ULTRA-SPORT 1000

INSTRUCTION BOOK

WARRANTY

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

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

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

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

GREAT PLANES® MODEL MANUFACTURING COMPANY

PO BOX 788 URBANA ILLINOIS 61801 2173984970

V1.1

TABLE OF CONTENTS

WARNING! THIS IS NOT A TOY!
THIS IS NOT A BEGINNER'S AIRPLANE!

This R/C kit and the model you will build is not a toy! It is capable of serious bodily harm and property damage. **IT IS YOUR RESPONSIBILITY AND YOURS ALONE** to build this kit correctly, properly install all R/C components and flying gear (engine, tank, pushrods, etc) and to test the model and fly it only with experienced, competent help, using common sense and in accordance with all safety standards as set down in the Academy of Model Aeronautics Safety Code. It is suggested that you join the AMA to become properly insured before you attempt to fly this model. IF YOU ARE JUST STARTING R/C MODELING, CONSULT YOUR LOCAL HOBBY SHOP OR WRITE TO THE ACADEMY OF MODEL AERONAUTICS TO FIND AN EXPERIENCED INSTRUCTOR IN YOUR AREA.

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

IF THINGS AREN'T RIGHT WITH YOUR KIT

Please inspect all parts carefully before starting to build! If any parts are missing, broken or defective, or if you have any questions about building or flying this airplane, please call us at (217) 398-8970 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.

INTRODUCTION

Congratulations' Thank you for purchasing the Great Planes **Ultra-Sport 1000!** Jim Feldmann's original design Ultra-Sport 60 was featured as a construction article in the August, 1989 issue of *RC Modeler magazine,* and has been hailed by many as "the best sport flying airplane ever"' The design starts with the legendary "Kaos" wing platform, and features modern styling and state-of-the-art construction techniques The result is an ultra-stable, ultra-smooth flying airplane that does what you want it to, no more and no less. Now in its largest size, the Ultra-Sport 1000 is better than ever

The Ultra-Sport 1000 is easy to build, totally predictable, smooth-flying and has very docile stall characteristics, making it the ultimate sport airplane for the modeler who wants to fly with a higher degree of precision Because it naturally tracks through maneuvers better than other sport airplanes, you'll fly better when you're flying an Ultra-Sport 1000

This is not a beginner's airplane! While the Ultra-Sport 1000 is easy to build and flies great, we must discourage you from selecting this kit as your **first** R/C airplane It is fast, highly maneuverable, and lacks the self-recovery characteristics of a good **basic trainer** such as the Great Planes **PT Series** airplanes On the other hand, if you have already learned the basics of R/C flying and you are able to safely handle an "aileron trainer" airplane such as the Great Planes **Trainer Series** or **Big Stick Series** airplanes, the Ultra-Sport 1000 is an excellent choice

Because the Ultra-Sport 1000 has a wingspan over 80", it is considered "Giant Scale" and can qualify to fly in IMAA sanctioned events. However, if you plan to do so, you must be aware of the **IMAA Safety Guidelines,** and take the necessary precautions while building this airplane to insure compliance with those guidelines We have reprinted several important sections of the guidelines in the Appendix at the end of this book. **Read them now.** In addition, it would be a good idea to talk in advance with the designated **safety officers** for the IMAA events you plan to attend, to determine if any modifications need to be made to qualify your Ultra-Sport 1000.

PRECAUTIONS

1. You must build the plane **according to the plans and instructions.** Do not alter or modify the model as represented by the plans, as doing so may result in an unsafe or unflyable model In a few cases the plans and instructions may differ

slightly from the photos In those instances you should assume the plans and written instructions are correct Also you may notice a slight difference in length between some of the longer parts and the plans This is normal and is caused by the plans expanding and shrinking with the changing moisture content in the air Do not modify the parts to fit the plan.

2 You must take time to **build** straight, true and strong **IMPORTANT -** glue should never be substituted for a good joint Take a little extra time to get a close fitting joint and glue it properly It will be stronger neater and much lighter than a bad joint held together with excess glue

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

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

5 You must **test** the operation of the model before the first and each successive flight to insure that all equipment is operating, and you must make certain that the model has remained structurally sound Be sure to check the nylon clevises and horns often, and replace if they show signs of wear.

6 You must **fly** the model **only with the competent help** of a highly experienced R/C pilot if you are not already an experienced and knowledgeable R/C pilot at this time

Note- We, as the kit manufacturer, can provide you with a top quality kit and great instructions, but ultimately the quality 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 light, straight and true.

COMMON ABBREVIATIONS USED IN THIS BOOK AND ON THE PLANS:

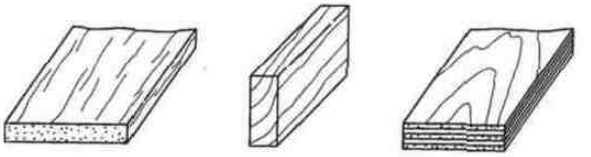
Elev = Elevator
Fuse = Fuselage
LE = Leading Edge (front)
LG = Landing Gear
Lt = Left
Ply = Plywood
Rt = Right
Stab = Stabilizer
TE = Trailing Edge (rear)
"= Inches

ENGLISH/METRIC CONVERSIONS

NOTE All dimensions in this book are given in inches and fractions of an inch Use the table below to convert these dimensions to the metric system, if that is what you are most familiar with

INCHES		MILLIMETERS
1"	=	25.4mm
7/8"	=	22.2mm
3/4"	=	19.0mm
5/8"	=	15.9mm
1/2"	=	12.7mm
3/8"	=	9.5mm
1/4"	=	6.3mm
3/16"	=	4.8mm
1/8"	=	3.2mm
3/32"	=	2.4mm
5/64"	=	2.Omm
1/16"	=	1.6mm
1/32"	=	.08mm

TYPES OF WOOD



Balsa **Basswood** **Plywood**

DECISIONS YOU MUST MAKE NOW

ENGINE, MOUNT, AND SPINNER SELECTION

The recommended engine size range is as follows:
90 - 1 50 cubic inch displacement **2-cycle**
1.20 -1.60 cubic inch displacement **4-cycle**

The complete "ENGINE APPLICATION TABLE" is printed on the fuselage plan A portion of that table is reprinted here to help in your selection of engine, propeller, mount and spinner.

COMPONENTS RECOMMENDED FOR THE ULTRA SPORT 1000:

ENGINE	PROP	ENGINE MOUNT	SPINNER
OS 120 SURPASS SP*	**16x8**	J-TECJT-120SP(SV)**	2-3/4"
SUPERTIGRE 2500	16x10	J-TECJT-ST125(SV)**	3"
OS 120 SURPASS II	**15x8**	J-TECJT-122(SV)**	2-3/4"
OS108FSR	**15x8**	J-TECJT-M108(SV)**	2-3/4"
OS 160 TWIN	15x10	Mount incl w/ engine	3"

* Supercharged version
** "SV" denotes the rubber-cushioned version of this mount, which is recommended.

The above components you select will determine how you build the fuselage, so it is important that you have these components close at hand while building

MUFFLER SELECTION FOR SUPERTIGRE 2500

If you are using the Supertigre 2500 engine, you have two muffler choices One is the standard **SuperTigre "S 3000"** silencer that is made for this engine, and which is outlined on the plans If you prefer a more conventional style muffler, you may choose the **J-TEC "JT-3000S"** muffler which was custom made as a result of this project (it is pictured in an Ultra-Sport 1000 on the cover of the April, 1992 issue of R/C Modeler magazine) Both mufflers work well, but they are very different styles (See the photos on page 43)

LANDING GEAR CONFIGURATION

The Ultra-Sport 1000 may be built with a **"taildragger"** or **"tricycle"** landing gear configuration, and a **retractable main gear** may be installed if you want to really "clean up' this airplane **for** ultra-smooth and precise aerobatics.

The Ultra-Sport 1000 was not designed to accommodate a nose gear retract, therefore if you want retracts, you'll have to use the "taildragger" configuration.

You have a few choices regarding retracts, and you should read the following before selecting the retracts to be used in your plane.

1. The retracts shown in this book are B&D 90-degree 2-gear mains These units are mechanical and are supplied with 5/32" wire struts which are not considered strong enough for this airplane, therefore, this kit includes 3/16" wire struts which you may install in the B&D retract units by drilling them out Although this system has worked reliably for us. we have experienced breakage in a couple of instances involving moderately hard landings

2. The Robart company has indicated that the following pneumatic retract system will work for airplanes up to 12 lbs using stock wire struts, but that the Robostruts should be used for planes over 12 lbs Listed here are the Robart items needed for the complete system *#606* Retracts, #650 Robostruts, #188 Air control kit, #190 Quick disconnects, #189 Airline restricters, #164G Pump w/ gauge, #170 Air line retainers.

3. **A**t the date of this writing, Robart has also indicated that they will have new heavy-duty mechanical retracts with 3/16" wire struts available for this airplane These retracts, although not tested in the US1000, may be ideal for this airplane you may want to check with your hobby dealer regarding the availability of these retracts.

OTHER ITEMS REQUIRED

Four-channel radio with 6 servos (additional channel and retract servo required if retracts are being used). An 800 to 1200 mAh receiver battery is recommended (IMAA requires 1000 mAh)

- 2 - Servo wire "Y"-harnesses.
- 2 - Servo wire extensions.
- 18-Hinges*
- Propellers (Top Flite" Power Point" recommended - see engine instructions and above table).
- Spinner - 2-3/4" or 3" diameter (see above table)
- Fuel Tank (12 to 16 ounce)
- Main Wheels - 2 (3" dia. for fixed gear, 2-3/4" for **retracts)**
- Nose Wheel - 1 (3" diameter, required for trike only)
- Tail Wheel - 1 (1" diameter, required for taildragger only)
- 3/16" Wheel Collars - 4 or 6
- 3/32" Wheel Collars - 2 (required for taildragger only)
- Iron-on Covering Material **(Top Flite MonoKote® recommended)**
- Silicone Fuel Tubing
- Wing Seating Tape (or silicone sealer . . . see page 50)
- Latex Foam Rubber Padding (1/4" thick)
- Dubro "E-Z Connectors" (or equivalent) - 2
- **Plastic** Pilot (Williams Bros. 1/4-scale)

***NOTE:** There are many types of good hinges on the market, and everyone has their personal preferences, therefore, hinges have not been included in this kit. The current favorite for many modelers is the type of laminated hinge that permits hinge slotting with an X-acto knife, and gluing with thin CA adhesive If you are building a **taildragger,** heavy-duty hinges are recommended for the rudder. See the IMAA Safety Guidelines, a portion of which is printed in the Appendix at the end of this book.

SUPPLIES AND TOOLS NEEDED

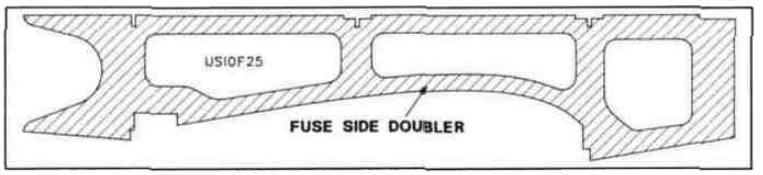
- 3 oz. Thin Bullet CA Adhesive
- 3 oz. Medium or Thick Bullet CA Adhesive
- 2.5 oz. 30-Minute Bullet Epoxy
- Hand or Electric Drill
- Drill Bits: 1/16", 5/64", 3/32", 7/64", 1/8", 9/64", 5/32", 3/16" (Long), 13/64", 1/4", and 5/16"
- Hobby Saw (X-acto Razor Saw)
- X-acto Knife, #11 Blades
- Pliers
- Screw Drivers
- T-Pins
- Straightedge
- Masking Tape
- Sandpaper (coarse, medium, fine grit)*
- T-Bar Sanding Block, or similar
- Waxed Paper
- Lightweight Balsa Filler
- 1/4-20 Tap, Tap Wrench
- Vaseline Petroleum Jelly
- Sealing Iron
- **Heat** Gun
- Isopropyl Rubbing Alcohol (70%)
- 3M "77" Spray Adhesive (optional)
- Dremel Moto Tool or similar (optional)

***NOTE:** On our workbench, we have four 11" T-Bar sanders, equipped with #50, #80, #100 and #150-grit sandpaper This setup is all that is required for almost any sanding task.

DIE PATTERNS

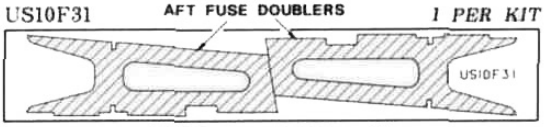
Use This Drawing To Identify Die-Cut Parts

US10F25 — 2 PER KIT



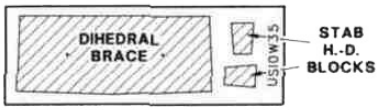
PLY 1/8" x 5-3/4" x 26-1/2"

US10F31 — AFT FUSE DOUBLERS — 1 PER KIT



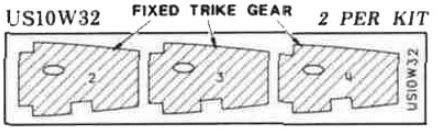
PLY 1/8" x 3-1/4" x 19"

US10W35 — 1 PER KIT



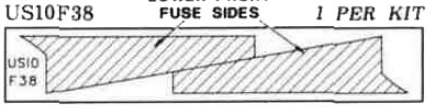
PLY 1/8" x 3-1/2" x 9-7/8"

US10W32 — RIB DOUBLERS FIXED TRIKE GEAR — 2 PER KIT



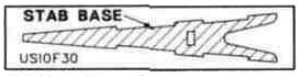
PLY 1/8" x 3-1/4" x 15"

US10F38 — LOWER FRONT FUSE SIDES — 1 PER KIT



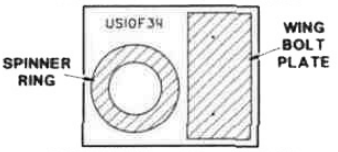
BALSA 3/16" x 2-5/8" x 14-7/8"

US10F30 — 1 PER KIT



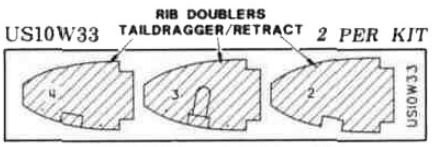
PLY 1/8" x 2-1/4" x 10-1/4"

US10F34 — 1 PER KIT



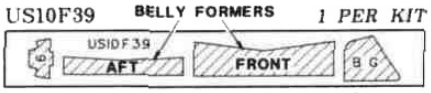
PLY 1/16" x 5" x 6-1/4"

US10W33 — RIB DOUBLERS TAILDRAGGER/RETRACT — 2 PER KIT



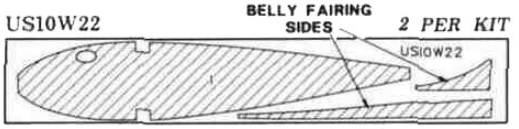
PLY 1/8" x 3-1/4" x 15"

US10F39 — BELLY FORMERS — 1 PER KIT



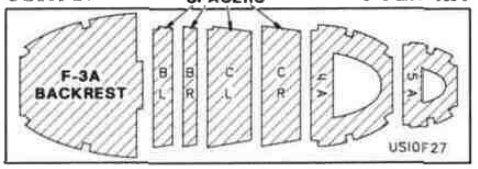
BALSA 1/8" x 2" x 14-7/8"

US10W22 — BELLY FAIRING SIDES — 2 PER KIT



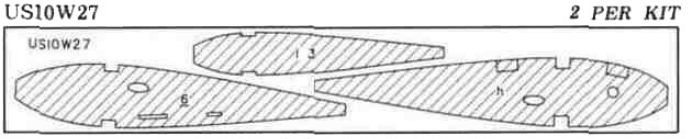
BALSA 1/8" x 3" x 17-7/8"

US10F27 — FIREWALL SPACERS — 1 PER KIT



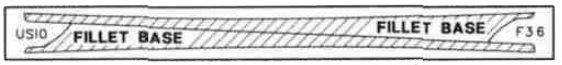
PLY 1/8" x 5-1/2" x 16-1/2"

US10W27 — 2 PER KIT



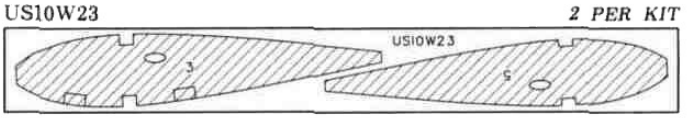
BALSA 3/32" x 3-3/4" x 24"

US10F36 — 1 PER KIT



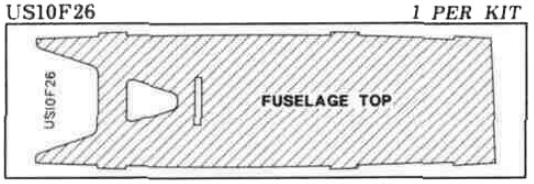
PLY 1/32" x 19-1/2" x 1-7/8"

US10W23 — 2 PER KIT



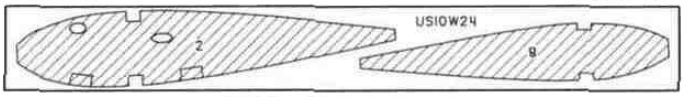
BALSA 3/32" x 3" x 24

US10F26 — 1 PER KIT



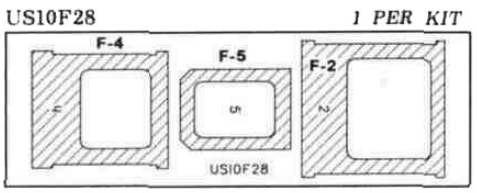
PLY 1/8" x 5-1/2" x 18-1/2"

US10W24 — 2 PER KIT



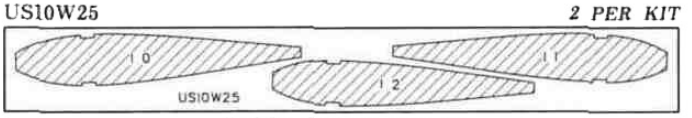
BALSA 3/32" x 3" x 24

US10F28 — 1 PER KIT



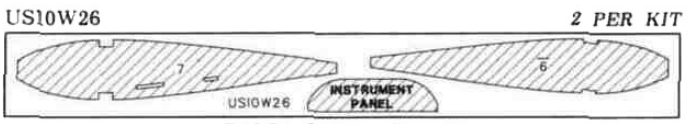
PLY 1/8" x 5-1/2" x 16-1/2"

US10W25 — 2 PER KIT



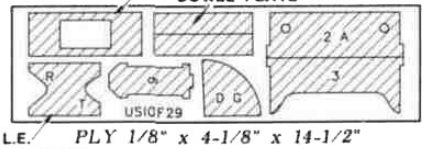
BALSA 3/32" x 3" x 24

US10W26 — 2 PER KIT



BALSA 3/32" x 3" x 24

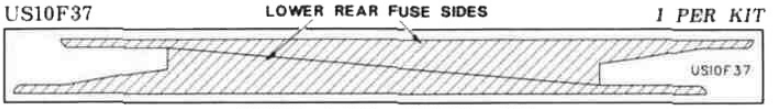
US10F29 — RETRACT SERVO TRAY DOWEL PLATE — 1 PER KIT



L.E. TEMPLATE

PLY 1/8" x 4-1/8" x 14-1/2"

US10F37 — LOWER REAR FUSE SIDES — 1 PER KIT



BALSA 3/16" x 2-5/8" x 27"

GET READY TO BUILD

D 1. Unroll the plan sheets Re-roll them inside out to make them lie flat NOTE You may cut the fuselage plan into two sections for ease of building on the "Bottom View" You may also cut the wing plan into three sections by cutting along the "cut lines."

D 2 Remove all parts from the box As you do, figure out the name of each part by comparing it with the plans and the parts list (see separate sheet). Using a soft pencil or a felt tip pen, write the part **name** or **size** on each piece to avoid confusion later Use the **die-cut patterns** on page 7 to identify the die-cut parts and mark them **before** punching out Save all scraps If any of the die-cut parts are difficult to punch out, do not force them' Instead, first cut around the parts with an X-acto knife After punching out the die-cut parts, use your T-Bar or sanding block to **lightly** sand the edges to square them up and remove any die-cutting irregularities

D 3 As you identify and mark the parts, separate them into groups, such as fuse, wing, fin and stab, and hardware.

TAIL FEATHERS

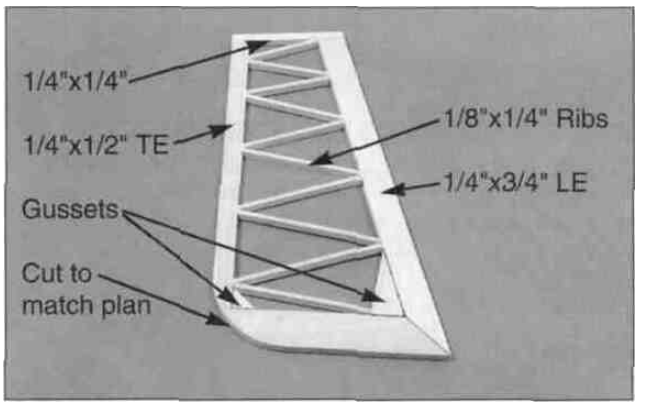
PARTS NEEDED TO BUILD THE FIN AND RUDDER:

D (1) US10S01 1/4" x 1" x 9" Balsa **Rudder Bottom, etc.**
D (1) US10S02 1/4" x 1/2" x 9" Balsa **Rudder TE**
D (1) US10S03 1/4" x 3/4" x 20" Balsa **Fin TE, Rudder LE**
D (1) US10S04 1/4" x 1/4" x 3-1/2" Balsa **Rudder Top**
D (1) US10S05 3/8" x 1-1/2" x 10-1/2" Balsa **Fin LE**
D (1) US10S20 3/8" x 1" x 7" Balsa **Fin Top**
D (2) US10S06 1/4" x 3-1/4" x 1-1/2" Balsa **Fin Bottom**
D (2) US10S08 1/8" x 1/4" x 30" Balsa **Fin & Rudder "Ribs"**
D (3) US10S17 1/16" x 3" x 30" Balsa **Stab/Fin Sheeting**
D (1) WBNT128 3/32" wire **Tailgear Assembly**

BUILD THE RUDDER

D 1 Tape the **fuselage plan** (side view) down to your flat work surface Tape a piece of waxed paper over the fin and rudder portion of the plan

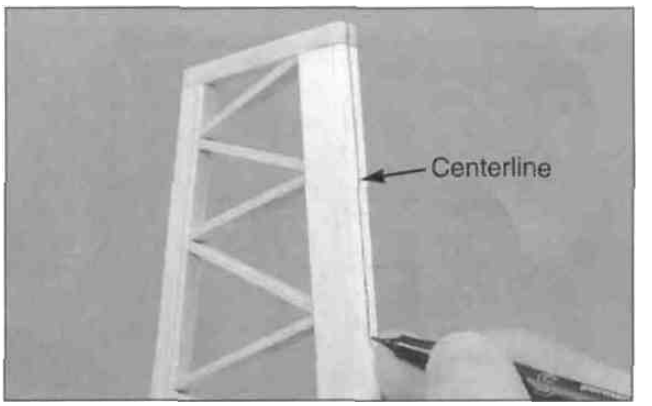
D 2. Using a razor saw, cut a piece of 1/4" x 3/4" balsa (from the 20" stick) to make the rudder **leading edge** Trim the ends of the 1/4" x 1/2" x 9" balsa stick to make the rudder **trailing edge** From the 1/4" x 1" x 9" stick, cut the rudder **bottom,** and glue on the 1/4" x 1/4" x 3-1/2" balsa rudder **top** Cut two **gussets** from the remaining 1/4" x 1" balsa for the inside corners of the rudder Working right on the plan, pin these parts in place and glue them together to make the rudder framework.



D 3 From the 1/8" x 1/4" x 30" sticks, cut the internal rudder **"ribs"** (trussing) to fit between the rudder framework, and glue them in place **NOTE:** It is **not** necessary to get these braces in the **exact** position shown on the plan.

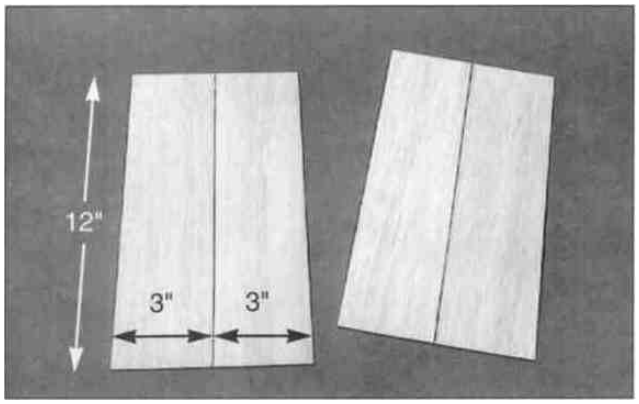
D 4 Examine the rudder framework and add thick CA glue to any open joints, then, use your T-bar with medium grit sandpaper to sand both sides **of the** rudder framework smooth.

D 5. Cut and sand the outside perimeter of the rudder framework to match the plan.



D 6 Carefully draw a **centerline** all around the edges **of** the rudder (this will help to maintain symmetry when sanding)

D 7 Using a sanding block and **coarse** (50 or 80-grit) sandpaper, sand both sides of the rudder to a **taper** as shown on the plans The trailing edge should end up approximately 1/16" wide



D 8 From the 1/16" x 3" x 30" balsa sheets, cut four 12" lengths Edge glue these sheets together in pairs to make two 6" x 12" sheets, and sand both sides smooth with a sanding block

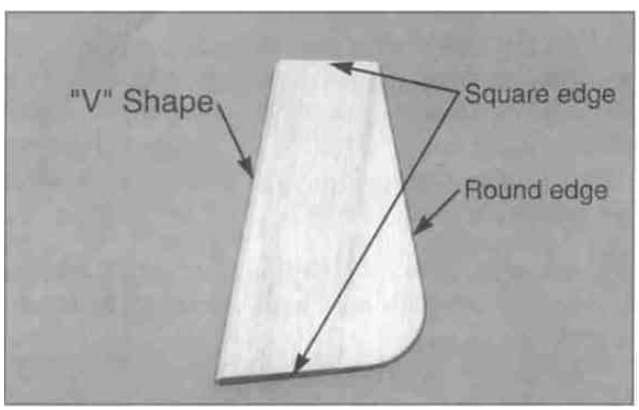
D 9 Lay the rudder framework on the sheeting, mark the outline, and trim the sheeting to the approximate outline Leave the sheeting slightly oversize to allow for positioning.

IMPORTANT NOTE: It is essential to get a very good glue bond between the rudder framework and the sheeting

D 10. Securely glue the 1/16" balsa sheeting to one side of the rudder framework

D 11. Trim and sand the edges of the sheeting flush with the perimeter of the stab framework.

D 12 Repeat steps 10 and 11, sheeting the other side of the rudder.



D 13 Sand the leading edge of the rudder to a **"V-shape"** and sand the trailing edge to a rounded shape (see the rudder cross-section on the plan) Leave the top and bottom edges square.

BUILD THE FIN

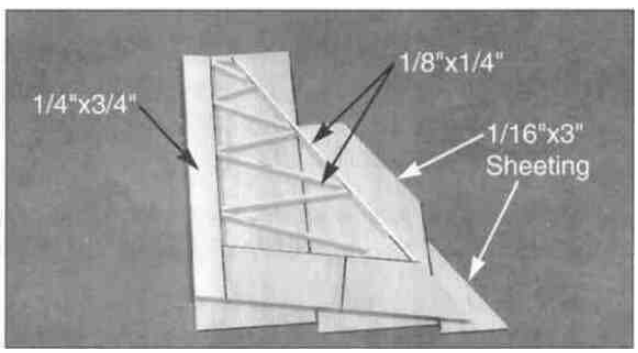
NOTE: You will construct the fin framework and add the 1/16" balsa sheeting, **then,** you will add the 3/8" balsa leading edge and fin top.

D 1. Cut the remaining 1/4" x 3/4" balsa stick to make the **fin trailing edge.**

D 2 Edge glue the two 1/4" x 3-1/4" x 1-1/2" balsa blocks together to make the 6-1/2" x 1-1/2" **fin bottom** Cut off the ends of this sheet to match the plan Pin the fin bottom and trailing edge to the plan.

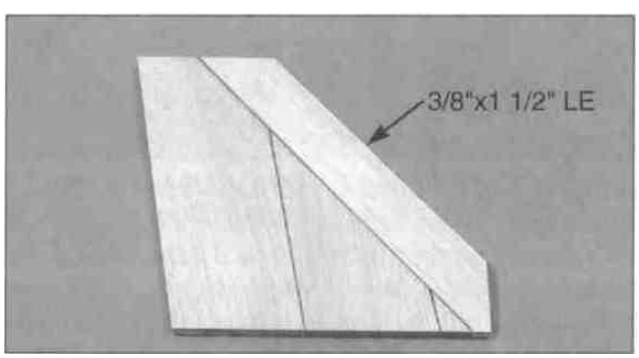
D 3. Complete the fin framework by cutting and fitting pieces of 1/8" x 1/4" balsa, as shown on the plan. Glue this assembly together.

D 4 From the remaining 1/4" x 1" balsa stock, cut a gusset to fit in the lower front corner of the fin Glue in place

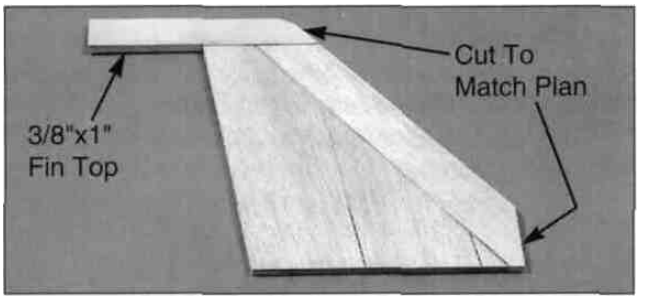


D 5. Remove the fin framework from the building board, sand both sides smooth, and sheet both sides of the fin with 1/16" balsa in the same manner as the rudder The fin can be sheeted using only **one** of the 1/16" x 3" x 30" balsa sheets

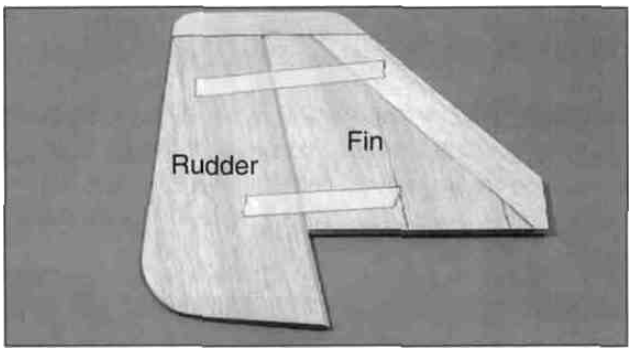
D 6. Glue the 3/8" x 1-1/2" x 10-1/2" balsa fin **leading edge** to the front edge of the built-up fin.



