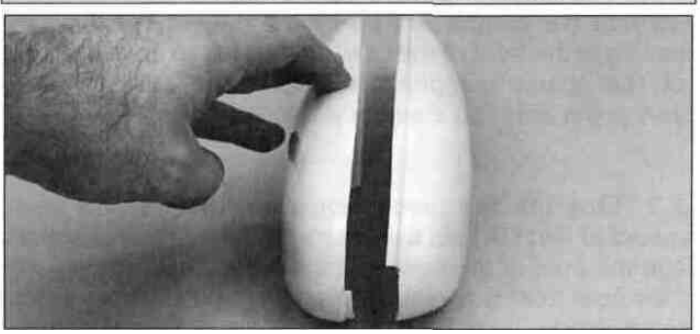
D 5. Center the servo arms then position four servos on the servo rails with the pushrods on the correct side of the servos, as shown on the plans. Mark the servo mounting holes and use servo mounting screws to attach the servos to the servo rail. The servos for the rudder and elevator must be high torque servos. The servo for the throttle can be a standard servo.



D 6. Attach a solder clevis to the outermost hole in the rudder and elevator servo arms. Center the rudder and elevator servo arms on the servos. Cut the rudder and elevator pushrods to the appropriate length. Remove the pushrods and the solder clevis from the fuselage and slide a silicone retainer on the pushrod, then solder the clevis on the pushrod. Reinstall the pushrods and attach the clevises to the servo arms and control horns.

D 7. Position the tail wheel bracket on the bottom rear deck. Mark the location of the tail wheel wire on the bottom of the rudder. Remove the tail wheel wire and drill a 9/64" hole at the mark. Test fit the tail wheel wire in the rudder. The hole will be slightly larger than the wire. This allows the epoxy to form a sleeve around the wire when it is glued in.

Assemble The Wheel Pants



D D 1. Trim one matching set of wheel pant halves along the molded cut lines. Notice that the **top** of the outer pant goes **over** the lip of the inner pant and the **bottom** of the inner pant goes over the lip of the outer pant. You can use a hobby knife to **carefully** score along the cut lines and flex the plastic until the excess breaks free, or use small scissors to cut along the lines. Kyosho curved Lexan cutting scissors (KYOR1010) work extremely well for this and make the job a cinch. For now, don't worry about accurately cutting out the opening in each wheel pant half - just cut an approximate opening for the wheels.

D D 2. Use your bar sander to carefully true the edges of the overlapping pieces of the wheel pant halves so when you glue them together the seam will be as small and straight as possible. Notice that the rear of the pant halves do not overlap. Use 150 or 220-grit sandpaper to remove the flashing and **thoroughly** roughen all areas that are to be glued, including the indentation on the inside of both inner pant halves.

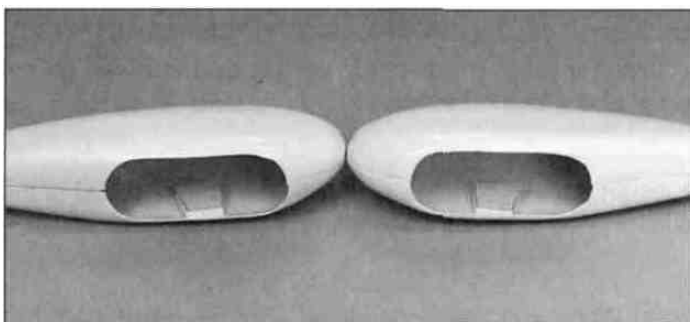
D D 3. Test fit the wheel pant halves **and make** adjustments where necessary.

D D 4. Join the wheel pant halves by carefully spot gluing them with thin CA. Glue the top, the front and then the rear where the two halves butt together. After the halves are joined, apply thin CA along the length of all seams.

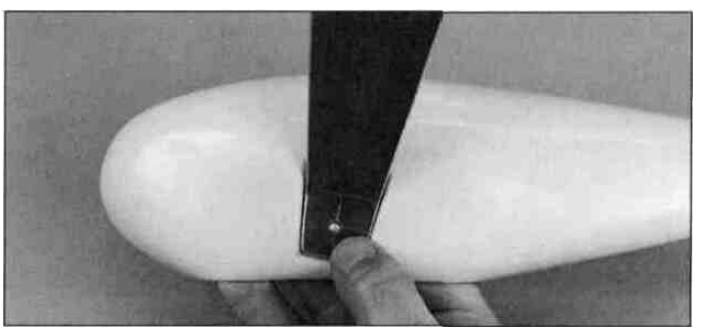
Note: Do **not** use CA accelerator. Use of accelerator on the ABS plastic may cause cracks and/or prevent paint from adhering.

D D 5. Use your hobby knife or a power tool with a sanding drum to cut out the wheel opening.

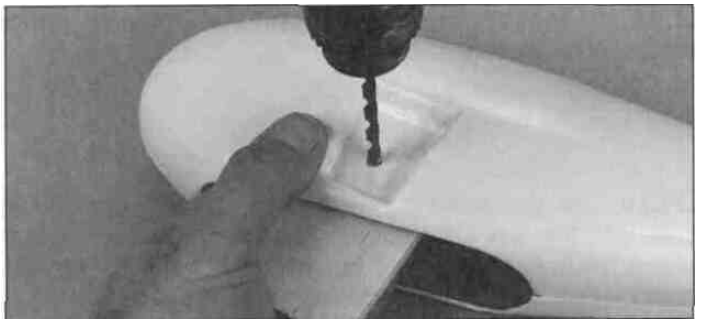
Hint: Make the wheel opening wide as this will make installing the wheel and axle easier and cause less interference with the wheel upon landing and takeoff. You can see the size of the wheel opening in the following photo.



D D 6. Use medium CA to glue the die-cut 1/16" plywood **wheel pant mount** to the **inside** of each wheel pant.



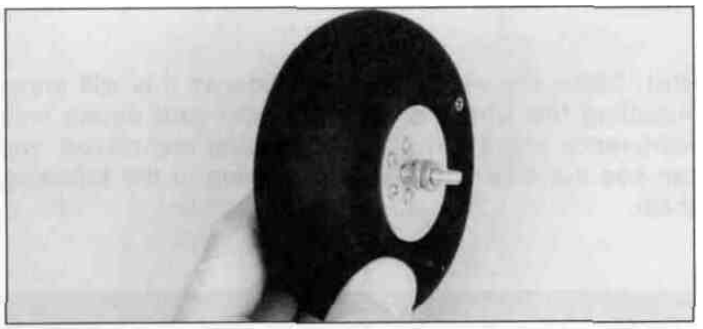
D D 7. Use a metal file to chamfer the edges and corners of the aluminum landing gear so it will fit neatly in the recess of the wheel pant. Position the wheel pant on the aluminum landing gear. Use a felt-tip pen to accurately mark the location of the axle mounting hole.



D D 8. Drill a 3/16" hole in the wheel pant at the mark. Back up the wheel pant mount with a piece of plywood so you do not split it as the drill goes through.

D D 9. If the axle you are using does not fit through the wheel hub of your 4" wheel, enlarge the wheel hub with a 3/16" drill bit.

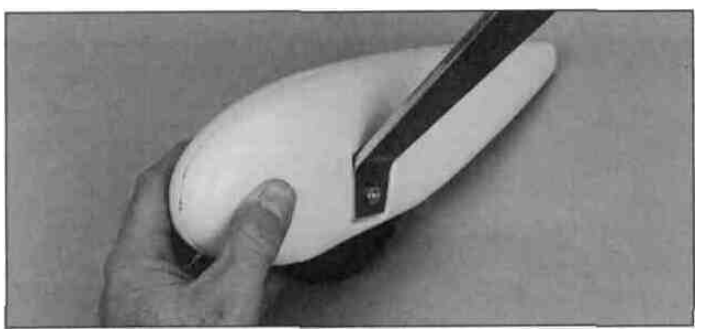
D D 10. Test fit the wheel in the wheel pant using the following procedure.



