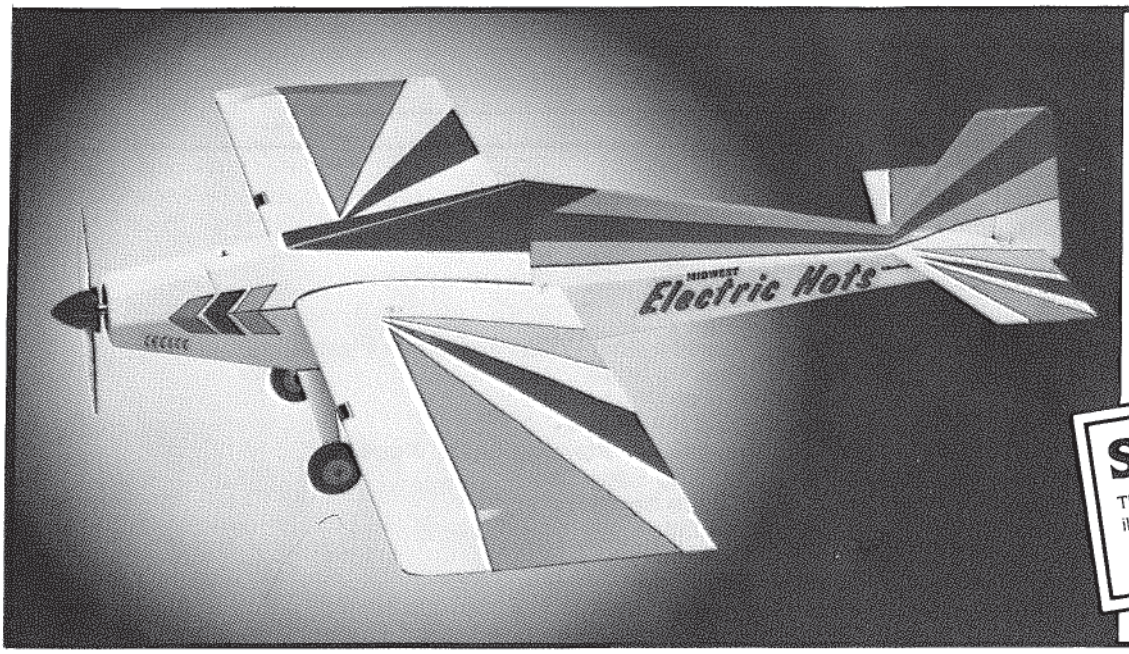
MIDWEST

Electric Hots



High Performance Electric Powered Model

Kit #165

Success Series®

This kit features a complete and fully illustrated step-by-step construction manual -AND- full-size plans that ASSURE SUCCESS!

Warning

The radio controlled model built from this kit is not a toy. R/C models are capable of causing serious bodily injury and property damage. **This product is sold with exclusion of all warranty expressed or implied, statutory or otherwise. Buyer assumes all risk of use.** It is your sole responsibility to build this kit correctly, to properly install all of the additional components and gear and to test and fly the model in accordance with all safety standards as set down in the Academy of Model Aeronautics Safety Code. (See "The Electric Hots" page #5, for additional information on the Academy of Model Aeronautics).

About This Construction Manual

In order to build this model **correctly**, you **must** follow these instructions in the order that they are presented.

Please read through this construction manual before starting assembly. It contains a complete list of everything necessary to build this kit, listed under "Materials You Will Need" and "Additional Components".

This manual also contains important warnings and instructions for the building and operation of your Electric Hots.

Customer Service

Should you experience a problem building this kit, we recommend you see your hobby dealer first. If you are unable to solve the problem, feel free to call, or write, our Customer Service Department.

If you find any missing or incorrectly made parts in this kit, contact our Customer Service Department.

Customer Service Department
Midwest Products Co., Inc.
P.O. Box 564
Hobart, IN 46342
(219) 942-1134

MIDWEST PRODUCTS CO., INC.
400 S. Indiana St., P.O. Box 564, Hobart, IN 46342

Micro-Cut® Quality Woods

Kit Contents

Note: All Wood Parts Listed are Balsa Unless Otherwise Noted

Wing

2	1/16" x 1" x 36"	PRE-CUT Trailing Edge Sheeting
2	1/16" x 2-3/8" x 36"	PRE-CUT Leading Edge Sheeting
4	1/16" x 3/16" x 36"	Cap Strips & Filler
4	1/16" x 2-7/8" x 8-1/8"	Center Section Sheeting
12	1/16" x 2-11/16" x 1-1/16"	PRE-CUT Shear Webs
1	1/16" x 5/8" x 1-1/2"	PRE-CUT Plywood Rear Wing Hold Down Plate
1	3/32" x 3/8" x 36"	PRE-CUT Leading Edge
2	1/8" x 1/4" x 36"	PRE-CUT Spruce Wing Spars
2	1/8" x 1/8" x 36"	Trailing Edge & Filler
2	3mm x 1-1/8" x 2-7/16"	PRE-CUT Micro-Lite® Plywood Shear Webs
1	5/32" x 7/16" x 36"	PRE-CUT Leading Edge Cap
2	1/4" x 1/4" x 2-7/16"	PRE-CUT Spruce Servo Rails
1	1/4" x Triangle x 5-7/8"	Leading Edge Filler
1	1/4" x 1" x 36"	PRE-CUT Ailerons
1	1/4" x 7/8" x 2-7/16"	PRE-CUT Spar Filler
1	1/4" x 15/32" x 36"	PRE-CUT Wing Jig
2		Nylon Control Horns
4		2-56 x 1/2" Round Head Machine Screws
2		Nylon Clevises
2		6" Threaded Pushrods
3		4-40 T-Nuts
3		4-40 x "1 Socket Head Cap Screws
3		#4 Flat Washers
2		Easy Hinge Material
2		Pushrod Connector, Screw, and Washer

Fuselage

1	1/16" x 2-7/8" x 24"	Fuselage Bottom Sheeting
1	1/16" x 2-5/8" x 6-1/4"	PRE-CUT Bottom Forward Fuselage Sheet
1	3/32" x 2-7/8" x 11-7/8"	Miscellaneous Fuselage Sheeting
1	3/32" x 1-1/4" x 2-7/16"	PRE-CUT F-4
1	3/32" x 7/8" x 2-7/16"	PRE-CUT and Drilled Plywood Wing Bolt Plate
2	1/8" x 1/4" x 2-7/16"	PRE-CUT Spruce Servo Rails
1	1/8" x 1/4" x 17-7/8"	Spruce Bolt Plate Support and Longeron Material
1	1/8" x 3/16" x 13-1/2"	PRE-CUT Top Stringer
1	3mm x 1-1/4" x 2-7/16"	PRE-CUT Micro-Lite Plywood Landing Gear Block
1	3mm x 2-7/16" x 5-1/2"	PRE-CUT, Micro-Lite Plywood Battery Floor
2	3mm x 5/8" x 2-7/16"	PRE-CUT Micro-Lite Plywood Rear Hold Down Block
1	3/16" x 3/8" x Dowel	PRE-CUT Birch F-5A Attach
2	1/4" Triangle x 2-3/16"	PRE-CUT Landing Gear Braces
2	1/4" Triangle x 5/8"	PRE-CUT Hold Down Block Fillers
1	1/4" Triangle x 2"	Servo Rail Reinforcing
2	1/4" x 1/4" x 11-7/8"	PRE-CUT Pushrods
1		Main Landing Gear
2		6-32 x 1" Round Head Machine Screws
4		6-32 Hex Nuts
2		#4 x 3/8 Sheet Metal Screws
1		Molded Cockpit Latch
2		3mm x 10mm Pan Head Machine Screws
1		5/16 x 6 " Heatshrink Tubing
2		#4 Flat Washers
3		Pushrod Connectors, Screws, and Washers
2		1/16" x 6" Music Wires
1		1/16" x 12" Music Wire
2		9" Threaded Pushrods
2		1/16" Wheel Collars and Set Screws
2		Throttle Springs
1		1/8" x 1" Heatshrink Tubing
1		PRE-BENT 1/16" Tailwheel Wire
2		Nylon Tailwheel Keepers
2		Nylon Clevises

Stabilizer

2	3/16" x 1/4" x 24"	Stabilizer Frameworks
1	3/16" x 23/32" x 5-3/32"	PRE-CUT Stabilizer Leading Edge Brace
1	3/16" x 1-1/4" x 2-25/32"	PRE-CUT Stabilizer Center Block
2	3/16" x 1-7/16" x 6-3/4"	PRE-CUT Elevators
2		Easy Hinge Material
1		PRE-BENT 1/16" Music Wire Elevator Connector
1		Nylon Control Horn
2		2-56 x 1/2" Round Head Machine Screws

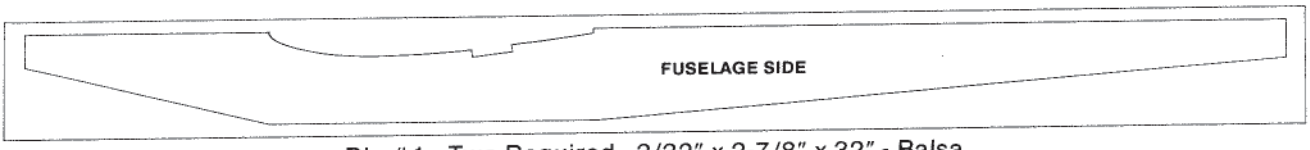
Fin & Rudder

1	3/16" x 1" x 4-13/16"	PRE-CUT Fin Trailing Edge
1	3/16" x 2-23/32" x 6"	PRE-CUT Rudder
1	3/16" x 2-7/8" x 4-13/16"	PRE-CUT Fin Leading Edge
1		Easy Hinge Material
1		Nylon Control Horn
2		2-56 x 1/2" Round Head Machine Screws

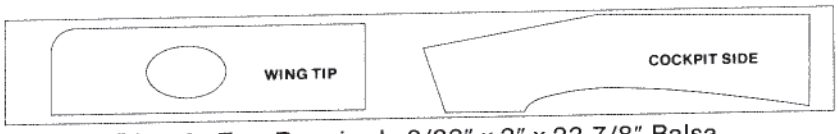
Accessories

1	HP-100 Motor, Capacitors, and Switch Harness
1	7-6 Nylon Prop
1	1-1/2" Nylon Spinner
1	Aluminum Prop Adaptor
1	6-32 x 5/8" Socket Head Cap Screw
1	4-40 x 1/8" Set Screw
1	#6 Flat Washer
1	.050 Allen Wrench
1	7/64" Allen Wrench
2	1-3/4" Lite-Flite Wheels
1	1/2" Tailwheel
1	3/4" x 12" Velcro Loop Material
1	3/4" x 12" Velcro Hook Material
1	Pressure Sensitive Trim Sheet

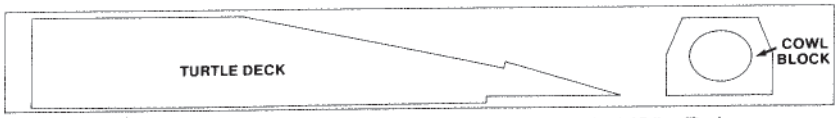
Die-Cut Parts



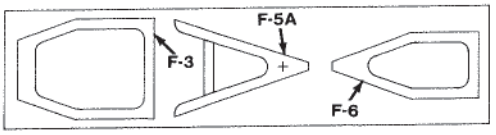
Die #1 - Two Required - 3/32" x 2-7/8" x 32" - Balsa



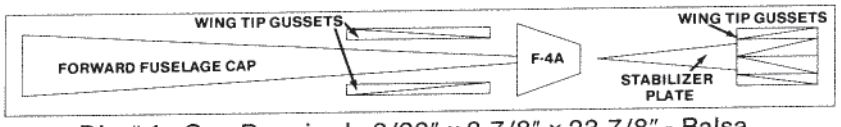
Die #2 - Two Required - 3/32" x 3" x 23-7/8" Balsa



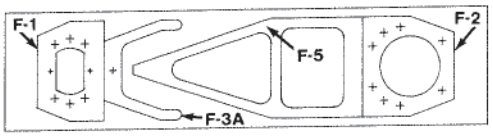
Die #3 - Two Required - 3/32" x 3" x 23-7/8" - Balsa



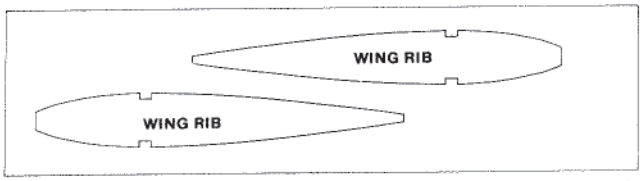
Die #6 - One Required -
3mm x 2-7/8" x 11-7/8" - Micro-Lite Plywood



Die #4 - One Required - 3/32" x 2-7/8" x 23-7/8" - Balsa



Die #5 - One Required -
3mm x 2-7/8" x 11-7/8" - Micro-Lite Plywood



Die #7 - Seven Required - 1/16" x 2-7/8" x 11-7/8" - Balsa

Table of Contents

Before You Begin

The Electric Hots

The "Electric Hots" is a fully aerobatic electric sport model. Midwest Products has engineered this kit so you can build the entire model using cyanoacrylate (super-glue type) adhesives. Although the model has a removable wing, a quick release cockpit hatch has been provided to allow the motor battery to be removed for charging without removing the wing.

The motor battery recommended for this model, coupled with the motor and propeller supplied in the kit, gives the Electric Hots full aerobatic capability at the recommended flying weight. Flying time should average four minutes.

Weight is critical to the performance of electric R/C model aircraft. The recommended maximum weight of this model is **44 ozs.** In order to stay at or below this weight, we urge you to avoid the use of white glue, epoxy, and paint. The recommended adhesives and finishing materials will help you build a strong, light model.

Although this model is quite stable, it is a **sport** model. Sport models are more maneuverable and faster than "trainer type" models. If you have any doubts about your ability to fly a sport model, we urge you to seek the help of an experienced, competent, person to assist you with the initial flights. He should be able to check your model over to be certain that it is ready to fly and he should be able to take over if you lose control during the first flights. Joining an R/C model airplane club is the best way to find help. Consult your local hobby dealer for a list of the clubs in your area. We also recommend, and most clubs require, that you join the Academy of Model Aeronautics. AMA membership will provide some insurance coverage, and will introduce you to a wealth of material that will help you to learn more about R/C models. The AMA can also provide you with a list of the clubs in you area.

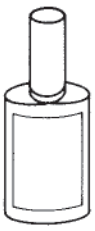
Academy of Model Aeronautics
1810 Samuel Morse Drive
Reston, VA 22090
(703) 435-0750

Getting Started

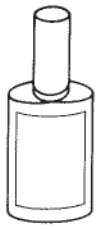
Materials You Will Need

You will need the following items to build this kit. Most of them are available from your Hobby Dealer.

☐ **Fast-drying Cyanoacrylate Adhesive -** Used to bond balsa wood to balsa and some hardwood parts. (Use where an instruction tells you to glue, or bond parts with **CA**.)



☐ **Slow-drying Cyanoacrylate Adhesive -** Used to bond balsa and hardwood joints. (Use where an instruction tells you to glue, or bond, parts with **Slow CA**.)



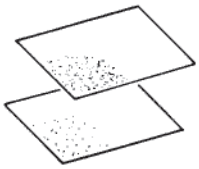
Note: Cyanoacrylate adhesives are manufactured in many different formulations, some of which do not work well on models. Consult your local hobby dealer for the proper adhesive brands. (See "Using Adhesives", page #8).

Warning: Cyanoacrylate adhesives cure very rapidly. Read all warnings and safety instructions on these adhesives.

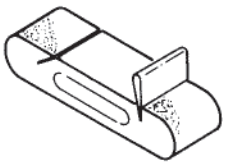
☐ **Accelerator -**
Used to speed up the drying time of cyanoacrylate adhesives.

Note: Be sure that the accelerator you buy is the same brand or compatable with the brand of CA and Slow CA you will be using.

☐ **#80 and #220 Grit Aluminum Oxide Sandpaper -**
Used to shape and smooth wood parts. For the most part, the 80 grit paper can be used with the sanding block to roughly shape parts and contour assemblies. The 220 grit paper is used to finish-sand the model prior to covering.



☐ **Sanding Block -**
This is a wood or aluminum block with a flat side. It has grooves and a wedge to hold sandpaper to it and is used to sand straight edges and surfaces.



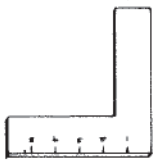
☐ **4-40 Ball Driver -**
This is an Allen head driver with a ball on the end that allows it to fit into Allen head screws at an angle. **This tool is** absolutely necessary to build this model.

☐ **Needle-Nose Pliers (with cutting jaws) -**
Used to bend, shape, and cut small diameter wire.

☐ **T-Pins -**
Used to secure parts to the building board during construction.

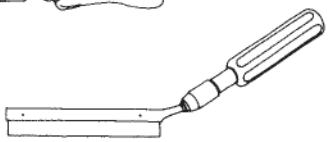
☐ **Light Machine Oil -**
Such as 3-in-1 oil.