D 7 Trim off the top and bottom of the leading edge **to** match the plan Sand both sides of the fin smooth



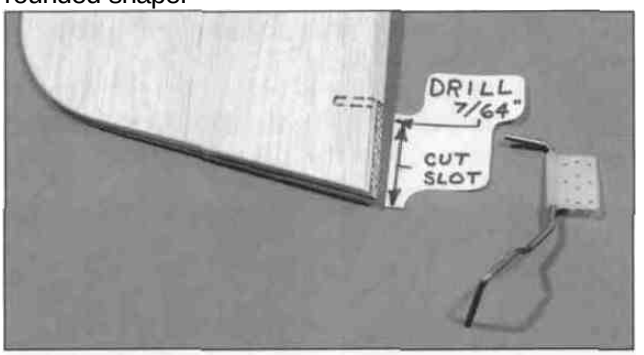
D 8. Glue the 3/8" x 1" x 7" balsa **fin top** to the top edge of the fin assembly. Trim and sand the front end of this piece to match the plan.



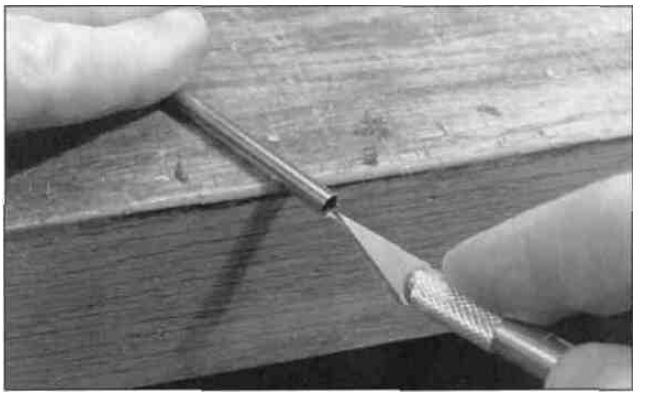
D 9. Temporarily tape the rudder to the fin. While holding the rudder in the neutral position, sand the 3/8" x 1" fin top to match the rudder.

D **10.** Draw a centerline on the fin leading edge and fin top, which will help you maintain symmetry while sanding.

D 11. Using a sanding block, sand the fin leading edge to the approximate shape as shown in the fin cross-section on the plan. Sand the fin top to a rounded shape.



D 12. If you are building your Ultra-Sport 1000 as a "taildragger," check the plans and mark the location of the **tailgear** on the rudder. Drill a 7/64" hole in the rudder (the hole is drilled slightly oversize to allow for positioning, and to create a hard epoxy "sleeve" around the wire). Then **groove** the rudder leading edge to accept the **tailgear wire** and the nylon **tailgear bearing.**



HINT: Using an X-acto knife, sharpen the inside of one end of a 1/8" diameter brass tube, and use it to cut the groove in the leading edge of the rudder.

PARTS NEEDED TO BUILD THE ELEVATORS AND STABILIZER:

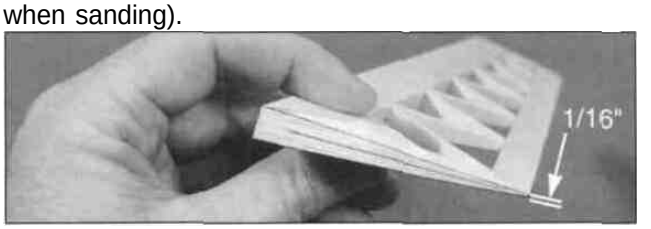
D (1) US10S14 3/8" x 2-3/4" x 5" Balsa **Stab Center**
D (1) US10S15 3/8" Shaped Plywood **Stab "Spar"**
D (2) US10S12 3/8" x 3/4" x 26-3/4" Balsa **Stab TE, Elev LE**
D (1) US10S13 3/8" x 1/2" x 30" Balsa **Elev TE**
D (1) US10S11 1/4" x 3/8" x 4" Balsa **Elev End**
D (4) US10S16 1/8" x 3/8" x 30" Balsa **Stab "Ribs"**
D (2) US10S09 1/2" x 2" x 14-7/8" Balsa **Stab LE**
D (2) US10S10 1/2" x 1" x 6-1/4" Balsa **Stab Tips**
D (6) US10S17 1/16" x 3" x 30" Balsa **Stab/Fin Sheeting**
D (1)US10S21 1/32" x 1-1/4" x 11-1/2" Ply **Spar Thickener**

BUILD THE ELEVATORS

D 1. Tape the **stabilizer plan** (side view) down to your flat work surface, and cover with waxed paper.

D 2. In the same manner as the rudder (steps 1 - 5), build the framework of both elevators. Cut one of the 3/8" x 3/4" x 26-3/4" balsa sticks to make the leading edges. Use the 3/8" x 1/2" x 30" balsa stick for the trailing edges. Cut up the 1/8" x 3/8" x 30" sticks **as** needed for the "ribs" (trussing).

D 3. Carefully draw a **centerline** all around the edges of the elevators (this will help to maintain symmetry when sanding).



D 4 Using a sanding block and **coarse** (50 or 80-grit) sandpaper, sand both sides of the elevators to a **taper** as shown on the plans. The trailing edge should end up approximately 1/16" wide. (See photo proceeding page.)

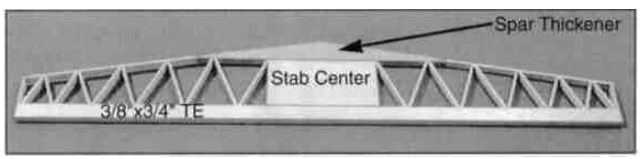
D 5 Select the two **softest** (lightest) 1/16" x 3" x 30" balsa sheets, and use them to sheet both sides of the elevators Make sure you obtain a good glue bond between the sheeting and the internal structure.

D 6. Sand the leading edge of the elevators to a **"V-shape"** as shown on the plan Sand the trailing edge to a slightly rounded shape Do not round the elevator ends (leave them square)

BUILD THE STABILIZER

NOTE: You will construct the stab **framework** and add the 1/16" balsa sheeting, **then,** you will add the 1/2" balsa leading edges and tips.

D 1 Accurately pin the 3/8" x 3/4" x 26-3/4" balsa **stab TE** onto the plan.



D 2 Trial fit the 3/8" x 2-3/4" x 5" balsa stab **center** and the triangle-shaped 3/8" ply **spar*** in place on the **plan.** The leading edge of the spar should line up with the lines on the plan If not, sand the edges of the balsa stab center until these parts line up correctly Securely glue the stab center to the stab TE, and glue the spar to the stab center.

***NOTE:** It is common for the 3/8" ply to be slightly thinner than the 3/8" balsa For this reason, we have included a 1/32" x 1-1/4" x 11-1/2" ply sheet If the spar in your kit is thinner than the 3/8" balsa stab center, glue the 1/32" ply sheet to the spar, and trim the edges to match the spar.

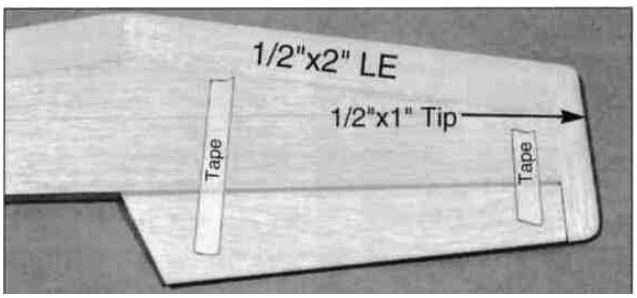
D 3 Complete the stab framework by cutting and fitting pieces of 1/8" x 3/8" x 30" balsa, as shown on **the** plan. Glue this assembly together.

D 4 Remove the stab framework from the building board and sand both sides and all edges smooth.

D 5. There are four remaining 1/16" x 3" x 30" balsa sheets Edge glue these sheets together in pairs to make two 6" x 30" sheets, and sand both sides smooth with a sanding block Use these to sheet the top and bottom of the stab framework **NOTE: It is essential to get a strong and complete bond between the stab sheeting and the stab framework, especially in the center,** therefore, we recommend using 30-minute epoxy when you apply the final piece of sheeting Spread the epoxy evenly but sparingly, to avoid excess weight

D 6 Cut one end of the two 1/2" x 2" x 14-7/8" balsa stab **leading edges** to match the plan at the stab centerline Glue the leading edges to the stab framework Cut and sand the ends of the leading edges to match the ends of the stab.

D 7 Glue the 1/2" x 1" x 6-1/4" balsa stab **tips** to the ends of the stab Trim and sand the front ends of the stab tips to match the plan



D 8 Temporarily tape the elevators to the stab. While holding the elevators in the neutral position, sand the 1/2" x 1" stab tips to match the elevator.

D 9 Draw a centerline on the stab leading edge and tips, which will help to maintain symmetry while sanding.

D 10. Using a sanding block, sand the stab leading edge to the approximate shape as shown in the stab cross-section on the plan Sand the stab tips to a rounded shape.

TEMPORARILY INSTALL HINGES

D 1 Using the plans as a guide, mark the hinge locations on the stab, elevators, fin and rudder.

NOTE: There are many types of good hinges on the market, and everyone has their personal preferences, therefore, hinges have not been included in this kit. The current favorite for many modelers is the type of laminated hinge that permits hinge slotting with an X-acto knife, and gluing with thin CA adhesive If you are building a **taildragger,** heavy-duty hinges are recommended for the rudder See the IMAA Safety Guidelines in the Appendix at the end of this book.

CAUTION!!!: You must use extreme care when cutting hinge slots with an X-acto knife, to avoid cutting yourself! If the balsa part breaks while you are pushing on the knife, the blade could go into your hand before you know it! A good pre caution is to wear leather gloves while performing this step.

D 2. Cut the hinge slots and temporarily install the elevator and rudder hinges.

WING ASSEMBLY

PARTS NEEDED TO BUILD THE WING:

D (4) US10W07 1/8"x1/2"x39-1/8" Basswood **Long Spar**
D (4) US10W08 1/8"x1/2"x26" Basswood **Medium Spar**
D (4)US10W09 1/8"x1/2"x13-13/16" Basswood Short **Spar**
D (1) US10W02 Shaped Balsa **LE and TE Set**
D (1) US10W14 3/32" x3" x2-5/8" Balsa **Shear Webs (22)**
D (2) US10W01 15/32"x1-1/2"x40" Tapered Balsa **Aileron**
D (4) US1 OW03 3/32"x2"x39-3/8" Balsa **TE Sheeting**
D (4) US10W04 3/32 x3"x39-1/8" Balsa **LE Sheeting**
D (2) US10W05 3/32"x1-3/4"x24-1/2" Balsa **Front LE Sheet**
D (4) US10W06 1/8"x1/2"x3-1/4" Ply **Aileron Servo Rail**
D (12) US10W10 3/32"x3"x11-1/8" Balsa Center Sheeting
D (1) US10W20 3/32"x3'x18" Balsa **Aileron Bay Sheeting**
D (2) US10W21 1-1/4"x1-7/8"x11-5/8" Balsa **Wing Tip**
D (1) US10W12 1/4"x39-1/8" Tapered Balsa **TE Support Jig**
D (2) US10W15 5/16" Dia. x 6" Birch **Wing Dowel**
D (2) US10W22 Die-cut 1/8" Balsa **Rib 1, etc.**
D (2) US10W27 Die-cut 3/32" Balsa **Ribs 4, 6 & 13**
D (2) US10W23 Die-cut 3/32" Balsa **Ribs 3 & 5**
D (2) US10W24 Die-cut 3/32" Balsa **Ribs 2 & 8**
D (2) US10W25 Die-cut 3/32" Balsa **Ribs 10, 11 & 12**
D (2) US10W26 Die-cut 3/32" Balsa **Ribs 7 & 9, etc.**
D (1) US10W35 Die-cut 1/8" Ply **Dihedral Brace**
D (1) US10F29 Die-cut 1/8" Ply **Dihedral Gauge, etc.**
D (1) US10F34 Die-cut 1/16" Ply **Bolt Plate, etc.**
D (1) GLTP014 4" x 36" **Fiberglass Cloth**
D (6) SS90W11 3/32" x 3/8" x 36" Balsa **Cap Strips**
D (2) NYLON03 Small nylon **Control Horn**
D (10) SCRW002 2-56 x 5/8" **Machine Screw**

(ADDITIONAL PARTS NEEDED FOR FIXED LANDING GEAR)

D (2) SS90W18 1/2"x3/4"x7-3/4" Basswood **Main LG Block**
D (2) US10W13 1/2"x3/4"x 1-1/2" Maple **Short LG Block**
D (2) SS90W20 1/2"x3/4"x1/2" Maple **LG Reinf. Block**
D (2) US1 OW33 Die-cut 1/8" Ply **Rib Doublers** (taildrag ger)
D (2) US10W32 Die-cut 1/8" Ply **Rib Doublers** (tnke gear)
D (2) WBNT170 3/16" wire **Main LG Struts**

(PARTS NEEDED FOR OPTIONAL RETRACTABLE LANDING GEAR)

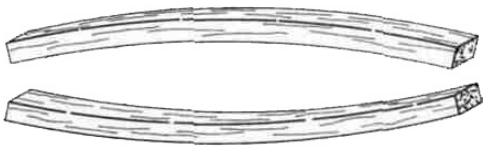
D (2) US10W16 1/4"x1-5/16"x3-5/16" Ply **Rear Mtng. Plate**
D (2) US10W17 1/4"x3-5/16" Tapered Ply **Front Mtng. Plate**
D (2) US10W33 Die-cut 1/8" Ply **Rib Doublers** (taildrag ger)
D (1) WBNT171 3/16" wire **Left Retract Strut**
D (1) WBNT172 3/16" wire **Right Retract Strut**
D (2) Pushrod wires w/ 2-56 threads one end (NOT INC)
D (2) 2-56 steel clevises (NOT INCLUDED)

PREPARE WING PARTS

Before assembling the wing, there are several preliminary assemblies that must be made . ..

D 1. Before using the hard balsa **spars,** examine them carefully for possible imperfections Look for knots, soft spots, diagonal grain and any other imperfections If possible, position each spar so the imperfections (if any) are on the outer half of the wing panel (toward the tip), where they will be least affected by high stress If the spars are warped slightly, try to "balance them out" by installing the warped spars in opposite directions (see sketch) **NOTICE:** If you feel that any of the wing parts are unusable due to severe warps or other defects, give us a call and we'll replace the parts.

Two Warped Spars Installed This Way Will Result In A Straight Wing



Two Warped Spars Installed This Way Will Result In A Warped Wing

D 2 Sand one end of each of the medium and short spars to a 2-1/2" taper as shown in the **"Wing Spar** Detail" on the plan

D 3. Glue the medium spars to the long spars, and glue the short spars to the medium spars, **as shown in the "Wing Spar Detail."** Sand the edges of the spars to remove any excess glue and to make the edges uniform. Make **four** spar assemblies.

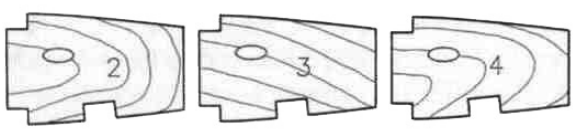
RIBS

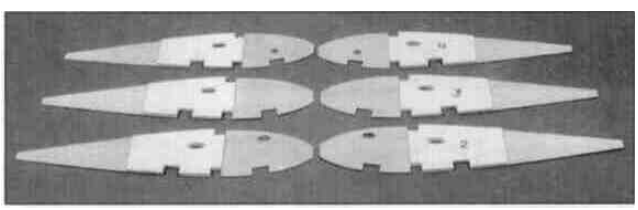
D 1. Carefully punch out all the die-cut balsa **wing ribs.** Sand the edges **slightly** to remove any die-cutting irregularities.

D 2. Note that the wing plan shows two alternate locations for the main landing gear blocks Note also that Ribs W-2, W-3 and W-4 have **partial cutouts** for each of the two locations If you are building your plane as a fixed gear **taildragger,** cut out the **front** notches in these ribs If you are building your plane with a **tricycle gear,** cut out the **rear** notches (If you will be installing retracts, do not cut out any of the notches).

RIB DOUBLERS (Fixed Landing Gear - TRIKE)
(Skip this section if your airplane is to be a taildragger)

D 1. Identify the die-cut 1/8" ply **landing gear doublers for fixed trike gear,** using the following sketch:



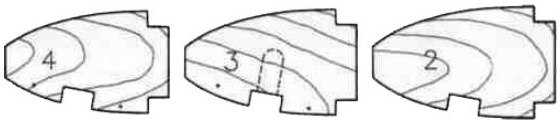


Do not *cut out front rib notches as shown in photo.*

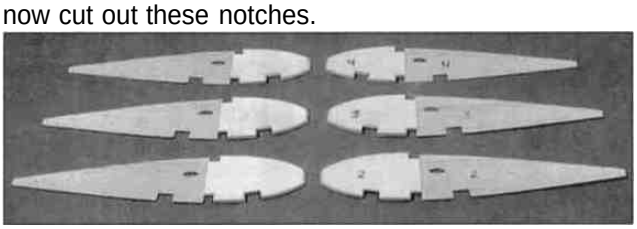
D 2. Glue these die-cut 1/8" ply landing gear doublers to ribs W-2, W-3 and W-4. **NOTE: Make a RIGHT and a LEFT set, gluing the doublers to the inboard side of the ribs.**

RIB DOUBLERS (Fixed Landing Gear - TAILDRAGGER)
(Skip this section of you will be installing retracts)

D 1 Identify the die-cut 1/8" ply **landing gear doublers for fixed taildragger,** using the following sketch:



D 2. The doubler for rib W-2 has a notch cut out for the landing gear block The doublers for ribs W-3 and W-4 have the notch locations marked, and you must now cut out these notches.

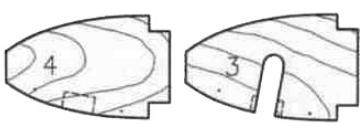


Do not *cut out aft rib notches as shown in photo.*

D 3 Glue these die-cut 1/8" ply landing gear doublers to ribs W-2, W-3 and W-4 **NOTE: Make a RIGHT and a LEFT set, gluing the doublers to the inboard side of the ribs.** Take care to carefully align the doublers with the spar notches The doublers are slightly shorter than the ribs at the front edge, to allow fitting into the leading edge notches.

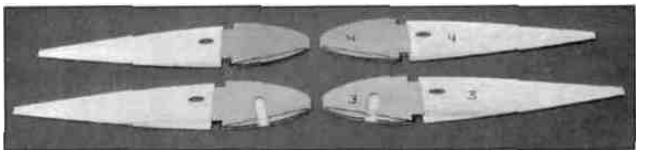
RIB DOUBLERS (Optional Retractable Landing Gear)

D 1. Identify the die-cut 1/8" ply **landing gear doublers for retracts,** using the following sketch:



D 2. Note that these doublers have two small punch marks. Push a T-pin through these marks so the location is visible on both sides Now draw a line from the front edge of each doubler to the back edge, using the two small holes for alignment Draw the lines on both sides These lines will later be used for alignment of the retract mounting plates.

D 3 The doubler for rib W-3 is marked for a long, narrow notch Extend the lines of this notch to the edge of the doubler, and cut out this notch



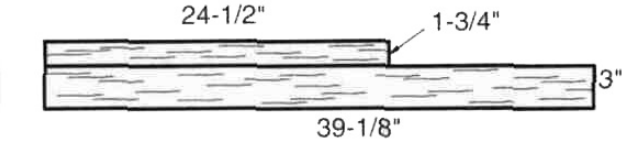
D 4 Glue these die-cut 1/8" ply landing gear doublers to ribs W-3 and W-4 **NOTE: Make a RIGHT and a LEFT set, gluing the doublers to the inboard side of the ribs.** Take care to carefully align the doublers with the spar notches The doublers are slightly shorter than the ribs at the front edge, to allow fitting the ribs into the leading edge notches

D 5 Cut out the long slot in the W-3 ribs using the slot in the doublers as a guide

D 6 If you will be installing B&D retracts, drill a 3/8" hole in the #4 doublers, using the punched hole in the W-4 ribs as a guide.

LEADING EDGE SHEETING

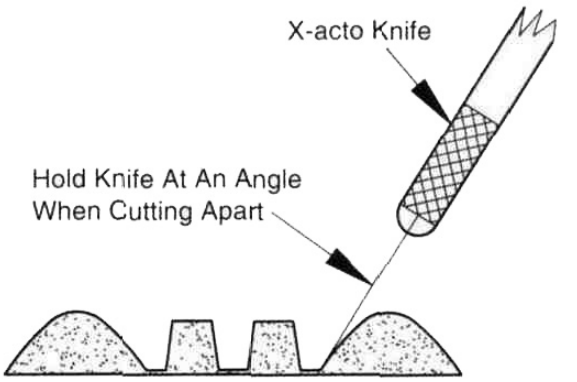
D 1. Prepare the **leading edge sheeting** as follows Edge glue the 3/32" x 1-3/4" x 24-1/2" balsa sheets to the 3/32" x 3" x 39-1/8" balsa sheets as shown here, making four sets. **NOTE:** The two smaller front sheets will be cut on a diagonal in the next step, providing you with the front pieces you will need to complete the 3rd and 4th sets

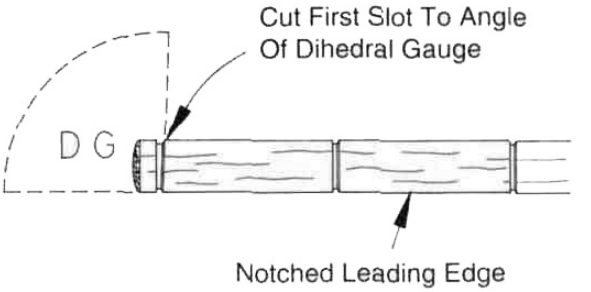


D 2. Now measure and mark the balsa sheeting (see sketch below), then cut the angle in the sheeting, cutting along a metal straightedge for accuracy

LEADING & TRAILING EDGES

D 1 The shaped and notched wing **leading edges** (LE) and **trailing edges** (TE) are fastened together by thin strips of balsa Separate them by **cutting** with an X-acto knife, as shown in the following sketch.





D 2 Examine the shaped, notched leading and trailing edges Notice that the notches at one end of each LE and TE are 3-1/2" apart These are the notches for W-1 and W-2 Also notice that all notches in the LE and TE are vertical, however, rib W-1 will be installed at a slight angle using the Dihedral Gauge Therefore, you should now modify the notch for W-1 by cutting it to the angle of the rib You may determine the approximate angle of the cut by holding the Dihedral Gauge (DG) against the LE as shown above.

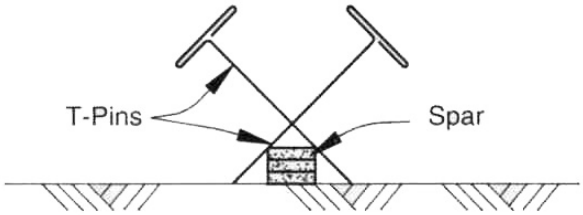
BUILD THE WING PANELS

NOTE: It will be helpful to build the wing on a piece of "Celotex" or other semi-soft (and flat) surface, into which you may easily stick pins to firmly hold down the wing parts while building, to avoid warps

D 1 Tape the plan to your flat work surface, and cover the wing drawing with waxed paper (so you won't glue the wing to the plan') **NOTE:** If your work

space is limited, you may cut the left and right wing half drawings apart

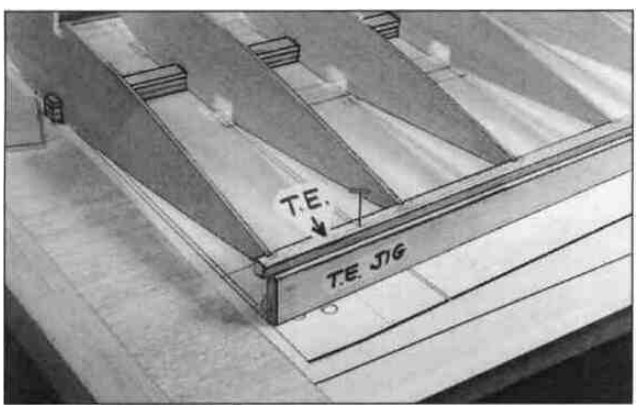
NOTE: Follow steps 2 through 45 to build the RIGHT wing panel, then repeat these steps to build the LEFT wing panel.



D D 2 Pin one of the spars to the plan with the **short spar facing up and toward the root. NOTE:** The spars are cut slightly too long Center the spar on the plan so an equal amount protrudes on both ends.

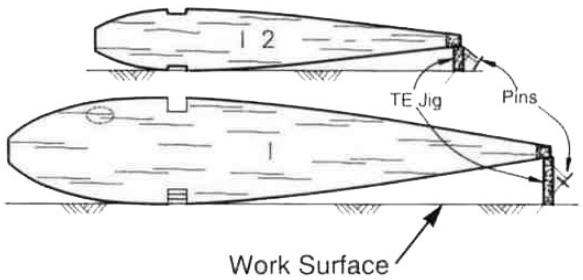
D D 3 Place the ribs on the spar in their approximate position, but do not glue **IMPORTANT:** Pay special attention to the way ribs W-1 through W-7 are installed ..

W-1: Oval-shaped retract pushrod hole **up.**
W-2: LG slots **down,** LG doubler (if any) towards **tip**
W-3: LG slots **down,** LG doubler towards **tip**
W-4: LG slots **down,** LG doubler towards **root.**
W-5: Oval-shaped aileron servo wire hole **up**
W-6: Aileron servo rail slots **down**
W-7: Aileron servo rail slots **down**



This photo is not 100% accurate Some components may vary

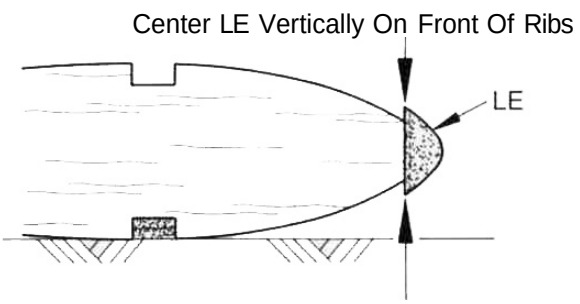
D D 4 Insert the rear ends of the ribs into the notches in the **TE,** then block up the TE with the 1/4" balsa TE Jig supplied **NOTE: THE NARROW END OF THE TE JIG IS AT RIB W-13.** Securely pin the jig to the building surface, with the aft edge of the Jig even with the aft edge of the TE (see sketch below) You may cover the top edge of the Jig with a strip of waxed paper or plastic wrap to avoid gluing it to the TE

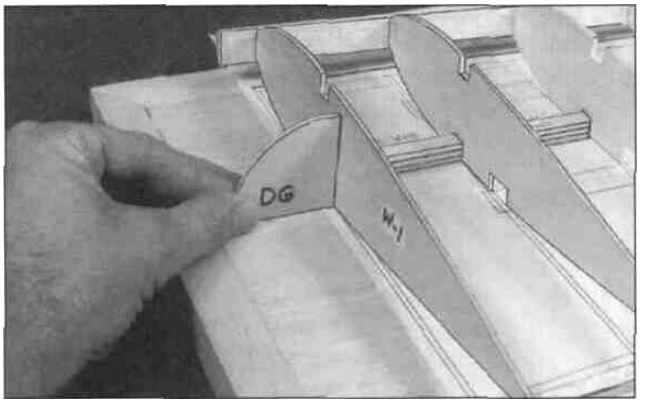


D D 5 Pin the TE to the TE Jig, making sure the ribs line up with the plan

D D 6 Glue ribs W-2 through W-13 to the TE (Apply glue sparingly, to avoid gluing the TE to the Jig) Glue ribs W-2, W-6 and W-13 to the spar, making sure they are lined up with the plan, and positioned at 90-degrees to the work surface

D D 7 Work the notched **leading edge** onto the front ends of the ribs **NOTE:** Position the LE as shown here

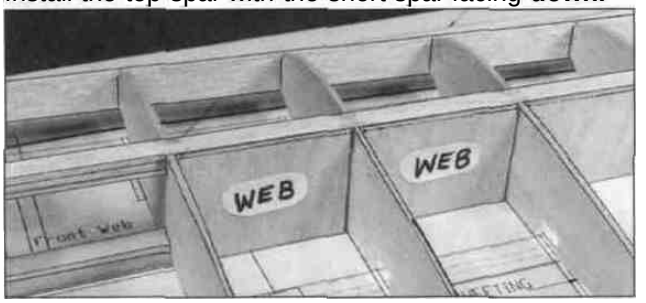




This photo is not 100% accurate. Some components may vary.

D D 8. Make sure the ribs are fully down on the plan and all ribs are inserted into the LE notches. Angle rib W-1 slightly using the **dihedral gauge (DG).** Glue W-1 to the TE, LE and bottom spar. Glue all other ribs to the LE and bottom spar. Follow up by applying a drop or two of medium or thick CA to all spar/rib joints.

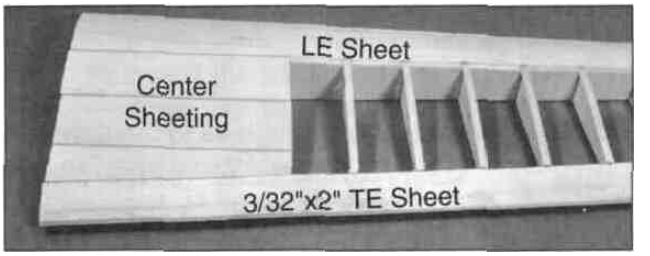
D D 9. Glue the top spar in place, making sure you do not change the angle of W-1. **IMPORTANT:** Install the top spar with the short spar facing **down.**



This photo is not 100% accurate. Some components may vary.

D D 10. Sort through the pre-cut 3/32" balsa vertical grain **shear webs,** selecting the hardest ones (which will be used near the root of the wing). Glue the shear webs to the rear edge of the spars in all rib bays **except between ribs W-1 and W-2. NOTE:** You may wish to trial fit, mark, and trim each web before gluing in. **NOTE:** The webs must be securely glued to the spars, but it is **not** necessary to glue the webs to the ribs.

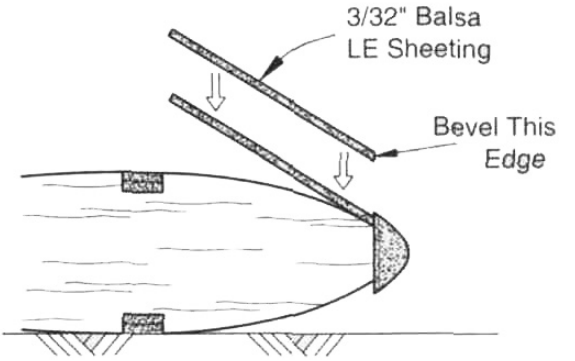
NOTE: In the next steps, maintain straightness by keeping the wing down on the flat surface and on the TE Jig.