A. Install a 3/16" wheel collar on the axle followed by the wheel and a second collar.

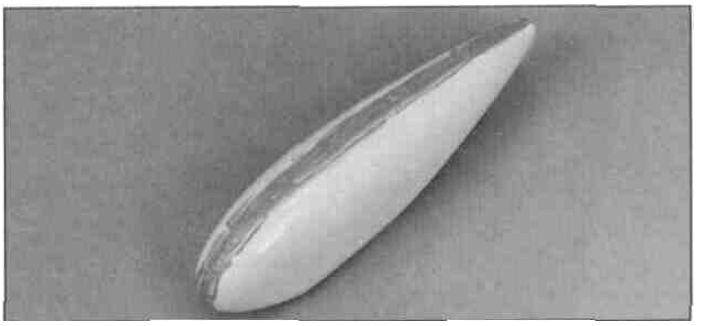
B. Insert the wheel in the pant with the threaded end of the axle inserted in the plywood wheel pant mount.

Note: When you install the wheel after the wheel pant has been painted, put masking tape on the bottom of the pant to avoid scratching the paint.



D D 11. Temporarily mount the wheel pant to the landing gear with the nut supplied with the axle.

D D 12. Perform the same procedure to assemble and temporally mount the other wheel pant to the landing gear.



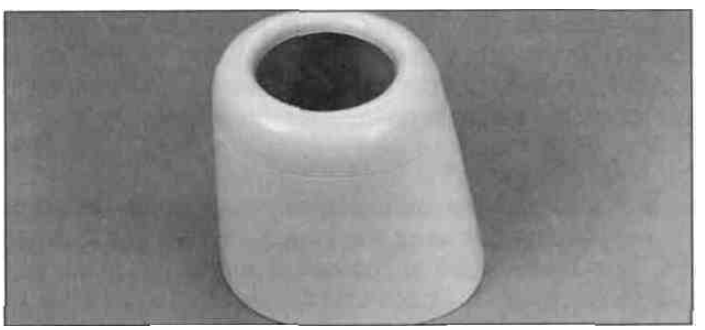
D D 13. Before painting the wheel pants, fill the seams with putty filler such as Squadron White Putty or resin filler such as Bondo . We use Bondo most of the time as it cures quickly and is easy to sand but usually it must be purchased in large quantities. Squadron putty works well but it takes overnight to dry and usually requires at least two applications because it shrinks as it dries.

D 14. After the filler cures, wet sand the wheel **pants** with 400-grit sandpaper to prepare them for primer.

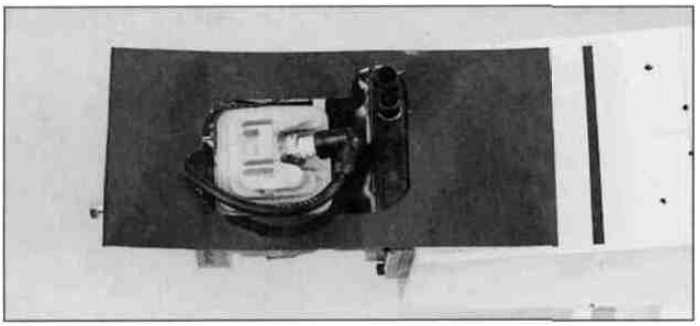
Assemble The Cowl

D 1. The cowl is assembled following the same procedure as the wheel pants. Cut the cowl along the cut lines. Then use your bar sander to true all the edges. For now, the opening in the front of the cowl only needs to be roughly cut out. Use coarse sandpaper to roughen the inside of all the overlapping areas so the glue will stick.

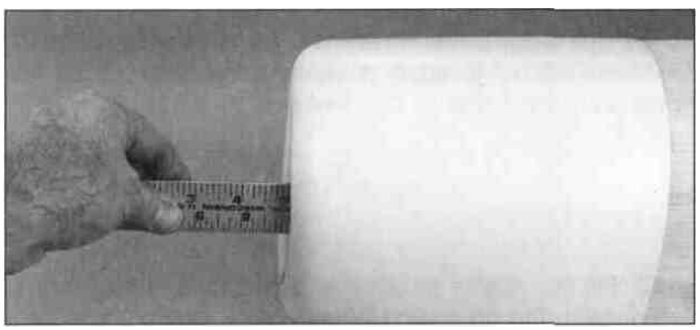
D 2. Tape the two pieces together, then wick a small amount of thin CA into the seams of the overlapping joints. Tape the front of the cowl to the side. Notice that one side of the cowl front is angled. The angle matches the angle on the cowl side. Wick CA into the seams of the overlapping joints. After the CA has cured, remove the tape and make sure you have thoroughly glued the two pieces together by inspecting the glue joints and adding thin CA if necessary.



D 3. Use a sharp hobby knife or a power tool with a sanding drum to accurately cut the engine opening in the front of the cowl.



D 4. Reinstall the engine on the firewall. If the muffler hits the fuselage balsa bottom blocks, trim the blocks so they clear the muffler by at least 1/8". Use a piece of thin cardboard or plastic to make a template for the cutout in the cowl for the head of the engine and the carburetor. Tape the template to the fuselage side accurately indicating the position of the head.



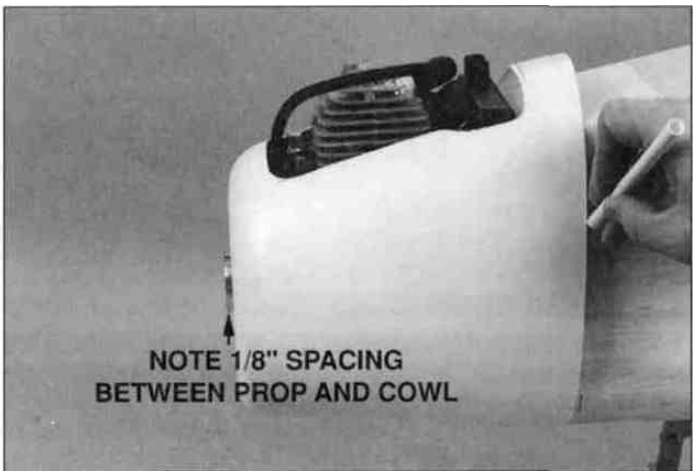
D 5. Measure the distance between the firewall and the front of the drive washer (it should be 7-1/8"). Remove the engine from the fuselage. Then position the cowl on the fuselage so the forward edge is 1/8" **aft** of the measurement you just made. Use a ballpoint pen to lightly mark the location of the rear of the cowl on the fuselage top.

D 6. Align the cowl with the mark you made on the fuselage. Then use a felt-tip pen to transfer the hole in the template onto the cowl.

Note: The hole on the template may be slightly aft of the actual position of the head of the engine due to the upward sweep of the template when the cowl is in position.

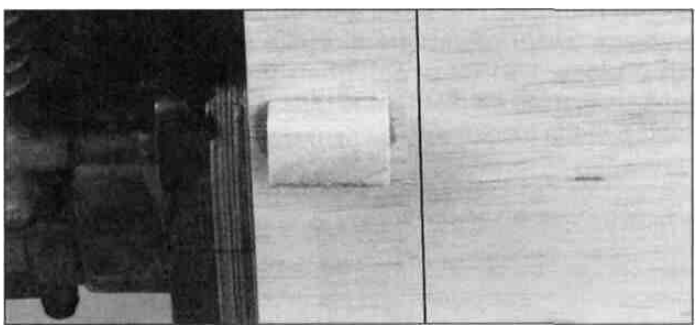
D 7. Remove the cowl and template, then remount the engine. Cut the hole in the cowl and test fit it on the fuselage. You may want to make the cuts slightly forward of the template outline to allow for the upward sweep of the template. Adjust the position and size of the hole as needed. The location of the hole determines the clearance between the front of the cowl and the back of the prop.

