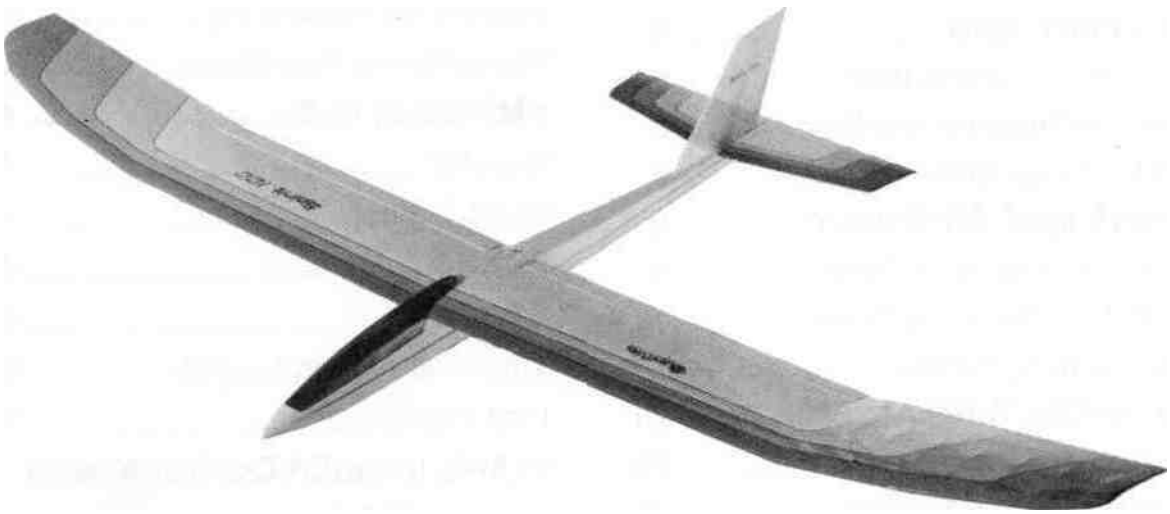
SPIRIT 100

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

TABLE OF CONTENTS

INTRODUCTION 3
Precautions..... 3
Other Items Required 3
Supplies and Tools Needed 4
Abbreviations 4
Types of Wood 4
Decisions You Must Make Now 4
Die Patterns 5
Get Ready to Build 6
TAIL FEATHERS 6
Build the Fin and Rudder 6
Build the Stabilizer and Elevator..... 7
Cut the Hinge Slots..... 8
SPORT WING ASSEMBLY 9
Build the Inner Wing Panel 9
Build the Outer Wing Panel..... 14
Join the Wing Panels **..... 15**
ADVANCED WING ASSEMBLY 20
Build the Inner Wing Panel 20
Build the Outer Wing Panel..... **26**
Join the Wing Panels 28
Install Aileron Servos 30
Install Flap Torque Rods..... 32
Aileron / Flap Assembly 33
FUSELAGE ASSEMBLY 34
Assemble Fuselage Sides 34
Frame-up the Fuselage 35
Assemble the Cockpit/Canopy 39
FINAL ASSEMBLY 41
Balance the Airplane Laterally 41
Mount the Tail Surfaces 42
Final Sanding 43
Covering**..... 43**
Checking for Warps 43
Hinge the Control Surfaces..... 44
Install Radio Gear 44
Install The Spoilers **..... 47**
Control Throws 47
Control Surface Mixing 47
Balance The Model 47
Final Hookups and Checks **..... 48**
PRE-FLIGHT..... 48
Charge the Batteries 48
Find a Safe Place to Fly..... **48**
Range Check Your Radio 49
AMA Safety Code..... 49
General**..... 49**
Radio Control..... 49
FLYING 49
Trim Flights**..... 49**
Your First Hi-Start Launch **50**
First Flights **..... 50**
FLAPS, CAMBER CHANGING AND CROW MIXING 51
Launching 51
Flying 51
Landing 51
THERMAL FLYING..... 51
Facts About Thermals 51
Thermal Soaring **52**
Pointers for Contest Flying **..... 53**
SLOPE SOARING..... 53
Flying 53
Slope Landings 54
BALLASTING 54
BUILDING NOTES 54
PARTS LIST 55
2-VIEW DRAWING 56

WARNING! THIS IS NOT A TOY!

The model you will build from this kit 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 to test the model and fly it ONLY with experienced, competent help in accordance with all safety standards and common sense 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 the 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(800) 435-9262

INTRODUCTION

Congratulations! You now own a revolutionary sailplane kit! A bold statement indeed, but no other sailplane kit has ever been able to satisfy so many desires. No matter what your skill level - rank beginner or national soaring champion you will enjoy this kit from the moment you start construction.

Thank you for purchasing the Great Planes **SPIRIT 100** sailplane.

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.

PRECAUTIONS

1. You must build the plane **according to the plans and instructions.** Do not alter or modify the model as doing so may result in an unsafe or un-flyable model In a few cases the plans and instructions may differ slightly from the photos In those instances you should assume **the plans and written instructions are correct.**

2. You must take time to **build** straight, true and strong.

3. You must use a proper R/C **radio** that is in first class condition and meets or exceeds "1991 specs".

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 the model has remained structurally sound. Be sure to check the nylon clevises often, and replace if they show signs of wear.

6. You must **fly** the model **only with the competent help** of a well 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 "flyabilily" 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 safely of your completed model.

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

OTHER ITEMS REQUIRED

0 Radio having at least 2 channels (a third channel is required for optional spoilers and a 4 channel radio with 5 servos is required for the advanced wing) A computer radio or comparable radio with mixing capabilities may be used to achieve total camber control and CROW type mixing
0 Monokote or other covering material (2 rolls)
0 Latex foam rubber padding (1/4" thick)
0 #64 rubber bands
0 Heavy duty hi-start or other launching device
0 BB's or lead shot for balancing
0 Thin but strong thread - 30 (2 - 4lb fishing line works great)
0 Pushrods (Sullivan #503 or equivalent)
0 Hinges

The optional spoilers also require:

0 2 - 36" lengths of 20-30 lb fishing line
0 2 - 36" lengths of 1/8 " plastic tubing

The advanced wing also requires:

0 Thin copper wire or similar (for wrapping flap linkage)
0 2 - 36" servo extensions (or equivalent)
0 2 or 3 -12" servo extensions

SUPPLIES AND TOOLS NEEDED

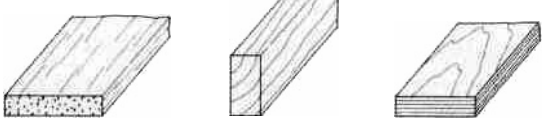
0 2 oz Thin CA Adhesive
0 2 07 Medium or Thick CA Adhesive
0 2 5 oz 5-Minute Epoxy
0 Hand or Electric Drill
0 Drill Bits 1/16", 3/32", 1/8", 5/32", 11/64, 13/64" & 1/4"
0 Sealing Iron
0 Heat Gun
0 Soldering Iron (Advanced wing)
0 Razor Saw
0 Hobby Knife, #11 Blades
0 Pliers
0 Screw **Drivers**
0 T-Pins
0 Assorted **Rubber Bands**
0 Straightedge
0 Drafting Triangle
0 Masking Tape
0 Cellophane Tape
0 Vinyl Tape
0 Sandpaper (coarse, medium, fine grit)*
0 T-Bar Sanding Block (or similar)
0 Waxed Paper
0 Lightweight Balsa Filler
0 2-56 Tap, Tap Wrench
0 1/4 20 Tap (for bolt on wing option)
0 Dremel Moto Tool or Similar (optional)

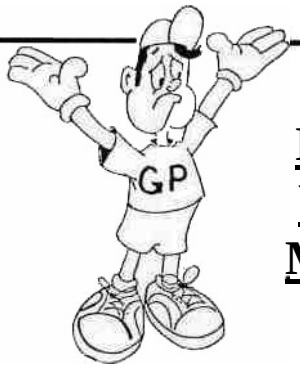
***NOTE:** On our workbench, we have four 11 T-Bar sanders, equipped with #50, #80, #100 and #150-gnt sandpaper This setup is all that is required for almost any sanding task We also keep some #320-grt wet-or dry sandpaper handy for finish sanding before covering

COMMON ABBREVIATIONS USED IN THIS BOOK AND ON THE PLANS:

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

TYPES OF WOOD





DECISIONS YOU MUST MAKE NOW

WING CONFIGURATION

The SPIRIT 100 kit has two different wing options

The **SPORT** wing uses the Selig 3010 airfoil, has optional spoilers and is recommended for novice sailplane pilots This wing is easy to build, easy to fly and offers great all-around performance without requiring expensive radio equipment The spoilers arc highly recommended as they make it much easier to land in smaller spaces or to lose altitude in a safe controlled manner

The **ADVANCED** wing utilizes the Selig Donovan 7037 airfoil along with flaps and ailerons to provide incredible thermal soaring performance This wing is designed to be built with polyhedral which has been found to work great - enabling the Spirit 100 to thermal very tightly in low level thermals "Straight wing" enthusiasts can cut their own polyhedral braces to eliminate the polyhedral if they desire Computer radios and radios with mixing capabilities can be used to obtain total camber control (the whole trailing edge will raise or lower together) and CROW (the ailerons raise about 75 degrees and the flaps drop almost 90 degrees) The SD 7037 airfoil, combined with total camber control, gives you a sailplane that has an incredible L/D, yet will really slow down and float when the whole trailing edge is dropped about 3/32 This feature enables the Spirit 100 to out thermal any other plane in its class

RUBBER BAND OR BOLT-ON WING

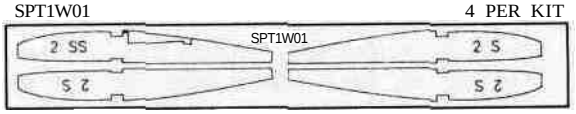
Parts are included to build cither a rubber band on wing or a bolt-on wing held in place with four 1/4-20 nylon bolts

The rubber band on wing is easier to build and will absorb hard landings better so we recommend it tor less experienced builders

The bolt on wing offers less drag and more precise attachment It is recommended for the advanced wing and the serious contest flyer

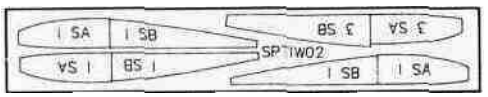
DIE PATTERNS

SPT1W01 — 4 PER KIT



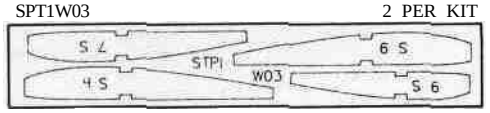
BALSA 1/16- X 2-6/8" X 1/8"

SPT1W02 — **2 PER KIT**



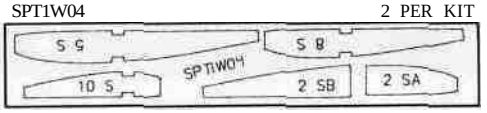
BALSA 1/8" X 2-6/8" X 16"

SPT1W03 — 2 PER KIT



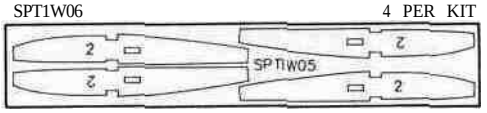
BALSA 1/16" X 2-5/8" **X 16"**

SPT1W04 — 2 PER KIT



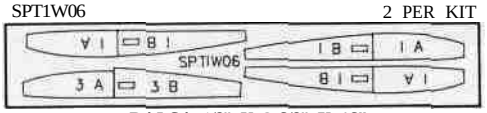
BALSA 1/16" X 2-6/8" X 16-

SPT1W06 — 4 PER KIT



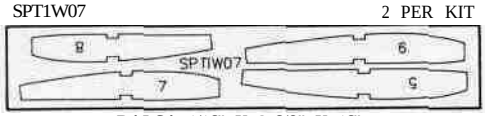
BALSA 1/16" X 2-6/8" X 16"

SPT1W06 — 2 PER KIT



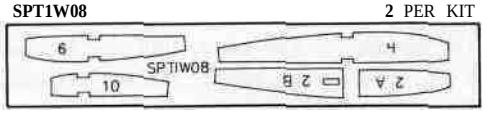
BALSA 1/8" X 2-6/8" **X 16"**

SPT1W07 — 2 PER KIT



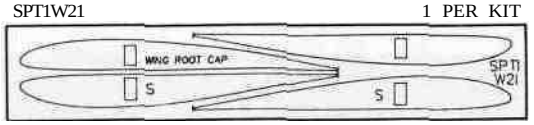
BALSA 1/16" X 2-6/8" X 16"

SPT1W08 — **2** PER KIT



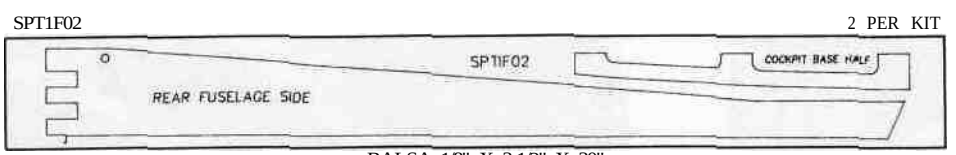
BALSA 1/16" X 2-6/8" X 16"

SPT1W21 — 1 PER KIT



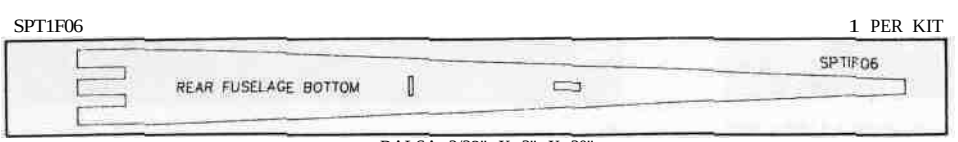
BALSA 1/16" X 3" X 18"

SPT1F02 — 2 PER KIT



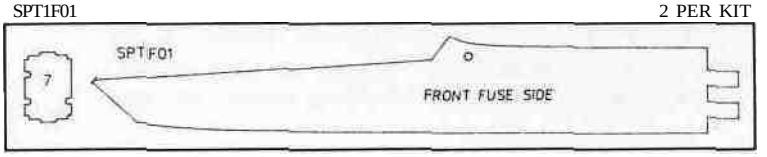
BALSA 1/8" X 3-1/2" X 30"

SPT1F06 — **1** PER KIT



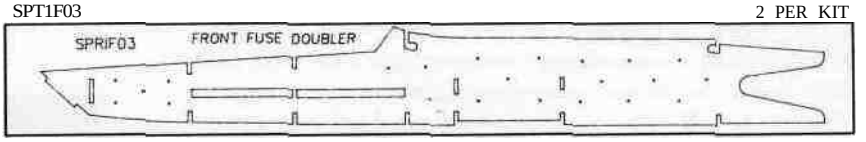
BALSA 3/32" X 3" X 30"

SPT1F01 — 2 PER KIT



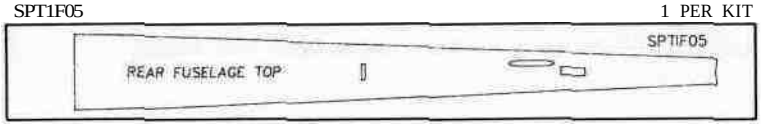
BALSA 1/8" X 4" X 24"

SPT1F03 — 2 PER KIT



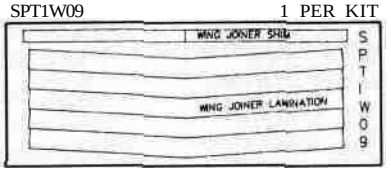
BALSA 3/32- X 3-1/2" X 27"

SPT1F05 — 1 PER KIT



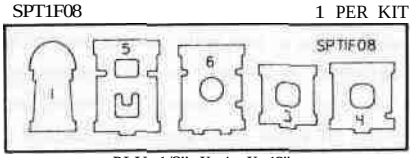
BALSA 3/32" X 3" X 22"

SPT1W09 — 1 PER KIT



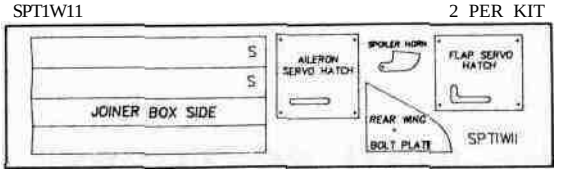
PLY 1/16" X 4-1/2" X 12"

SPT1F08 — 1 PER KIT



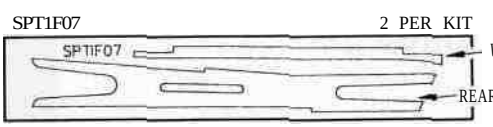
PLY 1/8" X 4- X 12"

SPT1W11 — 2 PER KIT



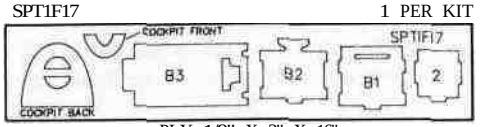
PLY 1/16" X 4-1/2" X 18"

SPT1F07 — 2 PER KIT



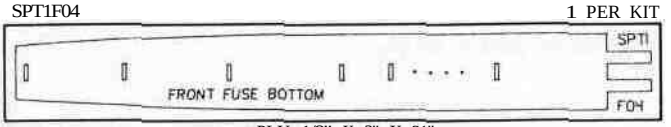
BALSA 3/32" X 2-6/8" X 16"

SPT1F17 — 1 PER KIT



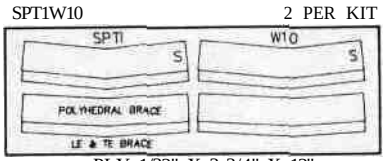
PLY 1/8" X 3" X 16"

SPT1F04 — **1** PER KIT



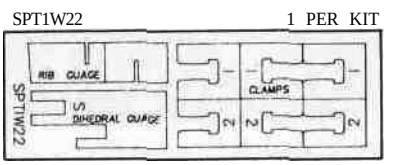
PLY 1/8" X 3" X 21"

SPT1W10 — 2 PER KIT



PLY 1/32" X 3-3/4" X 12"

SPT1W22 — 1 PER KIT



PLY 1/8" X 4- X 12"

GET READY TO BUILD

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

D 1. Unroll the plan sheet. Re-roll the plan inside out and let it uncurl while you read through this instruction book. This will help the plan lay flat and you to get acquainted with the building process. **NOTE,: Because there are several options to consider when building the SPIRIT 100, you should read the instruction book through before building and then go back and cross off the steps you won't use to build your model.**

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 at the back of this book. Write the part **name** or **size** on each piece to avoid confusion later. Use the die-cut patterns shown on page 5 to identify the die-cut parts and mark them. If any of the die-cut parts arc difficult to punch out during construction, do not force them! Instead, first cut around the parts with a hobby knife. After punching out the die-cut parts, use your T-Bar or sanding block to **lightly** sand the edges to remove any die-cutting irregularities.

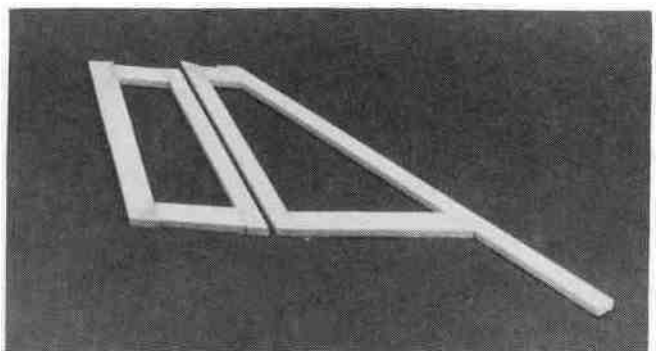
"TAIL FEATHERS"

BUILD THE FIN AND RUDDER

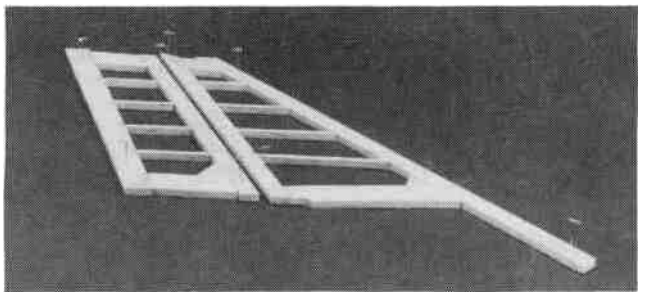
You'll need the following pans:

SPT1S01	1/4" x 1/2" x 30" Balsa Tail Frame
SPT1S02	1/4" x 3/4" x 24" Balsa Tail Tips
SPT1S04	1/8" x 1/4" x 30" Balsa Tail Ribs

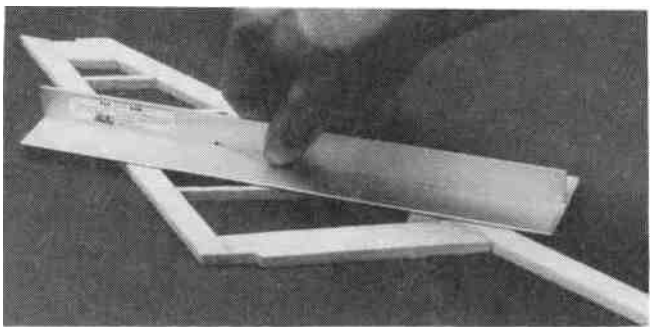
D 1. Tape or pin the plan down to your flat work surface. Tape a piece of waxed paper over the fin and rudder portion of the plan (so you don't glue the parts to the plan).



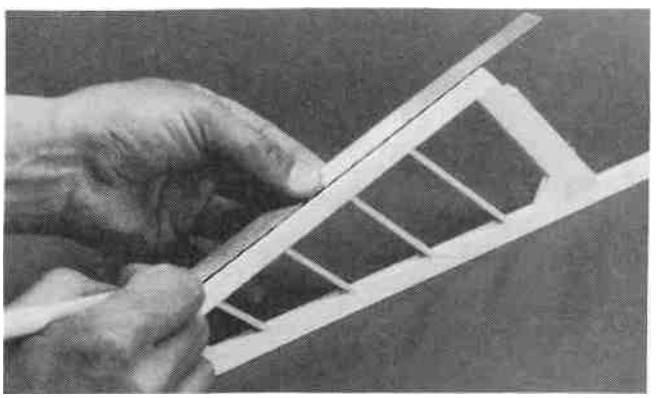
D 2. Using the plan as a guide, cut pieces of 1/4" x 1/2" **x 30" Balsa Tail Frame** (SPT1S01) and 1/4" x 3/4" **x 24" Balsa Tail Tips** (SPT1S02) to make the **Rudder and Fin Framework.** Notice that the fin leading edge extends down into the fuse so cut it long enough to extend past the fuse bottom. It will be trimmed off flush with the fuse bottom later Pin these pieces in place on the plan and glue the parts together using thin CA glue. **CAUTION: Do not** glue **the fin** to the **rudder!** Cut the notch near the back of the fin bottom so it will fit over the stab.



D 3. From the **1/8" x** 1/4" **x 30" Balsa Tail Rib Sticks** (SPT1S04), cut the "ribs" to fit inside the rudder and fin framework, and glue them in place. Cut the **gussets** from the 1/4" x 3/4" x 24" **Balsa Tail Tips Stick** (SPT1S02) and glue them in place.

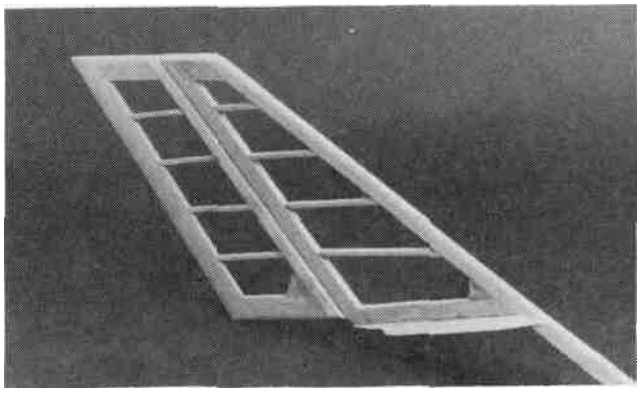


D 4. Remove the fin and rudder assemblies from the plan and examine them for any open or bad joints. Fill any gaps with medium or thick CA, then use your sanding block with medium grit sandpaper to sand both sides of the framework smooth.

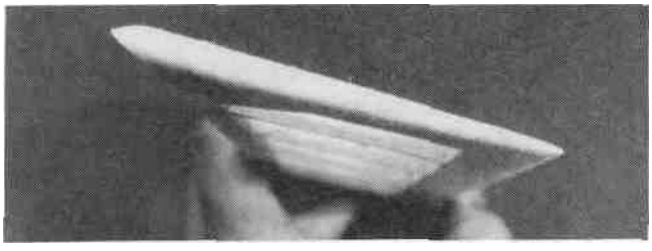


D 5. Carefully draw a **centerline** all around the edges of the rudder. This will help to maintain symmetry when sanding.

D 6. Using a sanding block and coarse (50 or 80-gnt) sandpaper, sand the leading edge of the **rudder** to the V-shape as shown on the plans (a small razor plane works great for initial shaping). Sand the three remaining edges to a smooth rounded shape.* Sand the top and the leading edge of the fin to a nice rounded shape. The leading edge of the fin extends down through the fuse so you don't need to sand below the edge of the fin bottom. **NOTE: The trailing edge of the FIN must remain square, do not sand it!**



D 7, Cut two 6" lengths of 1/4" **Balsa** Triangle(BAL141)and glue them along the bottom of the fin. The bottom edges of the triangle should be flush with the bottom of the fin. Sand the triangle stock to blend with the leading and trailing edges of the fin. Also, cut or sand the bottom of the triangle stock to match the notch in the 1/4" balsa fin bottom.

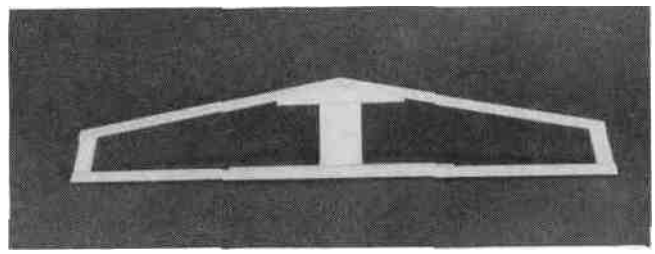


*** MAXIMUM PERFORMANCE TIP -** Sand both sides of the rudder to a taper as shown on the plans. This requires a little more work but will help to reduce drag and thus increase performance of the sailplane.

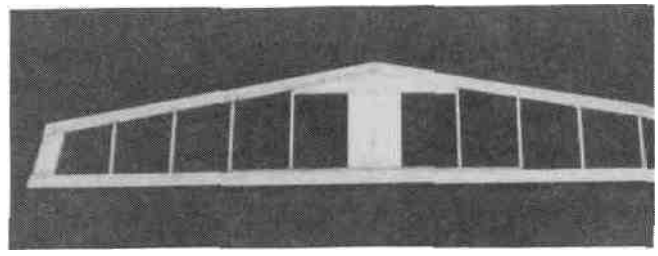
BUILD THE STABILIZER AND ELEVATOR

You'll need the following parts:

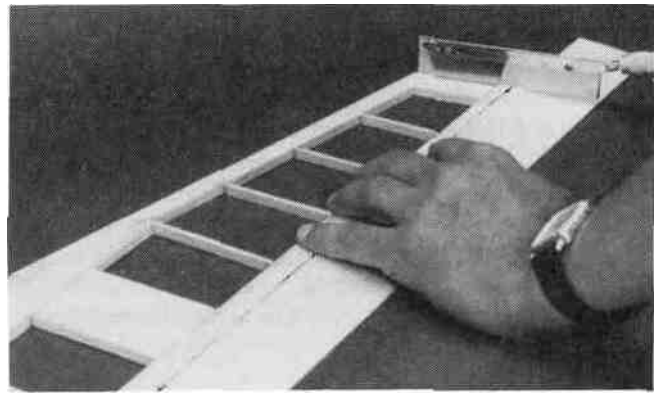
SPT1S01	1/4" x 1/2" x 30" Balsa Tail Frame
SPT1S02	1/4" x 3/4" x 24" Balsa Tail Tips
SPT1S03	1/4" x 1" x 15" Balsa Stab Center Piece
SFT1S04	1/8" x 1/4" x 30" Balsa Tail Ribs
SPT1S05	1/4" Balsa Tapered Elevator



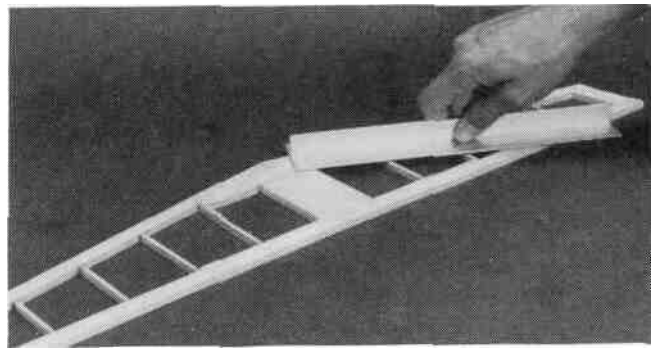
D 1. Tape waxed paper over the **stabilizer** drawing on the plan. Cut the leading and trailing edges from the 1/4" x 1/2" **x 30" Balsa Tail Frame Stick** (SPT1S01). Cut the lips from the 1/4" x 3/4" x 24" **Balsa Tail Tips Stick** (SPT1S02) and cut the centerpieces from the 1/4" **x 1" x 15" Balsa Stab Center Piece Stick** (SPT 1 S03). Pin these pieces in place over the plan and add thin CA to each joint.



D 2. Cut the **"ribs"** from the 1/8" x 1/4" x 30" Balsa Stick (SPT 1 S04) and glue them in place.



D 3. Pin or tape the 1/4" **Balsa Tapered** Elevator (SPT1 S05) in place behind the stab and use your razor saw to cut the ends off to match the angle of the stab lips.



D 4. Remove the slab from ihc plan and examine it for any open or bad joints. Fill any gaps with medium or thick CA, then

use your sanding block with medium grit sandpaper to sand both sides smooth.

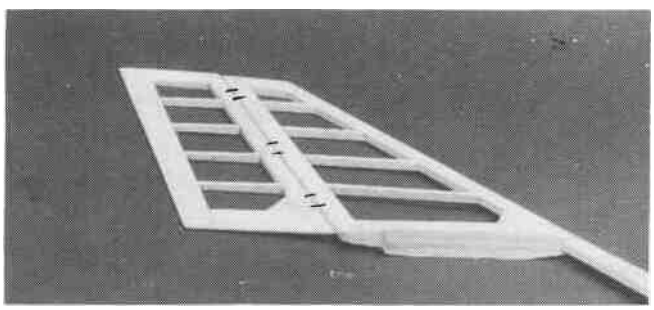
D 5. Carefully draw a **centerline** all around the edges of the stab (this will help to maintain symmetry when sanding).

D 6. Tape the elevator to the stab with masking tape and using a sanding block with **coarse** (50 or 80-grit) sandpaper, sand the leading edge of the stab, the stab tips and the elevator tips to a smooth rounded shape. The tips of the elevator should blend in nicely with the stab tips. **NOTE: The trailing edge of the STAB must remain square, do not sand it!**

D 7. Remove the elevator and draw a center line down its leading edge. Use your sanding block to sand the same V-shape as you did on the rudder. The trailing edge should also be sanded to a smooth rounded shape.

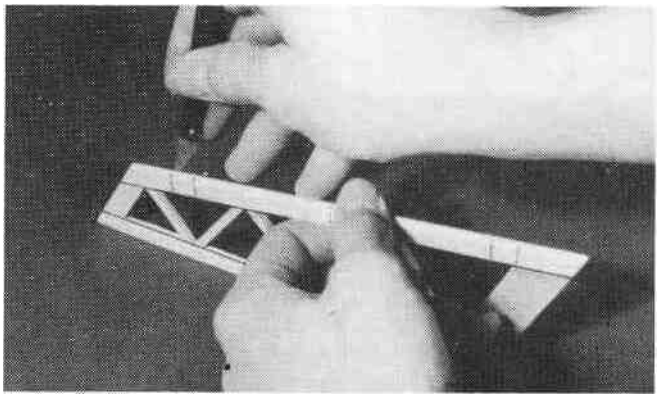
CUT THE HINGE SLOTS (Do not glue)

NOTE: Due to the many types of hinges available and the fact that everybody seems to have their own favorite, we did not include hinges in this kit. We can however, highly recommend the "laminated" type hinges that you install with thin CA, Our R&D department has thoroughly tested these hinges and found them to be easy to install and sufficiently strong and durable for this type of airplane. However, as the kit builder, you are reminded that you are ultimately responsible for the structural integrity of your aircraft. If you are not confident using this type of hinge, please feel free to use your favorite hinge. The hinge slots for this type of hinge can be cut now or you can wait and cut them alter the surfaces are covered.
The following instructions explain how to install most hinges.



D 1. Lay the rudder and elevators on the plan and mark the hinge locations. Place the rudder against the fin TE and transfer the marks over to the fin. Place the elevator against the stab TE and transfer the marks over to the stab.

CAUTION!!!: You must use extreme care when cutting hinge slots with a hobby 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 precaution is to wear leather gloves while performing the following steps.



D 2. Cut the hinge slots **on the accurate centerlines which you previously drew** using a hobby knife. (The recommended hinge slotting technique is listed below).

A. Begin by carefully cutting a very shallow slit at the hinge location. This first cut is to establish your cut in the right place, so concentrate on staying on the centerline and don't cut too deep!

B. Make three or four more cuts in the same line, **going slightly deeper each** time. As you make these additional cuts, work on going straight into the wood. Continue this process while "wiggling" the knife handle forward and backward until the blade has reached the proper depth for the hinge.

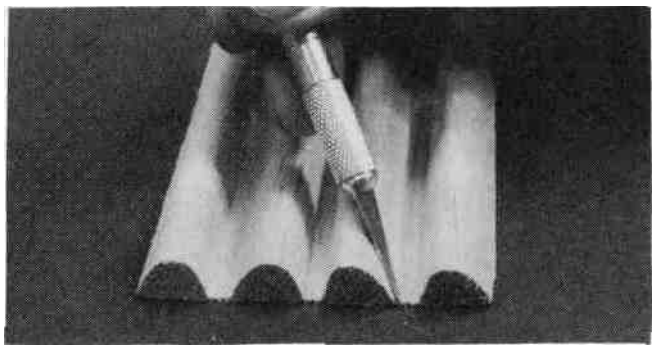
C. Trial fit the hinge into the slot. If the hinge is difficult to push in, re-insert the knife and move it back and forth in the slot a few times to enlarge the slot.

D 3. Insert the hinges into the slots and trial fit the rudder and elevator in place on the fin and stab. Do not glue the hinges until after you have covered the model. Hinge gluing instructions are included later.

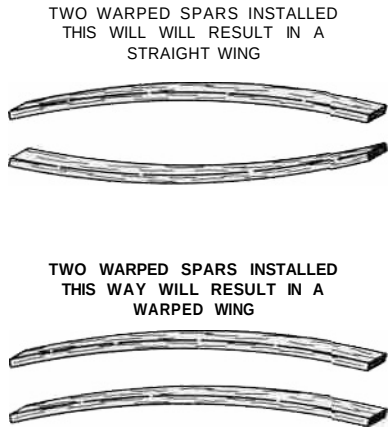
IF YOU HAVE DECIDED TO BUILD THE ADVANCED WING PLEASE SKIP TO PAGE 20.