☐ **Square -**

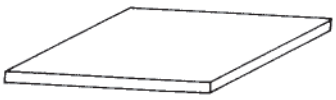


☐ **Flat File -**

☐ **Razor Saw -**

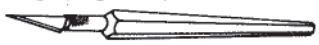


☐ **Building Board -**
This can be any **flat**, stiff material that will accept and hold T-pins. You will need a building board that is at least 16" x 38". A soft pine or cork bulletin board will work well.



Note: It is very important that the building board be **flat**. The wings will be built on this board. If it is twisted or bowed, the wings will assume this shape and the model will not fly properly.

☐ **X-Acto® Knife and Extra #11 Blades -**
This is a hobby knife with a metal handle. The #11 blades are a general purpose size and can be used to cut and trim all of the wood parts in this kit (See "Cutting" page #7).

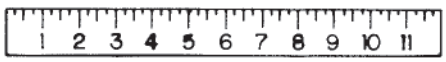


☐ **Plastic Wrap or Waxed Paper -**
Used to cover the plans and building board so that parts are not accidently bonded to them.

☐ **#2 Pencil -**
Used to mark part locations.

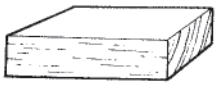
Note: Do not use a ball point pen or marking pen to draw or write on parts. The ink in these instruments will bleed through most finishing materials and cause a smudge.

☐ **12" and 36" Steel or Aluminum Straight Edges -**
Used to measure and align parts and assemblies.



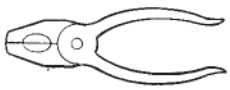
☐ **Masking Tape -**
Used to temporarily hold parts during construction and gluing.

☐ **Scrap Hardwood Block -**
Used as a backing when drilling holes in wood parts. A 1/2" x 4" x 4" block will be adequate.



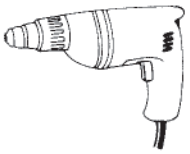
☐ **Assorted Screwdrivers -**

☐ **Pliers -**

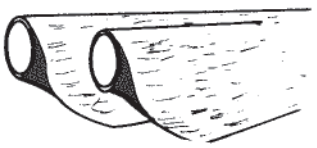


☐ **Scissors -**

☐ **1/4" Electric Drill and a Variety of Drill Bits -**
To include a 1/16", 3/32", 1/8", 5/32", 3/16", and 1/4" sizes.



☐ **Finishing Materials -**
In order to keep this model as light as possible, we recommend that you finish it with Super Monokote. This is an iron-on covering that has a high gloss finish. If damaged, it can be repaired quickly and easily. You will need 2 six foot rolls of Super Monokote to cover your Electric Hots, not including trim colors. (See " Finishing", page #48).



Note: If you decide to finish your Electric Hots with Super Monokote, you will also need a Monokote iron and heat gun.

There are other iron-on finishing materials available. Your hobby dealer will be glad to explain their application.

Additional Components

The following list of parts and components are required to complete this model and make it ready to fly. Because of variety, availability, and personal preference, these items are left for the builder to select. All of these items are shown on the plan. Specific brands illustrate installation only and are not necessarily recommendations for these products.

- ☐ **4 Channel Radio** - which has a 225 MAH receiver battery and four micro servos, or a four channel radio with three micro servos and BEC (Battery Eliminator Circuit) and/or electronic throttle.
- ☐ **Seven Cell, 8.4 volt, 1400 to 1700 MAH Sub-C Battery Pack.**

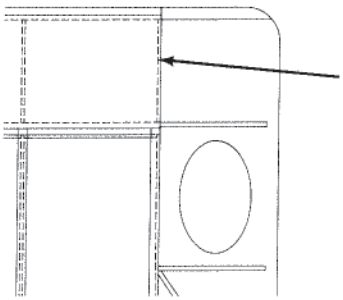
Note: This model will **not** fly using a six cell, 7.2 volt battery pack.

Construction Tips

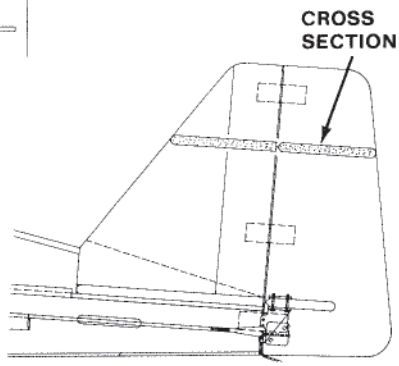
How to Read the Plans

If the symbols and lines on the plan are unfamiliar to you, this section will explain what the plan is and how to use it.

The plan is a full-size drawing of the model that shows the correct size, shape, and relationship of all the parts. In order to show all the parts **together**, the plan is drawn using cutaway views, dashed lines, and sections that allow you to **see through** some, or all, of the parts.



Dashed lines indicate a part, or a portion of a part, that is underneath or inside of another part.



Parts that have shapes not apparent in one view are shown by cross sections. Cross sections reveal the shape of the part if you were to cut through it or view it from one end.

The plan will be used in several ways. It will be helpful in identifying and positioning parts and is also used as a jig on which to construct assemblies such as the wing and stabilizer. Use it, too, to locate the position of components, such as the radio, before you install your own equipment in the model.

Cutting

Most of the parts in this kit are pre-cut to size. **Do not** cut or shape parts unless the instructions tell you to do so.

When cutting parts with your knife, make your first cut at light pressure, being careful that the point of the knife goes exactly where you want it. Subsequent cuts should be made at moderate pressure until the part is cut out. Use a steel straight edge to guide the blade when cutting straight lines.

If, during construction, you notice the knife blade starting to **tear** the wood as you cut, the blade is dull. Replace it with a new blade. A sharp blade will make cutting easier and will enable you to work more accurately.

Since you are going to finish your model with one of the iron-on coverings, you will find that these materials will dull knife blades very quickly, and it will be necessary to replace blades often. Typically, you can expect to use four to six blades to cut and trim iron-on finishing materials for a model of this size.

Using Adhesives

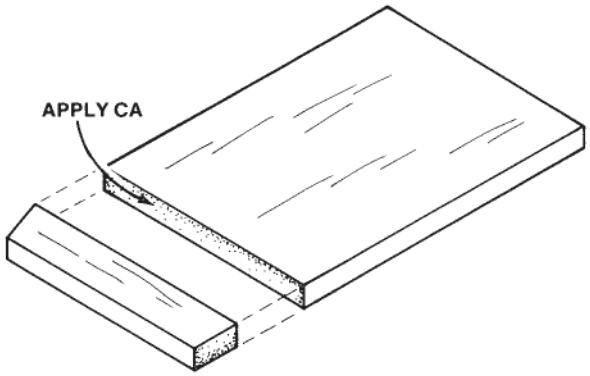
This kit has been designed to be built using cyanoacrylate adhesives; CA and Slow CA. These adhesives dry very rapidly. This will save you a lot of time and work by eliminating the need to pin or tape many parts together during assembly. They will also save a great deal of weight.

There are several different brands of CA adhesives available from you hobby dealer that have been formulated specifically for use in model construction. Among these are Zap, Hot Stuff, and Jet. These are all fine products and any of them will do the job.

The following general uses apply to all CA adhesives. However, there are slight differences in the way each brand is used. Read and follow the instructions applicable to the brand you are going to use. **If used improperly, they can be dangerous.**

When using **CA** adhesives, place the parts to be bonded into contact and then run the CA into the joint. In order for these adhesives to bond, there should not be any gaps in the joint between the parts. The bond will be instantaneous, so be certain that the parts are positioned exactly as you want them.

Slow CA is a thick form of CA. It has the ability to bridge small gaps between parts. It also cures at a slower rate. Generally, it is to be used where parts must be moved around during gluing, where parts are too large to be held in the desired position, or where the gluing surface is too large to apply CA to the joint. In use, Slow CA is applied to one of the parts, and then the parts are joined.



Note: Some brands of Slow CA will soak into the end grain of the wood parts, resulting in a weak joint. To prevent this, apply Slow CA to the end grain of the part and allow it to cure. This will seal the end grain. Apply a second coat of Slow CA to the part and then join the two parts. This is called **pre-gluing**. Test the Slow CA that you will use on some scrap wood to see if pre-gluing is necessary for that brand.

Most CA manufacturers have a product available that is known by the generic name **debonder**. This is a solution that will dissolve CA and Slow CA adhesives. It is very useful for separating parts that are not constructed properly, and for removing CA adhesives that come into contact with your skin and tools. Although debonder isn't necessary to build this model, you may want to have it available during construction.

Assembly Instructions

In order to build this model **correctly**, you **must** follow these instructions in the order that they are presented.

This manual divides construction of the Electric Hots into sections; Wing, Fuselage, etc. Within each section, construction is further broken down into sub-assemblies; Stabilizer and Elevator, Fin and Rudder, etc. Where necessary, general instructions and comments appear at the start of each sub-assembly. Explanations that clarify individual instructions appear as **notes** following the instruction. Read each section carefully and identify all of the parts used in each sub-assembly before starting construction. Most of the wood parts for each sub-assembly are packed in plastic bags. In some bags, not all of the parts will be used at once. Parts not used should be put back in the proper bag. They will be used later in construction.

Most hardware items are packed in one plastic bag. Various parts from this bag will be used at different points in construction. To avoid losing these small parts and screws, they should be kept in this bag until needed.

If you find any missing or incorrectly made parts in this kit, contact our Customer Service Department. (See "Customer Service", page #1).

Check-off boxes (☐) appear next to each instruction throughout the text to help you keep track of your progress. Dual check-off boxes (☐ ☐) appear next to instructions that are to be repeated.

Some of the sections in this manual do not have check-off boxes. These sections explain **general** procedures, rather than specific instructions.

The illustrations in this manual are not proportionally correct. Their purpose is to augment the written instructions and the plan. The manual and plan should be used together during construction.

Follow the instructions in this manual carefully. Install and operate the motor, radio and all accessories as per the manufacturer's instructions. Build each sub-assembly accurately, according to the plan and instructions. Be sure that all of the parts are aligned correctly and that you use the proper adhesive for each assembly. The instructions will tell you which adhesive to use for each assembly.

The importance of building this model accurately, correctly, and properly, **cannot** be over-stressed. A model that has not been built straight, correctly aligned and balanced, will not fly properly and will be difficult to control. Remember, you are only going to build the model once. Hopefully, you will fly it for a long time. So, using a little extra care in construction will pay off in a model that gives you many hours of enjoyable, trouble-free flying.

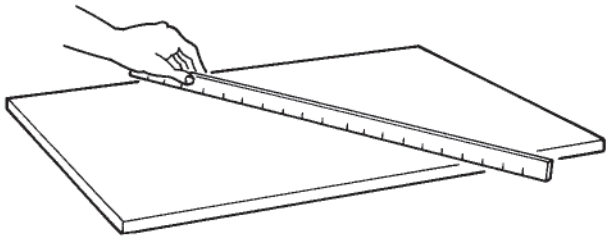
Wing Construction

In order to build the fuselage, it will be necessary to have the wing already built. So, we will start construction with the wing.

The wing for the Electric Hots is built in one piece on a simple 1/4" x 15/32" x 36" pre-shaped balsa jig. It will be necessary to turn the wing over during construction. The construction sequence must be followed in order to properly build the wing. This method of construction will allow you to build the wing quickly and correct any misalignment before completion. Note that the plan shows the Bottom View of the wing.

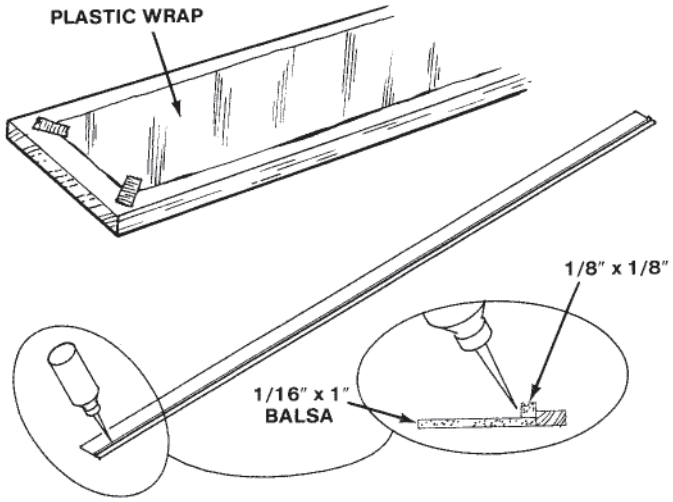
Check-off boxes appear next to each instruction throughout the text to help you keep track of your progress.

Wing



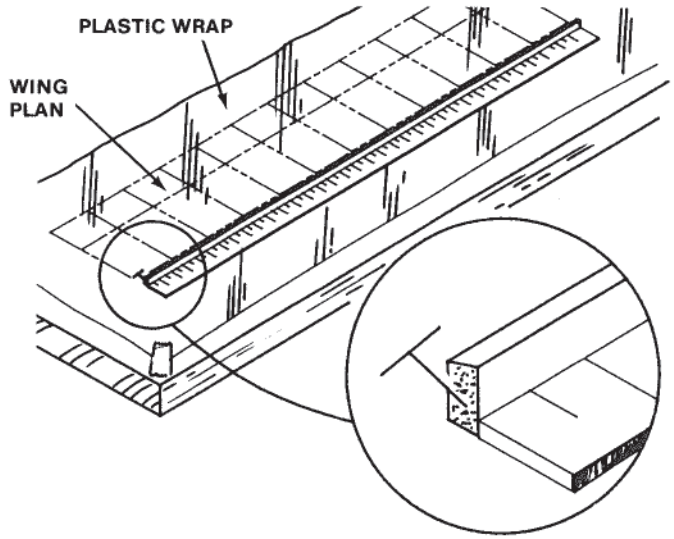
☑ 1. Stand the 36" straight edge on edge, against the building board. Move it around the board and note any high or low spots. Correct these, so that the board is **flat.**

Note: If necessary, shims made from thin wood strips or folded paper can be placed under the board to raise the low spots.



☐ 2. Lay a 38" to 40" piece of plastic wrap on your building board. Lay one 1/16" x 1" x 36" trailing edge sheet **flat** on the plastic wrap and building board. Use CA to bond the 1/8" x 1/8" x 36" trailing edge **flush** on both ends and one long edge of the trailing edge, as shown.

Note: To help align the edges of these two parts, press them both against one of the 1/8" x 1/4" x 36" spruce spars, as shown. Working a short section at a time, press the trailing edge sheet and trailing edge against the spar while **sparingly** applying CA to the joint **opposite** the spar, as shown. Be careful not to glue the spar to the trailing edge.

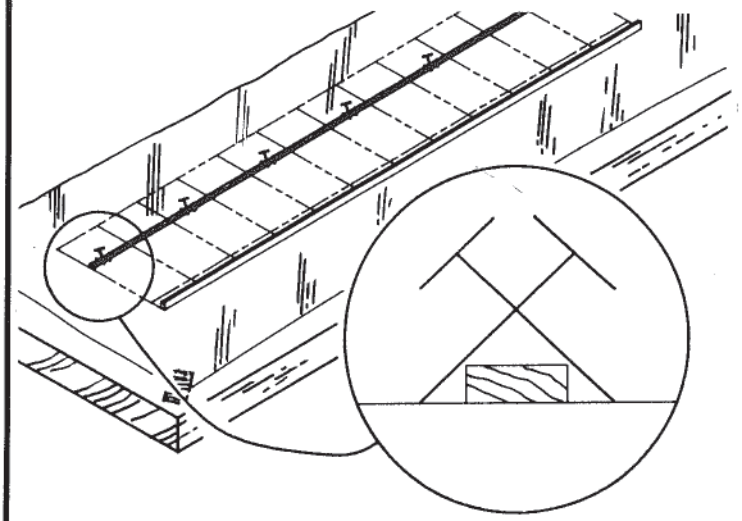


☑ 3. Cut the wing drawing from the plan. Lay the wing drawing flat on your building board and cover it with plastic wrap.

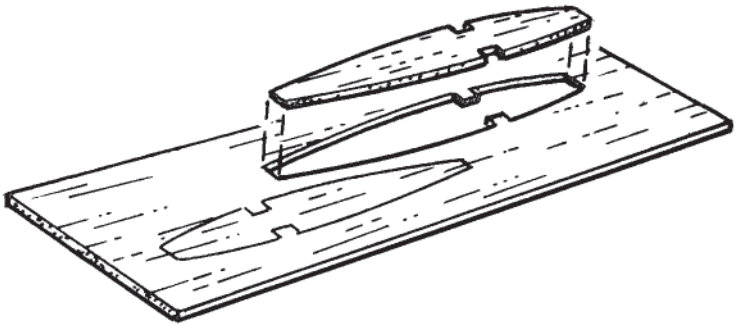
☐ 4. Align the ends of the 1/4" x 15/32" x 36" pre-shaped balsa jig over the jig location marks on the plan. Pin the **ends** of the jig to the plan and building board, as shown.