Hint: Cut the hole in the cowl slightly undersize at first so you can make adjustments to its position.



D 8. Drill a hole that is slightly larger than the crankshaft, through the center of a flat stick. Mount the stick tight against the drive washer on your engine. With the drive washer centered at the front of the cowl, align the cowl so there is approximately 1/8" clearance between the stick and the cowl. Use a ballpoint pen to mark the fuselage sides at the aft edge of the cowl.

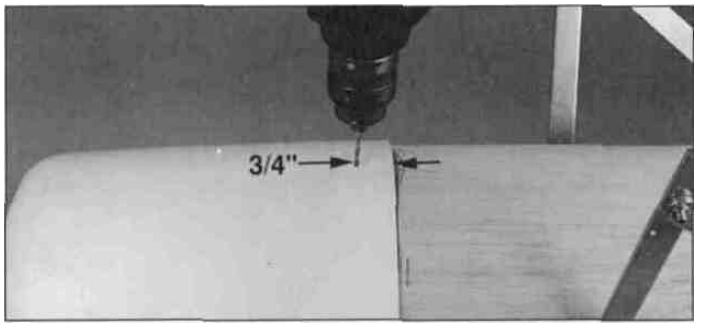
D 9. Remove the cowl, then use 6-minute epoxy to glue the two 1/2" x 5/8" x 1" hardwood cowl mounting blocks to the fuselage sides in the location shown on the plan 1/4" in front of the lines you marked that indicate the aft end of the cowl.



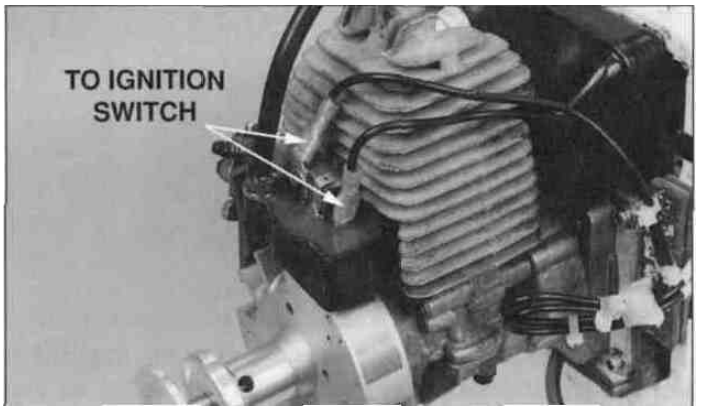
D 10. Shape the cowl mount blocks with your bar sander and 150-grit sandpaper to match the shape of the cowl. Test fit the cowl and make adjustments to the blocks if necessary.

D 11. Position the cowl on the fuselage, centering the drive washer in the opening in the front of the cowl. Use a felt-tip pen to mark the cowl for the cowl mounting screws. Drill a 3/32" hole through the cowl and cowl mounting blocks at the marks. Remove the cowl and enlarge the holes in the **cowl** to 9/64".

D 12. Mount the cowl to the fuselage with two #6 **x 1/2" button head screws** and two #6 **washers** supplied with this kit.

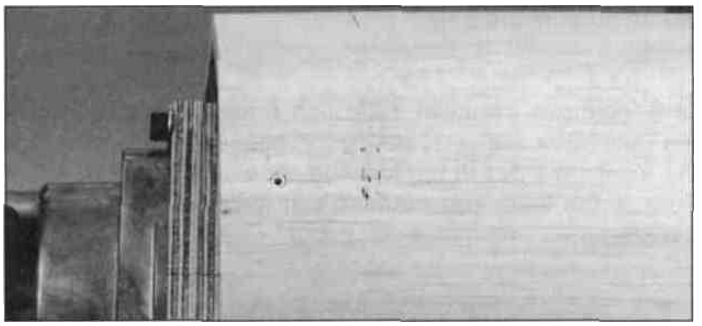


D 13. In the top of the cowl, drill a 3/32" hole through the cowl and fuselage 3/4" from the aft edge of the cowl and centered between the sides of the cowl.



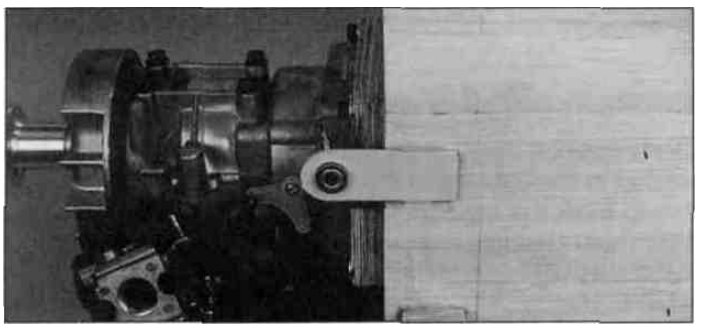
D 16. If your Aeromaster will be powered by a gas engine, an on/off switch must be installed on the engine. Gas engines have a coil that generates electricity to produce a spark. The on/off switch will prevent the engine from starting accidentally. We connected a 5 amp/125 volt on/off switch to the coil and mounted it on the side of the fuselage.

Note: For additional strength, we recommend using 30-minute epoxy to apply a layer of fiberglass cloth (not included) to the inside of the cowl over all joints.



D 14. Remove the cowl and enlarge the hole in the **fuselage** to 1/8". From the 2" **white inner pushrod tube,** cut a piece 1/2" long. Roughen the tube with 220-grit sandpaper. Use medium CA to glue the tube into the hole in the top of the fuselage.

D 17. Fill the seams or other imperfections in the cowl as described in the preceding Wheel Pants section. Wet sand the entire cowl with 400-grit sandpaper to prepare it for priming.



D 15. On our prototype Giant Aeromaster we made a mount for the Great Planes Easy Fueler (for gas) from leftover 1/8" plywood, then securely glued it to the side of the fuselage. We cut an access hole in the cowl for the fueler using the template method.

COVERING

Preparing The Surface

D 1. If you've hooked up the pushrods to the servos before you covered the model, disconnect and remove all the control rods, hinges and control horns from the ailerons, elevators and rudder. Remove the engine, cabanes, tail wheel bracket and any other hardware you may have installed.

D 2. Most of the model should be rough-sanded by now with all the tabs and rough edges sanded even. Check the cross-section views as you sand and round the edges. Fill all dents, seams, low spots and notches with HobbyLite balsa colored filler. (See expert tip that follows.)

To remove minor dents in balsa wood, lightly wet the dented area Then, with your sealing iron set on high, lightly iron the dent out If the dent is only minor it should come right out

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

Covering Technique

Cover the model with Top Flite MonoKote™ film, using the recommended covering sequence that follows Before you cover the fuselage, first apply 1/4" wide strips of MonoKote film in the corners of the stab and fuselage and the fin and the fuselage then proceed to cover the fin and stab with pre-cut pieces that meet in the corners and overlap the 1/4" strips **Never** cut the covering on the stab and fin after it has been applied except around the leading and trailing edges and the tips Modelers who do this may cut through the covering and into the stab and fin This will weaken the structure to a point where it may fail during flight Some modelers drill a small hole in each rib and the trailing edge of the elevator and rudder to allow expanded gas to exit while heating the MonoKote film This procedure keeps the covering from "ballooning" and allows you to securely bond it to the entire elevator.