SPORT WING ASSEMBLY

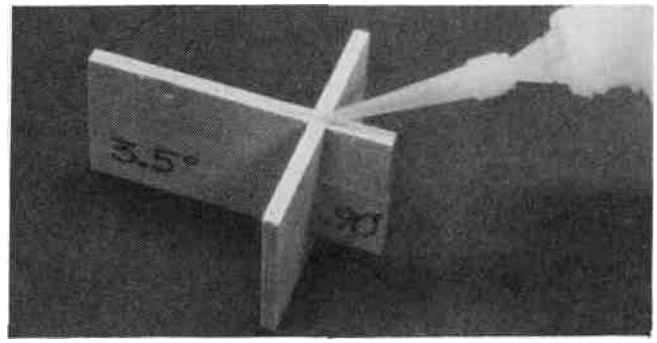
D 1. **Tape the plan to your flat work surface and cover the wing drawing with waxed paper. NOTE:** If your work space is limited, you may cut the wing drawings apart from the rest of the plans.



D 2. The **Shaped Wing Leading Edges** (SPT1W14) are fastened together by thin strips of balsa. Separate them by carefully cutting **between** the LE'S, with the knife resting against the LE as a guide. Do not cut vertically at the edge of the LE or it will end up too narrow. Allow the cut to follow the cross sectional shape of the LE. Sand away any excess balsa that remains along the edges using a sanding block with 100-grit sandpaper, but do not "square off the edges.



D 3. Before using the 1/8" x 3/8" Basswood Spars, examine them carefully for possible imperfections. Look for knots, soft spots, diagonal grain and any other imperfections. If possible, position each spar so the imperfections are on the outer half of the wing panel (toward the lip), where they will be least affected by high stress. If the spars are warped slightly, "balance them out" by installing the warped spars in opposite directions (see sketch).



D 4. Punch out the two **Rib** Gauge Pieces (SPT1W22) and assemble them using CA. Notice that one end of the gauge is slanted at a 3-1/2 degree angle for positioning the end ribs. The other 3 ends are perpendicular and can be used to keep parts 90 degrees to the work surface.

BUILD THE INNER WING PANEL

You'll need the following parts:

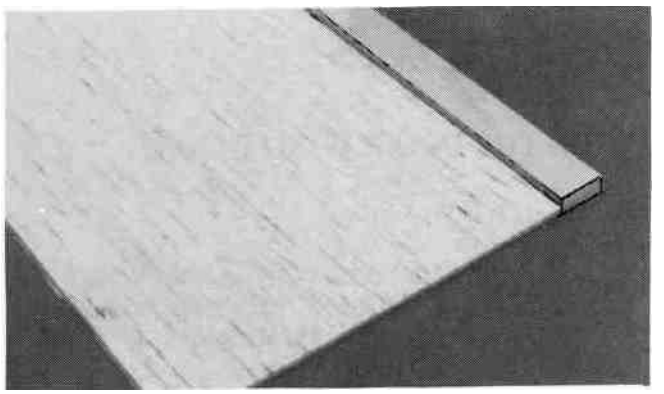
SPT1W01	1/16" Balsa DC Wing Ribs - W2S, W2SS
SPT1W02	1/8" Balsa DC Wing Ribs - W1S, W3S
SPT1W03	1/16" Balsa **DC** Wing Ribs - W4S, W6S, W7S, W9S
SPT1W04	1/16" Balsa DC Wing Ribs - W2SA & B, W5S,W8S,W10S
SPT1W12	1/8" x 3/8" x 30" Basswood Inner Spars
SPT1W14	Shaped Balsa Leading Edge
SPT1W15	11/32" Balsa Notched Inner TE/Flap
SPT1W20	1/16" x 3" x 30 Balsa Wing Bottom Sheet
SPT1W22	1/8" Ply DC Clamps and Gauges
SPT1W24	1/16" Balsa Shear Web Pack (26)

D 1. Locate all the SPT1W01, SPT1W02, SPT1W03, and SPT1W04 die-cut rib sheets. Check to make sure you can read the embossing on each rib. If you can not, use the die patterns on page 5 to determine the rib #'s and mark the #'s on the ribs. Carefully punch out all the die-cut balsa wing ribs. Sand the edges **slightly** to remove any die-cutting irregularities.

NOTE: If you are installing spoilers, cut out the embossed area on the two W2SS ribs and make sure you install these ribs in the proper locations. You can also refer to the plans and mark on each rib where the spoiler tube will be. Drill a 1/8" hole in the proper ribs and make sure they get installed in the correct places.

D 2. Son through the three 1/16" x 3" x 30" Balsa Wing Sheeting (SPT1W20) and pick out the two sheets that most closely match each other in weight and grain. These will be the bottom sheeting for the inner wing panels. Check to make sure the two "bottom" sheets have at least one straight edge. If' not, use a metal straight edge to cut as little as possible off of one long edge to make it straight.

NOTE: Follow the steps with two check boxes to build the RIGHT wing panel, then repeat these steps to build the LEFT wing panel.



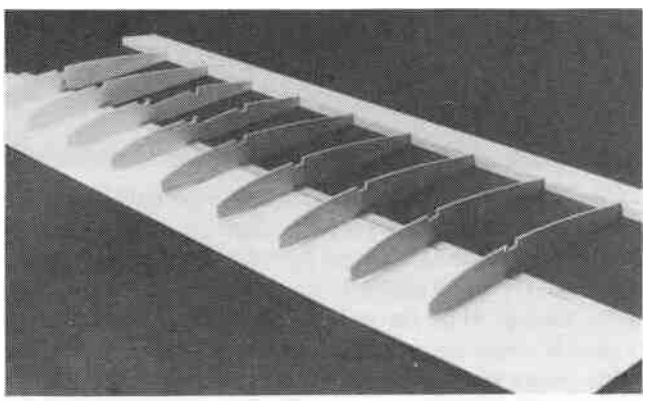
D D 3. Glue one of the "Inner Bottom" wing sheets to the edge of an 1/8" x 3/8" x 30" Basswood Inner Spar (SPT1W12) using the following procedure. With the spar in position on the plan, hold the straight edge of the bottom wing sheet up against it. Starling about 9 inches from the "root" end (where the second W2S rib will be positioned), add thin CA along the joint. Be sure to hold both the spar and the bottom wing sheet flat against the work surface while the glue cures. Glue a 5" -6" section at a time until you get within 4" of the other end (where the last W2S rib will be installed). Do not glue the two ends yet as some of the sheeting will be cut away later.

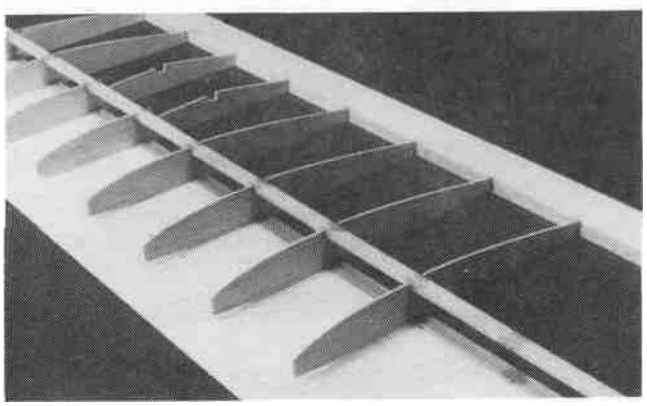
D D 4. Align the bottom spar/wing sheet assembly with the "Inner Panel" drawing on the plan and pin it in place. This assembly will be a little long but just center it over the inner panel drawing.

D D 5. Pin one of the **11/32" Balsa Inner Trailing Edges** (SPT1W15) to the plan, lining up the notches in the TE wilh the notches on the plan. Use a couple of W2S ribs to correctly space the TE behind the spar. If the notches are off a little from the plan it is due to the moisture content of the air. Just line up the root end of the TE and space the ribs according to the TE, not the plans.

DD 6. Place six **W2S and** two W2SS **ribs** (SPT1W01) on the spar in their approximate positions, work the ribs into the notches on the trailing edge but do not glue anythmg yet. **NOTE:** The W2SS ribs should be installed where the spoiler will be located.

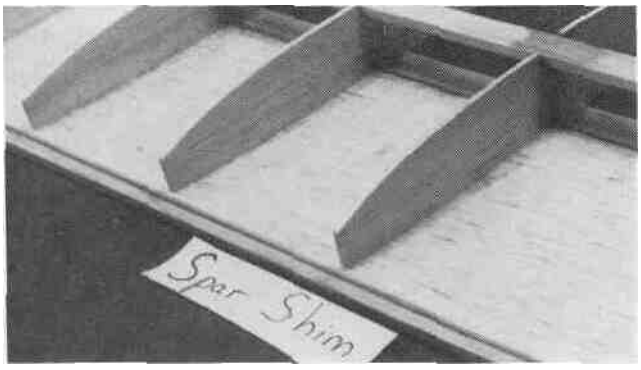
D D 7. Make sure the ribs are properly positioned according to the plans and glue them to the spar using med. or thick CA. **Do not purposely** glue **the ribs to the sheeting yet.** Use the square end of the rib gauge to keep the ribs perpendicular to the work surface. Hold the TE and the ribs flat against the plan. With the ribs inserted fully into the notches, add a drop of thin CA to each joint.



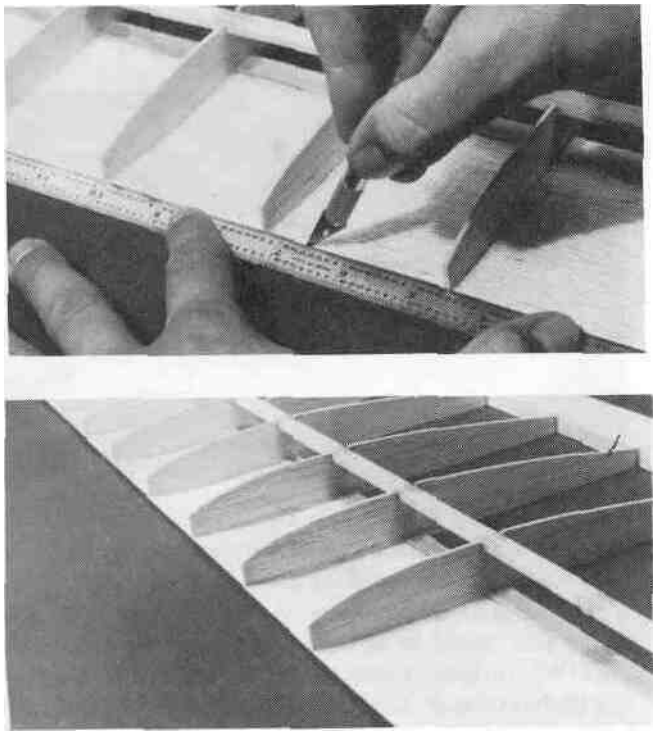


D D 8. Trial fit the Top 1/8" x 3/8" x 30" Basswood Inner Spar (SPT 1 W 12) into the notches in the ribs by carefully pushing the spar completely down into the notches. Make sure the top spar is lined up lengthwise with the bottom spar. Remove the spar and apply med. or thick CA to the notches. Replace the spar and make sure the spar is level with the front half of the rib so the sheeting will lie flat on the spar.

D D 9. Position a 1/8" x 3/8" x 23-1/2" **Basswood Outer Spar** (SPT1W 13) under the front edge of the leading edge sheet to hold it up against the front of the rib. Use weights or pins near the spar to hold the panel flat on the work surface during this step. Apply Am CA to glue the sheeting to the ribs. The outer spar is

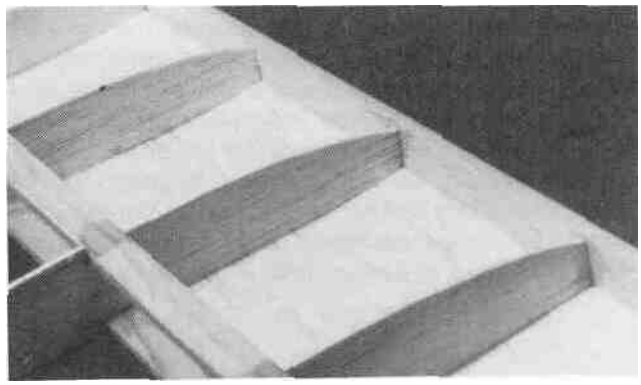


shorter than the panel so you will have to do approx **half the** ribs then move the spar down to do the rest of the ribs



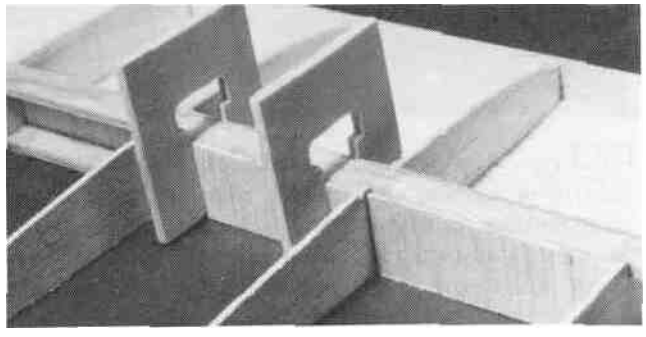
D D 10 Unpin the wing panel from the work surface and hold a metal straight edge against the front of the ribs Allow the panel to tip up so the front edge of the sheeting is flat on the work surface and use an Xacto knife to **carefully** cut the sheeting off flush with the from edge of the ribs Use a **sanding block** to remove any "bumps" but be careful not to sand any dips into the sheeting or sand the ribs

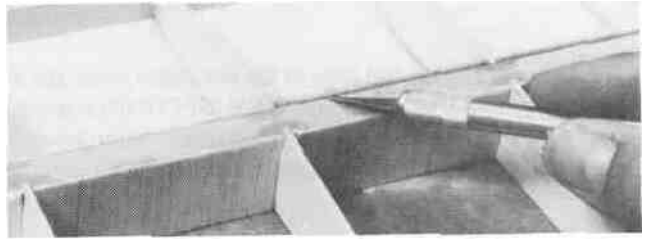
D D 11 Position a Pre-Shaped Balsa Leading Edge (SPT1W14) in place against the front of the ribs NOTE: 1 these leading edges are NOT symmetrical. Refer to one of the section views on the plans to determine which way they should be installed Carefully hold the leading edge against one of the end



W2S ribs and note that it is wider than the front of the rib This is because the 1/16 balsa leading edge top sheeting will be added later Align the lower surface of the leading edge with the bottom of the lower LE sheet and glue it in place with a drop of thin CA Align the other end of the leading edge with the bottom of the opposite end W2S and glue it with a drop of thin CA Go down the line and glue the remaining ribs to the leading edge, one at a time, so you can make sure they are aligned Make sure the LE sheeting is flush with the bottom of the LE and add CA between the ribs Do not glue the sheeting to the LE past the last W2S ribs yet.

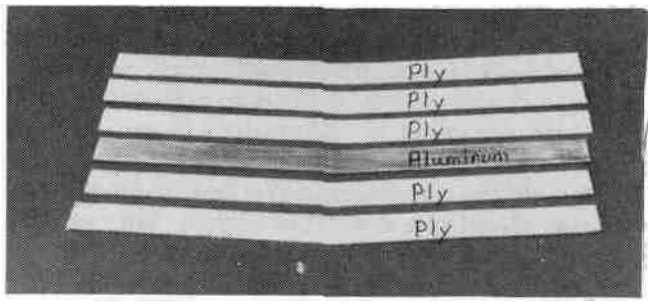
IMPORTANT - MAKE SURE THE WING PANEL REMAINS ABSOLUTELY FLAT DURING THE NEXT STEP!



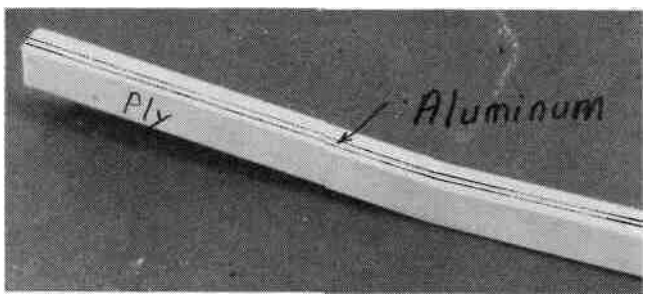


DD 12 Locate the **1/16" Balsa Shear Webs** (SPT1W24) Trial fit one of the webs in place between the first and second W2S ribs Glue the shear web in place on the back of the spars using med or thick CA The web should be pressed down against

the work surface and tightly against the spars. It is important to do a good job of gluing these in place as they are responsible for most of the wing's strength. Also glue a shear web to the front of the spars. Because of the 1/16" bottom sheeting, the front shear webs will extend above the top spar, but just trim them off after you have installed all the webs. C-1 and C-2 Clamps (SFT1W22) can be used to help hold the webs in place while the glue cures. Install the remaining balsa shear webs. They continue on both the front and the back of the spar all the way to the last W2S Rib.



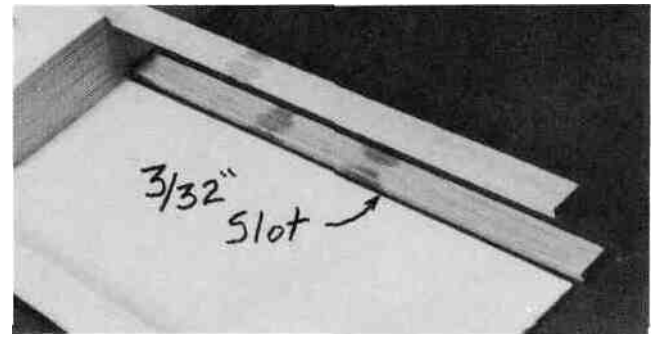
DD 13. Punch out the five 1/16" Ply Wing Joiner Laminations (SPT1W09) and lightly sand the edges to remove any rough spots. Locate the 1/16" Aluminum Wing Joiner Blade (ALUM008). Clean the aluminum joiner with alcohol to remove any oily residue and sand each side with coarse sandpaper to scratch the surface and help the glue stick.



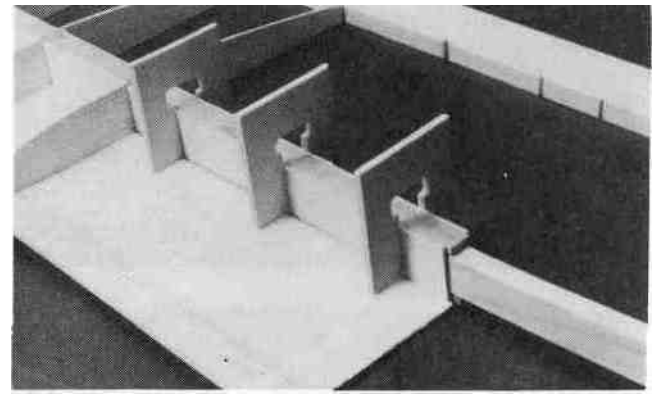
l—ll—l 14. Use either epoxy or med. or thick CA to glue one of the 1/16" ply laminations to the 1/16" aluminum blade. Apply as much pressure (clamps, clothespins, weights, etc.) as possible while the glue is curing and be sure to accurately line up the two pieces. Glue two more 1/16" ply laminations to each side of the **now** 1/8" thick joiner using the same procedure.

DD 15. Sand the top edge of the laminated joiner flat and glue the Die-Cut 1/16" Ply Joiner Shim (SPT 1W09) in place on top of the joiner. Sand the edges of the finished "wing joiner" to remove any glue globs and to round off the comers.

DD 16. Locale two of the **1/16" Ply Joiner Box Sides** (SPT 1 W 11) that have an "S" embossed on them. Hold one of the sides in place on the front of the spars at the "root" (inner) end of



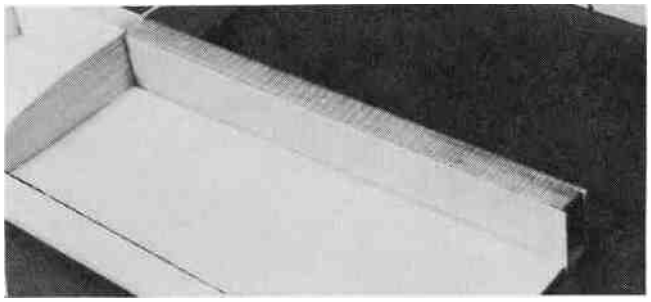
the panel and mark approximately 1/32" in front of it. Now cut along this line and the spar to remove a 3/32" wide strip of wood from the root of the panel to the first W2S rib. Scrape off any glue or balsa wood thai may still be on the spar with the back edge of an Xacto knife. **IMPORTANT** - Be sure to get the edge of the spar "clean" as a good glue joint between the spar and the joiner box side is very important.



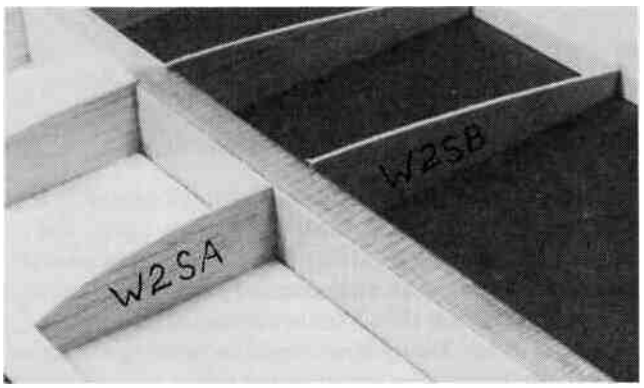
DD 17. Test fit the joiner box sides in place. **One** side should be installed on the front of the spars and the other on the back. Notice that one end of the side is slanted at a 3-1/2 degree angle. This end must be at the wing centerline. The "long" edge of the side should be at the bottom. Use the **C1 Clamps** (SPT 1 W22) to hold the sides in place and test **tit the wing joiner into** the **box formed.** This "box" will be referred to as the **"joiner box".** The spars should fit snugly down on the wing joiner, but make sure the joiner is not holding the spars above their normal **position.** If it is remove the joiner and sand it until it fits correctly.

DD 18. Remove the clamps and the joiner and apply a bead of epoxy along the spar edges. Install the joiner box sides and hold them in place with the C1 clamps. A good glue joint is important here but be careful not to get any excess glue inside the box formed by these sides. Insert the joiner into the box and then remove it a couple of times to scrape any excess glue out of the box. Wipe any glue off the joiner before it cures.

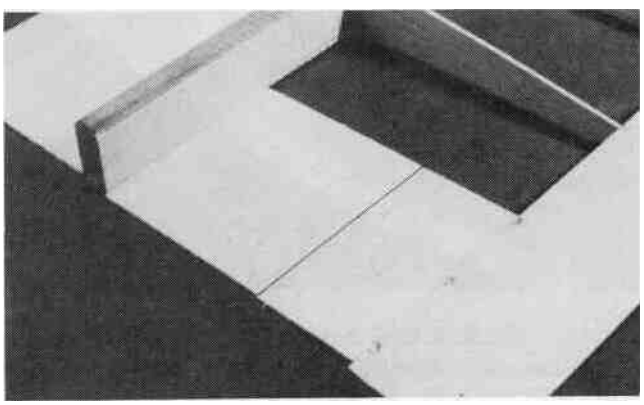
DD 19. Sand the edges of the joiner sides to remove any sharp comers or glue globs. Wrap the entire joiner box with a strong thread (2 - 4 lb. fishing line works well). The thread should



be tightly wrapped and closely spaced near the root end but it can be spaced farther apart as you get closer to the W2S rib Do not allow the thread to overlap or it will build up in thickness and the top sheeting will not seat properly on the spar When finished wrapping, soak the entire thread with CA **HINT -** It will take at least 15 feet of thread to properly wrap each joiner box

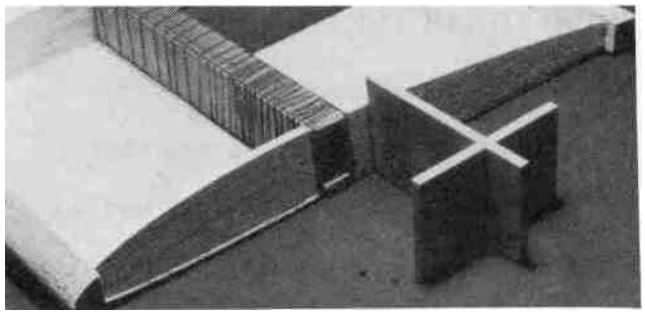


D D 20 With the wing panel over the plans for reference, glue **W2SA** and the **W2SB** (SPT1W04) in place



DD 21. Locate the "odd" (see p10, step 2) **1/16" x** 3" **x** 30" Balsa Sheet (SPRTW20) and cut off three pieces 3" long Slide one of the sheets in place behind the joiner box and glue it in place with med or thick CA Cut another piece to fit between the first sheet and the TE and glue it in place Save the remaining pieces for the other wing panel

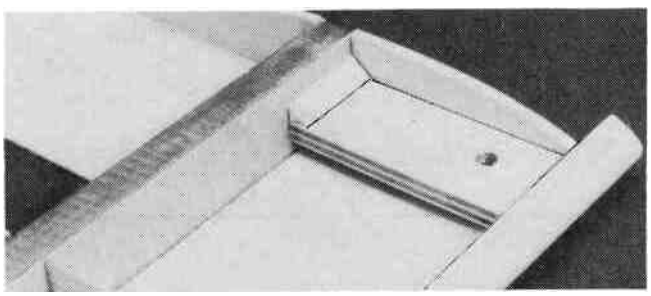
D D 22 Punch out three **W1SA** ribs and three **W1SB** ribs (SPRTW01) and test fit the end W1SA and W1SB ribs into position A little sanding may be necessary to make them fit properly They should be tilted in (towards the tip) at the top using the slanted end of the rib gauge to achieve the correct angle Glue



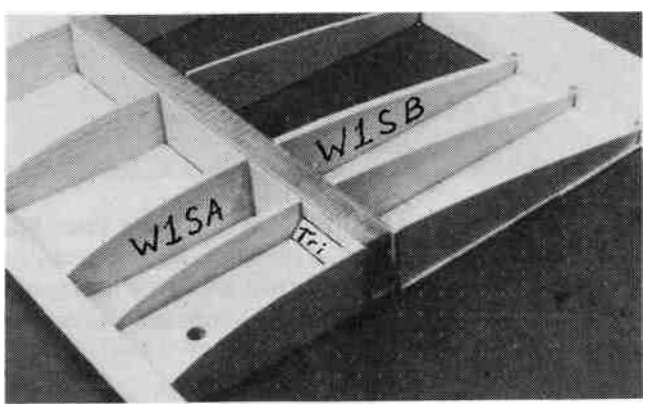
these ribs into place NOTE: **If you are going to install spoilers, you should drill 1/8" holes in the remaining W1 SB ribs for the tubing before gluing them in place.**

D D 23 Position the 1/4" xl-l/8" x 2-7/8" Ply Front Wing Bolt Plate (SPT1W27) next to the template on the plan Use the measurements given to mark where to drill the hole Drill a 13/64 hole at the mark Notice that the hole is off-center

SKIP THIS STEP IF YOU ARE BUILDING A RUBBER BAND ON WING.



D D 24 Test fit the front wing bolt plate in place against the W1SA rib It should be centered up and down on the LE and it should be parallel to the work surface, with the hole off-center towards the root of the wing Sand it if necessary to achieve a good fit between the LE and the joiner box When satisfied with the fit, securely glue it in place with either med or thick CA or epoxy Add 1/4" balsa triangle along the spar and a Fillet of glue along the LE.



D D 25 Glue the remaining **W1SA and W 1 SB** ribs in place The second W1SA should be against the wing bolt plate Glue the bottom sheeting to each of these ribs and cut off any excess sheeting, spars, LE, or TE flush with the end W1S rib

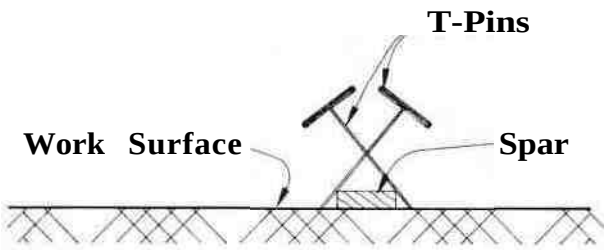
BUILD THE OUTER WING PANEL

You'll need the following parts:

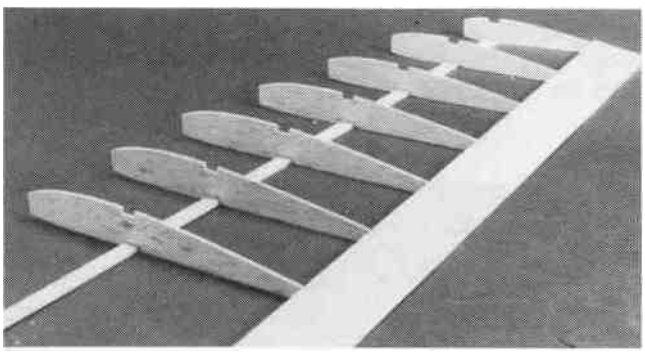
SPT1W03	1/16" Balsa DC Wing Ribs - W4S, W6S, W7S, W9S
SPT1W04	1/16" Balsa DC Wing Ribs - W2SA **& B,** W5S,W8S,W10S
SPT1W13	1/8" x 3/8" x 23-1/2" Basswood Outer Spars
SPT1W14	Shaped Balsa Leading Edge
SPT1W16	11/32" Balsa Notched Outer Trailing Edge
SPT1W23	7/8" Shaped Balsa Wing Tip Block

D D 1. Lay one of the **Balsa Outer Trailing** *Edges* (SPT1W16) in place over the plan. Align the notches in the trailing edge with the notches on the plans and pin it in position.

NOTE: The excess TE will later be cut off and used to make the spoiler.

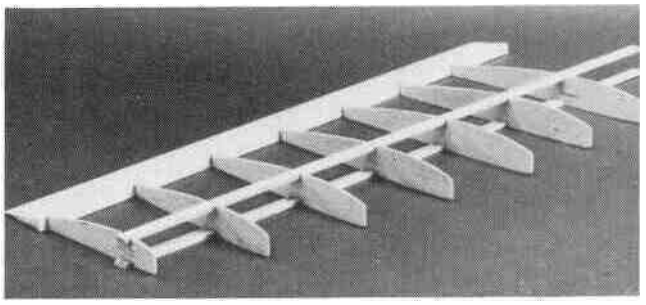


D D 2. "Cross pin" one of the 1/8" x 3/8" x 23-1/2" **Basswood Outer Spars** (SPT1W13) in place.

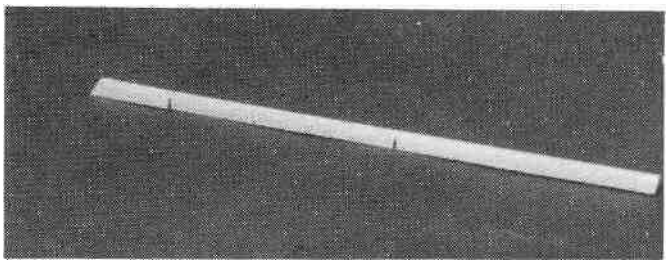


D D 3. Locate the **1/16"** (W4S - **W10S) Outer Panel Ribs** (SPT1W03 & SPT1W04). Glue the ribs in place with med. or thick CA at the spar Joint and a drop of thin CA at the trailing edge joint. Use the rib gauge to keep the ribs perpendicular to the work surface.

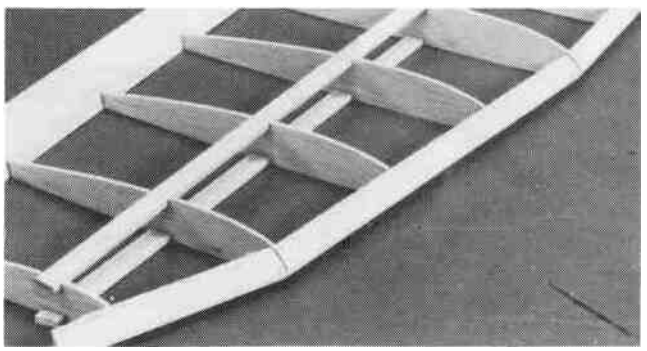
D D 4. Trial fit the Top 1/8" x 3/8" x 23-1/2" Basswood Outer Spar (SPT1W13) in place by carefully pressing the spar



into the notches until it is flush with the top of the ribs. Remove the spar and apply med or thick CA to the notches. Replace the spar and allow the glue to cure.

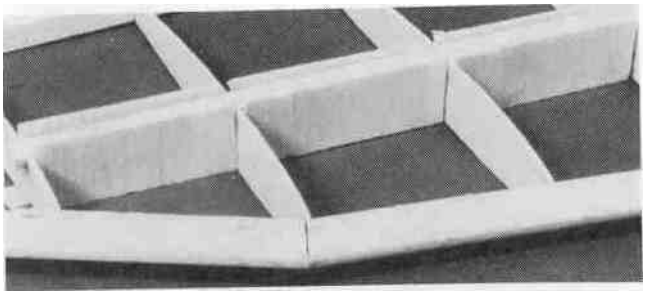


D D 5. Lay a **Pre-Shaped Balsa Leading Edge** (SPT 1 W! 4) over the LEADING EDGE TEMPLATE on the plans. Use this drawing as a reference to cut the relief notches. **It** is a good idea to **cut the leading** edge **approximately** 1/4" longer on both **ends** to be on **the** safe side. It can be trimmed to the correct Ie n g th after it is installed. The relief notches do not need to go all the way through the leading edge but should go within 1/8" of doing so.

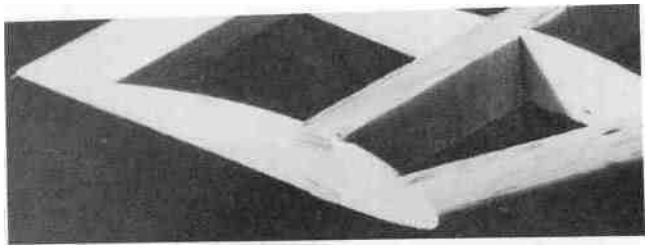


D D 16. Carefully bend the leading edge to the angle shown on the plans and position it against the ribs. The bends should be at ribs W6S and W9S. Align the leading edge with the ribs and glue it in place, just as you did for the inner panel, except start at ribs W6S and W9S. Add med. or thick CA to each relief notch to fill in any gaps.

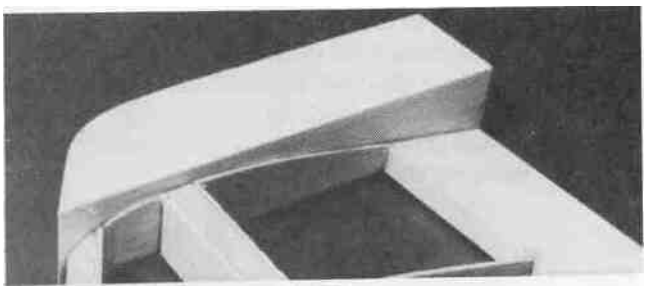
D D 7 With the panel flat on the work surface, install me 1/16" Shear Webs (SPT 1W24), following the same procedure as **you** did on the inner panel. The webs will extend past the top spar



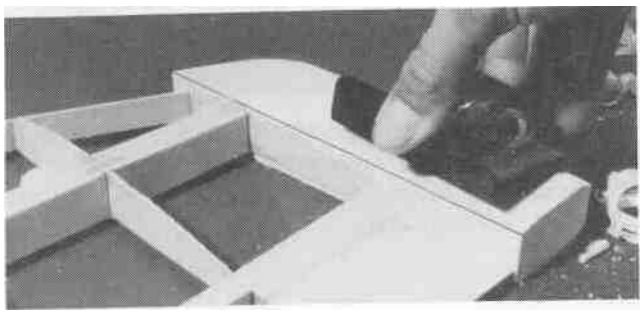
but just trim them flush with the spars and sand the edges round so they do not make a ridge when the covering is applied.