D D 11. Lightly sand the tops of the ribs to blend with the notched trailing edge; then glue one of the 3/32" x 2" x 39-3/8" balsa **trailing edge sheets** in place. **NOTE:** The edge of the TE sheet may not be exactly straight, but just position the sheet so it slightly overlaps the TE, and any overlap can be sanded off later.

D D 12. Before applying the leading edge sheeting in the next step, block up the leading edge in a few places with scraps of wood. Then use your T-bar to lightly sand off the edges of the shear webs and smoothly blend the ribs to the spar. Also, lightly sand the tops of the ribs to eliminate imperfections.

D D 13. Prepare the 3/32" balsa **leading edge sheeting** by sanding the front edge to a slight bevel so it will fit snugly against the back of the leading edge.



NOTE: It will be helpful to have the following items handy for the next step . . . thin CA, thick CA, a wet cloth and masking tape. Read through the following step and go through a "dry run" before actually gluing.

D D 14. Position the leading edge sheeting at the rear edge of the notched LE so there is an equal

amount protruding on both ends of the wing Using thin CA, glue the front (beveled) edge of the leading edge sheeting to the back edge of the leading edge. Now wet the top surface of the sheeting (if necessary) to make it bend easier Apply thick CA glue to the top edge of the ribs and to the front half of the spar Then immediately bend the sheeting down onto the ribs and spar Hold the sheeting down with long strips of masking tape until the glue has set.

D D 15 Using the 3/32" x 3" x 11-1/8" balsa sheets, glue the top **center section sheeting** in place as shown on the plan (Use the scraps trimmed from the LE sheeting if needed for the aft pieces).

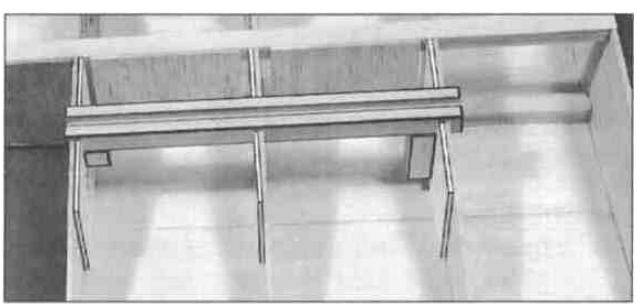
D D 16 From the 3/32" x 3/8" x 36" balsa sticks, cut and glue **cap strips** to the top edges of all exposed ribs, from the TE sheeting to the LE sheeting **HINT:** For easier positioning of the cap strips, first mark the location of each rib on the LE and TE sheeting

D D 17. Remove the wing panel from the building board Check all glue joints, adding glue as necessary.

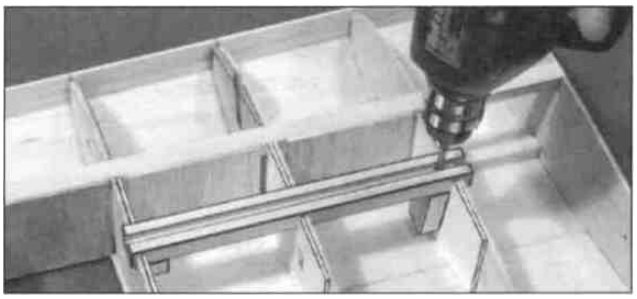
D D 18. Using a razor saw and a sanding block, carefully cut off and sand all excess sheeting spars, LE and TE even with W-1 and W-13. Sand the TE sheeting flush with the TE.

FOR FIXED LANDING GEAR, perform steps 19-22

D D 19 Trial fit the long grooved hardwood **LG block** into the notches in ribs W-2, W-3 and W-4 (see the wing plan for proper positioning) File the notches if necessary for a good fit. Now use epoxy to securely glue the block in place.



D D 20. Epoxy the 1/2" x 3/4" x 1-1/2" **hardwood block** to the LG block and to the 1/8" ply doubter on rib W-2, as shown on the plan and in the photo Then epoxy the 1/2" x 3/4" x 1/2" **hardwood block** to the other end of the LG block and to the 1/8" ply doubler on rib W-4.



D D 21 Drill a 3/16" hole down through the grooved LG block and the 1-1/2" block Line up the drill so you are drilling straight down through the middle of the 1-1/2" block.

D D 22 Trial fit the 3/16" diameter **main landing gear wire** into the landing gear block at this time Cut or file the groove and hole in the landing gear block as necessary for a good fit

FOR RETRACTS, perform steps 23 - 31

NOTE: In the Ultra-Sport 1000 prototype we used B&D mechanical retracts, and you will see them in the photographs You may use whatever type of retracts you prefer, as long as they are of the correct size for this airplane (see the introductory remarks at the beginning of this book) If you are using B&D retracts, it will be necessary to drill them out to accept the 3/16" wire struts supplied in this kit (see below*) It is also recommended that you file a "flat" on the 3/16" struts at the set screw location, to prevent the struts from turning You should wait until the retracts have been installed before doing so, to insure proper alignment (See Step 30).

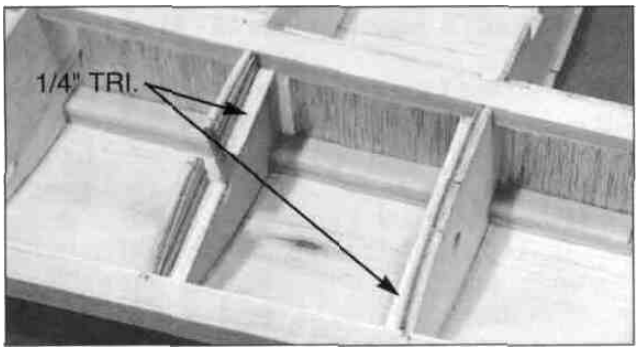
instructions for drilling B&D retracts. Back out the set screw so it won't interfere with the drill Drill out the strut hole first with an 11/64" bit, then a 3/16" bit If it is difficult to insert the strut, re-drill the hole with a #12 (.189") drill bit **Stop drilling as soon as you feel the bit bottom out in the hole.** Temporarily install the gear strut, tighten the setscrew, and check operation. Due to the larger strut, the setscrew may bind against the actuator arm and prevent full retraction If this is the case, you'll have to file a small amount off the top of the set screw Do this by drilling a 5/32" hole in a scrap piece of hardwood, screwing the set screw in with 1/32" protruding, and filing off the top of the set screw.

NOTE: Most standard wheels have a 5/32" diameter axle hole, so you'll have to drill the hubs of your wheels to fit the 3/16" diameter landing gear wire supplied in this kit Start by using a 3/16" drill bit, but because the nylon hub material is somewhat flexible, it may be necessary to use a 13/64" drill bit to get the hole large enough to allow the wheel to turn freely.

NOTE: Install a wheel on the strut and check out how much force it takes to raise the wheel If you are using standard (heavy) wheels, it may be necessary to increase the tension on the retract assist spring If you are using lighter wheels, such as Sullivan "Skylite" wheels, the stock spring tension may be adequate

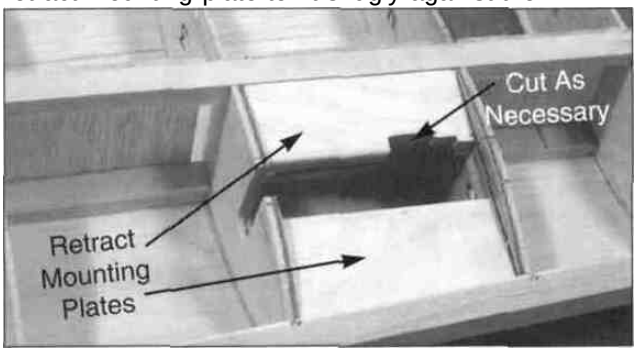
D D 23. You previously drew lines through the location holes in the doublers on ribs W-3 and W-4. Now measure down 1/4" from this line (toward the top sheeting) and make a few marks

D D 24 Find all the 1/4" balsa triangle in the kit, and select the **hardest** balsa for the next step



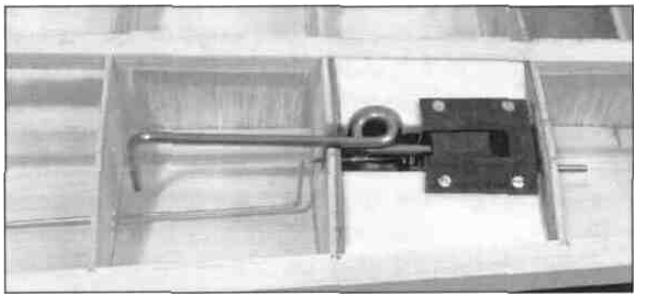
D D 25. Cut pieces of 1/4" balsa triangle to run 1/4" **below** the lines on the doublers, from the spar to the LE Glue these triangles to the doublers to serve as supports for the retract mounting plates Cut away the section of the triangle that bridges the slot in W-3.

D D 26 Bevel the rear edge of the 1/4" x 1-5/16" x 3-5/16" ply aft retract mounting plate to fit snugly against the spar Bevel the front edge of the tapered 1/4 ply retract mounting plate to fit snugly against the LE



D D 27 Trial fit your retract mechanism onto the mounting plates, and cut out notches in the plates as necessary to clear the mechanism

D D 28 Using 30-minute epoxy, glue the retract mounting plates securely to the rib doublers, spar and LE Wipe away any excess epoxy along the LE

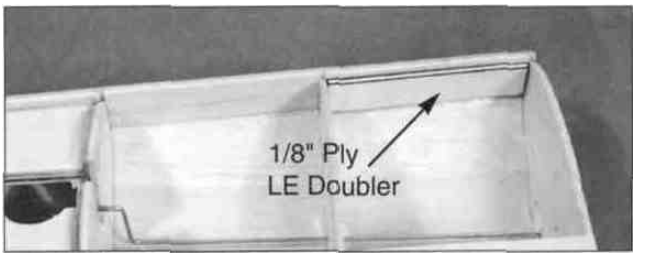


D D 29 Install the retract mechanism (with the gear strut but without a wheel) and the pushrod * Cut clearance holes and notches in the ribs and mounting plate as required for the strut and pushrod Cycle the gear a few times to make sure everything clears
*Pushrods for optional retracts not included in kit

D D 30 This is a good time to file a "flat" on the gear strut A good way to do this is to align the axle with the spar (or set it to "toe-in" slightly), then tighten the set screw to mark the strut Remove the strut, and file a flat area on the strut similar to the stock strut that came with the retracts Re-install the strut, tighten the set screw, and check the strut alignment.

D D 31. Remove the strut, but leave the retract mechanism in the mount Measure exactly where the strut socket is, and make reference marks on the spar and LE so that you can later cut into the leading edge sheeting in the right place to find it after the sheeting has been installed

WING ASSEMBLY CONTINUES
(for all landing gear options)



D D 32 Glue one of the die-cut 1/8" ply **LE doublers** to the back of the LE, between ribs W-1 and W-2

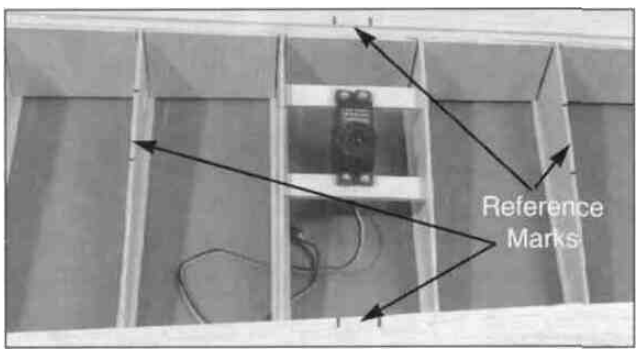
D D 33 Place the wing panel upside down on the building board, turn the TE support jig end for end and pin the TE to the support jig (again, with the narrow end of the jig at the wing tip), and place blocks under the leading edge for additional support

D D 34 Sand the TE to blend with the ribs Sand off any excess glue or other imperfections on the bottom **of** the wing Then install the 3/32" x 2" x 39-3/8" bottom TE sheeting.

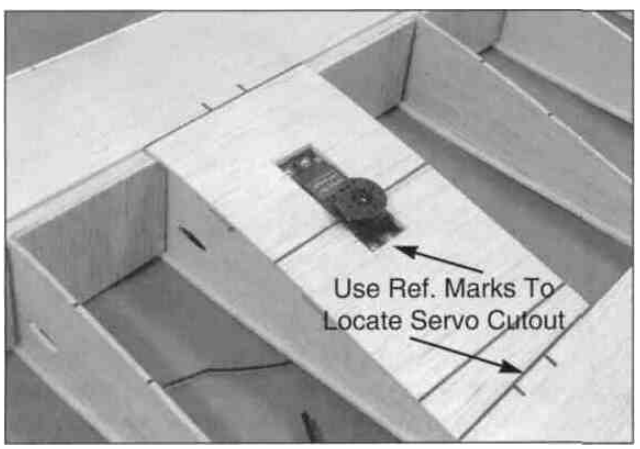
IMPORTANT NOTE: To insure a straight wing, you must pin or weight the TE securely down on the TE jig while the bottom sheeting is glued in place!

D D 35 Sand a bevel on the front of the LE sheeting, and glue it in place as previously done on the top (When bending the sheeting down over the ribs, use long strips of masking tape to hold the sheeting down, rather than using heavy downward pressure with your hands, to avoid introducing warps). **NOTE:** If you are using fixed taildragger gear, you will need to cut a slot in the sheeting to fit around the main gear block If you are using retracts, you will be sheeting over the retract mechanism If you have installed retracts, use your measurements and reference marks to locate and trim away the sheeting at the center of the retract unit

DO NOT install the bottom center section sheeting at this time.



D D 36. Glue the 1/8" x 1/2" x 3-1/4" ply **aileron servo rails** into the slots in W-6 and W-7, spacing them to fit your servo Temporarily mount a servo to the rails. Make reference marks for the edges of the servo on the LE and TE sheeting and on ribs W-5 and W-8 which you will use in the next step Now remove the servo.



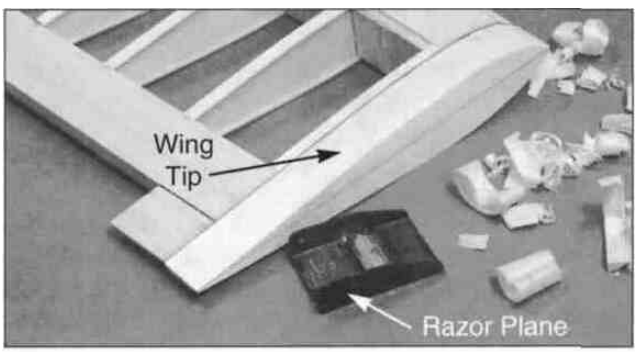
D D 37. Using the 3/32" x 3" x 18" balsa sheet, cut and glue pieces to the bottom of ribs W-6 and W-7 This sheeting covers the area from the LE sheeting to the TE sheeting, and it should extend about 1/8" past the ribs on each side to simulate cap strips Cut a hole in this sheeting over the servo rails just big enough for the servo to pass through, then mount the servo to the rails **NOTE:** For most standard servos, this will result in the top of the servo case being flush with the sheeting, with only a enough gap in the sheeting at each end of the servo for servo installation and access to the mounting screws.

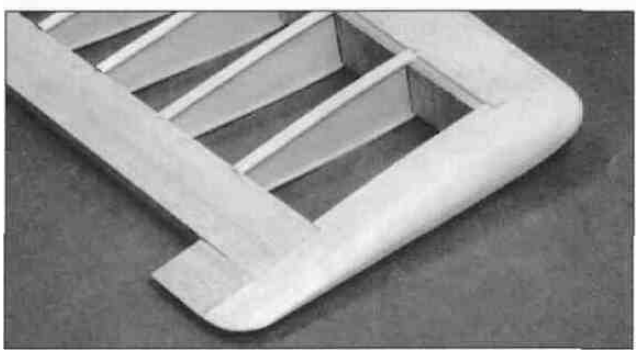
D D 38. From the 3/32" x 3/8" x 36" balsa sticks, cut and glue **cap strips** to ribs W-5, W-8, W-9, W-10, W-11,W-12andW-13.

DO NOT install the bottom center section sheeting at this time.

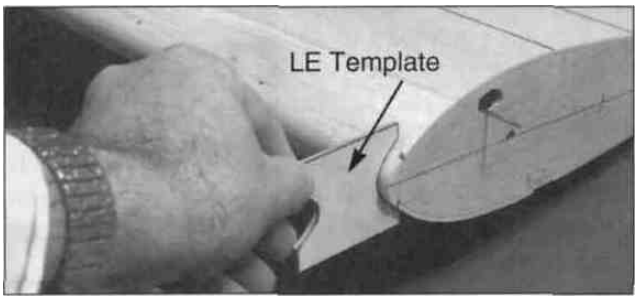
D D 39. Remove the wing panel from the building board and re-check your glue joints Sand the sheeting flush with ribs W-1 and W-13. Sand the TE sheeting flush with the TE.

D D 40 Cut a 3" piece and a 6" piece off the 1-1/2" x 40" tapered balsa aileron stock and glue these pieces to the tip and root ends respectively (see the wing plan) **IMPORTANT:** When gluing these pieces, make sure they line up equally with the top and bottom surfaces of the wing Sand these pieces flush with W-1 and W-13 and to blend smoothly with the wing.





D D 41 Glue the 1-1/4" x 1-7/8" x 11-5/8" balsa **wing tip** to rib W-13 Then carve and sand it to the shape shown on the plan. A razor plane and a sanding block with coarse sandpaper will speed this task.

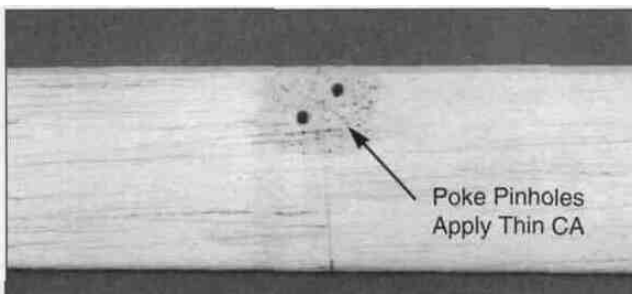


D D 42. **The shape of the leading edge is very important to the performance of the finished airplane*.** Carve and sand the leading edge to match the template at the root and tip, and taper it smoothly from one end to the other ***NOTE:** If you shape the leading edge to match the die-cut 1/8" ply LE Template supplied, this will result in a very stable wing that will resist tip stalling at high angles of attack For example, it will be forgiving if you happen to flare a little too much on the landing approach, and recovery from spins will be instantaneous On the other hand, this stability may make the airplane somewhat sluggish when entering snap and spin maneuvers, and it may require increased elevator and rudder throws (and possibly an aft CG location) to perform these maneuvers If your flying style demands crisp snap and spin capabilities, you may want to sand the leading edge to a slightly sharper shape (smaller radius LE)

To avoid tip stalls, make sure the leading edges of both wing panels have the <u>same</u> shape.

D D 43 Cut the remaining aileron stock to the correct length and trim the ends to the correct angles Now sand the leading edge of the aileron to a "V"-shape as shown on the plan A razor plane is especially helpful for rough shaping the aileron leading edge.

D D 44. Mark the hinge locations on the aileron and the wing TE. Cut the hinge slots and test fit the aileron.



D D 45 From the plans, determine the location of the small nylon control horn on the **bottom** of the aileron Hold the control horn in place and mark the screw locations. Drill 3/32" holes for the screws, drilling straight down through the aileron (not perpendicular to the top or bottom surfaces) **Harden the balsa** in the area of the control horns (on both sides of the aileron) by poking several small holes with a pin, then applying thin CA glue Sand smooth. Temporarily mount the nylon horn using the 2-56 x 5/8" machine screws and the nylon nutplates.

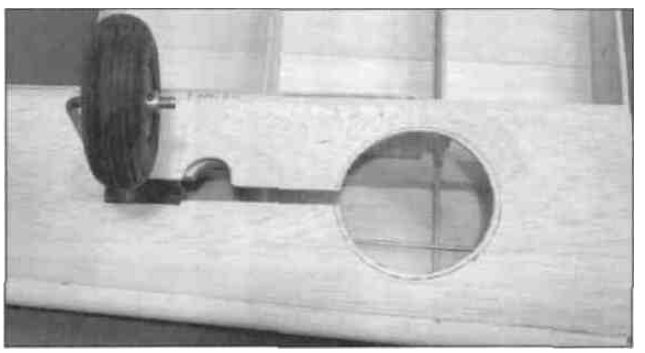
D 46. Now go back and repeat Steps 2 through 45 to build the other wing panel.

FINISH INSTALLING RETRACTS
(Skip to next section if using fixed gear)

NOTE: You should allow at least 24 hours from the time you apply the bottom LE sheeting until you make the wheel well cutout in the following steps This will give the balsa sheeting time to assume the new shape

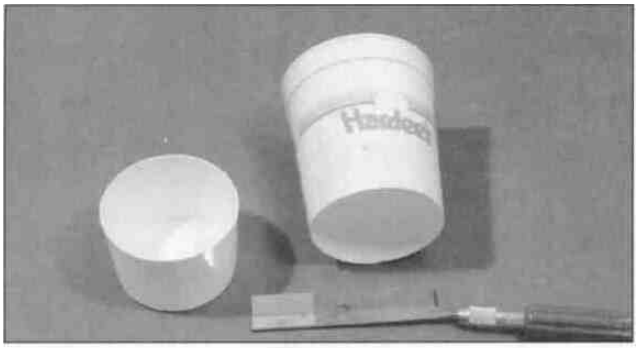
D 1. Using your previous reference marks and measurements, cut a hole through the bottom LE sheeting over each retract mechanism These holes should be just large enough to allow the gear strut to be installed with the gear in the extended position.

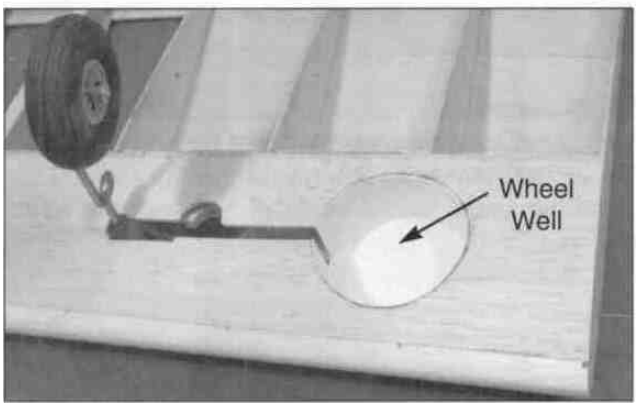
D 2. Mount a 2-3/4" wheel on each gear strut and install the struts in the retract mechanisms With the gear in the "down and locked" position, make sure the wheels are properly aligned (0-degrees to 1-degree toe-in) **NOTE:** You may cut off any excess strut axle length that protrudes beyond the wheel collar.



D 3 Slowly retract the gear, cutting away the leading edge sheeting and W-2 rib as required to clear the strut and wheel as it retracts.

D 4. Re-extend the gear, then enlarge the wheel well area to 3-1/8" diameter Check frequently to be sure that the opening remains centered around the retracted wheel Remove as much of rib W-2 as necessary.



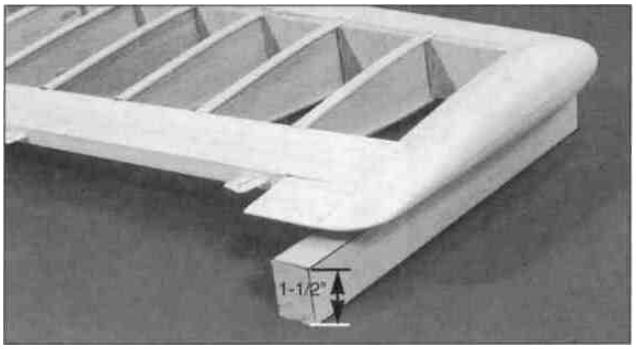


D 5. Use either vertical grain 1/16" balsa or a section of foam or plastic cup to form the walls of the wheel **wells.** The large plastic cups that are commonly found at fast food restaurants, 7-11 type stores and college football games are ideal for wheel wells. Install the wheel well cup deep enough into the wing to permit full retraction of the gear. Glue the wheel well securely to the sheeting. Then trim and sand it flush with the sheeting. **NOTE:** There should be sufficient room for the retract pushrod to pass under the wheel well; if not it may be necessary to cut pushrod clearance holes through both sides of the wheel well so that the pushrod has a straight route to the retract mechanism.

D 6 Verify that the retracts work properly with **no** interference or binding.

JOIN THE WING PANELS

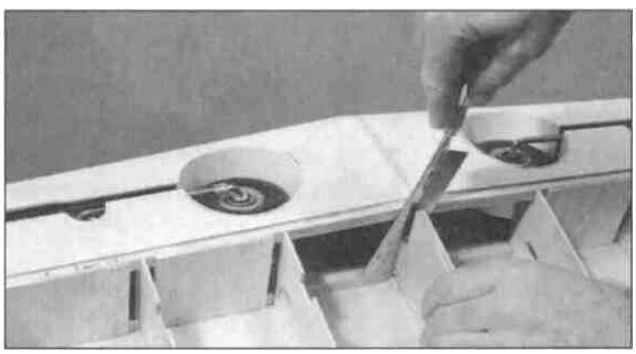
NOTE: 30-minute epoxy is strongly recommended for the wing joining process.



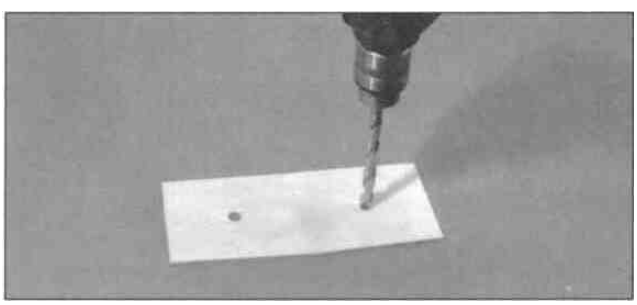
D 1. Place the two wing panels together on a flat surface and block up both wing tips 1-1/2". The blocks should be located at the W-13 ribs. Sand the root end of the wing panels until they fit together properly **at** that angle.

D 2. With waxed paper or protective plastic under **the** center section, carefully align the wing panels at the centerline. Hold the leading and trailing edges together with pins or strips of masking tape.

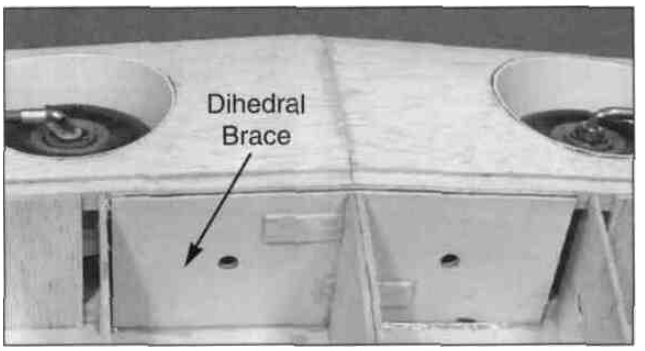
D 3. Lock the wing panels together by dripping thin CA into the center joint. Fill any minor gaps with thick CA. **NOTE: The center joint has very little strength at this point, so handle the wing gently.**



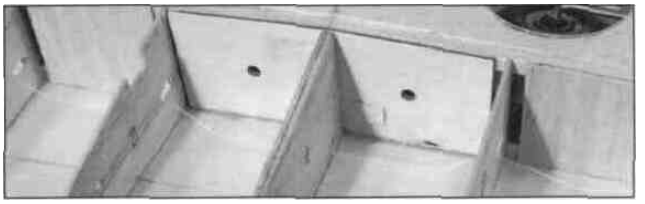
D 4. Turn the wing over and cut a 1/8" slot for the die-cut 1/8" ply **dihedral brace** through the W-1 ribs, immediately behind the spars. Yes, this is a challenging little task, (we didn't want to make it *too* easy)! Use a razor saw and a little patience.



D 5. Drill two 5/16" holes for the wing dowels in the die-cut 1/8" ply dihedral brace, at the marked locations.



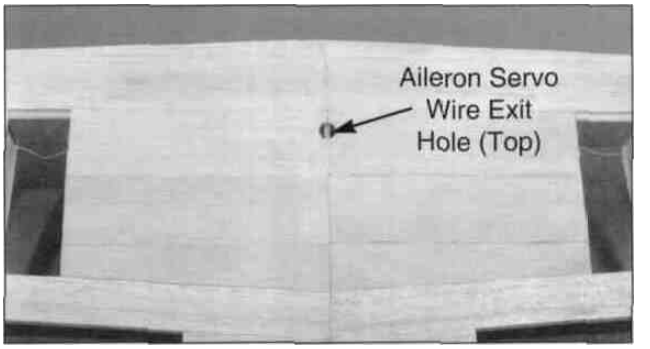
D 6 Using 30-minute epoxy, securely glue the dihedral brace to the back of the spars Observe (in the photograph) how two small balsa wedges were used to hold the dihedral brace against the spars with slight pressure Wipe off excess glue that may have squeezed out onto the top of the spar. Let the glue fully harden before proceeding.



D 7 You will later have to thread an aileron servo extension wire through the holes in the ribs As an aid in doing so, tie a 70" length of string to the aileron servo rails in one wing panel and pass the string through the servo wire holes in the W-6 through W-2 ribs Make a new hole in the W-1 ribs 1/2" behind the spars and close to the top sheeting Pass the string through the W-1 ribs and out the other wing panel and tie it to the other servo rails Leave plenty of slack and be sure you can reach the string through the servo holes in the servo bay sheeting You will later cut a hole in the top sheeting to expose this string, and you will use this string to pull the servo wires through the wing after the wing is covered.

D 8 Using the remaining 3/32" x 3" x 11-1/8" sheets, install the **bottom center sheeting** If you are using tricycle gear you will need to cut a slot in the sheeting to clear the main gear block.

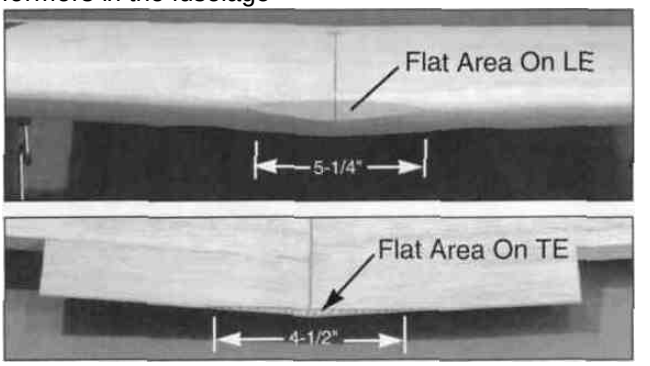
D 9. Sand the wing joint smooth all around.



