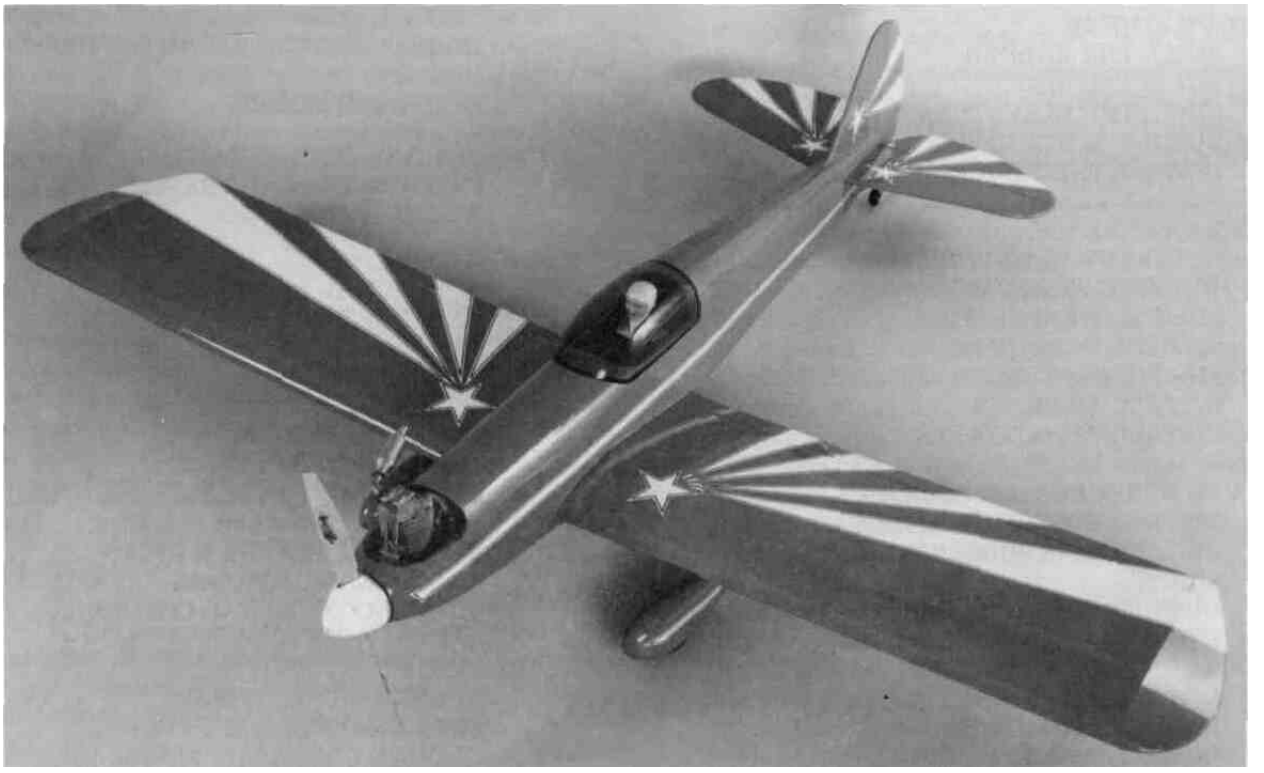
Super Sportster 90/120

Instruction Book



READ THROUGH THIS INSTRUCTION BOOK FIRST. IT CONTAINS IMPORTANT IN. STRUCTIONS AND WARNINGS CONCERN-ING THE BUILDING AND USE OF THIS MODEL.

INSTRUCTIONS IN BOXES LIKE THIS ARE VERY IMPORTANT AND SHOULD BE FOLLOWED CAREFULLY.

WARNING!

This R/C kit and the model you will build is not a toy'. It is capable of serious bodily harm and property damage. **IT IS YOUR RESPONSIBILITY AND YOURS ALONE** — to build this kit correctly, properly install all R/C components and flying gear (engine, tank, pushrods, etc.) and to test the model and fly it *only* with experienced, competent help 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 and become properly insured before you attempt to fly this model. IF YOU ARE JUST STARTING R/C MODELING, CONSULT YOUR LOCAL HOBBY SHOP OR WRITE TO THE ACADEMY OF MODEL AERONAUTICS TO FIND AN EXPERIENCED INSTRUCTOR IN YOUR AREA.

Academy of Model Aeronautics
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GREAT PLANES
MODEL MANUFACTURING COMPANY
P O BOX 721 URBANA ILLINOIS 61801

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INTRODUCTION

Pssst! Please don't tell your Super Sportster 90/120 how big it really is, because it thinks it is a "40-size"! What we mean is that this fantastic airplane flies with all the smoothness and agility of our other Super Sportsters (20, 40 and 60), and we can hardly tell the difference, except for the **awesome** size **and power!** We think you'll agree that this is the most exciting Super Sportster yet!

Yes, the Super Sportster 90/120 is a scaled-up version of our Super Sportster 60, **but** we have incorporated many major structural improvements to add strength (without extra weight) and to make it much easier to build straight and true.

In this book we'll take you, one easy step at a time, through the construction sequence, plus we'll give you specific pointers on installing your radio, engine and accessories, and end up with tips on finishing, balancing and flying your Super Sportster 90/120.

Before starting to build, we encourage you to read through these introductory pages very thoroughly, as they contain a lot of vital information you need to know, such as decisions you must make now, engine and radio selection, safety precautions and additional items you will have to purchase.

This is not a beginner's airplane! While the Super Sportster 90/120 is easy to build and flies great, we must discourage you from selecting this kit as your first *R/C* airplane. It is fast, highly maneuverable, and lacks the self-recovery characteristics of a good **basic trainer** such as the Great Planes **PT Series** airplanes. On the other hand, if you have

already learned the basics of R/C flying and you are able to safely handle an "aileron trainer" airplane such as the Great Planes **Trainer** Series or **Big** Stik **Series** airplanes, the Super Sportster 90/120 is an excellent choice

We think you will agree that the Great Planes Super Sportster 90/120 is the highest quality, best building and best flying airplane of its type on the market today!

If you have any questions or problems about building or flying this airplane, or if any of the kit parts are badly warped, defective or missing, please call us at (217) 367-2069 between 8 00 AM and 4 00 PM (central time) and we'll be glad to help If your call concerns defective or missing parts, please be ready to give us the 8-digit code (on the box end flap) and the part numbers

PRECAUTIONS

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

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

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

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

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

6. You must **fly** the model **only with the 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 flyability of your finished model depends on how you build it, therefore, we cannot in any way guarantee the performance of your completed model, and no representations are expressed or implied as to the performance or safety of your completed model

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

DECISIONS YOU MUST MAKE NOW

ENGINE AND MOUNT SELECTION:

The recommended engine size range is as follows:

.61 - .91 cubic inch displacement **2-cycle**

.90 - 1.20 cubic inch displacement **4-cycle**

Do not power your airplane with an engine larger than the recommended size (91 2-Cycle, 1 20 4-Cycle) Also, if using a 91 2-Cycle, do not use a tuned pipe

When you start building the fuselage, one of the first steps will be to cut off a portion of the front of the fuselage sides and fuselage doublers if you will be using a 4-cycle engine, due to the increased length and weight of the 4-cycle engines Therefore, it is important that you have your engine close at hand while building.

This kit includes hardwood engine mounting rails, but you may wish to purchase a custom engine mount for your engine, and the instructions allow for that type of installation.

LANDING GEAR CONFIGURATION

The Super Sportster 90/120 may be built with a "taildragger" or "tricycle" landing gear configuration Some people prefer the tricycle gear setup because they believe it handles better on the ground Others prefer to build it as a taildragger for the classic appearance This airplane actually handles very well in either configuration, so the choice is up to you **Please make this decision now,** as it will affect several things you will do during the construction.

CHOOSING YOUR RADIO AND SERVOS

Most good quality radio systems on the market today are suitable for this airplane You may, however, have to purchase a 5th servo or a high-torque servo (see the note below).

IMPORTANT NOTE We have found standard servos which provide approximately 45 oz/in of torque to be satisfactory for use in the Sportster 90/120 **with the following exception** If you are using standard servos you should use **one servo for each elevator** (use a "Y"- Connector to plug both elevator servos into the elevator channel of your receiver) If you want to use only one servo for the elevators, you must use two pushrods and a high torque servo providing at least 60 oz/in of torque.

Please make sure you select a radio system that is on a frequency designated "for aircraft use only", and one that meets current FCC standards.

OTHER ITEMS REQUIRED

Propellers (see engine instructions for size)

3" diameter Spinner

Fuel Tank (14 - 16 oz. or larger)
(Larger tanks require custom fitting)

2 - 3" diameter Main Wheels

1 - 2-3/4" diameter Nose Wheel
(or)
1 - 1-1/4" diameter Tail Wheel

4 - 3/16" Wheel Collars for Main Wheels

2 - 5/32" Wheel Collars for Nose Wheel
(or)
2 - 3/32" Wheel Collars for Tail Wheel

Iron-on Covering Material

Silicone Fuel Tubing

Foam Wing Seating Tape

Foam Rubber Padding, 1/2" thick

Dummy Pilot Figure (2-1/2" - 3" tall)

2 - DuBro E-Z Connectors (or similar)

"Y"-Connector (for double elevator servos)

SUPPLIES AND TOOLS NEEDED

2-3 oz. - Thin CA Adhesive

2 oz. - Medium or Thick CA Adhesive

2.5 oz.- 5 Minute Epoxy

2.5 oz.- 30 Minute Epoxy

Hand or Electric Drill

Drill Bits (No. 53. 1/16", 5/64", 3/32" 7/64",

1/8", 5/32", 3/16", 11/64", 13/64", 1/4", 5/16"

Sealing Iron

Heat Gun

Hinge Slotting Tool

Hobby Saw (X-Acto Razor Saw)

X-Acto Knife, #11 Blades

Pliers

Screw Driver

T-Pins

Straightedge

Masking Tape

Sandpaper, (Coarse, medium and fine grit)

T-Bar sanding block, or similar

Waxed Paper

Balsa Filler

1/4-20 Tap

Tap Wrench

Dremel Moto Tool or similar (Optional)

COMMON ABBREVIATIONS USED IN THIS BOOK AND ON THE PLANS:

Stab = Stabilizer

Elev = Elevator

LE = Leading Edge (front)

TE = Trailing Edge (rear)

Lt = Left

Rt = Right

" = Inches

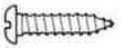
Fuse = Fuselage

LG = Landing Gear

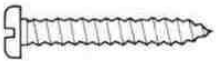
Ply = Plywood

HARDWARE

#2x3/8" SCREW

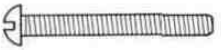


#4x1/2" SCREW



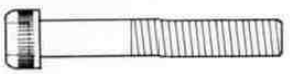
#6 x I SCREW

2-56 x 5/8" SCREW



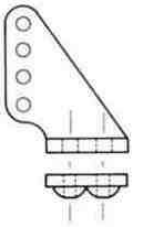
4-40x1" BOLT

6-32 x 1/4 " SCREW

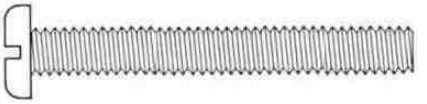


10-32 SOCKET HEAD CAP SCREW

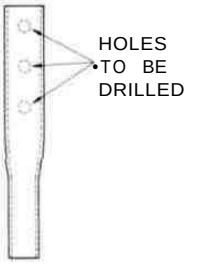
LANDING GEAR CLIP (NYLON)



NYLON HORN AND NUT PLATE

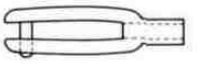


1/4-20 NYLON BOLT



BRASS AILERON HORN

2-56 HEX NUT



NYLON CLEVIS

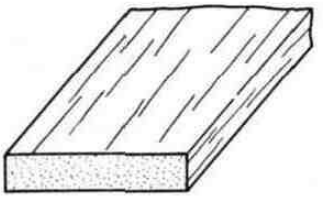
METAL CLEVIS

RETAINER CUP

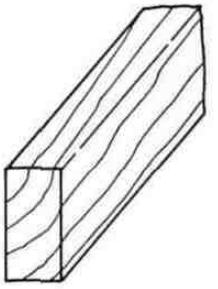
5/32" COLLAR

NYLON LG. STRAP

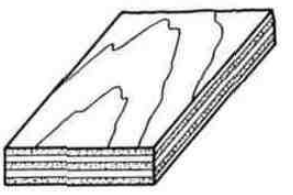
TYPES OF WOOD



BALSA



HARDWOOD

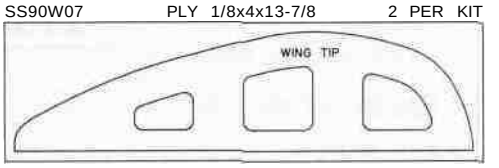


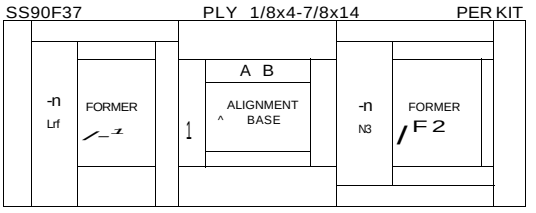
PLYWOOD

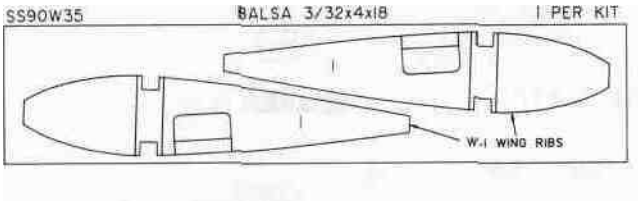
GET READY TO BUILD

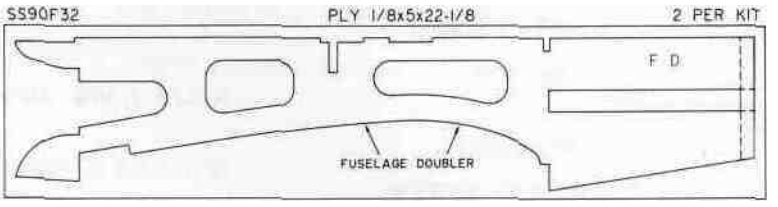
D 1. Unroll the plan sheets. Re-roll them inside out to make them lie flat.

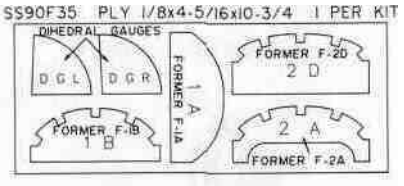
D 2 Remove all parts from the box Figure out the name of each part by comparing it with the plans Using a felt tip pen, write the part name on each piece to avoid confusion later. Use the die cut patterns shown below to identify the die cut parts and mark **before** punching them out. Save all scraps.

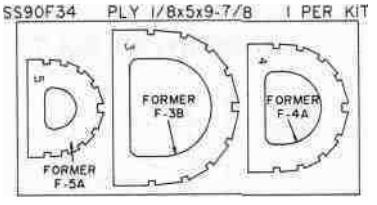


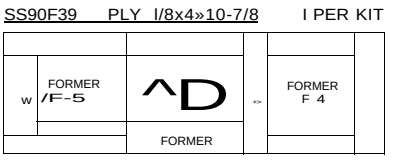


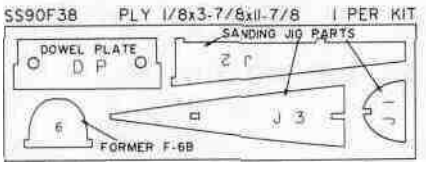


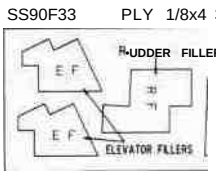




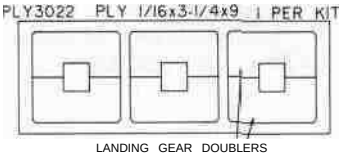


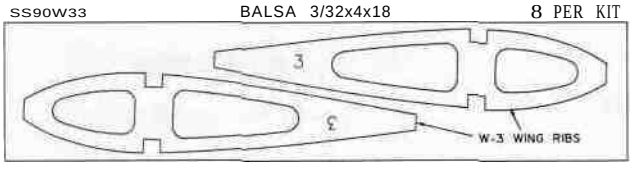


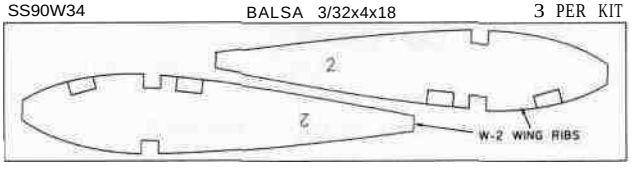




D B DIHEDRAL BRACE







TAIL FEATHERS

NOTE The Rudder, Fin, Elevators and Stabilizer are all built in a very similar manner The following section explains in detail how to build the **Rudder** to make you familiar with the procedure, then you can use the same techniques for building the other "tail feathers" with very little instruction, except for a few important comments Here we go!

BUILD THE RUDDER

To build the rudder you'll need the following:

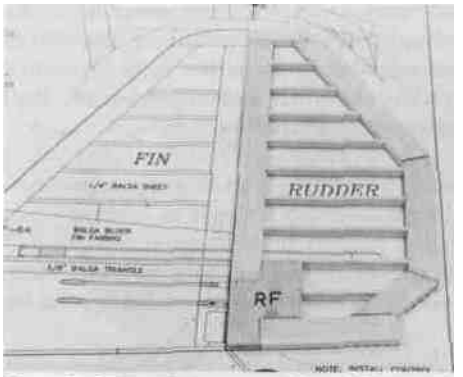
1/4" x 3/4" x 36" balsa sticks (set aside the straightest hard stick for the stabilizer TE)

1/8" x 1/4" x 36" balsa sticks (set aside the two **softest** sticks to be used later on the wing tips)

1/16" x 3" x 36" balsa sheets

Two 1/8" die-cut ply **rudder filler** (RF) pieces

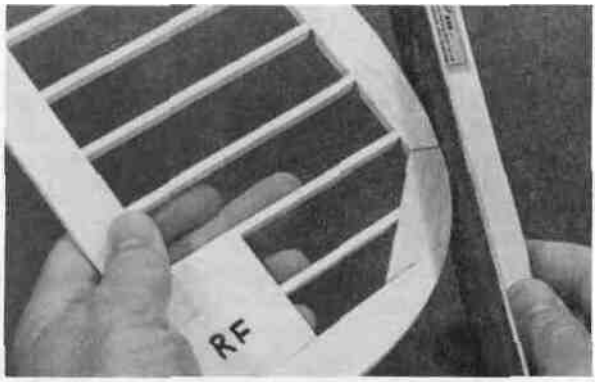
D 1. Tape the **fuselage plan** down to your flat work surface Tape a piece of waxed paper over the fin and rudder portion of the plan.



☐ 2. Glue the two **rudder fillers** (RF) together using thick CA glue, making one piece 1/4" thick.

3. Using a razor saw, cut pieces of 1/4" x 3/4" balsa (from the 36" sticks) to make the rudder framework. Working right on the plan, glue these pieces together along with the ply **RF** piece, using thin CA glue.

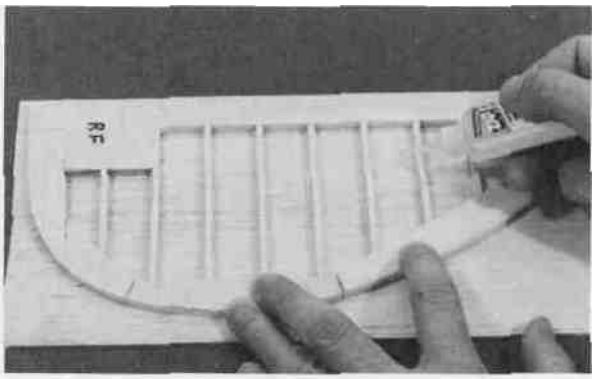
4. From the 1/8" x 1/4" x 36" sticks, cut "ribs" to fit between the rudder framework, and glue them in place. NOTE: It is not necessary to get these ribs in the exact position shown on the plan.



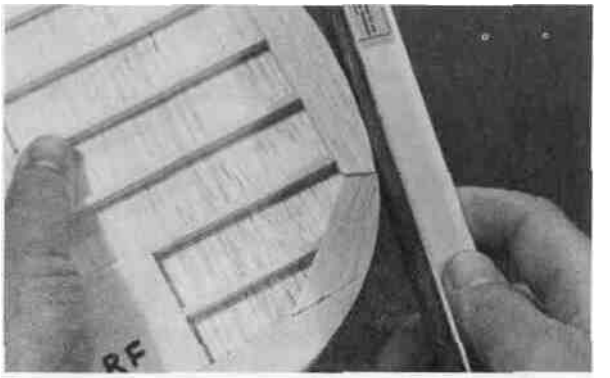
☐ 5. After the glue has completely set, remove the rudder assembly from the plan and using a T-bar sander or a sanding block with **coarse** grit sandpaper, sand the outside edge of the rudder to the approximate shape as shown on the plan.

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

7. From the 1/16" x 3" x 36" balsa sheets, cut four pieces 12" long. Edge glue these pieces together in pairs, using thin CA glue, to make two sheets 6" x 12". Sand the surfaces of these sheets smooth, using a T-bar with medium to fine grit sandpaper.



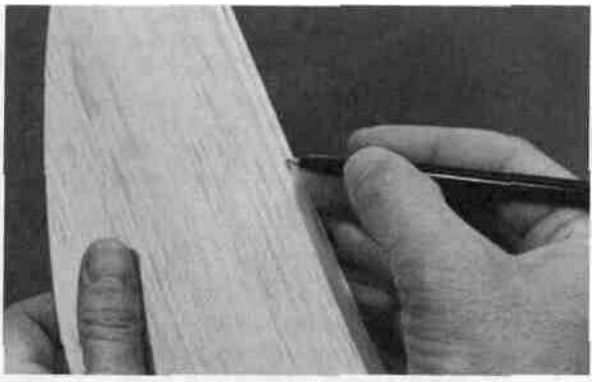
☐ 8. Lay the rudder assembly on top of one of your 6" x 12" sheets. Hold the rudder assembly down and apply thin CA glue along the edges of the framework and ribs.



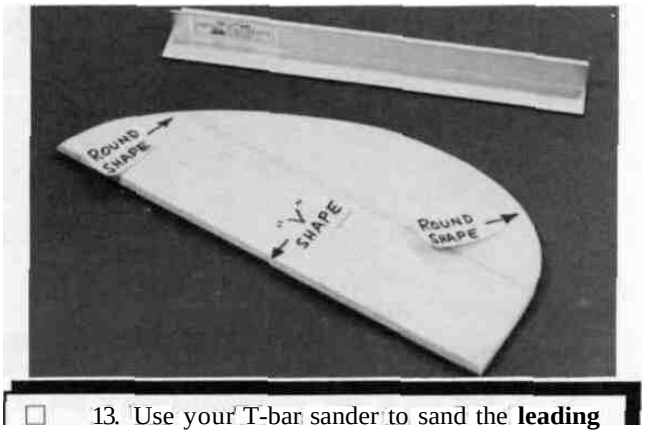
☐ 9. Sand the edges of the 1/16" sheeting flush with the edges of the framework.

D 10. Apply thick (slow setting) CA glue (or 30-minute epoxy if you need more time) to the rudder framework and ribs, then lay the other 6" x 12" balsa sheet in place. Hold the sheeting in place with your hands or with books until the glue has set.

D 11. Sand the edges of the sheeting flush with the edges of the framework.



☐ 12. Carefully draw a **centerline** all around the edges of the rudder.



☐ 13. Use your T-bar sander to sand the **leading edge** of the rudder to a "V" shape (take a look at the top view of the rudder on the plan to determine the proper angle of the "V")

D 14 Sand **all other edges** of the rudder to a **round** shape NOTE The centerline you previously drew will help you to sand the same amount from both sides.