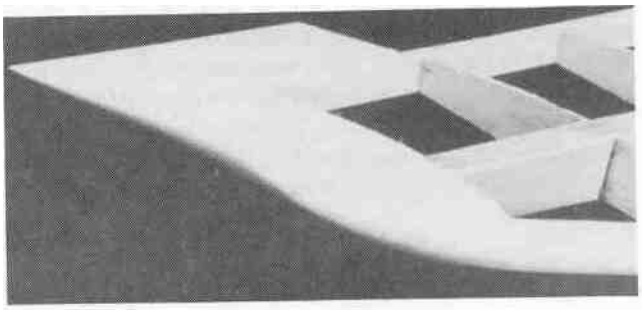
DD 8. Cut and sand the trailing edge, spars and leading edge flush with rib W10S. Set the panel down on the plan and cut the root end of the spars, LE and TE to the correct length. Save the scrap piece of TE to use as a spoiler if needed.

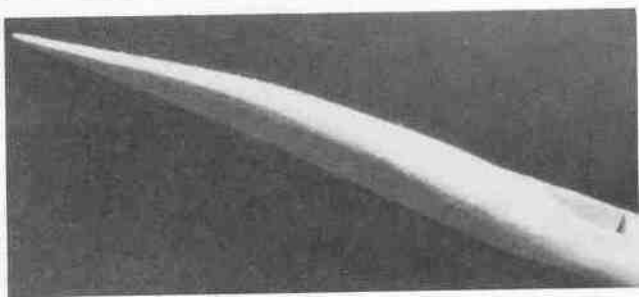


DD 9. Glue the 7/8" Balsa Wing Tip Blocks (SPTlW23) to W10S with med. or thick CA. Line up the front of the tip block with the front of the LE and allow the excess to extend past the TE.



DD 10. Carve and sand the wing tip to blend in with rib W1OS and the TE. Be careful not to change the shape of W10S while sanding the tip. There are three section views on the left wing plan

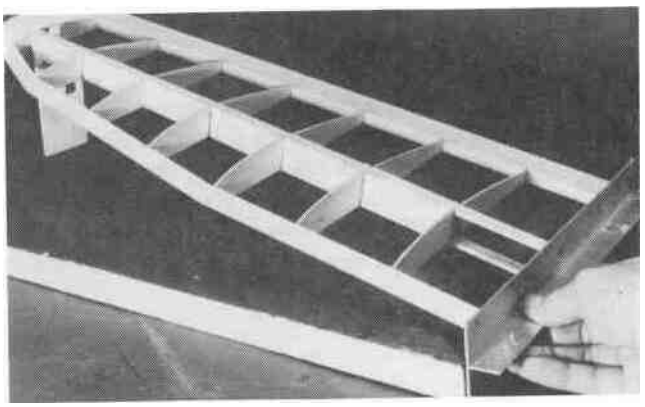




and the above photos to show you the recommended shape. **CAUTION - Do not sand the TE of the tip to a very thin edge or it will get damaged very easily. It is best to leave it** 1/32" **-1/16" thick.**

D D 11. Apply several drops of thin CA to the rear portion of the balsa wing tip. Allow the glue to soak into the wood and cure. The glue will help harden the wood and protect it from damage.

JOIN THE INNER AND OUTER WING PANELS

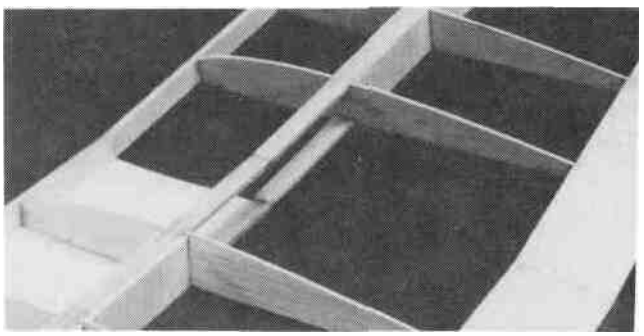


D D 1. Prop up the outer wing panel 3-1/2" (from the work surface to the bottom of the spar at W10S), using the top notch in the Dihedral Gauge (SPT1W22) between ribs W9S and W10S. Move the dihedral gauge if necessary to get the correct

measurement at rib W10S. Use a sanding block to carefully sand the leading edge, spars and trailing edge to achieve vertical surfaces on each. Check your progress by occasionally setting the panel on the plans to make sure you are not sanding any "sweep" (forward or backward tilt) into the wing. HINT- Set the panel on an "elevated" building surface an inch or so above the work surface and use the edge of the elevated surface to hold the sanding block perpendicular to the work surface as shown in the photo.

D D 2. With the **inner panel** flat on the work surface, sand the leading edge, spars and trailing edge so they are all even and of the correct length.

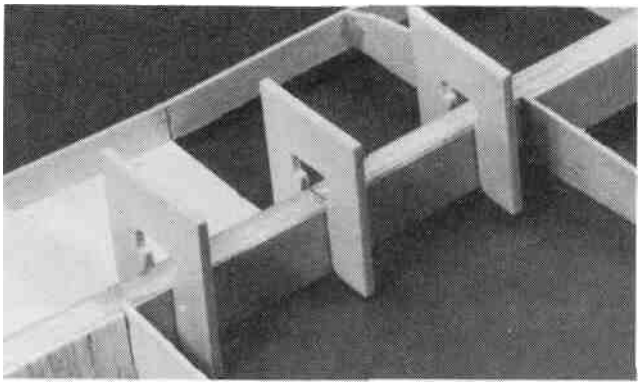
D D 3. Test fit the inner and outer panels together over the plan to make sure the leading edges, spars, and trailing edges all meet up nicely when the tip panel is blocked up the required 3-1/2" (at the bottom of rib W10S) with the dihedral gauge. Sand any ends if needed to make everything fit well.



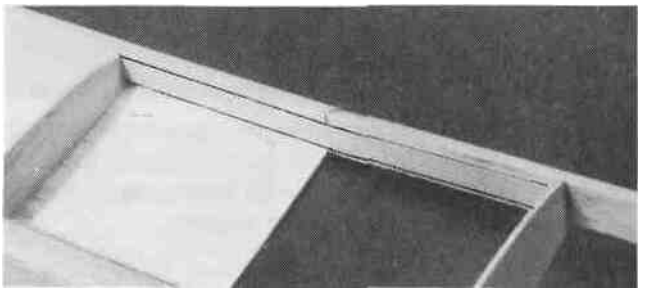
D D 4. With the dihedral gauge in place, Apply med. or thick CA or epoxy to the leading edge, trailing edge and spar joints to "tack glue" the two panels together. Hold everything in place until the glue has cured.

D D 5. Cut the balsa bottom sheeting away (1/32") from the front of the inner panel spar to clear the polyhedral brace. The cut should start at the last W2S rib and continue to the end of the spar. Punch out two of the 1/32" **Die-Cut Ply Polyhedral Braces** (SPT1W10) with an "S" embossed on them and test fit them in place against the front and back of the spars. Sand them if needed to achieve a good fit.

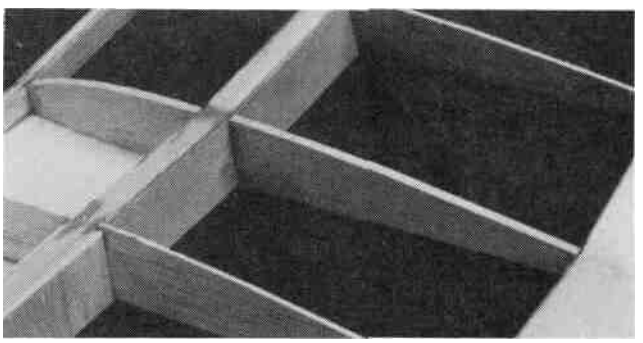
D D 6. When satisfied with the fit, apply a generous bead of epoxy or med. or thick CA to the spars and install the braces on



both sides of the spars. Use the die-cut C2 **clamps** (SPT1W22) to hold everything in place. Wipe off any excess glue before it cures.

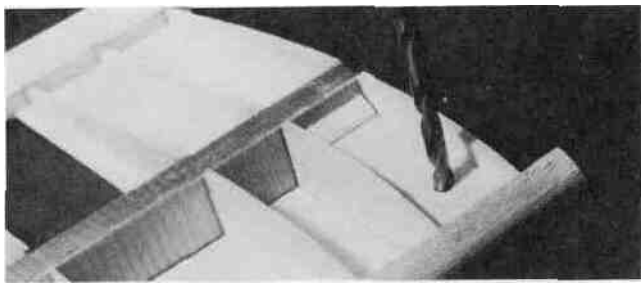


D D 7. Locate the two 1/32" **Die-Cut Ply Leading and Trailing Edge Braces** (SPT1W10) that were next to the polyhedral braces you used earlier. Test fit them in place and sand them if needed to make them fit between the rib W2S and W4S. The LE brace should be at least 1/16" below the top of the LE to allow for the 1/16" top sheeting, which will be added later. Glue them in place with med. or thick CA. If the TE brace extends above or below the surface of the TE, sand it flush.



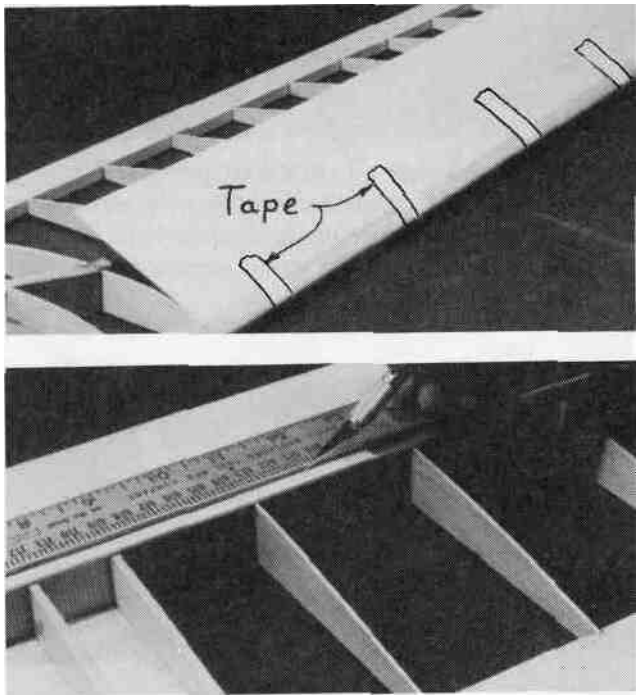
D D 8. Install ribs **W3SA** and **W3SB** (SPT1W02) between the inner and outer panels using med. or thick CA. A little sanding may be necessary to achieve a good fit. Use the rib gauge to tilt the ribs to the proper angle.

D D 9. Drill a 13/64" hole down through the hole in the front wing bolt plate and through the 1/16" bottom sheeting. Lightly



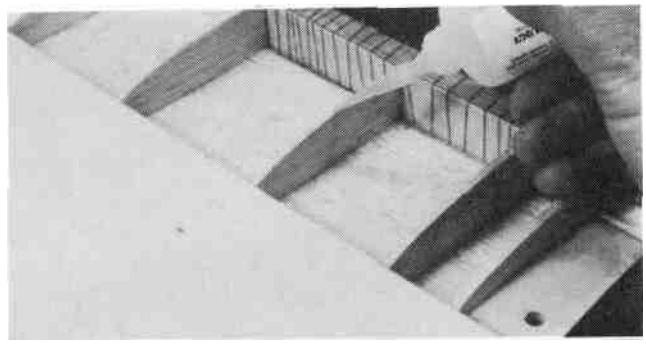
sand the tops of the inner panel ribs and the spar to remove any glue globs or uneven places.

DD 10 Checktomakesureoneedgeofthel/16"x3-l/2"x **30" Balsa Top Leading Edge Sheeting** (SPT1W25) is straight, and if not, cut it straight using a metal straight edge.



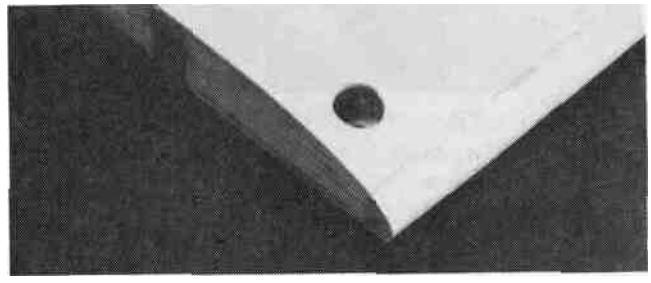
D D 11. Position the 1/16" sheeting in place so the straight edge is against the leading edge and one end is covering W3SA Apply several strips of masking tape to hold it in place and act as a hinge lor the gluing process Press the sheeting onto the ribs and trim it flush with the back edge of the spar using a modeling knife and straight edge Be careful not to cut into the thread when cutting near the root of the panel Save the scrap of sheeting for later

D D 12. Lift the sheeting up and apply a bead of med or thick CA along the top of each rib and along the top spar Quickly press the sheeting down into place and hold it until the glue has cured Keep the sheeting pressed against the ribs and the spar while the glue cures A **straight** strip of wood the length of the panel, can be a big help when trying to hold the sheeting down evenly You



can put weights on the strip of wood if needed CAUTION • It is important to keep the wing flat and warp-free during this step!

D D 13 Apply thin CA between the pieces of masking tape along the leading edge Remove the tape and apply thin CA where the tape was



D D 14 Drill a 13/64" hole up through the hole in the wing bolt plate and through the 1/16" top sheeting Enlarge the hole in the **top sheeting** to approx 5/8 diameter so the head of the wing bolt will pass through

IF YOU ARE NOT INSTALLING SPOILERS, SKIP TO STEP 23

D D 15 Cut one 8" long spoiler from the un-notched scrap end of each Outer Panel Trailing Edge (SPRTW12) Cut four pieces of 3/16 x 1/4 balsa 1-1/2 long and two pieces 1" long from the 3/16" x 1/4" x 24" Balsa Spoiler Bay Frame (SPT1W26) Also cut two pieces of 1/16" x 1/8" Balsa 8-1/16" long from scrap 1/16" sheeting.

D D 16 Glue the **1/16" x** 1/8" x 8-1/16" piece of balsa to the back edge of the sheeting, between the W2S ribs as shown in the

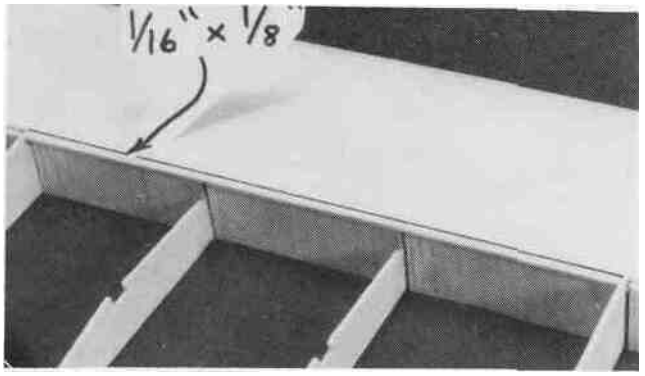
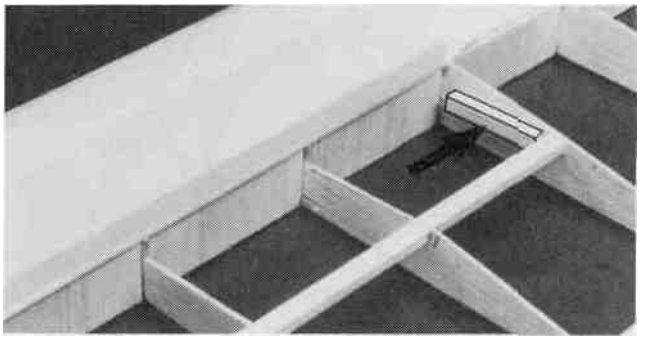
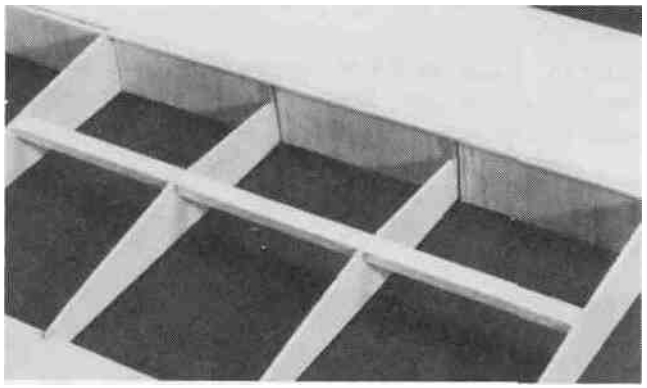


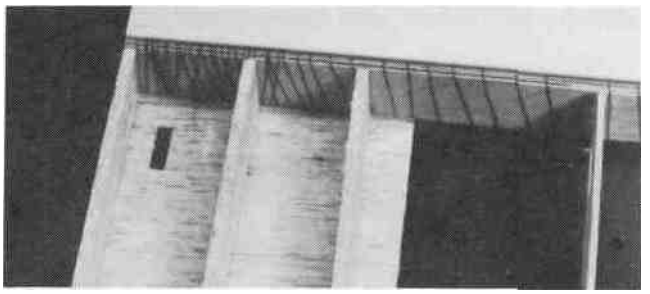
photo. It should be flush with the top of the leading edge sheeting.



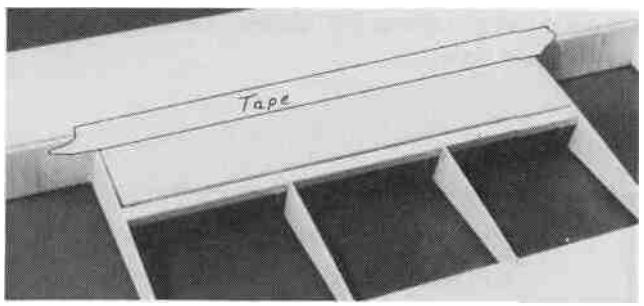
to hold the spoiler about 1/32" above the surface of the wing and then sand the spoiler to match the contour of the wing surface.



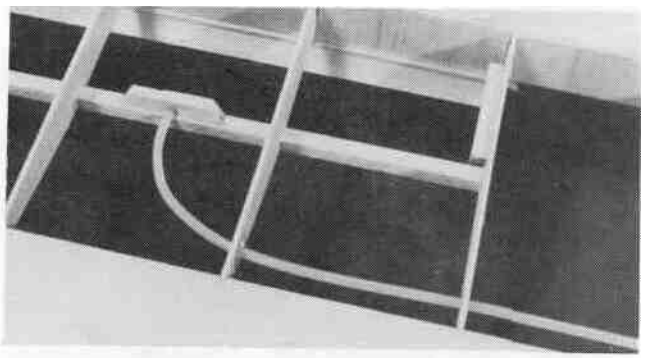
DD 17. Cut a piece of 3/16" x 1/4" Balsa (SPT1W26) to fit between the W2S ribs (approx. 8-1/16" long). Glue the strip of balsa in the notch on the W2SS ribs. It should be glued to the W2S ribs at its ends and be flush with the **TOP** of the ribs.

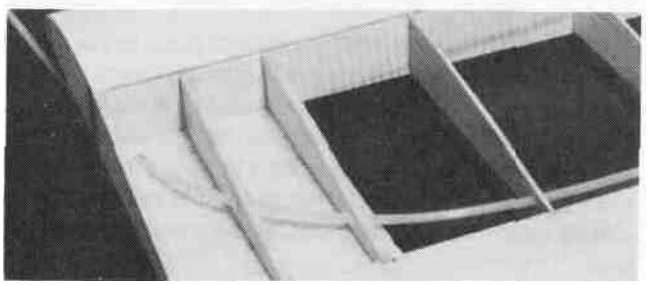


D D 20. If you are using the spoiler setup shown on the plans, the spoiler tube should exit the bottom of the wing just behind the wing joiner box, between the first and second W1BS ribs. Drill a 1/8" hole in the bottom center section sheeting for the tube.



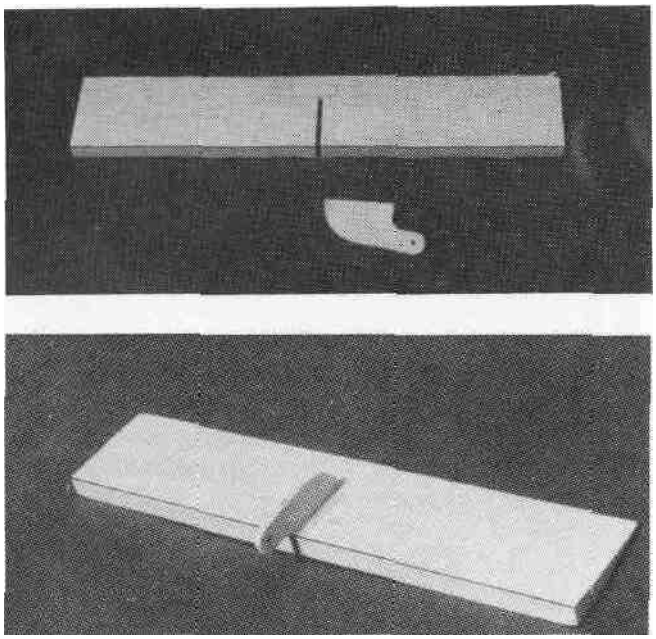
D D 18. Test fit the spoiler in the "bay" and sand it if necessary to achieve a 1/32" gap around the sides and trailing edge. Use a strip of masking tape to temporarily hinge the spoiler along the 1/16" x 1/8" strip of balsa.



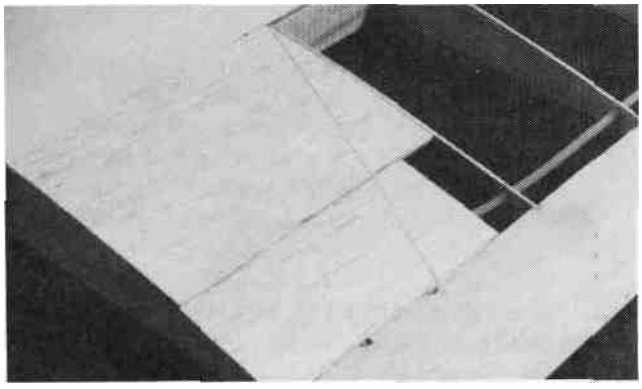


DD 21. Slide a 1/8" diameter nylon tubing (inner pushrod tube or antenna tube, not included) through the holes in the ribs. Cut a 1/8" wide, 1/8" deep notch in the middle of the **3/16" x** 1/4" x 1" piece of balsa and glue it to the bottom of the 3/16" x 1/4" x 8-1/16" piece, trapping the end of the spoiler tube in the notch as shown in the photo. The nylon lube should extend past the LE approximately 4" to help get the spoiler string to the servos in the fuse. Glue the tube to each rib and the bottom sheeting using med. or thick CA.

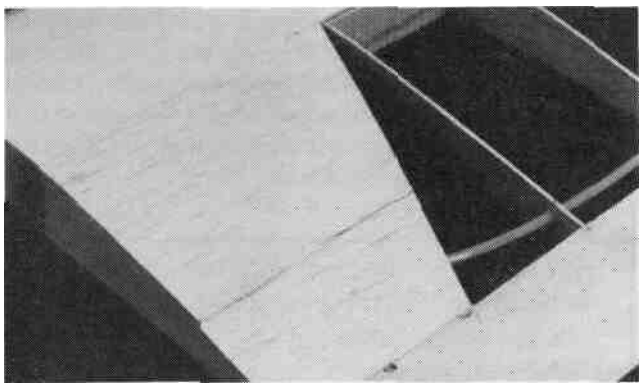
D D 19. With the spoiler in place, glue the **3/16" x** 1/4" x 1-1/2" pieces of balsa to the W2S ribs. These are the spoiler rests and should be positioned so they hold the spoiler flush with the top surface of the wing. **NOTE: It is important that the spoiler sit flush with the top of the wing or it will disrupt the airflow over the wing.** If you desire, you can position the 1-1/2" pieces



D D 22. Drill a 1/16" hole in each **1/16" Die-Cut Ply Spoiler Horn** (SPT1W11) at the indentation. Cut a 1/16" wide slot in the spoiler for the spoiler horn using a razor saw (a hack saw blade will also work fine), and glue the horn in place. It should be flush with the top surface of the spoiler as shown on the plans. This completes the assembly of the spoilers until after the wing is covered.

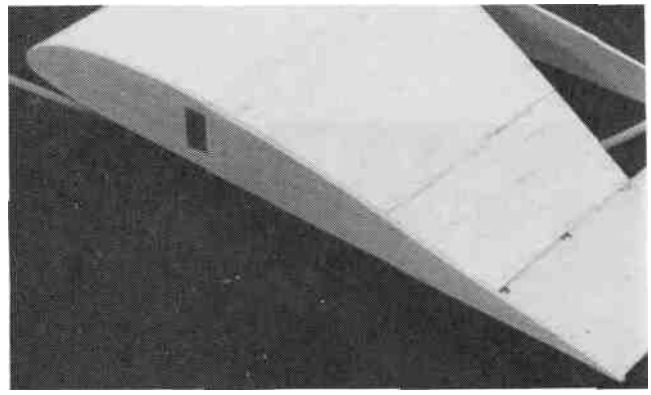


DD 23. Cut a 4" and a 5" piece of l/16" balsa sheeting to sheet the top inboard center section out to rib W2BS, as shown in the photo. Med. or thick CA should be used for this step. Glue the 5" piece near the spars, and cut the 4" piece to fit between the first piece and the trailing edge.

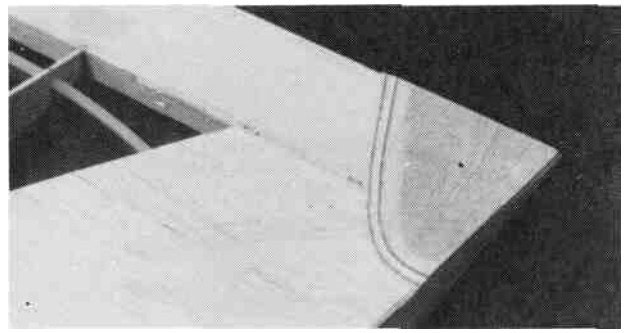


D D 24. Cut the sheeting off at an angle from the front of W2BS to approx. 1/4" out from the rear of W1BS as shown on the plans. Sand the sheeting flush with the **W1BS** rib at the wing root. (The photo for this step is at the bottom of the last column)

D 25. Now go back to page 9 and assemble the other wing panel.



D 26. Trial fit the two wing halves together using the wing joiner. Sand the root of each panel, if needed, to achieve a nice close joint between the two wings. If there are large gaps, fill them with scrap balsa or filler. Glue the 1/16" **Balsa Wing Root Caps with an** "S" (SPT1W21) to the root of each panel.

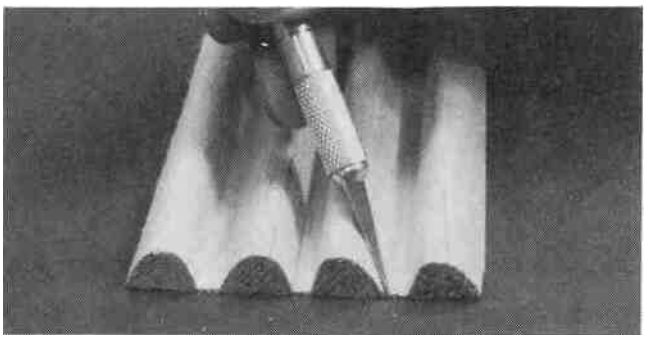


D 27. Make sure you can see the pinpoint punch on the top of a **1/16" Ply Rear Wing Bolt Plate** (SPT1W11). If not, stick a pin through the punch mark. Sand the "outside" **top** edges of the rear wing bolt plate to a taper as shown in the photo. Glue each one in place so the rear is flush with the back of the TE and the side is flush with the root cap. Sand the inside edge to match the dihedral angle of the root cap.

D 28. This completes the SPORT wing assembly so skip to page 34 to FUSELAGE ASSEMBLY.

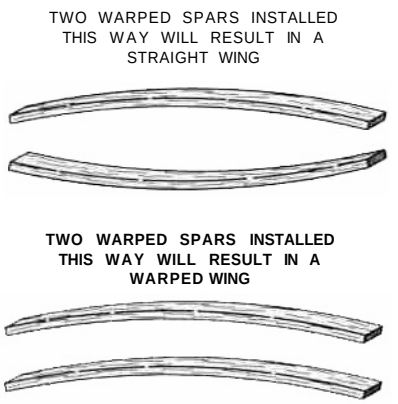
ADVANCED WING ASSEMBLY

D 1. Tape the plan to your flat work surface and cover the wing drawing with waxed paper. NOTE: If your work space is limited, you may cut the wing drawings apart from the rest of the plans.

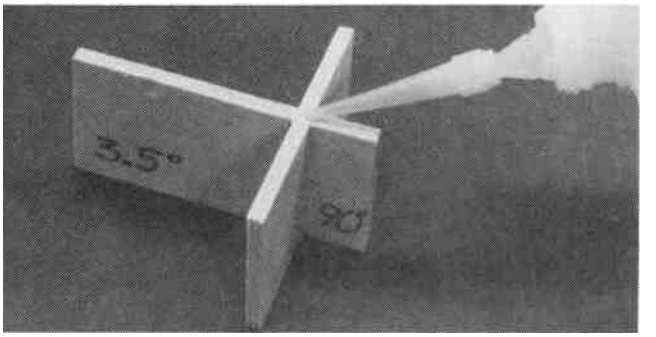


D 2. The Shaped Wing Leading Edges (SPTlW14) are fastened together.

Cut **between** the LE'S, with the knife resting against the LE as a guide. Do not cut vertically at the edge of the LE or it will end up to narrow. Allow the cut to follow the cross sectional shape of the LE. Sand away any excess balsa that remains along the edges using a sanding block with 100-grit sandpaper, but do not "square off" the edges.



D 3. Before using the 1/8" x 3/8" Basswood Spars, examine them carefully for possible imperfections. Look for knots, soft spots, diagonal grain and any other imperfections. If possible, position each spar so the imperfections are on the outer half of the wing panel (toward the tip), where they will be least affected by high stress. If the spars are warped slightly, "balance them out" by installing the warped spars in opposite directions (see sketch).



D 4. Punch out the two Rib Gauge Pieces (SPT1W22) and assemble them using CA. Notice that one end of the gauge is slanted at a 3-1/2 degree angle for positioning the end ribs. The other 3 ends are perpendicular and can be used to keep parts 90 degrees to the work surface.

BUILD THE INNER WING PANEL

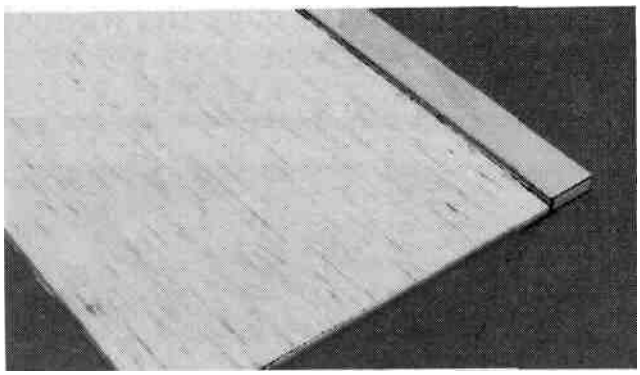
You'll need the following parts:

SPT1W05	1/16" Balsa DC Wing Ribs - W2
SPT1W06	1/8" Balsa DC Wing Ribs - W1, W3
SPT1W07	1/16" Balsa DC Wing Ribs - W4, W6, W7,W9
SPT1W08	1/16" Balsa DC Wing Ribs - W2A & B, W5,W8,W10
SPT1W12	1/8" x 3/8" x 30" Basswood Inner Spars
SPT1W14	Shaped Balsa Leading Edge
SPT1W18	3/8" Balsa Notched Inner Sub TE
SPT1W20	1/16" x 3" x 30" Balsa Wing Bottom Sheet
SPT1W22	1/8" Ply DC Clamps and Gauges
SPT1W24	1/16" Balsa Shear Web Pack (26)

D 1. Locate all the **SPT1W05, SPT1W06, SPT1W07** and **SPT1W08** die-cut rib sheets. Check to make sure you can read the embossing on each rib. If you can not, use the die patterns on page 5 to determine the rib #'s and mark the #'s on the ribs. Carefully punch out all the die-cut 1/16" Balsa Wing Ribs. Sand the edges **slightly** to remove any die-cutting irregularities.

D 2. Son through the three **1/16" x 3" x 30" Balsa Wing Bottom Sheeting** (SPT1W20) and pick out the two sheets that most closely match each other in weight and grain. These two sheets will be the bottom sheeting for the inner panels. Check to make sure the two "bottom" sheets have at least one **straight** edge. If not, use a metal straight edge to cut as little as possible off one long edge to make it straight.

NOTE: Follow the steps with two check boxes to build the RIGHT wing panel, then repeat these steps to build the LEFT wing panel.

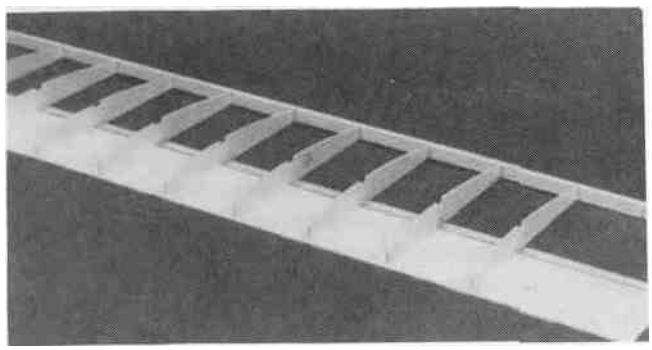


D D 3. Glue one of the "Inner Bottom" wing sheets to the edge of a 1/8" x 3/8" x 30" **Basswood Inner Spar** (SPT1W12) using the following procedure. With the spar in position on the plan, hold the straight edge of the bottom wing sheet up against it. Starting about 9 inches from the "root" end (where the first W2 rib will be positioned), add thin CA along the joint. Be sure to hold both the spar and the bottom wing sheet **flat** against the work surface while the glue cures. Glue a 5" - 6" section at a time until you get within 4" of the other end (where the last W2 rib will be installed). Do not glue the two ends yet as some of the sheeting will be cut away later.

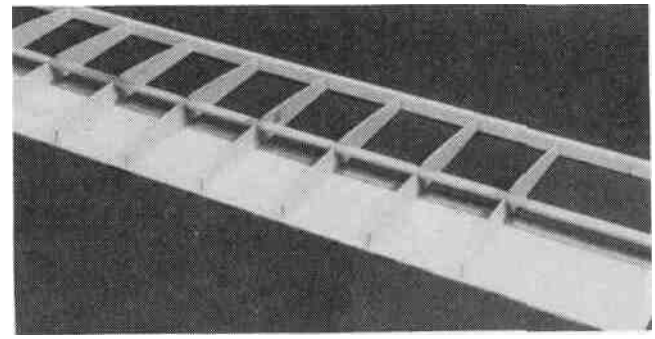
D D 4. Align the bottom spar/wing sheet assembly with the "Inner Panel" drawing on the wing plan and pin it in place. This assembly will be a little long but just center it over the inner panel drawing.