D 10 Now turn the wing right side up and cut a 1/2" hole in the center of the top sheeting about 1/2" behind the spars, for the servo wires to exit the wing. This hole should include a section of W-1 so that it provides access from one wing panel to the other, and should expose the **string** which you installed in step 7

SAND "FLATS" ON LE AND TE

D 1. Study the wing plan near the wing centerline. Note that the center portion of the LE and TE must be sanded straight across to properly mate with the formers in the fuselage



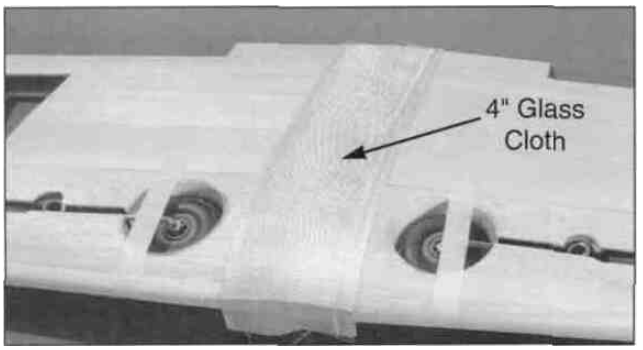
D 2 Sand approximately 5/32" into the LE at the centerline, and approximately 5/32" into the TE at the centerline (The flats will end up approximately 5-1/4" wide at the LE, and 4-1/2" wide at the TE)

FIBERGLASS THE CENTER SECTION

NOTE: Because of the high stresses in the center of this wing, fiberglass reinforcement is REQUIRED. Please do not omit this important section!

NOTE: If you have previous experience with applying fiberglass, feel free to use your favorite method, providing that it results in a strong bond between the glass cloth and the wood If this is your first time, we offer the following suggested method, which is the fastest and easiest we have seen.

D 1 Make **location marks** for the fiberglass reinforcement cloth, 2" each way from the wing centerline. Cut the 4" x 36" strip of glass cloth in half, making two strips approx. 18" long.



D 2 **Trial fit** the fiberglass cloth in place The cloth will wrap around the LE, but not around the TE.

D 3 Spray a **very light mist** of 3M "77" Spray Adhesive on one side of a strip of fiberglass cloth. **Hold the spray can at least 12" away from the cloth** when doing this to avoid a heavy buildup The purpose of this is **only** to give the cloth a little "tackiness" If you apply too much spray it could result in a poor glue bond Allow the spray to dry for a few minutes before proceeding to Step 4

D 4 Beginning at the trailing edge, lay the glass cloth in place on the wing Gently press the cloth in place, working out all wrinkles The "77" spray adhesive should hold the cloth down to the surface, but will permit you to lift and reposition the cloth if you make a mistake Wrap the glass cloth down over the center leading edge Do not attempt to wrap the glass cloth around the trailing edge

D 5 Working outdoors or in a **very well-ventilated area** apply **thin** CA glue to the glass cloth Begin by running a bead of glue down the center of the glass cloth strip Then continue applying the glue in lines until all the cloth has been secured Run the thin CA out 1/4" beyond the edges of the glass cloth to help protect the balsa sheeting when sanding later. **WARNING: This operation produces a larger than normal quantity of CA fumes, so adequate ventilation is a must!**

D 6. Inspect the surface of the glass cloth If any areas are not glued down, apply a couple more drops of CA glue and press down with a piece of waxed paper until the glue sets.

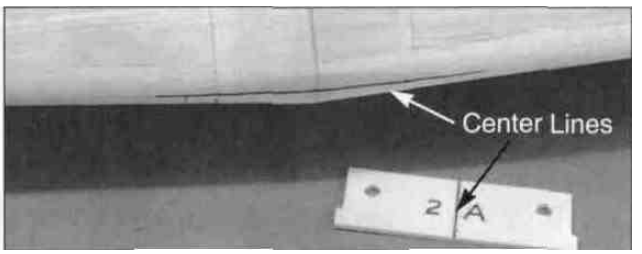
D 7. To make sure the glass cloth is fully "wetted out and bonded to the balsa, you may apply more thin or medium CA, a few drops at a time, and spread it out with a piece of waxed paper

D 8 After the glue has set, trim the excess cloth at the trailing edge with a sharp X-acto knife followed by a sanding block.

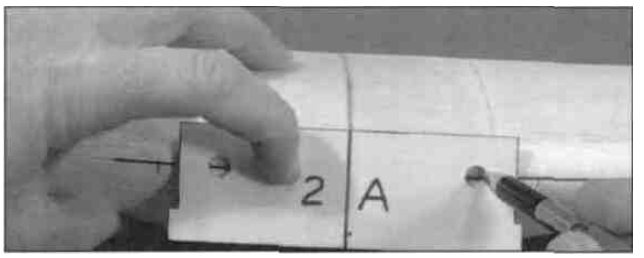
D 9 Repeat the process for the other side.

D 10 Carefully feather out the **edges** of the glass cloth with a T-bar sander with 80 or 100-grit sandpaper to blend smoothly with the sheeting Also, **lightly** sand the surface of the glass cloth with a piece of 320 or 400-grit wet-or-dry sandpaper held in your fingers to remove any rough spots **WARNING: When sanding fiberglass, wear safety goggles and a dust mask to avoid breathing airborne glass fibers.**

INSTALL WING DOWELS



D 1. Mark a horizontal centerline on the flat which you sanded on the wing LE Also mark a vertical centerline on the die-cut 1/8" ply former **F-2A** (the Wing Dowel Plate).



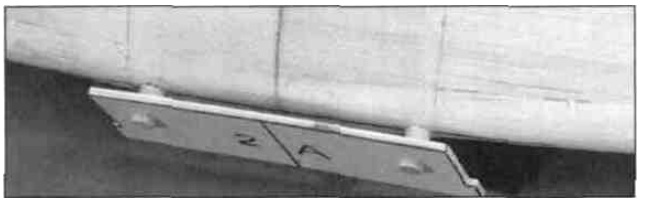
D 2 Holding the die-cut 1/8" balsa **F-2A** on the leading edge, in the exact center of the wing, mark the dowel locations through the dowel plate holes

D 3 Remove F-2A and double check to make sure the dowel locations are both the same distance from the wing center joint.

D 4. It is important that you now drill the dowel holes **accurately!** To insure accurately positioned holes, begin by drilling small (1/8") holes in the center of the marked locations Then gradually increase drill bit sizes until you have finally drilled the holes to **5/16" diameter.**

D 5 Sand **one end** of each wing dowel to a rounded or pointed shape This will help when inserting the dowels through the holes in the dihedral brace.

Slightly round (or chamfer) the ends of the dowels that will protrude out of the LE

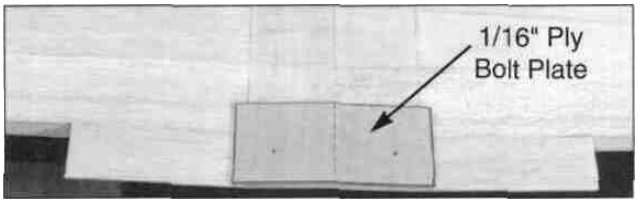


D 6 Trial fit the dowels into the dowel holes You should be able to probe around and find the dowel holes in the dihedral brace Now trial fit the dowel plate over the dowels If the dowels fit too tightly, you may enlarge the holes slightly using a round file

D 7. Mix up a batch of 30-minute epoxy Use a long stick to work some epoxy into the dowel holes Smear epoxy on the dowels and then re-insert the dowels into the wing leaving them protrude 1/2" Wipe away all excess epoxy Then allow the epoxy to fully harden

INSTALL WING BOLT PLATE

D 1 Mark a centerline on the die-cut 1/16" x 4-1/2" x 2-1/4" ply **wing bolt plate.**



D 2 Position the wing bolt plate on the **bottom** of the wing, **with the punch marks visible,** and line it up with the wing TE and centerline Glue it in place

D 3 Sand the wing bolt plate flush with the wing TE.

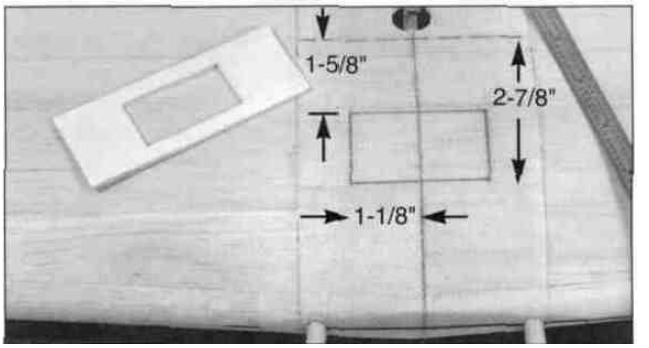
FILL LANDING GEAR SLOTS
(For fixed gear only)

D 1. Temporarily install the main LG wires.

D 2 Check the plan for the location of the nylon landing gear straps (NYLON36) and temporarily install them. using #2 x 3/8" sheet metal screws

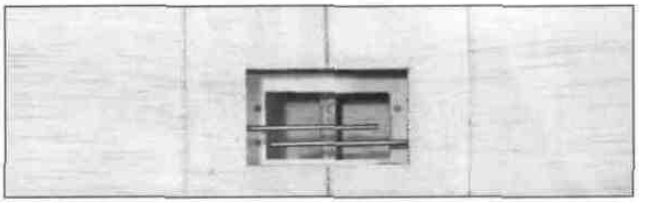
D 3 Using scraps of balsa, fill the ends of the slots in the notched LG blocks and sand flush with the surface of the wing This will aid in covering later

INSTALL RETRACT SERVO
(Skip this section if you are using fixed gear)

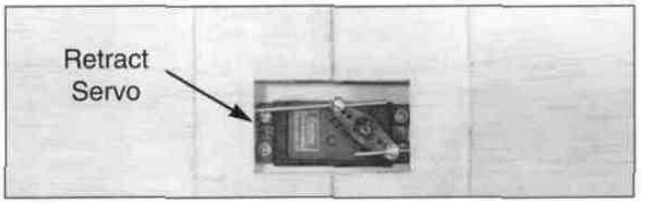


D 1 Mark the location of the retract servo opening as follows With the wing right side up lay a straightedge along the aft edge of the spars and draw a reference line on the fiberglass cloth From this line, measure forward and make marks at 1-5/8" and 2-7/8 Draw lines through these marks and parallel with the reference line Now measure and make marks 1-1/8" left and right of the wing centerline and draw lines through these marks and parallel with the wing centerline

D 2 Cut a hole in the top sheeting for the retract servo installation



D 3 Working through this hole cut away as much of the W-1 ribs as necessary to permit the die-cut 1/8" ply retract servo tray to rest down on top of the 5/16" dowels and to provide clearance for the retract servo itself Now securely glue (epoxy is recommended) the servo tray to the top of the wing dowels Enlarge the hole if necessary to perform this installation, but keep it **as** small as possible



D 4 Install your retract servo hook up the retract pushrods and make a final check that everything is working properly

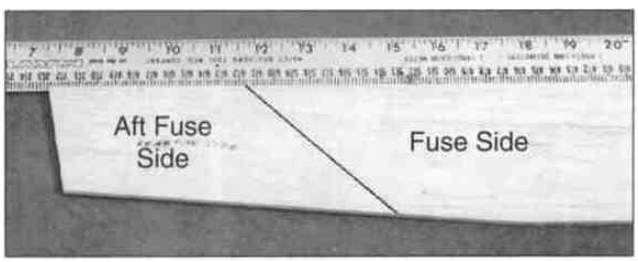
FUSELAGE ASSEMBLY

NOTE: For ease of working with these big plans, you may cut out the fuselage top and side views and work with them separately.

PREPARE FUSE SIDES

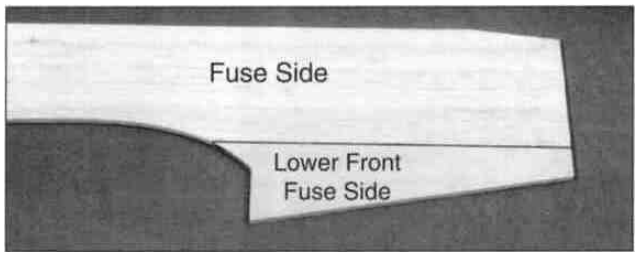
PARTS NEEDED

D (2) US10F01 3/16" x 48" Shaped Balsa **Fuse Sides**
D (2) US10F02 3/16 Shaped Balsa Aft Fuse Sides
D (1) US10F38 Die-cut 3/16" Balsa **Lower Front Fuse Sides**
D (1) US10F37 Die-cut 3/16" Balsa **Lower Rear Fuse Sides**
D (1) US10F19 1-1/4" x 3" Tapered Balsa **Tail Wedge**
D (2) US1 0F25 Die-cut 1/8" Ply **Fuse Side Doubler**
D (1) US10F31 Die-cut 1/8" Ply **Aft Fuse Side Doubler**
D (2) US10F41 3/8" x 30" Balsa **Triangle Stock**
D (1) Each **Firewall Spacers** (see text)



D 1. Trial fit the 3/16" balsa **aft fuse side** against the aft edge of the long 3/16" balsa **fuse side** Lay a straightedge along the top edge of these parts to insure straightness Sand the mating edges as necessary for a good fit Glue the aft fuse side to the fuse side, using thick CA, epoxy or aliphatic resin glue. Block sand the joint smooth on both sides.

D 2 Lay the **fuse side** in place on the fuselage plan side view Carefully align the long **top edge** of the fuse side with the corresponding line on the plan, and position it so the **front edge** lines up with the **alignment arrows** (approx 3/32" forward of the front edge of F-1) on the plan Tape or pin the fuse side so it can't move **NOTE:** The fuse side may be a little longer at the rear than indicated by the plan. This is as it should be



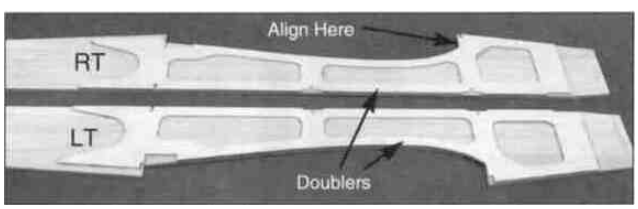
D 3 Carefully position the die-cut 3/16" balsa **lower front fuse side** so the vertical rear edge lines up with the front of the wing saddle opening on the plan (the rear edge of F-2A) You may have to lightly sand the top edge of the die-cut 3/16" balsa for a good fit against the bottom edge of the fuse side Edge glue the lower front fuse side to the fuse side **NOTE:** Use waxed paper under the balsa to avoid gluing to the plan.

D 4 Carefully position the die-cut 3/16" balsa **lower rear fuse side** so the vertical front edge lines up with the rear of the wing saddle opening on the plan (the front edge of F-4) Edge glue the lower rear fuse side to the fuse side.

D 5. Trim and sand off the die-cut "bumps" from the front and rear portion of the lower rear fuse side, blending with the upper fuse side.

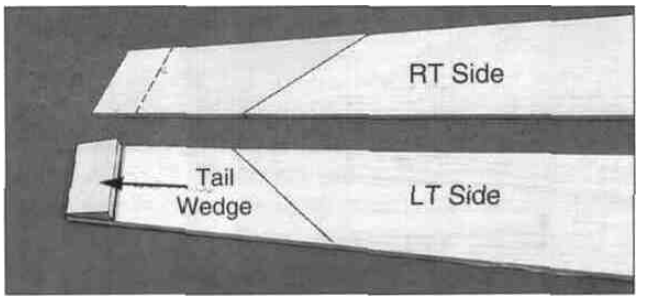
D 6 Block sand the fuse side smooth on both sides using a T-bar and 100-grit sandpaper Then repeat the above steps to make the other fuse side.

CAUTION ... Do not make two Left sides!

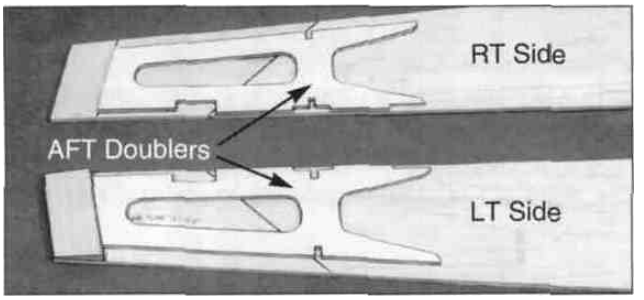


D 7. Carefully position the large die-cut 1/8" ply fuselage doublers on the fuse sides, making a RIGHT and a LEFT side It is important that the fuse doubler and fuse side line up along the top edge and the front of the wing opening While holding in position, apply thin CA glue around all the notches and lightening holes, then around the edges. Make sure you apply

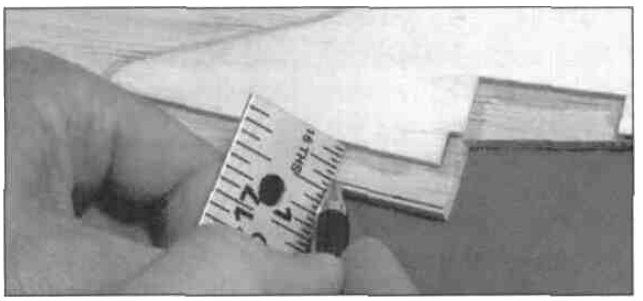
sufficient glue so it flows under the doubler to produce a strong bond



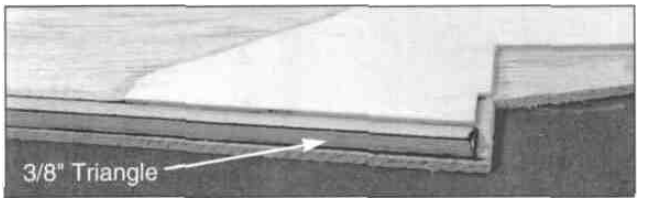
D 8. Find the 1-1/4" x 3" tapered balsa **tail wedge.** Holding the tail wedge in place on the **right** fuse side (aligned with the aft edge of the fuse side) draw a line on the fuse side at the front edge of the tail wedge. Now glue the tail wedge to the **left** fuse side and trim the ends of the tail wedge flush with the top and bottom edges of the fuse side.



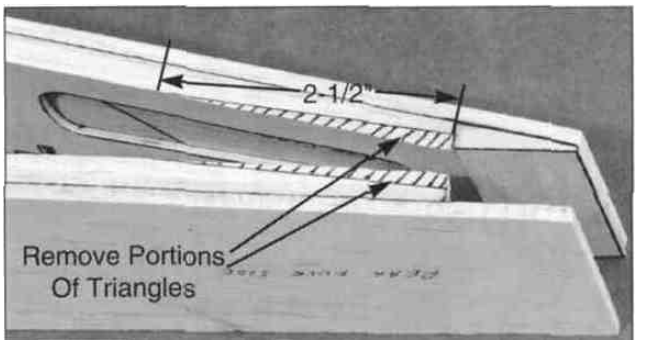
D 9. Carefully position the die-cut 1/8" ply **aft fuse doublers** on the fuse sides The doublers must line up with the top edge of the fuse sides and the front edge of the tail wedge Glue the doublers in place. **NOTE:** The aft 2" of the top edge of the doubler is 1/8" **below** the top edge of the fuse,



D 10. The bottom edge of the fuse sides should be exactly 3/8" below the bottom edge of the fuse doublers, from F-4 to the aft end, however, there may be a little extra To insure accuracy, measure and make marks 3/8" below the doublers near F-4 and near the aft end, then connect these marks with a straight line In the next step, install the bottom edge of the 3/8" triangles along this line.



D 11 From the 3/8" x 30" balsa triangle, cut pieces to fit between the tail wedge and the <u>rear</u> **of** F-4, along the bottom inside of both fuse sides. Glue in place.



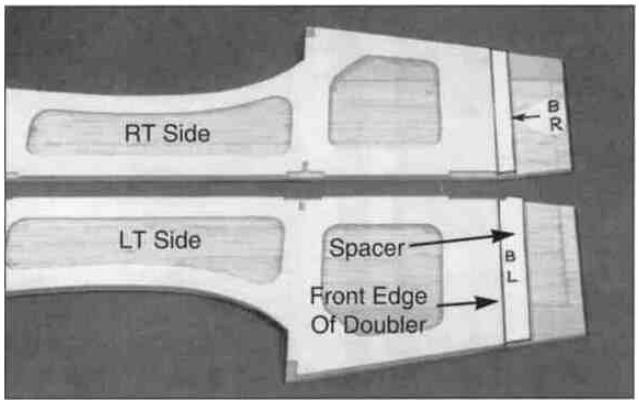
D 12 Sand the aft ends of the balsa triangle to a taper, which will permit the fuse sides to be pulled together at the aft end **NOTE:** The taper shown in the photo is approximate and may have to be modified during assembly.

D 13. From the **"ENGINE APPLICATION TABLE"** on the fuse plan, determine which firewall (A, **B,** or C) is right for your engine This will govern which **firewall spacers** you will use. For instance, if your engine is an OS 120 Surpass, the "B" firewall applies, and you will install the **"BL"** and **"BR"** firewall spacers If your engine is not listed in the table, you'll have to compare the overall length of your engine/mount with the plans to determine which firewall location is appropriate. (See step 14 before gluing in the spacers).

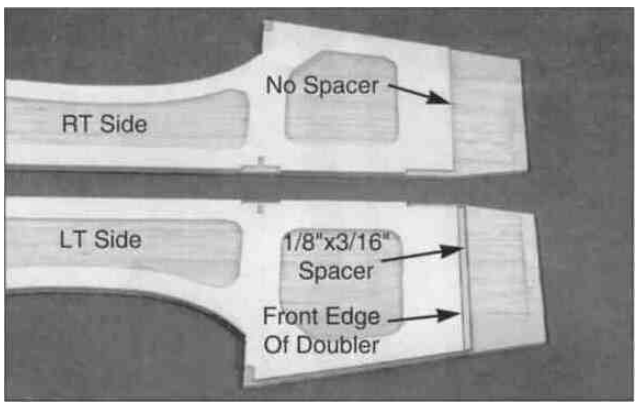
IMPORTANT: The purpose of the firewall spacers is to provide 2-degrees of right engine thrust. Study the next step carefully and trial fit the parts before proceeding. <u>The smaller of the two firewall spacers always goes on the right fuse side.</u>

D 14 Securely glue the appropriate **firewall spacers** to the fuse sides and to the front edge of the fuse side doublers using 5-minute epoxy.

IMPORTANT: For the "C" firewall location, glue spacer **"CL"** to the left side and **"CR"** to the right side.



For the **"B"** firewall location, glue spacer **"BL"** to the left side and **"BR"** to the right side.



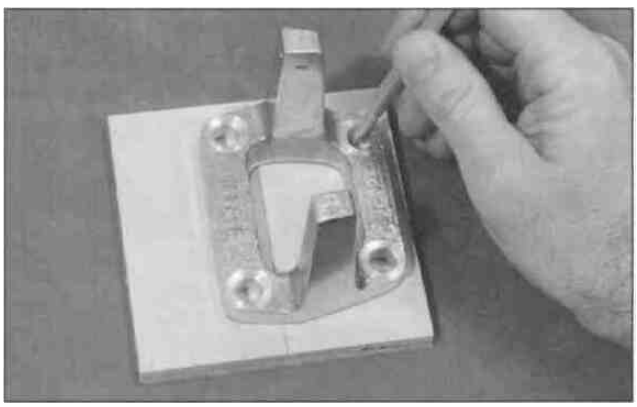
For the "A" firewall location, glue the **1/8" x 3/16" x 4-1/4" hardwood stick** (part #US10F08) to the **left** side (the top edge of the stick must be flush with the **top** edge of the slot in the doubler), and **do not install any spacer on the right side.**

PREPARE THE FIREWALL (F-1)

PARTS NEEDED:
D (1) US10F05 3/8" x 4-7/16" x 4-5/16" Ply **Firewall (F-1)**
D (1) Set Engine mount & hardware to fit your engine (see Engine Application Table) (NOT INCLUDED)

ADDITIONAL PARTS REQUIRED FOR TRIKE GEAR:
D (1) WBNT169 3/16" Wire **Nose Gear Strut**
D (2) NYLON05 Nylon **Nose Gear Bearings**
D (4) NUTS001 4-40 **Blind Nuts**
D (4) SCRW036 4-40 x 3/4" **Machine Screw**
D (1) NYLON69 **Steering Arm** for 3/16" Wire
D (1) SCRW007 6-32 x 1/4" **Socket Head Cap Screw**
D (2) WHCL011 3/16" **Wheel Collars**
D (2) SCRW005 6-32 x 1/8" Set Screw

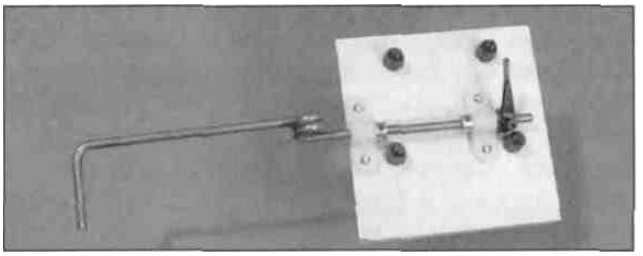
D 1. The 3/8" **firewall (F-1)** supplied in the kit is the correct size for the "A" firewall location (see Engine Application Table). If your engine requires the "B" or "C" firewall, it is necessary to cut the firewall down to the proper size Drawings for all three firewalls are shown on the fuse plan. Use these drawings **to** determine how much to cut **NOTE:** The top and bottom edges of F-1 are beveled at an 8-1/2 degree angle. When you cut your firewall, be sure to maintain the same angles on these edges Mark the "Front" and "Top" of F-1 for future reference.



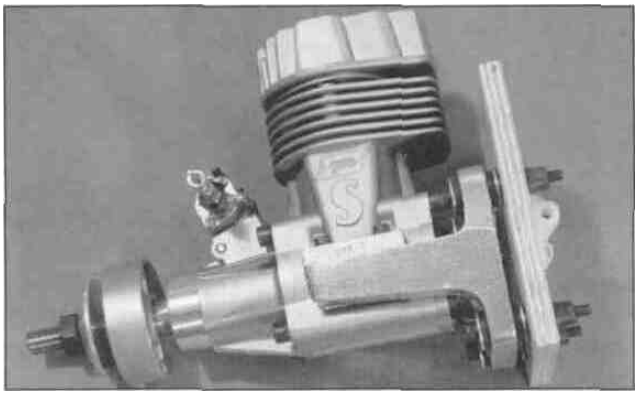
D 2. The firewall drawings on the plan show the correct positioning of various J-Tec engine mounts. From the appropriate drawing, determine the location of your mount on your firewall Note that the mount should be located slightly off center because of the 2 degrees of right thrust Place your mount on the firewall and mark the location of the mounting holes. **NOTE:** Hole locations may vary from mount to mount, so do not drill the holes based on the drawing . . . use your actual mount to locate the holes.

D 3. Drill holes in F-1 for your engine mount J-Tec **"SV"** (rubber isolated) mounts are shown on the plan, and are recommended for this model, and they require you to drill **3/8"** diameter holes To drill the holes accurately, we recommend first drilling a 1/8" pilot hole, followed by a 1/4" hole, then drill the 3/8" holes. If you choose to use a non-isolated mount, drill the holes to fit 10-32 bolts and blind nuts.

D 4. The firewall drawings also show the recommended position of the nylon **nose gear bearings** If you are building a tnke gear version, use the drawing to determine the location of these nylon bearings, and mark the mounting hole locations Drill 9/64" holes for the 4-40 bolts and blind nuts The blind nuts will be installed on the **front** of the firewall, so it may be necessary to countersink one or more of them to permit the engine mount to rest flat on the firewall. **NOTE:** It is also necessary to drill out the nylon bearings to accept the 3/16" nose gear strut.



D 5. Permanently attach the nose gear bearings (if applicable) to the back of the firewall with the 4-40 x 3/4" machine screws, cut off the excess bolt length that protrudes through the firewall, and trial fit the nose gear strut and steering arm. Temporarily mount your engine mount and engine onto the firewall, making sure everything fits properly. Remove the engine mount and the nose gear, leaving the nylon nose gear bearings in place. Now glue the rubber expansion nuts into the holes, per the instructions that came with the mount.

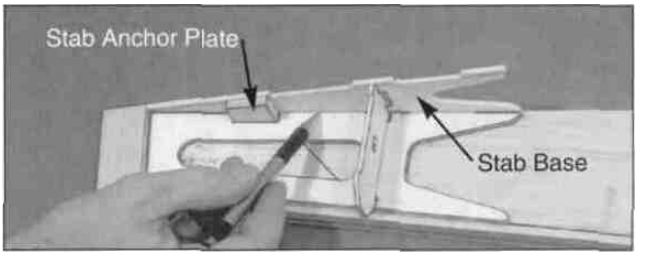


PREPARE STAB BASE

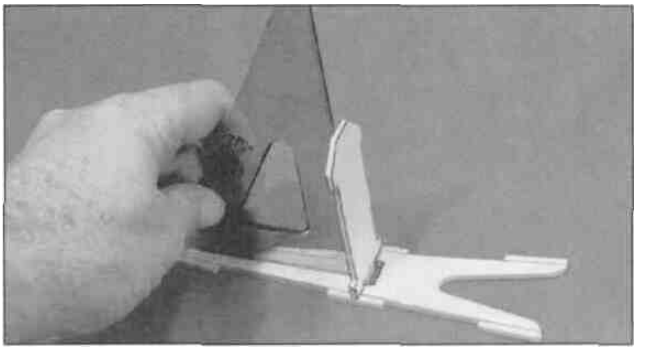
PARTS NEEDED:
D (1) US10F30 Die-cut 1/8" Ply **Stab Base**
D (1) US10W35 Die-cut 1/8" Ply **Stab Anchor Plates**
D (1) US10F29 Die-cut 1/8" Ply **F-6**
D (1) US10F42 1/4" x 30" Balsa **Triangle Stock**

D 1. Find the two die-cut 1/8" birch ply **stab anchor plates,** and glue them together to make a 1/4" block. Trial fit this block into the slots in the aft fuse side doublers, sanding the edges of the block until it fits. Also check the **thickness** of the block and sand it down as necessary so it does not prevent the stab base from fully seating into the slots in the doublers.

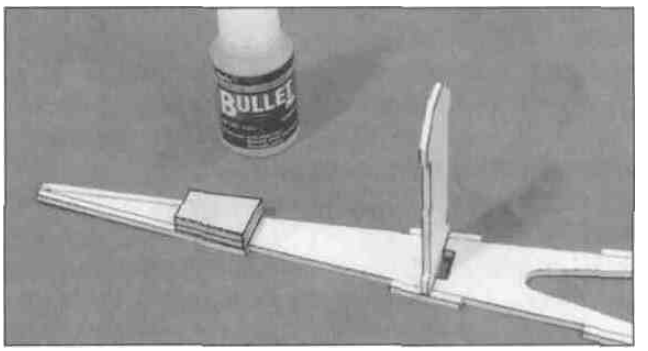
D 2. Trial fit the die-cut 1/8" ply **stab base** into the slots in the aft fuse side doublers. Sand the aft end of the stab base for a good fit against the tail wedge.