BUILD THE FIN

You'll need the following parts:

1/4" x 2-7/8" x 1-1/2" shaped balsa **front fin filler**

1/4" x 3" x 1-1/2" balsa **rear** fin **filler**

1/4" x 3/4" balsa sticks

1/8" x 1/4" balsa sticks

1/16" x 3" balsa sheets

D 1. In the same manner as the rudder, build the inner framework, including the 1/4" fin filler sheets, the 1/4" x 3/4" sticks and the 1/8" x 1/4" sticks (for ribs).

D 2. Sand the top front comer to the shape as shown on the plan.

D 3. Glue 1/16" balsa sheeting to both sides (vertical grain).

D 4. Sand the leading edge (only) to a round shape.

NOTE: The trailing edge, bottom edge and lower front edge must not be rounded or V-shaped, instead, just sand these edges flat.

BUILD THE ELEVATORS

You'll need the following parts:

4 1/8" die-cut ply elevator filler (E F) pieces

1/4" x 3/4" balsa sticks

1/8" x 1/4" balsa sticks

1/16" x 3" balsa sheets

D 1. Tape waxed paper over the separate elevator drawing on the fuse plan Glue the two **EF** pieces together, then in the same manner as the rudder, build the inner framework. **Build two identical elevators.**

D 2. Sand the framework to the shape as shown on the plan.

D 3. Glue 1/16" balsa sheeting to both sides of the elevators, with the grain running the long way.

D 4 Sand the leading edge to a "V'-shape, and the other edges to a round shape.

BUILD THE STABILIZER

You'll need the following parts:

1/4" x 3/4" balsa sticks

1/8" x 1/4" balsa sticks

1/16" x 3" balsa sheets

Shaped 1/4" ply **front stab brace**

1/4" x 1/2" x 6" ply rear stab brace

1/4" x 3-7/32" x 3" balsa **stab center sheet**

D 1. Tape waxed paper over the separate stabilizer'drawing on the fuse plan In the same manner as the rudder, build the inner framework, including the front stab brace, rear stab brace, 1/4" balsa center sheet, 1/4" x 3/4" sticks and 1/8" x 1/4" sticks.

D 2. Sand the outside edges to the shape as shown on the plan.

D 3. Glue 1/16" balsa sheeting to both sides, with the grain running the long way.

D 4. Sand the leading edge and the ends to a round shape.

NOTE- The trailing edge must not be rounded or V-shaped. Instead, just sand this edge **flat**

INSTALL THE HINGES (Do Not Glue)

NOTE: The large one-piece molded hinges supplied in this kit are strong, easy to install, and provide a good dampening effect to help prevent dangerous control surface flutter We recommend that you use these hinges in your Super Sportster 90/120.

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

D 2. Cut the hinge slots **on the** accurate **centerlines which** you **previously drew,** using a standard slotting fork and slotting hook. Because the hinges are wider than normal, you should use the following procedure: When first inserting the slotting fork, push it in only partway along one side of the hinge location, then push it in the full depth along the other side of the hinge location, finally, go back and complete the push in the original position. Clean out the slot with the slotting hook.

D 3. IMPORTANT! Condition or "break-in" the hinges by folding them tightly back and forth several times.

D 4. Insert **the** hinges into the slots **and** trial **fit the** rudder and elevators in place on the fin and stab. **Do not glue the hinges until after you have covered the model.**

WING

BUILD THE WING PANELS

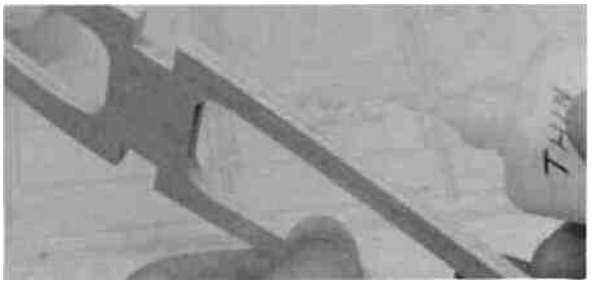
D 1. Tape the **wing plan** to your flat building surface, and tape a sheet of waxed paper over the wing panel portion of the plan.

Q 2. Punch out all the **wing ribs** from the die-cut sheets. Compare the ribs with the wing rib patterns on the wing plan and arrange them into stacks of the same kind of ribs.

D 3. Note that the drawing of rib **W-2** shows the two alternate locations for the main landing gear blocks. Note also that the W-2 ribs have **partial cutouts** for each of the two locations. If you are building your plane as a **taildragger,** cut out the **front** notches in the W-2 ribs. If you are building your plane with a **tricycle gear,** cut out the **rear** notches. Trim the die-cut 1/16" ply **doublers,** and glue them to the W-2 ribs as shown on the plan.

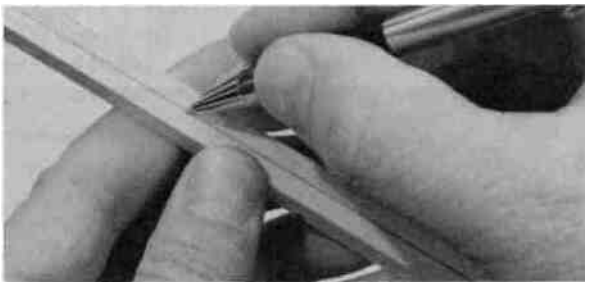
D 4. The notched balsa leading and trailing edges are supplied in one shaped piece and are held together by thin strips of balsa. Break these apart now, and break off any remaining pieces of the thin balsa. Sand the edges straight with your T-Bar sanding block.

NOTE: Follow steps 5 through 28 to build the RIGHT wing panel, then repeat these steps to build the LEFT wing panel UPSIDE DOWN.

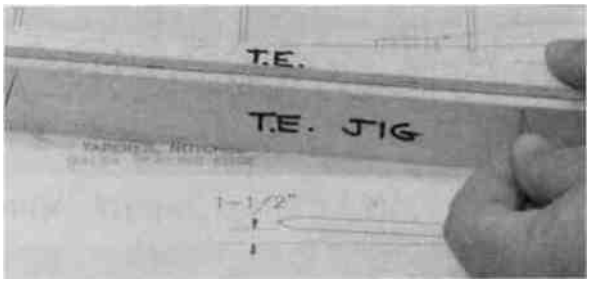


Lt. Rt.

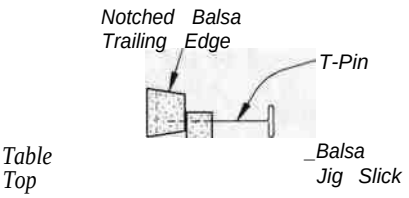
D D 5. Glue two W-3 ribs together to make one tip rib.



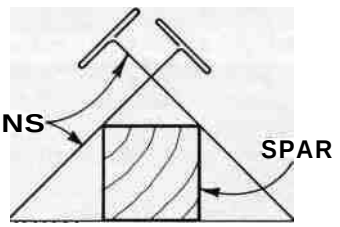
D D 6. Draw an accurate centerline along the rear edge of the notched balsa trailing edges.



D D 7. Pin one of the notched balsa trailing edges to the 1/4" x 1-5/32" x 33" balsa jig stick as shown in the following sketch. Note that the top of the jig stick must be on the centerline which you have drawn on the trailing edge.



D D 8. Place one of the 3/8" x 1/2" basswood main spars on the wing plan, line up the right end with the outside edge of the tip rib and pin the spar down with crossed T-pins as shown in the following sketch. NOTE: If you prefer not to use pins, you may hold the spar firmly in place using "shot bags" as shown in the photos, which are made by partially filling a sock with lead shot.



IMPORTANT NOTE!!!!!!!!!!!!!!!!!!

When building the **right** wing panel, position the ribs so the landing gear block notches in the W-2 ribs are **down,** and the servo opening in rib W-1 is **up.**

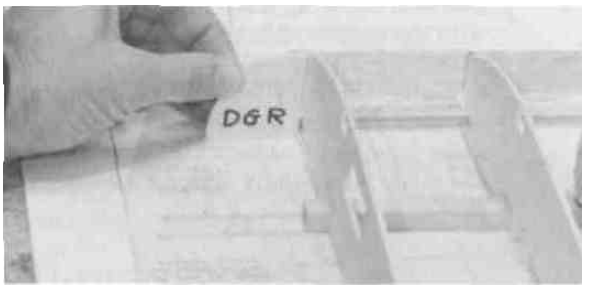
When building the left wing panel, position the ribs so the landing gear block notches in the W-2 ribs are **up,** and the servo opening in rib W-1 is down.

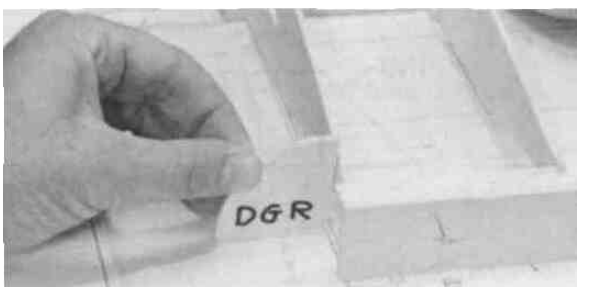
DO NOT BUILD TWO RIGHT WING HALVES!!!!!!!!!!!!!!

D D 9. Place the ribs on the spar in their approximate positions, but do not glue.

D D 10. Hold the notched balsa trailing edge in place (with jig attached) and carefully work the ribs into the notches, centering each rib up and down. In the same manner, insert the ribs into the notches in the balsa leading edge. **Note that one end of the leading and trailing edge stock has a notch at the end, and this notch must be at the wing tip.** Do not glue anything yet.

PLEASE STUDY THE FOLLOWING NOTE AND THE ACCOMPANYING PHOTOS BEFORE PROCEEDING!

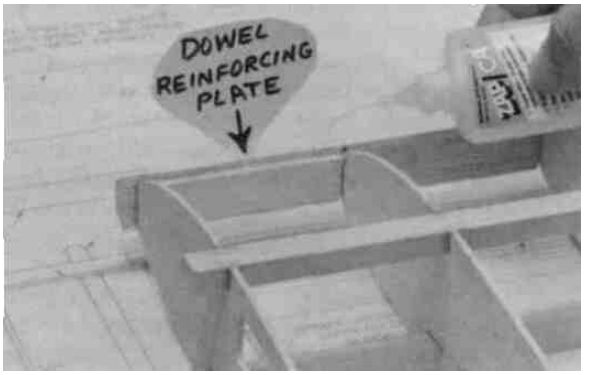




Note that the leading and trailing edges do not have a notch for the W-1 rib. Use the 1/8" die-cut ply **dihedral gauges** "DGR" and "DGL" to position rib W-1 at the proper angle. When building the **right** wing panel, use dihedral gauge **DGR** to position W-1, setting the rib's location and tilt with the point of DGR on the **"Right Wing Panel Centerline".** When building the **left** wing panel (upside down), use dihedral gauge **DGL** to position W-1, with the point of DGL on the **"Left Wing Panel Centerline".**

D D 11. Insert the top spar into the notches in the top of the ribs, with the right end even with the outside edge of the tip rib.

D D 12. Make sure the tip rib is vertical (90 degrees to the work surface), that the spars are lined up with the outside edge of the tip rib, that rib W-1 is set at the proper angle, and that all parts are properly aligned. Apply thin CA glue to all joints (but do not glue the "jig stick" **to** the TE!). Then apply thick CA glue to all joints which are not tight-fitting.



D D 13. Glue the 1/8" ply **dowel reinforcing plate** to the back of the leading edge, between W-1 and W-2.

D D 14. Glue the pre-cut 1/16" balsa **shear webs** to the rear edge of the spars in all rib bays except between W-1 and W-2.

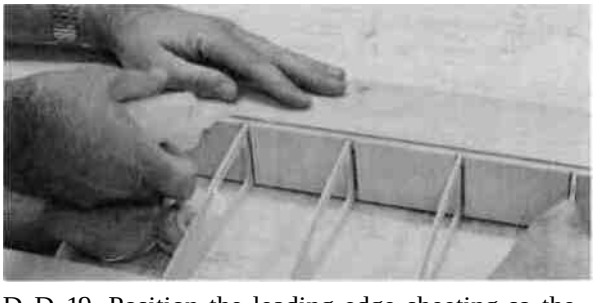
D D 15. Lightly sand the tops of the ribs to blend with the notched trailing edge, if necessary; then position one of the 3/32" x 1-13/32" x 33" balsa trailing edge sheets so the Rt. end is even with the outside edge of the tip rib and glue it in place.

D D 16. If you are building a taildragger, you should install the grooved hardwood **landing gear block** at this time. Refer to steps 20 - 23 for the correct procedure.

LI D 17. Before applying the leading edge sheeting in the next step, use your T-bar to lightly sand off the edges of the shear webs and the rear corners of the spars to blend with the ribs.

D D 18. Prepare the 3/32" x 3-27/32" x 33" balsa **bottom leading edge sheeting** by sanding one edge to a slight bevel so it will fit snugly against the back of the leading edge. If you are building a taildragger, carefully cut out an opening in the leading edge sheeting for the landing gear block.

NOTE: It will be helpful to have the following items handy for the next step . . . thin CA, thick CA, a wet cloth, masking tape and T-pins.

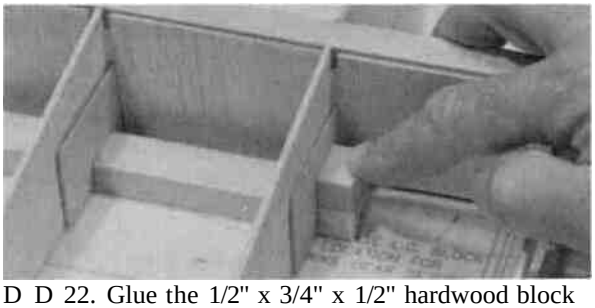


D D 19. Position the leading edge sheeting so the Rt. end is even with the outside edge of the tip rib. Using thin CA, glue the front (beveled) edge of the leading edge sheeting to the back edge of the leading edge. Wet the top surface of the sheeting so it will bend easier. Apply thick CA glue to the top edge of the ribs and to the front half of the spar, then immediately bend the sheeting down onto the ribs and spar. Hold the sheeting down with masking tape, pins and your hands until the glue has set.

NOTE: Do not install the TOP leading edge sheeting until after joining the left and right wing panels.

D D 20. Trial fit the long grooved hardwood **landing gear block** into the notches in the W-2 ribs (see the landing gear detail drawing on the wing plan for proper positioning). File the notches if necessary for a good fit. Now use epoxy to securely glue the block in place.

D D 21. Glue the short grooved hardwood block to the landing gear block and to the 1/16" ply doubler as shown on the plan and in the photo, using 5-minute epoxy. After the glue has firmly set, insert a 3/16" diameter drill bit down into the groove in the short hardwood block, then continue drilling through the long hardwood block.

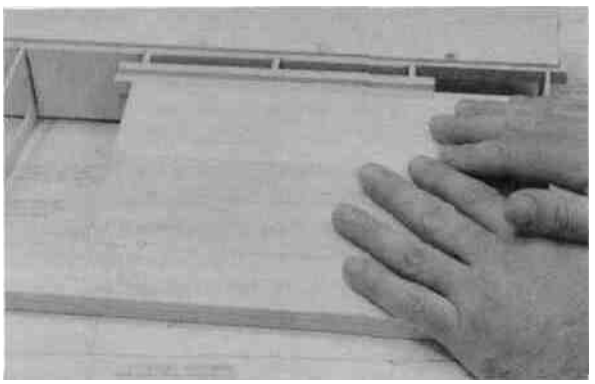


D D 22. Glue the 1/2" x 3/4" x 1/2" hardwood block to the other end of the landing gear block and to the 1/16" ply doubler, using 5-minute epoxy.

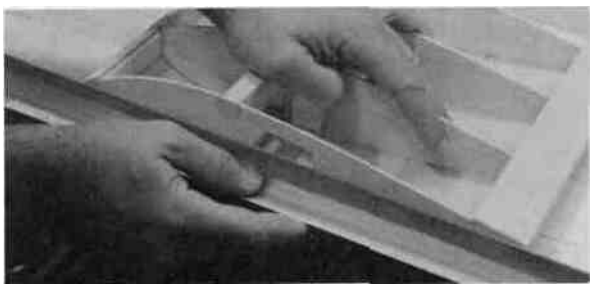
D D 23. Trial fit the 3/16" diameter main landing gear wire into the landing gear block at this time. Cut or file the groove and hole in the landing gear block as necessary for a good fit.

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

D D 24. **Glue** the 3/32" balsa trailing edge sheeting to the other side of the wing in **the** same manner as described in step 15.



L] D 25. Find the 8 balsa **center section sheets** (3/32" x 2-5/8" x 10-1/8") and the 4 balsa center section sheets (3/32 x 1-3/8 x 10-1/8). Glue 2 of the 2-5/8 wide sheets and one of the 1-3/8 sheets to the W-l and W-2 ribs **on the bottom of the wing only** Now glue **just one** 2-5/8 piece of top center section sheeting in place at the trailing edge (the balance of the top sheeting will be installed after joining the wing panels).



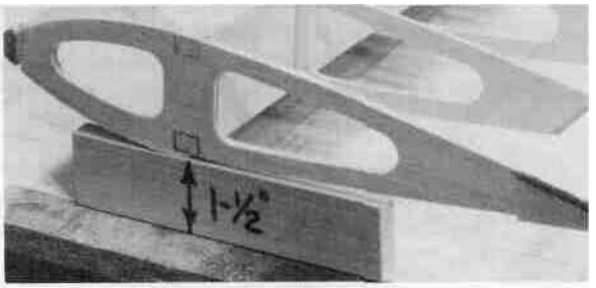
D D 26. Using a razor saw, carefully cut off all excess sheeting, spars, LE and TE even with W-l. Now sand the ends of the parts you just trimmed until they are smooth and flush with the face of W-l. Also sand the outside face of the tip rib at this time.

D D 27. Carefully cut out the center portion of the W-l ribs (1/8" in front and back of the spars), to make room for the plywood dihedral braces.

D 28. Now go back and repeat steps 5 through 27 to build the **left** wing panel. **Remember, you will build the left wing panel UPSIDE DOWN!**

JOIN THE WING PANELS

NOTE: Read Steps 1-5, then make a "dry run" through these steps before actually proceeding.



□ 1. Lay a piece of waxed paper down at the center of the wing, place the two wing panels together at the center, and block up both wing tips 1-1/2".

D 2. Trial fit the 1/8" ply **dihedral braces** to make sure they will readily slide into place.

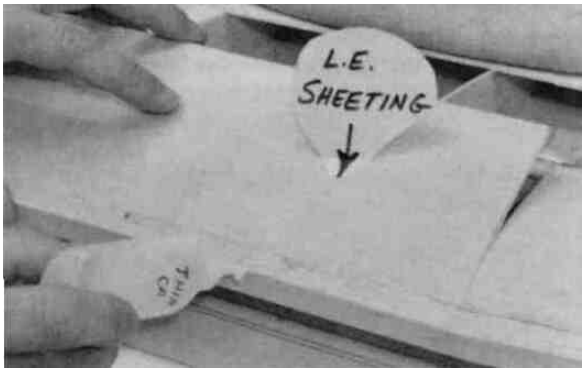
NOTE: Due to the extremely high stresses which occur at the center of this wing, you must use 30 minute epoxy in the next step to insure **adequate** strength.

D 3. Mix up a batch of 30 minute epoxy and spread it liberally on the front and back of the spars between ribs W-l and W-2, on the spar ends, and on one surface of each of the dihedral braces. Slide the dihedral braces into place and immediately proceed to the next step.

D 4. Carefully align the leading and trailing edges of both wing panels at the centerline and, while holding them in correct alignment, apply thin CA glue to the center joint to "lock" the panels together. **Do not apply CA glue to any area that is already coated with epoxy.** Immediately proceed to the next step.

D 5. Clamp the dihedral braces together as shown in the photo, wipe away any excess epoxy, then allow the epoxy to fully harden before disturbing **the wing.**

COMPLETING THE WING

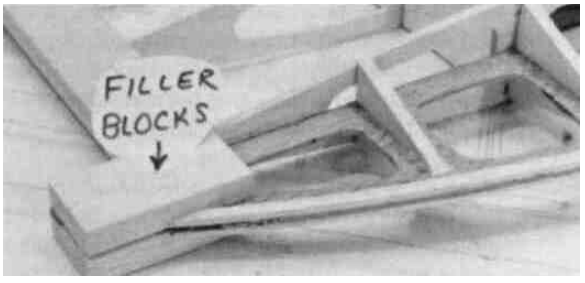


D 1. In the same manner as in Steps 18 and 19 above, glue the **top leading edge sheeting** in place.

D 2. Glue the top center section sheeting in place (Note: As you do so, it will be helpful to mark the location of the aileron servo opening on the top of the sheeting for future reference).

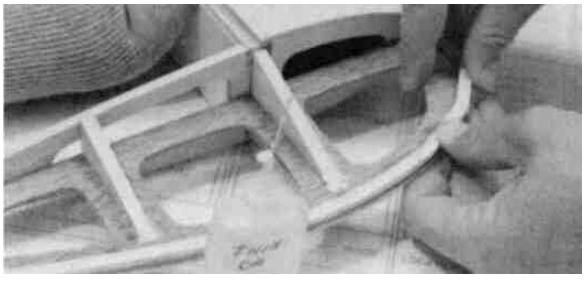
D 3. From the 1/4" x 1" x 7" balsa sheet and the 1/4" x 7/8" x 5-7/8" balsa sheet, cut out the triangular tip braces using the pattern on the wing plan, then glue them to the 1/8" ply wing tips.

D 4. Glue the wing tip and tip brace assemblies to the tip ribs.



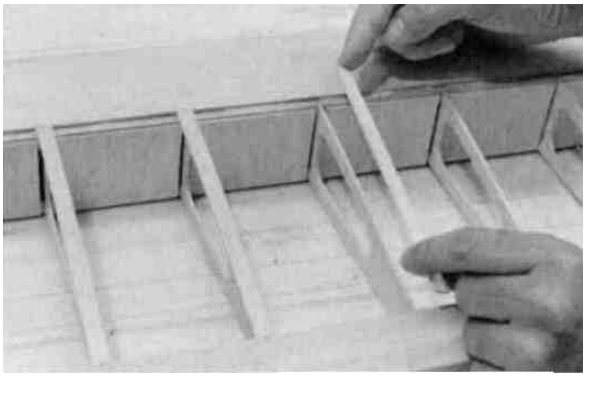
D 5. Glue the 1/2" x 1-1/2" x 2-15/16" balsa rear **tip fairing blocks** in place at the trailing edge of the wing tips.

D 6. Find the two **softest** 1/8" x 1/4" x 36" balsa sticks that you previously set aside when building the rudder.



D 7. Glue 1/8" x 1/4" **balsa** strips to the top and bottom of the wing tips as shown in the photos. Do not be concerned if the sticks break when they are bent around the curve. Just glue them down and-sand them to a rounded shape later.

D 8. Use a sanding block with coarse (#60 or #80) sandpaper to blend the rear tip fairing blocks to the wing tips, as shown. Also sand the outside edge of the wing tips to a smooth, rounded shape.

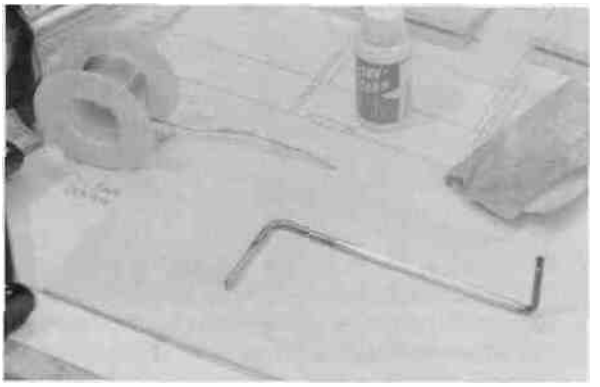


D 9. From the six 3/32" x 3/8" x 36" balsa sticks, cut **cap strips** to fit between the trailing edge sheeting and leading edge sheeting. Glue these cap strips to the top and bottom edges of all exposed ribs as shown on the plan.