D D 5. Pin one of the **Notched Balsa Inner Sub Trailing** edges (SPTW18) to the plan, lining up the notches in the sub TE with the notches on the plan. Use a couple of W2 ribs to correctly space the sub TE behind the spar. If the notches are off a little from the plan it is due to the moisture content of the air. Just line up the root end of the sub TE and **space the ribs according to the sub TE,** not the plans.

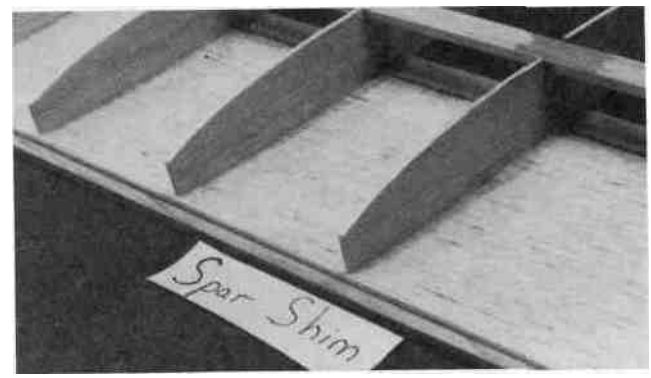
DD 6. Place the eight W-2 **ribs** (SPT1W05) on the spar in their approximate positions. Work the ribs into the notches on the trailing edge but do not glue anything yet.



DD 7. Make sure the ribs are properly positioned according to the plans and glue them to the spar using med. or thick CA. **Do** not purposely glue the ribs to the sheeting yet. Use the square end of the rib gauge to keep the ribs perpendicular to the work surface. Hold the sub TE and the first W2 rib flat against the plan and with the rib inserted fully into the notch, add a drop of thin CA to the joint. Do the same to the rest of the W2 ribs.

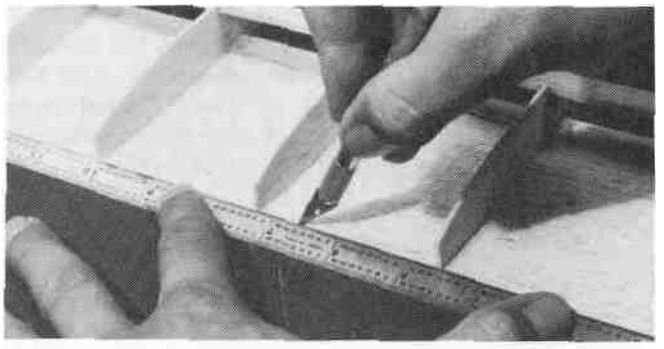


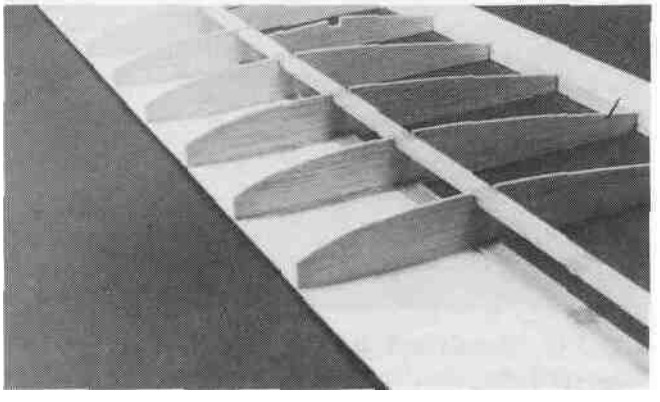
D D 8. Trial fit the **Top** 1/8" x 3/8" **x 30" Basswood Inner Spar** (SPT1W12) into the notches in the ribs by carefully pushing the spar completely down into the notches. Make sure the top spar is lined up lengthwise with the bottom spar. Remove the spar and apply med. or thick CA to the notches. Replace the spar and make sure the spar is level with the front half of the rib so the sheeting will lie flat on the spar.



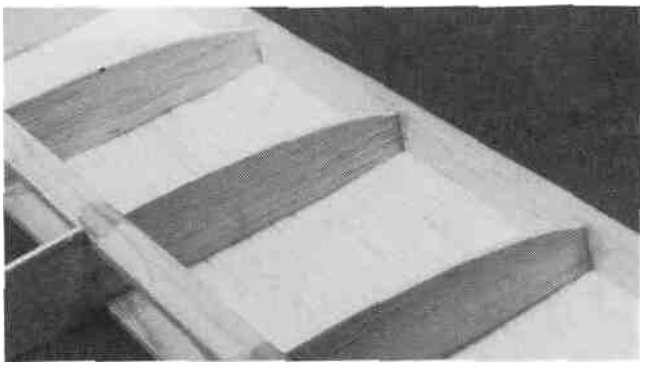
DD 9. Position a 1/8" x 3/8" x 23-1/2" Basswood **Outer** Spar (SPT1W13) under the front edge of the leading edge sheet to hold it up against the front of the rib. Use weights or pins near the spar to hold the panel flat on the work surface during this step. Apply thin CA to glue the sheeting to the ribs. The outer spar is shorter than the panel so you will have to do approx. half the ribs then move the spar down to do the rest of the ribs.

D D 10. Unpin the wing panel from the work surface and hold a metal straight edge against the front of the ribs. Allow the panel to tip up so the front edge of the sheeting is flat on the work surface and use an Xacto knife to **carefully** cut the sheeting off flush with the front edge of the ribs. Use a **sanding block** to remove any



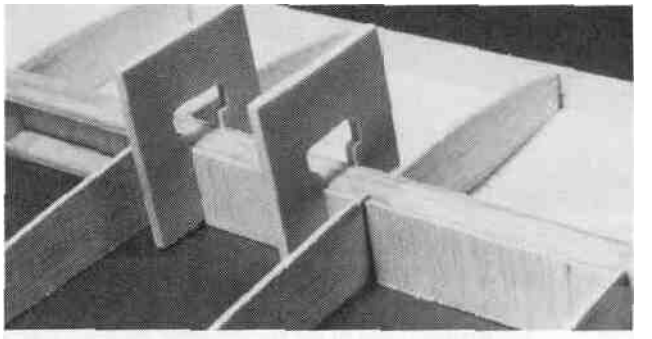


"bumps" but be careful not to sand any dips into the sheeting or sand the ribs

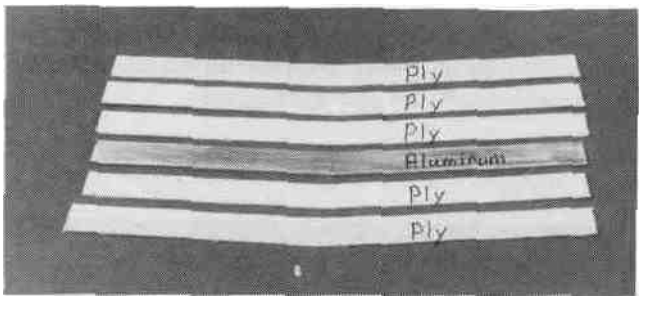


D D 11 Position a **Pre-Shaped Leading Edge** (SPT1W14) in place against the front of the ribs NOTE: **These leading edges are NOT symmetrical.** Refer to one of the section views on the plans to determine which way they should be installed Carefully hold the leading edge against one of the end W2 ribs and note it is wider than the front of the rib This is because the 1/16 balsa leading edge top sheeting will be added later Align the lower surface of the leading edge with the bottom of the lower LE sheet and glue it in place with a drop of thin CA Align the other end of the leading edge with the bottom of the opposite end W2 and glue it with a drop of thin CA Go down the line and glue the remaining ribs to the leading edge, one at a lime, so you can make sure they are aligned Make sure the LE sheeting is flush with the bottom of the LE and add CA between the ribs Do not glue the sheeting to the LE past the last W2 ribs yet

IMPORTANT - MAKE SURE THE WING PANEL REMAINS ABSOLUTELY FLAT DURING THE NEXT STEP!

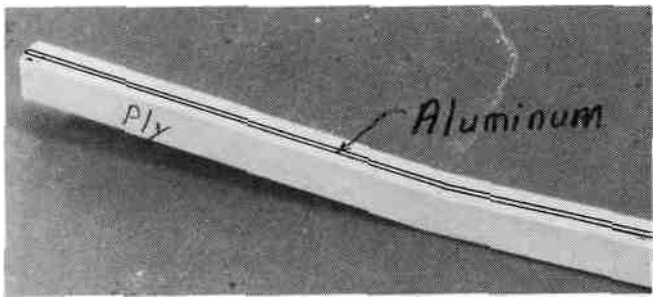


DD 12 Locate the **1/16" Balsa Shear Webs** (SPT1W24) Trial fit one of the webs in place between the second and third W2 ribs Glue the shear web in place on the back of the spars using med or thick CA The web should be pressed down against the work surface and tightly against the spars It is important to do a good job of gluing these in place as they are responsible for most of the wing's strength Also, glue a shear web to the front of the spars Because of the 1/16 bottom sheeting, the front shear webs will extend up past the top spar, but they will be trimmed off later **C-l and C-2 Clamps** (SPT1W22) can be used to help hold the webs in place while the glue cures Install the remaining balsa shear webs They continue on both the front and the back of the spar, all the way to the last W2 Rib

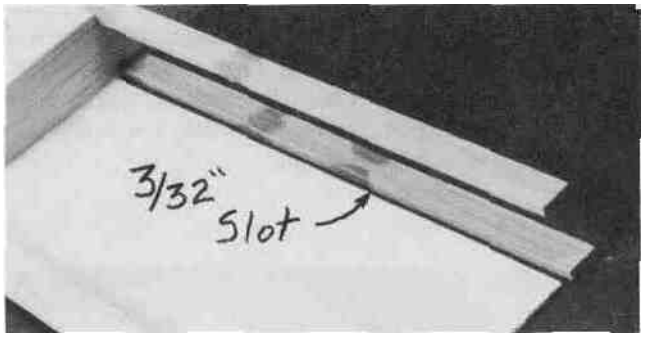


DD 13 **Punch out the five 1/16" PLY Wing Joiner Laminations** (SPT1W09) and lightly sand the edges to remove any rough spots Locate the **1/16" Aluminum Wing Joiner Blade** (ALUM008) Clean the alummum joiner with alcohol to remove any oily residue and sand each side with coarse sandpaper to scratch the surface and help the glue stick

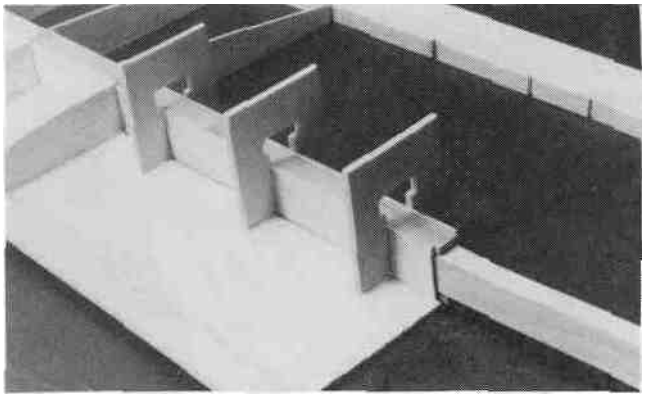
DD 14 Use either epoxy or med or thick CA to glue one of the 1/16" ply laminations to the 1/16" aluminum lamination Apply



as much pressure (clamps, clothespins, weights, etc) as possible while the glue is curing and be sure to accurately line up the two pieces Glue two more 1/16 laminations to the each side of the now 1/8 thick lamination using the same procedure

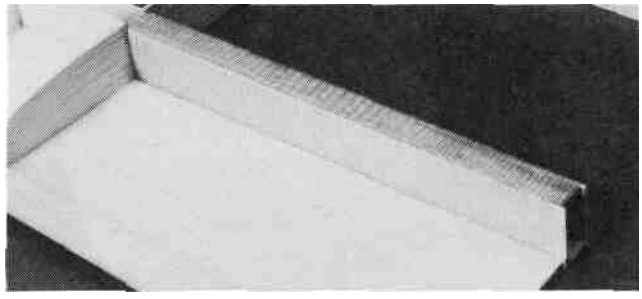


D D 15 Locate two of the **1/16" Ply Joiner Box Sides** (SPTlW11) that DO NOT have an "S" embossed on them Hold one of the sides in place on the front of the spars at the "root" (inner) end of the panel and mark approximately 1/32 in front of it Now cut along this line and the spar to remove a 3/32 wide strip of wood from the root of the panel to the first W2 rib Scrape off any glue or balsa wood may still be on the spar with the back edge of an Xacto knife **IMPORTANT** - Be sure to get the edge of the spar "clean" as a good glue joint between the spar and the joiner box side is of utmost importance

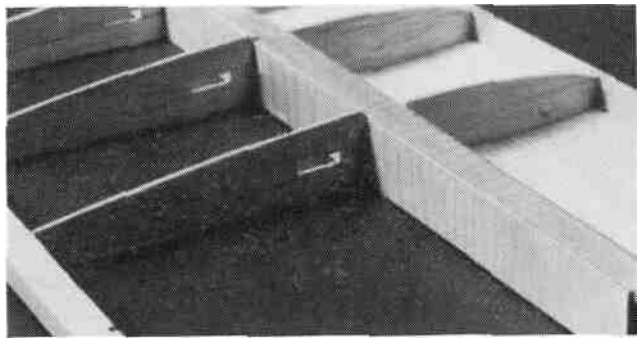


DD 16 Test fit the two joiner box sides in place One side should be installed on the front of the spars and the other on the back Notice one end of the side is slanted at a 3-1/2 degree angle The "long" edge of the side should be at the bottom Use the C1 clamps (SPT1W22) to hold the sides in place and test fit the wing joiner into the box formed This "box" will be referred to as the **"joiner box"** The spars should fit snugly down on the wing joiner but make sure the joiner is not holding the spars above their normal position If it is, remove the joiner and sand it until it fits correctly

D D 17 Remove the clamps and the joiner and apply a bead of epoxy along the spar edges Install the sides and hold them in place with the C1 clamps A good glue joint is imporiant here but be careful not to gel any excess glue inside the box formed by these sides or the wing joiner will not fit inside Insert the joiner into the box and then remove it a couple of times to scrape any excess glue out of the box Wipe any glue off the joiner before it cures

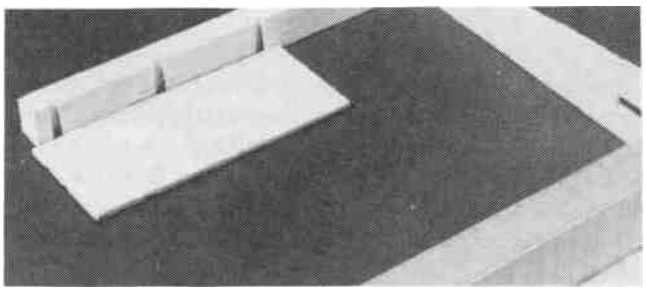


D D 18 Sand the edges of the joiner box sides lo remove any sharp comers or glue globs Wrap the entire joiner box with a strong thread (2 4 lb fishing line works well) The thread should be tightly wrapped and closely spaced near the root end, but it can be spaced farther apart as you get closer to the W2 rib Do not allow the thread to overlap or it will build up in thickness and the top sheeting will not seat properly on the spar When finished wrapping, soak the entire thread with CA **HINT** - It will take at least 15 feet of thread to properly wrap each joiner box

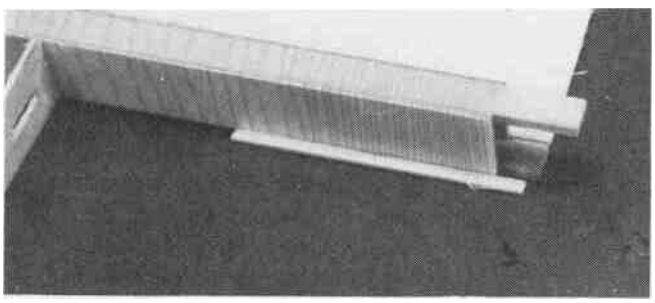


D D 19 With the wing panel over the plans for reference, glue **W2A** and the **W2B** (SPT1W04) in place

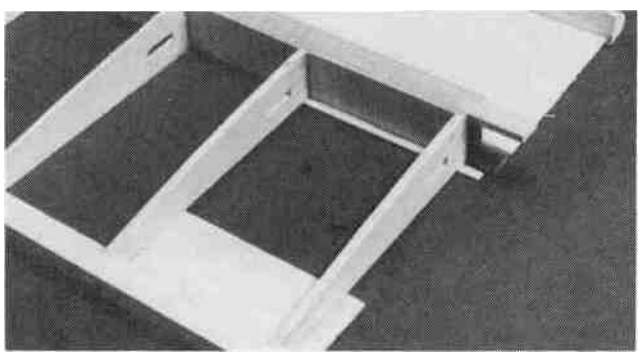
FOR LEFT WING PANEL ONLY - SKIP TO STEP 21 WHEN CONSTRUCTING THE RIGHT WING PANEL!



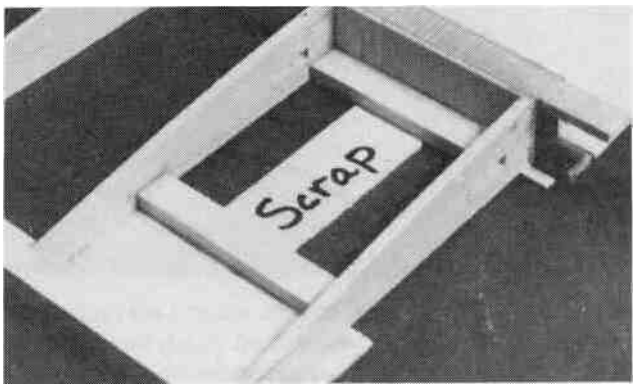
D D 20A From the remaining **1/16" x** 3" **x** 30" Balsa Wing Sheet (SPT1W20), cut a piece 1" wide and 3" long Align it and the wing panel with the plan and glue it to the sub TE at the root of the panel



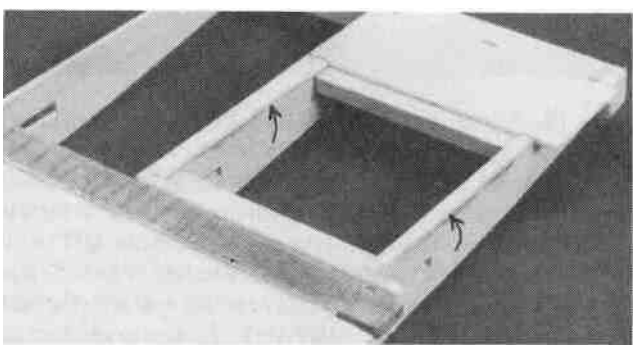
D D 20B Cut a strip of 1/16 sheeting 3/16" wide and 3" long and glue it to the back of the spar directly in front of the piece you just installed Test fit the 1/16" Die-Cut Ply Flap Servo Hatch (SPT1W11) between the two pieces of sheeting to make sure it fits If not, cut the rear piece of sheet to allow a 1/32 gap between the hatch and the sheet



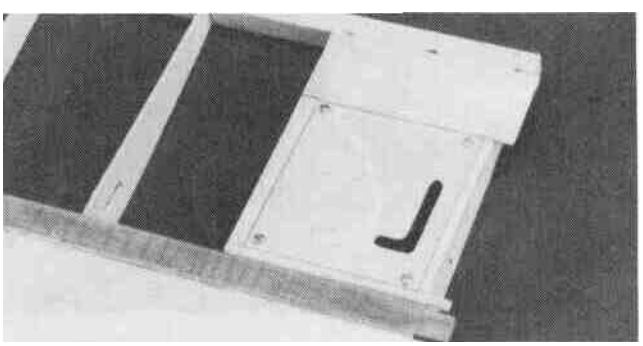
D D 20C Glue the first and third **W1B ribs** (SPT1W06) in place Use the rib gauge to tilt the first (end) rib in (towards the tip) at the top Do not install the middle W1B rib yet'



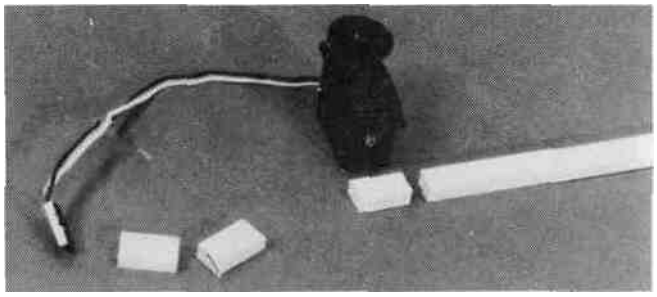
D D 20D Cm two pieces of 3/16" x 3/8" **Basswood Servo Rail** (SPT1F14) to fit belween the two W1B ribs and glue them in place on top of the 1/16" sheeting installed earlier One should be against the spar and the other should be about 1/3 of the way onto the rear piece of 1/16 sheeting Use a scrap piece of 1/16 balsa if needed, to keep the two pieces level with the bottom of the ribs while installing them Add med or thick CA to each rail where it connects to the ribs and spar



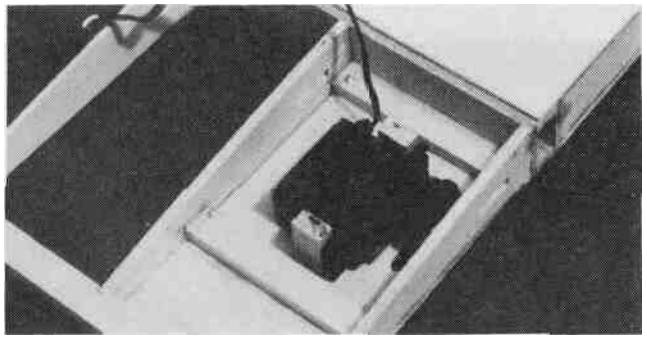
D D 20E Cut two strips of 1/16" balsa to go along the bottom of the W1B ribs One strip should be 1/8 wide and be glued to the first rib and the other should be 1/4 wide and glued to match up with the pieces of sheeting already applied



D D 20F Test fit the 1/16 Die-Cut Ply Flap Servo Hatch in place and sand it if necessary to obtain a 1/32 gap all the way around it to allow for the covering material The slot in the hatch goes towards the root of the wing Drill 1/16 holes in the four comers where the punch marks are Remove the hatch and enlarge the holes in the **hatch only** to 3/32" Attach the hatch with four #2 x 3/8 sheet metal screws.



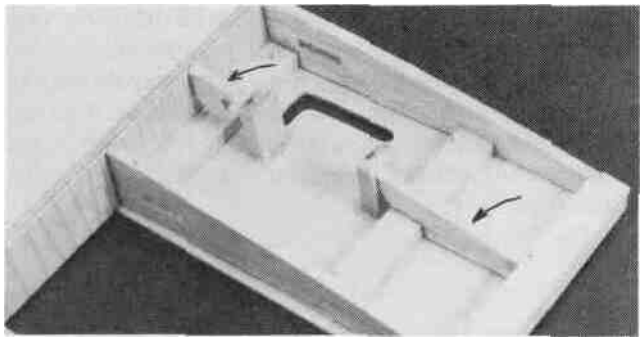
D D 20G Measure the width of your servos and cut six **Wing Servo Rails** from the 3/16" x 3/8" x 25" **Basswood Servo Rail Strip** (SPT1F14) that are as long as your servo is wide.



D D 20H. Position the flap servo so the output horn is centered in the slot. Look down the wing to make sure the servo does not extend past the lop of the W1B ribs. If it does you can move the servo forward and enlarge the slot to accommodate it. Put a drop of med. or thick CA on **one end** of two of the wing servo rails and glue them in place next to the servo mounting flanges. Remove the servo and add med. or thick CA around the rails to securely glue them in place.

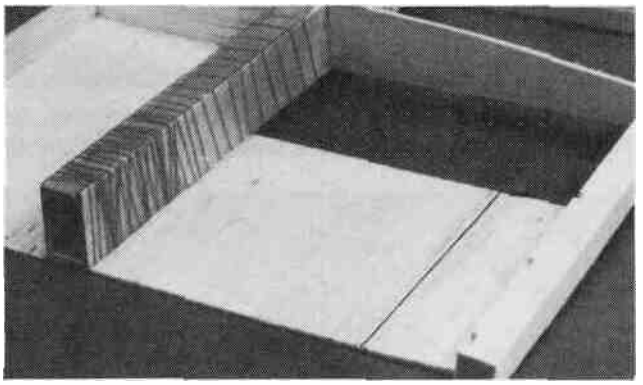
DD 201. Remove the hatch from the wing and drill 1/16" holes in the rails for the servo mounting screws and mount the flap servo **flat** against the hatch using the screws provided with the radio.

D D 20J. Replace the hatch with the servo installed and check to make sure the servo rails do not extend past the top of the two W1B ribs. If they do, sand them down until they don't.

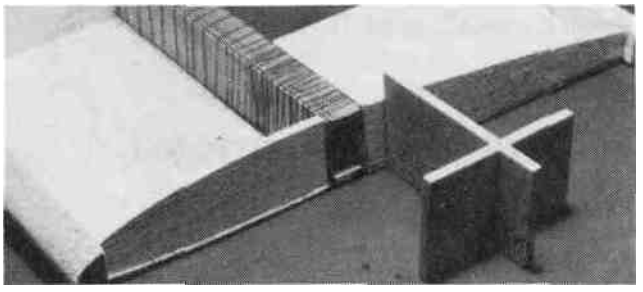


D D 20K. Cut the remaining W1B rib to fit behind the servo and glue it in place. If your installation permits, install part of the rib in front of the servo. Lightly sand the ribs to remove any high spots.

SKIP TO STEP 22 WHEN CONSTRUCTING THE LEFT WING PANEL!



DD 21. Locate one of the **1/16" x 3" x 30" Balsa Sheets** (SPRTW17) and cut off three pieces 3" long. Slide one of the sheets in place behind the joiner box and glue it in place with med. or thick CA. Cut another piece to fit between the first sheet and the sub TE and glue it to the first sheet, and the TE.

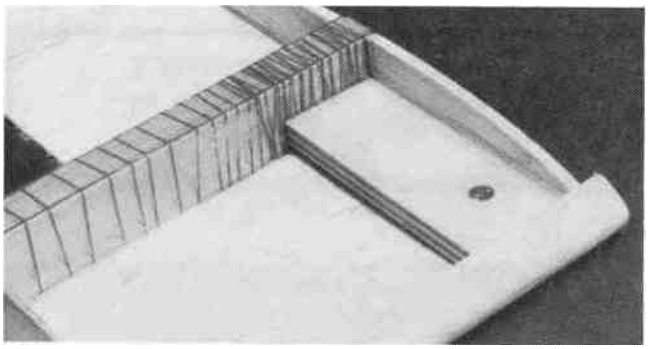


DD 22 Punch out three **W1A** ribs and three **W1B** ribs (SPT1W06) and test fit the end W1A and W1B ribs into position. A little sanding may be necessary to make them fit properly They should be tilted in (towards the tip) at the top using the slanted end of the rib gauge to give them the correct angle. Glue these ribs into place using med or thick CA. **NOTE:** The W1B ribs have already been installed on the left wing panel.

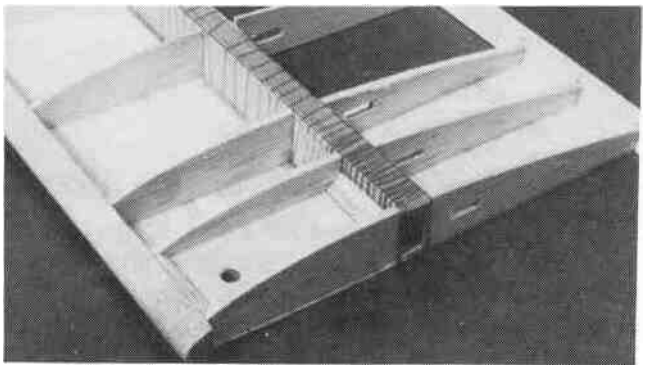
D D 23. Position the 1/4" **x 1-1/8" x** 2-7/8" Ply Front Wing Bolt Plate (SPT1W27) next to the template on the plan. Use the measurements given to mark where to drill the hole. Drill a 13/64" hole at the mark Notice the hole is off-center.

SKIP THIS STEP IF YOU ARE BUILDING A RUBBER BAND ON WING.

D D 24. Test fit the front wing bolt plate in place against the W1A rib. It should be centered up and down on the LE and it should be parallel to the work surface, with the hole off-center **towards** the root of the wing. Sand it, if necessary, to aclncve a good fit between the LE and the joiner box. When satisfied with



the fit, glue it in place with either med or thick CA or epoxy Add 1/4 balsa triangle along the spar *and* a fillet of glue along the LE



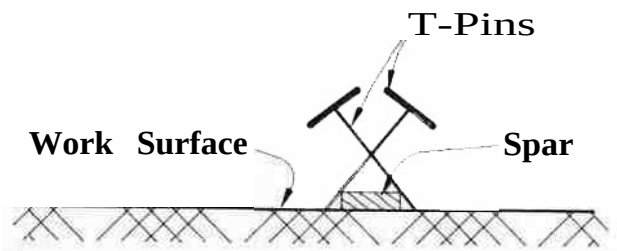
DD 25. Glue the remaining W1A and W1B ribs in place. The second W1A should be against the wing bolt plate Glue the bottom sheeting to each of these ribs and cut off any excess sheeting, spars, LE, or sub TE flush with the end W1 rib

BUILD THE OUTER WING PANEL

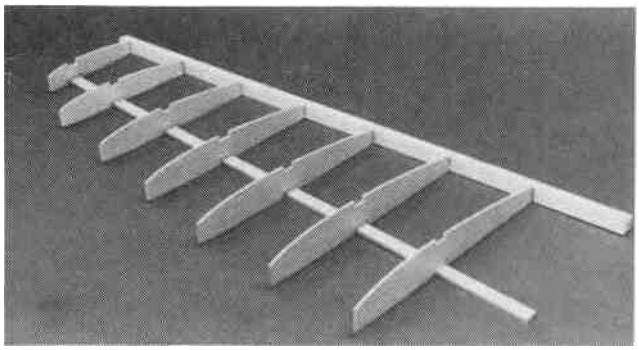
You'll need the following parts:

SPT1W07	**1/16" Balsa DC Wing Ribs - W4, W6,** W7, W9
SPT1W08	1/16 Balsa DC Wing Ribs - W2A & B, W5,W8,W10
SPT1W13	1/8" x 3/8" x 23-1/2" Basswood Outer Spars
SPT1W14	Shaped Balsa Leading Edge
SPT1W19	3/8 Balsa Outer Sub Trailing Edge
SPT1W23	7/8 Shaped Balsa Wing Tip Block
SPT1W24	1/16 Balsa Shear Webs

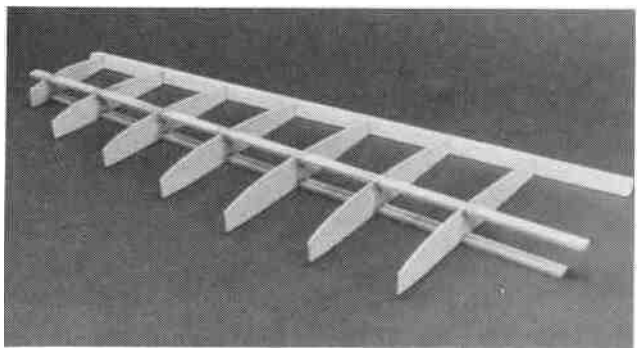
DD 1 Lay one of the **Balsa Outer Sub Trailing Edges** (SPT1W19) in place over the plan Align the notches in the trailing edge with the notches on the plans and pin it in position



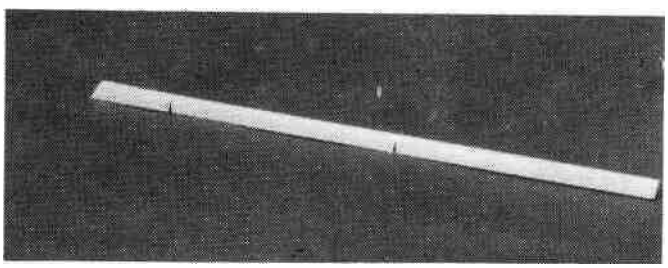
DD 2 "Cross pin" one of the 1/8" x 3/8" x 23-1/2" **Basswood Outer Spars** (SPT1W13) in place.



DD 3 Locale the **1/16" (W4 - W10) Outer Panel Ribs** (SPT1W03 & W04) and position them on the spar Glue the ribs in place with med or thick CA at the spar joint and a drop of thin CA at the sub TE joint Use the rib gauge to keep the ribs perpendicular to the work surface

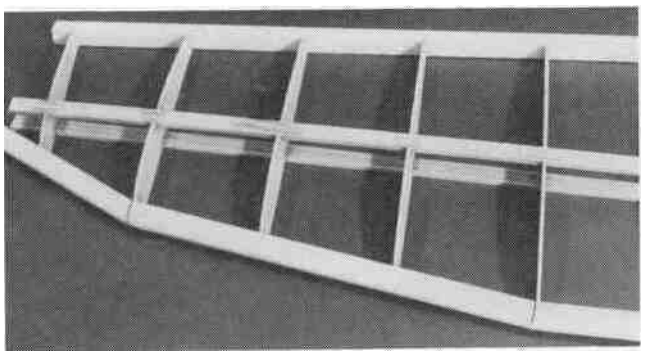


DD 4 Trial fit the **Top** 1/8" x 3/8" x 23-1/2" **Basswood Outer Spar** (SPT1W13) in place by carefully pressing the spar into the notches until it is flush with the top of the ribs Remove the spar and apply med or thick CA to the notches Replace the spar and allow the glue to cure.

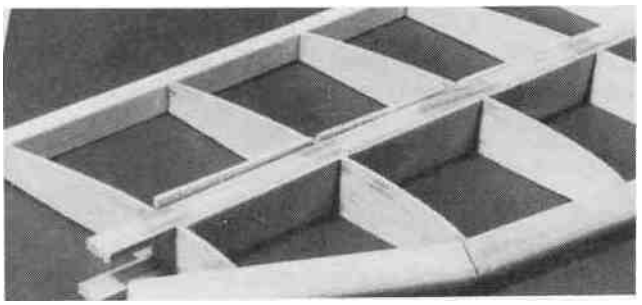


DD 5 Lay a Pre-Shaped Balsa Leading Edge (SPT1W14) over the LEADING EDGE TEMPLATE on the right corner of the plans Use this drawing as a reference to cut the relief notches The relief notches do not need to go all the way through the leading edge but should go within 1/8" of doing so. It is a good idea to cut the leading edge approximately 1/4 longer on both ends to be on the safe side It can be trimmed to the correct length after it is installed

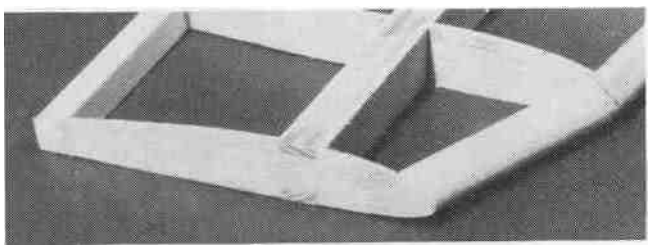
DD 6 Carefully bend the leading edge to the angle shown on the plans and position it against the ribs The bends should he at ribs W6 and W9 Align the leading edge with the ribs and glue



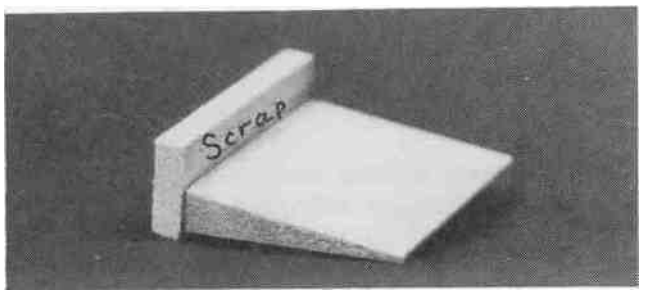
it in **place,** just as you did for the inner panel, except start at **ribs** W6 and W9. Add med or thick CA to each relief notch to fill in any gaps.