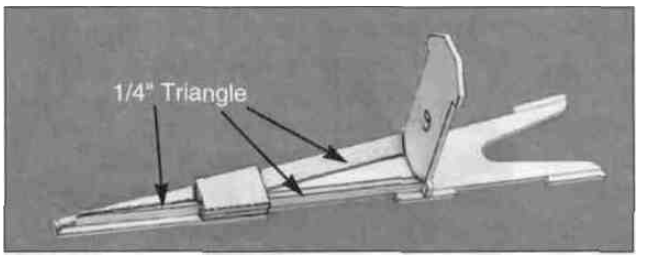


D 3. Temporarily assemble the stab base, the stab anchor block and the die-cut 1/8" ply former **F-6** onto one of the fuse sides. F-6 should be all the way **aft** in the slot in the stab base. While holding these parts together, draw lines on the bottom of the stab base to mark the location of the anchor block, F-6 and the inside edge of the fuse doubler. Now assemble these parts on the other fuse side and mark the inside edge of the fuse doubler along the other edge of the stab base. Now disassemble the parts.



D 4. Glue the die-cut 1/8" ply **F-6** into the slot in the stab base. F-6 must be installed in the slot as far **aft** as it will go, and it must be perpendicular to the stab base. Also glue the **stab anchor block** to the stab base, using the guidelines drawn in the previous step for positioning.



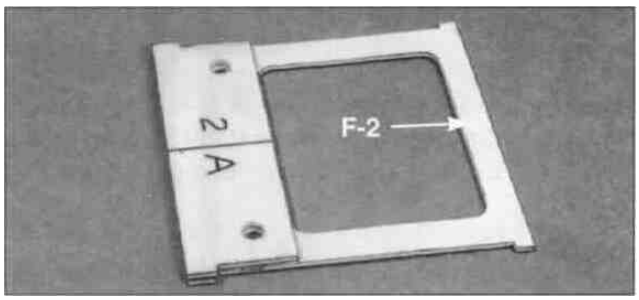


D 5. From the 1/4" **balsa triangle** stock, cut pieces to fit on both sides of the stab base between F-6 and

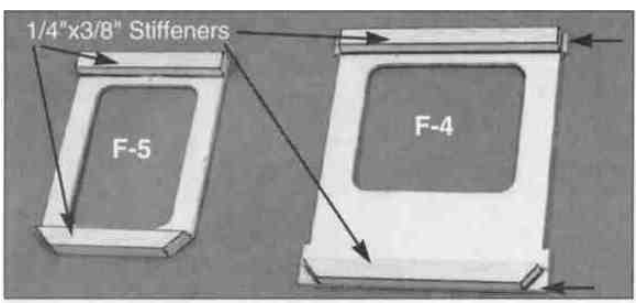
the stab anchor block, and between the anchor block and the tail wedge (notice how the triangles are sanded to a taper near the aft end). Glue the triangles in place using the guidelines drawn in step 4, as shown in the photo.

PREPARE FORMERS

PARTS NEEDED:
D(1)US10F161/4"x3/8"x15"BalsaStick**(Stiffeners)**
D (1) US10F28 Die-cut 1/8" Ply **Formers F-2, F-4 and F-5**
D (1) US10F29 Die-cut 1/8" Ply **Former F-2A**



D 1. Glue F-2A to F-2, then drill 5/16" holes through F-2, using the holes in F-2A as a guide. **NOTE:** Use a scrap board as a backing when drilling, to help prevent the plywood from splitting when the drill goes through.



D 2. From the 1/4" x 3/8" x 15" balsa stick, cut and glue **stiffeners** to the back side of F-4 and F-5 along the top and bottom edges. Note that the stiffeners on F-4 stop 1/8" short of the ends of the tabs, and you must cut the ends of the bottom stiffener at a 45 degree angle to fit between the 3/8" triangles. Now place F-4 and F-5 on the fuse plan bottom view and note the angle at which the fuse sides will contact the formers. Sand the sides of the formers to the same angle as the fuse sides.

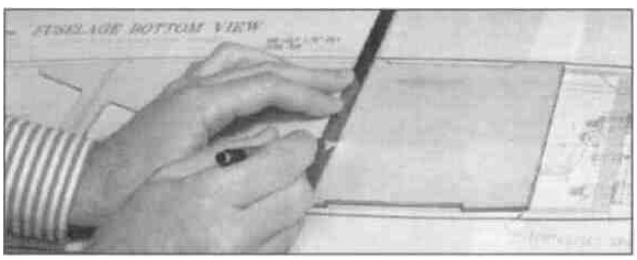
ASSEMBLE LOWER FUSELAGE

PARTS NEEDED:
D (1) US10F26 Die-cut 1/8" Ply **Fuse Top**
D (1) US10F29 Die-cut 1/8" Ply **Former F-3**
D (1) US10F20 1/4"x1/2"x3-9/16" Balsa **Frt Cross Brace**
D (1) US10F21 1/4"x1/2"x2-11/32" Balsa **Aft Cross Brace**
D (1) US10F07 1/2"x30" Balsa **Triangle Stock**
D (1) US10F10 3/8"x15" Balsa **Triangle Stock**
D (1) US1 0F04 3/8" Ply **Wing Hold-down Plate**
D (1) US1 0F24 1/8"x3"x30" Balsa **Fuse Bottom Sheeting**

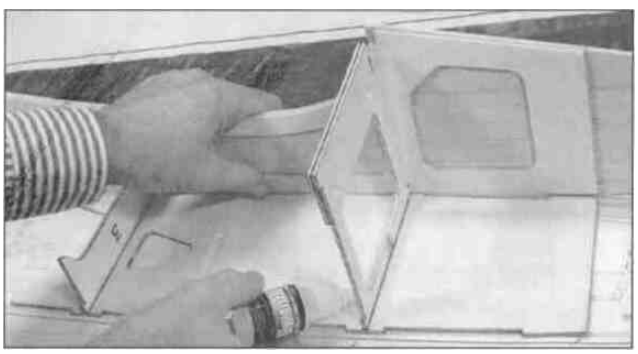
NOTE: The fuselage is assembled upside down.

D 1. Tape the fuselage plan **Bottom** View to your workbench and cover the plan with waxed paper.

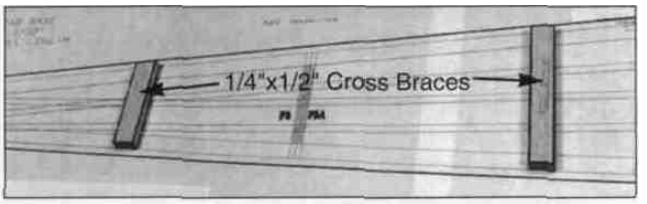
D 2. **Trial fit** formers F-2, F-3, and F-4 into the slots in both of the fuse side doublers, trimming as necessary for a good fit.



D 3. Accurately position the 1/8" die-cut ply **fuse top** on the plan and hold it **securely** in place with pins, tape or weights (or you may spray it lightly with 3M "77" spray adhesive, to hold it firmly but temporarily down on the plan). Note that the front edge of the fuse top is cut at an angle, so there is only one correct way to lay it down. Using the location marks as a reference, draw lines across the fuse top to mark the location of F-2 and F-3.

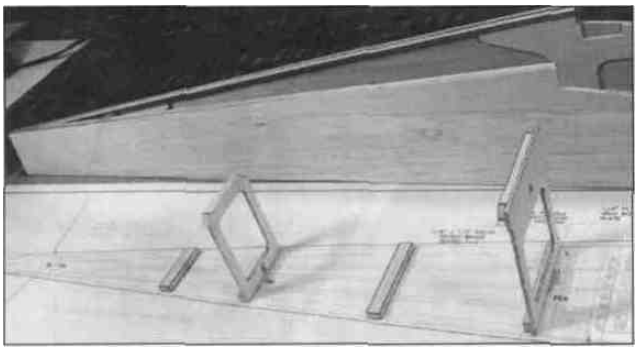


D 4. Glue F-2 and F-3 to the fuse top, making sure each is perpendicular to the board and centered between the fuse sides. To insure that these formers are properly located you may temporarily interlock the fuse sides with the fuse top, checking to make sure the tabs in F-2 will insert into the slots in the fuse side doublers.

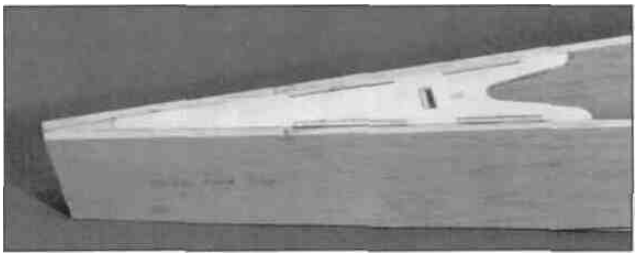


D 5. Accurately position the two pre-cut 1/4" x 1/2" balsa **cross-braces** on the plan, and pin them in place. Pin F-4 and F-5 to the building board, upside down, in their proper position on the plan.

D 6. Trial fit (do not glue) the following parts together: **Fuse top, fuse sides,** die-cut 1/8" ply **F-2, F-3,** and F-4. Check the fit of all parts and trim, file or sand as necessary for a good fit.



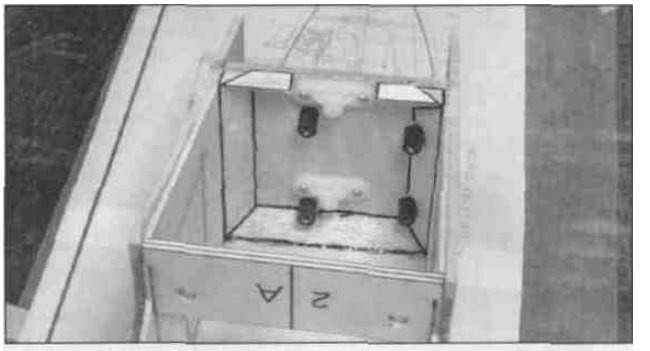
D 7. NOTE: You may want to use 30-minute epoxy for this step, to fill any gaps and to give you time to get the alignment right. Temporarily assemble the fuse sides and the stab base assembly. Pull the fuse sides together at the aft end and check the fits around the tail wedge, etc. Sand the tail wedge and the bottom triangle stock as required so the fuse sides fit together properly with the stab base in between. When satisfied with the fit, set the assembly upside down on a flat surface and check to make sure the fuse sides are vertical (perpendicular to the work surface). Now securely glue this aft fuse assembly together from the aft end to the front of the stab base. Make sure the stab anchor block is securely glued. Turn the assembly right side up and continue adding glue until all glue joints are secure. Block sand the stab base glue joints to remove any extra glue that has squeezed out.



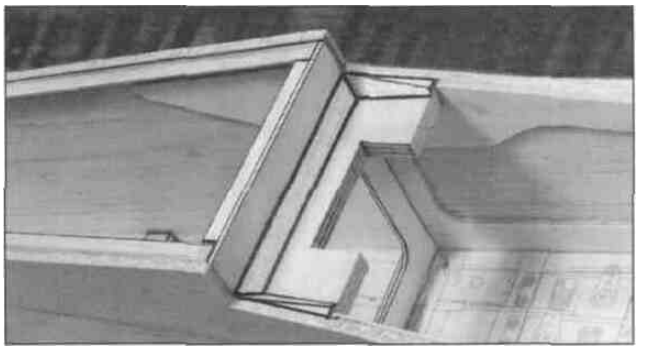
D 8. Place the above assembly upside down on the waxed paper covered plan, and align the aft portion of the fuse with the plan. Begin pulling the fuse sides together, and pin the sides to the board every few inches as you work forward. Glue the fuse sides to the rear cross-brace, F-5, the front cross-brace, and F-4 as you get to them.

D 9. When you reach the fuse top, slip the firewall (F-1) between the fuse sides at the front and use as many rubber bands as necessary to pull the fuse sides together until they are touching F-1. Then hold the fuse top and the sides firmly against the building board as you glue the fuse sides to the fuse top and to F-3 and F-2.

D 10. Now glue the firewall (F-1) in place with 30-minute epoxy. **Remember, the fuse is upside down so the "TOP" mark on the firewall goes at the bottom.**

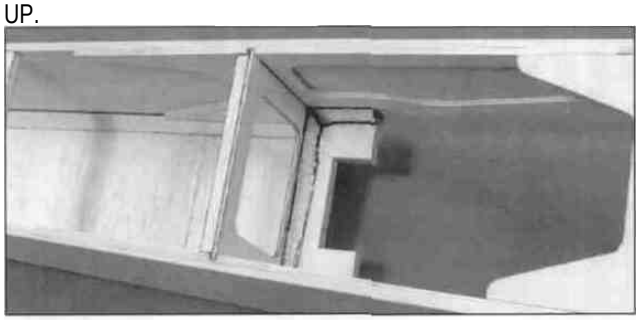


D 11. Add 1/2" **hard** balsa triangle behind all four sides of the firewall, allowing enough of the triangle to extend beyond the top and bottom of the firewall so the triangles can be sanded to match the angle of the top and chin blocks.



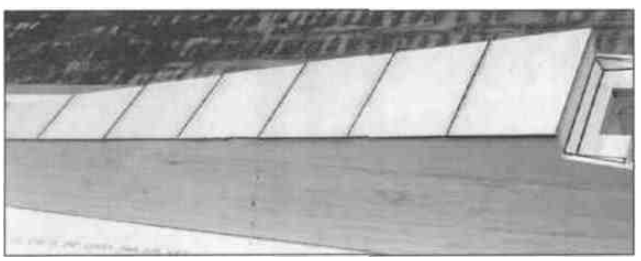
D 12. Find the 3/8" ply **wing hold-down plate** and trial fit it into the notches in the fuse side doublers,

sanding as necessary for a good fit. Glue the hold-down plate in place **securely,** using 30-minute epoxy. Then cut pieces of 3/8" hard balsa triangle and glue them in place above and below* the hold-down plate. Sand the triangles flush with the wing saddle. *You may wait to install the triangles **under** the hold-down plate until after you are able to turn the fuse right side UP.



D 13. Block sand the bottom of the fuse from F-4 to the aft end to remove any excess glue, and to provide a flat surface for the sheeting.

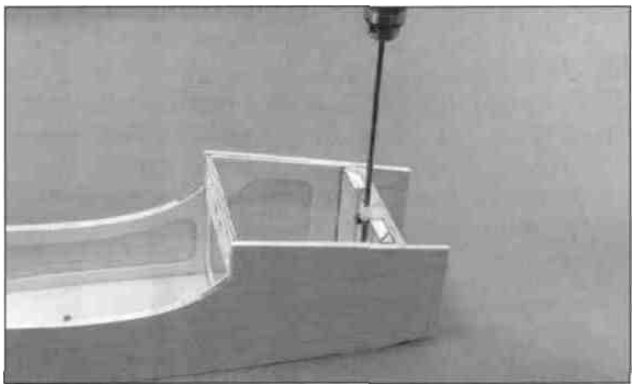
NOTE: If you want to install a separate "guide tube" for an internal radio antenna, this is a good time to do it. We like to install the tube along the bottom of the lightening holes in the formers, and exiting through the bottom sheeting a couple inches in front of the tail wedge.



D 14. From the 1/8" x 3" x 30" balsa sheet, cut and glue pieces of **cross-grain sheeting** to the bottom of the fuse, beginning at the front of F-4 and running to the aft end of the fuse.

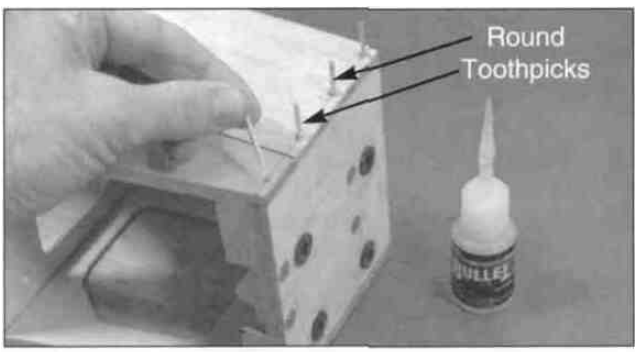
D 15. Now you may remove the fuselage from the work surface and sand the edges of the bottom sheeting flush with the fuse sides.

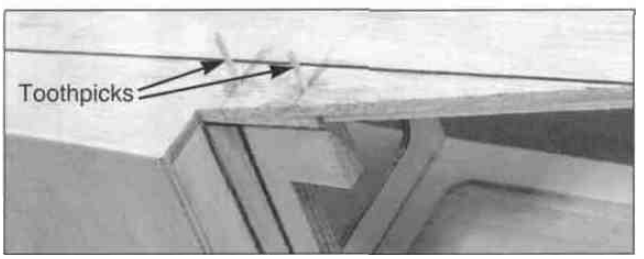
D 16. Check **all** glue joints and add thick CA glue to any joints that are not tight fitting. Then use a long sanding block to sand the top of the fuse flat and smooth.



D 17. If you are using a tricycle gear and firewall "A" location, use a long 3/16" drill bit to drill through the nylon nose gear bearings and out through the 1/8" ply fuse top. You will need this hole later to line up the nose gear strut hole in the chin block.

D 18. Cut off the excess fuse sides that extend in front of the firewall, and sand flush. Also, block sand the bottom of the fuse from F-1 to F-2 in preparation for installation of the chin block.





D 19. For additional security, "pin" F-1 and the wing hold-down plate to the fuse sides by drilling 3/32" holes through the fuse sides into the plywood and gluing round toothpicks into the holes on both sides (4 holes on both sides of F-1, and 2 holes per side for the hold-down plate). Measure back 3/16" from the front of F-1 and draw a drilling guideline to center the holes in F-1. Also harden the balsa around F-1 by soaking the front ends of the fuse sides with thin CA. When the glue has cured, trim and sand the toothpicks flush with the fuse sides. NOTE: This is a little trick that many modelers use to improve the bond between the firewall and the fuse sides.

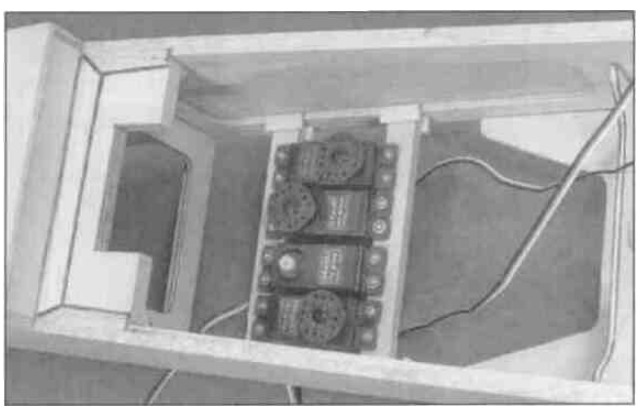
INSTALL SERVOS AND PUSHROD GUIDE TUBES

PARTS NEEDED:
D (2) US1 0F09 1/4" x 1/2" x 4-3/8" Ply **Servo Rails**
D (4) PLTB002 36" Plastic **Outer Pushrod Guide Tube**
D (1) NYLON69 Nylon **Nosegear Steering Arm**
D (1) SCRW007 6-32 x 1/4" **Socket Head Cap Screw**
D (2) WIRES17 34" Steel **Pushrod Wires**

NOTE: Although you may choose to wait until later, this is the best time to install the pushrod guides, because the fuselage is wide open and it is very easy to work inside.

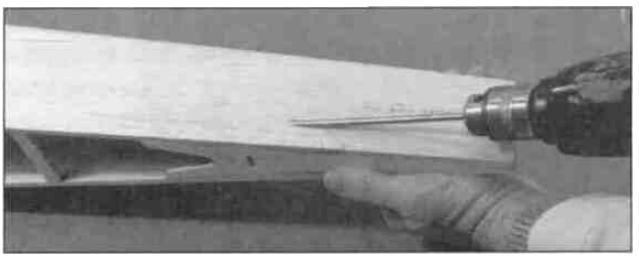
IMPORTANT: Before proceeding, **plan your servo and pushrod installation.** Especially note which side of the fuselage the throttle pushrod and nose gear pushrod (if any) will be located. Remember that the throttle arms of 2-cycle and some 4-cycle engines are on opposite sides. It will be helpful to actually sketch your pushrod locations on the plans with a pencil. It is desirable for the throttle pushrod (and the nosegear steering pushrod) to run along the **sides** of the fuselage. It is also desirable (but not essential) for the rudder and elevator pushrods to cross inside the fuselage, to avoid any sharp bends.

D 1. Set the fuselage upside down on blocks at least 1/2-inch high.



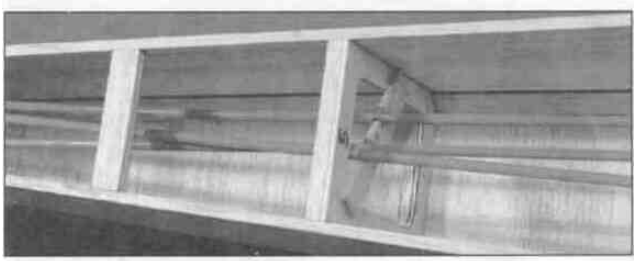
D 2. Trim the 1/4" x 1/2" x 4-3/8" ply **servo rails** to fit between the fuse side doublers in the locations shown on the plan. Temporarily mount your servos to the rails, and then glue the rails to the fuse side doublers. (Note that the surface of the rails is even with the edge of the lightening holes in the fuse side doublers). **Securely** lock the rails in place by gluing scraps of plywood on the top and bottom of the rails.

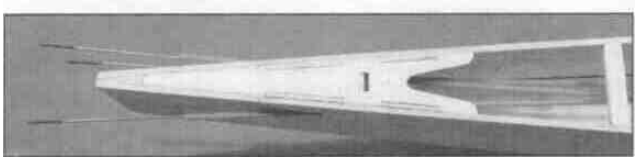
3. Sand the outer surface of the **pushrod guide tubes** with 100-grit sandpaper, providing a surface to which the glue will adhere.



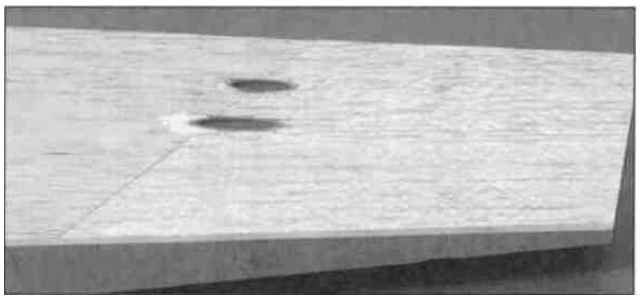
D 4. Use an X-acto knife to sharpen one end of a piece of 3/16" (outside diameter) brass tubing. Then use this tubing to cut the pushrod exit holes (you may use a 3/16" drill bit, but the brass tube method gives a much neater cut). Determine the location of these holes from the plans. You may chuck this brass tube in an electric drill to aid in getting through the ply doublers and F-6.

D 5. Insert the plastic pushrod tubes through the holes you just cut and through formers P-5 and F-4.





D 6. Route the pushrod tubes according to your radio installation plan. Temporarily insert the 34" pushrod wires into the tubes and hold them in the correct position (with tape) at the servo end. **Keep the tubes as straight as possible.** Glue the tube to the fuse sides at the rear exit points using thin CA glue. Use scraps of 1/8" balsa to anchor the tubes to F-5. **Do not anchor the tubes to F-4 at this time,** to allow for slight adjustment of their positions later.

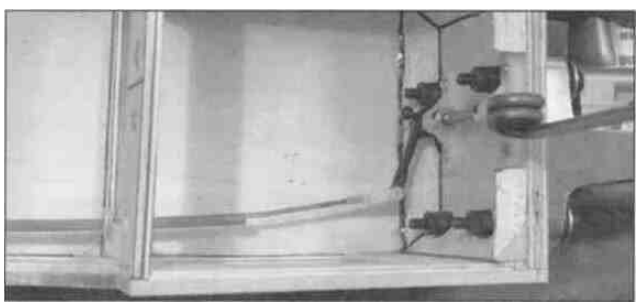


D 7 Cut off the tubes at the exit points and sand them flush with the fuse sides using a sanding block.

STEPS 8-11 ARE FOR TRIKE GEAR ONLY

D 8. Temporarily install the **nosegear** and **nosegear steering arm** if you are building a tricycle configuration If there is any possibility of the steering arm binding against the engine mounting hardware, cut 1/4" off the end of the steering arm Cut a 12" length from the remaining outer pushrod guide tubing and use it for the nosegear pushrod guide.

D 9 Route the nosegear steering pushrod from the rudder servo arm to the steering arm, anchoring the outer guide tube to formers F-2 and F-3.

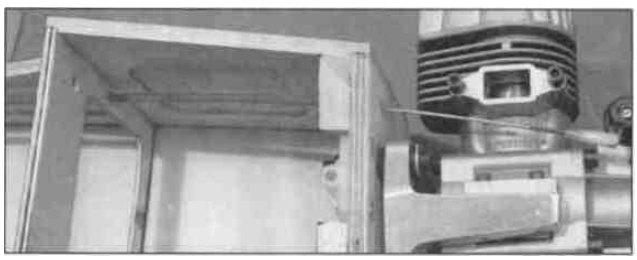


D 10 Hook up the pushrod to the steering arm (using a nylon clevis) and to the servo arm (using an **EZ** Connector) Rotate the servo arm to its neutral position, and set the nosegear to neutral Rotate the steering arm away from the firewall to provide sufficient free movement With the components in position as described above, tighten the steering arm set screw onto the nosegear strut which will mark the strut for the next step.

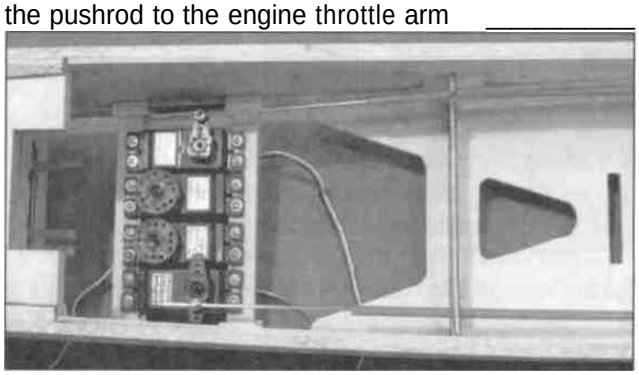
D 11 Remove the nosegear strut and file a notch in the strut at the setscrew location This will prevent the strut from slipping under high stress Leave the steering arm and pushrod in place

D 12 With the engine resting on the mount, plan the **throttle pushrod** routing The pushrod should be located as close as possible to the fuse side (to allow room for the fuel tank), and the guide tube should not have any tight bends Drill a 3/16" hole in F-1 for the throttle pushrod guide tube.

D 13. Drill or carve holes in F-2 and F-3 for the guide tubes Cut the remaining pushrod guide tube to length and trial fit the tube in the fuselage Glue the tube in place, then trim and sand the tube flush with the front **of F-1.**



D 14 Cut the **pushrod wire** to the required length and temporarily install the throttle pushrod Use the nylon clevis (NYLON 17) if needed for attachment of the pushrod to the engine throttle arm



D 15 Now remove the pushrod wires, engine, engine mount and servos (Leave the nosegear steering pushrod in place.

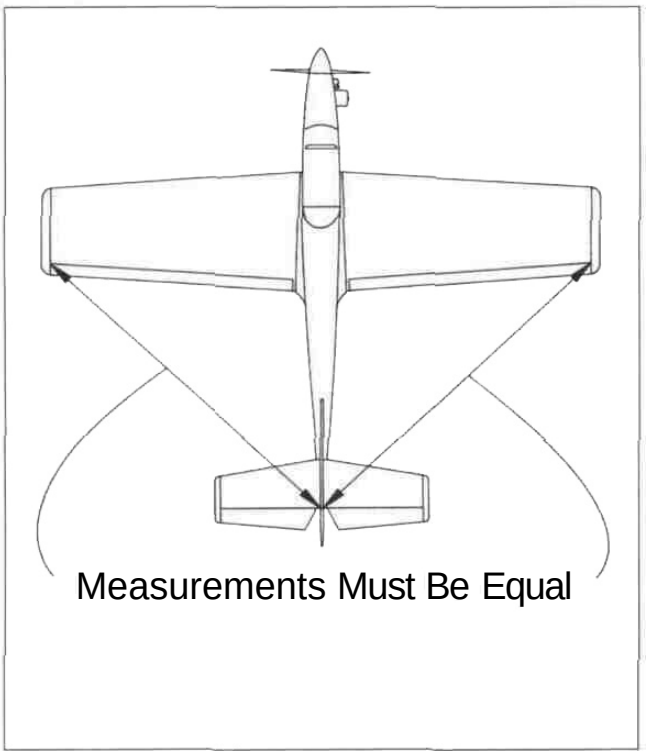
MOUNT THE WING TO THE FUSE

PARTS NEEDED:
D (2) NYLON13 1/4-20 **Nylon Bolts**

D 1. Sand the top surface of the fuse to remove any excess glue so the fuse will lie flat on the workbench

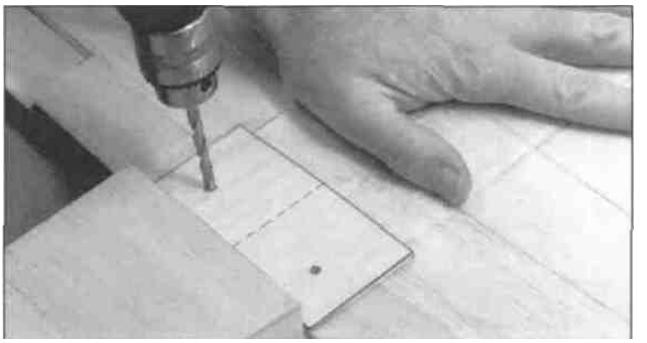
D 2 Sand the entire wing saddle area lightly until the fuse side doublers and fuse sides are flush.

D 3 With the fuselage upside down on a flat surface, trial fit the wing into the wing saddle You may have to enlarge the holes in F-2 in one direction or another (using a round file), and you will probably have to sand the wing saddle a bit to allow the wing to seat properly. The wing should be centered, front to back, in the wing saddle area, with approximately equal spaces at the LE and TE.