D 10. Temporarily install the main landing gear wires into the wing. Now fill the unused portion of the slot in the landing gear block with pieces cut from the 3/16" x 3/16" balsa stick. Glue these pieces in place.

D 11. Temporarily secure the landing gear in place with the nylon straps and #2 x 3/8" screws as shown in the landing gear detail drawing and the cross-section drawing of W-2 **on** the wing plan.

AILERON TORQUE RODS



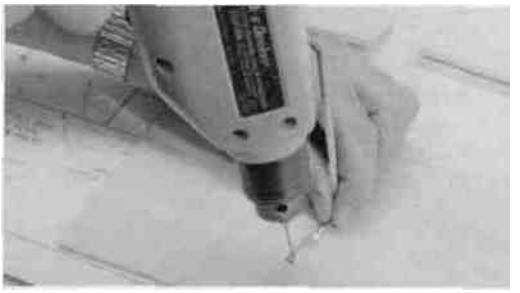
D 1. Sand the short end of the torque rod with 320 grit sandpaper.

D 2. Roughen the surface of the brass bearing tube with 100 grit sandpaper.

D 3. Clean the torque rod and bearing tube with degreasing solvent or thinner.

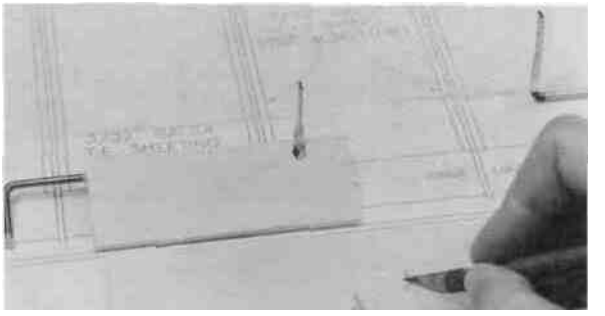
D 4. Apply a small amount of soldering flux to the short end of the torque rod, push on the brass tube which has been flattened at one end and rotate it to the proper position.

D 5. Heat the brass tube with a soldering gun or iron while applying solder to the joint. When the assembly becomes hot enough the solder will melt and flow freely into the joint. Then remove the heat and allow to cool without disturbing.



D 6. Drill holes in the flattened portion of the brass horn for the clevis pin **(Note:** The proper size drill bit to use here is a #53 bit, available at most hardware stores. You may, however, use a 1/16" bit, but a slight amount of "slop" may result). After drilling, carefully remove the sharpness from the edge of the holes with an Xacto knife.

D 7. Repeat the above process for the other torque rod. You should now have a **right** and a **left** torque rod.



D 8. Find the two grooved, tapered balsa **center trailing edge** pieces, and trial fit the torque rods into them. Determine from the plan where to cut the clearance notches in the center trailing edges and the wing trailing edge, which permit the torque rod horns to travel freely. Note: **The torque rod horns must exit the TOP of the wing!**

D 9. Slide the brass torque rod bearings toward the brass horns, then use a toothpick to apply a small amount of petroleum jelly to the ends of the brass tubes. This will help prevent glue from locking up the torque rods.

D 10. Use 5-minute epoxy to glue the brass torque rod bearings into the grooves in the center trailing edge pieces. Wipe off any excess glue and allow to harden.

D 11. Trial fit the trailing edge/torque rod assembly onto the wing trailing edge. Sand the center trailing edge pieces slightly where they join, for a good fit. Glue these pieces in place with epoxy. Also check to make sure the top and bottom of the TE pieces line up with the top and bottom of the wing.

FIBERGLASS THE CENTER SECTION

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

D 1. The fiberglass tape is supplied in two 3" strips, which are applied in such a way that they overlap 1-1/2" at the center (see the diagram in the lower left corner of the wing plan). Begin by marking the wing sheeting 3/4" each way from the center joint.

D 2. If you have previous experience with applying fiberglass, feel free to use your favorite method, providing that it results in a strong bond between the glass cloth and the wood. If this is your first time, we offer the following suggested method, which is the fastest and easiest we have seen.

☐ 3. Spray a **very light mist** of 3M "77" Spray Adhesive on the center section in the area to be glassed. Hold the spray can at least 12" away from the surface when doing this to avoid a heavy buildup. The purpose of this is only to give the wood a little "tackiness". If you apply too much spray it could result in a poor glue bond.

D 4. Beginning at the trailing edge, lay one of the glass tape strips in place on the wing, overlapping the center joint by 3/4". You can use a scissors to cut a hole in the glass cloth for the aileron torque rod horn. Gently press the cloth in place, working out all wrinkles. The "77" spray adhesive should hold the cloth down to the surface, but will permit you to lift and reposition the cloth if you make a mistake. Keep working forward along the top of the wing, around the leading edge, and along the bottom of the wing, ending at the trailing edge. It is not necessary to wrap the glass cloth around the trailing edge.

D 5. Working outdoors or in a **very well-ventilated area,** apply **thin** CA glue to the glass cloth. Begin by running a bead of glue down the center of the glass cloth strip, then continue applying the glue in lines until all the cloth **has been secured. WARNING: This operation produces a larger than normal quantity of CA fumes, so adequate ventilation is a must!**

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

D 7. After the glue has set, trim the excess cloth **at** the trailing edge with a sharp Xacto knife.

D 8. Carefully sand the edges of the glass cloth with a sanding block. Also, lightly sand the surface of the glass cloth to remove any rough spots.

D 9. Repeat steps 3 through 8 to apply the other 3" strip of fiberglass tape, again overlapping the center of the wing by 3/4".

INSTALL AILERONS

NOTE: Do not glue the aileron hinges until after your model has been covered.

D 1. Note on the wing plan the location of the small scrap balsa block filler at the wing tip near the end of the aileron. Glue this filler block in place at this time, and sand it to blend with the shape of the aileron.

D 2. Draw an accurate centerline along the leading edge of the aileron.

D 3. Check the length of your aileron against the actual aileron opening and trim the aileron as necessary. You should provide approximately 1/16" gap at each end of the aileron.

D 4. Lay the aileron in place in the opening, with the torque rod resting on top of the aileron. Mark the torque rod location on the top of the aileron.

D 5. Drill a 1/8" or 9/64" hole in the aileron at the torque rod location, starting at the leading edge centerline and drilling straight in to the proper depth.

D 6. Using an Xacto knife, sharpen the inside of one end of a 1/8" diameter brass tube and use it to cut a groove in the leading edge of the aileron to accept the torque rod. Cut this groove a little larger at the beginning, to make room for the torque rod bearing. Trial fit the aileron onto the torque rod and cut or file as necessary until it fits.

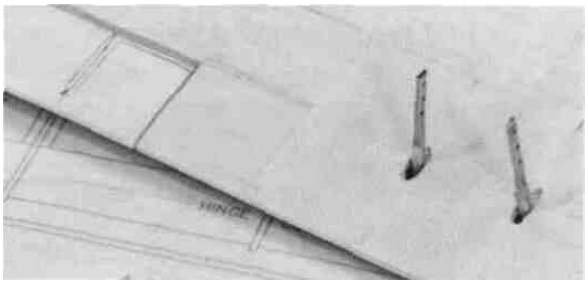
D 7. Lay the aileron on the plan and mark the hinge locations on the aileron. Place the aileron against the wing TE and transfer the marks over to the wing.

NOTE: The large one-piece molded hinges supplied in this kit are strong, easy to install, and provide a good dampening effect to help prevent dangerous control surface flutter. We recommend that you use these hinges in your Super Sportster 90/120.

D 8. Cut the hinge slots using a standard slotting fork and slotting hook. Because the hinges are wider than normal, you should use the following procedure: When first inserting the slotting fork, push it in only part-way along one side of the hinge location, then push it in the full depth along the other side of the hinge location, finally, go back and complete the push in the original position. Clean out the slot with the slotting hook.

D 9. IMPORTANT! Condition or "break-in" the hinges by folding them tightly back and forth several times.

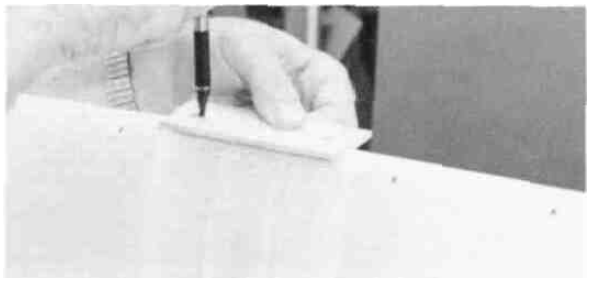
D 10. Sand the leading edge of the aileron to the same "V" shape as shown on the wing rib detail drawing.



D 11. Insert the hinges into the slots and trial fit the ailerons in place on the wing. **Do not glue the hinges until after you have covered the wing.**

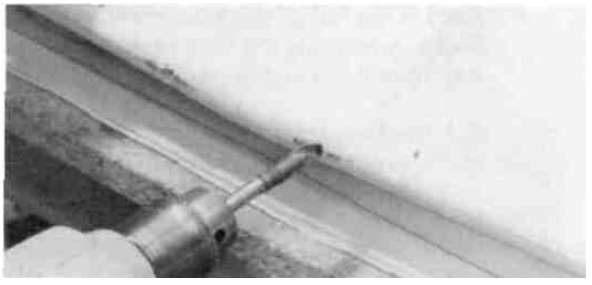
There should be no hinge gap!

INSTALL WING DOWELS (Do not glue)



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

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



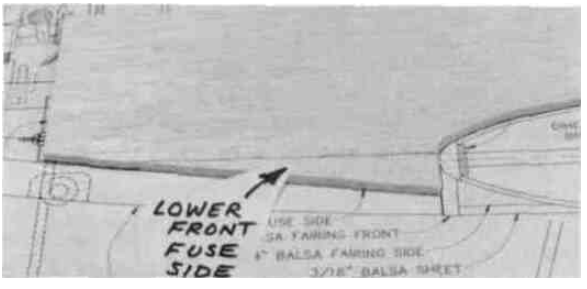
D 3. It is important that you now drill the dowel holes accurately! To insure accurately positioned holes, begin by drilling small (1/8") holes in the center of the marked locations. Then gradually increase drill bit sizes until you have finally drilled the holes to 5/16" diameter. The final holes you drill must extend 4-7/8" into the wing to penetrate the front dihedral brace.

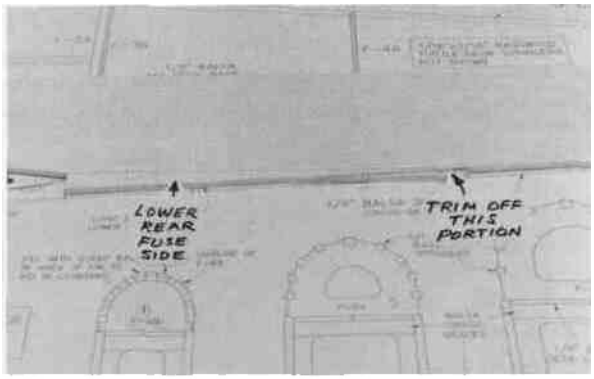
D 4. Sand **one end** of each wing dowel to a rounded or pointed shape. This is the end that will be inserted. Do not sand the other end at this time.

D 5. Trial fit the dowels into the dowel holes, and trial fit the dowel plate over the dowels. Do **not** glue the dowels in place at this time.

LOWER FUSELAGE ASSEMBLY

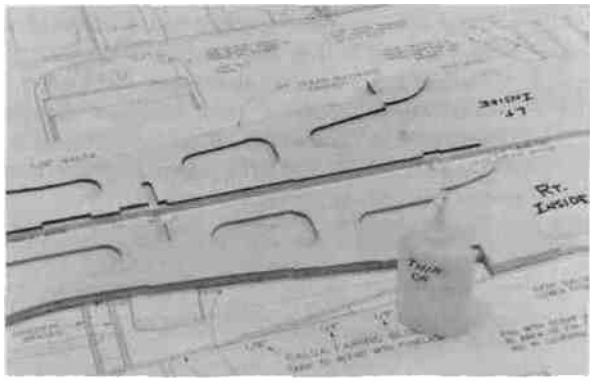
D 1. Lay one of the shaped 3/16" balsa **fuselage sides** in place on the fuselage plan side view. Note that the front of the fuse side extends forward beyond the firewall location, and this extra length is used if a 2-cycle engine will be installed. **If a 1.20 cu. in. 4-cycle engine will be used, carefully cut off the front** 3/8" **of the fuse sides, even with the front of F-1.**



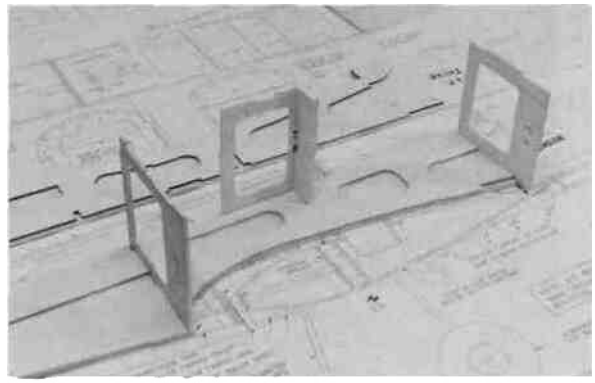


☐ 2. Find the shaped 3/16" balsa lower front fuse side and the lower rear fuse side pieces. Edge glue these pieces to the bottom edge of the fuse sides in the locations shown on the plan. Note that the lower rear fuse side pieces have extra material at the rear portion which must be sanded off.

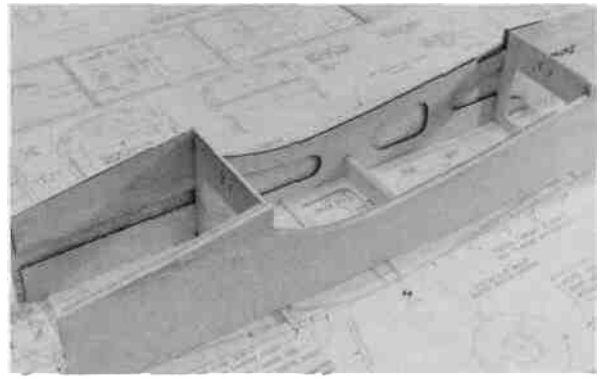
NOTE: If you are planning to install a 2-cycle engine you may use the 1/8" ply fuselage doublers without any changes. If, however, you will be using a 1.20 4-cycle engine, it will be necessary to cut 3/8" off the front of the doublers. In the die-cutting process, we have already started this cut for you, and you may complete it now. If you will not be cutting off the front portion of the fuse doubler, apply thick CA glue to the partial cut which we have made before proceeding to the next step.



☐ 3. Glue the die-cut 1/8" ply **fuse doublers** to the fuse sides, **making one RIGHT and one LEFT side.** Note that the top edge must line up, and the front of FD must be 3/8" behind the front edge of the fuse side. A good way to do this is to carefully align the fuse doublers and, while holding in position, apply thin CA glue around the notches and lightening holes, then around the edges. Make sure you apply sufficient glue so it flows under the doubler and produces a strong bond.



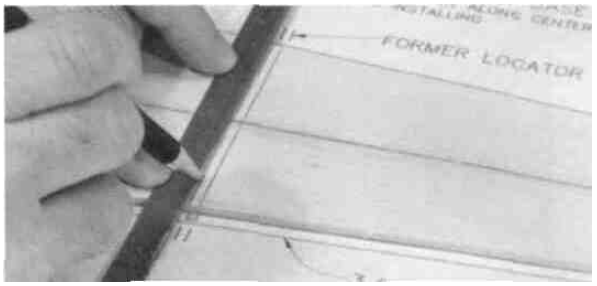
☐ 4. Insert the following parts into the notches in the right fuse side: Die-cut 1/8" ply **F-2,** die-cut 1/8" ply **F-3,** 1/4" x 7/8" balsa **cross-brace, and** the die-cut 1/8" ply alignment base (AB).



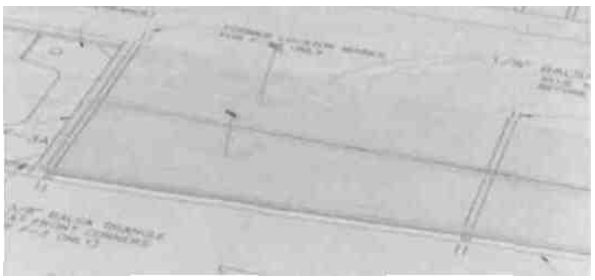
☐ 5. Press the left fuse side into place onto the above parts. Turn the fuse assembly upside down so the long straight edges of the fuse sides are resting on a flat surface. Check to make sure the above parts are all securely in place and square, then apply thin CA glue to the joints. Follow up with thick CA glue in any joints that are not tight fitting.

☐ 6. Find the two 1/8" shaped balsa **aft deck base** halves and edge glue them together along the straight edges.

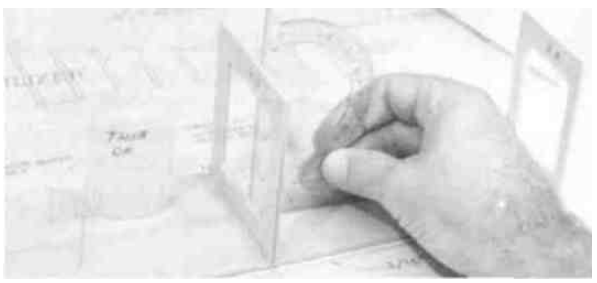
D 7. Carefully position the assembled aft deck base on the fuse plan top view. Note that the front edge of the aft deck base must line **up** with the dashed line which marks the back of F-3. Temporarily tape in place.



D 8. Using a straightedge and a pen or pencil, lightly draw lines to mark the F-3B, F-4A, F-5A and F-6B former locations, using the **former locator lines** on the plan (these lines will be used later).

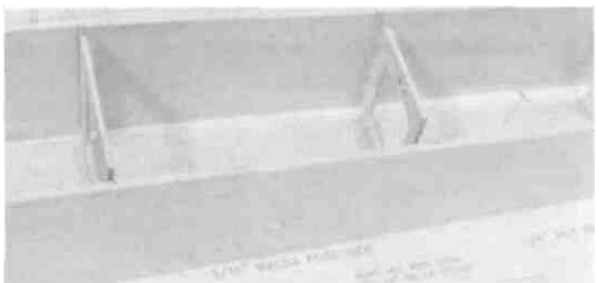


D 9. Turn the aft deck base upside down, pin or tape in place, and, using the same former locator marks, draw lines to locate formers F-4, F-5 and F-6.



D 10. Position former **F-4** in place between the lines on the aft deck base and center it, side-to-side. Glue F-4 to the aft deck base while using a draftsman's triangle or carpenter's square to make sure it is perpendicular.

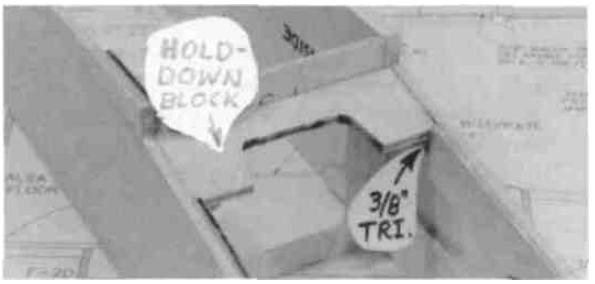
D 11. In the same manner, glue **F-5** and **F-6** to the aft deck base.



D 12. Carefully position the fuselage assembly (upside down) over the plan top view, holding the front portion securely in place with weights.

D 13. Pull the fuse sides together at the F-4, F-5 and F-6 locations and at the tail, using clamps or heavy blocks against the sides. Check alignment, then glue the fuse sides to the aft deck base and to the formers.

D 14. Glue the tapered balsa **tail wedge** in place at the aft end of the fuse.



D 15. Find the 1/4" ply **wing hold-down block** and trial fit it into the notches in the fuse side doublers, sanding as necessary for a good fit. Glue the hold-down block in place securely, using 30-minute epoxy, then cut pieces of 3/8" balsa triangle and glue them in place **under** the hold-down block.

INSTALL NOSEGEAR BEARING (If applicable)

IMPORTANT NOTE: If you are planning a "tricycle gear" setup and you are using the hardwood engine mounting rails supplied in the kit, you may mount the nosegear bearing on the **front** of F-1. If, however, you are using a custom engine mount you will have to mount the nose gear bearing on the **back** of F-l.

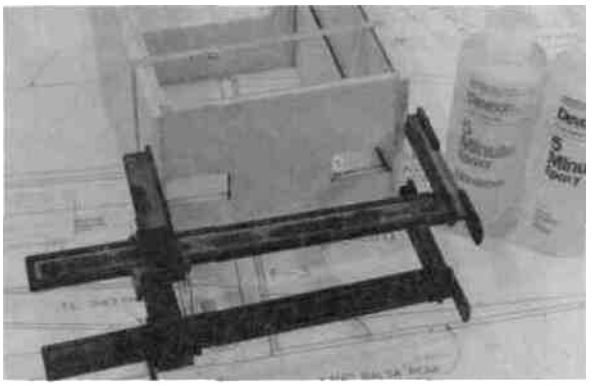
D 1. Hold the nylon **nose gear bearing** in position on the front of F-l and mark the location of the four mounting bolt holes.

D 2. Drill 1/8" diameter holes at the above marked locations.

D 3. If the nose-gear bearing is to be installed on the front of the firewall, install the 4-40 **blind nuts** on the back of the firewall.

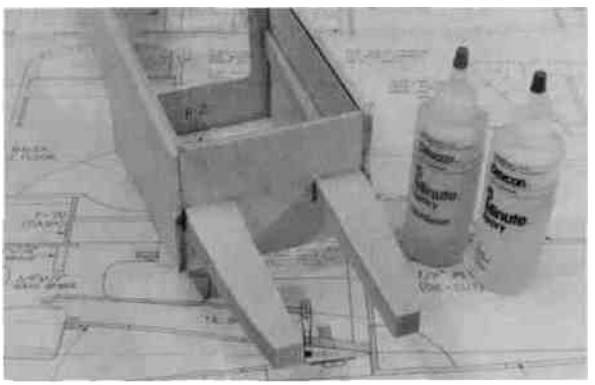
3a. If the nosegear bearing is to be installed on the back of the firewall (because a custom engine mount is being used), you will have to cut **indentations** into the front of the firewall at the blind nut locations so the blind nuts will be flush with the front surface of the firewall and thus not interfere with your custom engine mount.After cutting the indentations, install the nosegear bearing on the back of the firewall with the blind nuts on the front of the firewall.

4. If the nosegear bearing is on the front of the firewall, you may now drill the hole in F-l for your nose gear steering pushrod guide tube.



☐ 16. Trial fit the 3/8" ply firewall (F-l) so the large notches line up exactly with the long slots in the ply fuse doublers. Use 30-minute or 5-minute epoxy to securely glue the firewall in place, holding with clamps until the glue has firmly set. NOTE: Before the glue sets, double check to make sure F-l is properly aligned.

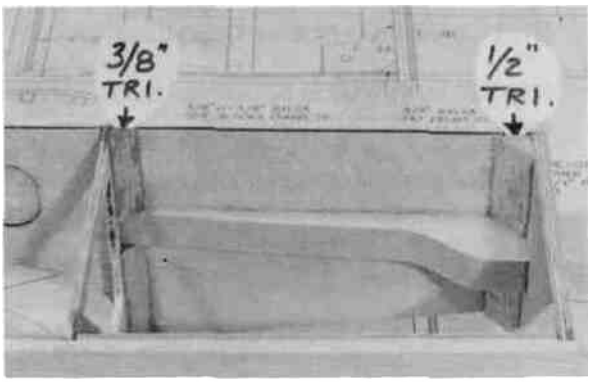
17. Now, using a small razor saw, cut out the small tabs in the front of the fuse doubler at the end of the engine mounting rail slots.