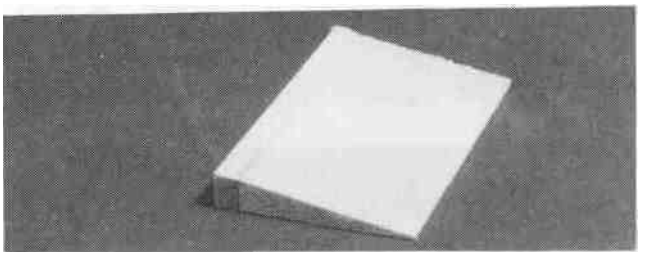
D D 7. With the panel **flat** on the work surface, install the 1/16" Shear Webs following the same procedure as you did on the inner panel The webs will extend past the top spar, but just trim them flush with the spars and sand the edges round so they do not make a ridge when the covering is applied.



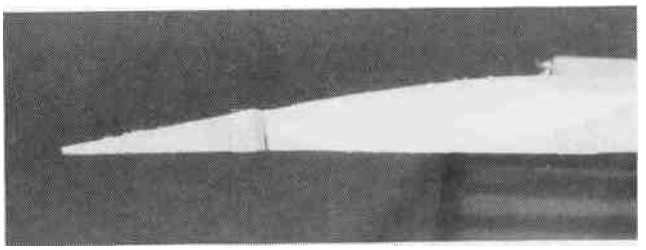
D D 8 Cut and sand the sub TE, spars and leading edge flush with rib W10 Set the panel down on the plan and cut the root end of the spars, LE and sub TE to the correct length.



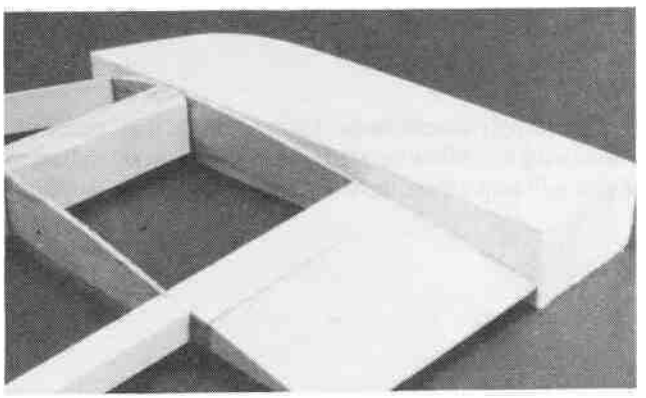
D D 9. Cut a 2" long piece of **11/32" Balsa Outer** TE/ Aileron (SPT1W16) from the UN-notched end. Glue a scrap piece of 1/4" balsa (from tail wood) to the LE of the 2" piece of aileron as shown in photo



DD 10 Trim and sand the 1/4 piece of balsa to match the contour of the 2 piece of aileron



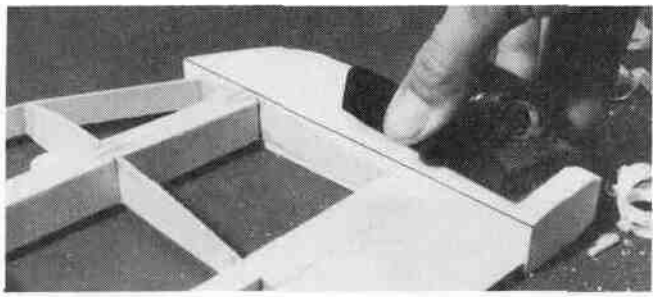
D D 11 Glue this assembly to the back edge of the sub TE so it extends slightly past W10 Notice that when the aileron piece is glued on correctly, it will droop slightly as shown in the photo Sand the piece flush with rib W10

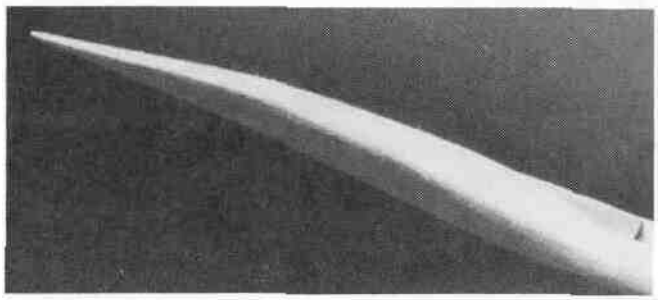


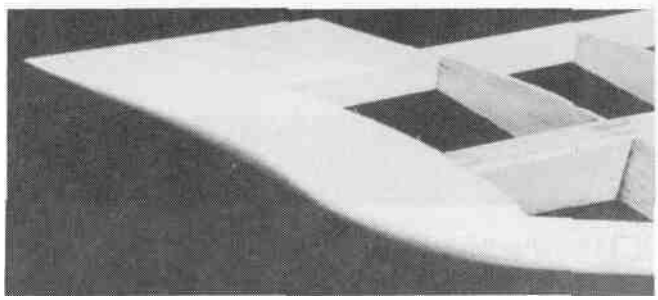
DD 12. Glue the 7/8" Balsa WingTip Blocks (SPT1W23) to W10 with med or thick CA Line up the front of the tip block with the front of the LE.

Do not securely glue the tip to the TE piece.

DD 13. Carve and sand the wing tip to blend in wilh rib W10 and the TE Be careful not to change the shape of W10 while sanding the tip There are three section views on the left wing plan





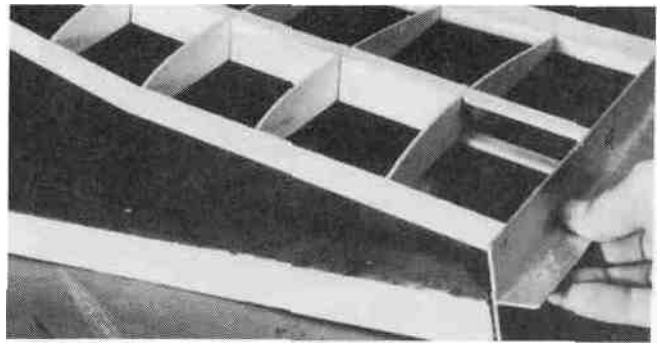


and the above photos to show you the recommended shape. CAUTION - Do not sand the TE of the tip to a very thin edge or it will get damaged easily. It is best to leave it 1/32" • **1/16"** thick. Remove the TE piece.

D D 14. Apply several drops of thin CA to the rear portion of the balsa wing up. Allow the glue to soak into the wood and cure. The glue will help harden the wood and protect it from damage.

JOIN THE INNER AND OUTER WING PANELS

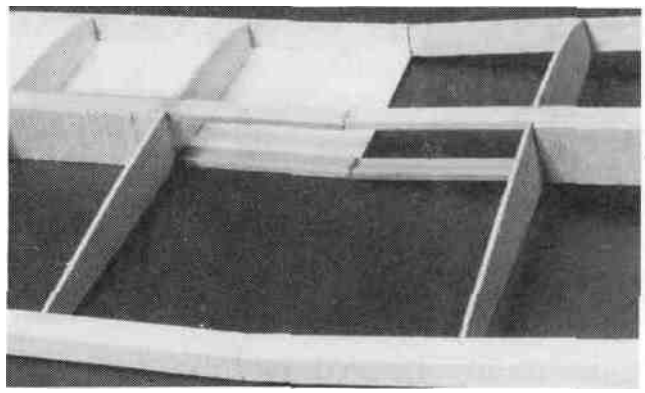
D D 1. Prop up the outer wing panel 2" (from the work surface to the bottom of the spar at W10) using the **bottom notch** in the **Dihedral Gauge** (SPT1W22) between ribs W9 and W10. Move the dihedral gauge if necessary to get the correct measurement at rib W10. Use a sanding block to carefully sand the leading edge, spars and trailing edge to achieve vertical surfaces on each as shown in the photo. **Check your progress** by occasionally setting the panel on the plans to make sure you are



not sanding any "sweep" (forward or backward tilt) into the wing. **HINT -** Set the panel on an "elevated" building surface an inch or so above the work surface and us the edge of the elevated surface to hold the sanding block perpendicular to the work surface as shown in the photo.

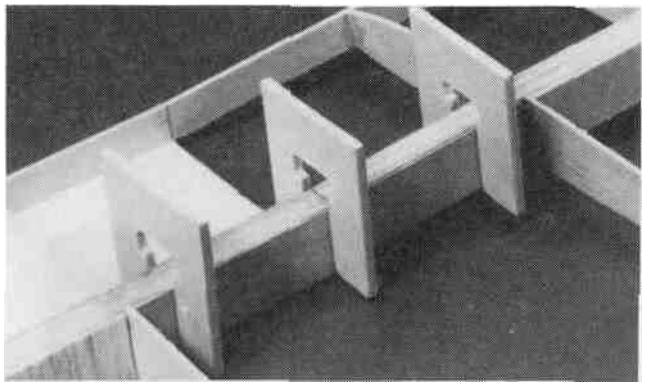
D D 2. With the **inner panel** flat on the work surface, sand the leading edge, spars and sub TE so they are all even and of the correct length.

D D 3. Test fit the inner and outer panels together over the plan to make sure the leading edges, spars, and sub TE'S all meet up nicely when the tip panel is blocked up the required 2" (at the bottom of rib W10) with the dihedral gauge. Sand any ends, if needed, to make everything fit well.

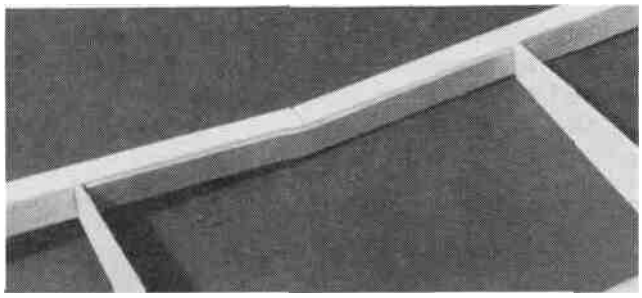


D D 4. With the dihedral gauge in place. Apply med. or thick CA or epoxy to the leading edge, sub TE and spar Joints to "tack glue" the two panels together. Hold everything in place until the glue has cured.

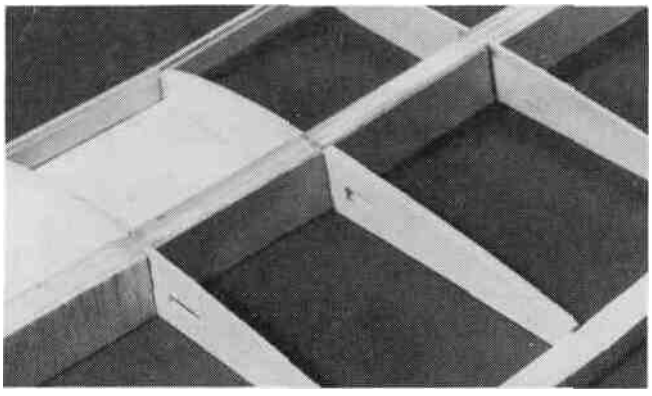
DD 5. Cut the balsa bottom sheeting away (1/32") from the front of the inner panel spar, from the last W2 rib to the end of the spar, to clear the polyhedral brace. Punch out two of the 1/32" **Die-Cut Ply Polyhedral Braces** (SPT1W10) **without** an "S" embossed on them and test fit them in place against the front and back of the spars. Sand them if needed to achieve a good fit.



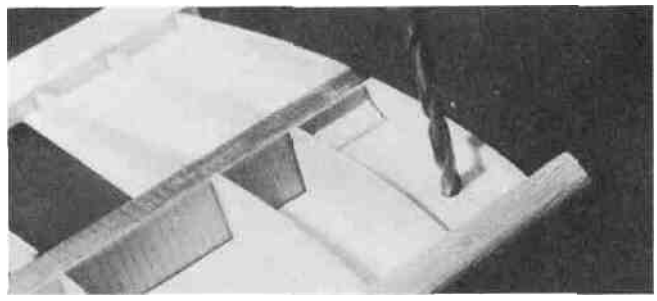
D D 6 When satisfied with the fit, apply a generous bead of epoxy or med or ihick CA to the spars and install the braces on both sides of the spars Use the die-cut C2 clamps (SPT1W22) to hold everything in place Wipe off any excess glue before it cures.



D D 7 Locate the two 1/32" Die-Cut Ply Leading **and** Trailing Edge Braces (SPT1W10) were next to the Polyhedral braces you used earlier Test fit them in place and sand them, if needed, to make them fit between the rib W2 and W4 The LE brace should be at least 1/16 below the top of the LE to allow for the 1/16 top sheeting, which will be added later Glue them in place with med or thick CA If the TE brace extends above or below the surlace of the sub TE, sand it flush

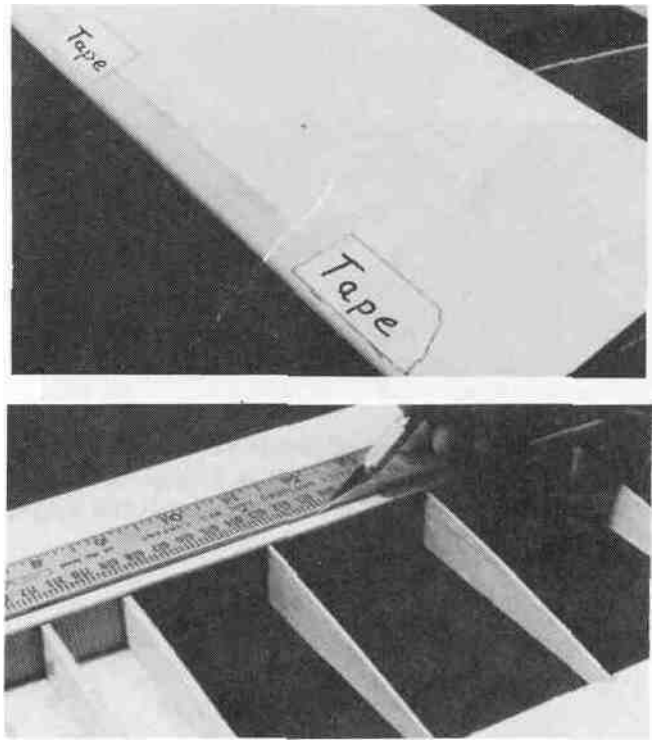


DD 8. Install ribs **W3A** and **W3B** (SPT1W06) between the inner and outer panels using med. or thick CA as shown in the photo A little sanding may be necessary to achieve a good fit Use the rib gauge to tilt the ribs to the proper angle



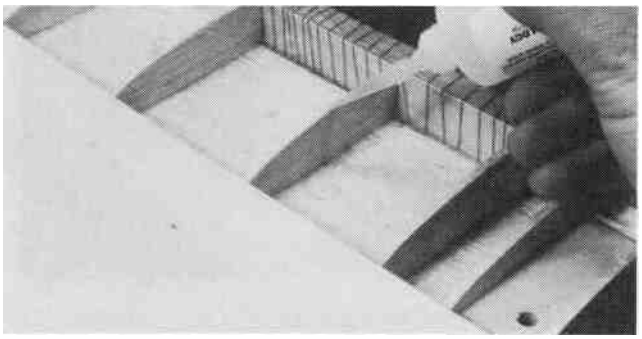
DD 9 Drill a 13/64" hole down through the hole in the front wing bolt plate and through the 1/16 bottom sheeting Lightly sand the tops of the inner panel ribs and the spar to remove any glue globs or uneven places

DD 10 Check to make sure one edge of the **1/16" x** 3-1/2" x 30" **Balsa Top Leading Edge** Sheeting (SPT1W25) is straight and if not, cut it straight with a straight edge



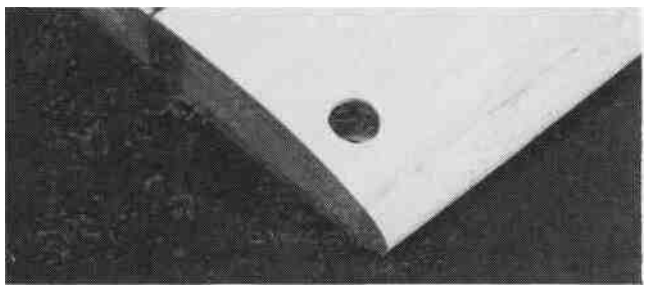
DD 11 Position the 1/16 sheeting in place so the straight edge is against the leading edge and one end is covering W3A Apply several strips of masking tape to hold it in place and act as a hinge for the gluing process Press the sheeting onto the ribs and trim it flush with the back edge of the spar using a modeling knife and straight edge Be careful not to cut into the thread when cutting near the root of the panel

DD12Liftthesheetingupandapplyabeadofmedorthick CA along the top of each rib and along the top spar Quickly press the sheeting down into place and hold it until the glue has cured Keep the sheeting pressed against the ribs and the spar while the glue cures A **straight** strip of wood the length of the panel can



be a big help when trying to hold the sheeting down evenly. You can put weights on the strip of wood if needed. **CAUTION - It is important to keep the wing flat and warp-free during this step!**

D D 13. Apply thin CA between the pieces of masking tape along the leading edge. Remove the tape and apply thin CA where the tape was.

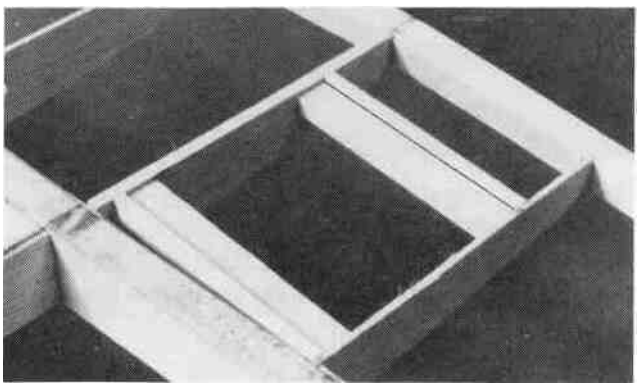


DD 14. Drill a 13/64" hole up through the hole in the wing bolt plate and through the 1/16" top sheeting. Enlarge the hole in the top sheeting to approx. 5/8" diameter so the head of the wing boll will pass through.

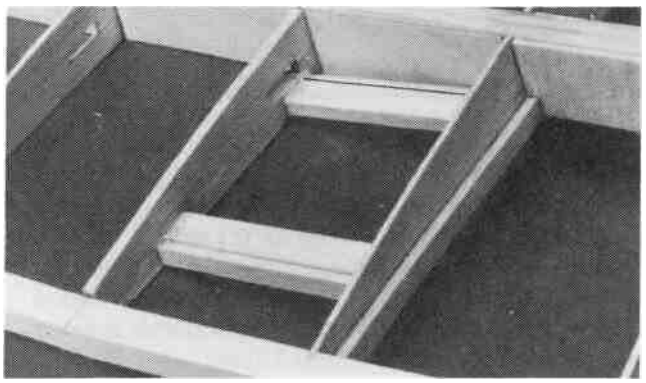
INSTALL AILERON SERVOS

D D 1. Cut two pieces of 1/8" x 1/4" Balsa (SPT1 S04) to fit between Ribs W3B and W4. Also cut two pieces of 3/16" x 3/8" Basswood Servo Rail (SPT1F14) to Fit between the same ribs. Glue one of the 1/8" x 1/4" balsa pieces in place between the two ribs so it is touching the spar near W4, flush with the bottom of the rib and parallel to the sub TE. (See photo at step 3)

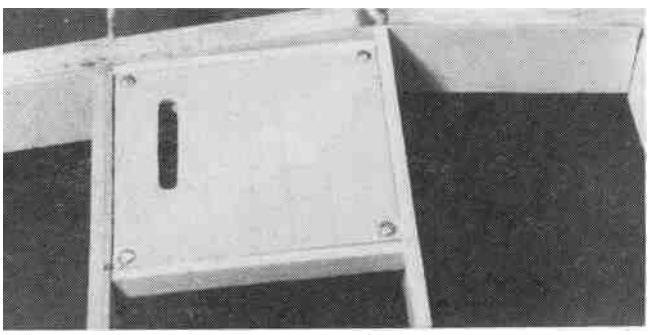
D D 2. Use the **1/16" Die-Cut Ply Aileron Servo Bay Hatch** (SPT1W11) to space and align things. Glue one of the **3/16" x** 3/8" **servo rails** to the back of the balsa piece you just glued in. It should be recessed 1/16" above the bottom of the ribs to allow for the hatch cover. Trial fit the other 3/16" x 3/8" basswood rail into place on the back edge of the hatch. The second rail should be positioned so the back edge extends approx. 1/32" past the edge of the hatch. This will allow space for the covering to wrap around these edges. Check your aileron servo to make sure it will fit between the rails. If not, carve a notch in the rails to clear the servo or space the rails farther apart and cut a new hatch to fit. Glue the second rail in place.



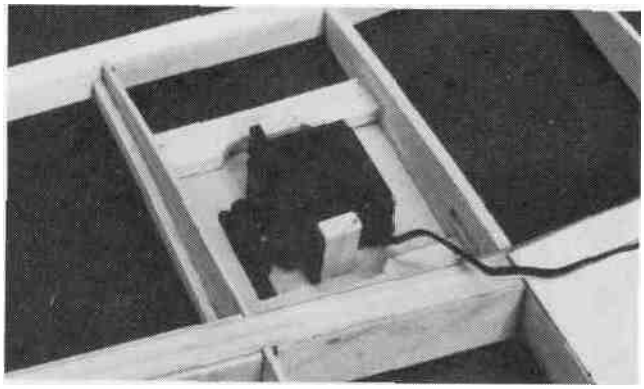
D D 3. Glue the second 1/8" x 1/4" Balsa Strip in place on the back edge of the second rail. It should be flush with the bottom of the ribs. When completed, you should have assembled a box to hold the 1/16" hatch flush with the bottom of the ribs, with about a 1/64" gap all the way around.



D D 4. Cut another piece of **1/8" x** 1/4" **Balsa** (SPT1S04) approx 3-3/4" long and glue it to the **outside** of **W4.** It should be flush with the bottom edge of the rib and will keep this rib from bowing when the covering is applied. Add thick Ca to the top of each basswood rail to help hold them in place.



D D 5. Center the hatch in the servo bay and drill a 1/16" hole in each comer where the punch marks arc. Remove the hatch and enlarge the holes in the hatch only to 3/32". Use four #2 x 3/8" Sheet Metal Screws (SCRW024) to temporarily install the hatch,

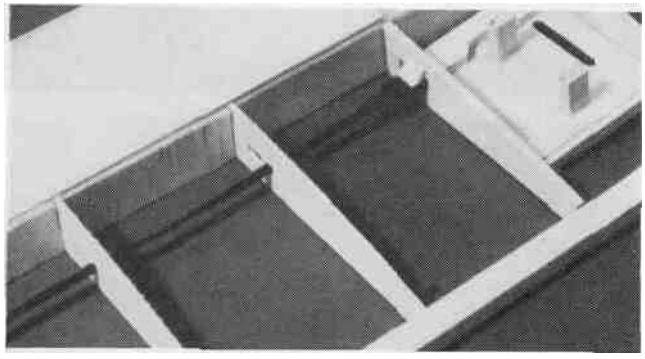


DD 6 Turn the wing right side up and position the aileron servo on the hatch so the servo horn is centered in the slot Look down the wing to make sure the servo does not extend past the top of the ribs II if does you can move the servo forward and enlarge the slot to accommodate it Put a drop of med or thick CA on one **end** of two of the wing servo rails you cut earlier and glue them in place next to the servo mounting flanges Remove the servo and add med or thick CA around the rails to securely glue them in place

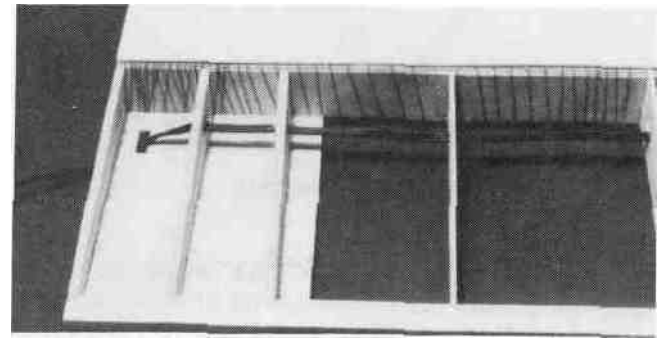
D D 7 Remove the hatch from the wing and replace the servo on the rails Drill **1/16"** holes in the servo rails for the servo mounting screws and mount the aileron servo flat against the mounting plate using the screws provided with the radio

D D 8 Replace the hatch with the servo installed and check to make sure the servo rails do not extend past the top of the ribs Sand the rails if necessary The lower the rails and the servo, the less chance they have of deforming the top wing covering when it is applied

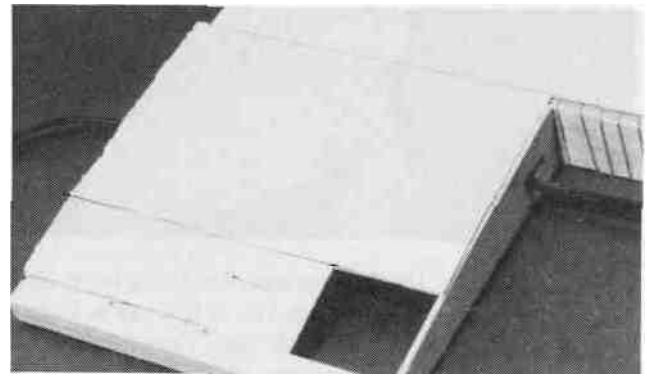
D D 9 The aileron servo extensions need to be installed now You will need about 36" of extensions in each wing so depending on the brand of radio you choose, you may need to join a couple of smaller extensions If you will have two extensions plugging together inside the inner panel put a drop of med or thick CA on the plugs (after they are assembled) to hold them together forever'



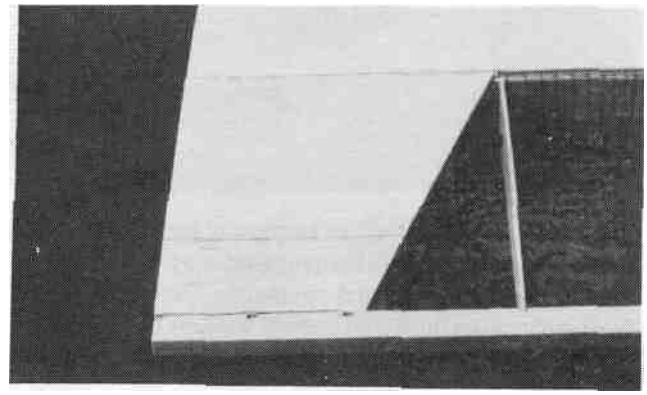
DD 10 Glue the **servo end** of the extension into the slot in W3B It needs to be installed there so the aileron servo can be removed later if needed Glue a piece of 1/4" balsa triangle stock around the plug to secure it



DD 11 Cut a slot in the bottom sheeting next to the first W1B rib for the extension to exit String the extension through the ribs and out the slot in the bottom sheeting Glue the extension to **each** rib with med or thick CA

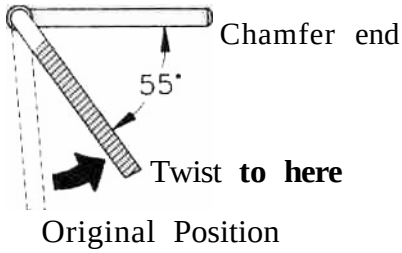


DD12 Cut a 4" and a 5" piece of 1/16" sheeting for the top inboard center section out to rib W2B as shown in the photo Med or thick CA should be used for this step Glue the 5" piece near the spars and cut the 4" piece to fit between the first piece and the sub TE Glue it in place

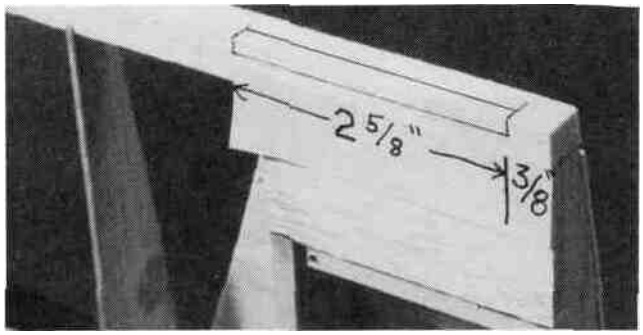


DD 13 Cut the sheeting off at an angle from the front of W2B to within 1/4 of the rear of W 1 B as shown on the plans Sand the sheeting flush with the **W1B** rib at the wing root

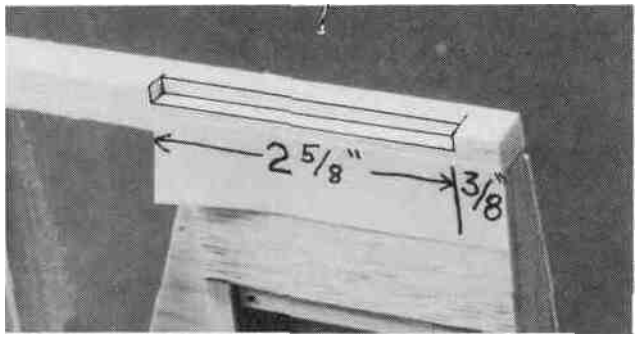
INSTALL FLAP TORQUE RODS



DD 1 Notice thereisa"right"anda"left"torquerodTwist each rod to match the sketch above (to allow the correct flap movement) Use a small file or very fine sandpaper to de-burr the very tip of the **unthreaded** end of each torque rod

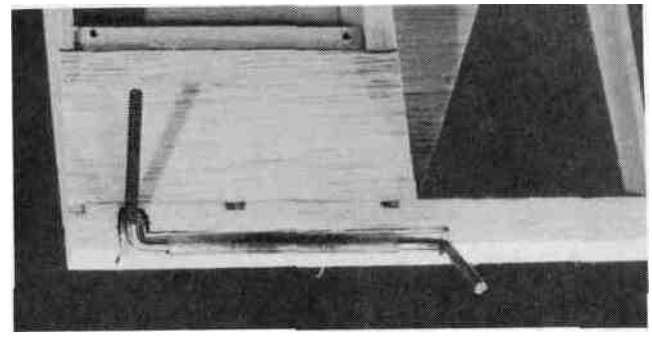


D D 2 Starting 3/8 from the root of one wing panel, draw a line on the **back** edge of the sub TE is 5/32 away from the **bottom** edge of the sub TE and 2-5/8" long Draw a line using the same procedure on the **bottom** of the sub TE Both of these lines should be 5/32 away from the **back - bottom** edge of the sub TE

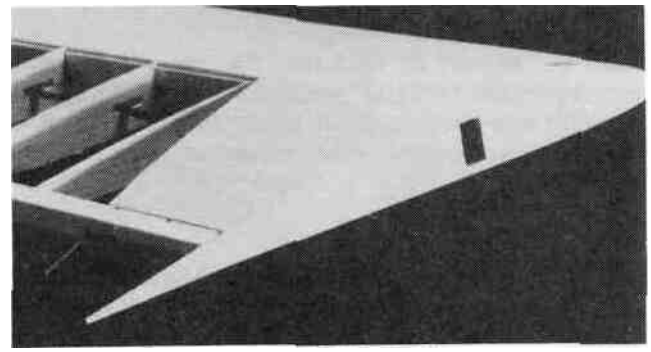


D D 3 Cut a 5/32 square strip out of the sub TE using the lines you just drew Test fit the torque rod into this groove to make sure the groove is long and deep enough The torque rod nylon bearing should be flush with both the **back** and the **bottom** edge of the sub TE You can make the slot longer or deeper if needed to allow the torque rod to operate freely

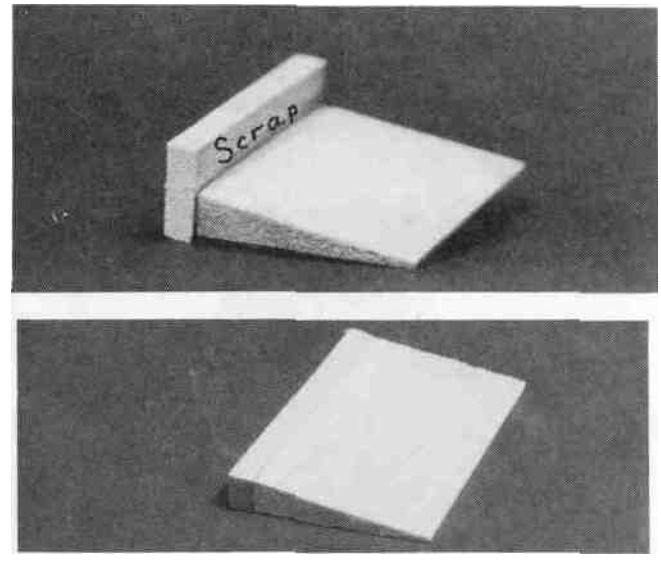
D D 4 Make sure you have the correct (right or left) torque rod with the correct panel and mark on the sub TE where the torque rod will exit the bottom Cut a notch in the sub TE to allow the torque rod to rotate forward



D D 5 Scuff up the outer surface of the torque rod bearing with coarse sandpaper Apply a small amount of vaseline around the **ends** of the bearing to keep glue from seeping in and glue it in place Make sure the bearing is centered on the torque rod and does not extend past the bottom or back surface of the sub TE

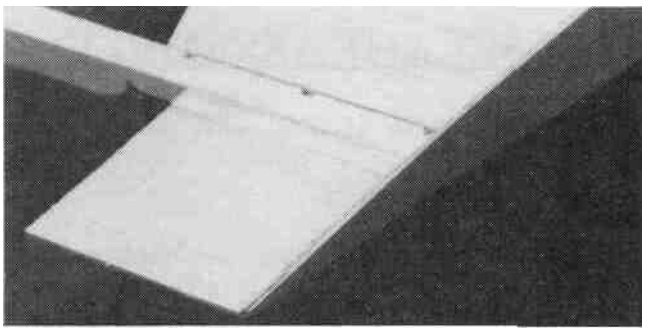


DD 6 Glue one of the 1/16" Balsa Root Caps (SPT1W21) without an "S" to the root of the wing panel It should be aligned with the sub TE, thcjoinerbox and the LE as best as possible Due to building and manufacturing tolerances, it is not unusual for this root cap to not match the wing shape exactly

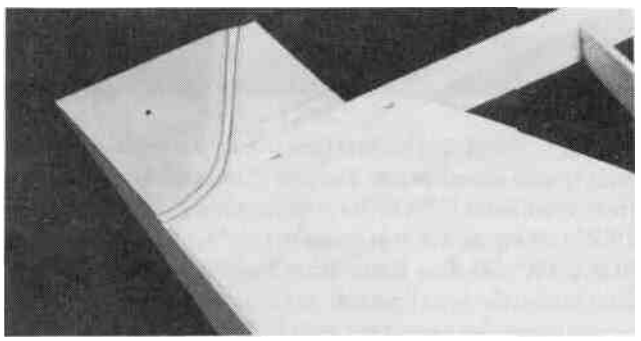


DD 7 Cut a piece of 11/32" Balsa Inner TE/Flap (SPT1W15) 2-1/4" long and a scrap piece of 1/4" thick wood 2-1/4" long (from

some left over tail wood). Glue the scrap piece of wood to the LE of the Flap/Inner TE to add 1/4" to the TE. Sand the scrap piece to match the contour of the TE.