Note: Be sure to lay the jig on the plan, so that the beveled edge is on top and slopes towards the spar, as shown.

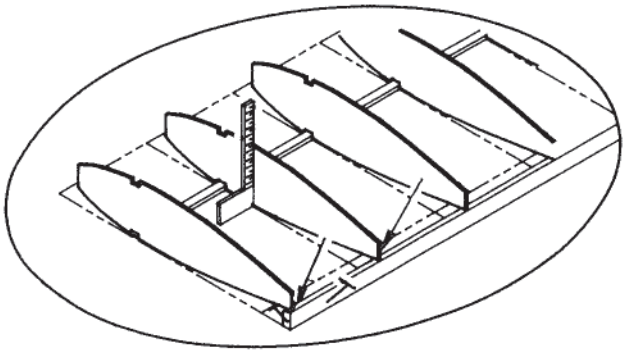
☐ 5. Lay the 36" straight edge against the jig to be certain it is straight, then pin the center of the jig to the building board.



☑ 6. Spray accelerator on all four sides of one 1/8" x 1/4" x 36" spruce spar. Pin the spar over the drawing of the spar on the plan, as shown. Do not push pins through the spar, as this could cause it to crack.

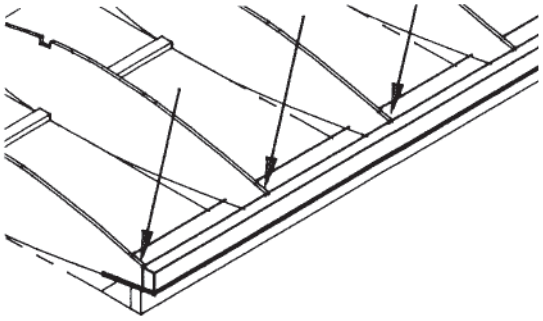


☑ 7. Press all fourteen ribs from the die-cut sheets.

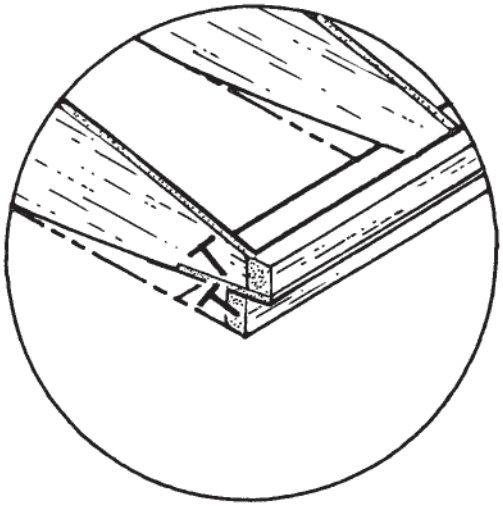


☑ 8. Place all 14 ribs on the spar, aligning each rib over the drawing of the ribs on the plan. (The ribs are symmetrical and either edge can be placed on the spar.) Rest the trailing edges of the ribs on top of the jig. Holding a small square against each rib, bond them to the spar with CA.

Note: There is no center rib used in this wing. Also, pay particular attention to the alignment of the Number #1 ribs with the plan, as they must overlap the fuselage sides later in construction.



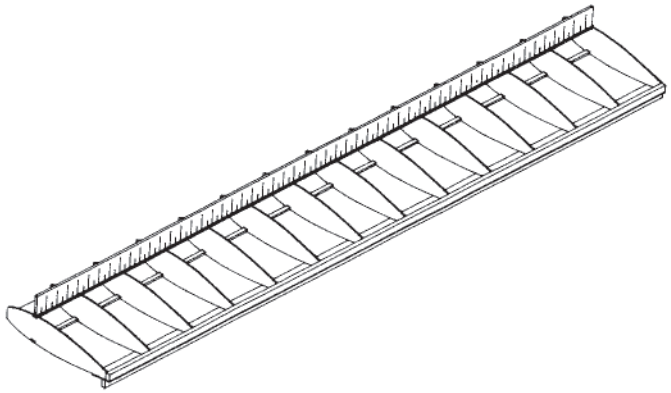
☑ 9. Slip the trailing edge sheet, assembled in Instruction #2, under the ends of the ribs. Push it forward until the trailing edge contacts the ends of the ribs, as shown.



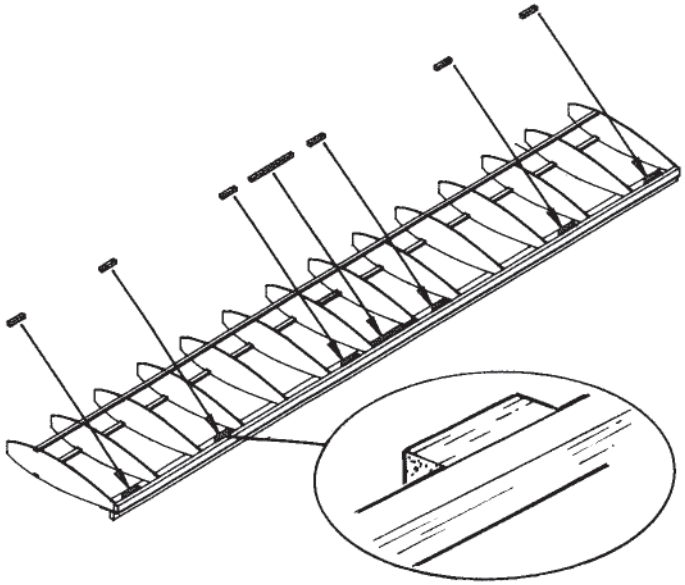
☑ 10. Using CA, bond the **tip** ribs **only** flush with the ends of the trailing edge and trailing edge sheet, as shown.

☐ 11. Push a T-pin through each tip rib, the trailing edge sheet and into the jig. These pins will trap the trailing edge and prevent it from moving sideways. Be certain that the tip ribs are aligned over the drawings of these parts on the plan and that the trailing edge sheet is in contact with the jig at both ends.

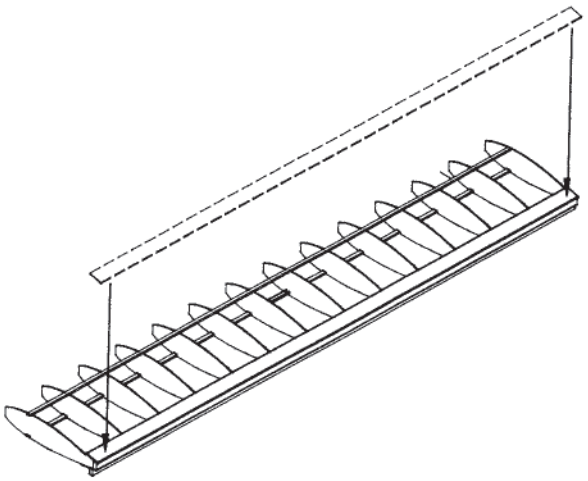
☑ 12. Bond the remaining ribs to the trailing edge and trailing edge sheet with CA. Be certain to align the ribs over the drawings of the ribs on the plan.



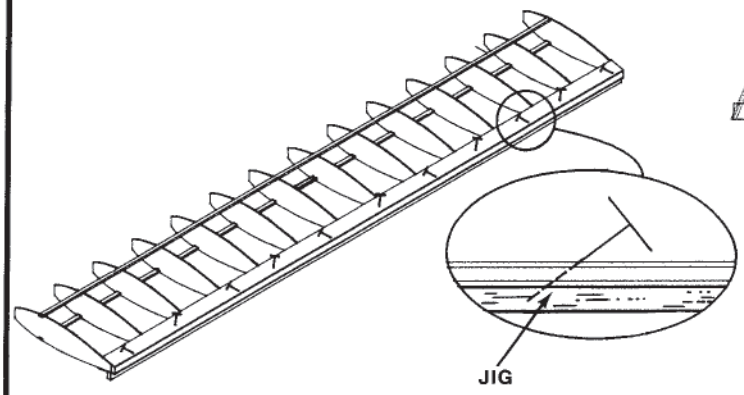
☐ 13. Spray accelerator on all four sides of the remaining 1/8" x 1/4" x 36" spruce spar. Press the spar into the notches of the ribs. Stand a 36" straight edge on the spar and adjust the spar so that it makes contact with the straight edge over its full length. Also, adjust the ribs so they are all square to the spars, then bond the spar to the ribs with CA.



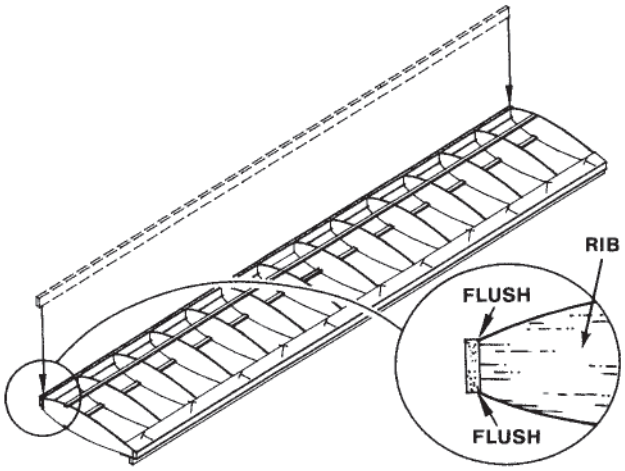
☑ 14. Cut the hinge filler pieces and the center section filler from the remaining 1/8" x 1/8" x 36" balsa strip. Use Slow CA to glue these parts to the trailing edge at the positions shown on the plan.



☐ 15. Apply Slow CA to the last 1″ of each rib and the full length of the trailing edge. Position a 1/16″ x 1″ x 36″ trailing edge sheet flush over the trailing edge and flush over the end ribs, then press it into contact with the ribs and trailing edge.

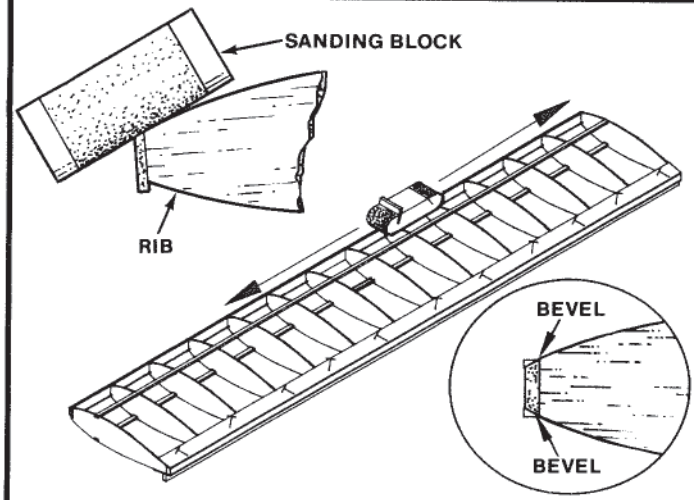


☐ 16. Push T-pins through the trailing edge sheets and into the jig at an angle. This will prevent the trailing edge from lifting from the jig.

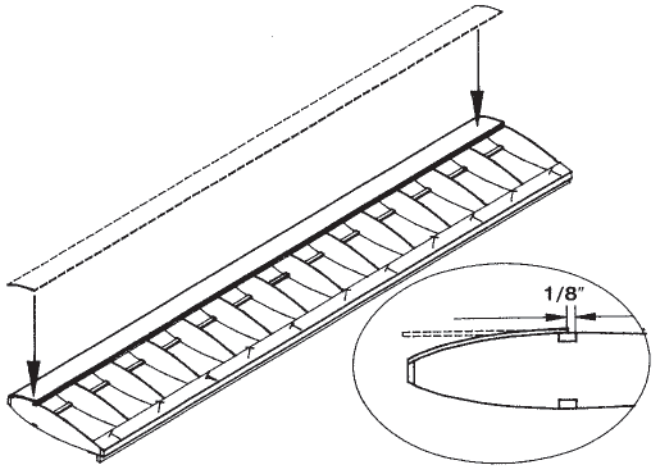


☐ 17. Apply Slow CA to the front edge of the **tip** ribs **only**. Press the 3/32″ x 3/8″ x 36″ balsa leading edge into contact with the tip ribs, so that its ends are flush with the ribs and its edges are flush with the top and bottom edges of the ribs.

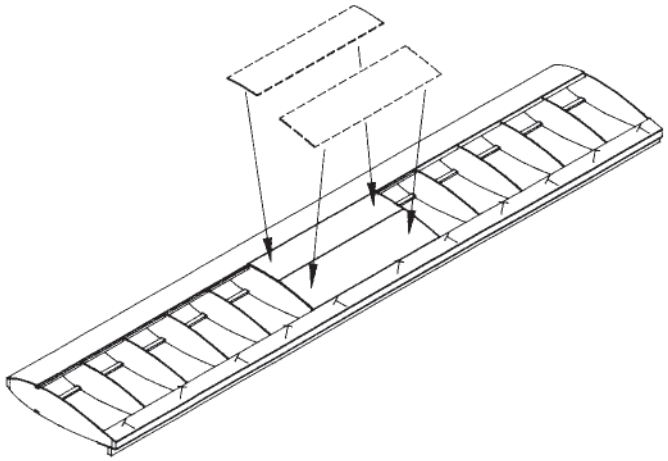
☐ 18. Press the leading edge against the remaining ribs and bond it to these ribs with CA. Again, be sure that the edges of the leading edge are flush with the top and bottom edges of each rib.



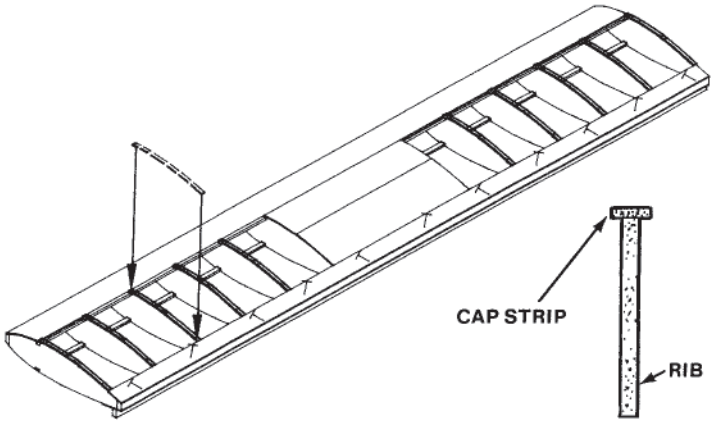
☐ 19. Hold a sanding block against the leading edge. **Lightly** sand a bevel into the leading edge that is flush with all of the ribs. Be sure to avoid sanding the edges of ribs.



☐ 20. Apply a bead of Slow CA to the spar, leading edge, and portions of the ribs between these parts. Position a 1/16" x 2-3/8" x 36" leading edge sheet flush over the end ribs and on the spar so that half of the spar is covered by this sheet, as shown. Press the leading edge sheet into firm contact with the spar **only** until the CA **grabs**. Then, starting at the center and working towards the ends, roll the leading edge sheet into contact with the ribs and leading edge.

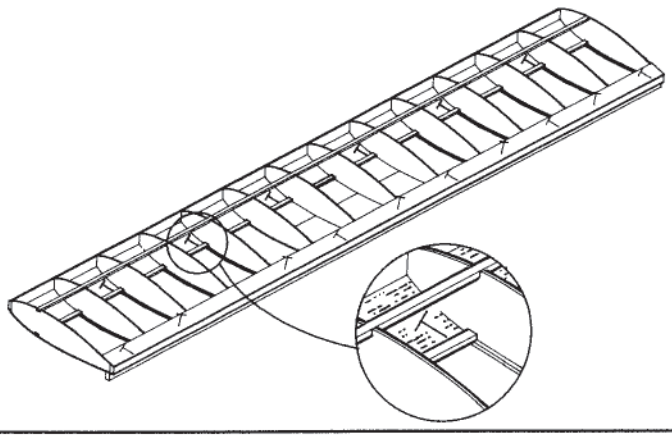


☐ 21. Use Slow CA to glue one 1/16" x 2-1/8" x 8-3/8" center section sheet to the center ribs and trailing edge sheet. Then, cut and fit a forward center section sheet from another 1/16" x 2-7/8" x 8-1/8" balsa sheet. Glue this sheet in place with Slow CA.

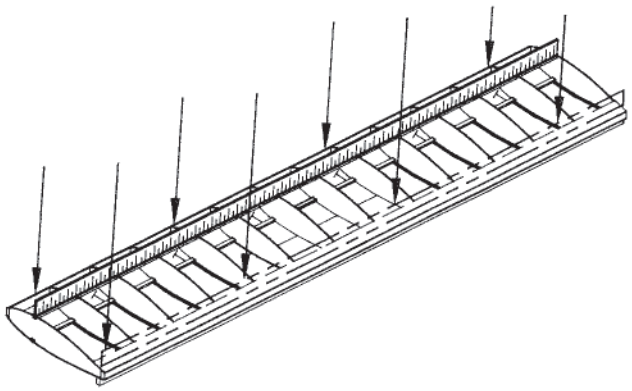


☐ 22. Cut the cap strips from the 1/16" x 3/16" x 36" balsa strips. Glue the cap strips to the ribs with Slow CA.