☐ 18. If you plan to use the hardwood engine mounting rails supplied in this kit, trial fit the rails through the openings in F-l and into the slots in the fuse doubler. Trim or sand the openings as necessary for a good fit. Glue the rails securely in place with **epoxy.**

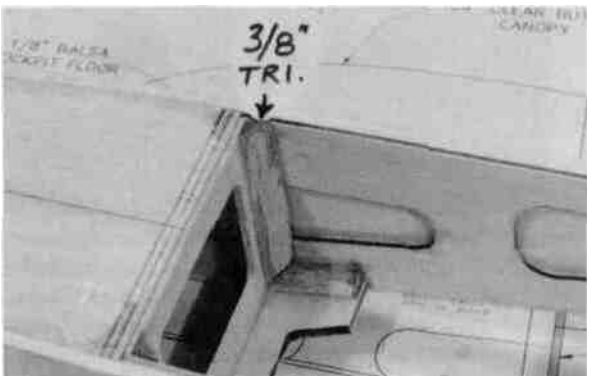
D 18a. If you plan to use an aluminum engine mount made for your engine, do not install the hardwood rails. Instead, glue the 3/8" x 5/8" x 1-1/8" hardwood blocks into the cutouts in F-l, using epoxy.

☐ 19. Note that the **bottom** of F-l may not be flush with the fuse sides, especially if you are planning a 4- cycle engine installation. If this is the case, glue a scrap of hard balsa to the bottom edge of F-l, then sand it off flush with the bottom edge of the fuse sides.



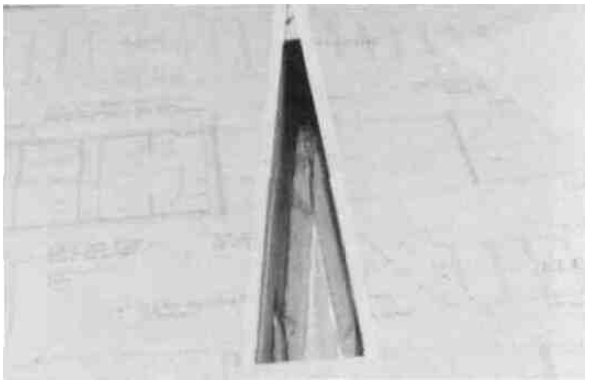
☐ 20. Cut pieces of 1/2" balsa triangle stock to fit in the front corners of the fuse, above and below the engine mounting rails. Glue in place.

D 21. Cut pieces of 3/8" balsa triangle to fit in the rear corners of the fuel tank compartment, above and below the engine mounting rails. Glue in place.



D 22. In the same manner, cut and glue 3/8" balsa triangle to fit in the front corners of F-3.

WARNING: Do not omit this next important step!

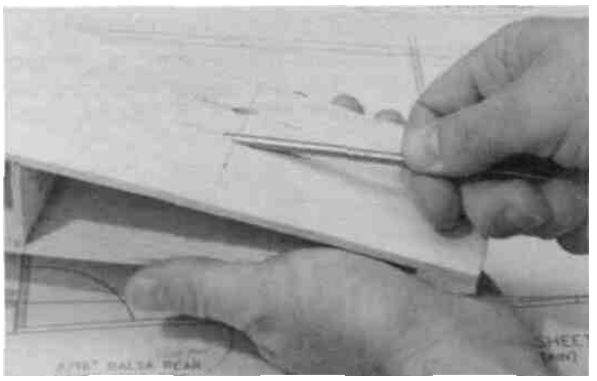


D 23. Cut two pieces of 3/8" balsa triangle to fit between F-6 and the tapered balsa tail filler, at the joints between the fuse sides and the aft deck base. You will have to taper the ends of these triangle pieces to fit properly, as shown on the fuse plan top view. Working through the opening in the fuse bottom, glue these pieces securely in place.

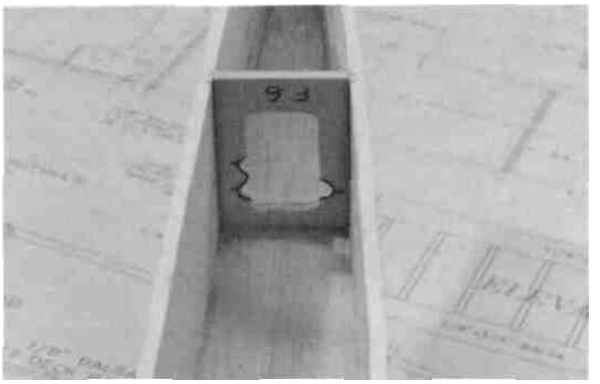
INSTALL REAR PUSHROD GUIDE TUBES

IMPORTANT NOTE: Before proceeding, **plan** your servo and pushrod installation. Especially note which side of the fuselage the throttle pushrod and nose gear pushrod (if any) will be located. Remember that the throttle arms of 2-cycle and 4- cycle engines are on opposite sides. It will be helpful to actually sketch your pushrod locations on the plans with a pencil.

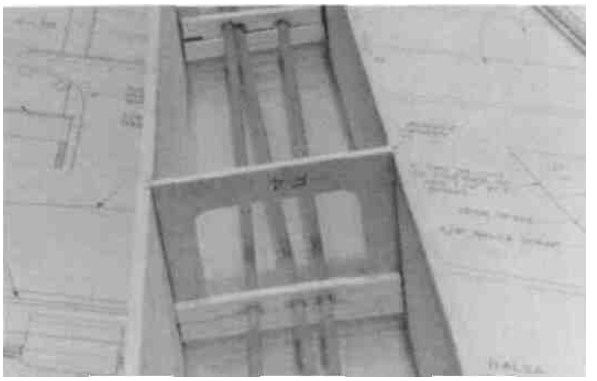
D 1. Sand the outer surface of the **pushrod guide tubes** with 100 grit sandpaper to provide a surface to which the glue will adhere.



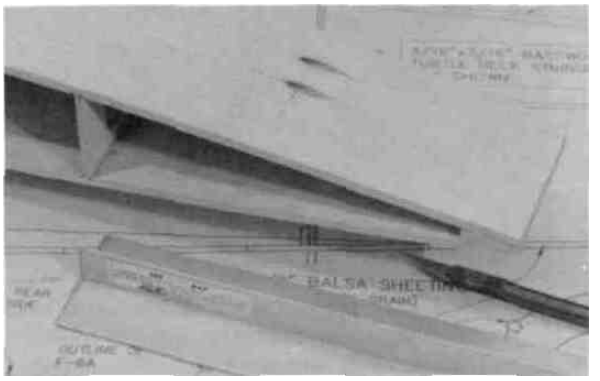
D 2. Use an Xacto knife to sharpen one end of a piece of 3/16" (outside diameter) brass tubing, then use this tubing to cut the pushrod **exit holes.** Determine the location of these holes from the plans. Note that each elevator requires a separate pushrod.



D 3. Insert the plastic pushrod tubes through the holes you just cut and through formers F-6, F-5, F-4 and F-3. Cut grooves in the inside opening of F-6 at the pushrod tube locations to minimize the curvature of the tubes.



☐ 4. Route the pushrod tubes according to your radio installation plan, and anchor the tubes to formers F-4, F-5 and F-6 using 1/8" x 3/8" balsa cross- braces. **Keep tubes as straight as possible. Do not anchor the tubes to** F-3 **at this time,** to allow for slight adjustment of the position of the pushrods when the servos are installed later. Leave approximately 2 inches of the pushrod tubes protruding into the radio compartment, and cut off the excess.



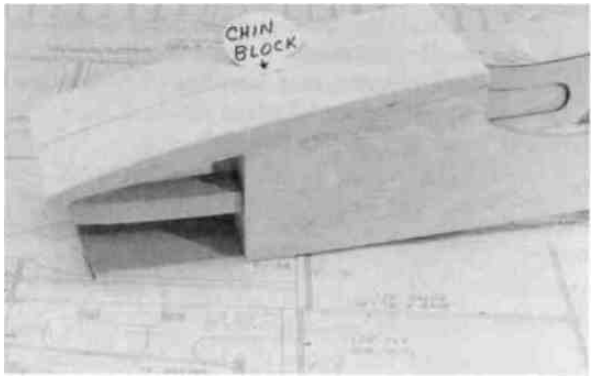
D 5. Glue the pushrod tubes to the fuse sides at the exit points, using thin CA glue. Then cut off the tubes and sand them flush with the fuse sides using a sanding block.

INSTALL CHIN BLOCK AND BOTTOM SHEETING

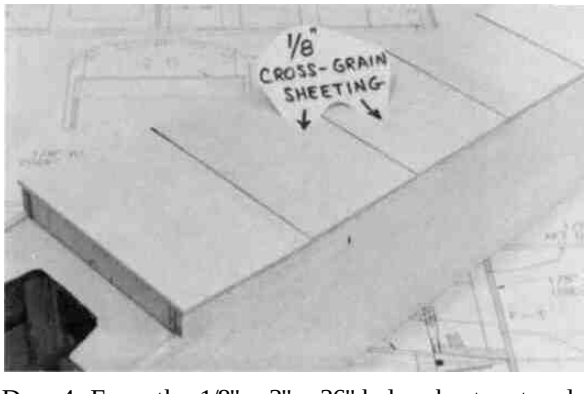
NOTE: Before installing the chin block, you should now take a few minutes to fuelproof the bottom of the engine mount rails and the area ofF-1 to which the nosegear bearing is mounted, using epoxy thinned with alcohol, polyester finishing resin, or fuelproof paint.

D 1. Using your T-Bar sanding block, sand the bottom of the fuse sides, F-l and F-2 in the fuel tank compartment area.

D 2. Find the two soft balsa **chin block** halves and glue them together on a flat surface.



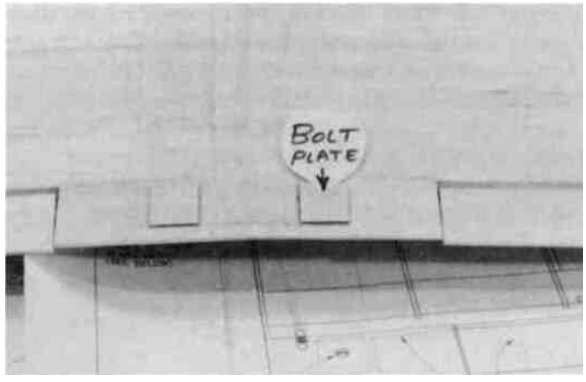
D 3. With the fuselage upside down, lay the chin block in place. Note that the rear edge of the chin block must be sanded to a slight angle to line up with F-2 and the front of the wing saddle area. Position the chin block so it protrudes 1/8" **behind** the rear surface of F-2, and so the centerline of the chin block lines up with the centerline of the fuselage. Glue the chin block securely in this position.



D 4. From the 1/8" x 3" x 36" balsa sheet, cut and glue pieces of **cross-grain sheeting** in place on the bottom of the fuse, beginning at the front of F-3 and running to the aft end of F-6. **(You will leave the rear part of the bottom fuselage sheeting off until after you lock the stabilizer to the fuselage later.)** Sand the edges of this glued sheeting flush with the fuse sides.

MOUNT THE WING TO THE FUSE

D 1. Sand the entire wing saddle area lightly if necessary until the fuse side doublers and fuse sides are flush.



D 2. Find the two 1/16" x 1" x 1" ply **wing bolt plates.** Mark their exact locations on the **bottom** of the wing, using the wing plan as a guide. Glue the wing bolt plates securely to the wing.

D 3. Insert the die-cut 1/8" ply **dowel plate** in place against the back of F-2 (do not glue).

D 4. Insert the 5/16" wing dowels into the wing so they stick out **only** 1/8".

D 5. With the fuselage upside down on a flat surface, trial fit the wing into the wing saddle. If the wing is slightly too large to fit into the saddle, sand the rear edge of the saddle and the wing trailing edge slightly until it fits.

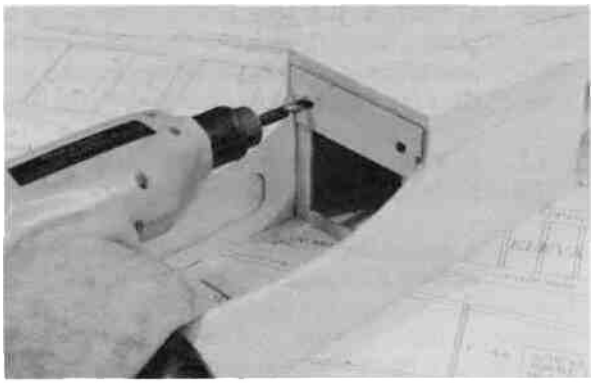
D 6. Carefully **align** the wing in the saddle as follows:

If you have drilled the dowel holes correctly, the wing should now be centered, side to side. Measure down from the bottom of both tip ribs to the flat surface. If the measurements are not equal (within 1/16"), sand the saddle slightly until the wing sits level in the saddle. Also measure from the rear corner of each wing tip to the tail end of the fuselage. These measurements must also agree within 1/16". If not,

shift the wing slightly until they do. With the wing in this position you may now check the wing incidence using an "incidence meter" or by measuring down to the flat surface from the center of the leading and trailing edges. The measurements should be the same (zero degrees incidence).

D 7. After making the necessary corrections to align the wing, **tack glue** the dowel plate to F-2 with a couple drops of CA. Also make marks at the wing trailing edge so you may easily re-align the wing later.

D 8. Remove the wing and securely glue the dowel plate in place by flowing thin CA into the wing dowel holes and around the edges. Follow up with thick CA in any gaps around the edges.



☐ 9. Drill 5/16" holes through F-2 using the holes in the dowel plate as a guide.

D 10. Use a pliers to grasp the ends of the wing dowels and pull them out. Mix up a batch of 30-minute epoxy, use a long stick to work some epoxy into the dowel holes, smear epoxy on the dowels, then re-insert the dowels, leaving them protrude 3/8". Wipe away all excess epoxy, then allow the epoxy to firmly set.

D 11. Replace the wing in the saddle and re-align.

☐ 12. Holding the wing **firmly** in place, drill 13/64" holes through the **center** of the 1/16" ply wing bolt plates and through the 1/4" ply hold-down blocks in the fuselage. Try to drill straight in, perpendicular to the 1/16" ply bolt plates.Do **not allow the wing to move while drilling!**

D 13. Remove the wing and re-drill the holes **in the wing only** to 1/4".

D 14. Use a 1/4-20 **tap** and a **tap wrench** to cut threads in the ply hold-down blocks in the fuselage. Note: To help get the tap started straight, you may keep the wing in place during this step.

D 15. **Harden** the threads in the hold-down blocks with thin CA glue, then re-tap the threads after the glue is completely dry.

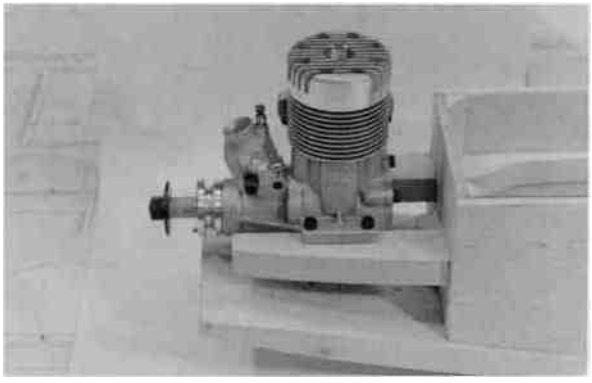
D 16. Trial fit the wing to the fuse using the two 1/4-20 nylon bolts provided. You may cut the bolts off to their proper length, so they protrude about 1/4" below the hold-down blocks in the fuselage.

D 17. Later you will apply foam **wing seating tape** to the wing saddle. To allow space for this tape, you may sand the saddle slightly in the areas where the wing touches the saddle, to provide a small gap.

MOUNT THE ENGINE

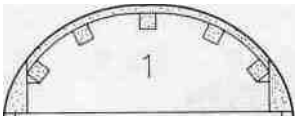
-1

D **la. If you are using a custom engine mount** made for your engine, you may attach the mount to F-l at this time using the mounting hardware supplied with your mount, or using the 10-32 blind nuts and bolts supplied in this kit. Skip the following steps which refer to the hardwood mounting rails.

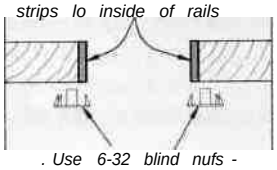


D Ib. **If you are using the hardwood engine mounting rails** supplied in this kit, set your engine in place on the rails to check the fit. If the space between the rails is too narrow, file or sand the rails until the engine fits properly. If you are installing a .60 engine that requires a smaller opening between the rails, epoxy 1/8" strips of hardwood or ply to the inside of the rails as shown in the following sketch. Position the engine fore-and-aft so the front of the "thrust washer" (rear of spinner backplate) is 3/4" (or slightly less) forward of the front edge of the mounting rails. **Note:** This puts the thrust washer of the OS Max .91 FSR approximately 5-1/8" forward of F-l, and the thrust washer of the OS Max FS-120 approximately 5-1/2" forward of F-l.

MOUNTING RAIL
MODIFICATION
FOR SMALLER ENGINES



Epoxy *1/8" ply or hardwood strips lo inside of rails*



. Use 6-32 blind nufs - and mounting hardware (Not supplied)

D 2. With the engine located as described above, centered between the rails, and aligned for zero degrees side thrust, **mark the mounting hole locations.**

NOTE: In this kit we have provided 10-32 bolts and blind nuts which are the proper size for mounting the OS Max .91 FSR or the OS Max FS-120. If, however, you are using an engine which requires 6-32 or 8-32 mounting hardware, please adjust the hole sizes in the following step to accommodate the hardware you are using.

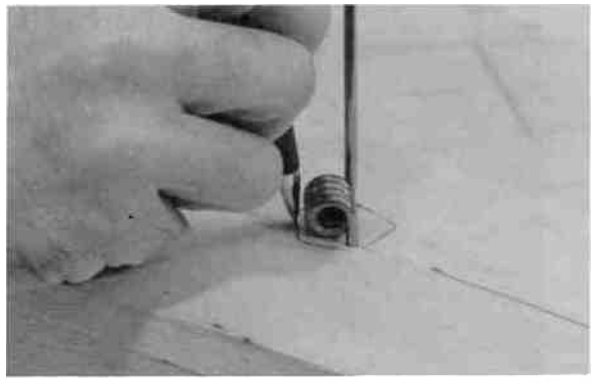
D 3. Drill holes in the hardwood rails for the **10-32 blind nuts.** To maintain accurate positioning of these holes and to minimize splitting the wood, we recommend that you begin by drilling 3/32" diameter **pilot holes,** then use progressively larger drill bits until the holes are large enough to accept the blind nuts.

D 4. Install the blind nuts in the bottom of the hardwood rails. Note that part of the blind nut flanges protrude into the engine mounting area. Trial fit your engine to find out if the protruding portion of the blind nuts will interfere with the engine crankcase. If they do, use a hacksaw or a Dremel Moto Tool and a "Tuff Grind" wheel to remove any part of the blind nuts that would touch the engine.

D 5. Temporarily mount your engine.

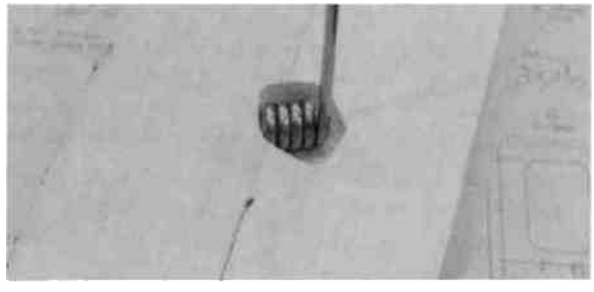
INSTALL NOSE GEAR (If applicable)

D 1. Using a long 5/32" drill bit, drill down through the nylon nose gear bearing and through the chin block.



☐ 2. Insert the nose gear until the spring rests on the bottom of the chin block. Rotate the nose gear (simulating a right and left turn) and mark the location of the spring on the chin block in all positions.

D 3. Using a Dremel Moto Tool, rout out an area in the chin block for the nose gear spring.



☐ 4. Re-insert the nose gear and check for unobstructed movement.

INSTALL FRONT PUSHROD GUIDE TUBES

D 1. Install the plastic pushrod guide tube for the nose gear steering pushrod if you are building the tricycle gear version.

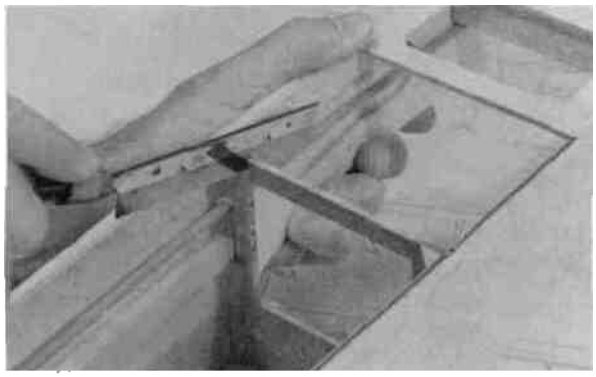
D 2. Insert the 5/32" wheel collar into the nylon **nose gear steering arm** and screw in the 6-32 x 1/4" screw. Install this steering arm onto the nose gear.

D 3. Insert one of the long threaded pushrod wires into the nosegear pushrod guide tube (threaded end forward). Screw a nylon clevis onto the threaded end of the pushrod until the threads protrude into the clevis opening, and attach the clevis to the steering arm. Cut off the excess pushrod wire at the servo end. **Leave this push rod and steering arm in place, as they would be very difficult to install later.**

D 4. Install the pushrod guide tube for the throttle pushrod, keeping it as close to the fuse side as possible in the fuel tank compartment. Glue this tube to F-l and F-2.

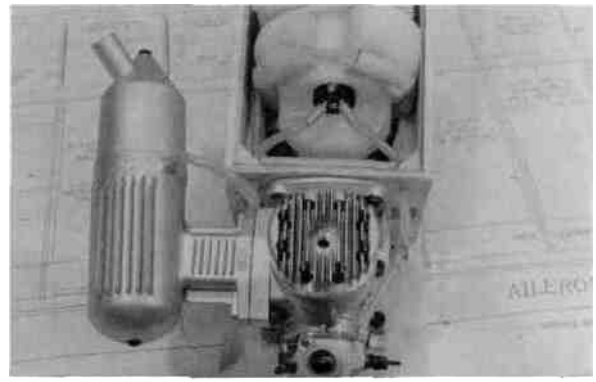
INSTALL FUEL TANK

NOTE: It is physically possible to install up to a 24-ounce fuel tank in this airplane, but we recommend that you use a 14 or 16 ounce tank for ease of installation and to avoid excessive shifts in balance.



☐ 1. Cut out the cross piece at the top of F-2. (In the die-cutting process we have started these cuts for you).

D 2. Glue the 1/8" x 2-1/4" x 4" balsa **fuel tank support** to the **bottom** of the hardwood rails in the location shown on the plan. NOTE: If you are not using the hardwood rails, use a few scraps of balsa to anchor the fuel tank support to the fuse sides.



☐ 3. Wrap the fuel tank with soft foam rubber and lay it in place on the fuel tank support. Adjust the position of the tank up or down by adding foam as necessary, until the center of the tank is approximately at the same level as the fuel intake on the carburetor.

D 4. Drill holes near the top of F-l and install silicone **fuel tubing** from the tank to the carb and to the pressure tap on the muffler. We recommend using a **fuel filter** in the line from the tank to the carb.

D 5. If you have not already done so, take a few minutes now to **fuelproof** the hardwood engine mounting rails, the front of F-l and the fuel tank compartment, as some of these areas may be difficult to get at later on.