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

Suggested Covering Sequence

Fuselage:

1 1/4" strips at fin and stab as described
2 Aft fuselage bottom
3 Forward fuselage bottom
4 Fuselage right side up to the top center of the turtle deck
5 Fuselage left side up to the top center of the turtle deck, overlapping by 1/8"
6 Forward fuselage deck top
7 Fin tip, followed by stab tips
8 Stab bottom, then top
9 Fin right side then left side
10 Elevator tips and root ends
11 Elevator bottoms, then tops
12. Rudder tips, right side, then left side

Top and Bottom Wing:

1 Tips of bottom wing
2. Trailing edges of wing and the inboard portion of tips bottom wing
3 Bottom of right, then left panel bottom wing
4 Top of right, then left panel bottom wing
5 Tips of top wing
6 Trailing edges of wing and inboard portion of tips top wing
7 Bottom of right, then left panel of top wing
8 Top of right, then left panel top wing
9 Aileron tips bottom, then top of aileron
10. Aileron servo hatches

Painting

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

Top Flite" LustreKote"" fuelproof paint is recommended for painting all ABS plastic parts and the aluminum landing gear Remove the wheel pants from the landing gear and use a file to round the corners of the aluminum landing gear before you paint it At least one coat of LustreKote primer is highly recommended to fill all the small scratches left from sanding as well as small pin holes in the filler Wet sand between coats with 400-gnt sandpaper and apply a second coat of primer if necessary.

Before painting the canopy, use a scissors or a hobby knife to trim along the molded cut lines, then true the edges with your bar sander and 220-grit sandpaper Use 400-gnt sandpaper to scuff the frame portion of the canopy so the paint will stick We recommend you paint the canopy frame with Pactra Formula-U or Chevron Perfect Paint Use masking tape or frisket film to cover the portion of the canopy that is not to be painted If you are not sure that the paint is compatible with the clear canopy, test the paint on a leftover piece of canopy material

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

Paint the cockpit interior using your own imagination We painted the back rest instrument panel and the cockpit sides with flat black brush-on paint, then covered the cockpit floor with 600-grit sandpaper glued in place with 3M 77 spray adhesive.

FINAL HOOKUPS AND CHECKS

1 Start with the elevators and stab Cut the covering from the hinge slots

2 If you are installing large plastic hinges, use 150-grit sandpaper to scuff-up the hinge Carefully apply petroleum jelly to the hinge pin area The petroleum jelly will prevent epoxy from getting into the hinge pin area

3 Apply 30-minute epoxy to the hinges and inside the hinge slots Install the hinges and close the hinge gap to 1/32" or less Wipe off any excess epoxy that squeezes out of the hinge slots with a cloth dampened with alcohol

4 After the epoxy has cured flex the hinged surfaces **to** loosen any epoxy in the hinge pin area

5 Repeat the hinge gluing process for the rudder and ailerons

6 If you have not yet installed and connected the control horns and elevator, rudder and aileron pushrods return to *"Install The Rudder And Elevator Servos"* on page 36 for instructions

Install The Hardware

D 1 Assemble the fuel tank per the manufacturers instructions Place 1/4" foam padding on the tank floor, fuselage sides and the bottom of the top deck Insert two 1' pieces of fuel tubing through the firewall from the engine side Connect one of the fuel tubes to the fuel pick-up fitting and the other to the overflow fitting on the tank Slide the tank through the opening above former (C) as you carefully pull the fuel lines through the firewall

D 2 Use 6-minute epoxy to glue the tail wheel wire in the rudder Before the epoxy cures screw the tail wheel bracket to the bottom of the fuselage.

D 3. Install a **1/8" wheel collar** on the tail wheel wire followed by a **1-1/2" tail wheel.** Secure the tailwheel with a second 1/8" wheel collar

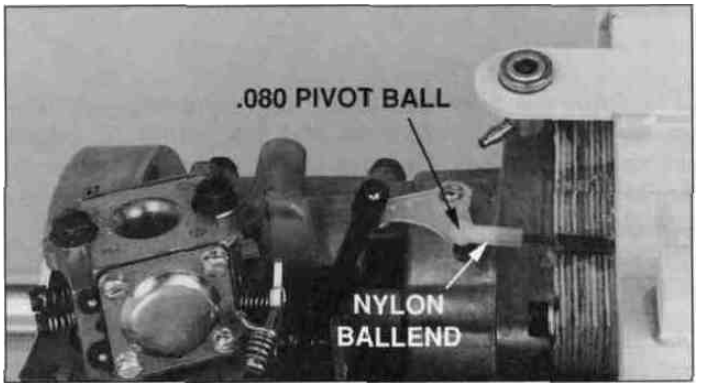
D 4 Apply masking tape to the wheel pants and install wheels Mount the wheel pants to the landing gear Secure the axle nuts with a drop of threadlock.

D 5. Mount the landing gear to the fuselage with 6-32 x 5/8" socket head bolts and #6 flat washers. Be sure to use thread lock on the threads of the bolt

D 6 Wrap the receiver and battery pack in 1/4" or thicker foam rubber Install one each in the two recesses between formers (K), (L) and the instrument panel Pack extra foam in the compartments to keep the receiver and battery pack from dislodging during aerobatics or rough landings Glue a mixing stick over each recess for added security.

D 7 Mount the receiver switch in a convenient location Be sure that will not interfere with the servos and pushrods inside the fuselage

D 8. Switch the radio system on and center the servo arms Install the elevator and rudder pushrods first, then install and hook up the control horns



D 9 If you are using the included throttle pushrod, secure a **.080" pivot ball** to the engine throttle arm with a **.080" nut** Apply threadlock to the nut to prevent it from vibrating loose Thread the **nylon ball end** 13 turns onto the 2-56 x 36" threaded rod Install a **Screw-Lock Pushrod Connector** on the throttle servo arm Insert the throttle pushrod in the throttle tube and through the pushrod connector Snap the nylon ball end onto the pivot ball With the radio system switched on adjust the throttle so that the carburetor opens completely at full throttle and closes completely when the throttle stick is moved to idle and the trim is reduced Use threadlock on the 1/8" socket head cap screw in the pushrod connector Cut off the excess throttle pushrod

D 10 If you installed an optional antenna tube in the fuselage, route the receiver antenna through the tube and out the aft end of the fuselage If you did not install the antenna tube drill a small hole in the aft wing mounting plate Make a strain relief from a cut off servo arm and place it on the antenna near the receiver Route the antenna through the hole in the mounting plate and down the bottom of the fuselage You can make a hook out of another cut-off servo arm and loop the end of the antenna to it, then connect the other end of the cut-off servo arm to a rubber band looped around the tailwheel wire - or you can also use a piece of trim sheet and tape the antenna to the bottom of the fuselage.

D 11 Apply 1/16" foam seating tape on the wing saddle of the fuselage (optional)

D 12 Prepare the engine compartment for cowl installation by connecting the fuel pick-up line to the carburetor routing the overflow line out the bottom of the fuselage and installing the fuel fill valve Install the cowl then the propeller

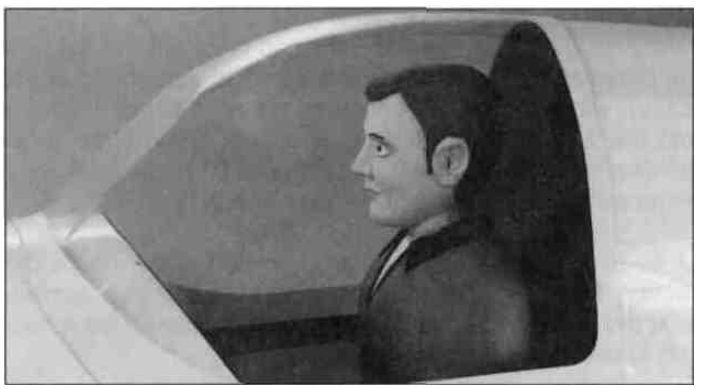
D 13 Use 6-32 x 5/8" socket head bolts and #6 washers to attach the cabane struts to the fuselage Make sure to use thread lock on all the bolts.