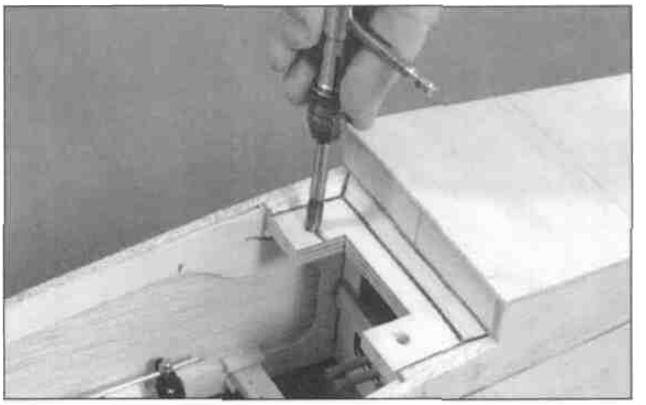
D 4. Carefully **align** the wing in the saddle as follows: The wing should now be **centered,** side to side. Measure down from the bottom of both tip ribs to the flat surface If the measurements are not equal (within 1/16"), sand the saddle (and modify the F-2 holes slightly) until the wing sits level in the saddle Also measure from the rear corner of each wing tip to the tail end of the fuselage These measurements must also agree within 1/16" If not, shift the wing slightly until they do With the wing in this position you may now check the wing **incidence** using an "incidence meter" or by measuring down to the flat surface from the center of the leading and trailing edges The measurements should be the same (zero degrees incidence) **CAUTION:** If your flat surface is not **level,** you will get erroneous incidence readings' If you are working on a flat surface that is not level, you must set the wing incidence the same as your flat surface.

D 5. After making the necessary corrections to align the wing, make **alignment marks** on the wing TE and the front of F-4 so you may easily re-check the wing alignment later.



D 6. Holding the wing **firmly** in place, drill 13/64" holes at the punch mark locations on the 1/16" ply wing bolt plate, drilling down through the bolt plate and through the 3/8" ply hold-down block in the fuselage. Try to drill straight in, perpendicular to the 1/16" ply bolt plate **IMPORTANT!: Do not allow the wing to move while drilling!**

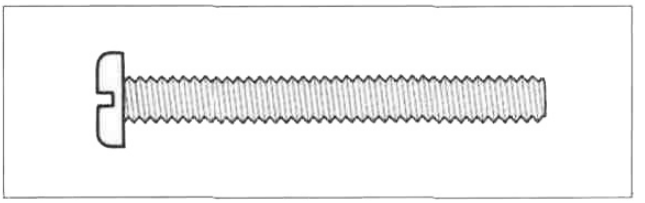
D 7. Remove the wing and re-drill the holes **in the wing only** to 1/4".



D 8. Use a 1/4-20 **tap** and a **tap wrench** to cut threads in the ply hold-down block in the fuselage.

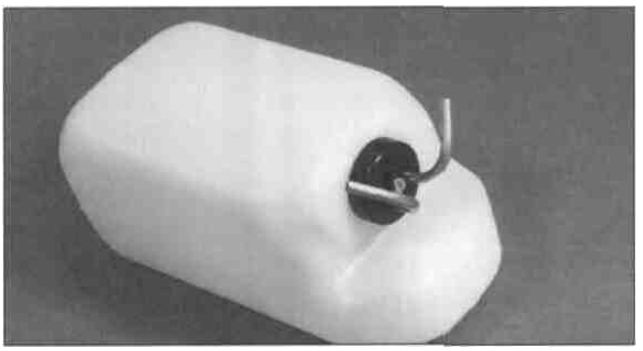
D 9 **Harden** the threads in the hold-down block with thin CA glue, then re-tap the threads after the glue is **completely** dry.

D 10 **Trial fit** the wing to the fuse using the two 1/4-20 nylon bolts provided You may cut the bolts off to their proper length, so they protrude about 1/4" below the hold-down block in the fuselage



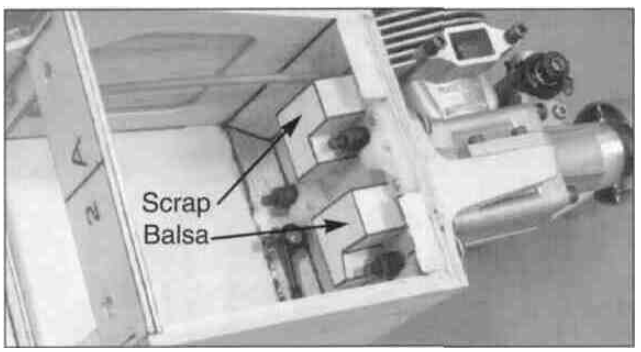
D 11. Later you will apply foam **wing seating tape** or **silicone sealer** to the wing saddle To allow space for this wing cushion material, you may sand the saddle **slightly** in the areas where the wing touches the saddle, to provide a small gap.

FIT FUEL TANK and FUELPROOF TANK COMPARTMENT

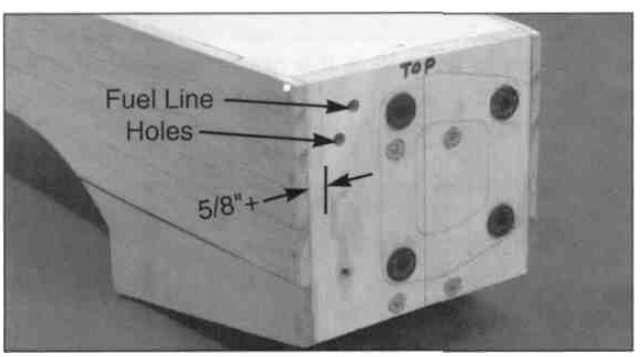


D 1. Assemble your **12 to 16 oz. fuel tank** We recommend bending the brass tubes as shown in the photo to prevent them from cutting through the silicone fuel lines if pressed against the front of the tank compartment **HINT:** To avoid kinking the tubes when bending, we use **K&S Tubing Bending Springs.**

D 2 Try sliding the tank in through F-2 In the unlikely event that the opening is not large enough, sand or file the opening until the tank slides in easily



D 3. Temporarily install the engine mount and note how far the mounting screws protrude into the fuel tank compartment Glue blocks of scrap balsa to the back of the firewall to prevent the tank from coming in contact with the engine mount screws Of course, these blocks must not interfere with the installation and operation of the nose gear strut



D 4 Drill two holes (7/32 or sized to fit your fuel tubing) near the top of F-1 for your **fuel tubing** vent and fill lines The location of these holes will depend somewhat upon the type of engine you are using etc It is OK to drill the holes in the upper left and upper right corners, but we prefer drilling both holes in the **upper right** corner **(as viewed from the rear)** for easier access The holes must be located at least 5/8" in from the outside edge of the fuse side, to make room for the 1/2" balsa nose sides

D 5 Now remove the engine mount and **fuelproof** the inside of the fuel tank compartment and the front of F-1 by brushing on a coat of polyester resin or 30-minute epoxy thinned with a small amount of alcohol **NOTE:** Later, when installing the nose pieces, you will fuelproof the chin block before installing it.

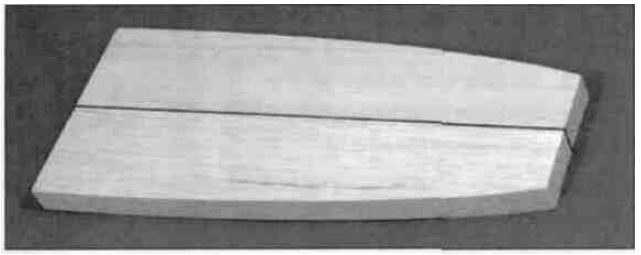
D 6 You may permanently install the **fuel tank** at this time, or you may wait until the plane is nearly completed **(If your plane is a trike gear you should wait to install the tank until after you have made the final installation of the nose gear).** If you do it now it will be easier to feed the fuel lines through F-1, and to make sure there are no kinks in the lines, however, you'll have to work around them while completing the nose Install the tank as low as possible in the fuse, and be sure to **cushion** it from vibration and prevent it from moving by surrounding the tank on all sides (and front) with **latex foam rubber** Leave several inches of extra fuel tubing in front of F-1 (you can cut off the excess later) **NOTE:** If you are using one of the lighter engines such as the OS 1 08 FSR, it may be necessary to add weight to the nose to balance In anticipation of this, you should install the battery pack under the fuel tank at this time

INSTALL CHIN BLOCK

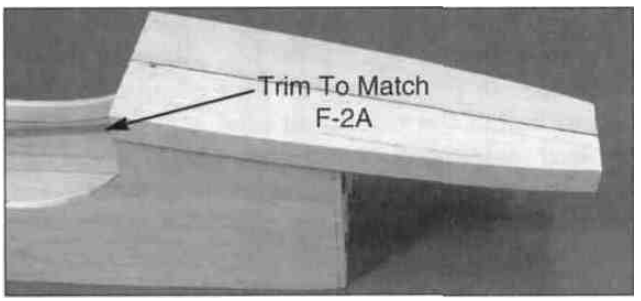
PARTS NEEDED-
D (2) US10F22 Shaped 3/4" Balsa **Chin Block Halves**

NOTE: At this point you will install the chin block on the bottom of the fuse leaving it oversize in front (we'll come back to that part later), and shaping it in the area of F-2 This will permit you to install the wing belly fairing while it is still possible to place the fuse upside down on a flat surface.

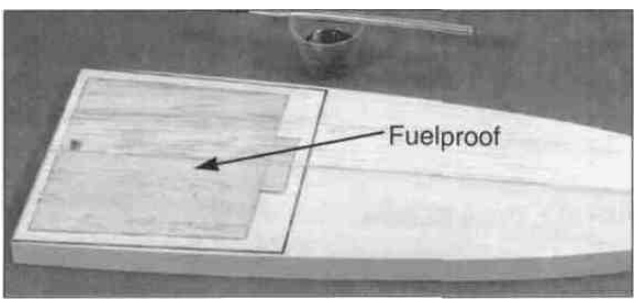
D 1 Sand the fuse bottom forward of **F-2A, in** preparation for installation of the chin block



D 2. Glue together the two halves of the 3/4" balsa **chin block.** Sand the glue joints smooth with your T-bar.

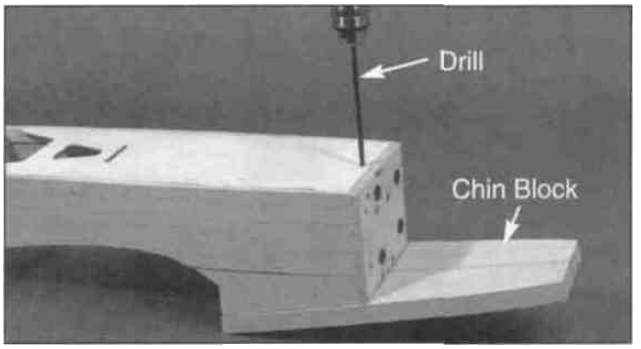


D 3. Trial fit the chin block onto the bottom of the fuse, and cut off and sand the aft **end** of the chin block to match the angle of F-2A. Mark where the front of F-1 intersects the chin block.

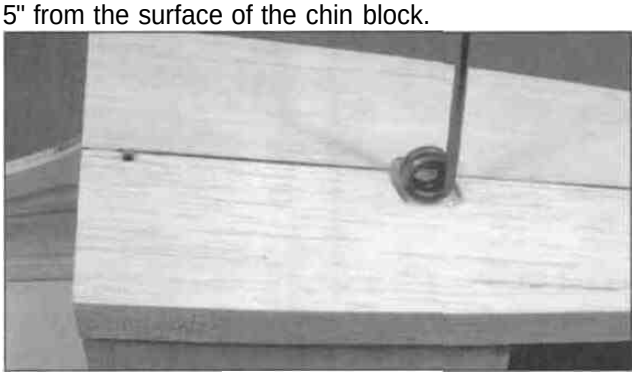


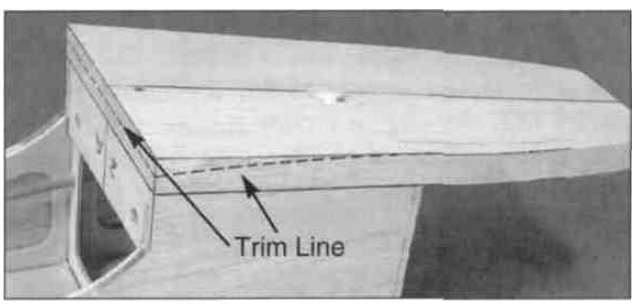
D 4. **Fuelproof** the portion of the chin block that will become the inside floor of the fuel tank compartment. Note that we have also installed a "dribble tube" near F-2 which will allow fuel to drain from the fuel tank compartment and will let us know if the tank or fuel lines develop a leak. The tube will be sanded off flush with the surfaces of the chin block after the fuelproofing has hardened.

D 5. Securely glue the chin block to the bottom of the fuse.

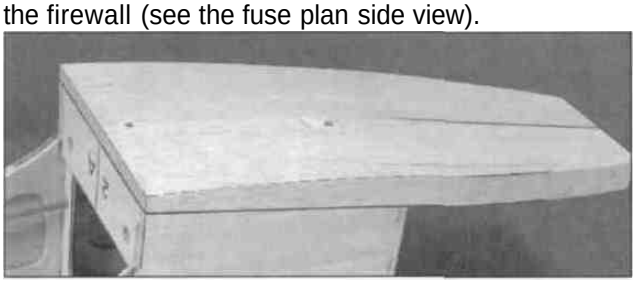


D 6. If you're using trike gear, use a long 3/16" drill bit to drill down through the nose gear bearings and out through the chin block. Insert the nose gear strut and carve out enough of the chin block so that the axle is 5" from the surface of the chin block.





D 7. Draw a line along the horizontal center of the rear edge of the chin block. Carve and sand the block down to this line in a smooth curve from just behind the firewall (see the fuse plan side view).

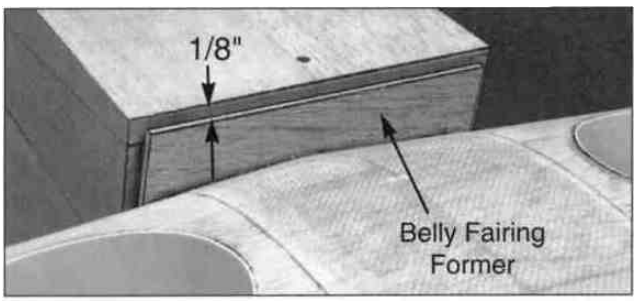


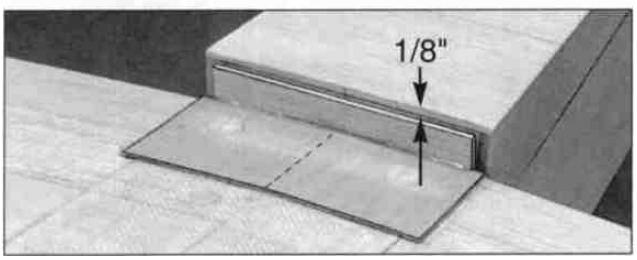
ASSEMBLE WING BELLY FAIRING

PARTS NEEDED:
D (2) US1 0W22 1/8" Die-cut Balsa **Belly Fairing Sides**
D (1) US10F39 1/8" Die-cut Balsa **Belly Fairing Formers**
D (2) US10W18 1/2" x 1-1/2" x 1-1/2" Balsa **Fairing locks**
D (1) US 10W33 1 /8" x 3" x 24" Balsa **Belly Fairing Sheeting**
D (1) US10W19 1/4" x 24" Balsa **Triangle Sto**

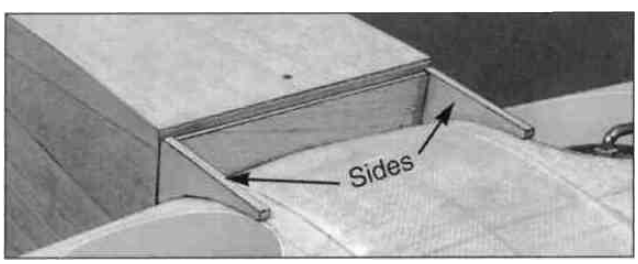
D 1. Attach the wing to the fuse with the wing bolts.

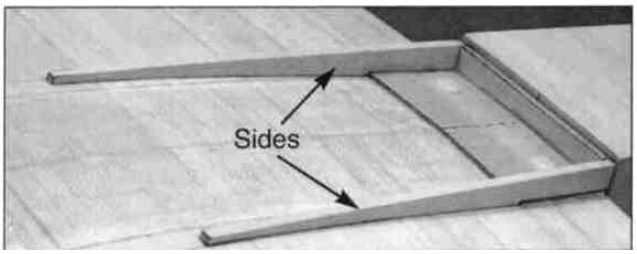
NOTE: To allow for variations in building, the belly fairing formers and sides are supplied slightly oversize. This gives you a little extra for accurately sanding and fitting to the wing.



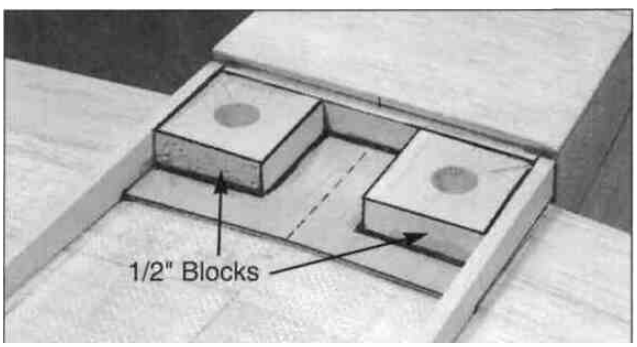


D 2. Trial fit the die-cut 1/8" balsa **front and rear belly fairing formers** to the leading and trailing edges of the wing, using scrap 1/16" balsa or plywood as temporary spacers to separate these formers from the fuselage formers. Sand the bottom edges of these formers to the angle of the wing surface. Also sand them down until the edge of the formers are 1/8" below the chin block and aft fuse sheeting, so the belly fairing sheeting will end up flush with the chin block and aft fuse sheeting. Center these formers between the fuse sides and glue them to the wing with medium or thick CA, being very careful to avoid gluing the wing to the fuse.



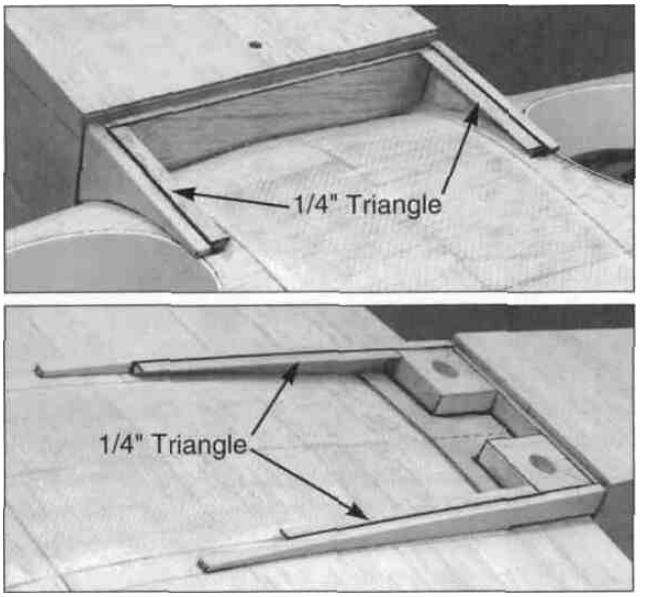


D 3. Glue the die-cut 1/8" balsa front and rear belly fairing **sides** in position. The outside edges of these parts should be approximately on a line from the edge of the fuse at F-2 to the edge of the fuse at F-4. Then sand them to flow smoothly into the angles of the fuse bottom sheeting and the chin block (see the fuse plan side view).

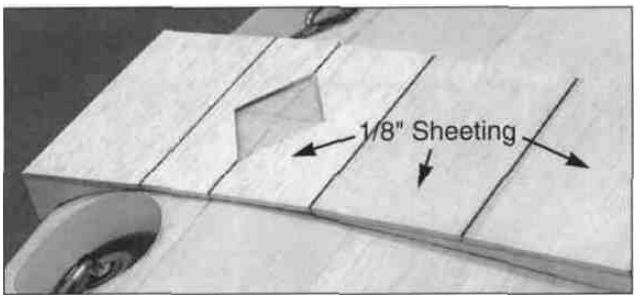


D 4. Make a 1/2" (or slightly larger) hole in the center of both of the 1/2" x 1-1/2" x 1-1/2" balsa **belly fairing blocks** to clear the wing bolts. Center these blocks over the heads of the nylon bolts and glue them to the wing bolt plate, in front of the rear belly former. Sand the top of the blocks flush with the belly fairing sides.

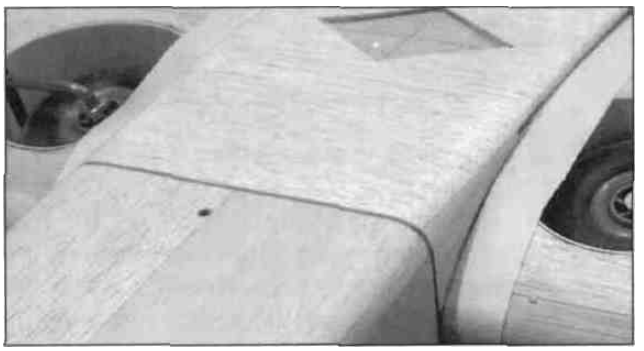
HINT: One way to make a clean 1/2" hole is to sharpen one end of a 1/2" brass tube in the same manner as shown in the photo on page 10, and push and rotate this sharpened tube down through the block. Another way is to begin by drilling a 1/4" or 3/8" hole with a conventional drill bit, and then enlarge the hole with a Dremel sanding drum.



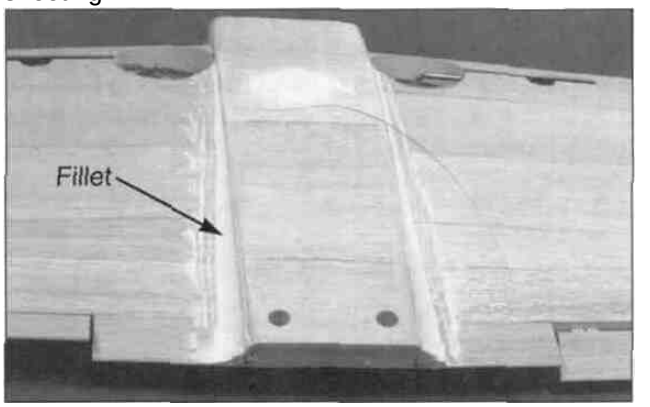
D 5. Add 1/4" balsa triangle along the edges of the belly fairing sides to provide extra material for rounding the corners. Sand the triangles flush with the sides.



D 6. Remove the wing from the fuse, and using the 1/8" x 3" x 24" balsa sheet, cut and glue pieces of cross-grain sheeting across the bottom. With a little careful cutting and fitting of the sheeting in the area of the wing spar you can minimize the amount of filler that will be required to finish it off.



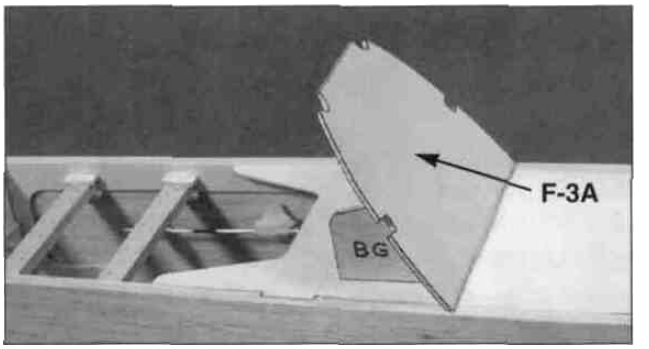
D 7. Now round the corners of the bottom of the fuselage, the belly fairing and the chin block (forward to the firewall). Use the drawings of F-2 and F-4 on the plans as a guide. This is also a good time to get out the lightweight balsa filler and make nice fillets between the belly fairing sides and the bottom wing sheeting.



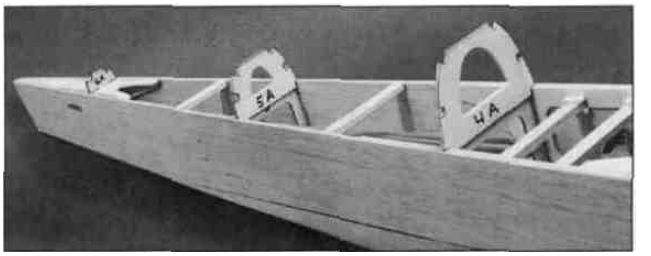
INSTALL TURTLE DECK

PARTS NEEDED:

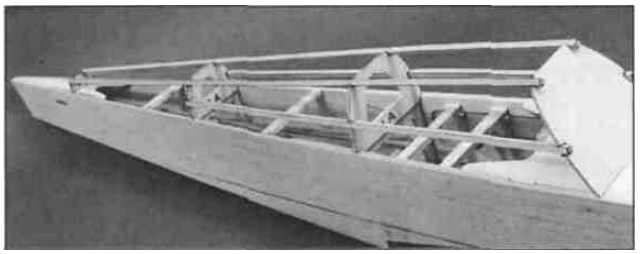
D (1) US10F27 1/8" Die-cut Ply **Formers F-3A. F-4A and F-5A**
D (1) US1 0F34 1/8" Die-cut Balsa **Former F-6A**
D (2) US10F11 1/4" x 1/4" x 31" Balsa **Top Stringers**
D (2) US10F12 1/4" x 1/4" x 21" Balsa **Side Stringers**
D (2) US1 0F13 3/32" x 3" x 33" Balsa **Turtle Deck Sheeting**
D (1) US1 0F14 5/8" x 2-7/8" x 31" Balsa **Top Block**



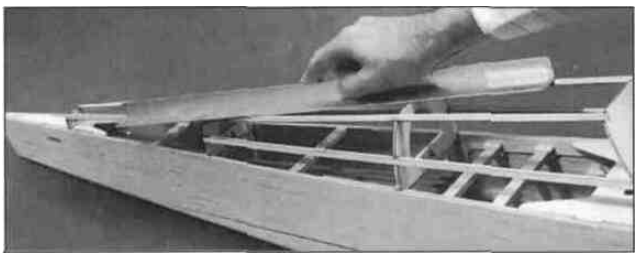
D 1. Trial fit the die-cut 1/8" ply "backrest" **(F-3A)** to the fuse top, using the "backrest gauge" (BG) to set it at the correct angle. Sand the bottom edge of F-3A to a bevel, to better fit the fuse top. Glue F-3A in place. NOTE: The gauge is used only for setting the angle (gluing the gauge in is optional).



D 2. Glue **F-4A** to the front of F-4.
Glue **F-5A** to the front of F-5.
Glue **F-6A** to the front of F-6 (insert the F-6A tab through the slot in the stab base).

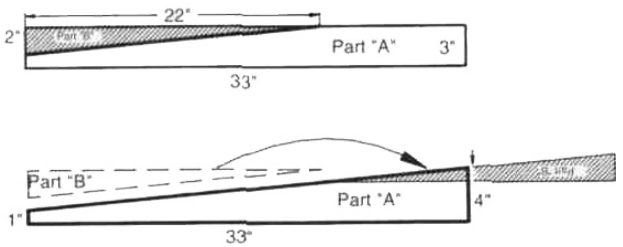


D 3. Glue the 1/4" x 1/4" x 31" balsa **top stringers** and the 1/4" x 1/4" x 21" balsa **side stringers** to the formers **HINT:** If F-3A is slightly warped, you may straighten it during this step by twisting it straight while gluing the stringers Trim and sand the ends of the stringers flush with the front of F-3A and the rear of F-6A.

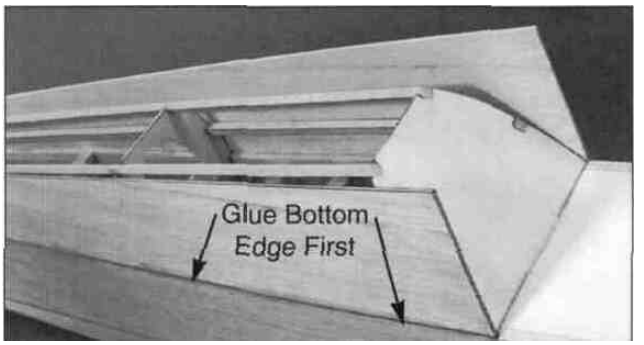


D 4. Use a sanding block to sand the sides of the stringers to blend with the formers (see the cross-section drawings on the plan) Also use a long sanding block to sand the stringers and the **tops** of the formers in a straight line from F-3A to F-6A.

D 5 Prepare the **turtle deck sides** by cutting the two 3/32" x 3" x 33" balsa sheets to the angle shown in the following sketch.

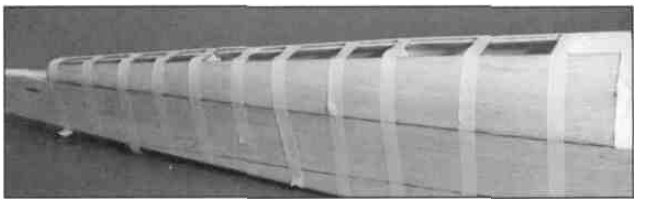


D 6 **Trial fit** one edge of the sheeting down onto the top of the fuse side Sand the edge of the sheeting if necessary, for a good fit.



D 7 Glue the bottom edge of the sheeting to the top of the fuse sides

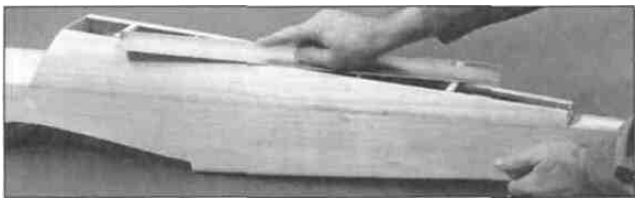
NOTE: Please read through the next step before proceeding The method described works very well, and gives you plenty of time to check alignment and apply glue as the masking tape strips will tend to hold things in place while you work



D 8. Wet the outside surface of the sheeting with a damp rag to permit easier bending Pull in the sheeting against the formers and stringers using approximately 10 long pieces of masking tape as shown in the photo Apply the first strips of tape right at the former locations, then add strips between the formers Try to keep the top edges of the sheeting following the normal gentle curvature of the top stringers and avoid pulling the sheeting in too much between formers by putting excessive tension on the strips of masking tape Glue the sheeting to the formers first by dripping thin CA onto the joints while pulling the sheeting firmly against the formers with your fingers Next drip thin CA onto the side stringers, again pulling the sheeting gently in against the stringers with your fingers Finally, add thin CA to the top stringers, pulling in the sheeting where it bulges out slightly between the tape strips After the glue has set, remove the masking tape strips and allow the sheeting to dry

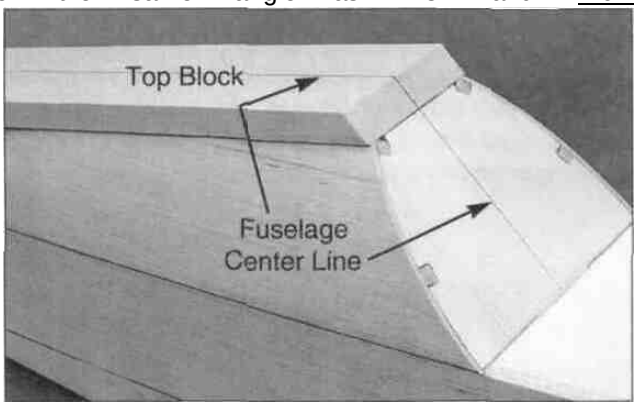
D 9 Trim and sand the sheeting flush with the front of F-3A and the rear of F-6A.