UPPER FUSELAGE STRUCTURE

FORMERS, STRINGERS AND HOOD

D 1. Find and identify the following parts:

Die-cut 1/8" ply F-1A, F-1B, F-2A, F-2D, F-3B, F-4A, F-5A and F-6B

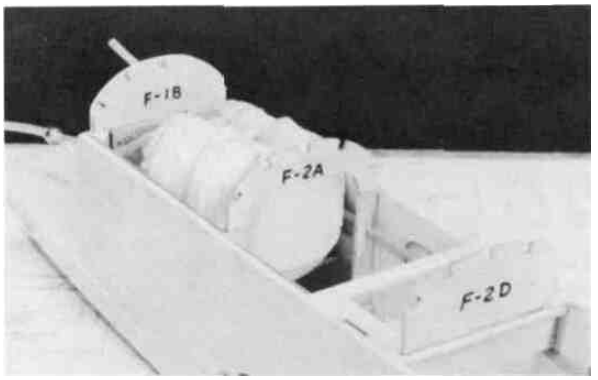
Shaped 1/4" balsa F-3A and F-6A; Five 1/4" x 1/4" x 12-3/4" balsa front stringers

One 1/4" x 1/4" x 19-3/4" hardwood rear stringer

Eight 3/16" x 3/16" x 19-3/4" hardwood rear stringers

Two 3/8" x 1-3/8" x 21-l/4" balsa hood side blocks

Two 1/8" x 2-1/4" x 14-7/8" balsa hood top sheeting.

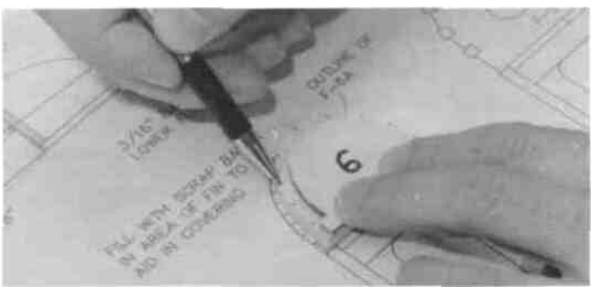


D 2. Glue **F-1A** to **F-1B,** center this assembly side-to-side on the top of F-l and line up the front face with the front of F-l, then glue this assembly to the top of F-l.

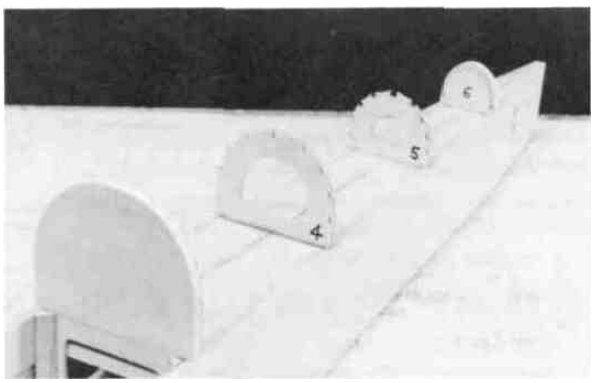
D 3. Trial fit **F-2A** in place and sand the opening as necessary for fuel tank clearance (you may have to remove the fuel tank through this opening sometime in the future!). Glue F-2A to the top of F-2.

D 4. Glue **F-2D** to the top of the alignment base (AB). Note that the rear edge of F-2D is located 1/4" in front of the rear edge of AB.

D 5. Glue **F-3A** to **F-3B,** and **F-6A** to **F-6B.**



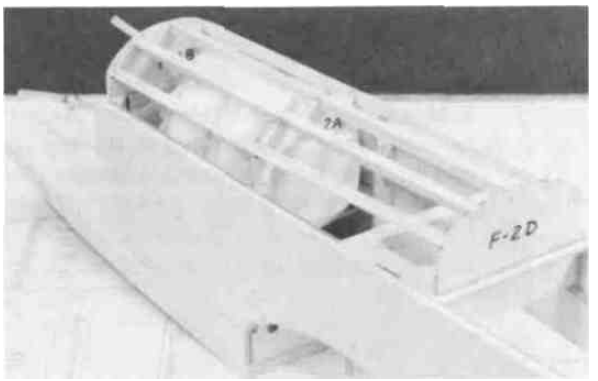
D 6. Lay the F- 6A and F-6B assembly on the F-6 detail drawing and mark the location of the center of each rear stringer on F-6A.



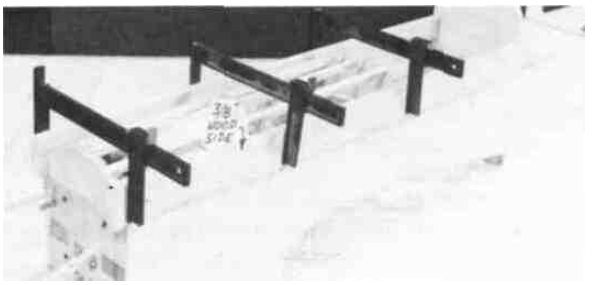
D 7. Position the F-3A and F-3B assembly on the **aft** deck base, centered side-to-side. The front of F-3A must line up with the front of F-3 and this assembly must be perpendicular (square) to the aft deck base. Glue in place.

D 8. In the same manner, glue **F-4A** and **F-5A** to the aft deck base in the locations you previously marked.

D 9. In the same manner, glue the F-6A and F-6B assembly to the aft deck base. The "former location lines" which you previously drew indicate the fore/aft position of F-6B.



D 10. Glue the balsa **front stringers** into the notches in F-1B, F-2A and F-2D, then sand off the stringers flush with the rear surface of F-2D.

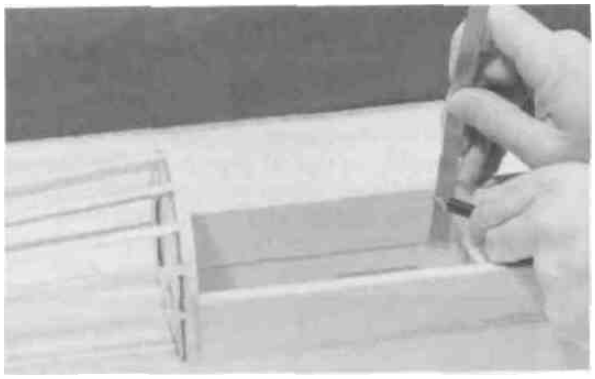


D 11. Glue the 3/8" balsa **hood sides** to the sides of F-1A, F-2A and F-2D, to the top edge of the fuse sides, and to the front of F-3A. **Do not cut off the front of the hood sides which protrude beyond F-1A.**

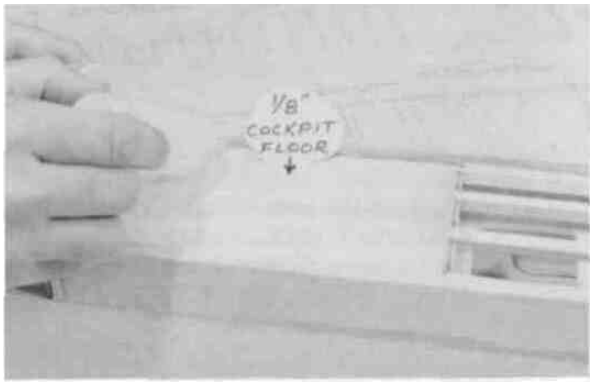
INSTALL COCKPIT FLOOR

D 1. Edge glue the two 1/8" x 2" x 7-1/4" balsa sheets together to make the **cockpit floor.** Sand smooth.

D 2. Lay the cockpit floor on the top edges of the hood sides, between F-2D and F-3A. While holding in place, use a pen up through the wing saddle opening to mark the inside edges of the hood sides on the cockpit floor. Trim the edges of the cockpit floor along these lines (leave a little extra for fitting), then sand the edges as necessary for a good fit between the hood sides.

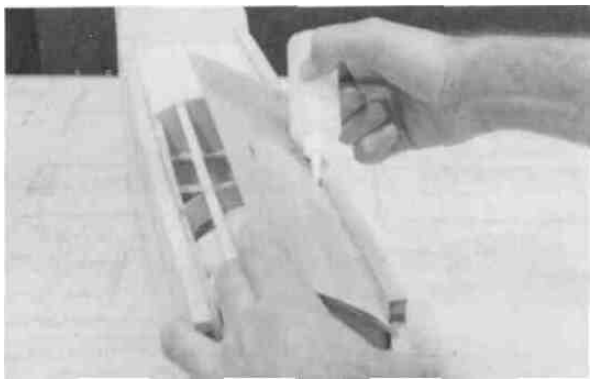


D 3. Measure 7/8" up from the bottom of the hood sides to mark the elevation of the **top** of the cockpit floor. Glue the cockpit floor in place.



INSTALL HOOD SHEETING

D 1. Sand one edge of one of the 1/8" balsa **hood sheets** to a bevel and shape it to fit in the corner between the side stringer and the hood side. The sheeting should protrude 3/4" in front of F-1A.



D 2. Glue the edge of the hood sheet to the hood side by holding it in place and applying thin CA glue.

D 3. Wet the top surface of this sheet with water or a mixture of water and ammonia which will make it easy to bend. Bend the sheeting down onto the top stringer and, using a straightedge and an Xacto knife, trim the sheeting along the center of the top stringer.

D 4. Apply thick CA to the tops of the formers and stringers (apply glue only to 1/2 of the top stringer), then immediately press the top sheet in place and hold down until the glue has set.

D 5. Repeat steps 1 - 4 to install the other half of the hood sheeting.

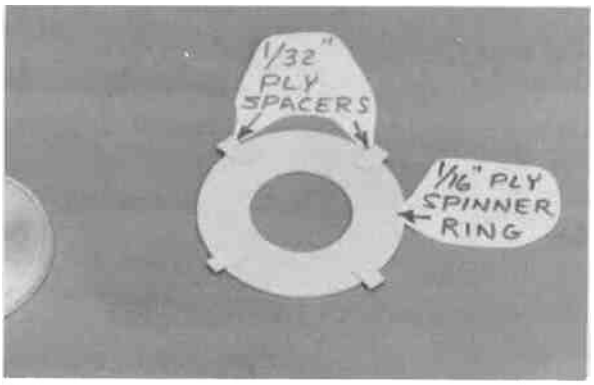
INSTALL REAR STRINGERS

D 1. Find the 1/4" x 1/4" x 19-3/4" hardwood **top rear stringer** and the eight 3/16" x 3/16" x 19-3/4" hardwood **rear stringers.**

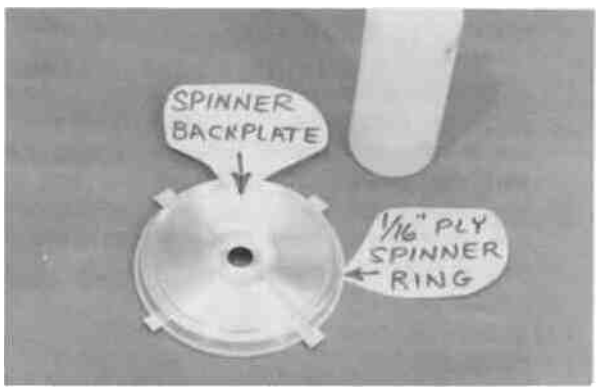
D 2. Trim and sand the ends of the rear stringers for a good fit, and glue them in place.

COMPLETING THE FUSE AND WING

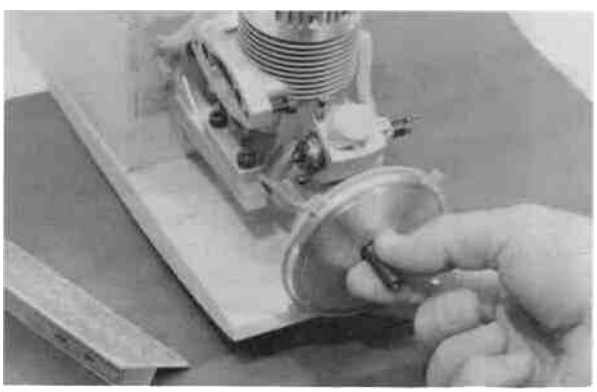
CONSTRUCT THE NOSE



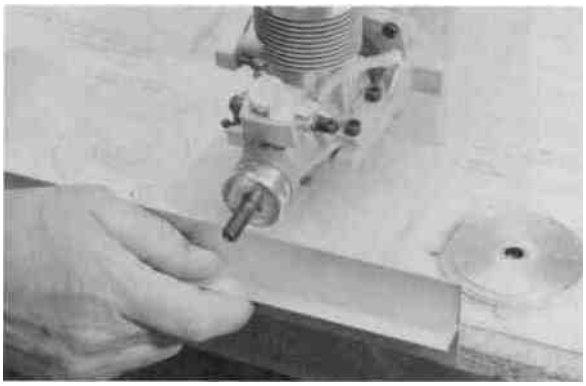
☐ 1. From the small scrap of 1/32" ply (included), cut four small pieces and tack glue them to the 1/16" ply **spinner ring** as shown, using a very small amount of thick CA (these will be removed later).



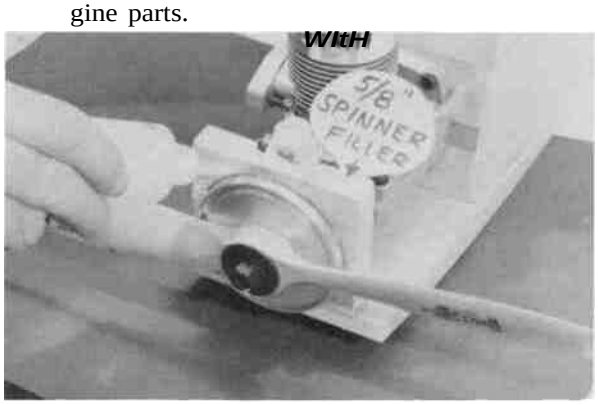
☐ 2 Now center your 3" diameter spinner back**plate** over the spinner ring, and tack glue it to the 1/32" ply spacers.



☐ 3. Trial fit the spinner ring and spinner backplate assembly onto the engine crankshaft. You will note that you are not able to seat the backplate fully against the thrust washer because the chin block is slightly too long. Remove the spinner backplate and, using a sanding block, sand the front of the chin block slightly. Repeat this procedure until you have the front of the chin block sanded just enough to permit the spinner backplate to rest against the thrust washer.Then temporarily bolt on the propeller to hold the spinner backplate and spinner ring in place.



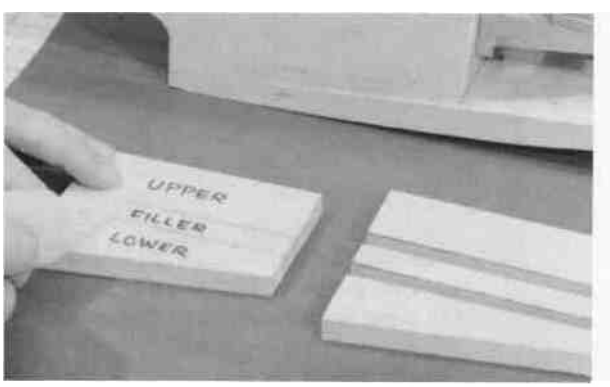
D 4. Find the "U"-shaped 5/8" balsa **spinner filler block** and trial fit it behind the 1/16" ply spinner ring. Sand the bottom of this block to a bevel to mate with the top of the chin block, and carve it as necessary to fit around the engine parts.



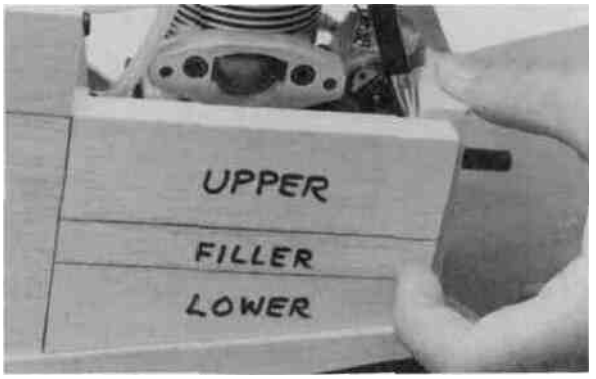
☐ 5. Glue the spinner ring, spinner filler block and chin block together.

D 6. Remove the propeller, then break the spinner backplate free. Remove the 1/32" ply spacers.

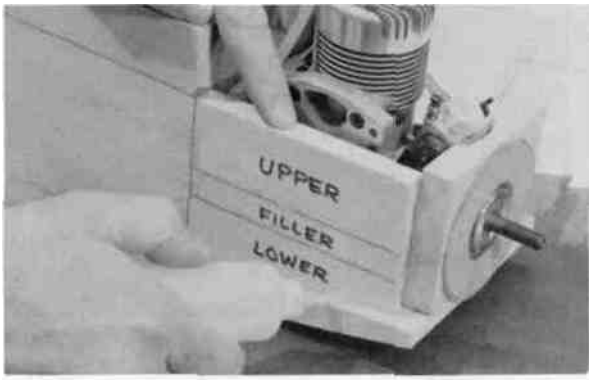
D 7. If you are using the hardwood engine mounting rails, find the two 3/16" x 5/8" x 4-7/8" balsa **engine rail fillers** and glue them to the outside edge of the hardwood rails. Sand flush with the top and bottom of the rails.



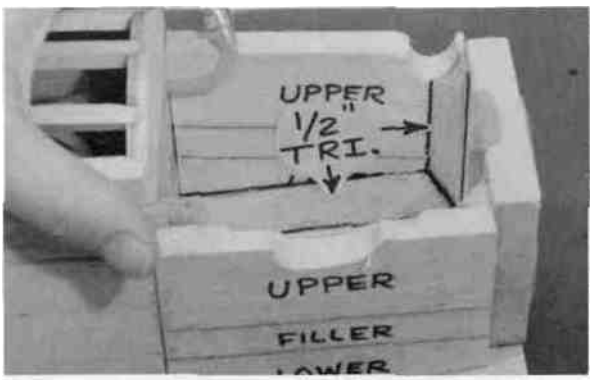
☐ 7a. If you are using a custom mount for your engine, find the two 1/2" x 5/8" x 4-13/16" balsa **nose side fillers** and the shaped 5/8" balsa upper and lower **nose sides,** and glue them together to make the nose side assemblies.



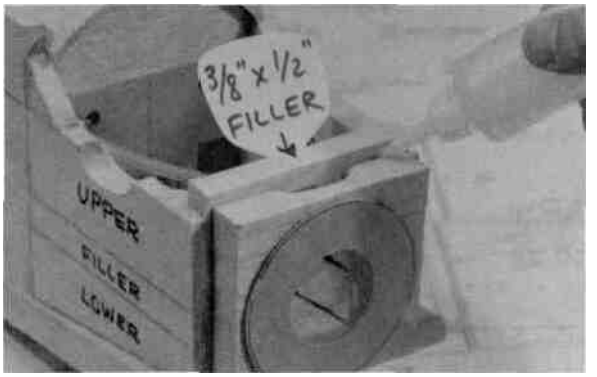
8. Holding the nose sides against the front of F-l, mark the location of the rear edge of the spinner filler block on the nose side pieces. Sand or trim off the front edge of the nose side pieces to fit snugly behind the spinner filler. Trial fit these pieces and carve as necessary for muffler and needle valve clearance.



☐ 9. Position the nose side pieces so the rear edge is flush with the fuse sides and the front edge overlaps behind the spinner filler block by 1/8". Securely glue the nose side pieces to the front of the fuse sides, the spinner filler block, the chin block (and to the engine mounting rails, if applicable).



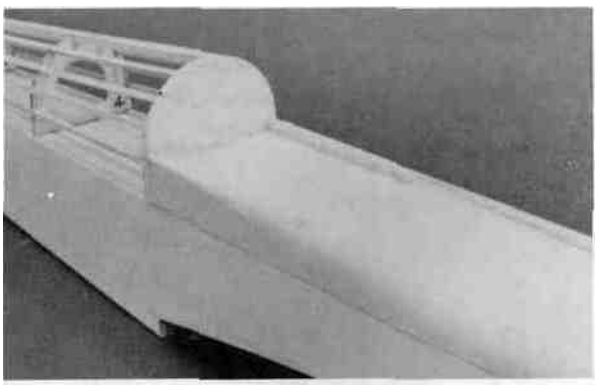
☐ 10. Cut pieces of 1/2" balsa triangle to fit in the corners of the engine compartment where shown, and glue in place.



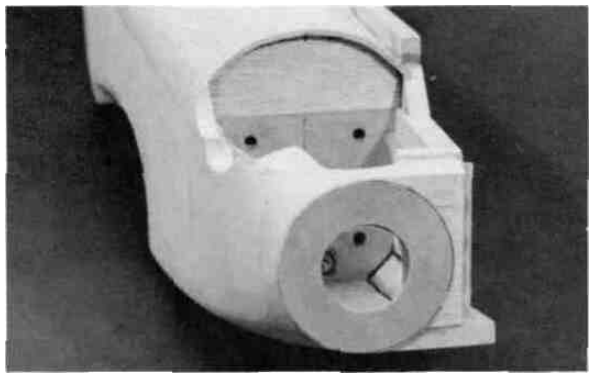
D 11. Find the 3/8" x 1/2" x 3- 5/8" **nose filler** and glue it to the back of the spinner filler and to the top of the upper nose sides. Carve and sand this piece as necessary for engine clearance.

SAND THE FUSELAGE

NOTE: Some heavy sanding is required to properly shape the hood sides and the nose area. This task can be made much easier if you use a sanding block with #60 or #80 grit sandpaper. The very coarse sandpaper is used to achieve the basic shapes, then use progressively finer grades of sandpaper for a smooth finish.



☐ 1. Carve and sand the hood sides to blend with the hood sheeting, then continue rounding the top fuse corners to the approximate shape as indicated in the cross-section drawings on the fuse plan. Use a piece of sandpaper wrapped around a dowel to blend the hood sides to the nose sides in front of F-l as shown on the plan and the photos. Note that the hood sides are **not** rounded at the rear of the cockpit area.



D 2. Sand the nose side pieces and chin block to blend smoothly with the spinner ring. You may also have to sand the spinner ring slightly for a good match with your 3" spinner backplate.

D 3. Sand the bottom rear fuse corners to a slight radius as shown on the cross-sections.

INSTALL WING FAIRINGS

NOTE: You will need the following parts for this section:

1 -1/4" x 1-3/16" x 4-11/16" balsa **fairing front**

2 - 1/4" x 3/4" x 1-5/8" balsa **fairing sides**

2 - 3/16" x 2-3/4" x 4-11/16" balsa fairing bottom

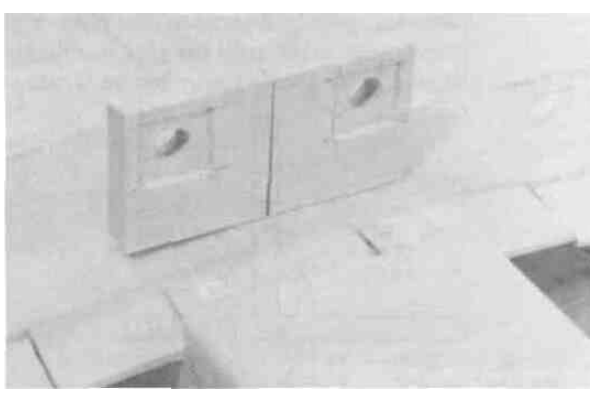
1 - 1/8" x 2-1/4" x 4-11/16" balsa **rear fairing block**

1 - 1/4" x 1-3/8" x 4-11/16" balsa **rear fairing block**

1 - 3/8" x 1-3/8" x 4-11/16" balsa rear fairing **block**

1 - 5/8" x 2-3/8" x 4-5/8" balsa rear fairing **block**

D 1. Mount the wing to the fuselage with the nylon bolts.

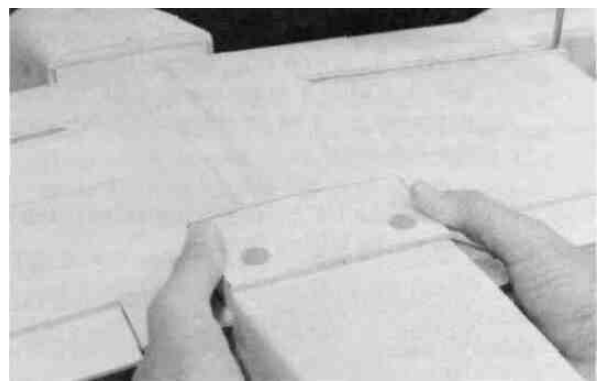


D 2. Position the 5/8" balsa rear fairing block on top of the nylon bolts, and centered between the fuse sides. Push down on this block to make imprints of the nylon bolt heads in the fairing block.