Attach The Canopy

D 1. Place the canopy on the fuselage in the location shown on the plan, then temporarily hold it in position with tape.

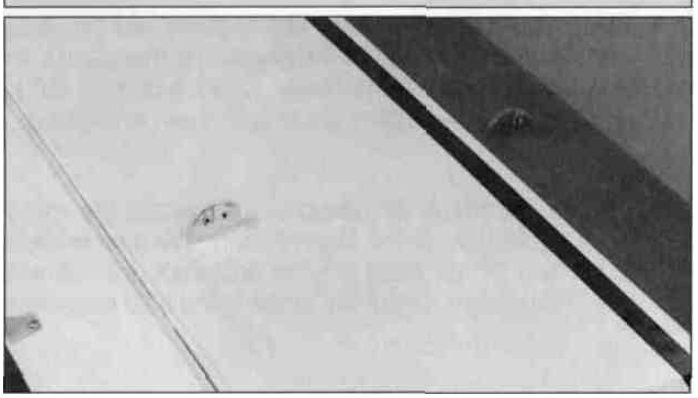
D 2 Use a felt-tip pen to accurately **trace** the canopy outline onto the covering Remove the canopy Use a sharp #11 blade to **carefully** cut away about a 1/32" wide strip of covering inside the line you marked **without cutting into the balsa** Wipe away the ink line with a paper towel lightly dampened with alcohol

D 3 Before permanently installing the canopy, securely glue your pilot in place For the most security, in addition to glue, screw the base of the pilot to the cockpit floor with two #4 or #6 sheet metal screws from the underside of the cockpit floor Place the instrument panel decal on the instrument panel



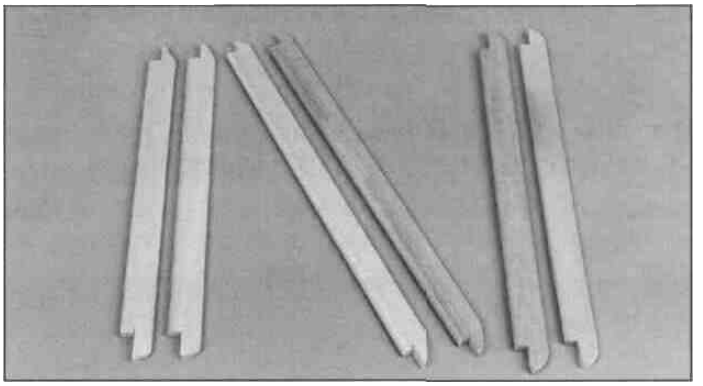
D 4. Reposition the canopy on the fuselage and confirm that it covers the exposed wood Glue the canopy to the fuselage using masking tape to hold it in position until the glue dries We recommend a glue specifically formulated for gluing on canopies such as Pacer Formula 560 canopy glue Formula 560 is like regular white glue (aliphatic resin) in that it dries clear and cleans-up with water but bonds extremely well to butyrate and dries overnight (to allow for accurate positioning).

Assemble The N-Struts

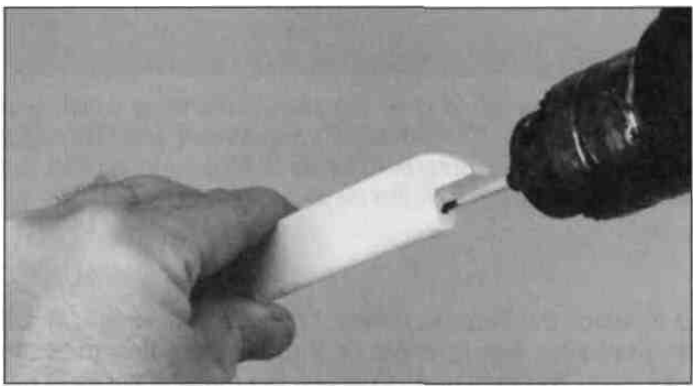


D 1 Use 30-minute epoxy to glue the eight strut tabs, you assembled before building the wings, into the slots in the top of the bottom wing and the bottom of the top wing.

D 2 After the epoxy cures, install the top and bottom wings on the fuselage

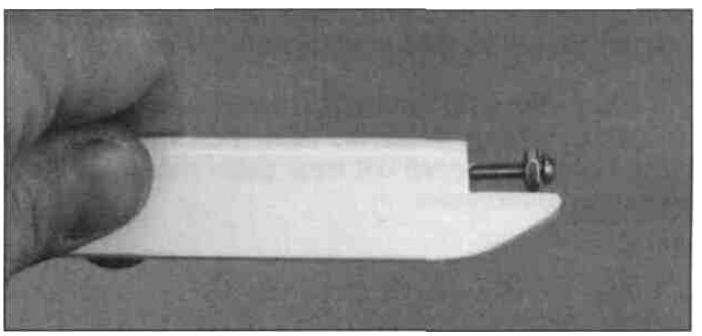


D 3 Cut the six 3/4" x 12" hardwood **struts** to the shape shown on the fuselage plan Use a sanding bar loaded with 150-grit sandpaper to round the tips to the desired shape The struts can be covered with MonoKote film covering or painted with a fuelproof paint such as LustreKote spray paint



D 4 Use a 5/64" drill bit to drill a hole 1/2" deep, centered in the notch, at both ends of the struts

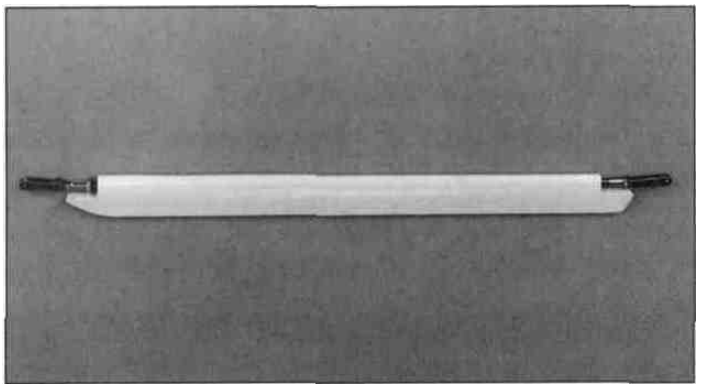
Hint: To drill a hole 1/2" deep, wrap a piece of masking tape around the drill bit 1/2" from the point Drill into the wood until the masking tape touches the wood Drill holes in both ends of all six struts.



D 5 Thread the six **4-40 nuts** close to the head of six of the **4-40 x 1" machine screws** Mix a small amount of 30-minute epoxy and apply a small amount to the last 1/2" of threads on the machine screws Then thread the machine screw halfway into one end of each strut Install only the six machine screws with the nuts installed.

D 6 After the epoxy has cured thread the nut against the strut Use a cut off wheel or hack saw to cut off the head of the machine screw Unscrew the nut from the machine screw. The nut will clean up the threads as it is removed.

D 7. After all the nuts have been removed, repeat steps 4-6 with the remaining six 4-40 x 1" machine screws.



D 8 Place the struts over the plan Determine which end will go at the top Thread a 4-40 nut on that end Thread a **4-40 metal clevis** onto both ends of all six struts The nut will be used later to lock the clevis in position

D 9 Attach the struts to the strut tabs on both wings Install the front strut first followed by the diagonal strut then the back strut You may need to adjust the metal clevises to get the struts to fit.

Balance The Airplane Laterally

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

Now that the model is covered and nearly completed, this is the time to balance it laterally (side-to-side) An airplane that is laterally balanced will track better during aerobatic maneuvers Here s how.