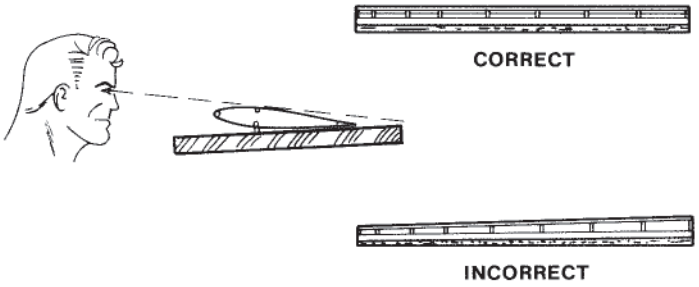
Note: The cap strips should be carefully centered over each rib.



☐ 23. Remove the wing from the building board and jig. Turn it over and lay it back into position on the building board, so that the trailing edge extends past the rear edge of the jig as shown on the plan. Then pin the trailing edge sheeting to the jig, as explained in Instruction #16. Pin the leading edge sheet to the plan and building board by pushing T-pins through the leading edge sheeting at an angle, near the spar, as shown.

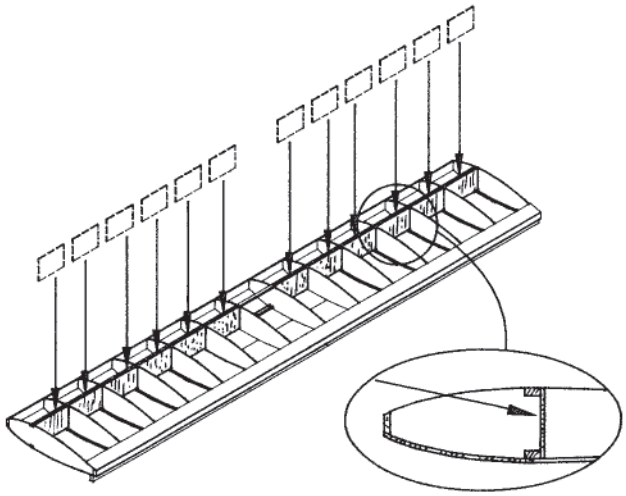


☐ 24. Stand a 36" straight edge on the trailing edge and then on the spar. Make certain that there are no gaps between these parts and the straight edge. If necessary, adjust the T-pins, or use shims, to make adjustments.



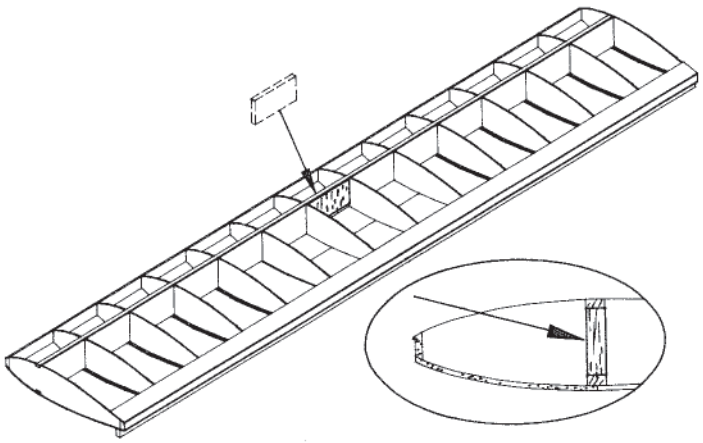
☐ 25. Sight across the spar and trailing edge sheet, as shown, to be certain that they are parallel. If they are bowed, this shape will be locked in when the leading edge sheet and the shear webs are installed.

Note: Instructions #24 and #25 are important. Adjust the T-pins or your building board, as necessary, to remove any bowing or twists in the wing.

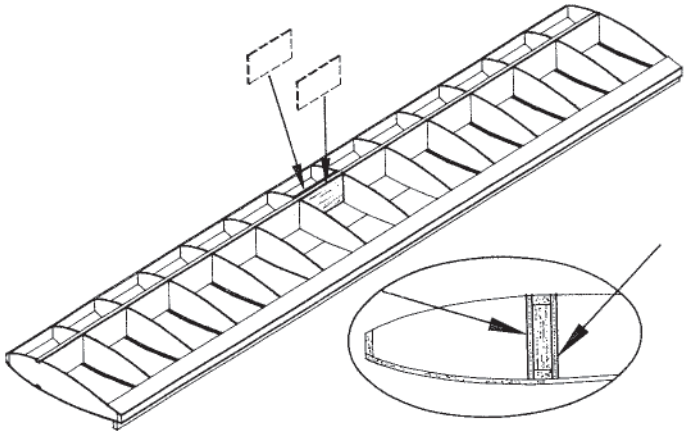


☐ 26. Use Slow CA to glue the pre-cut balsa shear webs to the **back** side of **both** spars, as shown on the plan. **Do not** glue a shear web between the #1 ribs.

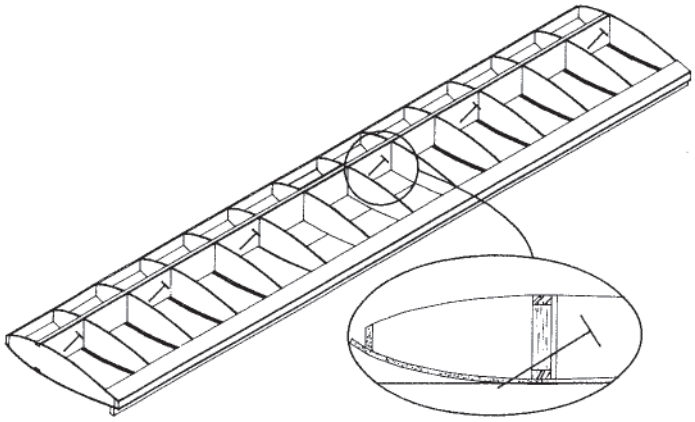
Note: Due to slight differences in construction techniques, it may be necessary to trim the shear webs to fit between the ribs. If a small gap results between the ribs and webs, it's ok. The important thing is to be sure that each shear web is bonded securely to **both** spars. These webs add a great deal of strength to the wing. **Do not** omit them.



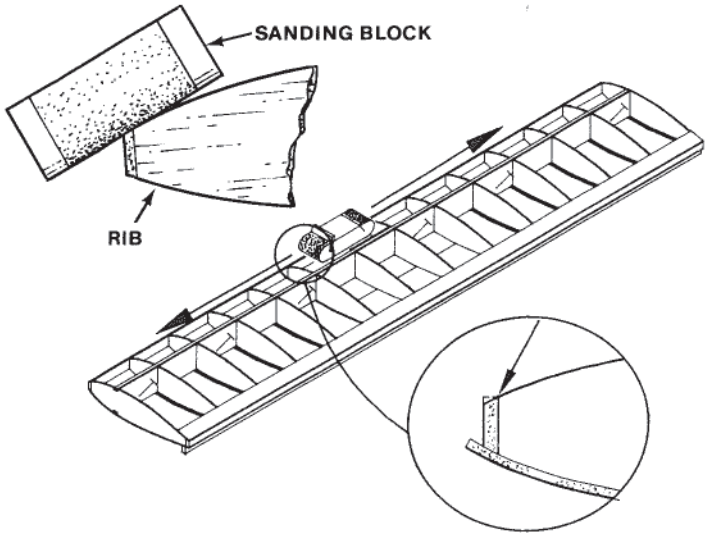
☐ 27. Fit the 1/4" x 7/8" x 2-7/16" balsa spar filler flush between the spars and the #1 ribs. Glue it in place with CA.



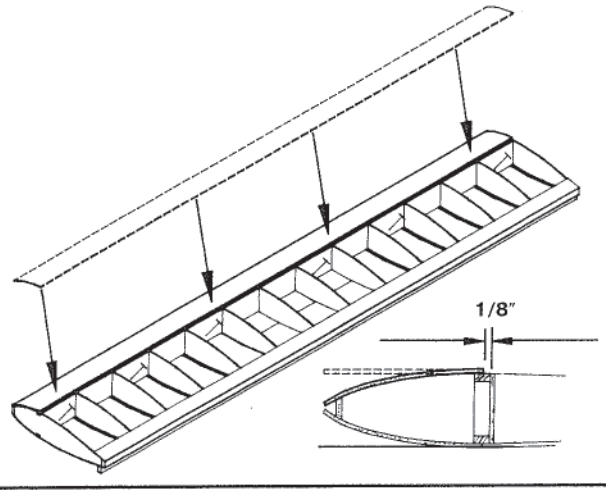
☐ 28. Glue the two 3mm x 1-1/8" x 2-7/16" Micro-Lite® plywood shear webs to both spars and the spar filler with Slow CA. Be sure these parts are flush with the top of the top spar, as shown.



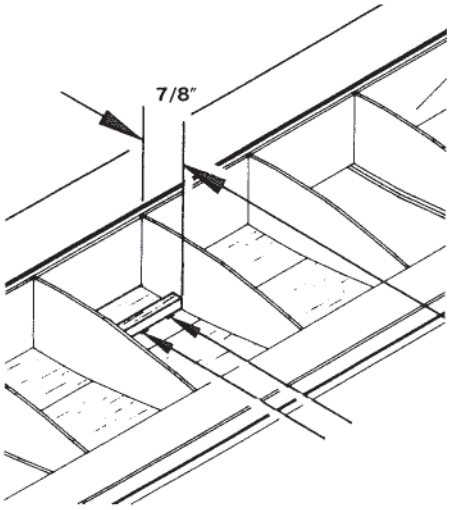
☐ 29. Remove the T-pins in the leading edge sheeting and reposition them so they pass through the shear webs, over the spar and into the building board.

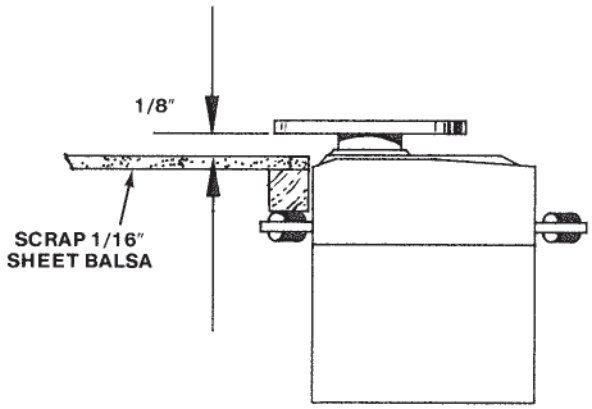


☐ 30. Hold a sanding block against the leading edge. **Lightly** sand a bevel into the leading edge that is flush with all of the ribs. Be sure to avoid sanding the edges of the ribs.



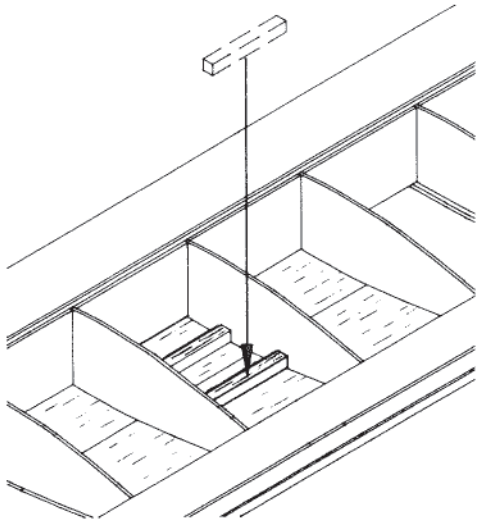
☐ 31. Apply a bead of Slow CA to the spar, leading edge and the portions of the ribs between these parts. Position a 1/16" x 2-3/8" x 36" leading edge sheet flush over the end ribs and on the spar so that half of the spar is covered by this sheet, as shown. Press the leading edge sheet into firm contact with the spar **only** until the CA **grabs**. Then, starting at the center and working towards the ends, roll the leading edge sheet into contact with the ribs and leading edge.





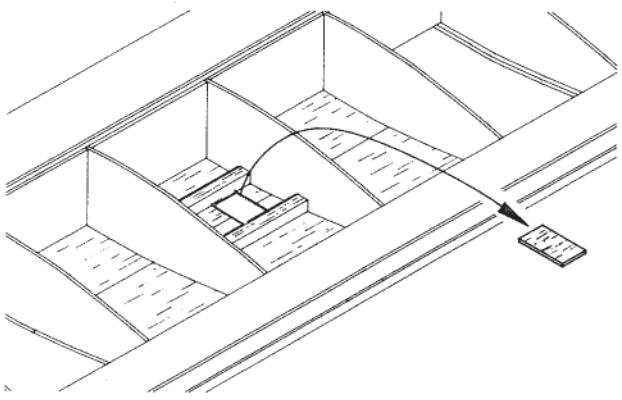
☐ 32. Use a ruler and pencil to measure and mark two points on the center sheeting, 7/8" behind the Micro-Lite plywood shear web and between the #1 ribs, as shown. Apply Slow CA to one side of one 1/4" x 1/4" x 2-7/16" spruce aileron servo rail. Position this rail on the center section sheeting, so that its rear edge is on the pencil marks, as shown.

Note: The aileron servo installation is shown in the Side View on the plan. This is a non-standard installation necessary to provide clearance between the aileron pushrods and other components. Check this clearance on your servo by holding the 1/4" x 1/4" x 2-7/16" servo rail and a piece of scrap 1/16" sheeting **above** the servo's mounting lugs, as shown. The height of the output arm or wheel on the servo should be about 1/8" above the center section sheeting, as shown here. If the clearance is less than 1/8", sand down the 1/4" servo rail until the desired clearance is obtained.

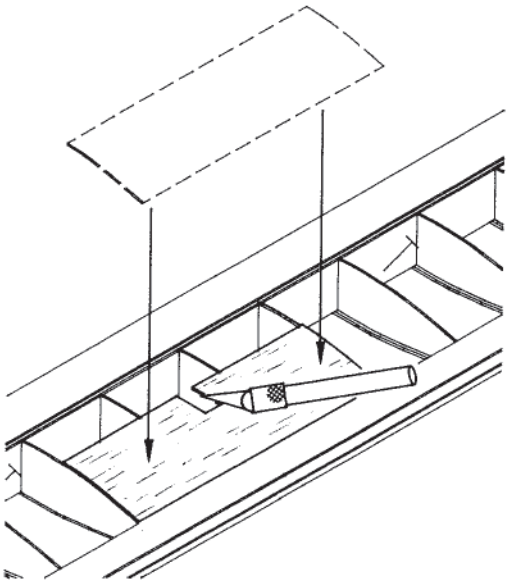


☐ 33. Measure and mark the position of the second 1/4" x 1/4" x 2-7/16" spruce aileron servo rail. This measurement will be determined by your servo lugs. Glue this rail in place with Slow CA.

Note: If necessary, sand this servo rail to the same thickness as the forward rail.

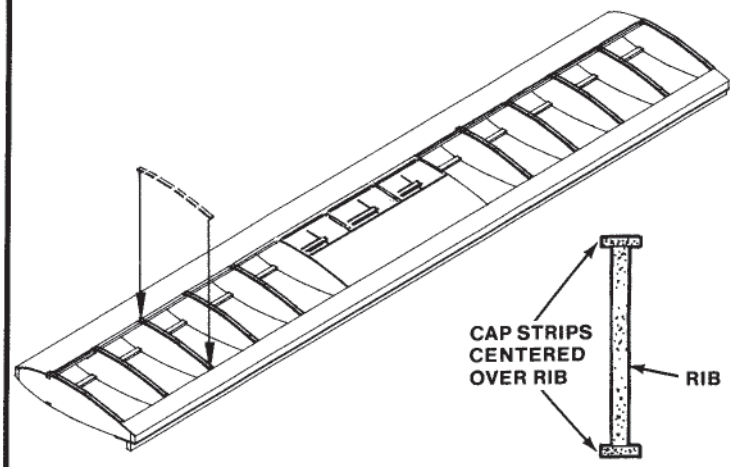


☐ 34. Use a sharp X-acto knife, cut a hole in the center section sheeting, between the servo rails. The hole should be centered between the #1 ribs, approximately 3/32" to 1/8" wider than the servo case.



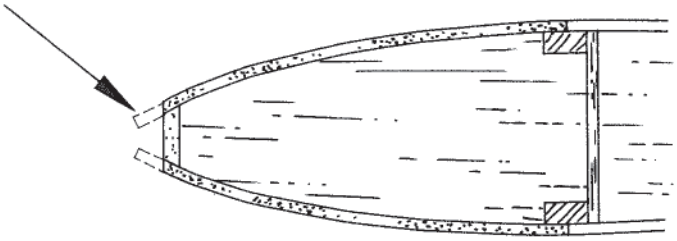
☐ 35. Use Slow CA to glue one 1/16" x 2-7/8" x 8-1/8" center section sheet to the ribs and **trailing edge** sheet. Then, use a straight edge and a sharp X-acto knife to cut a square slot in this sheet directly over (and the same size as), the hole in the bottom center section sheet.