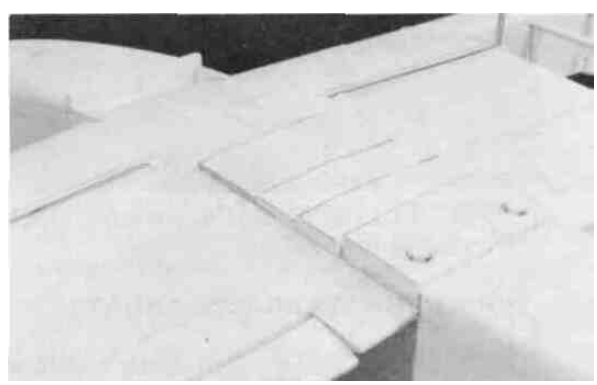
D 3. Make holes in the fairing block large **enough** to clear the heads of the nylon bolts.

D 4. Again hold the fairing block in position, pushing down to imprint the locations of the 1/16" ply wing hold-down plates on the fairing block. Carve the fairing block to clear the wing hold-down plates.

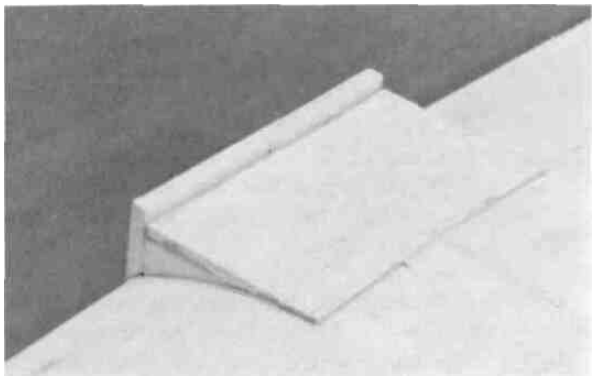
D 5. Make a 1/2" deep saw cut down the center of the rear fairing block (cut from the side of the block which faces the wing), which will permit the block to bend to the shape of the wing.



D 6. Hold the rear fairing block in place, leaving a slight (1/32") gap between the back of the block and the front of F-3, and apply a couple drops of thin CA to tack it in place. Remove the wing bolts and remove the wing from the fuse, then glue the block securely in place.



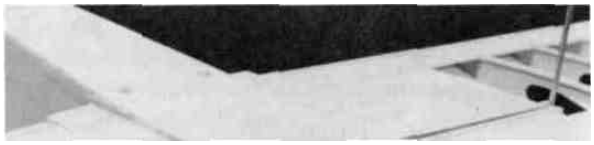
D 7. Glue the three remaining rear fairing blocks to the bottom of the wing in a similar manner. You'll have to make a saw cut in the center of the 3/8" block (and possibly the 1/4" block) to permit bending at the centerline.

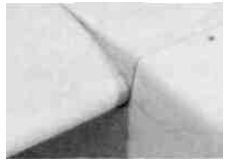


D 8. Sand one edge of the 1/4" balsa **fairing front** to fit the contour of the front of the wing. With the wing in place on the fuselage, hold the fairing front in place (allow 1/32" gap between the fairing front and the rear of the dowel plate) and tack glue it to the wing. **CAUTION: Use extreme care to avoid gluing the wing to the fuselage!**

D 9. Glue the 1/4" balsa **fairing sides** to the wing and to the fairing front.

D 10. Sand the bottom of the 3/16" balsa **fairing bottom** to match the bottom of the wing, then glue it in place.

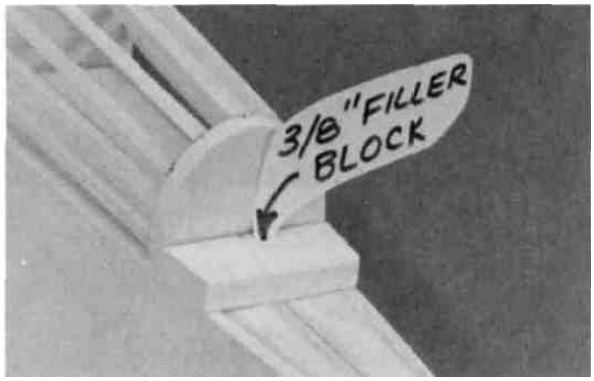




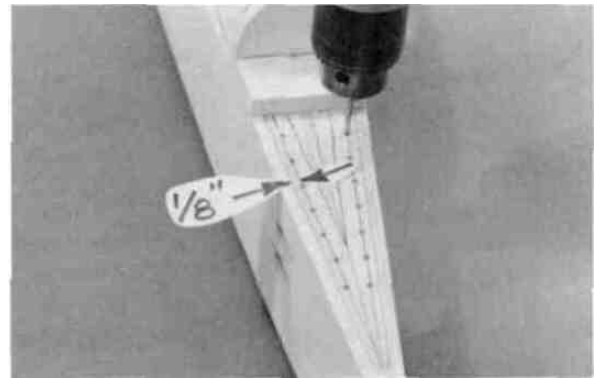
D 11. Sand the fairings to smoothly blend the wing to the fuselage.

MOUNT THE STABILIZER AND FIN

D 1. Lightly sand the stab saddle smooth with a T-bar sanding block.



D 2. Find the 3/8" x 15/16" x 2-1/32" balsa stab filler block and glue it to the stab saddle and the back of F-6A. Sand off the ends flush with the fuse sides.



D 3. Measure 1/8" in from the **inside** edge of the 3/16" balsa fuse sides and draw two lines on the stab saddle (see the above photo).

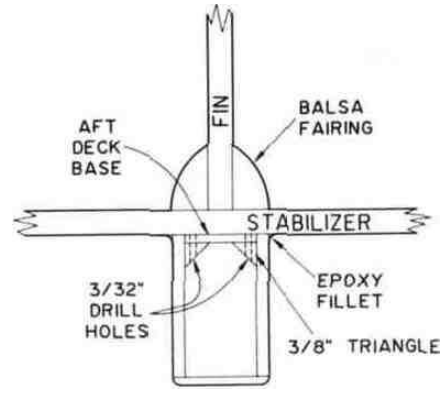
D 4. Drill 3/32" diameter holes, 1/2" apart, along the lines you drew on the stab saddle. Drill down through the aft deck base and the underlying 3/8" balsa triangle. NOTE: The purpose of these holes is to permit epoxy to flow into the holes, providing a very strong bond between the fuse and the stabilizer.

D 5. Accurately measure the trailing edge of the stabilizer and mark the center point.

D 6. Temporarily mount the wing in the saddle (for reference).

D 7. Lay the stab in position on the stab saddle with the center point lined up with the tail end of the fuselage. If the stab protrudes beyond the end of the fuselage, sand a little off the front of "the stab until it fits. Carefully check the stab alignment by measuring down from the tips to a flat surface, and from the stab tips to the wing tips (or to a point on the center of the fuse near the nose). Sand the stab saddle (a **little at a time!)** until it rests in proper alignment. With the stab in alignment, make a mark on the front of the stab and a corresponding mark on the back of F-6A, which will be used for rapid alignment when gluing.

D 8. Mix up a batch of 5-minute or 30-minute epoxy and apply it to the stab saddle. Use a flat stick to force some of the epoxy down into the 3/32" holes you previously drilled. Then press the stab into position and hold or pin in proper alignment until the glue has firmly set. Wipe off any excess epoxy before it sets up.



9. Using additional epoxy, make small fillets along the bottom of the stab at the fuse/stab joint.

10. Set the fin in place on the stab. The fin trailing edge must be even with the stab trailing edge. If the fin protrudes beyond the stab trailing edge, sand a small amount off the **front** of the fin.

11. Carefully align the fin on the stab. **The fin must be positioned perpendicular to the stab and must line up with the** fuselage **centerline EXACTLY!** While holding the fin in place, apply thin CA to glue it in place. (Note that it is OK to use CA for this step because the fin will be held securely to the stab by the large balsa fillets).

LOCK STABILIZER TO FUSELAGE

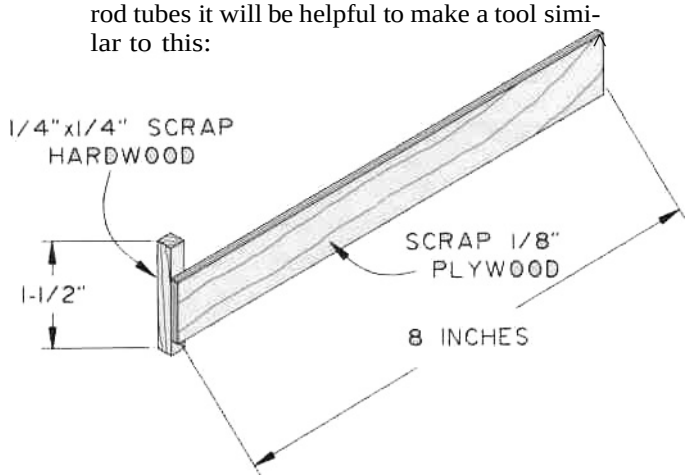
(See Fuselage Plan)

1. Accurately measure 1-9/16" and 2-9/16" back from the rear edge of F-6 and make two marks on the bottom of the aft deck base. If you don't have a short ruler with which to make this measurement, cut scraps of balsa 1-9/16" and 2-9/16" long and use them as your rulers. Continue these marks across the 3/8" balsa triangles and up the inside of the fuselage sides. These marks represent the front and rear edges of the 1-inch wide fiberglass cloth reinforcing tape to be installed.

2. Using a long-nose pliers, break off any epoxy bumps on the 3/8" balsa triangles between the above marks which you might have missed when you wiped up the excess epoxy.

3. Cut the 1" x 11" fiberglass cloth strip **into** two pieces, 6-l/2"and 4-1/2" long.

4. To aid in spreading epoxy between the push-rod tubes it will be helpful to make a tool similar to this:



5. Mix up a batch of slow cure epoxy and spread it on the bottom of the aft deck base between the marks you made in step 1. Continue spreading the epoxy up both of the fuse sides in a 1-inch wide strip. While the epoxy is still wet lay the 1" x 6-1/2" strip of glass cloth in place, pushing it down onto the aft deck base and up the sides of the fuse, using the above "tool" to work the glass cloth into place around the push-rod tubes. Spread more epoxy over the glass cloth to wet it thoroughly. Thicken the remaining epoxy by adding micro balloons. Place a 1/2-teaspoon glob of this thickened epoxy on the glass cloth in the middle of the aft deck base, then immediately take the tapered 1/4" plywood block and press it in place on top of the glass cloth as shown on the fuselage plan.

D 6. Mix up another batch of slow cure epoxy and apply it to the inside of the fuse sides in the rearmost 1-inch of the opening. While the epoxy is still wet, work the 1" x 4-1/2" strip of glass cloth into place, pressing it against the fuse sides and the 3/8" balsa triangles with a long thin stick. Spread more epoxy over the glass cloth to wet it thoroughly. Allow the epoxy to fully harden before proceeding.

NOTE: In the next steps you will be asked to drill 9/64 and 3/32 diameter holes through the aft deck base and into the stabilizer. The problem is that standard drill bits are not long enough to do this easily. Some hobby shops and hardware stores carry long drill bits, and this is the best solution; but you can extend the length of your standard drill bits by gluing them into close-fitting brass tubes (available from your hobby shop) with CA glue. To later remove the drill bit from the tube, heat the tube with a match or lighter while twisting and pulling them apart with two pairs of pliers, working in a well ventilated area to avoid breathing the fumes of the smoldering CA.

D 7. Install your long (or extended) **9/64"** drill bit into a drill. Measure up 3/8" from the tip of the drill bit and wrap a piece of masking tape around the drill bit to mark the maximum depth. The masking tape will be used as a depth gauge to prevent drilling too deeply.

D 8. Drill a 9/64" hole in the **center** of the 1/4" tapered plywood block which you installed in step 5, drilling straight in to a depth of 3/8" (using the masking tape as a guide).

D 9. Also drill a 9/64" hole to a depth of 3/8", starting 1/4" forward of the front edge of the tapered balsa tail filler block. Drill vertically, straight down through the epoxy and glass cloth which you previously installed. **NOTE:** It is very important that you drill this hole in the correct location, otherwise the locking screw may not go into the plywood brace in the stabilizer, which would defeat the whole purpose of this procedure!

D 10. Install the long (or extended) **3/32"** drill bit in your drill and wrap a piece of masking tape around it 1" from the tip.

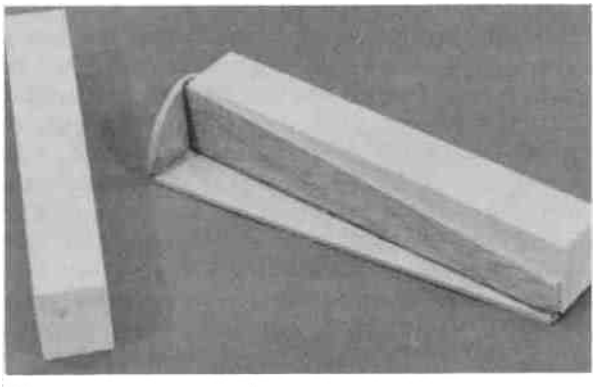
D 11. With the 3/32" drill bit, drill the holes of steps 8 and 9 of these instructions to a total depth of 1" (using the masking tape as a depth gauge).

D 12. Insert the #6 x 1" sheet metal screws into the holes and screw them down securely. **NOTE:** The screws are positioned so they go into the 1/4" plywood braces in the stabilizer, providing a strong and positive connection between the stabilizer and fuselage.

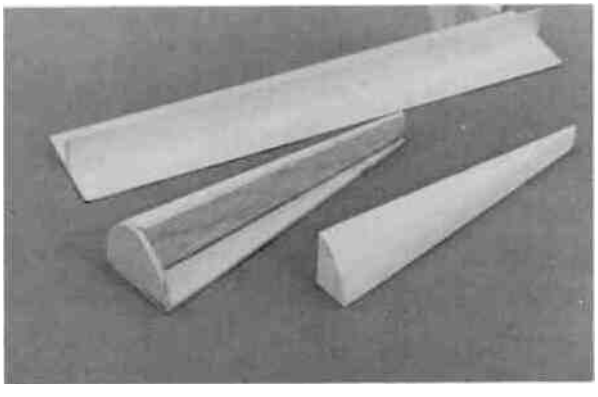
D 13. Now finish sheeting the fuselage bottom with 1/8" balsa from Former F-6 to the rear of the fuselage as shown on the plan.

FINISH MOUNTING THE STAB AND FIN

D 1. Assemble the **jig** for shaping the fin/stab fairing blocks. This jig consists of three 1/8" die-cut ply parts, and is glued together as shown in the photo.

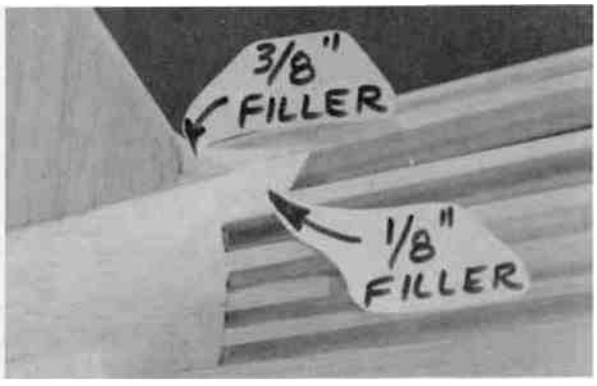


☐ 2. Tack glue the 7/8" x l-l/ 4" x 6-5/8" **fin/stab fairing blocks** to the jig, using only two small drops of thick CA glue per block.



D 3. Carve and sand the fairing blocks down to the shape of the jig.

D 4. Break the fairing blocks loose from the jig, trial fit on the sides of the fin, sanding as necessary for a good fit. Use epoxy to glue these fairing blocks in place.



☐ 5. From scraps of balsa cut small **fillers** and glue them in place at the front of the fin as shown in the above photo, which will enhance the appearance and aid in covering. Add lightweight balsa filler (such as Model Magic Filler) to any gaps in the tail area, allow to dry, then sand smooth.

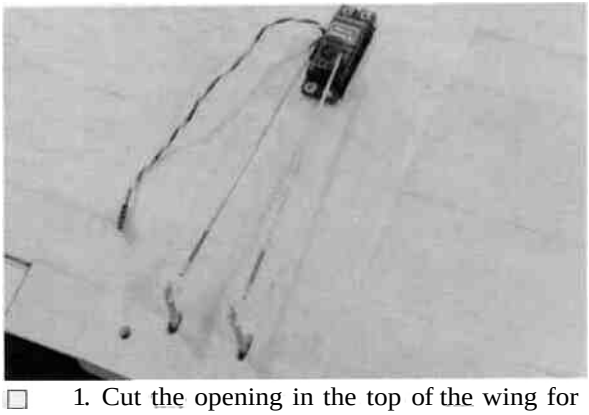
D 6. Temporarily attach the elevators and rudder to check their fit and operation.

IMPORTANT NOTE: When making the **tricycle** version, you'll have to install a 4th rudder hinge in the location where the tailgear bearing would have been located. Cutting the bottom hinge slot in the plywood and the fuse tail end joint is best accomplished by drilling a line of small holes at the hinge location with a small (1/16" or smaller) drill bit in a Dremel Moto Tool. You can then clean out the slot with a hinge slotting hook.

D 7. If you are building a taildragger, cut the slot in the fuse tail end for the nylon tailgear bearing at this time. Trial fit the tailgear assembly into the fuse and rudder to make sure it functions properly.

SERVOS, HORNS AND PUSHRODS

MOUNT AILERON SERVO AND PUSHRODS



☐ 1. Cut the opening in the top of the wing for the aileron servo If you were following instructions when you built the wing, you may still be able to see the marks you made at the front and rear of the servo opening area. If not, measure to find the location, based on the plans.

D 2. Glue the four 1/8" x 3/8" x 5/8" ply **aileron servo** rails under the wing sheeting to provide a good anchor for the aileron servo mounting screws.

D 3. Position your aileron servo in the center of the opening and mark the screw locations. Drill 1/16" pilot holes and temporarily mount the servo with four screws.

D 4. Screw nylon clevises onto the threaded end of the two 12" steel wire pushrods. **Be sure to screw the clevises onto the rods until the rods protrude into the clevis opening approximately 1/16".**

D 5. Attach the clevises to the brass horns on the aileron torque rods, then mark the point where each pushrod passes over the hole in the servo arm. Remove the pushrods and make a "Z-bend" in the rods at that point, using a "Z-bend pliers" or a standard pliers.

D 6. Remove the servo wheel from the servo and work the Z-bends into the wheel. **NOTE:** You may have to enlarge the servo wheel holes with a 5/64" diameter drill bit. Replace the servo wheel and check the operation of the ailerons. We recommend that you adjust your aileron linkage so the ailerons move 3/8" up and 3/8" down.

IMPORTANT NOTE: Later, when making the final hookup, we strongly recommend that you make small silicone rubber bands by cutting off small pieces of fuel line tubing and slide them over all the clevises to prevent them from opening. This safety measure may save your airplane in the event you encounter control surface flutter.

INSTALL SERVOS

IMPORTANT NOTE: We have found standard servos which provide approximately 45 oz/in of torque to be satisfactory for use in the Sportster 90/120 with the following exception . . . If you are using standard servos you should use one servo for each elevator (use a "Y"- Connector to plug both elevator servos into the elevator channel of your receiver). To use only one servo for the elevators, you must use a high torque servo providing at least 60 oz/in of torque.

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

☐ 1. Glue two of the 1/8" x 3/8" x 3-5/8" **ply servo rail supports** to the fuse doublers and to the bottom edge of the 3/8" balsa hood sides, in the area between F-3 and the 1/4" balsa cross brace.

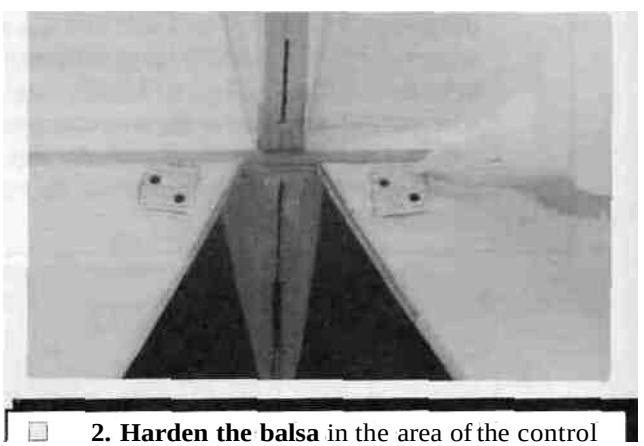
D 2. Lay the two 3/16" x 1/2" x 4-3/32" ply **servo rails** on the rail supports (sand as necessary to fit between the fuse sides), and use one of your servos to space the rails properly. Glue the servo rails to the rail supports and fuse doublers.

D 3. Lock the servo rails in place by gluing in the other two 1/8" ply rail supports.

D 4. Mount the servos to the rails with the hardware supplied in your radio system.

INSTALL ELEVATOR AND RUDDER HORNS

D 1. Hold the **nylon control horns** on the elevator and rudder in the positions shown on the plan and mark the mounting hole locations. Drill 3/32" diameter holes at these locations.



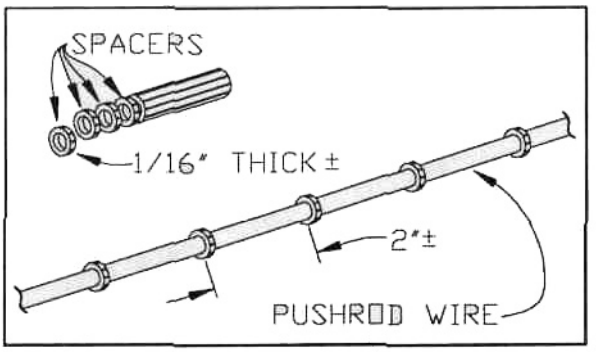
☐ **2. Harden the balsa** in the area of the control horns (on both sides of the control surfaces) by poking several holes with a pin, then applying thin CA glue. Sand smooth.

D 3. Mount the horns with 2-56 screws and the nylon **nutplates** which were attached to the horns.

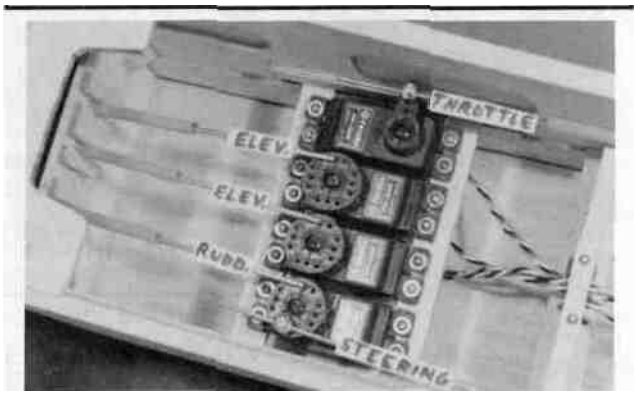
INSTALL PUSHRODS

NOTE: Use the steel wire pushrods supplied in this kit. Substitution of plastic inner pushrod may result **in** control surface flutter.

D 1. Screw a 2-56 hex nut onto the threaded end of each long steel wire pushrod and position it about half way down the threads. Screw a **metal clevis** onto the same threaded ends of the steel pushrod wires until they touch the hex nuts. The clevises should be screwed all the way on until the wire protrudes approximately 1/16" into the clevis opening.