D D 8. Sand the TE piece to fit against the sub TE and root cap without bending the root cap. It is OK to cut a relief groove in the TE piece if the torque rod is holding it out slightly. Align the TE piece with the root cap and glue it in place, but do not get glue on the torque rod itself. Sand the TE piece flush with the top and the bottom of the wing. Cut a notch in the TE piece to allow the torque rod to rotate backwards.



D D 9. Make sure you can sec the pinpoint punch on the top of a 1/16" **Ply Rear Wing Bolt Plate (SPT1W11).** If not stick a pin through the punch mark. Sand the "outside" **top** edges of the Rear Wing Bolt Plate to a taper as shown in the photo. Glue it in place so the rear is flush with the back of the TE and the side is flush with the root cap. Sand the inside edge to match the dihedral angle of the root cap.

AILERON/FLAP ASSEMBLY

D D 1. Locate the 1/4" **Balsa Aileron/Flap LE** (SPT1W17) and glue it to the front of each aileron and each flap. Lay the ailerons and flaps flat on the work surface and glue the LE in place with the "point" **up** as shown in the

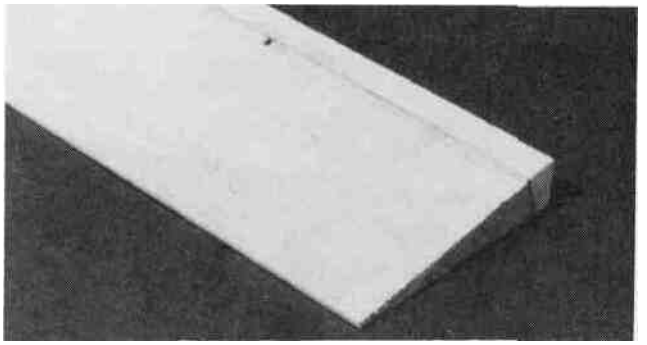
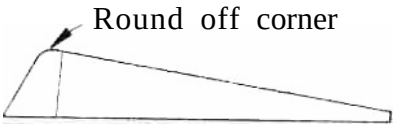
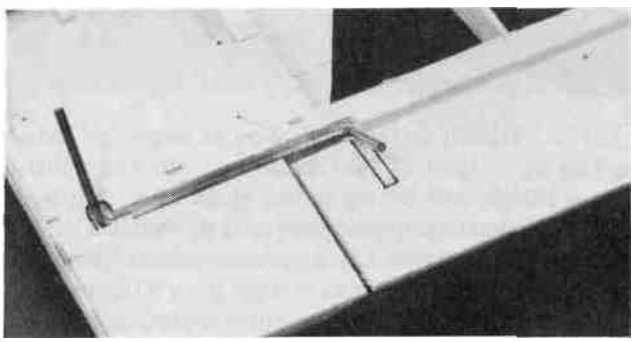


photo. Sand the LE'S to blend in with the ailerons/flaps and round off the corner as shown in the inset.

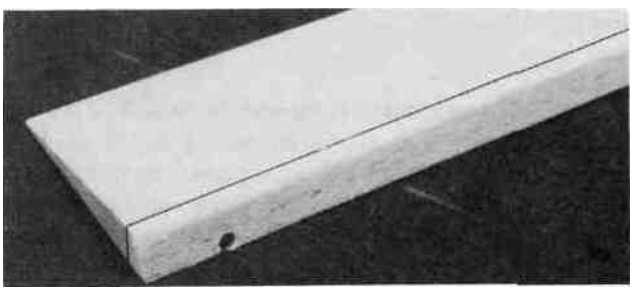


D D 2. Determine the length of the flap by measuring between the stationary TE piece and the polyhedral joint on each wing panel. Deduct 3/16" from the measurement and cut the flap to this length.

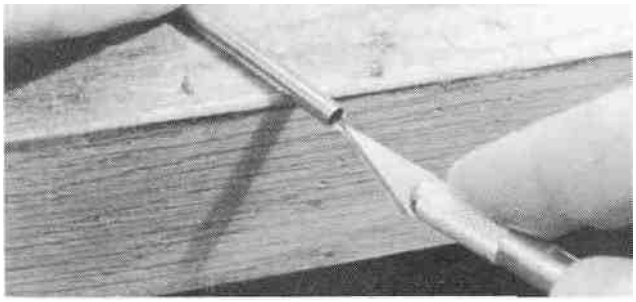


D D 3. Position the flap against the sub TE so there is a 3/32" gap between the end of the flap and the stationary TE. Adjust the torque rod so the threaded part is centered in the groove you cut earlier. Trace around the unthreaded end of the torque rod on the bottom of the flap.

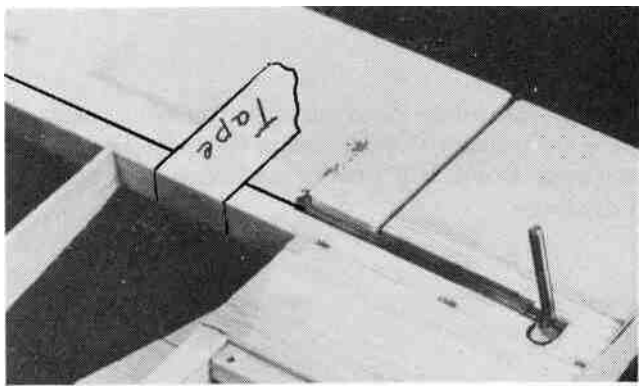
NOTE: The hinge " Gap" will be on the top of the flap.



D D 4. Remove the flap and drill a 1/8" hole where you drew the outline. The hole should just touch me bottom surface of the flap and should be approx. 1-1/4" deep.



D D 5. Use the point of an Xacto knife to carefully chamfer the inside edge of a 1/8" **OD x** 1-1/8" Brass Tube (BRST019). Rough up the outside of the tube with course sandpaper and slide it into the hole you just drilled until it is completely inside the flap, with the chamfered end out.



D D 6. Trial fit the flap in place on the torque rod and use masking tape to hinge it. First check to see if the flap is aligned UP and DOWN with the top surface of the wing. If it is not, remove the tube and enlarge the hole up or down until it is. Then check the movement, of the flap to make sure it does not bind when the flap raises about 10 degrees or drops about 90 degrees. If it does bind, push the tube in a little farther or check to make sure both the brass tube and the unthreaded end of the torque rod are perpendicular to the sub TE. When satisfied with the fit apply a drop or two of thin CA around the middle of the tube. Allow the CA to cure and then remove the flap and soak the area around the tube (within an inch or so) with thin CA. Add med. or thick CA to the bottom of the flap to fill any gaps but be careful not to get any glue inside the tube. NOTE: If you had to enlarge the hole a lot or you feel the wood is soft you can apply a very light layer of glass cloth (3/4 to 2 oz.) over this area of the flap to help strengthen it.

D D 7. Cut the aileron to fit between the flap and the wing tip. Leave about a 1/16" gap at the tip end and a good 1/8" gap at the flap end. Hinge the aileron in place with masking tape and then reflex the flap up about 10 degrees. Move the aileron up and down to make sure it will clear the flap without binding. Keep in mind the covering will take up another 1/32" or so. NOTE: The aileron is hinged on the top surface of the wing.

D D 8. Now go back and assemble the other wing panel.

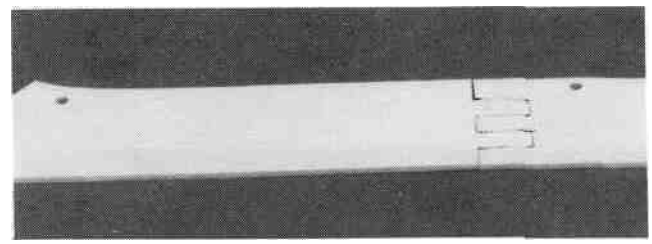
D 9. Trial fit the two wing halves together using the wing joiner. Sand the root of each panel if necessary to achieve a nice close joint between the two wings. If there are large gaps fill them with scrap balsa or filler.

FUSELAGE ASSEMBLY

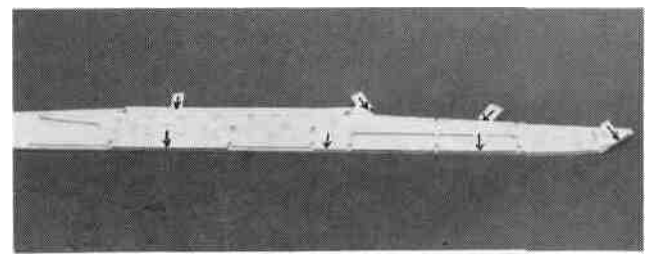
ASSEMBLE FUSE SIDES

You'll need the following items:

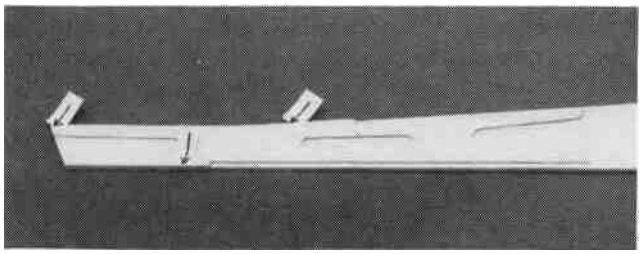
SPT1F01	1/8" **DC** Balsa Front Fuse Sides
SPT1F02	1/8" DC Rear Fuse Side
SPT1F03	3/32" DC Balsa Front Fuse Doublers
SPT1F07	3/32" DC Balsa Rear Fuse Doubler & Tripler
SPT1F11	1/8" Square **Balsa Stringers**



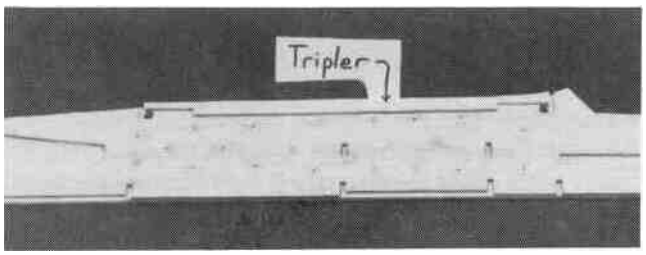
D D 1. Pin or tape the fuse plan to your flat work surface and cover it with waxed paper. Pin one of the 1/8" Die-Cut Balsa Front Fuse Sides (SPRTF01) down onto the FUSELAGE SIDE VIEW making sure it is accurately lined up with the drawing. Slide a 1/8" Die-Cut Balsa Rear Fuse Side (SPT1F02) into place behind the front fuse side and align it with the plan. Press the two pieces flat against the work surface and apply thin CA to the joint. This is going to be the LEFT fuse side.



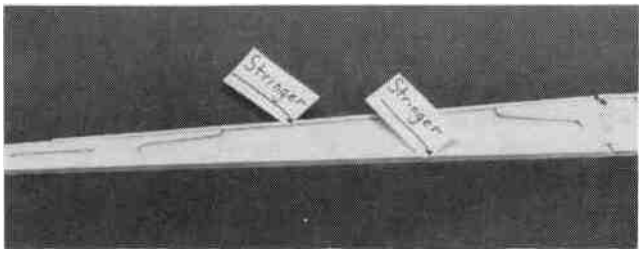
D D 2. Check the punch holes in the 3/32" **Die-Cut Balsa** Front Fuse Doublers (SPT1F03) to make sure they are punched through the doubler. If not, poke a straight pin through each punch mark. Trial fit the doubler onto the 1/8" Balsa Fuse Side. The doubler should line up with the fuse where the canopy will sit and in various other places. The arrows in the photo point out these areas. Apply thin CA around the edges of the doubler and in all of the former notches. Add a couple drops of thin CA to each pin hole, one drop at a time allowing it to soak in.



D D 3. Glue the 3/32" **Die-Cut Balsa Rear** Fuse **Doubler** (SPT1F07) in place making sure it lines up with the edges of the fuse side at the rear of the doubler where the arrows in the photo are pointing. Make sure the front of the doubler is centered on the fuse side to allow for the stingers which will be applied later.



D D 4. Glue one of the 3/32" **Die-Cut Balsa Wing Saddle Triplers** (SPT1F07) in place on top of the front fuse doubler. It should line up with the top edge of the fuse side. Do not let the tripler overlap the notches for the formers.



D D 5. Cut one of the **1/8" Sq. x** 24" **Balsa Stringers** (SPT1F11) to fit between the top notch for former F6 and the rear doubler and glue it in place making sure it is lined up flush with the top edge of the fuse side. Cut another 1/8" sq. balsa stringer to fit along the bottom between the rear doubler and the bottom notch for former F6 and glue it in place. It should be **flush** with the bottom edge of the fuse side but make sure it is not covering up the notches for F6.

D 6. Go back to step 2 and assemble the RIGHT fuse side. The easiest way to do this is to pin the other fuse side **upside down** above the one you just built as shown in the photo.

MAKE SURE YOU ARE NOT BUILDING TWO IDENTICAL SIDES, THEY SHOULD BE THE OPPOSITE OF EACH OTHER.

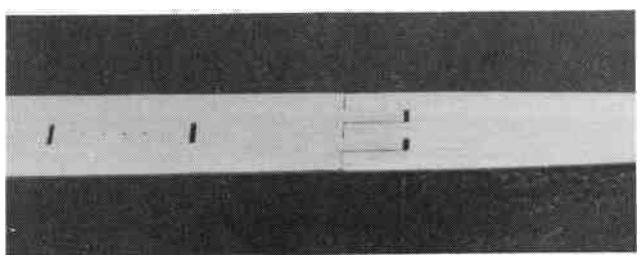
D 7. Sand the edges of the fuse sides to eliminate any rough edges or glue but be careful not to sand any dips into the fuse.

FRAME-UP THE FUSELAGE

You'll need the following items:

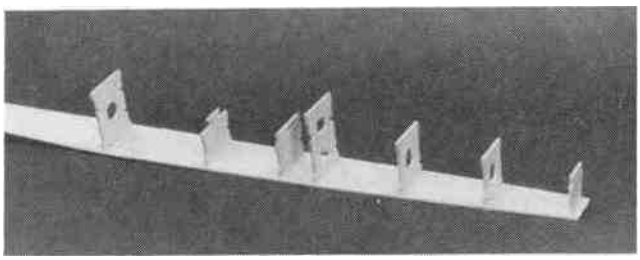
SPT1F04 1/8" DC Ply Front Fuse Bottom
SPT1 F05 3/32" Balsa Rear Top Fuse Sheet
SPT1F06 3/32" DC Balsa Rear Fuse Bottom
SPT1F08 1/8" DC Ply Formers
SPT1F10 1-7/8" Shaped Balsa Nose Block
SPT1F16 1/4" x 1/2" x 1" Basswood Ballast Box Handle
SPT1F17 1/8" DC Ply Formers and Cockpit Ends
SPT1W05 1/16" Ply Towhook Plate
BAL141 1/4" Balsa Triangle

IMPORTANT - There is an integral ballast box designed into the fuselage that will hold up to 30 oz. of lead directly over the CG. This box is formed by formers BB1 and BB2 with BB3 used as a top. It also doubles as a good place to store your wing bolts or rubber bands between flying sessions. However it is not necessary to include it in the construction of the plane. (See Ballasting, p. 54) At this point you should think ahead about your radio installation and determine if you would be better off using this space under the wing for your radio. When installing spoilers you need to determine where the spoiler servo will go. Normally the spoiler servo can go between formers F4 and F5 with the rudder and elevator servos between F3 and F4 and the receiver behind the ballast box. You may need to use several servo extensions to accomplish this but the ballast box is a handy feature. You should always install at least former BB2 which will add a little strength and help hold the receiver in place.



D 1. Lay a piece of waxed paper over the FUSELAGE TOP VIEW. Assemble but do not glue yet, the 1/8" **Die-Cut Ply Front Fuse Bottom** (SPT1F04) and the 3/32" **Die-Cut Balsa Rear Fuse Bottom** (SPT1F06) together over the FUSELAGE TOP VIEW on the plans. Line up the slots in the front with the formers

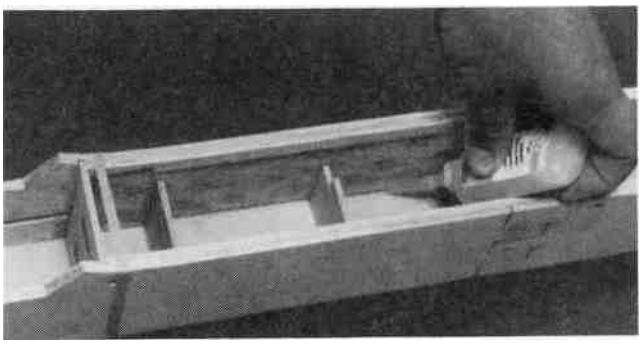
drawn on the plan. The 1/8" ply bottom should be installed with the four towhook hole marks DOWN so you can tell where to drill the towhook holes after the fuse is assembled. **NOTICE: two slots for former F6 are formed when the two pieces come** together. Make sure the bottoms are aligned with the plan and both pieces are pushed firmly against the work surface to even up the bottoms. If the joint is a nice tight fit, apply thin CA to the joint. If the joint is a little loose, take the bottoms apart, apply med. or thick CA and reassemble them.



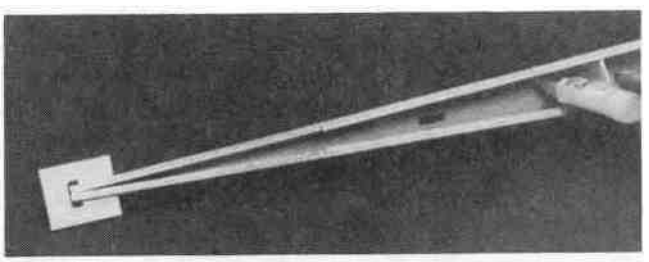
D 2. Trial fit all of the 1/8" **Die-Cut Ply Formers** (SPT1F08 & SPT1F17) except **F1** in the respective notches in the fuse bottom and trim them if needed to make them fit properly. The formers may be a tight fit in the slots but push them all the way down against the fuse bottom, this is to keep them lined up so the fuse will end up straight. Use **a drop** of med. or thick CA to "tack" glue the formers in place. The notches in the fuse sides will align the formers correctly.

D 3. Align the fuse sides with the fuse bottom and position the formers so they will key into the fuse side notches. Remove the assembly from the work surface and use rubber bands to hold it all together.

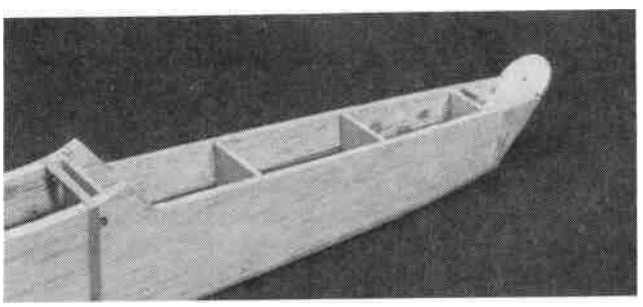
D 4. Check the fit of the **1/16" x** 2-1/8" x 3-7/32" **Ply Tow-hook Plate** (SPRTW05) in its slot between formers **BB1** and **BB2.** Sand the plate if needed to make it fit. Apply med. or thick CA to the bottom of the plate and press it in place. Do not allow the fuse sides to become glued to the bottom yet!



D 5. Spread the fuse sides out and apply med. or thick CA to formers F5, F6, BB1, BB2 and the bottom edge of the fuse sides between them and reassemble everything. Check to make sure the sides are pressed firmly against the formers and the bottom is fully seated against the fuse sides, and allow the glue to cure. Use rubber bands and/or masking tape to hold things while the glue cures.

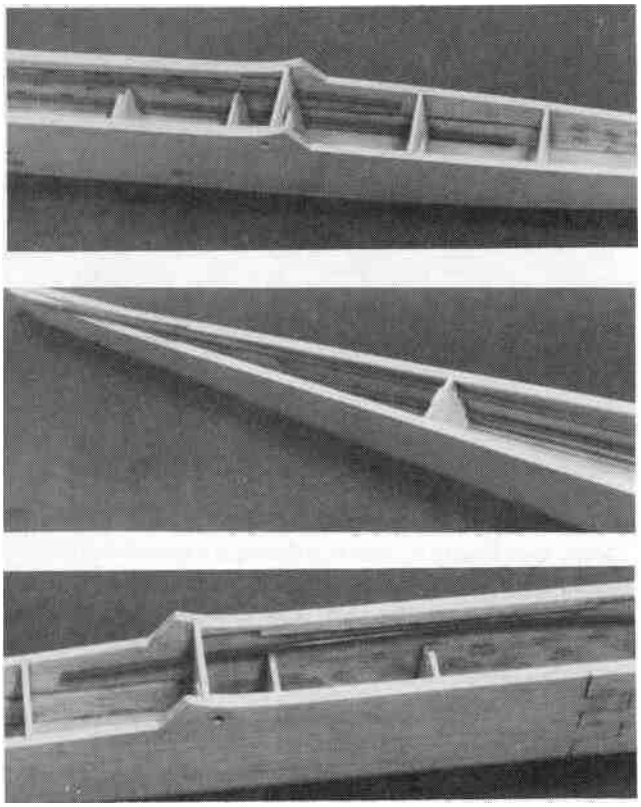


D 6. Pull the rear of the fuse sides together and make sure the sides are pressed firmly against former F7 and the bottom is fully seated against the fuse sides. A couple of C2 clamps can be used to hold the tail of the fuse together and rubber bands or masking tape will help elsewhere. Apply CA along the back edge of the rear fuse doubler, along the bottom sheeting joints and around former F6. Take your time applying the CA and be sure to get the bottom and the sides pressed together nicely. Med. or thick CA can then be added to these joints to add strength.



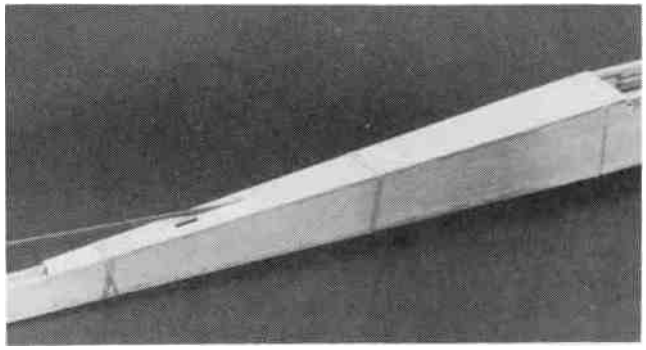
D 7. Pull the front fuse sides together and trial fit the 1/8" Die-**Cut Ply Former F1** (SPT1F08) in place with the punch mark toward the rear of the fuse. Apply med. or thick CA to the bottom of the fuse sides and the formers, install F1 and pull the fuse sides together. A few rubber bands and tape can be used to help hold the assembly while the glue cures.

IMPORTANT - Read this whole paragraph before gluing anything in place!

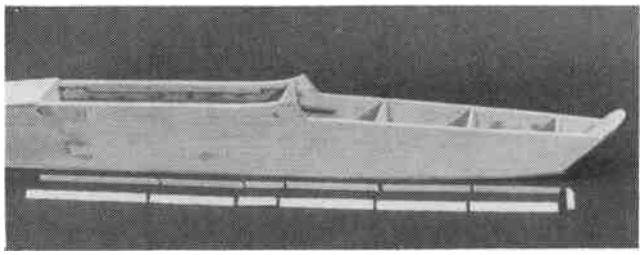


D 8. The pushrod outer tubes should be installed now. Due to the number of pushrods available today and the fact everybody seems to have their own favorite, we have not included pushrods in this kit. You are free to use whichever brand of pushrods you desire. The formers already have notches in them to fit the majority of pushrods available You can also use an extra pushrod tube or (similar) to route the receiver antenna down the fuse if you wish If you want to use a tube for the receiver antenna it should be installed first. Determine where you will put the receiver (normally between F3 and F4) and route the antenna tube to the compartment The antenna tube goes in the lower former notches and will be glued between the rear fuse doublers to the fuse bottom The elevator pushrod goes along the right fuse side and will be glued in place above the antenna tube. The rudder pushrod goes along the left fuse side and just sits on top of the fuse side until the fuse top sheet is installed You may have to drill holes in some formers to suit you installation Once you have all the tubes positioned where you want them, mark on each tube where the glue will be applied Remove the tubes (one at a time) and scuff the outer surface with coarse sand paper where the marks are. After all the tubes are back in place, apply med or thick CA wherever necessary to securely glue them in place BEHIND FORMER F6 ONLY! Do not glue them in place in front of former F6 until after the servos and wing bolt blocks are installed.

D 9. Trial fit the 3/32" **Balsa Rear Top Fuse Sheet** (SPT1F05) in place with the rudder pushrod cut-out **on the left side of the**

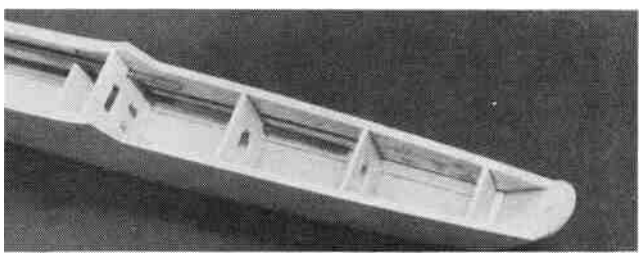


fuse. When satisfied with its f i t apply a bead of med or thick CA along the 1/8" balsa stringers, the fuse doublers, formers F6 and *F7* and the fuse sides and glue it in place.



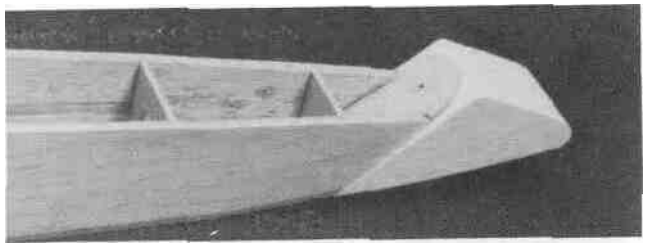
D 10. Cut pieces of 1/4" **Balsa Triangle** (BAL141) to fit between all the formers If you built the ballast box these pieces should be approximately the following lengths:

two pieces - 3" long
two pieces - 3-3/16" long
two pieces - 3-7/16" long
two pieces - 1-7/16" long
two pieces - 3-1/4" long
two pieces - 4-7/8" long
one piece - 1-5/16" long

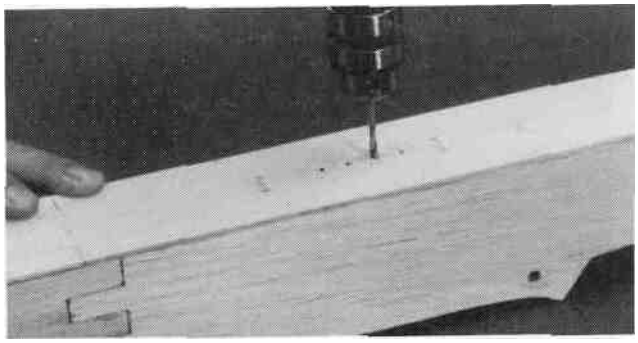


These pieces should be glued with med or thick CA They are pressed into the corner between the fuse bottom and the fuse doubler in the following places

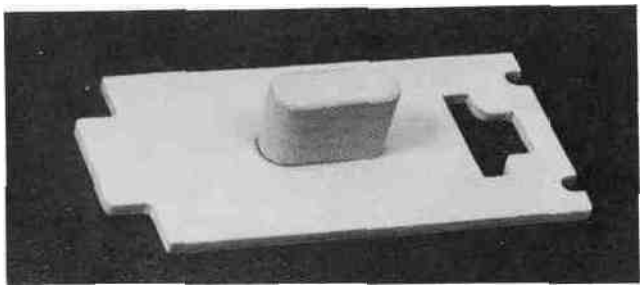
Glue the 3" long pieces between formers F2 and F3.
Glue the 3-3/16" long pieces between formers F3 and F4.
Glue the 3-7/16" long pieces between formers F4 and F5
Glue the **1-7/16"** long pieces between formers F5 and BB1.
Glue the **3-1/4"** pieces above the towhook plate
Glue the 4-7/8" long pieces between formers BB2 and F6.
And glue the **1-5/16"** long piece along the bottom between formers F1 and F2 to seal the gap there.



D 11 Sand the fuse sides and bottom flush with the front of former F1 and glue the 1-7/8" **Balsa** Nose **Block** (SPT1F10) in place with med or thick CA The bottom of the nose block should overlap the fuse bottom by about 1/32" to allow for sanding to final shape.

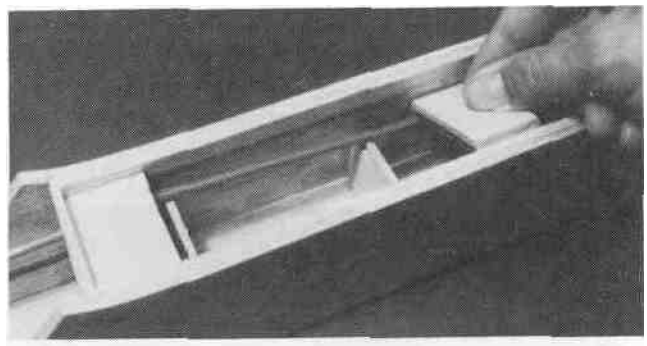


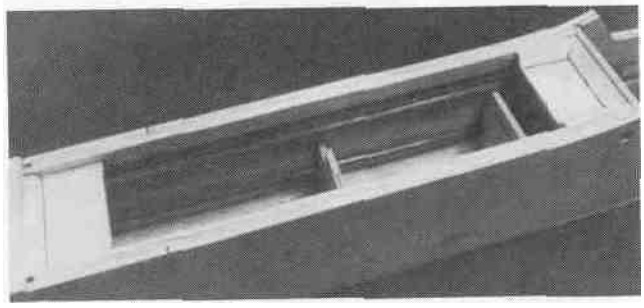
D 12 Drill four 11/64" (5/32" is tight but will work) holes in the 1/8 ply bottom for the towhook There should be four indentations to show you where to drill Gently **Tap the four 6-32 Blind Nuts** (NUTS001) into the holes (from the inside of the fuse) using a dowel and a hammer and securely glue them in place with med or thick CA or epoxy around the outside edges of each blind nut (be careful not to get glue inside the blind nut)



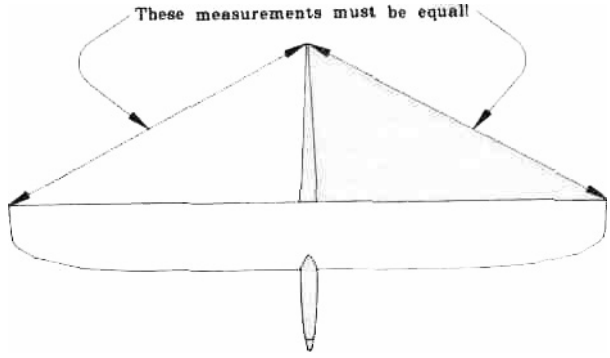
D 13 Locate the Ballast Box Top BB3 (SPT1F17) and the 1/4" x 1/2" x 1" **Basswood Ballast Box Handle** (SPT1F16). Round off the corners and edges on all but one 1/4 x 1 side Glue it to the center of the ballast box top with the rounded corners up Test fit the ballast box top in place.

IF YOU ARE BUILDING A RUBBER BAND ON WING SKIP AHEAD TO STEP 20!



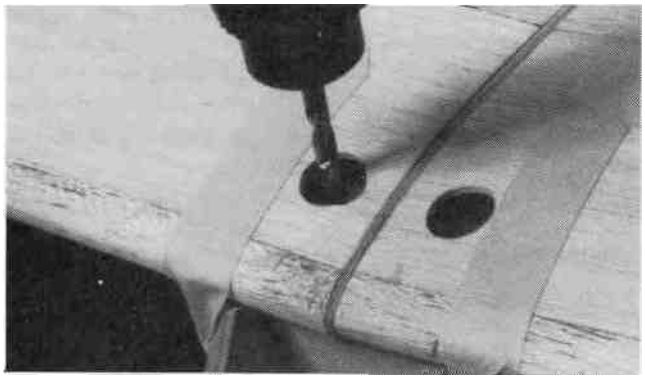


D 14 Install the two 1/4" **x 1-1/4" x 1-15/16" Birch Ply** Wing Bolt Blocks by inserting them at an angle behind BB2 while pushing the pushrod tubes down out of the way Once the blocks have cleared the tripler, slide them into place behind former F5 and in front of former F6 Securely glue these in place with epoxy Glue triangle stock around each one for extra strength

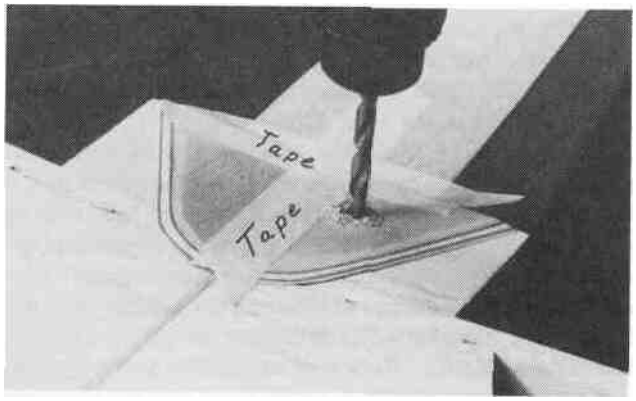


D 15 Assemble the two wing halves and temporarily lay the wing in position on the fuse Sand the wing saddle if needed, to achieve a nice fit between the wing and the fuse Center the wing on the fuse and use a string as shown in the sketch to make sure it is on straight Make a couple of alignment marks on the wing and fuse and apply masking tape to help you make sure it stays in position while drilling the wing bolt holes

D 16 Firmly hold the wing in place on the fuse and drill a 13/64" hole down through the hole in each front wing bolt plate



and through the front 1/4" ply wing bolt block in the fuse.



D 17. Make sure the wing has not moved and drill another 13/64" hole (where the punch marks are) through each rear wing bolt plate and through the 1/4" wing bolt block in the fuse.

D 18. Remove the wing and enlarge the four holes in the wing to 1/4". Use a 1/4 - 20 tap to thread the holes in the fuse blocks. Apply thin CA to the threads you just cut and allow it to cure completely. Use the 1/4 - 20 tap to re-tap these holes. This process makes the threads a lot tougher.

D 19. Test fit the wing in place with four 1/4 - 20 Nylon Bolts (NYLON13). These bolts are longer than you probably need so you can cut them off to any length you desire by first pressing an Xacto knife into the threads where you want to cut them and then bend the boll "away from the cut" with your hands. They will break where the cut is, just clean up the threads with the knife.