Note: Do not install the forward center section sheet until told to do so.



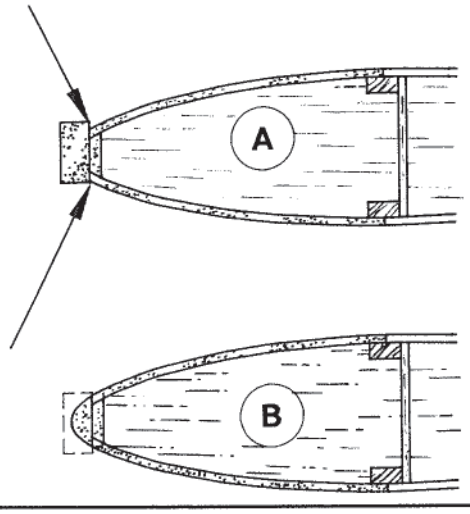
☐ 36. Cut the cap strips from the 1/16" x 3/16" x 36" balsa strips. Glue the cap strips to the ribs with Slow CA.

Note: The cap strips should be carefully centered over each rib.

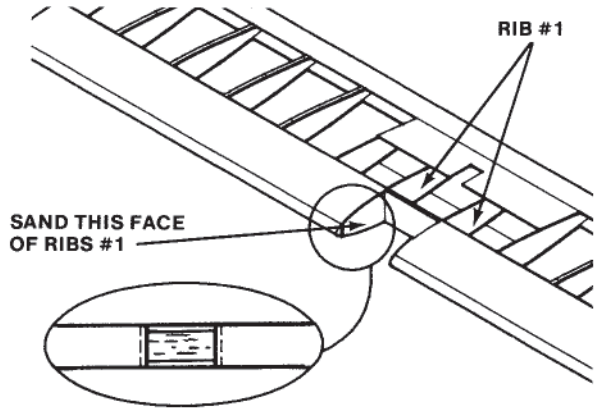


☐ 37. Remove the wing from the jig and building board.

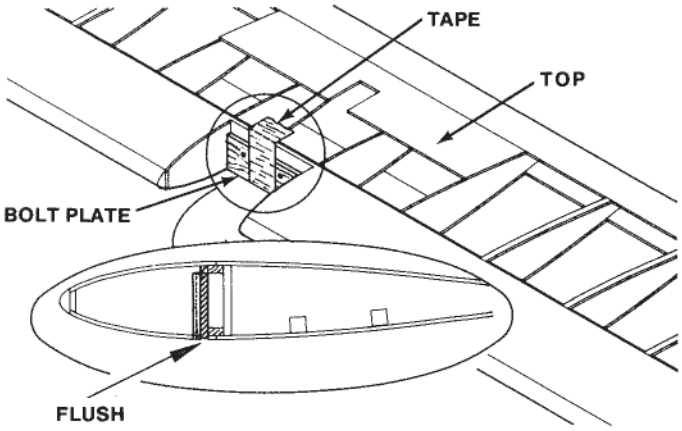
☐ 38. Use an X-acto knife to trim the excess 1/16" leading edge sheeting flush with the leading edge. Then, use a sanding block to sand the leading edge sheeting flush with the leading edge, as shown here and on the plan.



☐ 39. Apply Slow CA to the leading edge. Position the 5/32" x 7/16" x 36" leading edge cap on the leading edge, so that it overlaps both leading edge sheets, as shown in (A). Then, use a sanding block to sand the leading edge cap to a round section, as shown in (B) and on the plan.

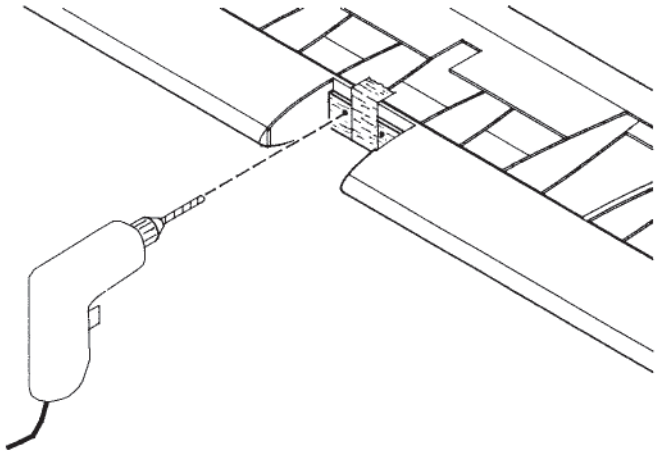


☑ 40. Use a sharp X-acto knife to remove the portions of the leading edge and leading edge sheeting between the #1 ribs. Then, use a sanding block to sand the edges of these parts flush with the #1 ribs, as shown.

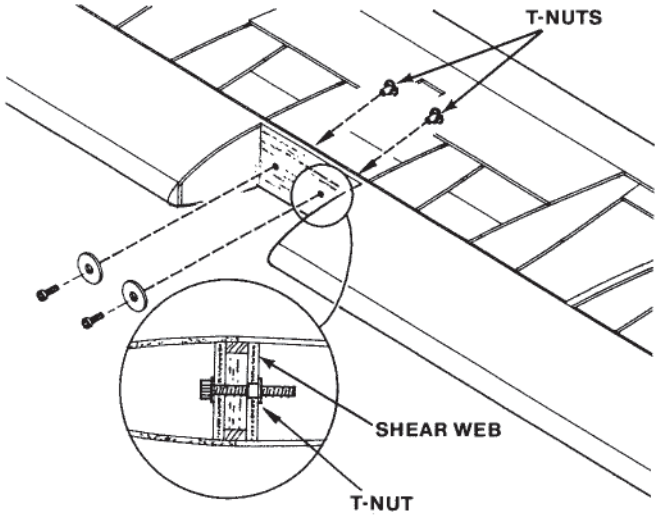


☑ 41. Temporarily lay the 3/32" x 7/8" x 2-7/16" pre-cut plywood wing bolt plate against the Micro-Lite plywood shear web. Position the bolt plate, so that it is flush with the **lower** leading edge sheeting, as shown. Hold the plate in position with masking tape.

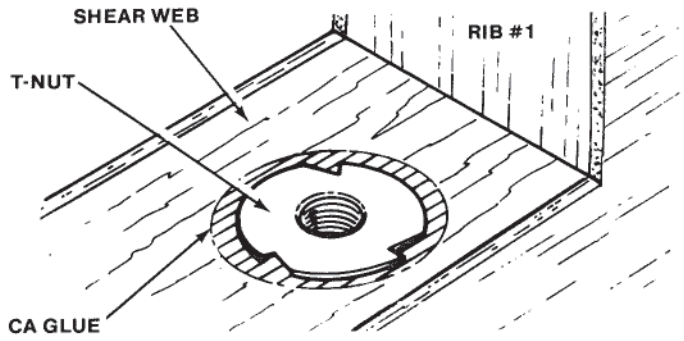
Note: To prevent confusion later in construction, write the word **top** on the upper center section sheeting.



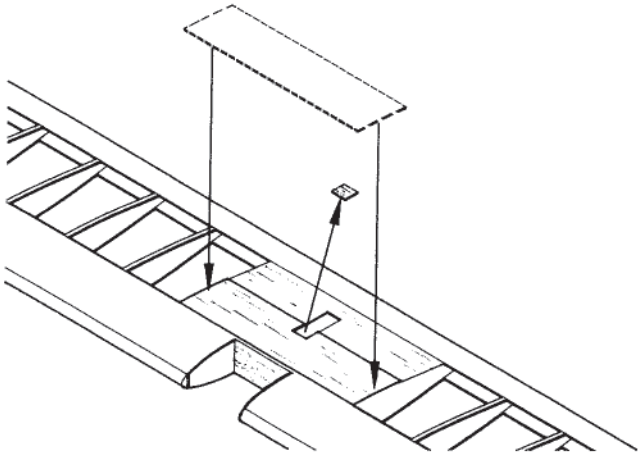
☐ 42. Using the pre-drilled holes in the bolt plate as a guide, drill through both Micro-Lite plywood shear webs with an 1/8" drill bit, as shown, then remove the tape and bolt plate.



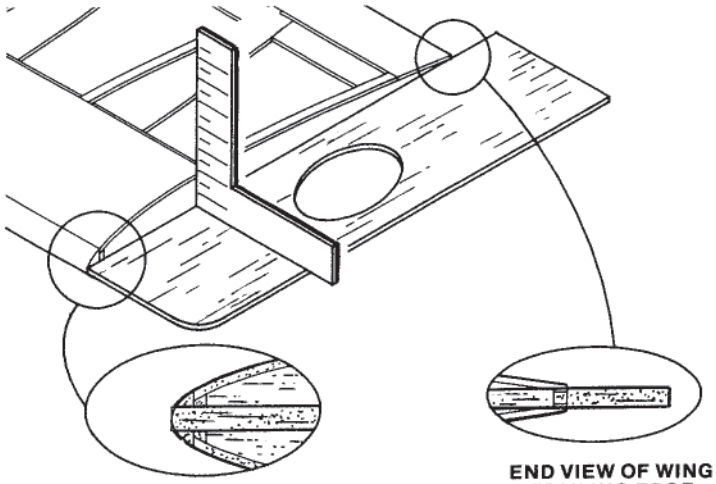
☑ 43. Press two 4-40 T-nuts into the holes in the **rear** shear web, as shown. Place washers over two 4-40 x 1" socket head cap screws. Insert the screws into the holes in the bolt plate and tighten them down to draw the T-nuts into the shear web.



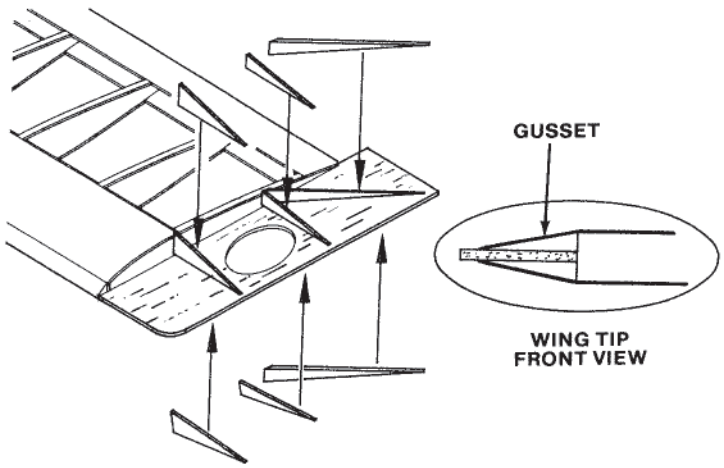
☐ 44. Remove the screws, washers, and plywood bolt plate from the wing. Hold the wing up, so that the leading edge is facing down. Then, run a small amount of CA onto the shear web, **near** each T-nut, to bond them in place.



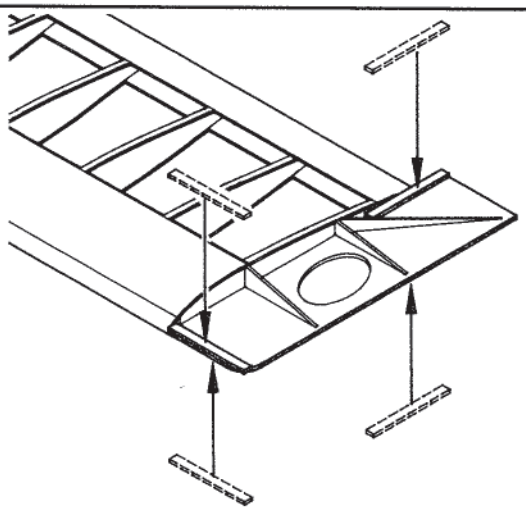
☐ 45. Lay the wing on the building board and jig. Cut and fit the remaining center section sheet from the last piece of 1/16" x 2-7/8" x 8-1/8" balsa sheet. Glue it in place with Slow CA. Then, use a sharp X-acto knife to open the slot started in the rear center section sheet, as shown here.



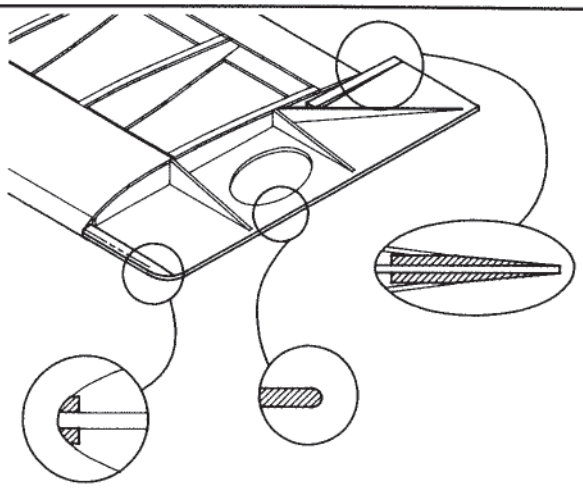
☐ ☐ 46. Apply Slow CA to the edge of one die-cut wing tip. Position the wing tip on the tip rib so that it is centered on the leading and trailing edges, as shown. Use a small square to align the wing tip relative to the tip rib, as shown.



☐ ☐ 47. Use Slow CA to glue the three sets of die-cut wing tip gussets to both sides of the wing tip and tip rib, as shown here and on the plan.



☐ ☐ 48. Cut 1/4" wide strips from the scrap wing tip die-cut sheet. Use Slow CA to glue these strips to both sides of the wing tip at the leading and trailing edges, as shown here and on the plan.



☐ ☐ 49. Use a sanding block to carefully sand the edges of the wing tip to a round section. Also, taper the trailing edge of the wing tip and the 3/32" strips flush with the trailing edge sheets, as shown here.

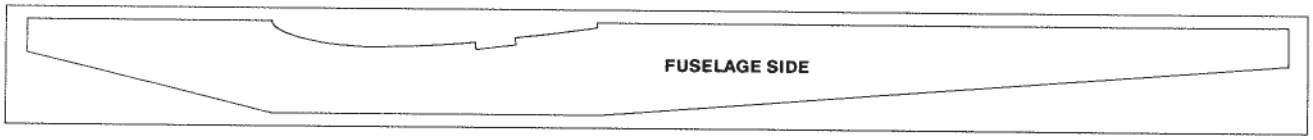
☐ 50. Repeat Instructions #46 through #49 to install the opposite wing tip.

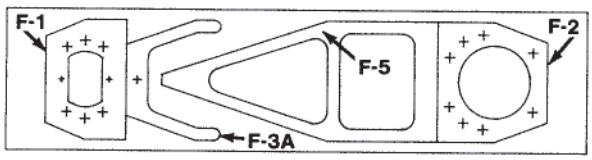
The wing is now complete, except for the trailing edge bolt plate, which will be added later in construction.

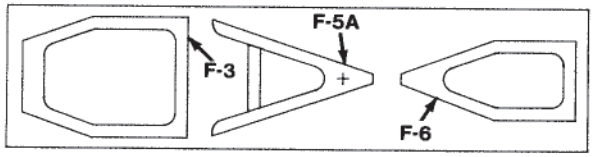
Fuselage Construction

The fuselage is a simple box structure and quite easy to build. However, the bulkheads must be located accurately, and squarely, in order to properly mount and remove the wing and cockpit hatch. Study the plan and text before starting construction.

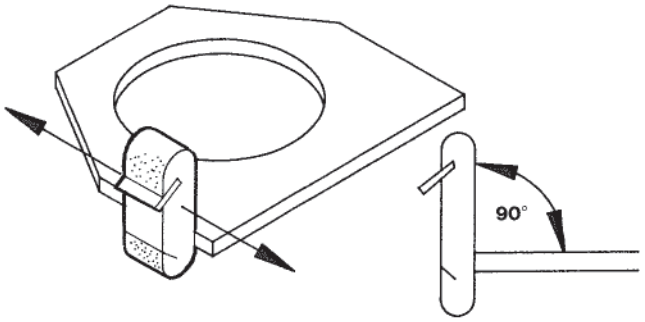
Fuselage



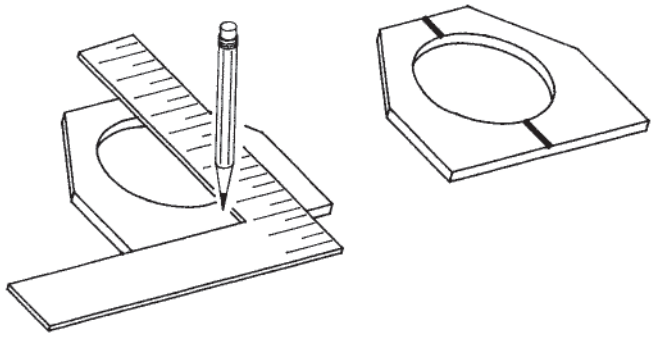




☐ 51. Remove the fuselage sides and bulkheads F-1, F-2, F-3, F-5, F-5A, and F-6 from the die-cut sheets.