D 1. With the wings level and attached to the model (and the engine and muffler installed), lift the model by the propeller shaft and the fin This will require an assistant Do this several times

D 2 The wing that consistently drops indicates the heavy side Balance the model by adding weight to the other wing tip.

ADJUSTMENTS

Adjusting The Wings

Due to the differences in building techniques and manufacturing the wings may not be perfectly parallel to each other and may also differ slightly in wing incidence The following procedure will allow you to adjust the wings to their proper settings It will require an incidence meter and some patience.

D 1 With the struts installed, measure the distance between the LE of the wings at the root and at the wing tips Adjust the front struts until the distance is equal

D 2 Measure the distance between the TE of the wings **at** the root and at the wing tips Adjust the rear struts until the distance is equal.

D 3 With the Aeromaster setting on a flat table, install the incidence meter on the stabilizer and block up the tail until the meter reads 0° Next, attach the incidence meter to the bottom wing and take measurements next to the fuselage and the wing tips If the wing was built properly on a flat building surface the meter should read 0° across the span **of** the wing If it does not, the wing has a twist in it

D 4 To remove twist in a wing, weigh down its center section Have a helper hold the wing at the tip and carefully twist the wing in the direction opposite the twist Use a heat gun to reshnnk the covering tight.

D 5 Follow the same procedure for the top wing.

D 6 Once the wings are flat (no twist) check the incidence of both wings It should read 0° with the stabilizer set at 0°.

D 7 Fit spacers made from plywood between the cabane struts and the wing to change the incidence of the top wing if needed Remember to also adjust the N-struts.

D 8 Once you have the wing and N-struts set properly, lock the top metal clevises in place on the struts by tightening the nut against the clevis Apply a drop of CA to the threads of the bottom clevises to lock them in position.

D 9. On our prototype Aeromaster we painted the metal clevises at the bottom of the N-struts only We also marked a small L and "R on each strut to designate the left and right side This makes assembly at the flying field quick and easy.

Setting up a biplane so that it will fly correctly does take some time and patience initially, but the reward is a great flying plane.

Make The Aileron Connecting Pushrod

The aileron connecting pushrods are assembled following the same method used to assemble the N-struts If you installed aileron servos in the top and bottom wing proceed to the ***Set the Control Throws*** section

D 1 Cut the two 5/8" x 12" hardwood **aileron connection pushrods** to the shape shown on the fuselage plan Use a sanding bar loaded with 150-grit sandpaper to round the tips to the desired shape The struts can be covered with MonoKote film covering or painted with a fuelproof paint such as LustreKote spray paint.

D 2 Use a 5/64" drill bit to drill a hole 1/2" deep, centered in the notch, at both ends of the connecting pushrod.

D 3. Thread two 4-40 nuts close to the head of two of the 4-40 x 1" machine screws Mix a small amount of 30-minute epoxy and apply a small amount to the last 1/2" **of** threads on the machine screws Then thread the machine screw halfway into the end of the connecting pushrod Install only the two machine screws with the nuts **installed.**

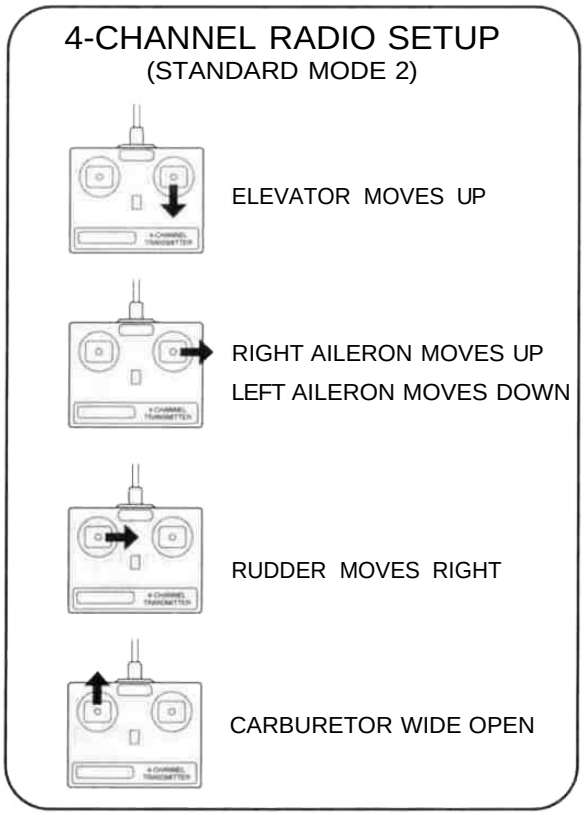
D 4 After the epoxy has cured, thread the nut against the connecting pushrods and use a cut-off wheel or hack saw to cut off the head of the machine screw Unscrew the nut from the machine screw The nut will clean up the threads as it is removed.

D 5 After all the nuts have been removed, thread the nuts onto the remaining two 4 40 x 1" machine screws and install them in the remaining ends of the struts following the same procedure as before.

D 6. Place the connecting pushrods over the plan to determine which end will go at the top Thread a 4-40 nut on that end Thread a 4-40 metal clevis onto both ends of the two connecting pushrods. The nut will be used later to lock the clevis in position.

D 7 Attach the connecting pushrods to the ailerons on both wings Adjust the aileron connecting pushrods so that the ailerons are in the same position on the top and bottom wing.

Set the Control Throws



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

Do not exceed the stated elevator throws.
We recommend the following control surface throws

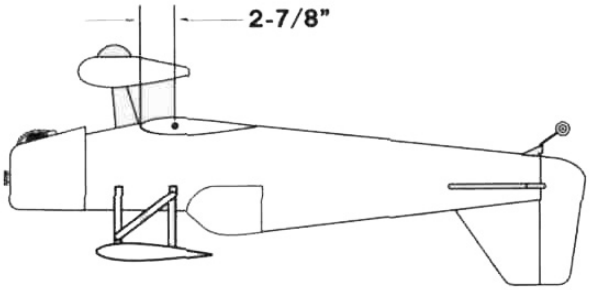
	High Rate	Low Rate
ELEVATOR:	1-1/16" up 1-1/16" down	3/4" up 3/4" down
RUDDER:	2-1/8" right 2-1/8" left	1-5/8" right 1-5/8" left
AILERONS:	3/4" up 3/4" down	9/16" up 9/16" down

NOTE If your radio does not have dual rates, set the control surfaces to move **between** the high rate and low rate throws

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

Balance Your Model

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



D 1. The balance point (CG) is located **2-7/8" back from the leading edge of the lower wing** next to the fuse sides as shown in the sketch and on the fuselage plan Accurately mark the balance point on the **top** of the wing on both sides of the fuselage Use thin strips of tape or a felt-tip pen to make the marks.

Hint: Reference the full size fuse plan to help you locate the proper balance point This is the balance point at which your model should balance for your first flights After initial trim flights and when you become more acquainted with your Aeromaster, you may wish to experiment by shifting the balance up to **3/8" forward or backward** to change its flying characteristics Moving the balance **forward** may improve the smoothness and stability but the model may then require more speed for takeoff and may become more difficult to slow for landing Moving the balance **aft** makes the model **more agile** with a lighter, snappier "feel" and often improves knife-edge capabilities In any case, **please start at the location we recommend. Do not at any time balance your model outside the recommended range.**

D 2 With the wing attached to the fuselage, all parts of the model installed (ready to fly) and an **empty** fuel tank, hold the model upside down, with the stabilizer level.

D 3. Lift the model at the balance point. If the **tail** drops when you lift, the model is "tail heavy" and you must add weight* to the nose to balance the model If the **nose** drops, it is "nose heavy' and you must add weight* to the tail to balance the model.