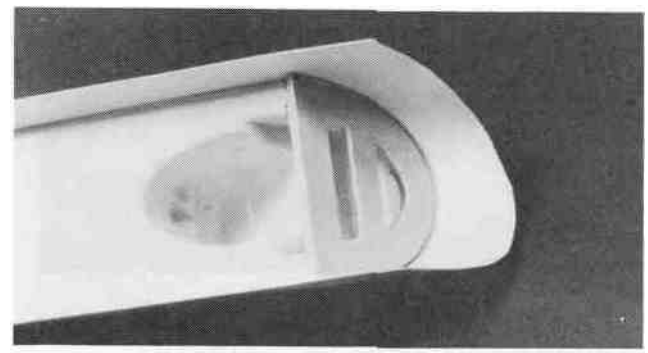
SKIP THE NEXT STEP IF YOU HAVE BUILT THE BOLT-ON WING!

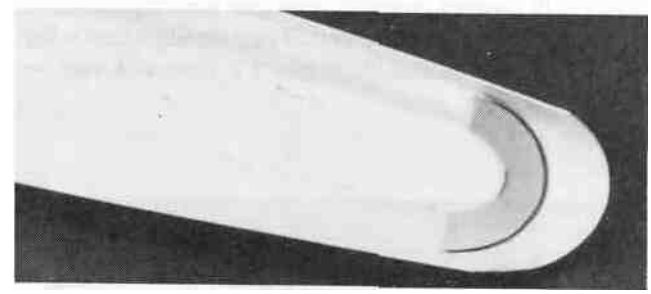
D 20. Use your sanding block with medium grit sandpaper to chamfer (slightly round) the ends of the 1/4" x 3-1/2" Hardwood Wing Dowels (DOWEL030). Center the 1/4" wing dowels in the holes in the fuse but do not glue them until after the fuse is covered.

ASSEMBLE THE COCKPIT/CANOPY

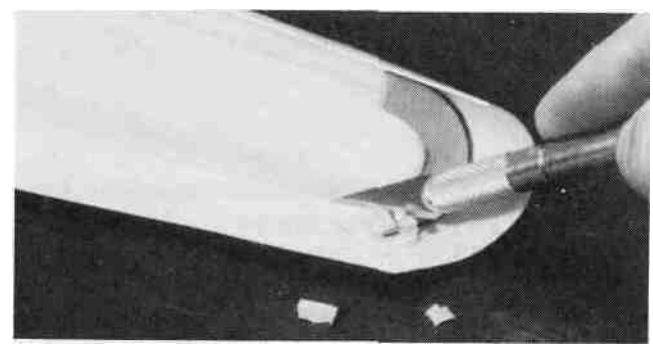
You'll need the following items:

SPT1F02	1/8" Balsa Cockpit Base
SPT1F13	Formed ABS Cockpit
SPT1F17	1/8" Ply Cockpit Front and Back
CANPY048	Clear Canopy

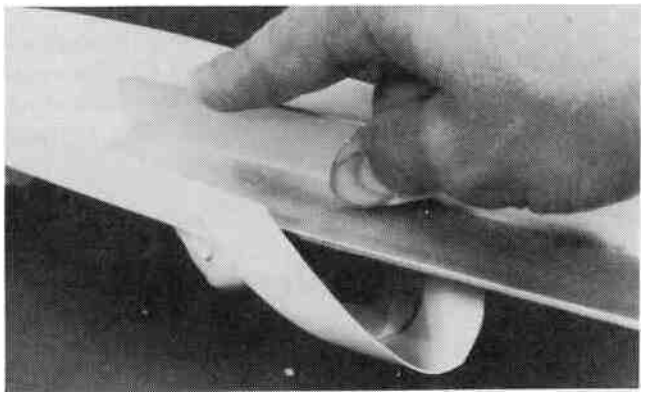




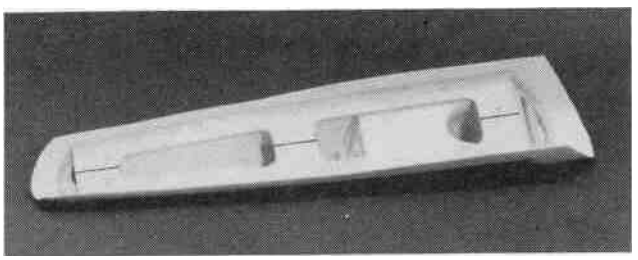
D 1 Trim the molding "base" off of the **Formed ABS Cockpit** (SPT1F13) Trail fit the 1/8" **Die-Cut Ply Cockpit Back** (SPT1F17) and the 1/8" **Die-Cut Ply Cockpit Front** (SPT1F17) in place in the formed ABS cockpit. Sand them if necessary for a smooth Fit and then glue them in place with med. or thick CA.



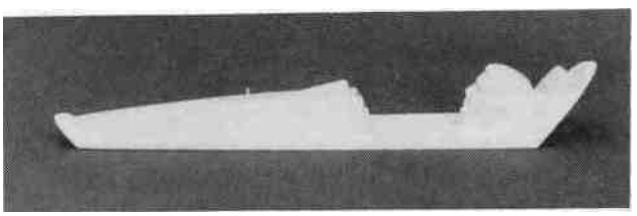
D 2. Trim and sand the bottom edges of the cockpit front and



back flush with the bottom of the cockpit. Be careful not to sand through the cockpit.



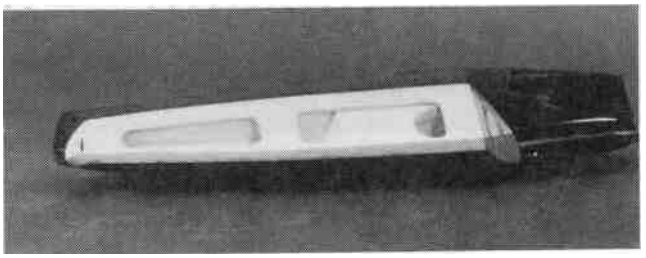
D 3. Punch out the 1/8" **Die-Cut Balsa Cockpit Base Halves** (SPT1F02) and trial fit them together. Sand them if necessary to get them to fit together nicely and then glue them together with CA. Trial fit the base in the cockpit and sand the edges until is fits easily. When satisfied with the fit glue it in place with med. or thick CA.



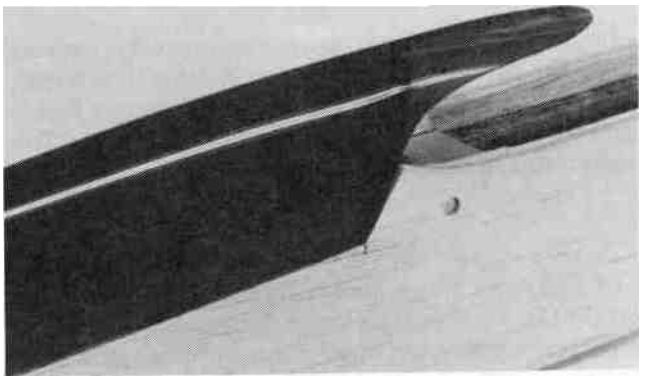
D 4. Trim and sand off the extra cockpit material flush with the edges of the cockpit back, cockpit base, and cockpit front. Saturate the front edge of the cockpit base with thin CA and allow it to soak in and cure. This is where the canopy hold down dowel will rest. Sand all edges of the cockpit flush with the cockpit front, the cockpit back and the cockpit base.

D 5. Paint the cockpit with the color scheme of your choice. Test the paint you are going to use on a scrap piece of the plastic you cut off to make sure it will not affect the plastic. Regular plastic model paints usually work well for this. Do not paint the edges of the cockpit where the canopy will attach or the glue will not hold as well. Striping tape can later be used to cover these areas. Lightly sand the edges of the cockpit to help the canopy adhere.

D 6. Tint the Canopy (CANPY048) if you wish, using regular clothing dye you can buy at the grocery store (powdered Rit, etc). Use very warm water (warmer than you can leave your hand in) but do not use very hot water or the canopy may deform. The warmer the water and the longer you leave the canopy in the dye, the darker the tint will be.

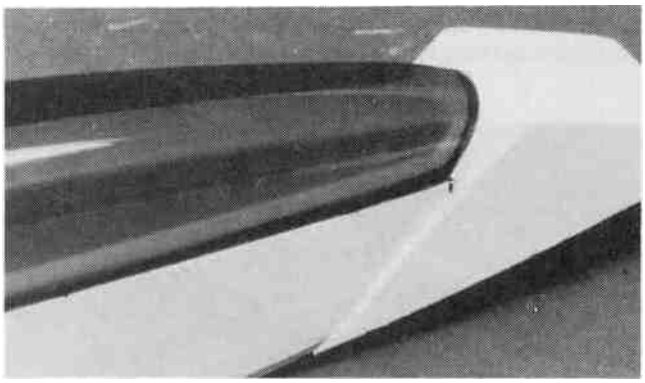


D 7. Set the cockpit inside the canopy and line the cockpit up with the scribe lines in the canopy. The scribe lines are only for reference while positioning the cockpit, do not try to get the cockpit to fit the scribe lines. Glue the canopy to the cockpit using medium CA. Use the glue very sparingly by holding the cockpit in place inside the canopy and apply glue one drop at a time to the seam. NOTE: To keep the cockpit from bowing during this step, put the first drop of glue at the very nose of the cockpit and then put the second drop at the very top rear of the cockpit without putting any pressure on the cockpit base until the glue cures. The glue will seep in along the seam and provide a nice clean **glue** joint. Work your way around the canopy and don't get in a hurry or you may get too much glue and it will run down the canopy. Be careful not to twist or move the cockpit once you start gluing it in place.

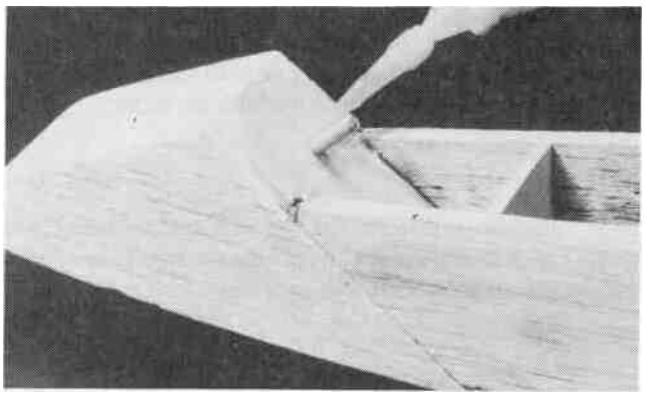


D 8. Trim and sand the canopy flush with the base and the front of the cockpit but **do not trim the back yet!** A small pair of scissors works well for trimming the canopy. Temporarily mount the wing in place on the fuse. **VERY CAREFULLY** trim the back of the canopy, **A LITTLE AT A TIME,** to fit over the wing. Take your lime and use the outlines on the canopy and the wing for guides.

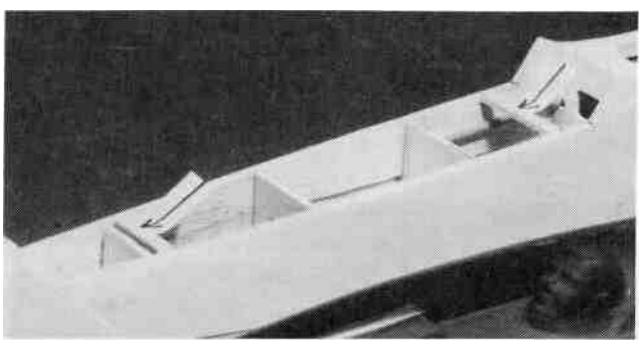
D 9. Test fit the canopy onto the fuse. You can sand the edges of the canopy slightly or you can sand the fuse if needed to get it



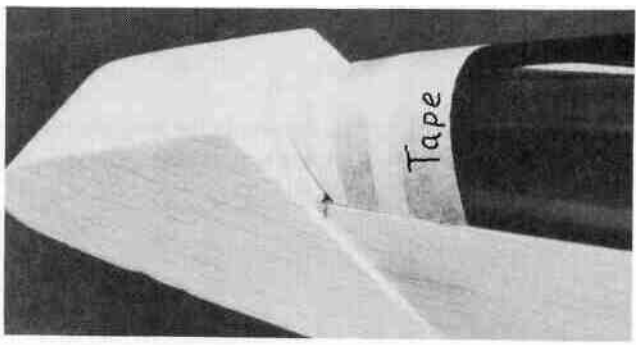
to fit properly. You can also add a layer of balsa to the back edge of F1 to take up any extra gap if needed.

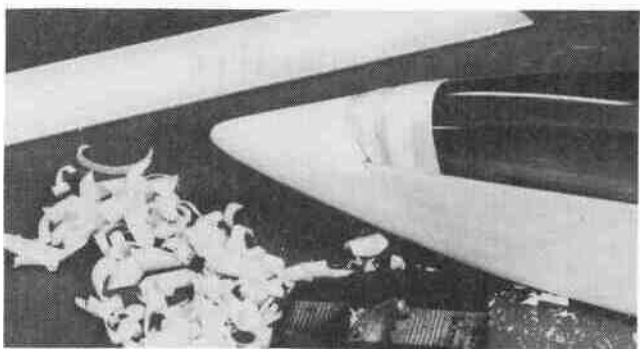


D 10. Drill a 1/8" diameter hole about 1" deep at approximately the angle shown on the plans where the punch mark is on F1. Insert the 1/8" x 1-1/4" **Canopy Hold Down Dowel** (DOWEL033) into the hole and slide the canopy into place to make sure it fits nicely. The dowel should hold the canopy down against the fuse. If it is too loose you can either enlarge the hole slightly and move the dowel down or you can build up the top surface of the cockpit base with thin ply and/or med. or thick CA. Glue the dowel in place with at least 3/8" extending.



D 11. Cut two pieces of 1/8" x 1/4" Balsa (from SPT1S04) to fit between the fuse sides, one between formers F4 and F5 and the other one just behind former F2. These pieces are called the Canopy Aligners. Wedge the aligners so they are slightly above the sides. Apply a small drop of med. or thick CA to the middle of the rear aligner and near the ends of the front aligner and carefully slide the canopy into place. Push down on the canopy to force the aligners against the cockpit base (with the canopy aligned with the fuse sides) and hold it until the glue has cured. Carefully remove the canopy and securely glue the aligners in place with more CA.





D 12. Apply a couple strips of masking tape around the front of the canopy to protect the plastic and install the canopy on the fuse. Use a razor plane, hobby knife or sanding block with coarse grit sandpaper to rough carve the nose block to shape. Use your sanding block with medium and then fine grit sandpaper to smooth out the nose block and fair it in with the canopy and the fuse.

FINAL ASSEMBLY

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.

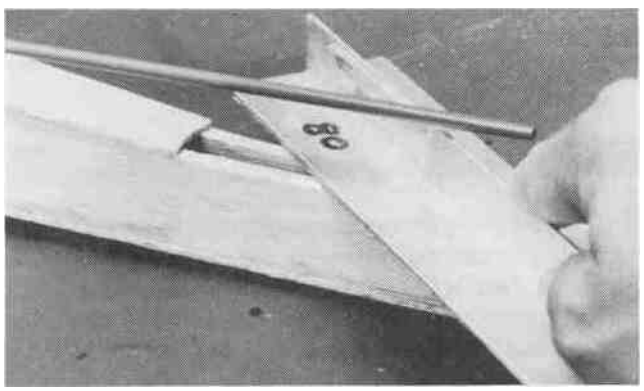
Now that you have the basic airframe nearly completed, this is a good time to balance the airplane **laterally** (side-to-side). Since

the wing is the major factor on a sailplane, we will only be concerned with it Here is how to do it

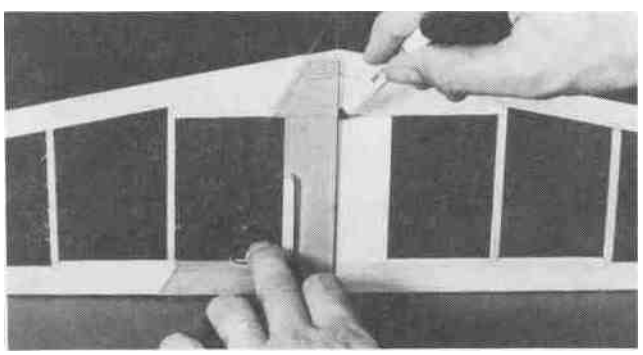
D 1 Assemble the wing and set it on a flat surface with both wing tips level Let go of the wing and notice which wing tip drops Do this several times and if the same wing tip keeps dropping push a thumb tack or small nail through rib W10 into the wing tip that keeps rising

D 2 Perform this test several times until the wing balances or the same wing tip does not drop every time and then glue the tacks or nails in place with a drop of thin CA

MOUNT THE TAIL SURFACES

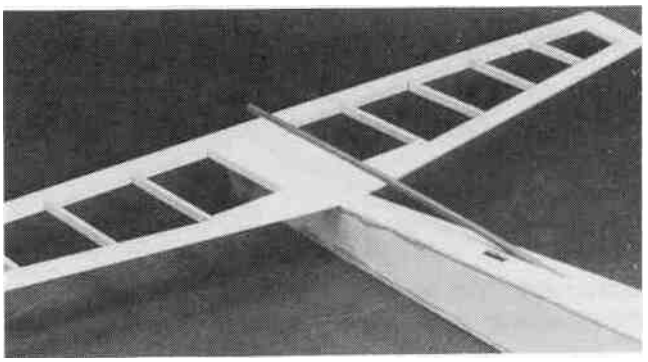


D 1 Gently sand the stab saddle area to remove any bumps or rough areas Keep both the fuse and the sanding block level with the work surface while doing this



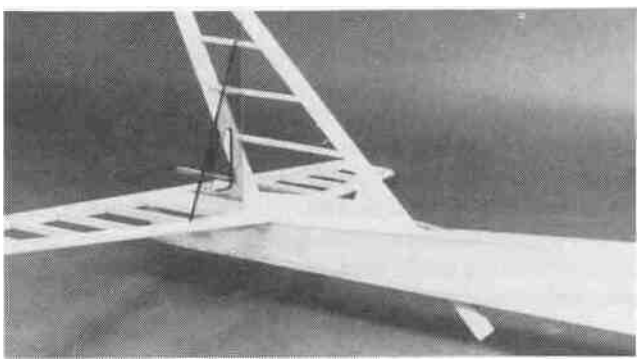
D 2 Use a drafting triangle to draw a line down the middle of the stab Use the center joint between the two LE as the center point

D 3 Rubber band or bolt the wing onto the fuse making sure it is square and centered with respect to the fuse

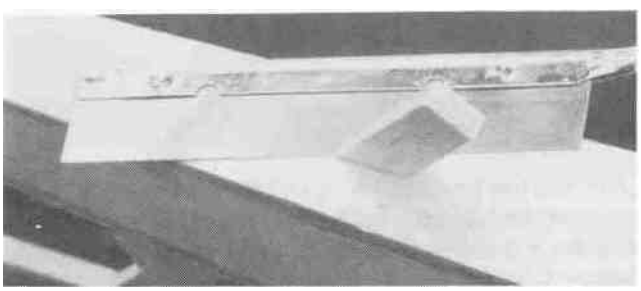


D 4 Position the stabilizer on the fuse and align the center line with the joint between the two fuse sides at the rear Adjust the front of the stab until the centerline is pointing straight at the nose of the plane Look at the plane from the front to make sure both the wing and the stab are level with the work surface Adjust the stab bed and/or the wing saddle until both are correct

D 5 Glue the stabilizer to the fuse with med or thick CA or epoxy Check its alignment with the wing while the glue is curing to make sure they are level with each other



D 6 Insert the fin LE into the slot on the fuse top and position the fin in place on top of the slab The LE should extend out the slot in the fuse bottom Check to make sure the f i n is both vertical to the stab and pointing directly at the nose of the plane Glue the fin in place on top of the stab using either med or thick CA or epoxy



D 7 Cut and sand the fin LE flush with the fuse bottom

D 8 Sand the edges of the fuse to nice rounded comers, as shown in the cross sections on the plans

FINAL SANDING

Check over the entire structure carefully, inspecting for any poorly glued joints, gaps and "dings" Apply additional glue and/or balsa filler as necessary then sand the entire structure smooth using progressively finer grades of sandpaper

COVERING

There are many different types of covering materials available these days but the iron on type coverings are by far the easiest to use and in most cases the best suited for the job There are also several different brands of iron-on coverings available We recommend you use Top Flite Super Monokote for covering your SPIRIT 100 due to this covering's higher strength Sailplanes, which usually have higher "aspect ratio" wings (long and thin), gain a great deal of strength from the covering This is evident by gently twisting the wing before and after it is covered, it is hard to believe the difference Because of this, the higher strength coverings are best suited for sailplanes

The following are some covering tips we have learned over the years but you should **follow the instructions included with your covering material.**

Sand the surfaces as smooth as possible before starting to cover the plane The finished covering job will only be as smooth as the surface you started with

Use a fresh single-edge razor blade or hobby knife blade and replace the blade as soon as it starts showing signs of dulling

Set the iron to the proper temperature by first applying a "test strip" of covering on a scrap of balsa

Work outward, start by tacking the covering in place at the comers and then start in the middle and work your way out to the corners, gently pulling any wrinkles out as you go

Securely seal all edges Make sure the edges are firmly sealed down to prevent the covering from pulling away at the seams when shrinking the panel

NOTE: When covering the fin, begin by applying a 1/2" wide strip of covering on each triangle at the base of the fin Next, cover the rest of the fin with pre-cut pieces having a straight edge to overlap (1/8"+ overlap) the strips you previously applied This is a tip you should remember as it makes it a lot easier to cover "compound" curves

IMPORTANT: When applying the covering to the stab and fin areas do not cut the covering while it is on the structure Doing this leaves "cut lines" in the wood and greatly weakens the structure Cut your piece of covering to fit before applying it

Recommended Covering Sequence:

1 Strips as described in above note
2 Rudder left side
3 Rudder right side
4 Bottom of elevator
5 Top of elevator
6 Fin left side
7 Fin right side
8 Slab bottom right **side**
9 Stab bottom left side
10 Slab top right side
11 Stab top left side
12 Fuse bottom
13 Fuse sides
14 Fuse lop
15 Bottom of left wing panels (inner and outer)
16 Bottom of right wing panels (inner and outer)
17 Top of left wing panels (overlap covering 1/4" at LE and TE)
18 Top of right wing panels (overlap covering 1/4" at LE and TE)
19 Ailerons and flaps or spoilers if installed

CHECKING FOR WARPS

This is a very important step and should be done every once in a while throughout the flying season A sailplane's wing is most efficient when it is not twisted or warped at all "Washout" (wing trailing edge twisted up at the tip) helps make a poor wing design fly better by adding stability (preventing stalls) at slow speeds but it cuts down on the wing efficiency at normal speeds The SPIRIT 100's wing is designed to fly well at slow speeds without any washout and therefore we recommend you check to make sure the wings are "flat" using the following procedure

D 1. Set the wing so an inner panel is resting on a flat surface. Any warp (twist) will show up by causing a corner of the panel to rise off of the work surface.

D 2. To remove the warp, gently twist the wing in the opposite direction while a helper glides an iron or heat gun over the covering on both the top and the bottom of the panel to re-shrink the covering. Hold the twist until the covering cools and then recheck for warps. It may take several trys to get a warp out but it is worth it as you will end up with a sailplane that flies straight and true and responds to air currents like a high performance sailplane should.

D 3. Follow the same procedure to check all four wing panels and then go back and double check them. Sometimes you put a warp in one panel while trying to fix another. You should also look at the tail surfaces as they too can warp.

HINGE THE CONTROL SURFACES

D 1. Lay the rudder and elevator on the plans and mark on the leading edge of each part the locations of the hinges. Now use a sharp hobby 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. In the same manner, slit the covering at the hinge locations in the stab and fin TE.

D 2. Follow the instructions that came with your particular hinges but keep this in mind: When gluing the hinges it is important plenty of glue gets **inside** the hinge slot.

D 3. Use Monokote strips or a good thin tape to hinge ailerons and flaps. Put one strip the entire length of the aileron or flap and put some small strips on the other side of the "hinge".

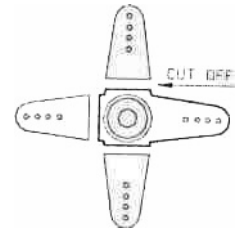
INSTALL RADIO GEAR

D 1. Read and follow the instructions that came with your radio to install or charge the batteries and get the servos ready for mounting. Plug the servos and the battery pack into the receiver and turn on the **transmitter** first and then the receiver. Adjust the trim levers to their neutral positions and allow the servos to return to their neutral positions.

D 2. Tack glue the **Nylon Control Horns** (NYLON03) in place on the rudder and elevator with a drop of thin CA. Use the plans as a reference for positioning the horns (Rudder on the left, elevator on the bottom). Drill two 3/32" holes through the control surfaces using the control horns as guides. Remove the control horns and 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 apply thin CA glue and allow it to soak in and cure. Wipe off any excess glue before it cures. Redrill the holes if necessary. Mount the control horns with the 2-56 x 5/8" Machine Screws (SCRW002) and the Nylon Nutplates which were attached to the horns.

D 3. Cut two 1/4" x 3/8" **Basswood** Servo **Rails** (SPT1F14) 2-1/16" long. Slide them into the slot between formers F4 and F5 (Cut two more for between F3 and F4 if you are installing spoilers). Slide one all the way forward and glue it in place with med. or thick CA. Slide the other servo rail all the way to the back. **Do not glue it yet!** Position one of your servos in place and use it to position the rear servo rail. **Do not** push the rear servo rail up light against the servo but rather leave about a 3/32" **gap** between the servo "body" and the rear servo rail. This will give you enough room to put the servos in and out without removing the rails. Glue the rear servo rail in place.

D 4. Position the rudder and elevator servos together in the middle of the rails and mark where the holes for the servo mounting screws should be drilled. Remove the servos and drill 1/16" holes where the marks are. Install the servos, with the wires exiting toward the receiver using the servo mounting screws that came with the radio.



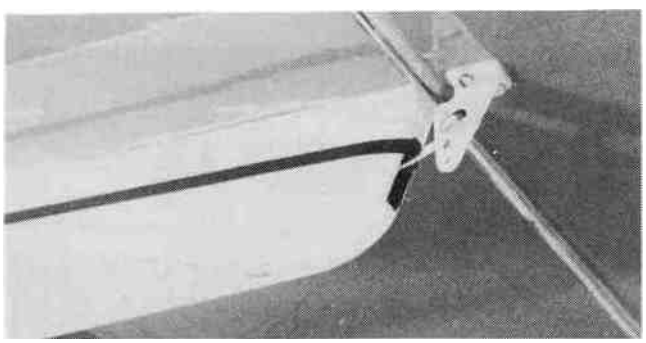
D 5. Cut three "arms" off of two X-type servo horns using wire cutting pliers or a razor saw as shown in the sketch. Install the

two servo horns with the arms facing opposite directions as shown on the plans. Operate the transmitter sticks to make sure the servo horns turn freely without hitting each other or the fuse sides. If they do, cut or sand them until they will operate freely. Turn off the **receiver first** and then the transmitter.

SKIP THE NEXT STEP IF YOU ARE NOT INSTALLING SPOILERS

D 6. If you are installing spoilers, mount the spoiler servo between formers F4 and F5. It can be mounted on servo rails, or on its side with servo tape. Cut 3 arms off of an X-type servo horn as you did for the tail surfaces. Insert a #2 x 3/8" Sheet Metal Screw (SCRW024) in the outside servo horn hole for the spoiler string. Leave it extending about 1/4" above the horn. Adjust the servo and your transmitter so the horn is almost pointing towards the rear of the plane when your transmitter stick is in the "spoilers closed" position. The horn should rotate towards the front of the plane when the transmitter stick is moved to the "spoilers open" position. Which way the transmitter stick moves to open the spoilers is up to you. Both directions are used by today's pilots.

NOTE: The following paragraph is written using ordinary nylon tube type pushrods. They arc intended only as a guideline to help you install your pushrods, so descriptions may differ from your particular setup.



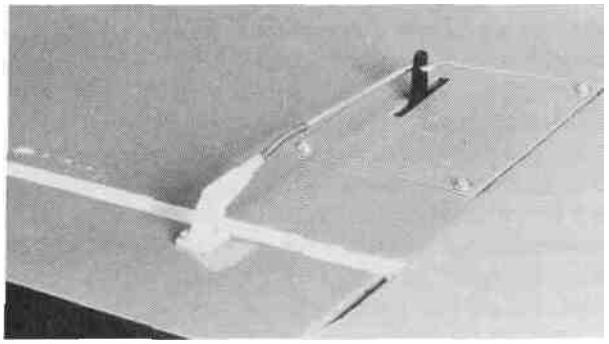
D 7. Slide the pushrod inner tubes into the fuse. Snap the nylon clevises into the outermost hole in the servo horns. The rudder pushrod goes to the left servo and the elevator pushrod goes to the right servo. A Z-bend is recommended for the elevator/pushrod connection. **With the elevator and elevator servo in their neutral position,** use a felt tip marker to make a small mark on **the pushrod wire where it crosses the hole in the control horn.** Remove the pushrod from the fuse and make a Z-bend in the wire with the first bend starting where the marks are. Cut any excess wire off 1/4" past the Z-bend and reinsert the pushrod into the fuse. Remove the nylon control horn from the elevator and insert the Z-bend into the second hole from the inside. Re-install the control horn to the elevator. Adjust the nylon clevises until the control surfaces are at neutral when the servo horns are perpendicular to the centerline of the fuse. Cut the 2-56 x 5/8" screws off flush with the nylon nutplates.

SKIP TO STEP 13 IF YOU BUILT THE SPORT WING!

D 8. Cut all the arms but one off of the three longest servo horns you can find for your radio (3/4" - 1" radius is needed for maximum surface throw). Mount the aileron servos on the ply hatches and install the servo horns so they are rotated approx. 15 - 20 degrees **forward** when the transmitter stick is at neutral. Mount the flap servo on its hatch and install the servo horn so it is rotated approx. 20 - 30 degrees **rearward** when the transmitter stick is at the "neutral flap" position. Install the hatches on the wing with four #2 x 3/8 sheet metal screws each.

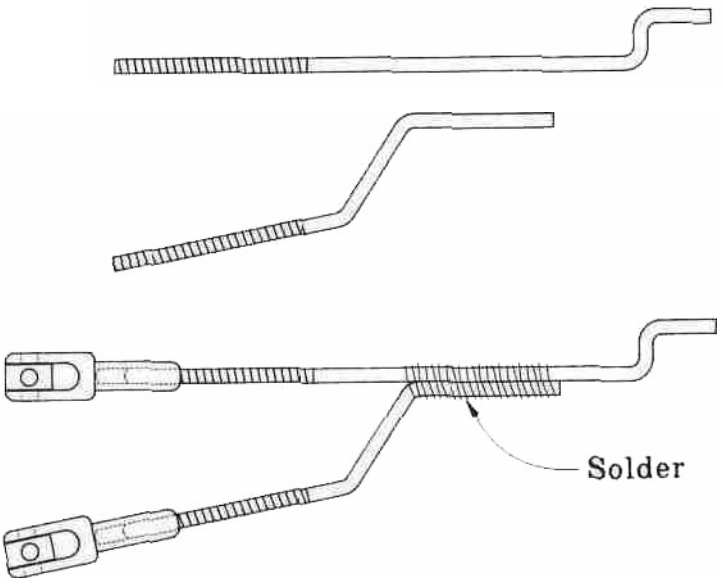
D 9. Tack glue the Nylon **Control Horns** (NYLON03) in place on the ailerons with a drop of thin CA. They should be located directly behind but about 3/32" outboard of the servo horn. Drill two 3/32" holes through each aileron using the control horns as guides. Remove the control horns and harden the balsa in the area of the control horns (on both sides of the ailerons) by poking several holes with a pin, then apply thin CA glue and allow it to soak in and cure. Wipe off any excess glue before it cures. Cut off the nylon control horns just above the second hole as shown in the sketch (if your radio does not have servo endpoint adjustments wait until you have all the control throws properly set before doing this). Mount the control horns with the 2-56 x 5/8" Machine Screws (SCRW002) and the Nylon Nutplates which were attached to the horns. Cut the screws off flush with the nylon Nutplates.

D 10. Screw a Nylon Clevis (NYLON17) on two 12" **Threaded** Wire Rods (WIRES16) until the threads start to exit the base. Snap the nylon clevis into the outer hole of the control arm and make a mark where the rod crosses the outer hole in the servo arm



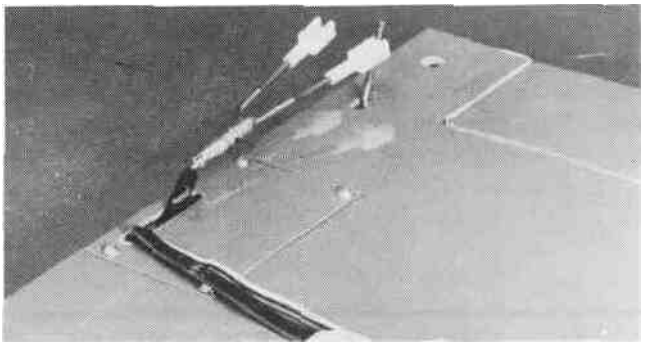
(Make sure the arm is in its neutral position - approx. 15 - 20 degrees forward). Make a Z-bend in the wire with the first bend starting where the mark is. Cut any excess wire off 1/4" past the Z-bend. Un-snap the clevis from the control horn and insert the Z-bend into the outer hole of servo arm. Replace the clevis on the control horn and check the movement of the aileron to make sure the pushrod does not bind throughout the aileron movement. You can bend the pushrod slightly as shown in the photo if needed, but try not to bend the threaded portion.

HINT - Use a 2-56 tap to tap the nylon control horns and swivel clevises before threading them on the wires. It makes them much easier to put on and adjust.



D 11. Use the remaining two **12" Threaded Wire Rods** (WIRES 16) to bend the flap pushrods according to the sketch **but don't add the Z-bend yet.** Clean the wires thoroughly with alcohol. Hold the two wires together and wrap the joint with a thin wire and then flow solder onto the joint. Screw a **Nylon Swivel Clevis** (NYLON21) onto each threaded portion of the flap linkage.

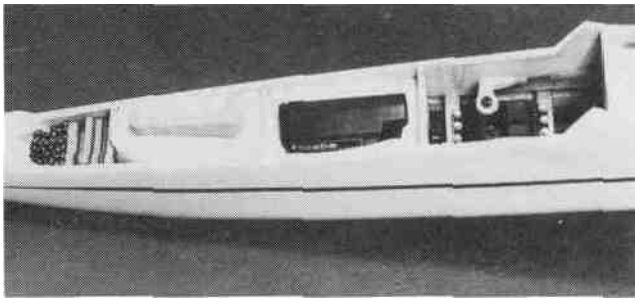
D 12. Screw a **Nylon Clevis Swivel** (NYLON20) onto the threaded portion of each torque rod until the little pins are approx. 5/8" from the surface of the wing. Snap the flap linkage into place on the torque rods. With the flaps and the flap servo in their



neutral position (the servo arm should be rotated approx. 20 to 30 degrees rearward), mark where the flap linkage crosses the outer hole in the flap servo arm. Remove the flap linkage and make a Z-bend starting where the mark is. Re-install the (flap linkage and check the operation of the flaps to make sure there is no binding throughout the full flap movement (10 degrees up and 90 degrees down). Also check to see the flaps are even with each other and move the same amount. If not, adjust the nylon swivels or clevises until they are. **NOTE:** To separate the wing panels, just unsnap the right clevis and leave the flap linkage connected to the left wing. **Keep an eye on the nylon clevises and replace them when they start showing signs of wear.**

D 13. Pack the receiver in at least 1/4" of foam and install it between formers F3 and F4. If you are installing spoilers, put the receiver behind the ballast box. The receiver antenna can run down through the fuse but try to route it as far away from the servos and servo wires as possible. Allow the excess antenna to trail from the fuse. **DO NOT CUT THE** ANTENNA!