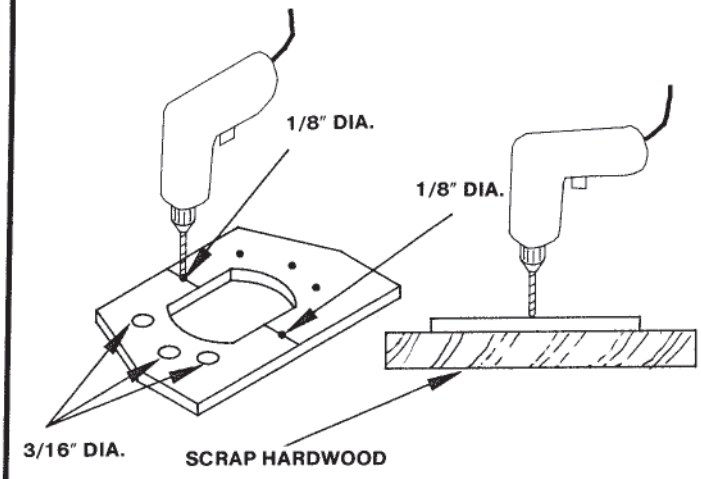


☐ 52. Use a sanding block to **lightly** sand the edges of all of the bulkheads, removing **only** the burrs and rough spots. Be sure to hold the sanding block at a 90° angle when sanding, as shown.



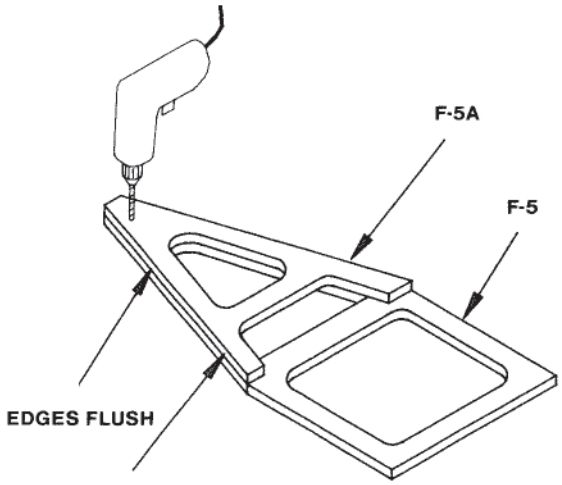
☐ 53. Precisely measure and mark (from the plan Top View), the centerline on both sides of bulkheads F-1, F-2, F-3, F-4, F-5, and F-5A.

Note: F-4 is a pre-cut balsa part; 3/32" x 1-1/4" x 2-7/16".

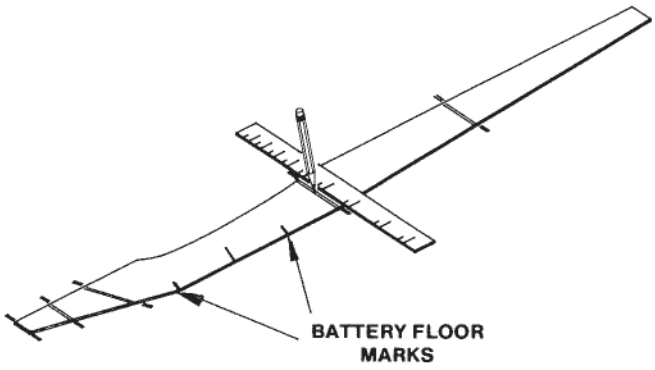


☐ 54. Drill through the two indented marks on F-1, shown here, with a 1/8" drill bit. Then, drill through the remaining indented marks on F-1 and F-2 with a 3/16" drill bit.

Note: When drilling holes in wood parts, lay the part on a piece of scrap hardwood. The hardwood will prevent the drill bit from splintering the edges of the hole when it comes out the back side of the part. To avoid splintering, apply only **light** pressure to the drill bit.

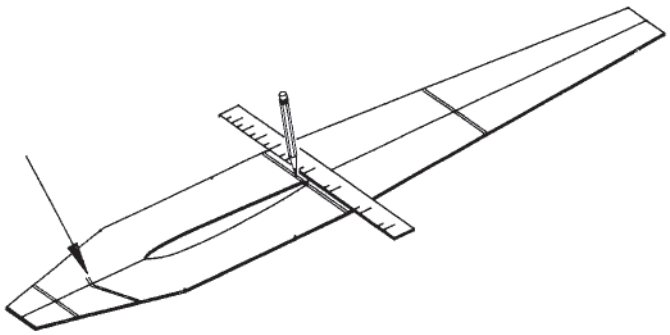


☐ 55. Lay bulkhead F-5A over F-5, so their outside edges are flush, as shown. Drill through both bulkheads at the indented mark on F-5A with a 3/16" drill bit. Then place F-5A aside, it will not be needed until later in construction.



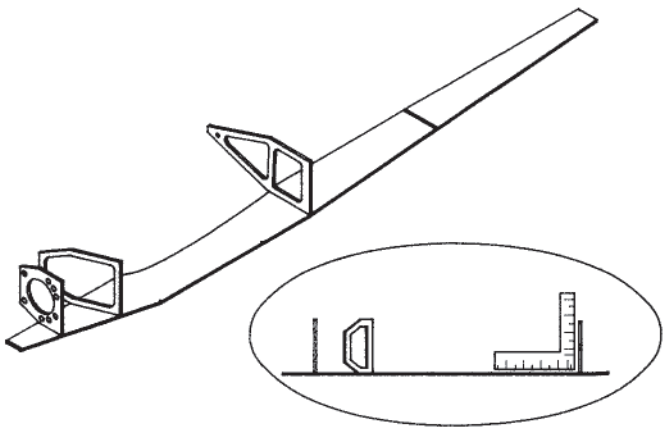
☐ 56. Lay one fuselage side over the Side View on the plan and carefully align it with the drawing of the fuselage side. Using the extended bulkhead lines as a guide, lay a straight edge across the fuselage and **lightly** mark the bulkhead positions for F-2, F-3, F-4, F-5, and F-6. Also, mark the position of the battery floor, as shown.

Note: The 1/8" x 1/4" spruce strips that contact the wing bolt plate, shown on the plan, are not bulkheads. Their locations, and the location of F-1, are not to be marked on the fuselage side.



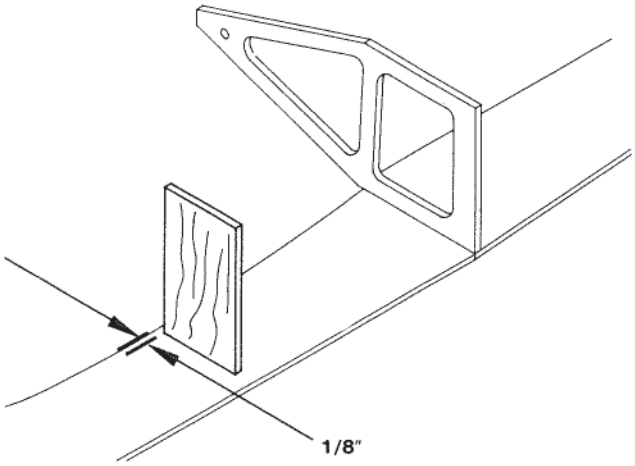
☐ 57. Lay the two fuselage sides so that their top edges are aligned. Use a straight edge and pencil to transfer the bulkhead locations to the other fuselage side.

Note: Because F-3 is installed at an angle, it is only necessary to mark its position on the upper edge of the **left** fuselage side, as shown by the arrow.



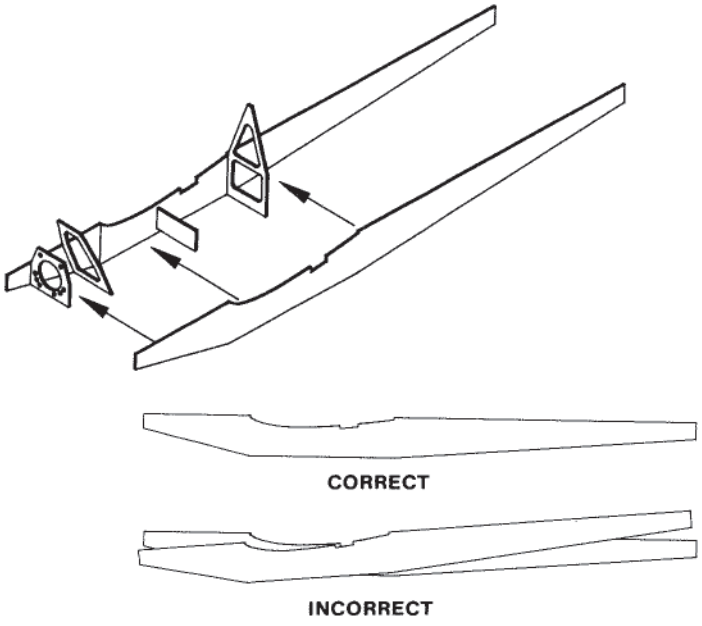
☐ 58. Use Slow CA to glue F-2, F-3, and F-5 flush over the penciled location marks on the **right** fuselage side, as shown. Be certain that the bottom edges of these bulkheads are flush with edge of the fuselage bottom, as shown on the plan.

Note: F-2 is marked "R" (right) and "L" (left). Be sure that the right edge of F-2 is glued to the right fuselage side, as shown.

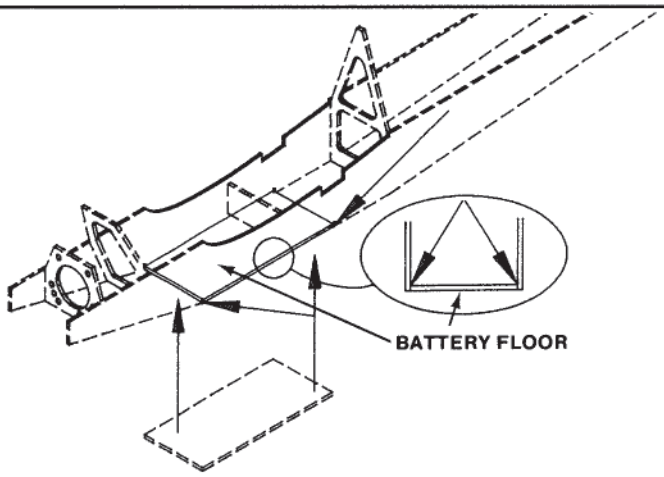


☐ 59. Install F-4 with a very small amount of Slow CA. Align its upper edge about 1/8" below the edge of the wing saddle, as shown here and on the plan.

Note: F-4 is a **temporary** bulkhead used to align and stiffen the fuselage sides. It will be removed later in construction. Use only enough Slow CA to tack it in place at this time.

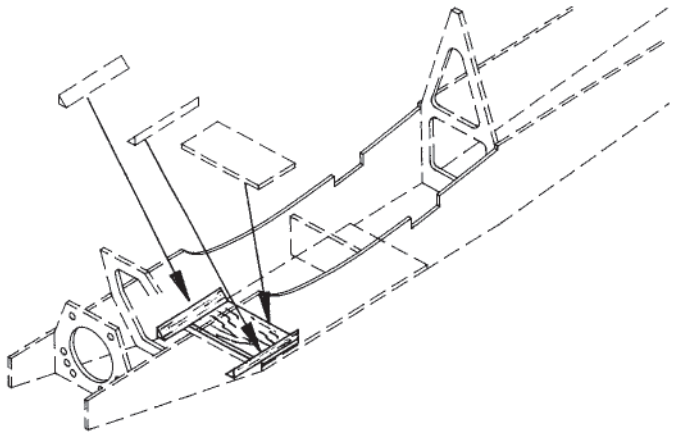


☐ 60. Carefully align and bond the left fuselage side to the bulkheads with Slow CA. Be sure the bulkheads are all square to the sides and that the top edges of the sides are parallel to each other.



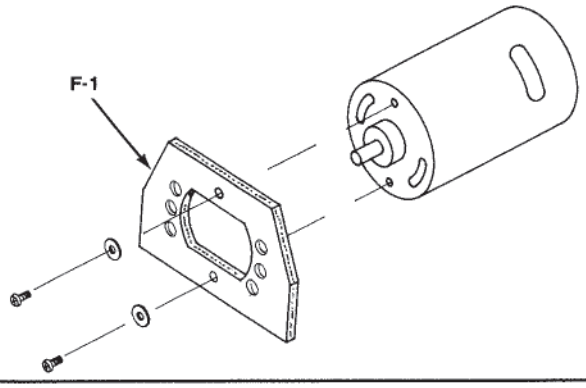
☐ 61. Fit the 3mm x 2-7/16" x 5-1/2" Micro-Lite plywood battery floor between the fuselage sides. If necessary, sand the edges to obtain a snug fit. Lay the fuselage on your building board and press it down onto the battery floor to align it flush with the bottom edges of the fuselage. Also, align it flush with the battery floor location marks, as shown. Then, bond it to the fuselage sides with CA.

Note: The fuselage sides will be quite flexible at this time. Re-check the squareness of the bulkheads relative to the fuselage sides before gluing the battery floor in place.



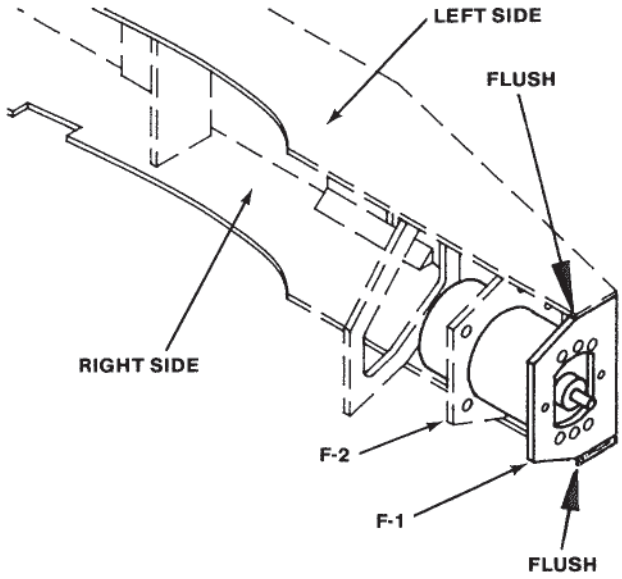
☐ 62. Install the 3mm x 1-1/4" x 2-7/16" pre-cut Micro-Lite plywood landing gear block with Slow CA.

☐ 63. Install the 1/4" x 2-3/16" triangle stock against the landing gear block and the fuselage sides with Slow CA.



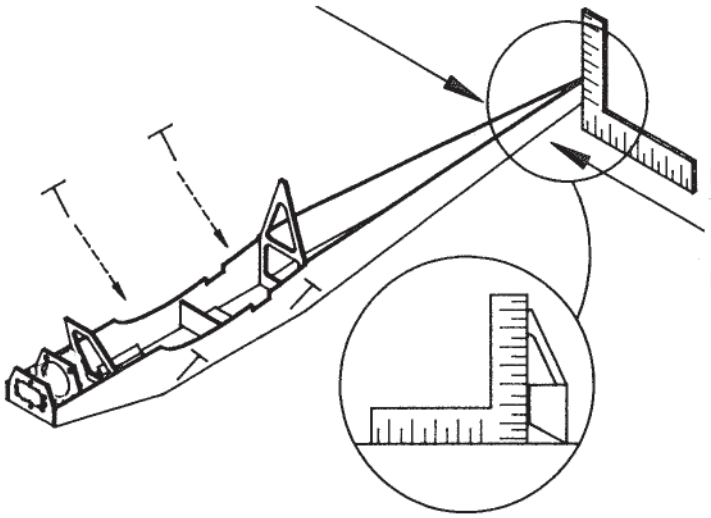
☐ 64. Spray accelerator on the edges of F-1.

☐ 65. Install the motor with two, 3mm x 10mm machine screws and two washers, as shown.



☑ 66. Lay the fuselage on its **right** side, flat on your building board. Insert the back of the motor through the hole in F-2. Align F-1, so that its front side is flush and even with the front edge of the fuselage side, as shown. Then, gently press the fuselage sides against F-1 and run CA into the joints between these parts. Be **very careful** not to get any CA on the motor.

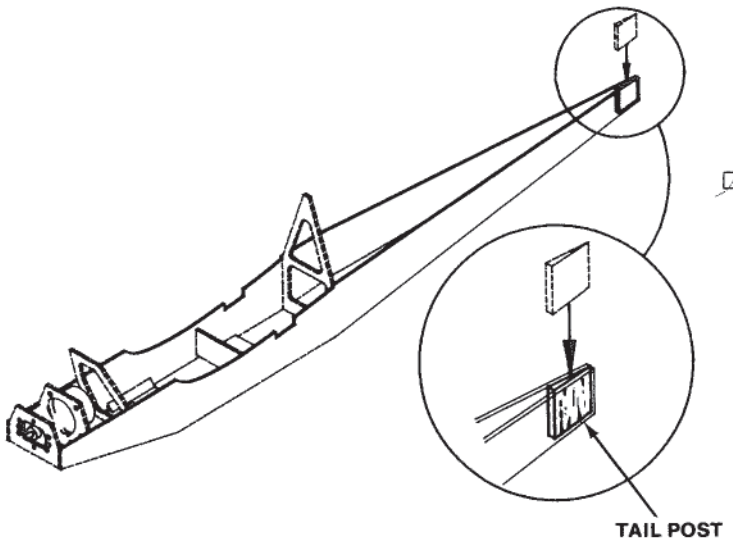
☑ 67. Remove the motor, machine screws, and washers. Place these items aside. They will not be needed again until later in construction.