D 10. Inspect the top edges of the sheeting and stringers by looking down the fuselage centerline If there are any noticeable dips or bulges to interrupt the normal smooth curvature correct this by installing cross-braces (from scrap balsa).



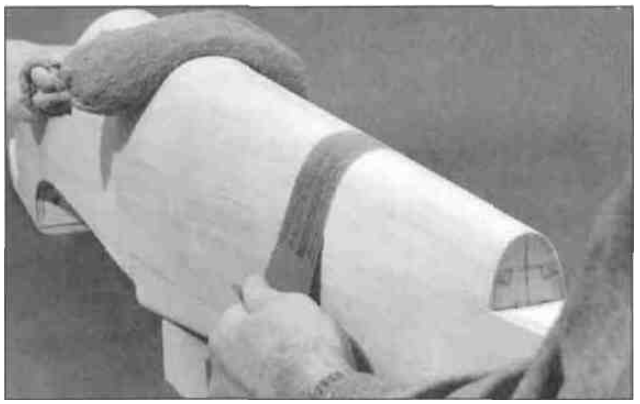
D 11 Using a long T-bar or sanding block with 80-grit sandpaper, sand the sheeting and stringers flush with the **top edges** of the formers.

D 12. Glue the 5/8" x 2-7/8" x 31" balsa **turtle deck top block** to the tops of the formers, stringers and sheeting Then trim the ends of the top block flush and on the same angle as F-3A and F-6A.



HINT: In the next step it will be helpful in keeping the top block symmetrical if you first mark a **fuselage centerline** on the top of the top block from front to back (this is a line from the centerline of F-3A to the centerline of F-6A).

D 13 Carve and sand the top block to blend smoothly with the sheeting (see the cross-sections on the plan) **HINT:** Use a razor plane (or a sharp wood chisel) and a sanding block with new 50 or 80-grit sandpaper for rough shaping the top block.



HINT: For a super-smooth and uniform finish on your turtle deck, cut a 2-1/4" x 11" strip of 320 or 400-grit wet-or-dry sandpaper, and work it like a "shoe-shine cloth" across the top of the turtle deck.

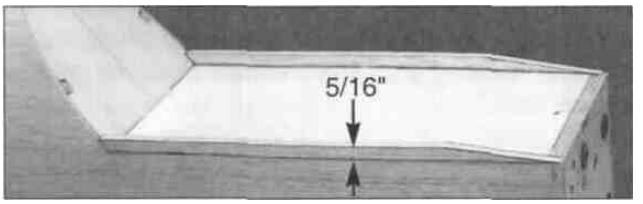
NOTE: From now on, when working on the fuselage upside down, you should always support the fuselage in a protective stand, such as a Robart "Super Stand" to avoid dents and nicks.

ASSEMBLE THE NOSE SECTION

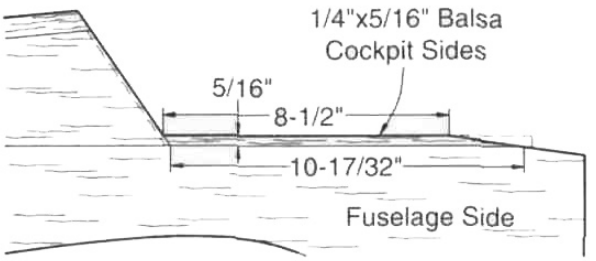
PARTS NEEDED
D (2) US10F17 1/4" x 5/16" x 11" Balsa **Cockpit Sides**
D (1) US10F34 Die-cut 1/16" Ply **Spinner Ring**
D (2) US10F23 Shaped 3/4" Balsa **Top Front Block Halves**
D (1) US1 0W26 Die-cut 3/32" Balsa **Instrument Panel**
D (1) US10F03 1/2" x 3" x 24" Balsa **Cowl Side Stock**
D (1) US10F06 1/2" x 18 **Soft Balsa Triangle Stock**

D 1 Find the 1/4" x 5/16" x 11" balsa **cockpit sides.** Cut off one end of each stick at an angle to fit the front edge of the backrest (F-3A). The cockpit sides are 5/16" tall and 1/4" wide.

D 2. Glue the cockpit sides to the top edge of the fuse sides and to F-3A The outside edge of the cockpit sides should be flush with the outside edge **of** the fuse sides



D 3 Measure, mark and sand off the cockpit sides according to the sketch Then sand the top front corners of the fuse sides on the same angle, to blend with the cockpit sides.



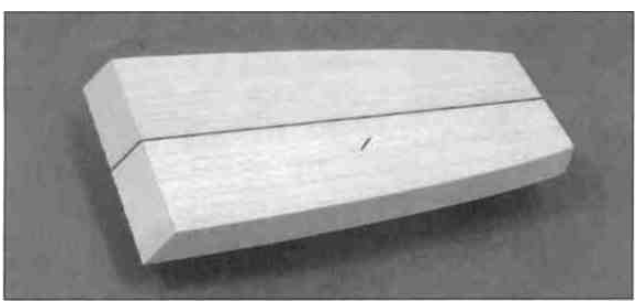
D 4. Attach the engine mount to F-1, and attach the engine to the mount.

D 5. From a scrap of 3/32" balsa, cut four small pieces and tack glue them to the 1/16" ply **spinner** ring as shown, using a very small amount of thick CA (these will be removed later) Make sure the backplate and ring are properly aligned.

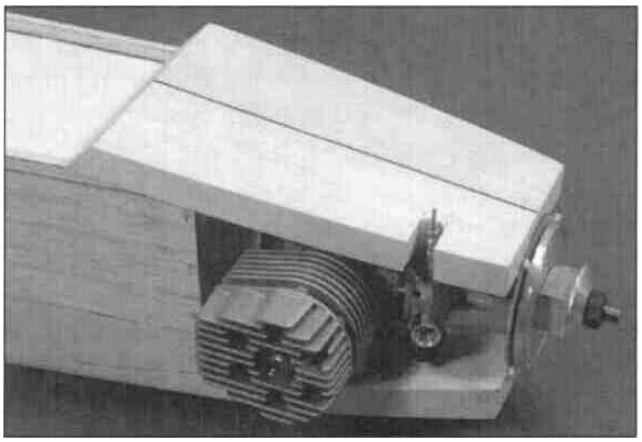
D 6. Now center your **spinner backplate** over the spinner ring, and tack glue it to the 3/32" balsa spacers.

D 7. Slide the spinner ring / spinner backplate assembly onto the driveshaft* and temporarily hold in place with the prop and prop nut. As you are doing this, shorten the chin block by trial and error until the spinner ring just touches the chin block when the backplate is tightened against the engine. In this position, the spinner ring should overlap the front edge of the chin block by approximately 3/8" to 1/2". Now glue the spinner ring to the chin block.

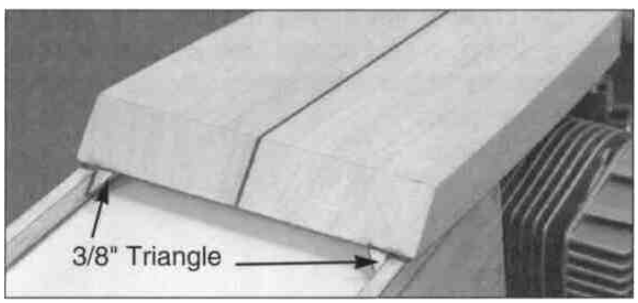
*NOTE: If you are using a SuperTigre 2500 engine, you will either have to drill two 5/32" holes in the spinner backplate or grind off the two conical points on the engine's thrust washer.



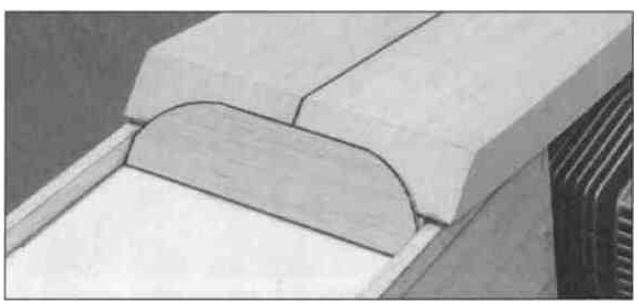
D 8. Glue together the two halves of the 3/4" balsa **top front block.** Sand the glue joints smooth with your T-bar. Using the fuse plan side view as a guide, mark and cut off the aft edge of the top front block to the angle shown at the instrument panel.



D 9. Lay the **top front block** in place on top of the fuselage. The aft end of the block should be in the position shown on the plans (measure forward from F-3A). Depending on your engine, you may also have to carve a groove for the needle valve. Cut and sand off the front of the top front block to mate with the spinner ring. The top front block should overlap the spinner ring approximately the same amount as the chin block, and you may re-sand (or shim) the angle on the cockpit sides to achieve this overlap. In addition, check if your engine mount touches the top front block, and provide clearance as necessary. Glue the top front block to the fuse and the spinner ring, using epoxy on the joint between the firewall and the top front block.



D 10. Cut two 2-1/2" lengths from the 3/8" balsa triangle stock and shape them to fit under the top front block, just in front of the instrument panel. Glue in place.



D 11. Sand the sides of the die-cut 3/32" balsa **instrument panel** to fit between the cockpit sides, and sand the bottom edge to an angle so it rests flat on the cockpit floor. Glue the instrument panel in place.

D 12 Remove the prop nut and propeller Pop the spinner backplate loose with a screwdriver and remove the spacers Remove the engine and mount in preparation for the next step, but mark the outline of the engine mount on F-1 with a pencil

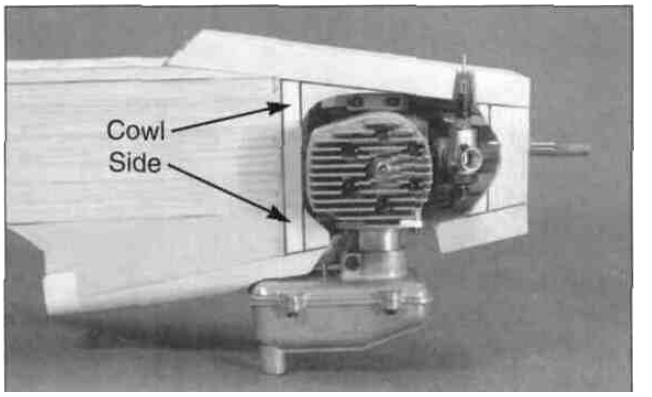
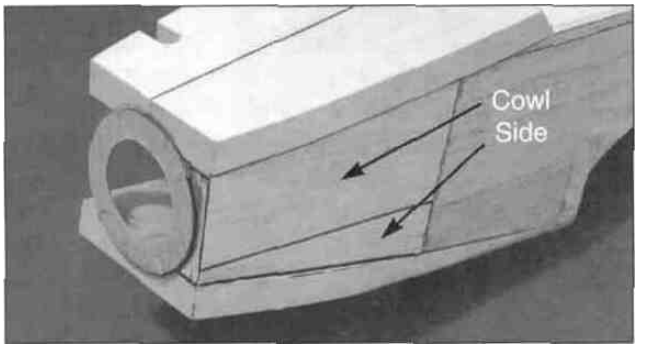


Photo shows SuperTigre 2500 engine with Supertigre muffler installed



D 13. A 1/2" x 3" x 24" balsa sheet is provided for the **cowl sides** From this sheet cut pieces to fit on the left side of the fuselage between the chin block, top front block, F-1 and the spinner ring To do this more easily you may lay the fuse on its left side on top of the 1/2" balsa sheet and mark the size of the opening on the sheet (When installing this block, make sure you stay clear of the engine mount) To allow for shaping, the cowl side should protrude approximately 1/16" outside of the fuse side at F-1, and should overlap the spinner ring by about 5/16" Glue the left cowl side in place.

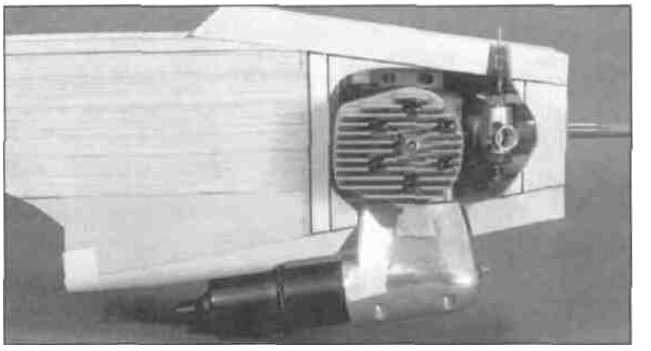
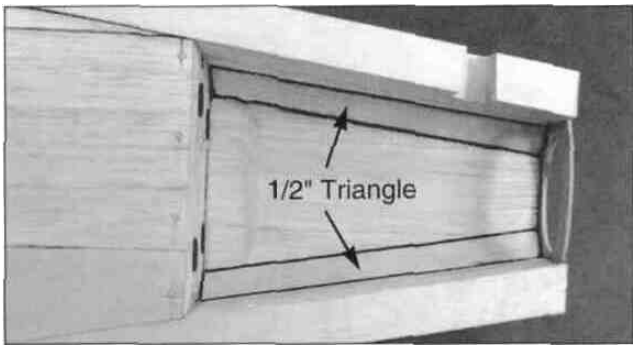


Photo shows SuperTigre 2500 engine with J-Tec muffler (for comparison).

D 15. Temporarily re-install the engine and mount; then, from the remaining 1/2" balsa sheet and 1/2" balsa triangle, cut pieces to partially fill in the **right side** around the engine (The right cowl side should be essentially the same as the left side, with the exception of the engine cutout) Also, trim the balsa as necessary to clear your muffler and throttle pushrod Cut away just enough of the right cowl side to allow you to remove and reinstall the engine and engine mount, and to permit convenient access to the throttle linkage Typically, you will remove and reinstall the engine and muffler several times, while cutting and sanding the cowl side parts for a nice fit



D 14 From the 1/2" balsa triangle stock provided cut lengths to fit in the upper left and lower left corners of the cowl, between F-1 and the spinner ring Sand these triangles if necessary to avoid interference with the engine mount Glue the triangles in place

D 16 If you have installed the Supertigre 2500 engine, check the clearance between the large thrust washer and the inside hole of the 1/16" ply spinner ring Grind the hole larger if necessary, to provide at least 3/32" clearance all around.

FINAL ASSEMBLY

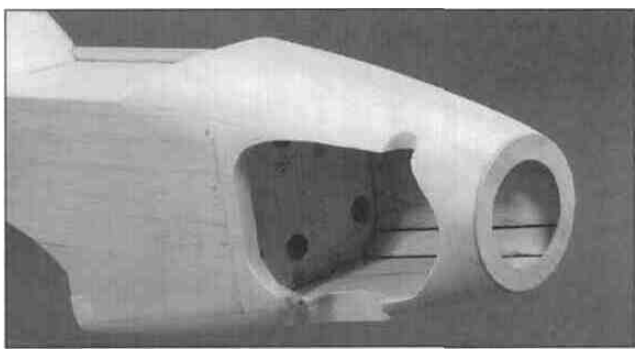
SAND THE FUSELAGE

NOTE: Some heavy sanding is required to properly shape the nose area This task can be made much easier if you use a razor plane and a sanding block

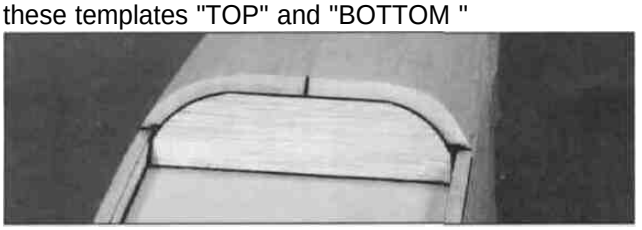
with new *#50* or #80-grit sandpaper for rough shaping The very coarse sandpaper is used to achieve the basic shapes Then use progressively finer grades of sandpaper for a smooth finish.

D 1 Turn the fuse upside down You have already shaped the aft end of the chin block, and you don't want to change that shape, so apply a strip of protective masking tape to the chin block near the aft end Now study the fuse plan side view and note the final shape and curvature of the chin block Use your razor plane and a sanding block with **coarse** sandpaper to sand the fuse bottom to the approximate shape as shown on the plan

D 2 With the fuse right side up, draw a line across the aft end of the top front block, approximately 1/16" down from the top edge Now study the fuse plan side view and note the final shape and curvature of the top front block Then sand the top front block to the approximate shape shown on the fuse plan side view.



D 3 Now sand the chin block, the top front block corners and the cowl side pieces to blend smoothly with the spinner ring Refer to the cross-section drawings of F-1 and F-2 on the plan to get an idea of the desired amount of rounding in the corners The top front block should be sanded with reference to the **instrument panel** (see the photo below) the top edge should end up approximately 1/4" from the edge of the instrument panel, following the same curvature around the corners For additional guidance, you may cut out one side of the F-1 drawing, glue it to a piece of wood and cut it out around the perimeter to make a checking template, then cut the template in half, so you will have separate templates to check the top and bottom curvature in the F-1 area Be sure to mark these templates "TOP" and "BOTTOM "



D 4 After the rough sanding has been completed, temporarily re-mount your engine and slide on the spinner backplate You'll probably have to sand down the edges of the spinner ring for a good match with the spinner backplate.

D 5 If you have not already done so, sand the bottom rear corners of the fuselage to a slight radius as shown on the cross-sections of F-5 and F-6, but don't change the fuse bottom shape at the wing TE.

D 6. Now, with the engine and mount removed, **fuelproof** the inside of the entire engine compartment with polyester resin or epoxy thinned with alcohol

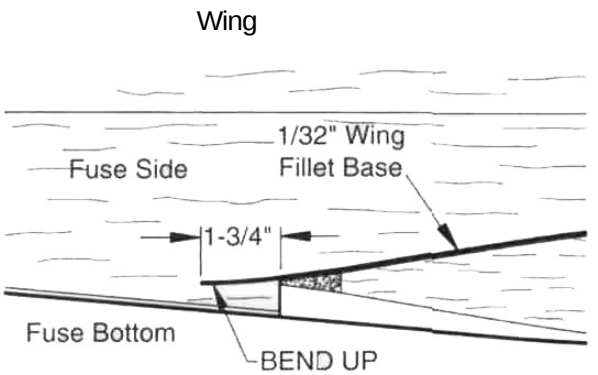
INSTALL WING FILLETS (OPTIONAL)

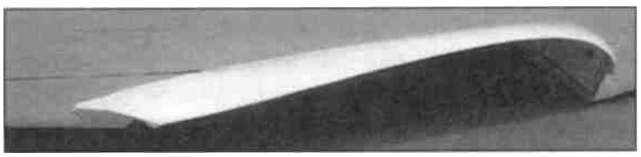
PARTS NEEDED-
D (1) US10F36 Die-cut 1/32" ply **Wing Fillet Bases**
Filler or scrap soft balsa (see below)

NOTE: The wing fillets are a nice addition to the US1000 They make it more pleasing to the eye and they do help to reduce drag The US1000 flies just fine without them, however, so the choice is yours whether or not to install them.

D 1. Tape a 10" x 19" piece of waxed paper or plastic wrap onto the top surface of the wing at the center, wrapping it around the LE and TE, then attach the wing to the fuse with the wing bolts

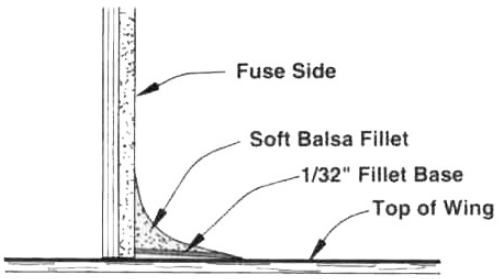
D 2 Lay the die-cut 1/32" ply wing fillet bases on the wing and glue them to the fuselage sides **NOTE:** For this procedure, we recommend that you use **thick** CA glue sparingly, and "kick" the glue with accelerator spray immediately after applying, to avoid accidentally gluing the wing to the fuse with "stray" glue **NOTE:** Bend the aft 1-3/4" of the fillet base to horizontal (see sketch)





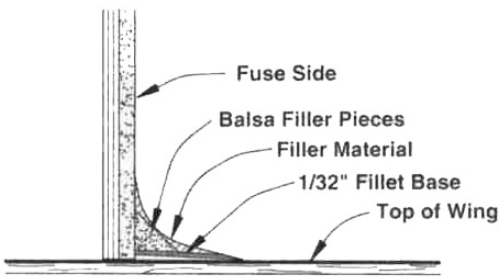
D 3 You may build the fillet on top of the fillet base in one of the following ways.

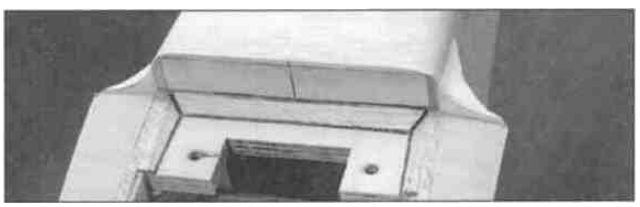
Method 1: Glue pieces of soft balsa onto the fillet bases, then sand to the fillet shape.



Method 2: Apply a good quality, lightweight model filler (light spackle), shape it with a wet teaspoon, and allow it to dry **thoroughly** before sanding.

Method 3: A combination of the above, where you first glue pieces of balsa to partially fill the fillet area, then add filler to form the fillet shape.





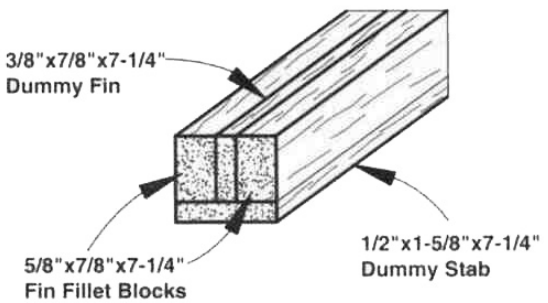
D 4. If you make a wing fillet as described above, it is also a nice touch to blend in the belly fairing fillets to the bottom of the fillets you just made An easy way to do this is to attach the wing and glue small 3/32" balsa fillet formers (from scrap) just behind the wing TE. Carefully sand these formers to match the curvature **of** the belly fairing fillets. Remove the wing, and make nice fillets behind the little formers using lightweight filler.

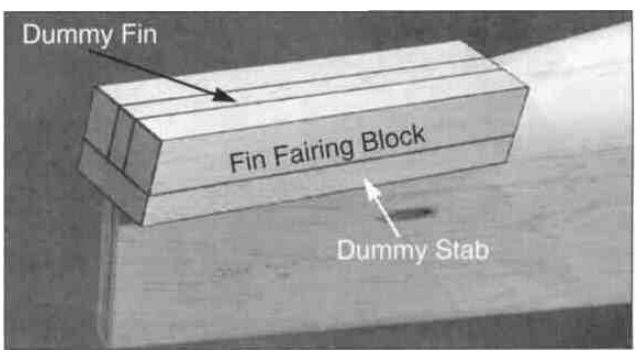
D 5. If you used lightweight filler to form the fillet, after sanding smooth you may spread a coat of thin CA over the surface of the filler, then give it a final sanding with 400 grit sandpaper This final coat is easy to sand smooth, and gives the filler a hard, durable surface to which covering sticks very well.

SHAPE THE FIN FAIRINGS

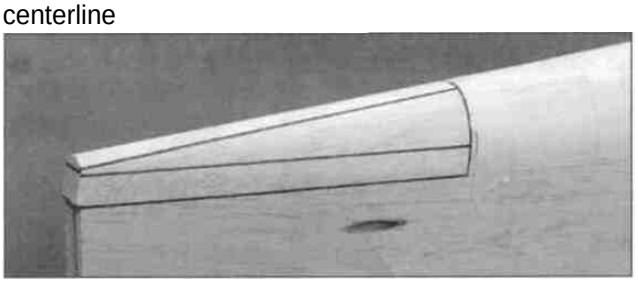
PARTS NEEDED:
D (1) US10S22 1/2" x 1-5/8" x 7-1/4" Balsa **Dummy Stab**
D (1) US10S23 3/8" x 7/8" x 7-1/4" Balsa **Dummy Fin**
D (2) US10F18 3/4" x 1" x 7-1/4" Balsa **Fin Fairings**

D 1. Using only one or two small drops of glue on each piece, tack glue the following balsa parts together (see sketch):

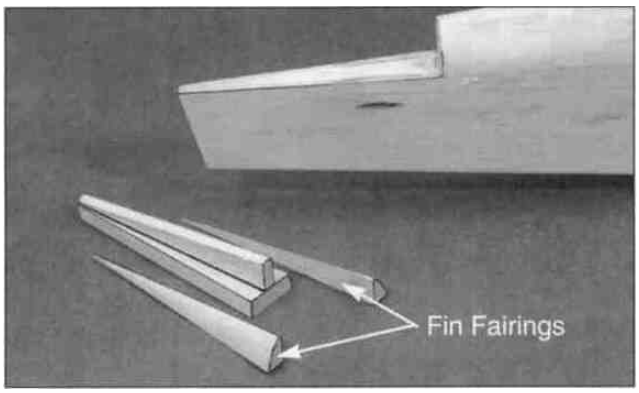




D 2 Tack glue the above assembly to the stab saddle with the "dummy fin" centered on the fuselage centerline



D 3. Apply a few strips of masking tape to the turtle deck for protection, then carve and sand the above assembly to blend smoothly with the fuse sides and the turtle deck.

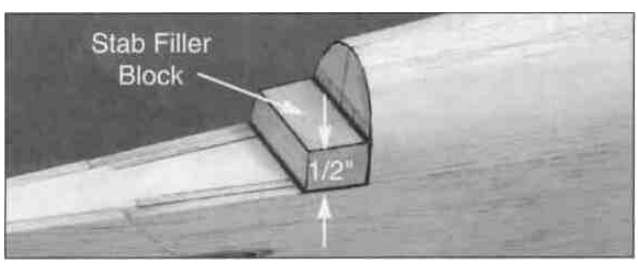


D 4. Break the assembly off the stab saddle and cut the parts apart. Save the shaped fin fairings for later.

MOUNT STABILIZER AND FIN

PARTS NEEDED:
D (1) US1 0F15 1/2"x3/4"x1 -5/8" Balsa **Stab Filler Block**
D (1) WSHR012 **3/4" Flat Washer**
D (1) SCRW070 #8x1" **Sheet Metal Screw**
D (1) US10F07 1/2"x30" Hard Balsa **Triangle Stock**
D (1) US10S19 Shaped 3/8" Balsa **Dorsal Fin**

D 1. Make sure the stab base is securely glued to the fuse sides, then lightly sand the stab saddle **area** smooth with a T-bar or sanding block.



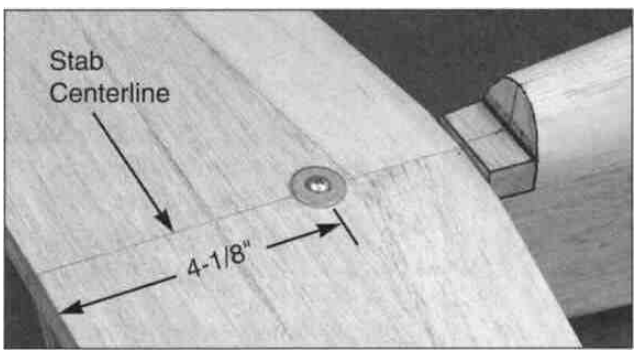
D 2. Find the 1/2" x 3/4" x 1-5/8" balsa **stab filler block** and glue it to the stab saddle and the back of F-**6A.** Sand off the ends flush with the fuse sides.

D 3. Accurately measure the trailing edge of the stabilizer and mark the center point Draw a centerline on the top of the stab Measure 4-1/8" forward, along the centerline, from the stab TE and drill a **5/32"** hole down through the stab This will be the location of the stab locking screw. (See the photo at Step 7).

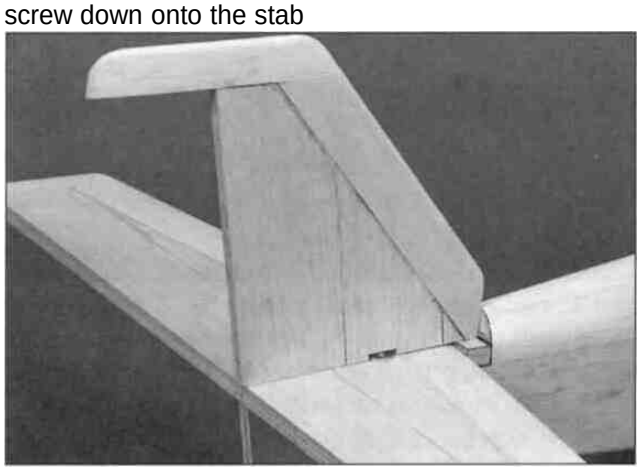
D 4 Temporarily mount the wing in the saddle (for reference).

D 5. Lay the stab in position on the stab saddle with the center point lined up with the tail end of the fuselage. If the stab protrudes beyond the end of the fuselage, sand a little off the front of the stab until it fits Carefully check the stab alignment by looking at the stab and wing from directly behind the fuse . .. the stab must be parallel with the wing Also check for stab skew by measuring from the stab tips to the wing tips (or to a point on the center of the fuse near the nose) Sand the stab saddle (a little at a time!) until the stab rests in proper alignment. With the stab in alignment, make a mark on the front of the stab and a corresponding mark on the back of F-6A, which will be used for rapid alignment when gluing.

D 6. Mix up a batch of 5-minute or 30-minute epoxy and apply it to the stab saddle Press the stab into position and **hold or pin in proper alignment until the glue has firmly set** Wipe off any excess epoxy before it sets up.

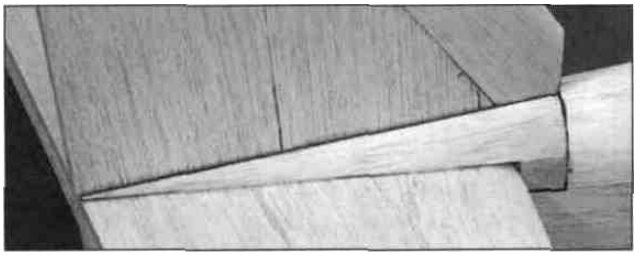


D 7 Insert a **1/8"** drill into the hole you previously drilled in the stab, and drill down through the stab base and stab hold-down block in the fuse Put the large washer onto the #8x1" sheet metal screw, apply epoxy to the screw threads, and tighten the screw down onto the stab

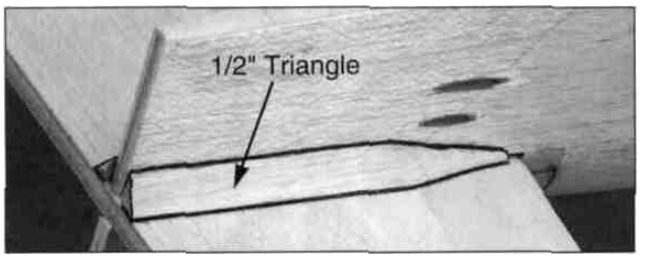


D 8 Trial fit the fin onto the stab The fin trailing edge must line up with the aft end of the fuselage. If the fin protrudes too far aft, sand a small amount off the **front** of the fin Remove material from the bottom of the fin to clear the screw and washer.