NOTE: Nose weight may be easily installed by using a "spinner weight" or gluing lead weights to the firewall Tail weight may be added by using Great Planes (GPMQ4485) "stick on" lead weights Later if the balance is 0 K , you can open the fuse bottom and glue the weights in permanently

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

PREFLIGHT

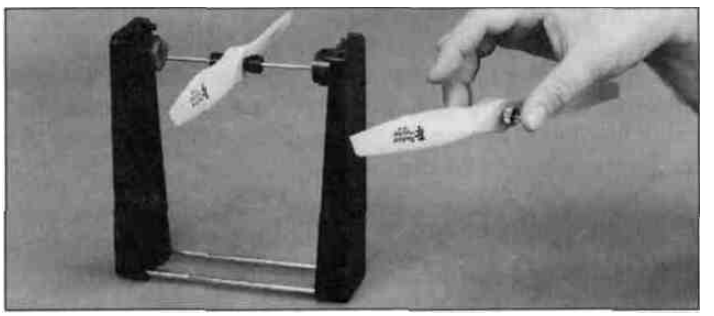
At this time check all connections including servo arm screws, clevises, servo cords and extensions. Make sure you have installed the **nylon retainer** on the Screw-Lock Pushrod Connector on the throttle pushrod at the servo arm and the **retainers** on all the clevises.

Charge The Batteries

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

Balance The Propeller

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



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

Find A Safe Place To Fly

Since you have chosen the Aeromaster we assume that you are an experienced modeler Therefore, you should already know about AMA chartered flying fields and other safe places to fly If, for some reason you are a relatively inexperienced modeler and have not been informed, we strongly suggest that the best place to fly is an AMA chartered club field Ask the AMA or your local hobby shop dealer if there is a club in your area and join Club fields are set up for R/C flying and that makes your outing safer and more enjoyable The AMA address and telephone number is in the front of this manual. If a club and flying site are not available, find a large, grassy area at least 6 miles away from houses, buildings and streets and any other R/C radio operation like R/C boats and R/C cars A schoolyard may look inviting but is too close **to** people, power lines and possible radio interference.

Ground Check The Model

Inspect your radio installation and confirm that all the control surfaces respond correctly to transmitter inputs The engine operation must also be checked by confirming that the engine idles reliably and transitions smoothly and rapidly to full power and maintains full power indefinitely The engine must be "broken-in" on the ground by running it for at least two tanks of fuel **Follow the engine manufacturer's recommendations for break-in.** Make sure all screws remain tight, that the hinges are secure and that the prop is on tight.

Range Check Your Radio

Whenever you go to the flying field, check the operational range of the radio before the first flight of the day First, make sure no one else is on you frequency (channel) With your transmitter antenna collapsed and the receiver and transmitter on, you should be able to walk at least 100 feet away from the model and still have control While you work the controls have a helper stand by your model and tell you what the control surfaces are doing Repeat this test **with the engine running** at various speeds with a helper holding the model If the control surfaces are not always responding correctly, **do not fly!** Find and correct the problem first Look for loose servo connections or corrosion, loose bolts that may cause vibration, a defective on/off switch low battery voltage or a defective cell, a damaged receiver antenna, or a receiver crystal that may have been damaged from a previous crash.

Engine Safety Precautions

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

Keep all engine fuel in a safe place, away from high heat, sparks or flames as fuel is very flammable Do not smoke near the engine or fuel, and remember that the engine exhaust gives off a great deal of deadly carbon monoxide **Do not run the engine in a closed room or garage** If you are running a gasoline powered engine we recommend that you carry a small fire extinguisher in your field box.

Get help from an experienced pilot when learning to operate engines Because of the size and power of the Giant Aeromaster, an assistant must hold the plane when starting the engine.

Use safety glasses when starting or running engines.

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

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

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

Use a "chicken stick," spring 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 When starting gasoline engines by hand we recommend wearing thick leather gloves to prevent injury in case the engine backfires.

Make all engine adjustments from **behind** the rotating propeller

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

To stop a glow 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 other body part to try to stop the engine To stop a gasoline powered engine an on/off switch should be connected to the engine coil Do not throw anything into the propeller of a running engine.

AMA SAFETY CODE (excerpt)

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

General

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

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

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

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

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

Radio Control

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

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

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

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

FLYING

CAUTION (THIS APPLIES TO ALL R/C AIRPLANES) If, while flying, you notice any unusual sounds, such as a low-pitched "buzz", this may indicate control surface "flutter" Because flutter can quickly destroy components of your airplane, any time you detect flutter you must **immediately** cut the throttle and land the airplane' Check all servo grommets for deterioration (this may indicate which surface fluttered) and make sure all pushrod linkages are 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, Excessive "play" or "backlash" in servo gears, and Insecure servo mounting

The Great Planes Giant Aeromaster is a great-flying large-scale sport model that flies smoothly and predictably, yet is highly acrobatic The Aeromaster does not, however, possess the self-recovery characteristics of a primary R/C trainer and should only be flown by experienced RC pilots This plane is fully capable of performing a full range of aerobatics - from simple loops and rolls to impressive Lomcevaks The Aeromaster is limited only by your abilities and imagination Have funi

Takeoff

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

Flight

We recommend that you take it easy with your Aeromaster for the first several flights, gradually 'getting acquainted with this great sport model as your engine gets fully broken in If you feel as though you have your hands full, keep this in mind **pull back on the throttle stick to slow the model down** This will make everything happen a little slower and allow yourself time to think and react Add and practice one maneuver at a time learning how the Aeromaster behaves in each For smooth flying and normal maneuvers, use the low rate settings as listed on page 45 High rate elevator may be required for crisp snap rolls and spins For good knife-edge performance forward fight speed is the key

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

Landing

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

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

Flight Trimming

A model is not a static object Unlike a car, which can only hunt left or right on the road (technically a car does yaw in corners and pitches when the brakes are applied) a plane moves through that fluid we call air in all directions simultaneously The plane may look like it's going forward but it could also be yawing slightly, slipping a little and simultaneously climbing or diving a bit. The controls interact Yaw can be a rudder problem, a lateral balance problem or an aileron rigging problem We must make many flights, with minor changes between each, to isolate and finally correct the problem.

The chart accompanying this article is intended to serve as a handy field reference when trimming your model Laminate it in plastic and keep it in your flight box You just might have need to consult it at the next contest' The chart is somewhat self-explanatory, but we will briefly run through the salient points
First, we are assuming that the model has been C G balanced according to the manufacturer s directions There s nothing sacred about that spot — frankly it only reflects the balance point where a prototype model handled the way the guy who designed it thought it should If your model s wing has a degree more or less of incidence then the whole balance formula is incorrect for you. But, it's a good ballpark place to start.

The second assumption is that the model has been balanced laterally Wrap a strong string or monofilament around the prop shaft behind the spinner then tie the other end to the tail wheel or to a screw driven into the bottom of the aft fuse Make the string into a bridle harness and suspend the entire model inverted (yes, with the wing on[1]) If the right wing always drops, sink some screws or lead into the left wing tip, etc You may be surprised to find out how much lead is needed.

At this point the model is statically trimmed It's only a starting point, so don't be surprised if you wind up changing it all One other critical feature is that the ailerons must have their hinge **gap** sealed If shoving some Scotch tape or MonoKote into the hinge gap to prevent the air from slipping from the top of the wing to the bottom and vice-versa, bothers you, then don't do it.