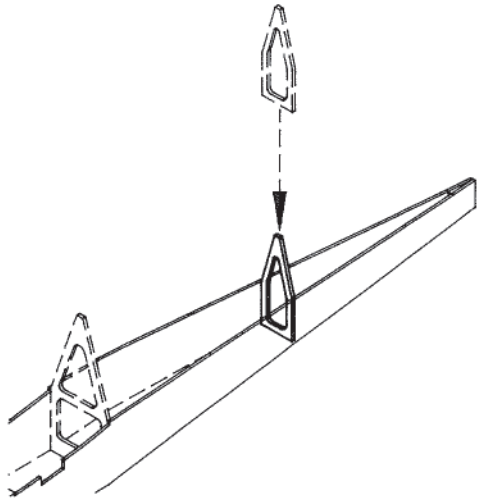
REAR VIEW OF
FUSELAGE AND SQUARE

☐ 68. Position the fuselage over the Top View on the plan. Pin it in position, so that the bulkhead centerlines are over the centerline shown on the plan.

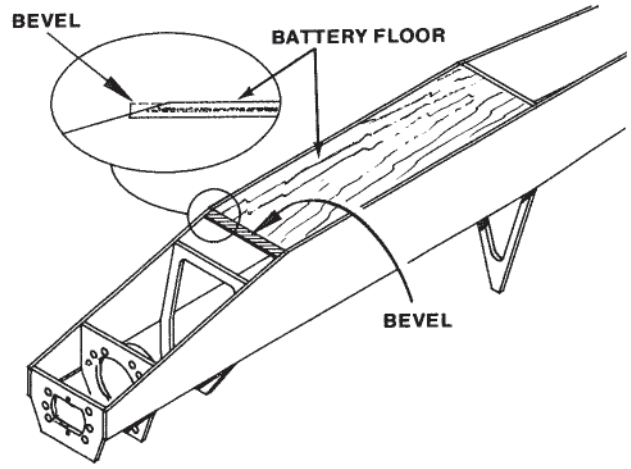
☐ 69. Pull the rear ends of the fuselage sides together and, using a small square as shown, align them over the centerline and glue them together with CA.



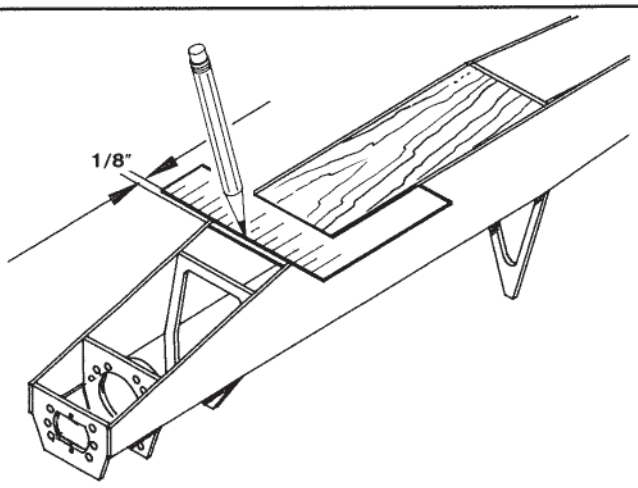
☑ 70. Make a tail post by tapering a piece of scrap 3/32" balsa. Install it **between** the fuselage sides with Slow CA.



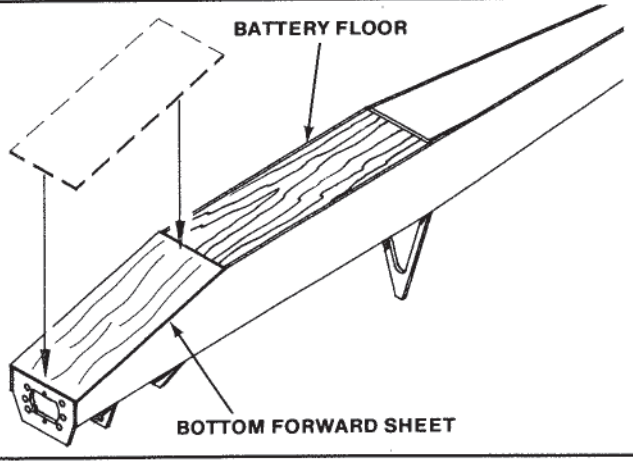
☐ 71. Install F-6 with CA using the plan and pencil lines as a guide to position this bulkhead. Then, remove the fuselage from the plan.



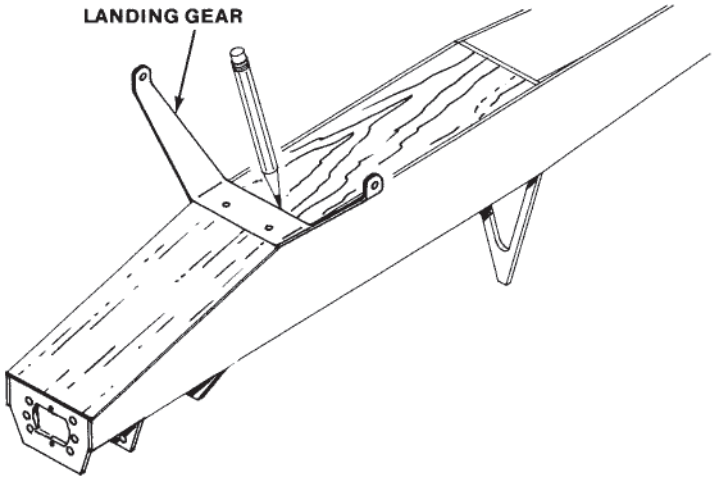
☐ 72. Use a sanding block to bevel the battery floor flush with the bottom of the fuselage, as shown here and in the Side View on the plan. Be careful not to sand into the fuselage sides.



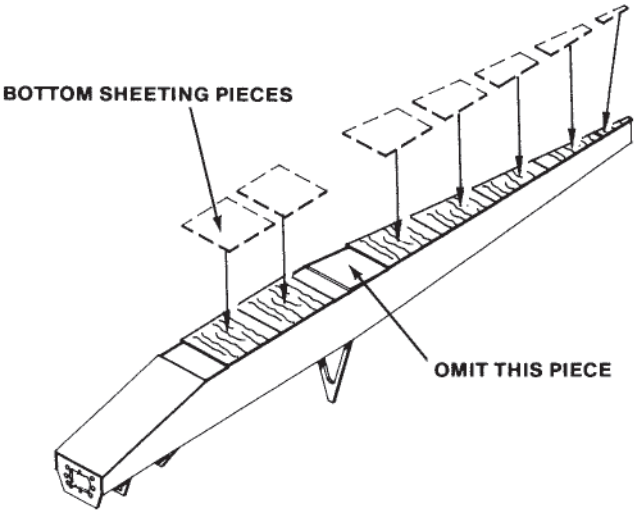
☐ 73. Use a square to mark a pencil line 1/8" behind the front edge of the battery floor, as shown.



☐ 74. Use Slow CA to glue the pre-cut 1/16" x 2-5/8" x 6-¼" balsa bottom forward fuselage sheet in place. Align its rear edge flush with the pencil line on the battery floor.

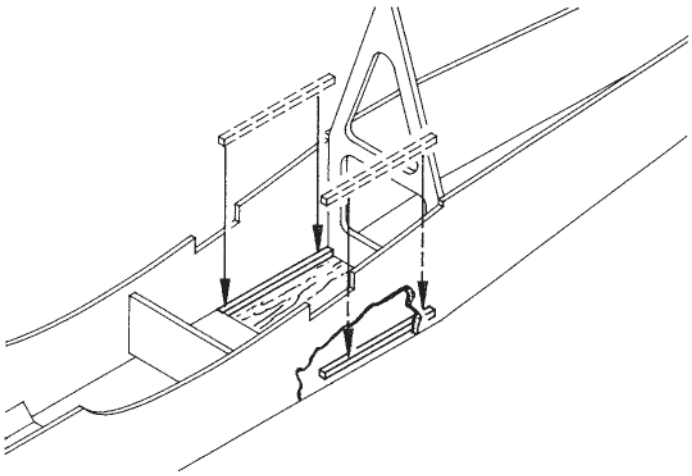


☐ 75. Place the landing gear on the battery floor and against the bottom forward fuselage sheet. Mark a pencil line across the battery floor, at the rear edge of the landing gear. Then, remove the landing gear.



☐ 76. Cut and fit the rear fuselage bottom sheeting from the 1/16" x 3" x 24" balsa sheet. Glue these pieces in place with Slow CA, starting at the pencil line on the battery floor and working back to the tail post. Omit the piece of bottom sheeting directly under the rear wing hold down bolt, shown on the plan, when performing this instruction. Later in construction, this area will need to be open so that the hole for the rear wing hold down bolt can be drilled from the bottom side.

Note: The rear fuselage will be flexible at this time. Be careful not to twist or bend the rear fuselage when adding the bottom sheeting.

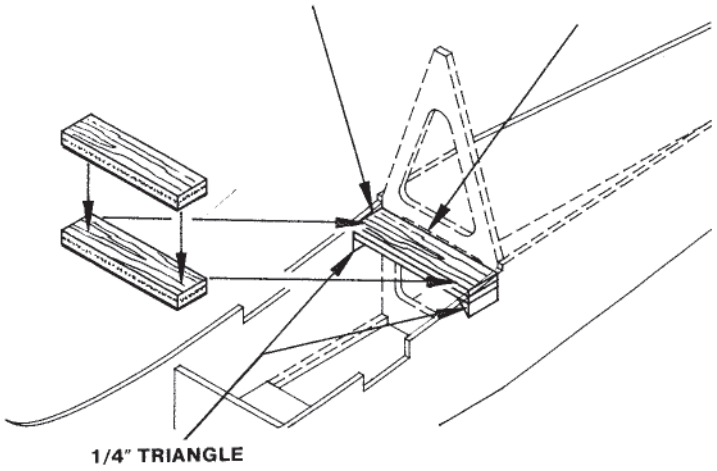


☐ 77. Inside the fuselage, use CA to glue a piece of 1/8" x 1/8" balsa to each fuselage side and the bottom sheeting, between the battery floor and F-5, as shown.

The basic fuselage is now complete. To ease assembly, the wing, tail assembly, and radio will be installed before finishing the fuselage.

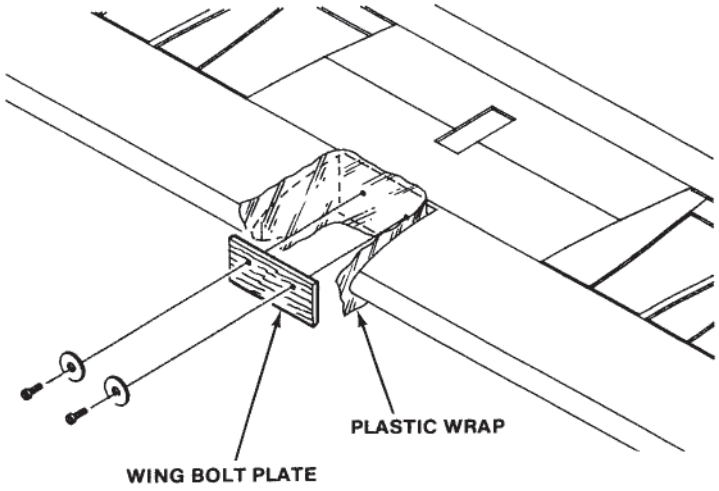
Mounting The Wing

This model uses a non-standard method of wing mounting that does not require the wing to contact the wing saddle. Follow the instructions carefully.



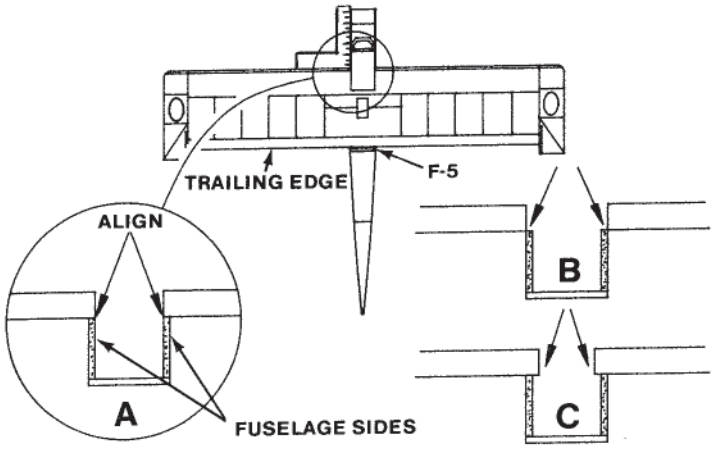
☐ 78. Laminate the two, 3mm x 5/8" x 2-7/16" Micro-Lite plywood wing hold down blocks together with Slow CA.

☐ 79. Insert the wing hold down block between the fuselage sides and against the cross-brace on F-5. Be sure that the upper edge of the hold down block is flush with the edges of the wing saddle, as shown. Glue this part in place with CA. Then, glue a 5/8" piece of 1/4" triangle stock under each corner of the hold down block, as shown, with Slow CA.



☐ 80. Cover the Micro-Lite plywood shear web and the #1 ribs with one piece of plastic wrap, as shown. Then re-install the wing bolt plate, washers, and screws in the wing, as explained in Instruction #42. Tighten the screws.

Note: After installing the wing bolt plate, trim the plastic wrap close to the edges of the leading edge sheets.

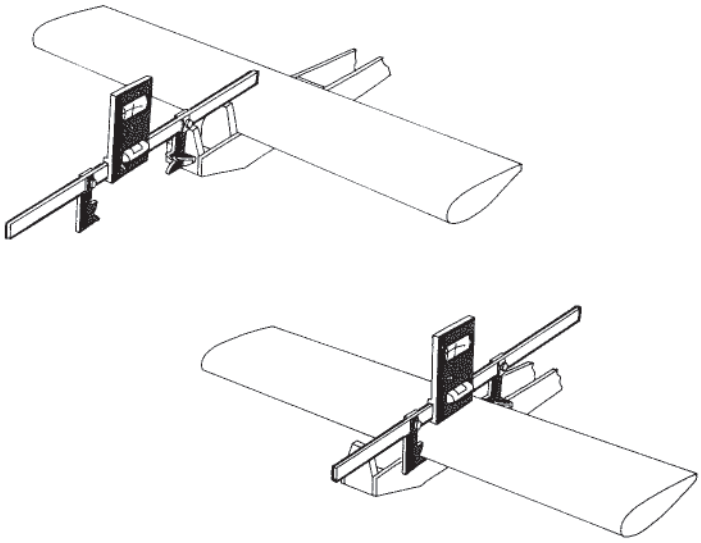


☐ 81. Place the wing on the wing saddle with its trailing edge against F-5.

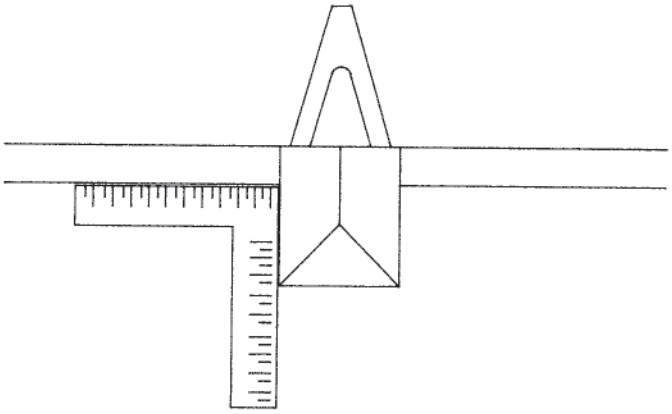
Note: Be certain that the **bottom side** of the wing is against the wing saddle.

☐ 82. Hold a square against the fuselage and leading edge of the wing, as shown. Align the #1 ribs with the inside edges of the fuselage sides as shown in (A). Then, pin the wing in place.

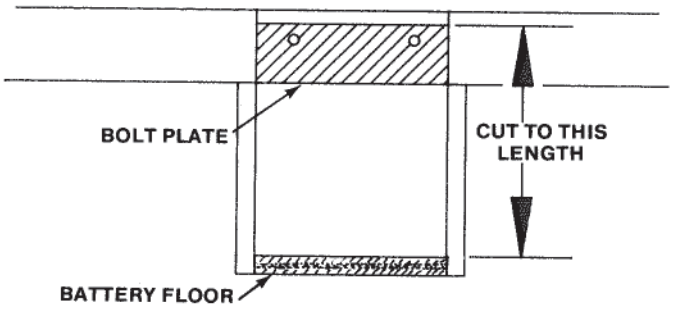
Note: If the width of the #1 ribs is different than the inside width of the fuselage, **center** the wing as shown in (B) or (C).