D 9 **Carefully align the fin on the stab The fin must be positioned perpendicular to the stab and must line up with the fuselage centerline EXACTLY!** Securely glue the fin in place with **epoxy, double-checking alignment** while the glue sets

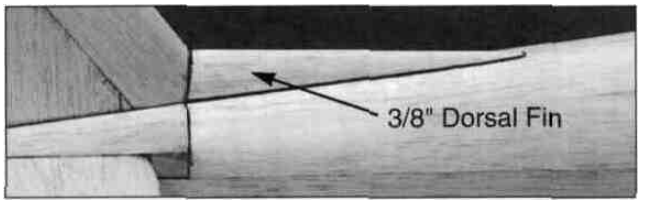


D 10. Trial fit the **fin fairings** into place along both sides of the fin, carving them out to clear the washer. Now securely glue them in place.



D 11 From the 1/2" balsa triangle supplied, cut and securely glue fillets **under the stab,** at the stab/fuse joint Note that the front ends of the triangles are sanded to a taper before gluing them in place

D 12 Temporarily attach the elevators and rudder to check their fit and operation Cut the bottom rudder hinge slot in the aft end of the fuse, and (if you are building a taildragger) cut the slot in the fuse for the tailgear bearing at the location shown on the fuse plan side view.



D 13. Glue the 3/8" balsa **dorsal** fin in place on the turtle deck The dorsal fin, like the fin, must also line up with the fuselage centerline Sand the leading edge of the dorsal fin to a rounded shape, and blend it to the fin with balsa filler.

D 14. Temporarily install the rudder, and observe how the bottom of the rudder lines up with the bottom of the fuse Sand the bottom of the rudder to match the bottom of the fuse.

INSTALL SERVOS, HORNS AND PUSHRODS

D 1. Re-mount the **aileron servos** in the wing, and mount the nylon aileron horns.

D 2. Screw the steel **clevises** (METAL013) approximately 2/3 of the way onto the threaded end of the two 12" steel wire pushrods (WIRES16).

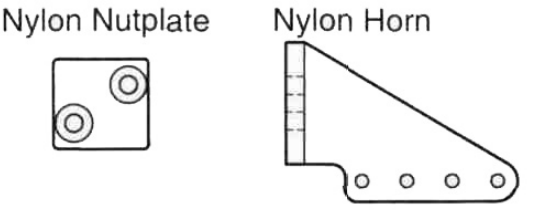
Steel Clevis Lock Clip

D 3. Attach the clevises to the aileron horns, and then, with the ailerons in the neutral position, mark the pushrod wires where they cross the holes in the servo arms Remove the pushrods and make a **"Z-bend"** in each rod at that point, using a "Z-bend pliers" or a standard pliers Cut off the excess pushrod wire.

D 4. Remove the servo wheel from the servo and work the Z-bends into the wheel **(NOTE:** You may have to enlarge the servo wheel holes with a 5/64" diameter drill bit) Replace the servo wheel and check the operation of the ailerons (See page 47 for the recommended amount of aileron movement).

REMEMBER: Plan your servo installation carefully, as your setup may differ from the plans and photos, depending on which engine you use, and whether you are building a trike or taildragger.

D 5. Re-mount the elevator, rudder and throttle **servos** in the fuselage.



D 6 Hold the **large nylon control horns** (NYLON02) on the elevator and rudder in the positions shown on the plan and mark the mounting hole locations Drill 3/32" holes at these locations

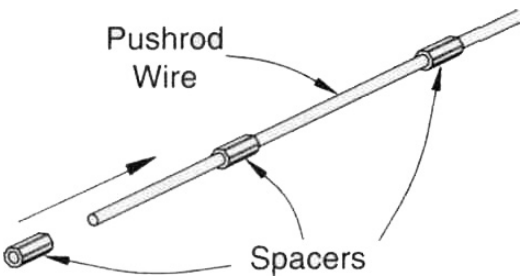
D 7. **Harden the balsa** in the area of the control horns (on both sides of the control surfaces) by poking several holes with a pin, then applying thin CA glue Sand smooth.

D 8 Mount the horns with 2-56 screws and the nylon **nutplates** which were attached to the horns

2-56 x 5/8" Machine Screw

D 9. Screw a metal clevis onto the threaded end of each long steel wire pushrod **NOTE: Screw them on all the way until the threads are protruding inside the clevis.**

D 10 Cut the short length of 1/8" diameter plastic tube (PLTB004) into several pieces, approximately 1/4" long Slide at least 8 of these pieces onto each of the long pushrod wires and space them approximately 2-1/2" apart (do not glue yet) **NOTE:** If these tubes do not slide on easily, cut them to a shorter length



NOTE: While installing the pushrods, position the above plastic tube spacers so they always stay inside the pushrod guide tubes If the tubes are not a tight friction fit on the pushrod wires, apply a drop of thin CA to secure them.

D 11. Insert the **pushrod wires** into the pushrod guide tubes (previously installed) and attach the clevises to the elevator and rudder horns.

D 12 While holding the rudder and elevators in the **neutral** position, mark where the pushrod wires cross the holes in the servo wheels where each pushrod will be attached

D 13 Remove the elevator and rudder pushrods and make **"Z-bends"** at the marks you just made. Cut off the excess pushrod wire

D 14. Unscrew the clevises, re-insert the pushrods, and replace the clevises Remove the servo wheels and work the Z-bends into the holes (drill out the holes in the servo wheels to 5/64' if necessary) Finally, place the servo wheels back onto the servos and check the operation of the elevator and rudder

CONTROL SURFACE THROWS

NOTE: Throws are measured at the **widest part** of the elevator and rudder.

ELEVATOR*:	(High Rate)	5/8" up 1/2" **down**
	(Low Rate)	3/8" up 5/16" down
RUDDER:**	(High Rate)	1-1/2"+ right & left
	(Low Rate)	7/8" nght7/8" left
AILERONS:	(High Rate)	1/2" up 1/2" down
	(Low Rate)	5/16" up1/4"down

NOTE: If your radio does not have "dual rates," then set up the control surfaces to move at the **high rate** throws

*The ideal elevator throws for your airplane will depend on where the plane is balanced If it is balanced toward the aft C G limit, the plane will be much more responsive to elevator Too much elevator throw may result in unwanted stalls or even snap rolls Start with the throws listed above, and experiment to find the best throws for your airplane and your flying style It may be necessary to increase the elevator and rudder throws (and possibly move the C G toward the aft limit) to obtain crisp snap rolls and spins.

**The Ultra-Sport 1000 has a slight tendency to pitch down when full high rate rudder is applied If you have a computer radio, you may find it beneficial to mix about 5% - 10% up elevator with both right and left rudder The actual amount your plane needs may vary

D 15 Securely anchor the pushrod guide tubes to F-4 using cross-braces cut from scrap 1/8" balsa

D 16 Attach the throttle pushrod (and nose gear steering pushrod) to the throttle and rudder servo arms **NOTE:** We recommend using DuBro "E-Z connectors" (or similar) for these hookups, for ease of installation and adjustment.

D 17 If you are using retracts, reinstall your retract servo at this time

D 18 Hook up your radio system and test the operation of all controls

FINISHING

ADDITIONAL FUELPROOFING

If you have not already done so, make sure the entire engine compartment is completely fuelproof. Also fuelproof any wood that will not be covered and which may be exposed to glow fuel residue, such as the landing gear block slots and the wing saddle Use epoxy thinned with alcohol, polyester finishing resin or fuelproof paint.

SEAL OFF COCKPIT

If you leave any openings through the fuse top into the cockpit area, there is the possibility of getting dust on the inside of the canopy, which will be nearly impossible to remove after the canopy has been installed Therefore, you should seal all openings to the inside of the cockpit, and paint all exposed balsa to prevent loose wood particles

Cut out the instrument panel decal (US10D01), trim it to fit, and apply it to the instrument **panel.**

PREPARE THE CANOPY

NOTE: Some modelers prefer to tint their canopies for a more subtle and realistic effect You may tint your canopy by immersing it in a concentrated mixture of Rit Liquid Dye and hot tap water The colors blue, black, brown and dark green work well Powdered dye will produce a darker tint than liquid dye Remove the canopy after 5 minutes and rinse it off to check the amount of tint The hotter the water and the longer you leave it in the dye solution, the darker it will tint. **CAUTION:** Do not heat the dye water above tap water temperature, as this could deform the canopy.

1. Using a scissors, carefully cut the clear plastic **canopy** (CANPY051) just below the trim line.

2 **Trial fit** the canopy onto the fuse, pressing into place Trim as necessary for a good fit A small, curved "Lexan Scissors" (available from your hobby shop) is a very handy tool for trimming the canopy **NOTE:** The trim line on the canopy is approximate. Your canopy trim will vary, depending on how you sanded the fuselage It may be necessary to do some additional sanding of the fuse near the front of the canopy, if the canopy does not fit properly

3. Sand the edges of the canopy with 320 grit sandpaper It is important that the canopy does not have any cracks along the edges, as the engine vibration could cause them to spread.

NOTE: Do not glue the canopy in place until after you have covered your model

BALANCE THE AIRPLANE LATERALLY

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

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

1. Temporarily attach the wing and engine (with muffler) to the fuselage.

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

3. If one wing tip always drops when you lift, it means that side is heavy Balance the airplane by gluing weight to the other wing tip **NOTE: An airplane that has been laterally balanced will track better in loops and other maneuvers**

FINAL SANDING

Check over the entire structure carefully, inspecting for any poorly glued joints, gaps and dents Small dents can often be swelled out by simply applying a drop of water or saliva Apply additional glue and/or balsa filler as necessary, then sand the entire fuselage and wing smooth using progressively finer grades of sandpaper

COVERING

NOTE: Top Flite Super MonoKote was used **to** cover and trim the prototype models of the Ultra-Sport 1000, and that is the recommended covering for this model.

Because it is assumed that you have had some previous model building experience, we won't go into detail in regard to the covering procedure. **Follow the instructions included with your covering material.**

NOTE: When covering the fin and stab, begin by applying 1/2" wide strips of covering in the corners between the fin and the fairing block, between the stab and the fairing block, and (on the bottom of the stab) between the stab and the fuse sides Next cover the fairing blocks with pre-cut pieces of covering Finally, cover the stab and fin with pre-cut pieces that have a straight edge to overlap (1/8"+ overlap) the strips you previously applied **DO NOT, under any circumstances, attempt to cut the covering material after it has been applied to the fin and stab, except around the leading and trailing edges and the tip.** Modelers who do this often cut through the covering and part-way into the balsa stab This can weaken the stab to the point where it may fail in flight'

Recommended Covering Sequence:

1. Strips as described in above note
2. Rudder left side
3. Rudder right side
4. Bottom of elevators
5. Top of elevators
6. Stab bottom
7. Stab top
8. Fuse bottom
9. Wing fillets*
10. Fuse sides
11. Fuse top
12. Fin left side
13. Fin right side
14. Ends of ailerons
15. Bottom of ailerons
16. Top of ailerons
17. Aileron openings in wing
18. Wing fairings (on bottom of wing)
19. Bottom of left wing panel
20. Bottom of right wing panel
21. Top of left wing panel (overlap covering 1/4" at wing LE)
22. Top of right wing panel (overlap covering 1/2" at the center and 1/4" at the LE)

*When covering concave surfaces, such as the wing fillets, use a Top Flite "Trim Seal Iron" with the rounded tip, and follow the iron with a damp cloth, pressing the covering down.

GLUE THE HINGES

1 Lay the rudder, elevators and ailerons on the plans and mark on the leading edge of each part the locations of the hinges (and tailgear if you have built a taildragger) Now use a sharp X-acto knife to cut slits in the covering at the hinge locations Trial fit the hinges to make sure you have "found" the slots which you previously cut.

2. If you have built a taildragger, glue the tailgear bearing into the slot in the aft end of the fuse, using the following procedure Using a toothpick, apply a small amount of Vaseline where the tailgear wire enters the nylon bearing (to prevent glue from getting inside and locking it up) When gluing in the nylon tailgear bearing, do not just smear glue on the nylon and push it into the slot as most of the glue will be wiped off as it is being pushed in You must also work some glue into the slot A good way of doing this is to scoop up some epoxy with a plastic soda straw, then pinch the end of the straw, insert it into the slot, and squeeze the straw to force glue into the slot Apply epoxy to the nylon, then insert it into the slot We recommend 30 minute epoxy for this process After pushing in the nylon bearing, **wipe away all excess glue with a tissue dampened with rubbing alcohol.**

3. If you are using the type of laminated hinges that are installed with thin CA glue merely assemble the ailerons to the wing and the elevators to the stab with dry hinges, check alignment, and then apply several drops of thin CA to both sides of each hinge You should keep a tissue handy while doing this, to soak up any excess CA in the event that you notice it starting to run down the hinge line

4. If you have built a taildragger, the procedure for hinging the rudder is slightly different Using coarse sandpaper, roughen the part of the tailgear wire that will be glued into the rudder, then clean off the sanded portion of the wire with alcohol or a degreasing solvent Put epoxy into the tailgear hole in the rudder, push the rudder and hinges into place and **wipe off all excess epoxy** Check the vertical positioning of the rudder, and glue the hinges securely in place with thin **CA.**

INSTALL PILOT

1 Assemble your **pilot figure** and trial fit it into the cockpit area with the canopy in place If you are using the recommended Williams Bros 1/4-scale pilot, you'll probably have to cut it down to fit If you cut it down, you should cut a new pilot base from scrap 1/8" ply, and glue it securely inside the pilot figure in preparation for the next step

2 Paint your pilot figure, and glue it to the cockpit floor **NOTE:** To avoid the possibility of the pilot coming loose inside the canopy, we recommend that you drill up through the cockpit floor and pilot base, and use two #6 or #8 sheet metal screws (not included) to lock the pilot in place.

GLUE CANOPY IN PLACE

1 Lightly sand the inside of the canopy around the edge (sand a strip approximately 1/8" wide) **NOTE:** To avoid sanding more than you want, it is helpful to first apply strips of vinyl tape (such as Great Planes "E-Z Mask") on the inside of the canopy, 1/8" in from the edges

2 Poke **pinholes** (1/8" apart) through the covering material in the area where the canopy will be glued to the fuselage, then lightly sand the covering material where the canopy will be glued.

3. Hold the canopy in place on the fuselage and very carefully apply medium viscosity CA glue (CA+) around the edges To control the amount of CA, it is very helpful to use the small diameter teflon applicator tubing which is supplied with most CA glues, or use a long pointed applicator tip The medium viscosity glue will be pulled into the joint **NOTE:** Do not use thin CA for this step, as it will fog the plastic.

4. To hide the canopy glue joint, you can use 1/4" wide Great Planes "Kwik Stripe" striping tape **as a** border around the canopy

INSTALL LANDING GEAR

1 Re-install the main landing gear struts, securing them with the nylon landing gear straps and #2 x 3/8" sheet metal screws.

WING SEATING

1 Apply 1/16" x 1/4" or 3/8" wide foam **wing seating tape** to the wing saddle area to seal the wing/fuse joints.*

2. Also apply a couple pieces of the foam tape to the 1/4" ply wing hold-down plate, which helps to distribute the load when the nylon bolts are tightened

***NOTE:** An alternate method of sealing the wing/fuse joint is to use **"silicone bathtub sealer."** This is an excellent method, used by many experts because it results in a permanent and nearly perfect wing saddle joint Briefly the technique is as follows 1 Cover the top of the wing center section with waxed paper or plastic kitchen wrap Pull out all wrinkles and tape it to the wing 2 Squeeze out a bead of silicone sealer onto the wing saddle area of the fuselage 3 Lay the wing in the saddle and push down gently The excess silicone sealer will squeeze out 4 Allow to dry without disturbing for at least 24 hours 5 Remove the tape, then remove the wing from the saddle (leaving the waxed paper or plastic wrap in place) 6 Gently pull the waxed paper or plastic wrap away from the sealer 7 Using a new single-edge razor blade, trim the sealer flush with the wing fillets, and along the inside of the fuselage.

RE-INSTALL ENGINE & RADIO

Re-install the engine, propeller battery, receiver, servos, control horns, pushrods, main LG, nose gear and **wheels** Attach the wing to the fuselage Secure all steel clevises with the small **retainer clips** (METAL014) IMAA regulations also require that lock nuts be installed at all clevises This prevents thread wear due to metal-to-metal vibration.

BALANCE YOUR MODEL

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

1. Accurately mark the balance point on the bottom of the wing on both sides of the fairing The balance point is shown on the plan (CG), and is located approximately 5-1/4 **inches** back from the leading edge This is the balance point at which your model should balance for your first flights Later, you may wish to experiment by shifting the balance up to **1/2" forward or back** to change the flying characteristics Moving the balance **forward** may improve the smoothness and arrow-like tracking, but it may then require more speed for takeoff and make it more difficult to slow down for landing Moving the balance **aft** gives the elevator more authority and makes the model more agile with a lighter and snappier "feel," and often improves knife-edge capabilities In any case, **do not balance your model outside the recommended range.**

2. With the wing attached to the fuselage, all parts of the model installed (ready to fly), and an **empty** fuel tank, block up the tail as necessary until the stab is **level** (If you have built a tricycle gear, the fuse should already be sitting level).

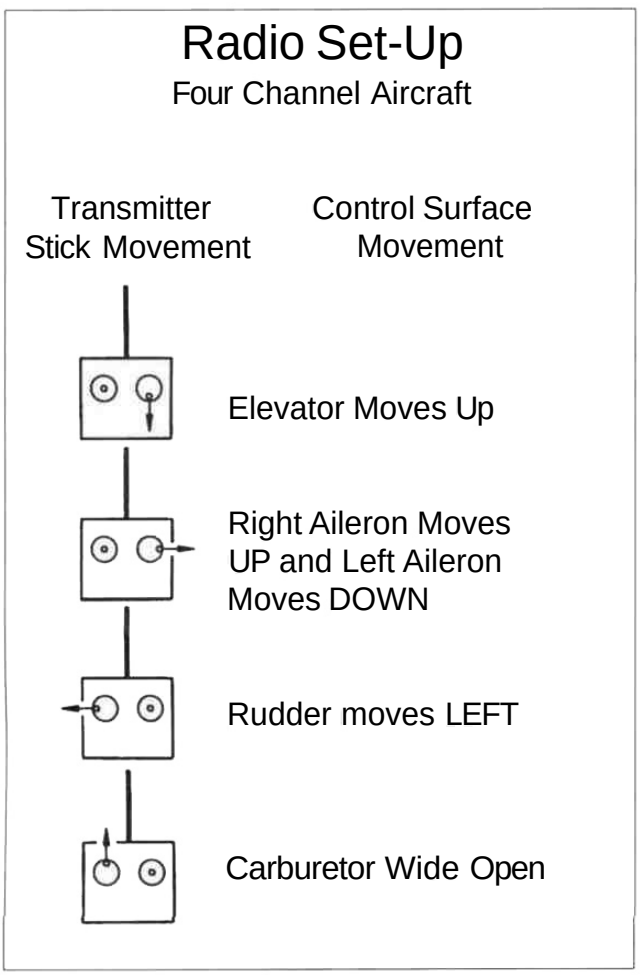
3. Lift the model at the CG marks If the tail drops when you lift, the model is "tail heavy" and you must add weight to the nose to balance If the nose drops, it is "nose heavy" and you must add weight to the tail to balance **NOTE:** Nose weight may be easily installed by using a Prather "Spinner Weight" (available in assorted weights, up to 2 ounces), or by

gluing strips of lead into the engine compartment under the engine Tail weight may be added by using "stick-on" lead weights*, and, later, if the balance proves to be OK you can open the fuse bottom and glue these in permanently If you are using one of the larger capacity receiver battery packs, as recommended, you can change the balance significantly by relocating that pack For instance, if you are using the SuperTigre 2500 engine, you may need to mount the battery pack behind the servos.

*Before applying stick-on weights to MonoKote, prepare the MonoKote as follows Clean the MonoKote thoroughly with alcohol, poke several pinholes in the area where the weights are to be located; apply a drop of thin CA to each pinhole, and wipe off any excess CA with a quick swipe of a tissue This technique bonds the MonoKote more securely to the balsa, preventing the weights from pulling the MonoKote away from the structure.

FINAL HOOKUPS AND CHECKS

1. Make sure the control surfaces move in the proper direction as illustrated in the following sketches:



2. Adjust your pushrod hookups as necessary to provide the proper control surface movements as listed on Page 47

3. Check for wing twist as follows:

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

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

PRE-FLIGHT

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.

FIND A SAFE PLACE TO FLY

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

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

GROUND CHECK THE MODEL

If you are not thoroughly familiar with the operation of R/C models, ask an experienced modeler to check to see that you have the radio installed correctly and that

all the control surfaces do what they are supposed to. The engine operation must also be checked and the engine "broken in" on the ground by running the engine for at least two tanks of fuel **Follow the engine manufacturer's recommendations for break-in.** Check to make sure all screws remain tight, that the hinges are secure and that the prop is on tight

RANGE CHECK YOUR RADIO

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

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

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

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

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

•Use safety glasses when starting or running engines.

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

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

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

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

•Use a **low** throttle setting when starting the engine.

•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 is not leaked onto a hot engine causing a fire.

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

FLYING

The ULTRA SPORT 1000 is a great flying sport airplane that flies smoothly and predictably, yet is highly maneuverable It does **not** have the self-recovery characteristics of a primary trainer, therefore you must either have mastered the basics of R/C flying or seek the assistance of a competent R/C pilot to help you with your first flights

TAKEOFF: If you have dual rates on your transmitter, set the switches to "high rate" for takeoff, especially when taking off in a crosswind Although the ULTRA SPORT 1000 has great low speed characteristics, you should always build up as much speed as your runway will permit before lifting off, as this will give you a safety margin in case of a "flame-out" If you have built a tricycle gear configuration and the ground handling seems too quick and "squirrely," this can be easily fixed by reducing the amount of nose gear steering throw.

FLYING: We recommend that you take it easy with your ULTRA SPORT 1000 for the first several flights and gradually "get acquainted" with this fantastic ship as your engine gets fully broken-in Add and practice one maneuver at a time, learning how she behaves in each one For ultra-smooth flying and normal maneuvers, we recommend using the "low rate" settings as listed on page 47 "High rate" elevator and rudder will be required for snap rolls and spins Try your first spins with elevator and rudder only, bringing the nose up to full stall before applying rudder If you notice any "sluggishness" in the way your ULTRA SPORT 1000 handles, it is probably a result of not enough speed, in which case you should install a propeller with increased pitch Do not exceed the recommended "high rate" throws for the rudder, as this will only result in pitch-down when full rudder is applied **Speed** is the key to good knife-edge performance

LANDING: When it's time to land, make your approach low and shallow, as this ship wants to just keep on flying (especially if built light) If you find that it lands a little fast you might try dialing in a few clicks of up elevator when you reduce the throttle on the downwind leg of the landing approach This will automatically help to bleed off some of the speed If your ULTRA SPORT 1000 is built straight and true, you'll find that you can really flare it out for slow, nose-high, full-stall landings without fear of tip stalling.

Have a ball! But always stay in control and fly in a safe manner.

GOOD LUCK AND GREAT FLYING!

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

SEE THE FULL LINE OF GREAT PLANES AIRPLANES AT YOUR HOBBY DEALER

WE HOPE YOU WILL SELECT ANOTHER "GREAT PLANE" AS YOUR NEXT PROJECT THANK YOU!

APPENDIX

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 refference when triming 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 of 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') 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 it 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 told 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 |ust 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 he done in calm weather Any wind will only make the model weathervane 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'll 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 he caused by the CG 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? When you add power again, did the nose pitch up a bit? It 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 control's 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 CG correct They are the basis upon which all other trim settings 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 he repeatable and 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 hank then take our hands off the controls The model should go a considerable 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 aileron's 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 arc 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 he warped or twisted) Yaw and lateral balance will also come into play here so be patient and eliminate the variables one-by one The manuver is a simple loop but it must be entered with the wings perfectly level Position the maneuver so that your assistant can observe if end-on Always loop into the wind Do several loops and see if the same symptom persists Note if the model loses heading on the front or back side of the loop If you lose if 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 many 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 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 tor 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 alter the vertical fall off as will rudder errors Even though we balanced 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? If so. then try trimming the ailerons down a small bit so that they will act as flaps It 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 It the model tends to pull upward, i.e. it swings toward a nose up direction then reduce the wing incidence It 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 vou change the wing incidence if will influence the way the elevator trim is at a given CG Re trimming the wing will also change the rigging on the ailerons, in effect, and they may have to be re-adjusted 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 if does and you'll be a better pilot tor if One thing we almost guarantee is that your plane's will be more reliable and predictable when they are properly trimmed out They will fly more etticiently 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 ot Scale R/C Modeler magazine. Pat Potega, Editor, August 1983 issue

See the Flight Trimming Chart on page 55.

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	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
SPLIT ELEVATORS (Also Yaw and C G)	Into wind pull open loops using only elevator Repeat tests doing outside loops to inverted entry	A Wings are level throughout B Plane tends toward outside when right side up and to inside when inverted C Plane goes in on regular loops and out on inverted D Plane goes out on both types of loops E Plane goes in on both types of loops	If A trim is fine If B add weight to right wing, or add right rudder If C add weight to left wing or add left rudder If D raise right half of elevator (or lower left) If E raise left half of elevator (or lower right)
YAW2	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 on 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 or make straight up climbs into Hammerheads Do same from inverted entry	A Wings are level and plane falls to either side randomly in Hammerhead B Falls off to left in both inside and outside loops Worsens as loops lighten C Falls off to right in both loops Worsens as loops tighten D Falls off in opposite directions on inside and outside loops	If A, trim is correct If B, add weight to right wing tip If C add weight to left wing tip If D, change aileron trim 3
AILERON RIGGING	With wings level pull to vertical climb and neutralize controls	A Climb continues along same path B Nose tends to go to 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
WING INCIDENCE	Knife edge flight	A Models tends to veer in nose up direction B Model veers in nose down direction	If A, reduce wing incidence If B, increase wing incidence

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 planes vantage point
3 Ailerons cannot always be trimmed without sealing the hinge gap

AMA SAFETY CODE

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

GENERAL

1. I will not fly my model aircraft in competition or **in** the presence of spectators until it has been proven to be airworthy by having been previously successfully flight tested

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

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

5. 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 flyer, unless assisted by an experienced helper.

3. I will perform my initial turn after takeoff away from the pit, spectator and parking areas, and I will not thereafter perform maneuvers, flights of any sort or landing approaches over a pit, spectator or parking area

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

IMAA SAFETY GUIDELINES
As of September 15, 1989
(Portions reprinted as follows)

For the purpose of the following IMAA Safety Guidelines, the term "Giant Scale" refers to a radio controlled model aircraft, either scale or non-scale, which has a wingspan of 80 inches or more for monoplanes, or 60 inches or more for multi-winged model aircraft, or, *true quarter scale aircraft.*

Sections 5A-D: RADIO REQUIREMENTS
(suggested minimum requirements)

5A Servos to be rated heavy duty with a minimum **of** 24 inch ounce of thrust for non-critical control functions, and a minimum of 45 inch ounce of thrust for stress functions The use of one servo for each aileron and one for each stabilizer half is strongly recommended Use of dual servos is also recommended

5B On-board batteries shall be 1000MAH up to 20 lbs , 1200 MAH to 30 lbs , 1800 MAH to 40 lbs , and 2000 MAH over 40 lbs flying weight.

5C Redundant and fail-safe battery systems are recommended

5D The use of anti-glitch devices for long leads are recommended

Sections 9A-F: MECHANICAL COMPONENTS

9A Servo arms and wheels to be rated heavy duty.

9B Control horns to be rated heavy duty

9C. Control surface linkage, in order of preference

1 Cable system (pull-pull)
2. Tube-in-tube (push-pull)
3. Arrow Shaft, fiberglass or aluminum, 1/4" or 5/16" **O** D
4 Hardwood dowel, 3/8" O.D.

9D. Hinges to be rated heavy duty and manufactured for Giant Scale use primarily Home-made and original design hinges are acceptable if determined to be adequate for the intended use

9E Clevis and attachment hardware shall be heavy duty 4/40 thread and rod type 2/56 thread size rod is acceptable for some applications Clevis is to have lock nuts and keepers

9F Propeller tips should be painted or colored in a visible and contrasting manner so as to increase the visibility of the propeller tip arc.

BUILDING NOTES

Kit Purchase Date _____

Where Purchased _____

Price _____

Date Construction Started _____

Date Construction Finished _____

Date of First Flight _____

Finished Weight _____

8 Digit Code (stamped on box end) _____

Flight Log

GREAT PLANES™
MODEL MANUFACTURING COMPANY

Fulfill all of your flying ambitions with our wide selection of world-class kits.

Two of the easiest-flying, most acrobatic aircraft ever designed!

- The kit quality and sparkling performance of the Ultra-Sport 1000 in .40- and .60-sized models.
- Even if you're a veteran pilot, you'll be surprised at how much "better" your maneuvers look with an Ultra-Sport.
- Proven Ultra-Sport airfoil offers low-speed stability **and** high-speed maneuverability.

Stylish kits designed to excel at your **favorite aerobatics**

- Impressive Super Sportster 90/120 gives you large-scale dimensions without sacrificing aerobatic performance.
- Also available in 20, 40, 60, and Bipe models.

The speed you need to turn and burn.

The F-14's front-mounted engine and prop offer familiar sport model construction.

- The speed and maneuverability of ducted fan jets in an easy-to-fly, affordable sport design.
- Realistically modeled after the famous, full-size Tomcats used in the Persian Gulf War and at the Naval Air Station's training academy in Miramar, California.
- Crowd-pleasing pizzazz in a .60-sized model that even the average hobbyist can succeed with.

Enjoy the "jet experience" without ducted fan models' cost or complexity.

With its conventional sport design, the Patriot can be successfully built and flown by anyone with average assembly **and** piloting skills.

- Incredible flying speeds—clocked at 115MPH!
- Show-stopping Air Force Thunderbird looks, and jet-like performance in a .40-sized sport model.
- Perform aileron rolls, high-speed passes, knife edges and more..

2-View Drawing

Use This For Planning Your Trim Scheme