☐ 2. Cut the 2-inch piece of yellow inner pushrod tubing into small disks approximately 1/16" thick. (These are used to prevent side play of the steel pushrods inside the guide tubes.) Clean the pushrod wire with alcohol to remove any oily residue. Before making any Z-bends in the pushrod wire, slide the pieces of tubing onto the wire, spaced approximately 2" apart. **NOTE: Avoid locating any of these spacers close to the points where the wire will exit the red outer tubing, as this could cause the pushrod to lock up.** If the spacers fit loosely over the wire, secure the spacers to the wire with a small drop of C/A glue. Insert the pushrods into the outer tubes and attach the clevises to the nylon elevator and rudder horns.



D 4. While holding the rudder and elevators in the **neutral** position, mark where the pushrod wires cross the holes in the servo wheels where each pushrod will be attached.

D 5. Remove the elevator and rudder pushrods and make Z-bends at the marks you just made. Cut off the excess pushrod wire.

NOTE: If you wish you can use solder clevises for the pushrod to servo linkage here.

D 6. Unscrew the metal clevises, re-insert the pushrods, and replace the clevises. Remove the servo wheels and work the Z-bends into the holes (drill the holes to 5/64" if necessary). Finally, place the servo wheels back onto the servos and check the operation of the elevator and rudder. We recommend the following control surface throws:

Elevator: 5/8" up, and 5/8" down

Rudder: 1-1/4" left, and 1-1/4" right

LI 7. Now install 1/8" balsa cross-braces on F-3 to secure the front ends of the pushrod guide tubes.

D 8. Attach the nosegear pushrod to the rudder servo wheel. NOTE: We recommend using a DuBro "E-Z connector" (or similar) for this hookup, for ease of installation and adjustment.

D 9. Attach the throttle pushrod to the throttle servo. NOTE: You may also use an "E-Z connector" for this hookup.

D 10. Anchor the throttle and nosegear pushrod guide tubes to the fuse sides and the 1/4" balsa cross-brace with pieces of scrap 1/8" ply.

D 11. Hook up your radio system **and** test **the** operation of all controls.

D 12. Make sure that the servos you are using have no free-play or "slop" in them. We have seen some new servos that have an unbelievable amount of slop. With your pushrod installation finalized and the radio turned on, check for servo slop by grasping the elevators and rudder and work them back and forth while observing the servo arms. If you find one or more servos that have free-play, you are advised to replace them and use the "bad" ones as throttle servos.

D 13. Make sure there is no slop in the connection of the pushrods to the servo wheels.

CANOPY AND WHEEL PANTS

PREPARE THE CANOPY

D 1. Using a scissors, carefully cut the canopy along the trim line.

D 2. Trial fit the canopy onto the fuse, pressing into place. Trim as necessary for a good fit.

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

WHEEL PANTS

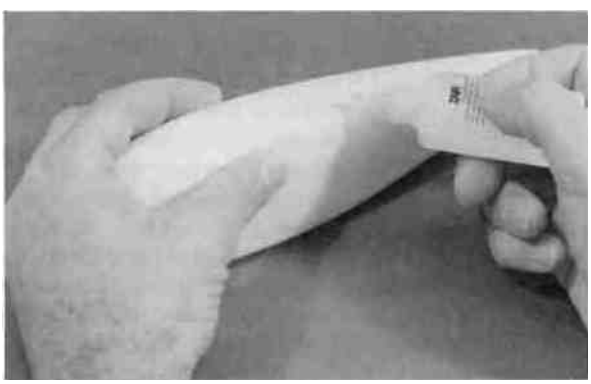
NOTES- Because the vast majority of Super Sportsters are built as "taildraggers", we have only included two wheel pants in this kit. If you have built a tricycle gear airplane and wish to install wheel pants on the nose gear, you may order Great Planes part No. WPNTS008 from your hobby shop, or write to Great Planes Model Mfg. and ask for the above part.

While they do decrease drag somewhat, the wheel pants are included primarily for cosmetic reasons; therefore, if you will be flying your Super Sportster 90/120 from a grass and/or rough field, we recommend that you do not install the wheel pants.

D 1. If you examine the inside of the wheel pants you will notice a raised **trim line** near the base. Using a scissors, cut away the excess plastic near the trim line. Use a large sanding block (or a sheet of sandpaper lying on a flat. table) to sand the pants down to the trim line.

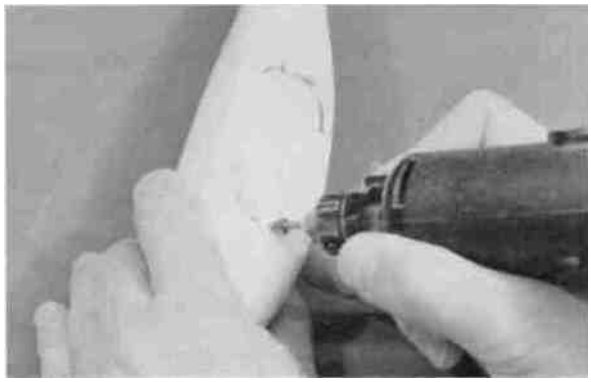
D 2. Clean the wheel pants halves with a tissue dampened with alcohol.

D 3. Lightly sand the inside of the wheel pants with fine sandpaper.

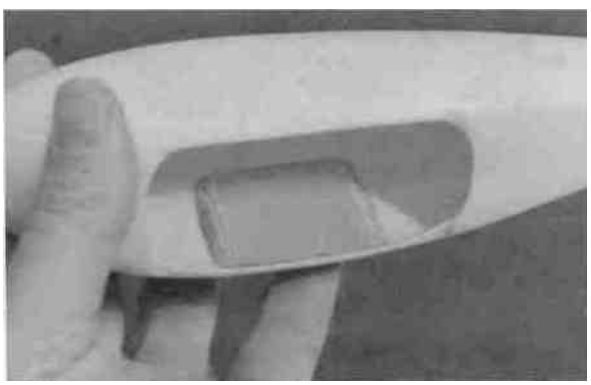


D 4. Hold two wheel pants halves together, carefully lining up the edges, and apply thin CA to bond them together all the way around.

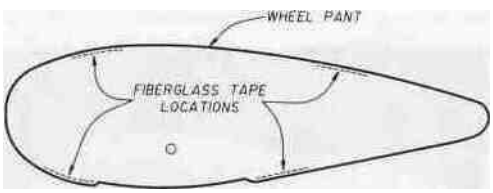
D 5. Using a sanding block, sand the pants along the joint to blend the two halves smoothly together.



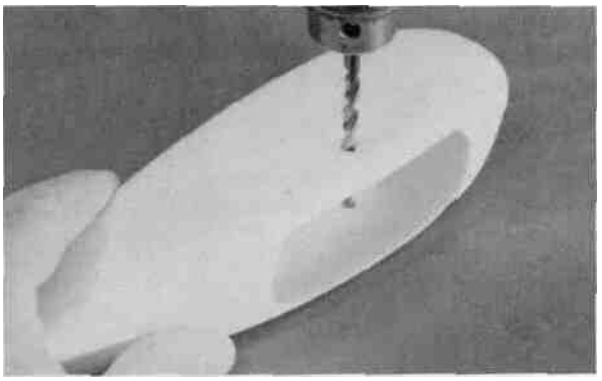
D 6. Cut the opening for the wheel, using an Xacto knife or a Dremel Moto Tool with a pointed bit. Sand the edges of this opening smooth with a Dremel sanding drum (or a piece of sandpaper wrapped around a dowel). Make sure the opening fits your wheel!



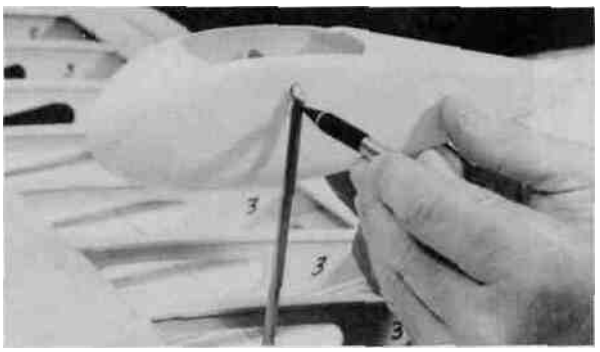
7. Sand one of the 1/8" x 1-3/4" x 1-3/4" ply **wheel pants screw plates** to fit the inside contour of the wheel pant, as shown in the detail drawing on the wing plan. **NOTE: Make a RIGHT and a LEFT wheel pant!**



D 8. Cut the strip of l"-wide fiberglass tape into l"-long pieces. Glue **four** pieces of this tape inside the pant at the center joint in the locations shown in the above sketch. A good method of doing this is to lay the glass cloth in position, apply thin CA glue, and press down with a piece of waxed paper until the glue sets.

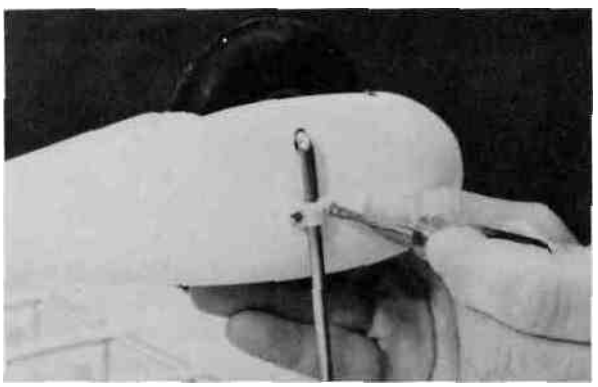


9. Determine from the detail drawing on the wing plan where the axle will enter the pant. Drill a 3/16" diameter hole (5/32" for nose gear pant) at this location. **Drill only through the side of the pant that has the ply screw plate.**



10. Slip the wheel pant on the landing gear wire, position the pant so it is parallel with the fuselage, and mark the gear location on the side of the pant. Notice that the bend in the landing gear prevents you from pushing the pant all the way on.

11. Remove the pant and carefully carve away the area of the pant at the bend in the landing gear, to allow the landing gear to fit flush against the side of the pant.



12. Check the pant alignment carefully, then attach the wheel pant to the landing gear using the nylon clip and two #4 x 1/2" screws. **NOTE:** After installing these screws once, remove them and cut 1/8" off the pointed ends to avoid puncturing the tires.

D 13. Remove the wheel pants and sand the entire outside surface lightly with 320 grit sandpaper.

D 14. Spray on a coat of primer, then sand smooth.

D 15. Paint the wheel pants with a fuelproof paint to match your covering material, and trim according to your preference.

FINISHING

ADDITIONAL FUELPROOFING

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

BALANCE THE AIRPLANE LATERALLY

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

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

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

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

D 3. If one wing always drops when you lift, it means that side is heavy. Balance the airplane by gluing weight to the other wing tip.

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 fuselage smooth using progressively finer grades of sandpaper.

COVERING

Because it is assumed that you have had some previous model building experience, we won't go into detail in regard to the covering procedure, except **for a** few important comments.

D 1. Before covering, fuelproof and paint the inside of the engine compartment.

D 2. We like to glue #400 grit wet-or-dry sandpaper to the cockpit floor, which gives it a nice flat black finish.

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

Recommended Covering Sequence:

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

GLUE THE HINGES

D 1. Lay the rudder, elevators and ailerons on the plans and mark on the leading edge of each part the locations of the hinges, torque rods (and tailgear if you have built a taildragger) Now use a sharp X-Acto knife to cut slits in the covering at the hinge locations Trial fit the hinges to make sure you have "found" the slots which you previously cut In the same manner, slit the covering at the hinge locations in the wing, stab and fin TE Also cut the covering away from the torque rod and tailgear slots.

NOTE: When gluing in the nylon tailgear bearing and the hinges, do not just smear glue on the hinge and push it into the slot, as most of the glue will be wiped off as it is being pushed in You must also work some glue into the slot A good way of doing this is to scoop up some epoxy with a plastic soda straw, then pinch the end of the straw, insert it into the hinge slot, and squeeze the straw to force glue into the slot Apply epoxy to the hinge, then insert the hinge into the slot After pushing in the hinge, wipe away all excess glue with a tissue. We recommend 30 minute epoxy for this process.

D 2 Glue the hinges (and tailgear bearing) into the slots in the wing, stab and fin TE using the above process and **allow the glue to harden before proceeding.**

D 3 Put epoxy into the slots in one of the elevators and on the corresponding hinges, then push the elevator onto the hinges and wipe away **all** excess epoxy with a tissue (for best results dampen the tissue with rubbing alcohol) Repeat for the other elevator.

D 4 Using coarse sandpaper, roughen the part of the aileron torque rods that will be glued into the ailerons, then clean off the sanded portion of the rods with a degreasing solvent **Roughen the tailgear wire in the same manner.**

D 5 Put epoxy into the rudder hinge slots (and the tailgear hole), push the rudder into place and wipe off **all** excess epoxy.

D 6. Put epoxy into the aileron hinge slots and the torque rod holes, push the ailerons into place and wipe off all excess epoxy

INSTALL PILOT

Assemble and paint your pilot figure, and glue it to the cockpit floor **NOTE** To avoid the possibility of the pilot coming loose inside the canopy, we recommend that you drill up through the cockpit floor and pilot base, and use two #6 or #8 sheet metal screws to lock the pilot in place

GLUE CANOPY IN PLACE

NOTE Some modelers prefer to tint their canopies for a more subtle and realistic effect You may tint your canopy by immersing it in a concentrated mixture of Rit Liquid Dye and hot tap water The colors blue, black, brown and dark green work well Remove the canopy after 5 minutes and rinse it off to check the amount of tint The longer you leave it **in the** dye solution the darker it will tint.

D 1 Lightly sand the inside of the canopy around the outside edge (sand a strip approximately 1/8" wide) **NOTE** To avoid sanding more than you want, it is helpful to first apply strips of masking tape on the inside of the canopy, 1/8" in from the edges.

D 2 Hold the canopy in place on the fuselage and very carefully apply thin CA glue around the edges To control the amount of CA, it is very helpful to use the small diameter teflon applicator tubing which is supplied with most CA glues.

D 3. To hide the canopy glue joint, you can use 1/4" wide striping tape as a border around the canopy

WING SEATING TAPE

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

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

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

RE-INSTALL ENGINE & RADIO

Re-install the engine, propeller, battery, receiver, servos, control horns, pushrods, main LG, nose gear and wheels Attach the wing to the fuselage.

BALANCE YOUR MODEL

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

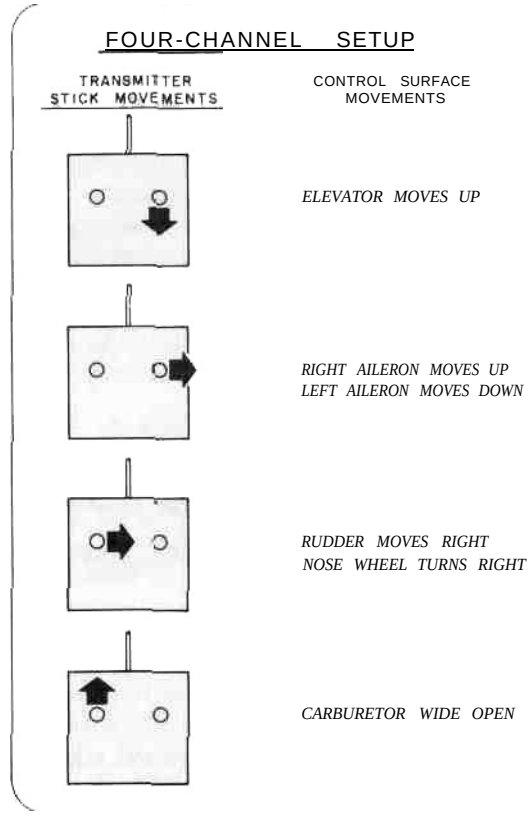
D 1. Accurately mark the balance point on the bottom of the wing The balance point is shown on the plan (CG), and is located approximately 3-7/8 inches to 4 inches back from the leading edge This is the balance point at which your model should balance for your first flights. Later, you may wish to shift the balance up to 1/2" forward or back to change the flying characteristics Moving the balance forward results in a model that is more resistant to stalls and spins but also may act sluggish and require more speed for takeoff and landing Moving the balance aft makes the model more agile with a lighter and snappier "feel" In any case, **do not balance your model outside the recommended range.**

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

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

FINAL HOOKUPS AND CHECKS

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



D 2. Adjust your pushrod hookups as necessary to provide the following control surface movements

Elevator. 5/8" up, and 5/8" down

Rudder 1-1/4" left, and 1-1/4" right

Ailerons. 3/8" **up, and** 3/8" **down**

NOTE: These control surface "throws" are approximate and provide a good starting point for the first flights with your Super Sportster 90/120 You may wish to adjust the throws slightly to provide the smoothness or quickness that you prefer

D 3. Check for wing twist as follows:

NOTE Even if you have built your wing on a perfectly flat surface and used utmost care, it is possible

that your wing may have a twist due to uneven shrinking of the covering material. **You must check for this condition and correct it before the first flight.**

If you do not own a **wing incidence meter,** we recommend that you purchase one or borrow one from another modeler. With the wing mounted to the fuselage, use the incidence meter to check the angle of your wing at the tips and at the root (alongside the fuselage). If the incidence meter reveals a wing twist of more than 1/2 degree, you must grasp the wing at the tip and twist it slightly, while reheating the covering material. Keep checking, twisting and reheating until the wing twist is removed.

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 and join. Club fields are set up for R/C flying which usually makes your outing more enjoyable. The AMA can also tell you the name of a club in your area. We recommend that you join AMA and a local club so you can have a safe place to fly and also have insurance to cover you in case of a flying accident.

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 forms of radio operation like R/C boats and R/C cars and also away from houses, buildings and streets. A schoolyard may look inviting but it is too close to people, power lines and possible radio interference.

GROUND CHECK THE MODEL

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

RANGE CHECK YOUR RADIO

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

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

ENGINE SAFETY PRECAUTIONS

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

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

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

Use safety glasses when starting or running engines.

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

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

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

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

Make all engine adjustments from behind the rotating propeller.

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

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

AMA SAFETY CODE

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

6 I will not fly my model unless it is identified with my name and address or AMA number, on or in the model Note This does not apply to models flown indoors

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

The SUPER SPORTSTER 90/120 is a great flying sport airplane that flies smoothly and predictably, yet is highly maneuverable It does **not** have the self-recovery characteristics of a primary trainer, therefore you must either have mastered the basics of R/C flying or seek the assistance of a competent R/C pilot to help you with your first flights

We recommend that you take it easy with your SUPER SPORTSTER 90/120 for the first several flights and gradually get acquainted with this fantastic ship Add and practice one maneuver at a time, learning how she behaves in each one We particularly enjoy the way the SUPER SPORTSTER 90/120 tracks through big loops, with very little aileron or rudder correction required' Spins, snap rolls and inverted spins are also performed with ease High speed knife edge flight and point rolls are performed with ease, but they require some aileron correction to counteract the slight amount of rudder-induced **bank**

When it's time to land, make your approach low and shallow, as this ship wants to just keep on flying (especially if built light) If you find that it lands a little fast, you might try dialing in a few clicks of up elevator when you cut the throttle on the downwind leg of the landing approach This will automatically help to bleed off some of the speed If you have trouble getting your big engine to idle down slow enough to land at a comfortable speed, we suggest that you purchase and install one of our "Switch-N-Glo onboard glow systems, which will allow you to set the idle much lower without killing the engine

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

Large, high performance airplanes like the Super Sportster 90/120 are more susceptible to **control surface flutter** than smaller or slower models, therefore, when flying your Super Sportster 90/120, you are advised to **control the speed** of the airplane to avoid exceeding the speed at which the control surfaces will flutter The "flutter speed" of your airplane depends on many factors, the most important of which is the amount of "slop" in the control linkages You can have a lot of fun and still fly safely by not pushing the speed "to the limit" This means **actively using the throttle** while flying For instance, cut the throttle when coming down out of big vertical maneuvers to avoid 90mph+ speeds Some people jam the throttle to "full" for takeoff and never cut it back until ready to land' We consider this practice to be not only unsafe and irresponsible, but also a very unrealistic way to fly an airplane of this size All full-scale airplanes have a "red line" speed beyond which flight is unsafe All R/C model airplanes also have "red line" speeds, however, they are much more difficult to pinpoint because each kit-built model has its own individual characteristics Therefore, you are strongly advised to fly sensibly and responsibly, considering the type of airplane you are flying

If you have any doubts about your ability to stay within the intended speed envelope described above, then we strongly encourage counter-balancing the elevators as instructed below (see drawing on page 44)

NOTE' We have (by permission of Model Aviation magazine) included a copy of an article by Ron Van Putte, which was published in the May, 1988 issue of Model Aviation to help you better understand the concept of control surface flutter According to this article, the "cure-all" is to static balance the control surfaces Although not required on a well built Super Sportster 90/120 that is flown in its designed speed envelope (see above), this is one modification that is authorized if you choose to do so, because (in theory) it will eliminate any possibility of control surface flutter (or "buzz") To balance the elevators it will require a 1-ounce weight approximately 2 inches forward of the hinge line (one weight per elevator) This addition will then require you to add approximately 6 ounces to the nose of the airplane to rebalance The article is at the end of these instructions

Do not fly unless your propeller, spinner and spinner backplate are precision balanced, using a "high-point" or similar balancer.

Do not use a propeller that will produce excessively high speeds. 6" Pitch is recommended for 2-cycle engines, and 8" pitch is recommended for 4-cycles.

Before each flight, inspect the clevises, horns, pushrods and all other parts of the control linkages, checking for any play that may have developed due to wear. Especially watch for enlargement of the holes in the nylon horns and servo arms, loose screws and nuts, and worn servo mounting grommets. Replace worn parts immediately.

GOOD LUCK AND GREAT FLYING!