D 14. The receiver switch can be taped wherever it fits best **inside the fuse** with double sided foam tape. Because the canopy is so easy to remove, there is no need for the switch to be accessible from the outside (this helps cut down on aerodynamic drag and accidental shut-offs during launching as well).



D 15. The battery pack should be wrapped in 1/4" of foam also and it should be positioned between formers F2 and F3.

D 16. Hook up your radio system and test the operation of all controls. The controls should move smoothly without any binding or looseness.

INSTALL THE SPOILERS (OPTIONAL)

D 1 Thread a 36" long piece of 20-30 lb fishing line through the spoiler tubing in the wing

D 2 Thread one end of the string through the small hole in the spoiler horn and use a piece of a round toothpick to hold the line in the horn Allow about 1/2" to hang out the othcr side of the horn for fine adjustments

U 3 Tape the spoiler in position in the wing using a strip of cellophane vinyl tape or a strip of covering The tape should be flexible enough to allow the spoiler to close on us own **The tape should also be replaced every once in a while as it will eventually rip.**

D 4 Glue a small lead weight on the bottom side of the spoiler to help it close 1/4 oz is usually enough since the airflow will keep the spoilers closed when the plane is flying

D 5 Mount the wings on the fuse and pull the ends of the spoiler strings up to the spoiler servo Position the spoiler servo horn at the rearward end of its swing and wrap one spoiler string around the screw in the horn With the spoilers taped or held closed, apply a drop of med or thick CA to glue the string to itself and form a small loop Remove the string and perform the same steps to the other string The two strings should be the same length (be careful not to glue the two strings together) and the **spoilers should open and close together** Small adjustments can be made at the toothpick end if needed

We recommend the following CONTROL SURFACE THROWS:

NOTE: Throws are measured at the **Trailing** Edge ot the elevator and rudder These control surface "throws" arc approximate and provide a good starting point for the first nights with your SPIRIT 100 You may wish to change the throws slightly to provide the responsiveness you prefer

ELEVATOR: 5/8" up, 5/8' down

RUDDER: 1-1/2" Rt, 1-1/2" Lt

FLAPS: 6 degrees up (3/16),
70 90 degrees down CROW

AILERONS: 3/4" up, 3/8" down
30 deg down, 60 - 70 deg up (CROW)

SPOILERS: 70 - 90 degrees up

Move the pushrod wires (Z-bends, nylon clevises) in or out on the control horns and servo horns to achieve the desired movements If your radio is equipped with "endpoint adjustments" you may set the throws from the transmitter

CONTROL SURFACE MIXING

Their are several types of mixing the SPIRIT 100 can take advantage of if you have a computer radio

CROW - This mixing is tied to the flap stick and allows the ailerons to come up (up to 75 degrees) as the flaps drop This is particularly useful when landing or trying to lose altitude

AILERON/RUDDER COUPLING - This is used to allow the sailplane to make efficient non slipping non skidding turns You will need to experiment to find the proper amount of throw required to do this but 1" of rudder throw at full aileron is probably a good place to start The idea behind this is to have the tail follow the "groove" of the turn rather than being pulled inside or pushed outside the groove Some radios have a 3 position switch to control the amount of rudder coupling If they do, we like to set it up so one position will have no coupling, the second position will have the coupling explained above, and the third position will have maximum rudder throw (almost hitting the stab) at full aileron The third position can be helpful when landing or when trying to turn ' flat' in very light lift

FLAPS (CROW)/ELEVATOR COUPLING - This is used to keep the plane level as the flaps come down You can set this up to suit your flying style but 1/8" of down elevator at full down flaps is a good place to start

ELEVATOR/CAMBER COUPLING - This is a neat type of mixing allows the TE to respond to the elevator When properly set up, this can be very useful when floating around in light air or when trying to thermal very lightly This mixing can change the flying characteristics of the plane so start off small and get used it A good place to start would be approx 1/8" of TE drop at full up elevator

CAMBER/ELEVATOR COUPLING If your radio allows this, just experiment to achieve level flight in all camber positions Generally a **small** amount of down elevator will be required as the TE drops

BALANCE THE MODEL

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

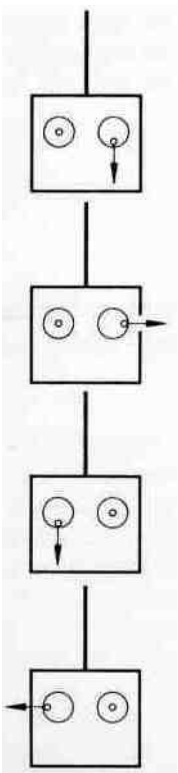
D 1.The balance point (CG - Center of Gravity) is shown on the plan, and is located under the spar This is the balance point at which your model should balance for your first flights Later, you may wish to shift the balance up to 1/2" behind the spar to change the flying characteristics Moving the CG forward of the spar will add stability but it will decrease the overall performance of the sailplane and make it stall easier at slower speeds Moving the balance behind the spar makes the model more agile with a lighter and snappier "feel" and improves the sailplane's response to air currents It also makes the model less stable and can cause the sailplane to "tuck under" or dive when its flying speed increases If you fly the SPIRIT 100 with its CG behind the spar

(usually only contest flying), pay close attention and do not let it gain excessive speed. If it does tuck under and you have plenty of altitude, give the plane a little down elevator and allow it to go on under. When it starts to climb up the back of the "outside loop" its airspeed will drop and you can pull out with up elevator or roll out with full rudder or ailerons. If you don't have plenty of altitude, gently pull out with up elevator but be **careful** and **don't** "jerk" it up or you may over stress the wing.

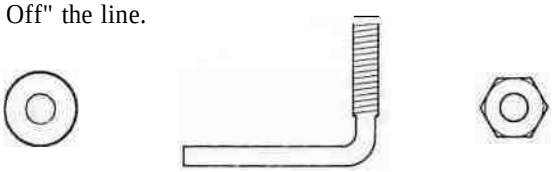
D 2. With the wing attached to the fuse, and all parts of the model installed (ready to fly), lift the model by picking it up with a finger on each bottom inner spar. If the tail drops when you lift, the model is "tail heavy" and you must add weight to the nose to balance. If the nose drops, it is "nose heavy" and you must add weight to the tail to balance. The model should hang with a slight nose down altitude Add BB's or lead to the weight compartment between formers F1 and F2 to correct a tail heavy model. In the unusual circumstance you would have a nose heavy model, you can switch the receiver and battery or even move the receiver behind the servos Getting the weight farther back helps correct the "nose heaviness". Make sure to glue any weight you add securely in place.

FINAL HOOKUPS AND CHECKS

D 3 1. Make sure the control surfaces move in the proper direction as illustrated in the following sketch If you built the ADVANCED wing, you will have to connect the servo extensions each time you assemble the plane. To prevent a possible switched connection and the resulting re-kitting of the plane that usually follows, it is a great idea to color code or otherwise mark both plugs of each servo extension.

Transmitter Stick Movements	Control Surface Movements (SPORT WING)	Control Surface Movements (ADVANCED WING)
	**Elevator moves UP**	**Elevator moves UP**
	Rudder moves RIGHT	Right aileron moves **UP and** Left **aileron moves DOWN**
	Spoilers OPEN **or** Spoilers CLOSED (Your Choice)	Flaps DOWN or Flaps UP (Your Choice)
	Not **used**	**Rudder moves** LEFT

D 2 Attach the **6-32 Threaded Towhook** (WBNT154) to the bottom of the fuse by threading a **6-32** Nut (NUTS010) and a #6 **Washer** (WSHR004) all the way onto the towhook and screwing the towhook into the front hole for the first flights With the towhook threaded almost all the way into the blind nut, make sure the towhook is facing straight back and lighten the 6-32 nut to secure it After the first fights the towhook can be moved back a hole or two for most flying conditions For contest flying you may want to try the rear hole as it can help achieve a higher launch but **be careful** as the sailplane will be less stable and more apt to "Pop Off" the line.



D 3 A piece of self adhesive foam rubber weather stripping can be applied to the front of the fuse bottom to help protect it from getting nicked up during landings.

D 4. The canopy is held in place with a rubber band Loop a medium size rubber band through the cut-out in the cockpit back. Thread the rubber band through itself and then hook it on the little extension on former F5. To remove the canopy, pick up on the back until the front is clear of the dowel. To put the canopy back on, do just the opposite.

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

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 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 on the front cover 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 and away from houses, buildings and streets. A

schoolyard may look inviting but it is usually too close to people, power lines and possible radio interference.

If you arc not thoroughly familiar with the operation of R/C models, ask an experienced modeler to check to see you have the radio installed correctly and all the control surfaces do what they are supposed to.

RANGE CHECK YOUR RADIO

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

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.

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.

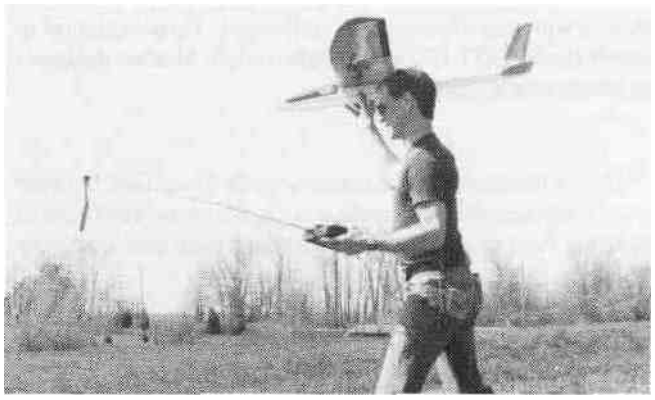
3. I will perform my initial turn after takeoff away from the pit, spectator and parking areas, and I will not thereafter perform maneuvers, flights of any sort or landing approaches over a pit, spectator or parking area.

FLYING

First of all, if you are flying with other flyers check to make **sure** they are not flying or testing on the same frequency as **your** model.

Try to find an experienced pilot to help you with your first flights. Although the SPIRIT 100 is very easy to fly, an experienced pilot can save you a lot of time and possible aggravation by helping you get your model in the air smoothly.

TRIM FLIGHTS



It is a good idea to do a couple of trim flights before each flying session to make sure the plane is still in trim and the radio is working properly. The model will survive a hard landing from 5 feet much better than it will one from several hundred feet. The first few trim flights should be done over a grass field. The longer the grass the better (more cushion).

Turn on the transmitter first and then the receiver and hold the SPIRIT 100 under the wing with the nose pointed slightly down and directly into the wind as shown in the photo. It is very important you launch the model with the wings level and the nose pointing at a spot on the ground about 50 feet in front of you. Have a friend stand off to the side of you and tell you weather the nose is pointing up or down. Show your friend the picture above so he will know what to look for. If the sailplane is launched with the nose up or launched too hard it will climb a few feet, stall and fall nose first straight down. With the nose pointed down slightly the sailplane will accelerate down until it picks up enough flying speed then level off and glide forward. The plane should be launched with a good push forward. With a little practice you will be able to launch it at just the right speed so it soars straight ahead in a long and impressive glide path. Adjust the trims on your transmitter to get the plane to fly straight ahead in a smooth glide path.

Once you get the hang of launching it you can try turning the plane during the trim flights by gently applying a "touch" of right or left rudder or aileron. You can also try "flaring" the landings by slowly applying a touch of up elevator (pull the stick back) as the plane nears the ground. The SPIRIT 100 will continue to fly just a few inches off the ground for a surprisingly long distance. It is important you don't "over-control" the model. Make any control inputs slowly and smoothly rather than moving the transmitter sticks abruptly.

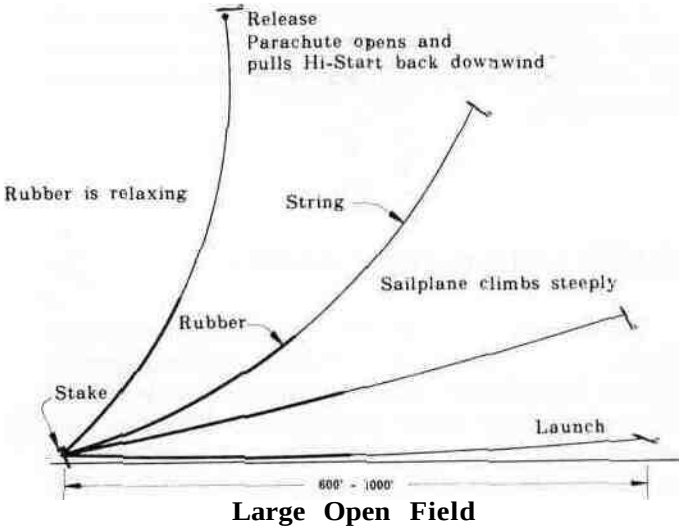
YOUR FIRST HI-START LAUNCH

A hi-start is the most popular way to launch your SPIRIT 100. It consists of 25'- 100' of rubber tubing and 200' - 400' of string with a parachute or streamer at the end. One end of the rubber is staked down directly upwind of the launch point. One end of the string is attached to the other end of the rubber and the end of the siring with the parachute has a loop or ring and is attached to the towhook on the sailplane. Because of the SPIRIT 100's larger size you will need a heavy duty type hi-start. **Do not attempt to launch the SPIRIT 100 with a light-weight hi-start designed for smaller sailplanes.**

Follow the directions that came with the hi-start and lay it out directly into the wind. Place the slake at the far **upwind** edge of the flying field so the parachute will blow back onto the flying field.

Turn on your transmitter and then your receiver and hook the parachute up to your plane's towhook. Pull the plane back approximately twice as far as the rubber is long (ie. 100' of rubber = pull back 200') or whatever the hi-start instructions slate. A "fish scale" is handy for determining the correct amount of pull. For your first flights pull the plane back until there is approximately 10-12 lbs. of tension. More tension can be used after you get acquainted with the launching procedure.

TYPICAL HI-START LAUNCH



Large Open Field

Hold the plane above your head with the wings level and the nose pointed slightly up and directly into the wind. Give the plane a healthy push forward to get it flying and it will climb up like a kite. You should not have to touch the elevator during the launch but use the rudder stick to keep it going straight up. You will find the ailerons arc not very responsive during the first part of the launch. As the rubber relaxes the plane will fly off the hi-start and the parachute will bring the end of the string back towards you.

FIRST FLIGHTS

Find a BIG OPEN field for your first nights. The bigger the better as you won't have to worry about where you need to land. Ground based objects (trees, poles, buildings, etc.) seem to attract model airplanes like a magnet. **Again, we would like to recommend you find an experienced pilot to help you with these first flights.**

NOTE: You need to remember your radio control responds as if you were sitting in the cockpit. When you push the transmitter stick to the right, the rudder moves to the plane's right!. This means when the plane is flying towards you it may seem like the rudder controls are reversed (when you give "right" rudder the plane turns to your left-which is the plane's "right") It is sometimes easier to learn to fly the plane if you always face your body in the direction the plane is flying and look over your shoulder to watch the model.

Don't worry about accomplishing very much on your first flights. Use these flights to get the "feel" of the controls and the SPIRIT 100's flying characteristics. Try to keep the plane upwind and just perform some gentle "S" turns (always turning into the wind) until it is time to set up for landing. Have a helper

adjust the trims on your transmitter (a little at a time) until the plane will fly straight and level with the transmitter sticks in their neutral positions It can be very hard for a beginner to fly a plane straight towards him as he would have to do if the plane were down wind and every mistake takes the plane a little farther down-wind When it is time to land just continue performing the gentle S-turns upwind and let the plane glide onto the ground Don't worry about where the plane lands, just miss any trees, etc

Practice flying directly into the wind (upwind of yourself) without letting the plane get off course and then turn and come downwind until the plane is even with you and try it again When you are comfortable with flying directly into the wind, start letting the plane go behind you (downwind) a little before you start back upwind Continue this until you can fly directly towards you from downwind without getting disoriented At this point you can start to establish a "landing pattern ' and bring the sailplane in for a landing from downwind This enables the plane to be flown as slowly (ground speed) as possible for accurate landings

FLAPS/CAMBER CHANGING AND CROW

If this is your first plane with flaps and ailerons you're in for a treat Even if your radio doesn't have mixing capabilities you can still take advantage of these surfaces

The flaps and ailerons are extremely effective on the SPIRIT 100 and can be used in a variety of situations

LAUNCHING The flaps should lower approximately three times as much as the ailerons A good place to start is about 15 degrees of flap and 5 degrees of aileron drop This auto-matically puts some washout in the wing which adds stability for arrow straight launches If you don't have a switch for launch camber, just use the flaps for launch You will want to experiment with the amounts and percentages until you get the best launch Keep in mind several factors including towhook position, CG, winch or hi-start strength and of course weather conditions, will affect the launch

FLYING The camber is usually controlled by either a 3-position switch or a side lever We prefer the 3-position switch because it always moves the surfaces to the same position every time eliminating possible trim problems and allowing you to become familiar with those flying characteristics There are several ways of setting up this switch and they are dependant on the weather conditions and the type of flying being done that day Below are the two ways we usually program the switch

The traditional way of setting this switch is to have the middle position set to neutral camber, one direction for reflex (the entire TE raises about 1/16) and the other direction for positive camber (the entire TE drops about 3/32) This way of program-ming the switch is great (or good thermal days or days with a lot of wind where you might need the reflex capability for coming up wind

The other way we set this switch is to have the "back" position (if the radio allows) for neutral camber, the middle position for a slight amount of positive camber (1/32"-1/16"), and the forward position for more positive camber (3/32"- 1/8") The middle position can be used once good air is located or when trying to gain a few extra seconds of air time Normally the L/D will not be as great as neutral camber but the sailplane will float belter The forward position is the "panic" position When the sailplane is low and encounters lift, don't panic, just hit the switch The SPIRIT 100 will really slow up and will thermal "on a dime" This is where the polyhedral really comes into play No other aileron sailplane can thermal as tight and efficiently, allowing you to take advantage of the small thermals most others miss This set-up is great for duration type flying without a lot of wind

CROW or full flaps can be used to lose altitude very quickly In a contest, this allows you to stay higher (and safer) longer, then drop the flaps and point the nose at the ground and come straight down if you desire The plane will lose altitude very quickly but will not build up excessive speed, but its a good idea to pull the nose up before you pull the flaps up or you could gain speed quickly

LANDING: Landings are a pleasure with flaps and ailerons If your radio has CROW capabilities you will enjoy the ultimate in sailplane control Be sure to use plenty of aileron differential in the CROW mixing because the ailerons become less effective at very high angles of deflection Also use plenty (maximum) rudder coupling at full CROW If you don t have CROW capabilities just use your flaps and make sure you have full rudder throw when the flaps start coming down It is a good idea to get lined up on the spot before dropping the flaps very much because the rudder is slow in turning the plane with the flaps down at slow speeds

THERMAL FLYING

Thermal soaring is one of the most intriguing of all aspects of flying and the SPIRIT 100 was designed to excel at thermal soaring even in the hands of a novice It can be hard for the average person to understand how a plane can fly for hours and gain altitude **without a motor!**

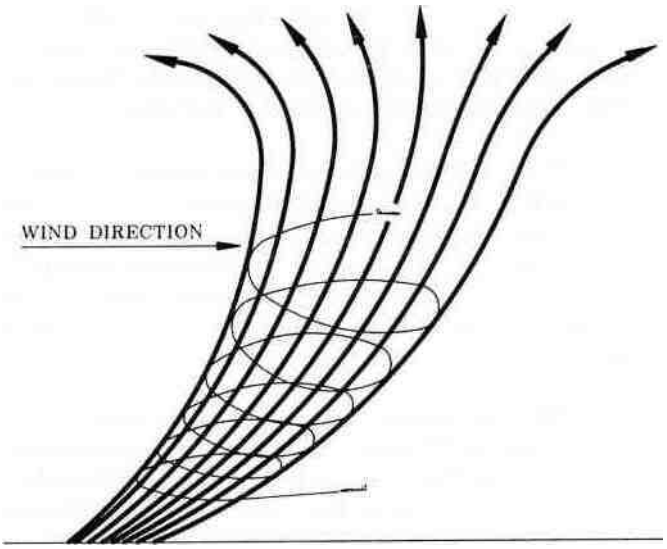
FACTS ABOUT THERMALS

Thermals are a natural phenomenon that happen outside, by the millions, every single day of the year Thermals are respon-sible for many things including forming several types of clouds, creating breezes, and distributing plant seeds and pollen If you have ever seen a dust devil (which is nothing more than a thermal that has picked up dust), you have seen a thermal in action Their swirling action is very similar to that of a tornado's but of course much gentler Most thermals have updrafts rising in the 200-700 feel per minute range but they have been known to produce

updrafts of over 5,000 feel per minute (that's over 50 miles/hour straight up') These strong thermals can rip a plane apart or carry the plane out of sight before the pilot can get out of the updraft

TYPICAL THERMAL

Wind causes thermal
to drift downwind



Thermals are formed by the uneven heating of the earth and buildings, etc by the sun The darker colored surfaces absorb heat faster than the lighter colors which reflect a great deal of the sun's energy back into space These darker areas (plowed fields, asphalt parking lots, tar roofs, etc) get warmer than the lighter areas (lakes, grassy Fields forests etc) This causes the air above the darker areas to be warmer than the air over the lighter areas and the more buoyant warm air rises as the cooler, denser air forces its way underneath the warmer air As this warm air is forced upward it contacts the cooler air of the higher altitudes and this larger temperature difference makes the thermal rise quicker The thermal is gradually cooled by the surrounding cooler air and it s strength diminishes Eventually the thermal stops rising and any moisture contained in the once warm air condenses and forms a puffy cumulus cloud These clouds, which mark the tops of thermals, are usually between 2000 and 5000 feet high

THERMAL SOARING

It takes a lot of concentration to thermal soar effectively A sailplane can fly along the edge of a thermal and unless the pilot is carefully watching the model he may not realize the opportunity to gain some altitude Because most thermals are relatively small (a couple hundred feet in diameter or less at 400' altitude) compared to the rest of the sky, the sailplanes will rarely fly directly into the thermal and start rising Generally, the sailplane will fly into the edge or near a thermal and the effects the thermal has on the plane may be **almost** unnoticeable As the sailplane approaches a thermal, the wing tip that reaches the rising air first will be lifted before the opposite wing lip This causes the plane to "bank" and turn away from where we would like the plane to go.

When you arc thermal soaring try to fly as smoothly and straight as possible Trim the plane to fly in a straight line and **only** touch the controls when you have to Watch the sailplane carefully and it will tell you what it is encountering

When the sailplane flys directly into a thermal it will either start rising or stop sinking Either case is reason enough to start circling (especially in a contest where every second counts) Fly straight ahead until you feel like you are in the strongest lift, **fly a couple of** seconds **farther** (so your circle will be centered in the strongest lift) and then start circling in a fairly light but smooth turn When the sailplane is low the turns have to be tighter to stay in the strongest lift As the plane gains altitude, the turns can be larger and flatter The flatter the turn the more efficient the plane is flying, but don't be afraid to really 'crank" it into a steep bank when you are low If you see the plane falling off on one side of the turn, move your circle over into the stronger lift Thermals move along with the wind so as you circle you will be swept along with it Be careful when thcrmaling that you don't get so far downwind you can't make it back to the field to land

If the sailplane is flying along straight and all of a sudden turns, let the plane continue to bank (you may have to give it some rudder to keep it banking) until it ha.s tuned 270 degrees 3/4 of a full circle) Straighten out the bank and fly into whatever turned the plane If you encounter lift, and you won't every time, start circling just as you did when flying directly into a thermal

Thermals are generated all day long, but the strongest thermals are produced when the sun is directly overhead. 10:00 am -2:00 pm seems to be the best time to get those "killer" thermals Some of these thermals can be very large and you may find it hard to get out of them If you find yourself getting too high, don't dive the plane to get out of the lift Sailplanes are very efficient aircraft and they will build up a lot of speed and could "blow up" in the rough air of a thermal The easiest way to lose altitude is to apply full rudder and full up elevator This will put the plane into a tight spin that will not over stress the airframe but it will enable it to lose allilude very quickly This is especially helpful if the sailplane gets sucked into a cloud or it gets too high to see The twirlmg action will give the sun a better chance of flashing off of the wing and catching our attention When y ou are high enough and want to leave the thermal, add a little down trim to pick up speed and fly 90 degrees to the direction of the wind If you are not real high and want to find another thermal, you may want to look upwind of the last thermal The same source that generated this thermal is probably producing another Just watch out for "sink" it is often found behind and between thermals

As you might expect, with all this air rising, there is also air sinking This air is the sailplane pilot's nightmare that can really

make soaring challenging "Sink" is **usually** not as strong as the thermals in the same area, but it can be very strong Down drafts of many hundreds of feet per minute are common on a good soaring day These down drafts can make a sailplane look like it is falling out of the air Because of this, it is important you do not let the sailplane get too far downwind

When encountering sink, immediately turn and fly 90 degrees to the direction of the wind (towards you if possible) Apply a little "down elevator" and pick up speed to get out of the sink as fast as possible Every second you stay in the sink is precious altitude lost

POINTERS FOR CONTEST FLYING

Pay Attention! - Pay close attention to the sailplanes flying before you, watch them and try to establish where and when the thermals are being formed Thermals are often formed in cycles and can be fairly regular so if you keep track of the time intervals you will have a pretty good idea of when and where a thermal may be generated

Watch the birds! - Thermals suck up small insects many birds love to eat A bunch of swallows flying around in one area may indicate a thermal Soaring birds (hawks, vultures, eagles etc) are the best thermal indicators They not only show you where the thermal is but they also show you where the center is These "Masters of the sky" will often fly right along with sailplanes

Practice those landings! - Most thermal contests are won or lost during the landing Establish a particular landing pattern and try to stick to it for all landings Learn to shift your pattern to account for the wind and particular flying field characteristics Spoilers can be very useful during contest landings They allow you to bring the sailplane in for a landing higher or faster than normal to guard against any last minute sink or gusts and dump the extra altitude and speed at the last second They can also be used to help control your skid Opening the spoilers will stop the plane from sliding a little quicker You can also "steer" the plane while it is sliding along the ground Don't expect to be able to "horse it around" but you can gain valuable inches by using the rudder to guide it towards the spot as it slides to a stop Be very careful not to "ground loop" the plane since you will lose your landing points if the plane flips over

Concentrate Keep your eye on your sailplane during your contest flights Have a helper or your counter watch the other sailplanes in the air Sometimes your sailplane will wiggle so quickly or gently you may miss it if you are not paying close attention If you find a productive thermal don't leave it because your helper tells you someone else has found a different one

Know your sailplane! - Learn what your sailplane will and won't do and fly within this envelope This will allow you to ride thermals downwind while knowing when you have to head back to make your landing safely

Learn from the wind! - Keep track of which way the wind is blowing. If the wind suddenly shifts, there is thermal action fairly close to you The air is probably being either sucked up into a thermal or falling out of sink In either case it is often a good idea to fly in the direction the wind is blowing if your sailplane is in the general area This will lake you towards a thermal if there is one or away from the sink, both of which are desirable

SLOPE SOARING

FLYING

Slope soaring is a type of flying that is very popular in hilly regions and along the coasts This type of soaring is possible when the wind is blowing directly up a hill or cliff As the wind hits the slope it is forced up producing lift which can be ulilized by real sailplanes, hang gliders, birds and even model sailplanes

To be able to slope soar, you need a slope with a smooth piece of land (or water) out in front of it and a breeze blowing pretty close to straight up the slope The higher and steeper the hill or cliff the better Also the larger and smoother the land out in front the better The air flowing along hits the hill, is forced up and can generate a very large area of lift Behind the hill is a large area of turbulent air that can be very dangerous to try to fly in The faster the wind is blowing the stronger the lift and turbulence will be

To fly off a slope, stand near the edge and throw the sailplane (nose down) into the wind As the sailplane flys out into the "band" of lift it will begin to gain altitude Turn and fly parallel to the slope and make all of your turns into the wind (especially when you are close to the slope) You will be surprised at the altitude you can gain just from slope lift Thermals will often be "popped loose" by these slopes If you catch a thermal and follow it downwind, be very careful to stay high enough to make it back to the slope without flying through the turbulent air behind the slope If you don't have enough altitude you may want to land a good distance behind the slope if possible to avoid this turbulent air

SLOPE LANDINGS

Landings can be very tricky on some slopes. **On** gentle slopes you can often fly very close to the top of the slope and "slide" into the top of the slope without encountering any turbulent air. On steeper slopes you may have to be a little more aggressive to get the plane out of the lift. In any case it is a good idea to plan your landing before you launch your plane.

BALLASTING

In strong wind conditions, you may want to add ballast (weight) to the sailplane to increase its wing loading which increases its normal flying speed. Increasing the weight of your sailplane does not change its "glide ratio" but it does make it fly faster which makes it sink a proportional amount faster. Because of this faster sink rate, you need to be very cautious when ballasting for a thermal contest. In duration type contests only use ballast on very windy days that also have a lot of thermal activity.

The SPIRIT 100 has a neat feature not found in any other sailplane kit - a built in ballast box. It is designed to hold up to 30 ounces of the self adhesive lead strips found at your local hobby shop. It is centered directly on the center of gravity of the plane so you can add ballast without having to re-balance the plane. When learning to ballast your plane, start out small and work your way up. 6-10 oz. will make a noticeable difference in the sailplane's flying speed.

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

GOOD LUCK AND GREAT FLYING!

BUILDING NOTES

Kit Purchase Date -

Where Purchased-

Price-

8-Digit # on End Flap of Box-

Date Construction Started-

Date Construction Finished-

Date of First Flight-

Finished Weight (ounces) -

Wing Loading (Weight - 6.57)-

Comments-

SPIRIT 100 PARTS LIST

PART#	QTY.	DESCRIPTION
PACKED LOOSE IN KIT		
BAL141	3	1/4" x 24" Balsa Triangle
CANPY048	1	Clear Canopy
SPT1F01	2	1/8" DC Balsa Front Fuse Side
SPT1F04	1	1/8" DC Ply Front Fuse Bottom
SPT1F10	1	1-7/8" Balsa Nose Block
SPT1F13	1	ABS Formed Cockpit
SPT1P01	1	Full Size Plan
SPT1P02	1	Instruction Book
SPT1W11	2	1/16" Ply DC Joiner Box Sides & Hatches
SPT1W23	2	7/8" Balsa Wing Tip
SPT1W24	2	1/16" Balsa Shear Web Pack (26)
SPT1A01	1	SUB-PACK. DC FUSE PARTS
SPT1F02	2	1/8" DC Balsa Rear Fuse Side
SPT1F03	2	3/32" DC Balsa Frontr Doubler
SPT1F05	1	3/32" Balsa DC Rear Fuse Top
SPT1F06	1	3/32" Balsa DC Rear Fuse Bottom
SPT1F07	2	3/32" Balsa DC Rear Doubler & Tripler
SPT1W21	1	1/16" Balsa DC Wing Root Caps
SPT1A02	1	SUB-PACK. SMALL WOOD PARTS
DOWEL030	2	1/4" X 3-1/2" Hardwood Wing Dowel
DOWEL033	1	1/8" X 1-1/4" Hardwood Canopy Dowel
SPT1F09	2	1/4" X 1-1/4" X 1-15/16" Ply Wing Bolt Block
SPT1F15	1	1/8" X 2-1/8" X 3-7/32" Ply Towhook Plate
SPT1F16	1	1/4" X 1/2" X 1" Basswood Ballast Box Handle
SPT1W27	2	1/4" x 1-1/8" x 2-7/8" Ply Front Bolt Plate
SPT1A03	1	SUB-PACK. LONG SHEETS
SPT1W20	3	1/16" x 3" x 30" Balsa Wing Bottom Sheet
SPT1W25	2	1/16" X 3-1/2" X 30" Balsa Wing Top Sheet
SPT1A04	1	SUB-PACK. SPORT WING RIBS
SPT1W01	4	1/16" Balsa DC Wing Ribs - W2S, W2SS
SPT1W02	2	1/8" Balsa DC Wing Ribs - W1S, W3S
SPT1W03	2	1/16" Balsa DC Wing Ribs - W4S, W6S, W7S, W9S
SPT1W04	2	1/16" Balsa DC Wing Ribs W2SA&B, W5S, W8S, W10S
SPT1A05	1	SUB-PACK. ADVANCED WING RIBS
SPT1W05	4	1/16" Balsa DC Wing Ribs-W2
SPT1W06	2	1/8" Balsa DC wing Ribs-W1, W3
SPT1W07	2	1/16" Balsa DC Wing Ribs-W5,W6, W7,W8
SPT1W08	2	1/16" Balsa DC Wing Ribs - W2A&B, W4, W9, W10

PART#	QTY.	DESCRIPTION
SPT1A06	1	SUB-PACK. LONG STICKS
SPT1S01	4	1/4" X 1/2" X 30" Balsa Tail Frame
SPT1S04	3	1/8" X 1/4" X 30" Balsa Tail Ribs
SPT1W12	4	1/8" X 3/8" X 30" Basswood Inner Spar
SPT1W13	4	1/8" X 3/8" X 30" Basswood Outer Spar
SPT1W14	1	7/16" Balsa Shaped LE Set
SPT1A07	1	SUB-PACK. DIE-CUT PLYWOOD
SPT1F08	1	1/8" Ply DC Formers 1,3,4,5 & 6
SPT1F17	1	1/8" Ply DC Formers & Cockpit Ends
SPT1W09	1	1/16" Ply DC Wing Joiner Laminations
SPT1W10	2	1/32" Ply DC Polyhedral Braces
SPT1W22	1	1/8" Ply DC Clamps and Gauges
SPT1A08	1	SUB-PACK. MEDIUM STICKS
SPT1F11	4	1/8" Sq x 24" Balsa Stringer
SPT1F14	1	3/16" X 3/8" X 25" Basswood Servo Rail Strip
SPT1S02	1	1/4" X 3/4" X 24" Balsa Tail Tips
SPT1S03	1	1/4" X 1" X 15" Balsa Stab Center Piece
SPT1W26	1	3/16" X 1/4" X 24" Balsa Spoiler Bay Frame
SPT1A09	1	SUB-PACK. ELEVATORS TE'S
SPT1S05	1	1/4" Balsa Tapered Elevator
SPT1W15	2	11/32" Balsa Notched Inner TE/Flap
SPT1W16	2	11/32" Balsa Notched Outer TE/Aileron
SPT1W17	4	3/8" Balsa Tapered Aileron/Flap LE
SPT1W18	2	3/8" Balsa Notched Inner Sub TE
SPT1W19	2	3/8" Balsa Notched Outer Sub TE
SPT1M01	1	SUB-PACK. HARDWARE
ALUM008	1	Aluminum Wing Blade
BRST019	2	1/8" ODX 1-1/8" Brass Tube
NUTS003	4	6-32 Blind Nut
NUTS010	1	6-32 Hex Nut
NYLON03	4	Nylon Control Horn
NYLON13	4	1/4-20x2" Nylon Bolt
NYLON17	2	Nylon Clevis
NYLON20	2	Nylon Swivel
NYLON21	2	Nylon Swivel Clevis
SCRW002	8	2-56 X 5/8" Machine Screw
SCRW024	12	#2 X 3/8" Sheet Metal Screw
WBNT153	1	Torque Rod Set (Left and Right)
WBNT154	1	6-32 Threaded Towhook
WIRES16	4	.074" x 12" Threaded Wire Rod
WSHR004	1	#6 Flat Washer

TWO-VIEW DRAWING

Use this to design your trim scheme