To achieve the maximum lateral trim on the model, the hinge gap on the ailerons should be sealed The easiest way to do this is to disconnect the aileron linkages and fold the ailerons as far over the top of the wing as possible (assuming they are top or center hinged) Apply a strip of clear tape along the joint line. When the aileron is returned to neutral the tape will be invisible and the gap will be effectively sealed Depending on how big the ailerons are, and how large a gaping gap you normally leave when you install hinges you could experience a 20 percent increase in aileron control response just by this simple measure

Your first flights should be to ascertain control centering and control feel Does the elevator always come back to neutral after a 180-degree turn or Split-S? Do the ailerons tend to hunt a little after a rolling maneuver? Put the plane through its paces Control centering is either a mechanical thing (binding servos, stiff linkages, etc), an electronic thing (bad servo resolution or dead-band in the radio system), or C.G. (aft Center of Gravity will make the plane wander a bit) The last possibility will be obvious, but don't continue the testing until you have isolated the problem and corrected it.

Let's get down to the task of trimming the model. Use the tachometer every time you start the engine to insure consistent results These trim flights must be done in calm weather Any wind will only make the model weather-vane Each "maneuver" on the list assumes that you will enter it dead straight-and-level The wings must be perfectly flat, or else the maneuver will not be correct and you Il get a wrong interpretation. That's where your observer comes in Instruct him to be especially watchful of the wings as you enter the maneuvers

Do all maneuvers at full throttle The only deviation from this is if the plane will be routinely flown through maneuvers at a different power setting

Let's commence with the "engine thrust angle" on the chart. Note that the observations you make can also be caused by the C.G , so be prepared to change both to see which gives the desired result Set up a straight-and-level pass The model should be almost hands-off Without touching any other control on the transmitter, suddenly chop the throttle Did the nose drop[9] When you add power again, did the nose pitch up a bit[7] If so you need some downthrust, or nose weight. When the thrust is correct, the model should continue along the same flight path for at least a dozen plane lengths before gravity starts to naturally bring it down

Do each maneuver several times, to make sure that you are getting a proper diagnosis Often, a gust, an accidental nudge on the controls, or just a poor maneuver entry can mislead you The thrust adjustments are a real pain to make On most models, it means taking the engine out, adding shims, then reassembling the whole thing. Don't take shortcuts Don t try to proceed with the other trim adjustments until you have the thrust line and/or C G correct They are the basis upon which all other trim setting are made.

Also, while you have landed, take the time to crank the clevises until the transmitter trims are at neutral Don't leave the airplane so that the transmitter has some odd ball combination of trim settings One bump of the transmitter and you have lost everything The trim must be repeatable, the only sure way to do this is to always start with the transmitter control trims at the middle.

The next maneuver is somewhat more tricky than it looks To verify the C G , we roll the model up to a 45 degree bank, then take our hands off the controls The model should go a reasonable distance with the fuse at an even keel If the nose pitches down remove some nose weight and the opposite if the nose pitches up The trick is to use only the ailerons to get the model up at a 45-degree bank We almost automatically start feeding in elevator, but that's a no no Do the bank in both directions, just to make sure that you are getting an accurate reading of the longitudinal balance.

We now want to test the correct alignment of both sides of the elevator (even if they aren't split, like a Pattern ship's they can still be warped or twisted). Yaw and lateral balance will also come

into play here so be patient and eliminate the variables one-by-one The maneuver is a simple loop but it must be entered with the wings perfectly level Position the maneuver so that your assistant can observe it end on Always loop into the wind Do several loops see if the same symptom persists Note if the model loses heading on the front or back side of the loop If you lose it on the way up it s probably an aileron problem while a loss of heading on the way back down is most likely a rudder situation After you get the inside loops going correctly do the same maneuver to the outside entering from an inverted position Before you make too many dramatic changes glance at the remainder of the chart and note the myriad combination of things we can do just with the ailerons Each change you make will affect all other variables'

Note that the Yaw test is the same looping sequences Here, however we are altering rudder and ailerons instead of the elevator halves We must repeat that many airplanes just will not achieve adequate lateral trim without sealing the hinge gaps shut The larger you make the loops (to a point), the more discernable the errors will be

The Lateral Balance test has us pulling those loops very tightly Actually we prefer the Hammerhead as a better test for a heavy wing Pull straight up into a vertical and watch which wing drops A true vertical is hard to do, so make sure that your assistant is observing from another vantage point Note that the engine torque will affect the vertical fall off, as will rudder errors Even though we balance the wing statically before leaving for the field, we are now trimming it dynamically

The Aileron Coupling (or rigging) is also tested by doing Hammerheads This time however we want to observe the side view of the model Does the plane want to tuck under a bit[9] If **so,** then try trimming the ailerons down a small bit so that they will act as flaps If the model tends to want to go over into a loop then rig both ailerons up a few turns on the clevises Note that drooping the ailerons will tend to cancel any washout you have in the wing On some models the lack of washout can lead to some nasty characteristics at low speeds

The effects noted with the Aileron Coupling tests can also be caused by an improperly set wing incidence The better test for this is knife edge flight If the model tends to pull upward, i e , it swings toward a nose up direction, then reduce the wing incidence If the model tries to go off heading toward the bottom side of the plane, then increase incidence

Again, we reiterate that all of these controls are interactive When you change the wing incidence, it will influence the way the elevator trim is at a given C G Re trimming the wing will also change the rigging on the ailerons, in effect and they may have to be readjusted accordingly

The whole process isn't hard As a matter of fact it's rather fun — but very time consuming It s amazing what you will learn about why a plane flies the way it does, and you'll be a better pilot for it One thing we almost guarantee is that your planes will be more reliable and predictable when they are properly trimmed out They will fly more efficiently and be less prone to doing radical and surprising things Your contest scores should improve, too.

We wish to acknowledge the Orlando, Florida, club newsletter, from which the basics of the chart presented here were gleaned

Reprinted in part by Great Planes Model Manufacturing Company courtesy of Scale R/C Modeler magazine, Pat Potega, Editor, August 1983 issue

Building Notes:

TRIM FEATURE	MANEUVERS	OBSERVATIONS	CORRECTIONS
CONTROL CENTERING	Fly general circles and random maneuvers	Try for hands off straight and level flight	Readjust linkages so that Tx trims are centered
CONTROL THROWS	Random maneuvers	A Too sensitive, jerky controls B Not sufficient control	If A, change linkages to reduce throws If B, increase throws
ENGINE THRUST ANGLE[1]	From straight flight chop throttle quickly	A Aircraft continues level path for short distance B Plane pitches nose up C Plane pitches nose down	If A, trim is okay If B, decrease downthrust If C, increase downthrust
CENTER OF GRAVITY LONGITUDINAL BALANCE	From level flight roll to 45-degree bank and neutralize controls	A Continues in bank for moderate distance B Nose pitches up C Nose drops	If A, trim is good If B, add nose weight If C, remove nose weight
YAW[2]	Into wind, do open loops, using only elevator Repeat tests doing outside loops from inverted entry	A Wings are level throughout B Yaws to right in both inside and outside loops C Yaws to left in both inside and outside loops D Yaws right on insides, and left on outside loops E Yaws left in insides and right on outside loops	If A, trim is correct If B, add left rudder trim If C, add right rudder trim If D, add left aileron trim If E, add right aileron trim
LATERAL BALANCE	Into wind, do tight inside loops	A Wings are level and plane falls to either side randomly B Falls off to left in loops Worsens as loops tighten C Falls off to right in loops Worsens as loops tighten	If A, trim is correct If B, add weight to right wing tip If C, add weight to left wing tip
AILERON RIGGING	With wings level, pull to vertical climb and neutralize controls	A Climb continiies along same path B Nose tends to goto inside loop C Nose tends to go to outside loop	If A, trim is correct If B raise both ailerons very slightly If C, lower both ailerons very slightly

1 Engine thrust angle and C G interact Check both
2 Yaw and lateral balance produce similar symptoms Note that fin may be crooked Right and left references are from the plane's vantage point

2-View Drawing

Use this 2-view to help plan your trim scheme.