PARTS LIST

PART#	QTY	DESCRIPTION
CANPY037		Clear Plastic Canopy
PLTB002		Plastic 36" Outer Pushrod Tubes
SS90F01		Balsa Shaped 3/16 Fuselage Side
SS90F05		Balsa Shaped 13/16 Chin Block
SS90F06		Hardwood Shaped 5/8 Engine Mount Rail
SS90F27		Balsa 3/8x1-3/8x21-1/4 Hood Side Block
SS90F32		3-Ply 1/8 DC* Fuse **Doubler**
SS90P01		Fuselage Plan
SS90P02		Wing Plan
SS90P03		Instructions
WIRES17		Wire 2-56 x 34" Pushrod, Threaded One End
WPNTS003		ABS Plastic Wheel Pants Set
SS90A01		**HARDWOOD PARTS**
PLY3021		3-Ply 1/16 DC Spinner Ring
PLY3022		3-Ply 1/16 DC Landing Gear Braces
SS90F03		5-Ply Shaped 3/8 **F-l** Firewall
SS90F08		5-Ply 1/4x1-1/2x4-5/16 Wing Bolt Plate
SS90F18		5-Ply 3/16 x 1/2 x 4-3/32 Servo Rails
SS90F41		**3-Ply** 1/32 **x 1 x 1 Spinner** Ring Spacer
SS90F43		3-Ply 1/8 X 3/8 X 3-5/8 Servo Rail Supports
SS90F44		5-Ply 1/4x1x1 Stab Reinforcement Block
5590503		5-Ply Shaped 1/4 Front Stab Brace
5590504		5-Ply 1/4x1/2x6 Rear Stab Brace
SS90W17		Hardwood 5/16 Diax 4-1/2 Wing Dowel
SS90W18		Hardwood 1/2 x 3/4 x 7-3/4 Landing Gear Block
SS90W19		Hardwood 1/2 x 3/4 x 29/32 Landing Gear Block Support
SS90W20		Hardwood 1/2 x 3/4 x 1/2 Landing Gear Block Gusset
SS90W21		5-Ply 1/8x1-3/4x1-3/4 Wheel Pants Screw Plate
SS90W22		3-Ply 1/16x1x1 Wing Bolt Plate
SS90W32		5-Ply 1/8 x 3/8 x 5/8 Aileron Servo Rail

ff Note: "DC" **Die Cut**

PART#	QTY	DESCRIPTION
SS90A02	1	**BALSA FUSELAGE PARTS**
SS90F20		Balsa Shaped 3/16 Rear Fuse Side
SS90F26		Balsa 7/8 Fin Fairing
SS90F29		Balsa 1/2 Upper Nose Side
SS90F30		Balsa Shaped 1/2 Lower Nose Side
SS90F42		Balsa 1/2x5/8x4-13/16 Nose Side Fillers
SS90A03	1	BALSA FUSELAGE PARTS
SS90F09	1	Balsa Shaped 1/4 F-3A Bulkhead
SS90F10	1	Balsa Shaped 1/4 F-6A Bulkhead
SS90F11	1	Balsa Shaped 5/8x3x3-1/2 Spinner Filler
SS90F12	1	Balsa 3/8x1/2x3-5/8 Nose Filler
SS90F16	1	Balsa 3/8x15/16x2-1/32 Stab Filler Block
SS90F17	1	Balsa 1/4x7/8x4-5/16 Fuse Cross-Brace
SS90F19	2	Balsa Shaped 3/16 Front Fuse Side
SS90F21	1	Balsa Tapered 1/4 Tail Filler
SS90F25	1	Balsa 3/8x1x1 Fin Fairing
SS90F28	2	Balsa 3/16x5/8x4-7/8 Engine Rail Filler
SS90F40	1	Balsa 1/8x2-1/4x4 Fuel Tank Support
SS90R02	1	Balsa Shaped 1/4 Front Fin Filler
SS90R03	1	Balsa 1/4 x 3 x 1-1/2 Rear Fin Filler
SS90S02	1	Balsa 1/4x3-7/32x3 Stab Center
SS90A04	1	DIE CUT WING RIBS
SS90W33	8	Balsa 3/32 DC W-3 Wing Rib Sheet
SS90W34	3	Balsa 3/32 DC W-2 Wing Rib Sheet
SS90W35	1	Balsa 3/32 DC W-l Wing Rib Sheet
SS90A05		**DIE CUT FORMERS**
SS90F34		3-Ply 1/8 DC Formers 5A, 4A, 3B
SS90F35		3-Ply 1/8 DC Formers 1A, 1B, 2A, 2D
SS90F37		3-Ply 1/8 DC Formers F2, F3.AB

PART#	QTY	DESCRIPTION
SS90A06	1	BALSA WING PARTS
SS90W12	2	Balsa Tapered 35/64 x 4 Center TE
SS90W13	1	Balsa 1/4x1x7 Front Tip Brace
SS90W14	1	Balsa 1/4x7/8x5-7/8 Rear Tip Brace
SS90W15	4	Balsa 1/2x1-1/2x2-15/16 Rear Tip Fairing
SS90W16	2	Balsa 3/8x9/16x1-1/2 Aileron End Filler
SS90W23	1	Balsa 1/8x2-1/4x4-11/16 Rear Fairing Block
SS90W24	1	Balsa 1/4 x 1-3/8x4-11/16 Rear Fairing Block
SS90W25	1	Balsa 3/8x1-3/8x4-11/16 Rear Fairing Block
SS90W26	1	Balsa 5/8x2-3/8x4-5/8 Rear Fairing Block
SS90W27	1	Balsa 1/4 x 1-3/16 x 4-11/16 Fairing Front
SS90W28	2	Balsa 1/4x3/4x1-5/8 Fairing Side
SS90W29	1	Balsa 3/16x2-3/4x4-11/16 Fairing Bottom
SS90W30	1	Balsa 3/16x3/16x2-7/8 LG Block Slot Filler
SS90A07	1	**BALSA STICKS**
BAL047	7	Balsa 1/8 x 1/4 x 36 Stab/Fin Ribs/Wing Tip
SS90F13	1	Balsa 1/2 Trix 29-7/8 Corner Brace
SS90F14	1	Balsa 3/8 Trix 29-7/8 Comer Brace
SS90F15	1	Balsa 1/8x3/8x30 Pushrod Brace
SS90S01	5	Balsa 1/4x3/4x36 Stab/Fin Framing
SS90W 11	6	Balsa 3/32 x 3/8 x 36 Cap Strips
SS90A08	1	DIE CUT PARTS
SS90F33	2	3-Ply 1/8 DC Fillers, Dihedral Brace
SS90F38	1	3-Ply 1/8 DC Sanding Jig (J1,J2,J3)6B
SS90F39	1	3-Ply 1/8 DC Formers F4, F5,F6
SS90W07	2	3-Ply 1/8 DC Wing Tip
SS90A09	1	**SHEETING**
SS90F04	2	Balsa 1/8x2x7-1/4 Cockpit Floor
SS90W08	8	Balsa 3/32x2-5/8x10-1/8 Center Wing Sheeting
SS90W09	4	Balsa 3/32 x 1-3/8 x 10-1/8 Center Wing Sheeting
SS90A10	1	**SHEAR WEB**
SS90W10	18	Balsa 1/16x3x2-1/4 Shear Web
SS90A11	1	**STRINGERS**
SS90F22	5	Balsa 1/4 x 1/4 x 12-3/4 Front Stringers
SS90F23	1	Hardwood 1/4 x 1/4 x 19-3/4 Top Rear Stringer
SS90F24	8	Hardwood 3/16x3/16x19-3/4 Rear Stringers

PART#	QTY	DESCRIPTION
SS90A12		**SHEETING**
SS90F02		Balsa Shaped 1/8 Aft Deck Base
SS90F07		Balsa 1/8x2-1/4x14-7/8 Hood Top Sheet
SS90F31		Balsa 1/8x3x36 Fuse Bottom Sheeting
SS90R01		Balsa 1/16 x 3 x 36 Stab/Fin Sheeting
SS90W01		**WING PACK**
SS90W02		Balsa Shaped 1/2 x 3-1/4 x33LE/TE
SS90W03		Hardwood 3/8 x 1/2 x 33 **Spar**
SS90W04		Balsa 3/32x1-13/32x33 TE Sheeting
SS90W05		Balsa 3/32x3-27/32x33 LE Sheeting
SS90W06		Balsa 35/64 x 28-1/2 **Aileron**
SS90W31		Balsa 1/4x1-5/32x33 Wing Jig
SS90M01	1	HARDWARE BAG
BRSH001	2	Brass Tube Control Horn
METAL013	3	Metal Clevis
METAL014	3	Metal Clevis Retainer Clip
NUTS001	4	4-40 Blind Nut
NUTS005	3	2-56 Hex Nut
NUTS015	4	10-32 Blind Nut
NYLON02	3	Nylon Control Horn, Large
NYLON13	2	Nylon 1/4-20 x 2 Wing Bolt
NYLON16	1	Nylon Steering Arm
NYLON17	4	Nylon Clevis
NYLON30	2	Nylon Landing Gear Clip
NYLON33	1	Nylon Nosegear Bearing
NYLON34 •	3	Nylon Hinges (Sets of 6)
NYLON36	4	Nylon LG Hold Down Strap
SCRW002	6	2-56 x 5/8 Screws
SCRW003	4	4-40 x 1 Bolt
SCRW004	4	#4x1/2 Screws (Wheel Pants)
SCRW020	1	6-32 x 1/4 Screw
SCRW024	8	#2x3/8 Screw
SCRW039	4	10-32x1-1/4 Socket head Cap Screw
SCRW042	2	#6x1 Screw
WHCL005	1	5-32 Wheel Collar
SS90M02	1	HARDWARE BAG
GLTP001	1	Fiberglass Tape 1x8 (Wheel Pants)
GLTP007	2	Fiberglass Tape 3x29 (Wing Center)
GLTP009	1	Fiberglass Tape 1x11 (Tail Section)
PLTB004	3	Plastic Inner Pushrod Tube
WBNT125	2	Bent Wire 3/16 Main Landing Gear
WBNT126	1	Bent Wire 5/32 Nosegear
WBNT127	1	Bent Wire 1/8 Aileron Torque Rod Set
WBNT128	1	Bent Wire 3/32 Tailgear
WIRES16	2	2-56 x 12 Threaded one end Pushrod Wire

Radio Control

Sport and Aerobatics

Ron Van Putte

111 Sleepy Oaks Rd.
Ft. Walton Beach, FL 32548

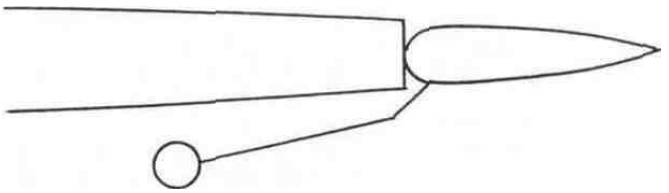


Figure 1. Balancing a control surface eliminates flutter. Putting the mechanism outside is easiest, but there are drawbacks: not very pretty, and the hardware can catch on things.

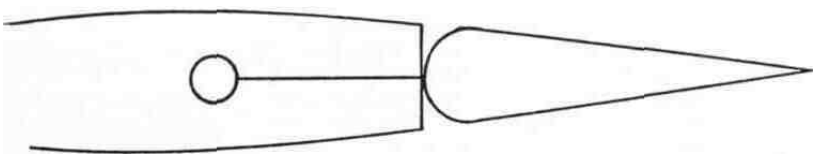


Figure 2. Another way to mass-balance a control surface. Neat, but hard to make.

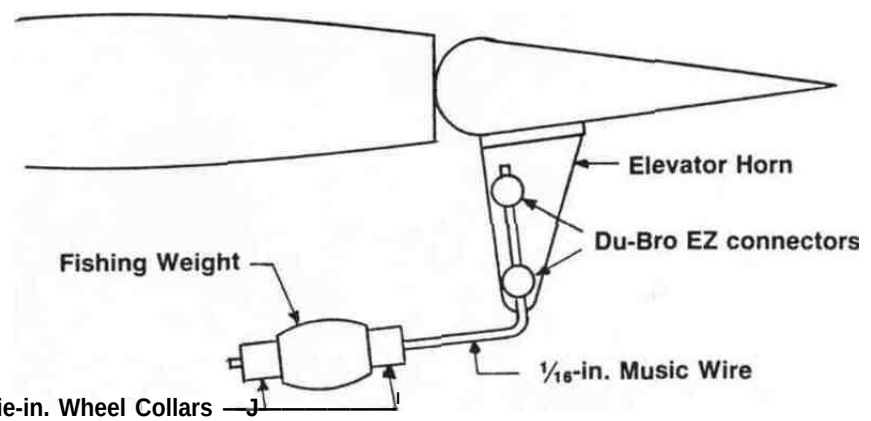


Figure 3. Bowing to the inevitable—do it the easiest way. Here's a suggested set of common materials to use for a neat, functional job of statically balancing a control surface.

PERIODICALLY I read in aircraft design articles about how to "prevent" control surface flutter In most cases the suggestions are good ideas to use in *delaying the onset of* the phenomenon, but few actually work in *preventing* flutter

Before I get into the subject further, there are a few things which need to be clarified First, in the classical sense, what modelers usually call control surface flutter isn't flutter at all but control surface buzz Flutter engineers reserve the word "flutter" to describe oscillatory, self-sustaining motion of aircraft components which involves the interaction of two or more modes of component motion Control surface buzz involves only one mode of aircraft component motion Big deal, right[9]

To a flutter engineer the distinction is important, because it describes a completely different mechanism of interactions To modelers the distinction is usually not important because **we** seldom observe classical flutter

Flutter is inherently destructive At the flutter speed, aircraft components bend and/or twist in sustained oscillations whose amplitudes neither decrease or increase However, once the flutter speed is exceeded, the oscillations grow in amplitude until something breaks or otherwise changes the relationships among the affected aircraft components (Many modern fighters must be loaded with external stores very carefully because their thin, flexible wings are potential flutter victims)

I have observed only one case of model flutter It happened to me on an early version of the Senior Falcon The original wing design was much less rigid in both bending and torsion than the present wing, and my aircraft went into a classical case of wing bending/torsion flutter at the bottom of a near-vertical dive The right wing separated from the aircraft about where the wing sheeting ended Senior Falcons don't fly too well with little more than half a wing

Now, having pointed out that control surface flutter isn't really flutter at all but is actually control surface buzz, I'm going to turn around and call it control surface flutter anyway, because that's what most of us call it This kind of motion involves only oscillatory rotation of the aileron or elevator It is caused by the way we hinge them and the way we move them

Since they are hinged at the front, the center of mass of the surface is behind the hinge point They are often moved via a torque rod which enters the inboard end of the surface It is the combination of these two design features which produces control surface flutter, and once you have them, there is a speed at which you will have flutter If you're lucky, the flutter speed is faster than the airplane is capable of achieving In that case, you'll never have flutter, and this is why some of the techniques to "prevent" flutter are successful

The two most common flutter-prevention techniques work on opposite ends of the problem. The easiest to implement is sealing the gap between the control surface and the wing or horizontal stabilizer This attacks the aerodynamic driver of the flutter problem and will cause flutter to occur **at a higher airspeed. The second fix is to** make the control surface torque rod suffer This causes the natural frequency of aileron rotation to increase, which causes flutter to occur at a higher airspeed

However, suppose you try both these techniques, and you still have flutter Is there anything else which can be done[9] Yes, there are a few possible correctives, like removing the control surface and replacing it with one that is thicker at the leading edge than the trailing edge of the wing or horizontal tail it is attached to You can also make the trailing edge of the control surface more blunt Both of these fixes also tend to in-

Back In his February 1988 column, author Van Putte suggested that one way to get differential aileron travel was to bend the aileron horn forward. Some people felt that this would do no good, so Ron drew this sketch to prove his point. The radiuses to the arc (R) represent the control horn position as the servo (L) gives equal Up and Down inputs. There is a noticeable difference in control horn travel between the Neutral position and Up compared to the travel from Neutral to Down. (This sketch illustrates the aileron horn on a low-wing airplane.)

Neutral **Down**

crease the airplane speed at which flutter occurs.

Still have flutter? Then you must be ready for the cure-all control surface static balance It's not pretty, but it works every time What you must do is move the center of mass of the control surface Just in front of the hinge line If you do, flutter will not occur at any airspeed There are several ways to statically balance control surfaces Figure 1 shows functionally how to accomplish it, but there are many ways to implement it.

One of the problems of static balancing is that you'll probably have the mechanism out in the breeze where it will snag on things, although I have seen some really neat static balancing Jobs which were hidden inside the wing (Figure 2)

Figure 3 shows a straightforward way to balance a control surface using common materials. It is recommended for ease of installation, structural integrity, and the ability to change weights.

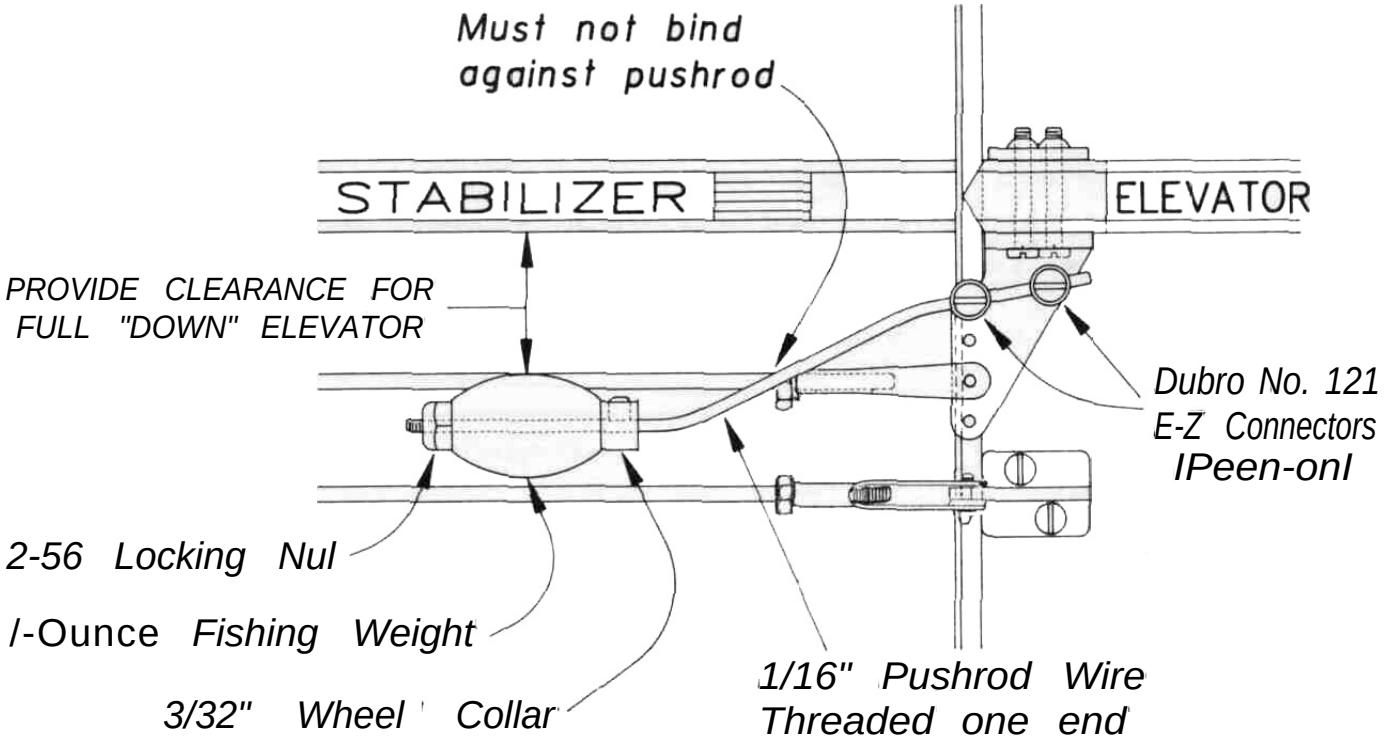
What you must do is get the balance weight large enough to cause the control surface to barely move up when it is released in the neutral position (Don't forget to disconnect the servo linkage first before you do this') Of course, it is assumed that your control surface hinges are nice and free so that the surface will flop down when released if no balance weights are used Don't overdo the static balancing of elevators, because it can create another problem An overly balanced elevator will tend to move Up in positive-G maneuvers (like loops) This causes higher Gs, which causes the elevator to move Up more, which . . and so on.

(From *Model Aviation* , May, 1988 Reprinted by permission)

SUPER SPORTSTER 90-120

METHOD FOR STATIC BALANCING ELEVATORS

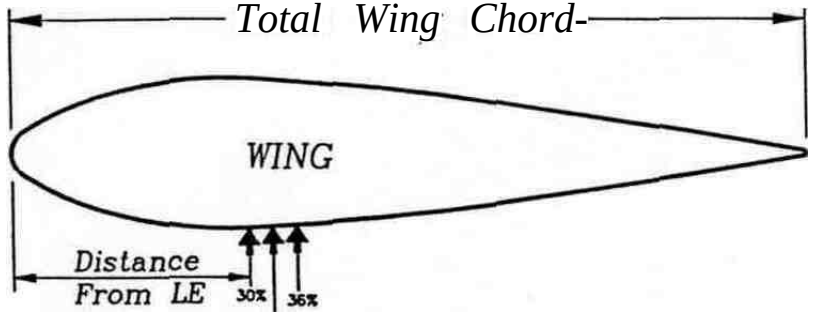
(DRAWING IS ACTUAL SIZE)



GREAT PLANES PRODUCT IMPROVEMENT SHEET

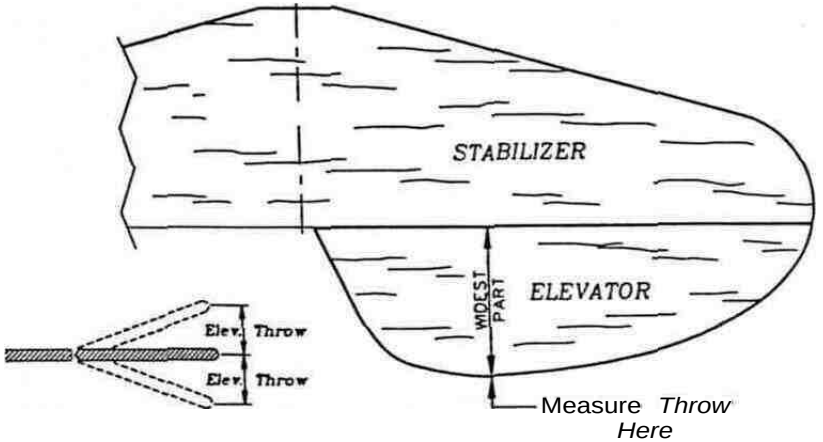
INSTRUCTIONS FOR BALANCING YOUR SUPER SPORTSTER

The recommended balance point for the Super Sportsters is shown on the plan, and is located approximately 29% back from the lead ing edge. However, all Sportsters have been thoroughly test flown as far back as 36%, and found to be completely stable throughout the entire range from 29% to 36%. (These numbers represent a percentage of the total wing chord, as shown in the sketch).

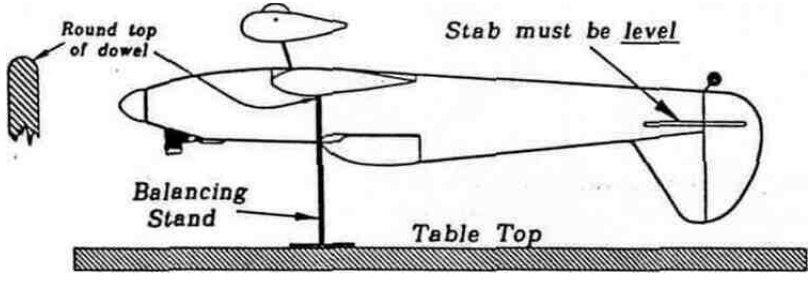


Balance Points

If, when balancing your Super Sportster, you find it necessary to add several ounces of nose weight to balance it at the location shown on Ihe plan, it is preferable to balance farther aft, up to 36% (the aft limit), rather than adding a lot of weight As you balance farther aft, however, the airplane will become more responsive to elevator control; therefore, you should reduce the maximum elevator throw in accordance with the table of "Recommended Maximum Elevator Throws." The elevator throw is measured at the widest part of the elevator, as shown in the sketch.



The best way to balance your Super Sportster is to make a Balancing Stand from a square of 1/4" plywood and two 3/8" dowels. Mark the fore and aft limits of the balance range on the top of the wing (on both sides of the fuselage), and place the airplane upside down on the balancing stand as shown in the sketch (empty fuel tank). Move the airplane forward or aft on the stand until it balances with the stab level. If it balances outside the 29% to 36'% range, you must either shift the location of radio components or add weight to the nose or tail until **it** balances within the range.



Take note of where the airplane balances. If it balances near the front of the recommended range, then adjust the linkages to your elevator to provide the maximum throw listed in the 29% -30% column in the table below. If it balances near the middle of the range, set your elevator for the maximum throw listed in the 33% column. If it balances near the aft limit **of** the range, set your elevator for the maximum throw listed in the 36% column.

RECOMMENDED MAXIMUM ELEVATOR THROWS
FOR VARIOUS BALANCE POINTS

MOOEL	(29-30X) LE to CC	MAX ELEV.	(33X) LE lo CG	MAX ELEV	(36X) LE to CC	MAX ELEV.
SPORTSTER **20**			2-15/16"		3-3/16"[9/32-]	IV--]
SPORTSTER 40			[11/32-](5/16-]3-3/8'3-5/6'[V6-]			
SPORTSTER 60				[13/32-]3-5/16'[7/16-]3		3/4-(3/B-)
SPORTSTER 90	3-15/16'				4-13/16"t'V'6-]4-3/6-[5/6-]	
SPORTSTER BIPE	1-1/2'-	[3/8"]	1-7/6'.	(11/32']	2-1/16'-	[5/16-]

(MESAURED BACK FROM **LE OF BOTTOM WING)**

WARNING! If you balance your Super Sportster aft of the plan location but fail to reduce the maximum elevator throw, the elevator may over control the pitch of the airplane, and may result in unwanted stalls and "snap rolls"!

SSADDOl