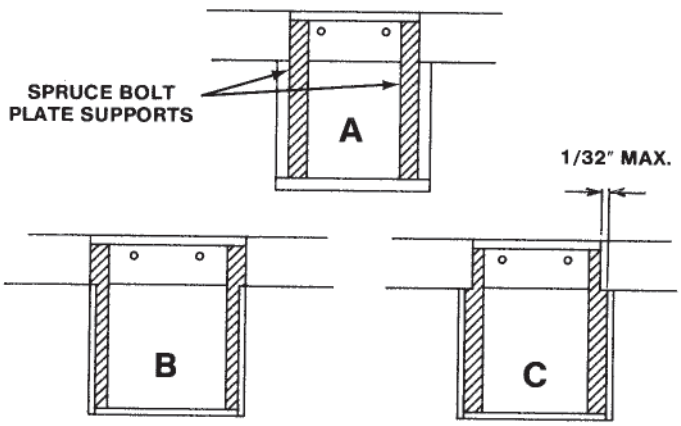
☐ 83. Use an incidence meter to check the alignment of the wing, relative to F-1. Both readings should be the same. If necessary, insert scrap wood shims between the fuselage and wing to obtain the correct alignment.



☑ 84. Sight down the fuselage from the rear. Check the squareness of the wing to the fuselage with a square, as shown. If necessary, insert scrap wood shims between the fuselage and wing to obtain the correct alignment.

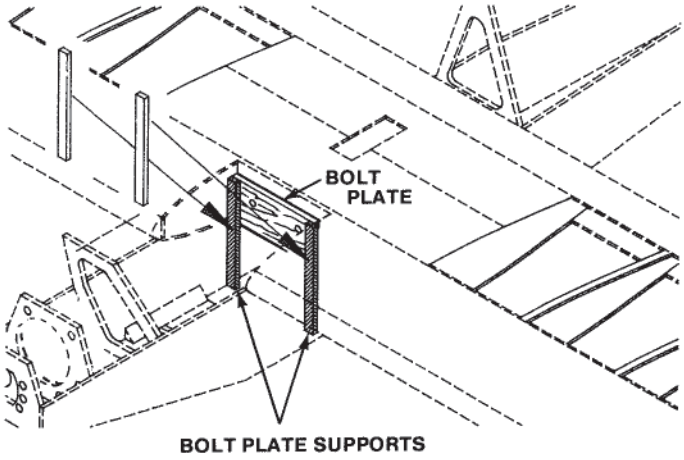


☐ 85. Cut two 1/8" x 1/4" spruce bolt plate supports equal in length to the distance from the battery floor to the top edge of the bolt plate, as shown.

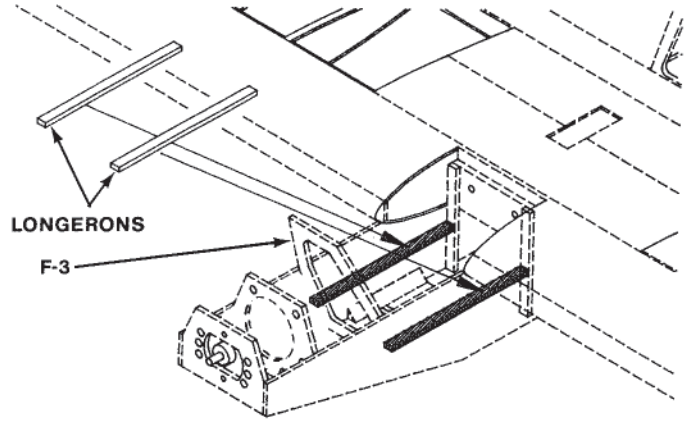


☐ 86. Test-fit the two bolt plate supports against the bolt plate and fuselage sides. They should make full contact with the fuselage sides, as shown. If not, cut them to fit as in (B) or (C).

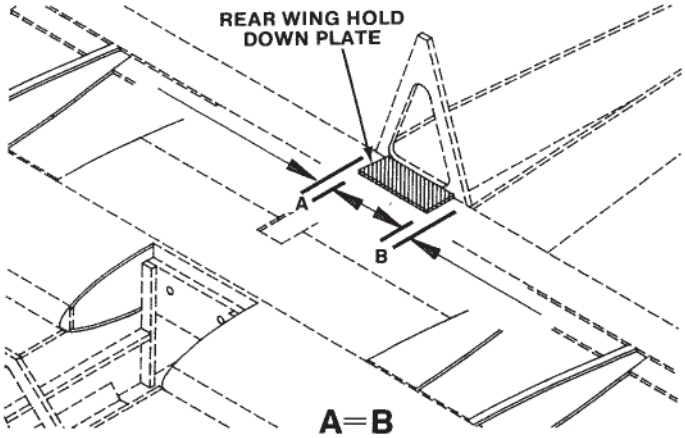
Warning: Trim no more than 1/32" from the bolt plate supports.



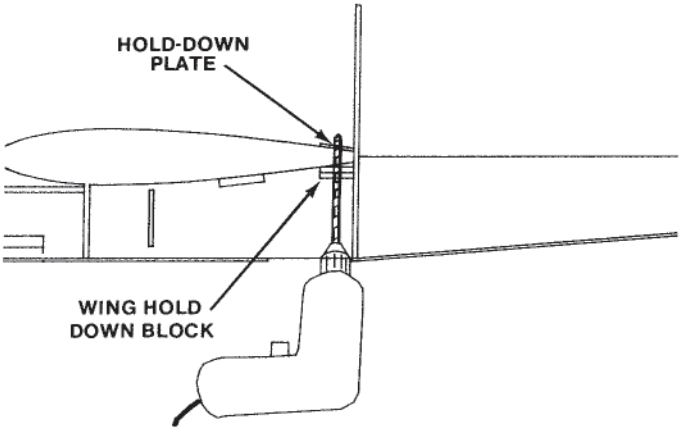
☐ 87. Apply Slow CA to the portions of one edge and one side of each bolt plate support that will contact the bolt plate and fuselage side and press these parts in place.



☐ 88. Cut two longerons from a piece of 1/8" x 1/4" spruce to fit between the bolt plate supports and F-3, as shown here and on the plan. Glue the longerons in place against the fuselage sides with Slow CA.

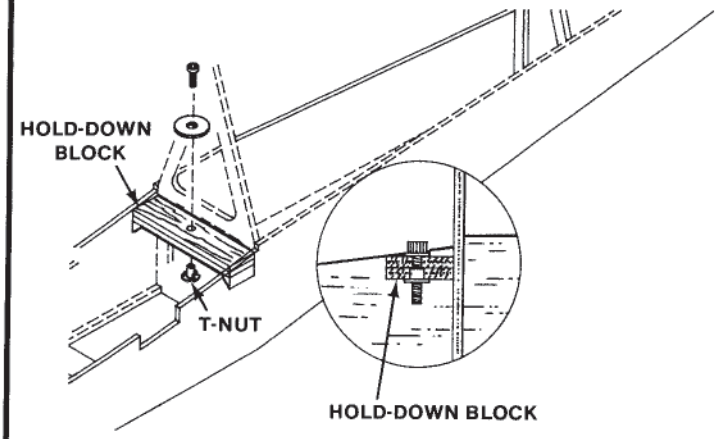


☐ 89. Apply Slow CA to the 1/16" x 5/8" x 1-1/2" plywood rear wing hold down plate. **Center** this plate between the outside edges of F-5 and flush with the wing trailing edges, as shown.

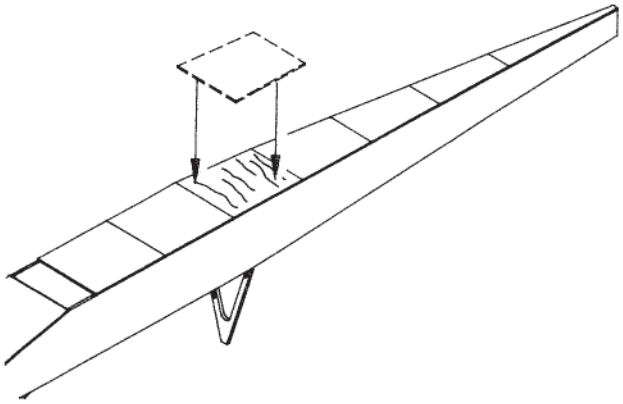


☐ 90. Drill through the wing hold down block, wing, and rear wing hold down plate with a 1/8" drill bit, as shown here and on the plan.

☐ 91. Remove the cap screws from the bolt plate and remove the wing from the fuselage.

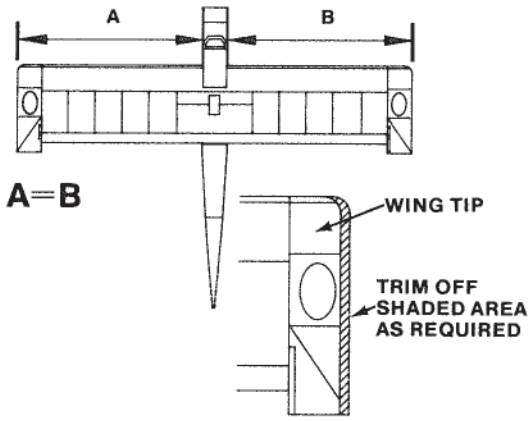


☐ 92. Insert a 4-40 T-nut into the hole in the underside of the rear wing hold-down block. Place a washer over a 4-40 x 1" socket head cap screw and insert the screw into the hole in the wing hold-down block. Tighten the screw to draw the T-nut into the hold-down block, as shown.



☐ 93. Carefully remove F-4 from the fuselage. It is no longer needed.

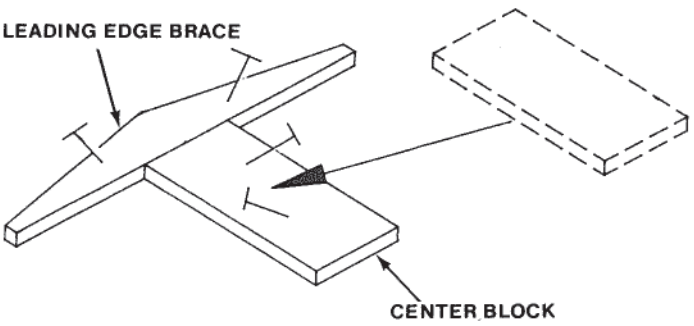
☐ 94. Install the remaining 1/16" bottom sheet with Slow CA.



☐ 95. Due to slight differences in construction techniques, there may be a slight difference in the span of each wing on your model. With the wing bolted in place, measure from the fuselage sides to each wing tip, as shown. If there is a difference in span, trim the wing tip of the longer wing, as shown, to equalize the span.

Tail Assembly

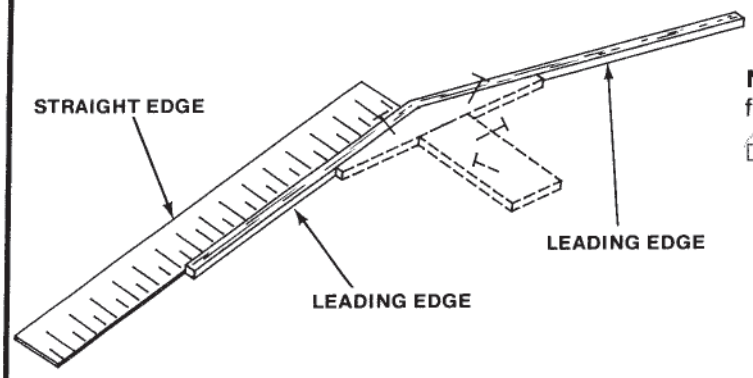
Stabilizer



☐ 96. Lay the plan flat on your building board, so that the drawing of the stabilizer is completely over the building board. Then, cover the stabilizer drawing with plastic wrap.

☐ 97. Align the pre-cut 3/16" balsa leading edge brace over the drawing of this part on the plan and pin it in position.

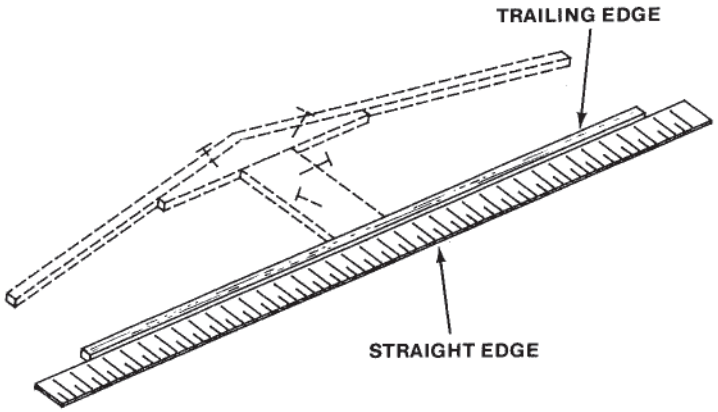
☐ 98. Apply Slow CA to the 3/16" x 1-1/4" x 2-25/32" center block. Align it over the drawing of this part on the plan. Butt it tightly against the leading edge brace and pin it in position.



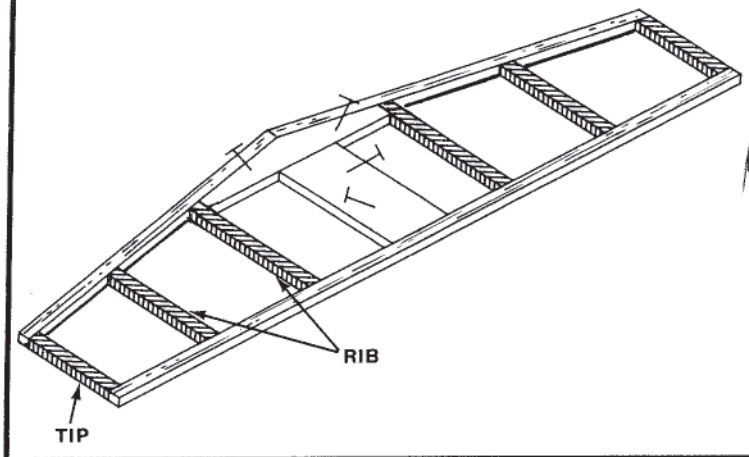
Note: All of the remaining stabilizer parts are to be cut from the two 1/4" x 3/16" x 24" balsa strips.

☐ 99. Use the plan as a pattern to cut the two leading edges from the balsa strips. Apply CA to each leading edge. Butt them against the leading edge brace and pin them in position.

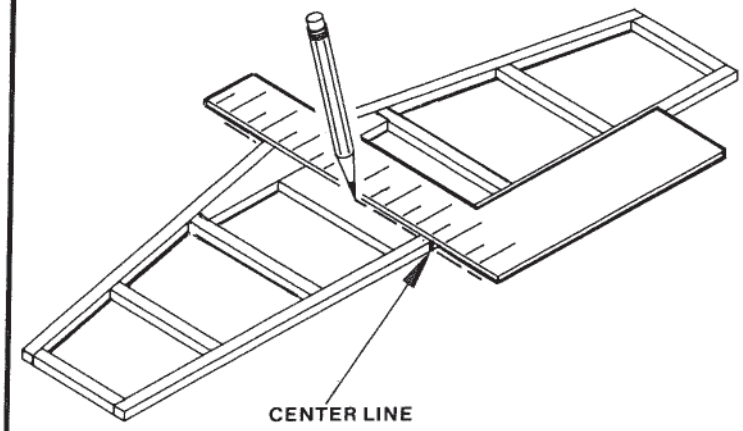
Note: Pull each leading edge against a straight edge when pinning them down, as shown, to insure that they are held straight.



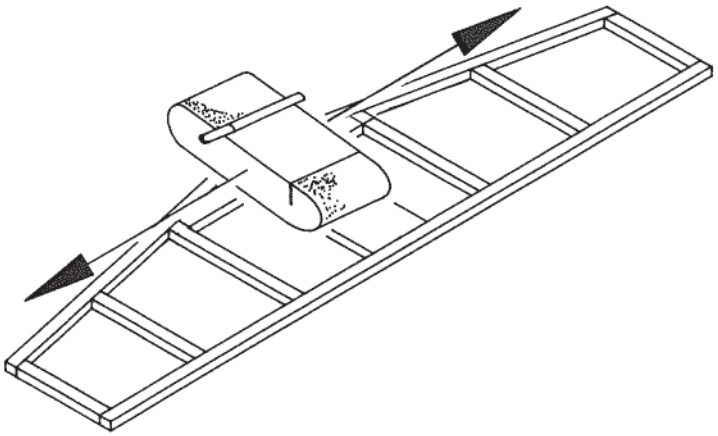
☐ 100. Use the plan as a pattern to cut the trailing edge. Apply Slow CA to this part and butt it against the center block. Align it with the drawing and pin it in position. Again, use a straight edge while pinning it in place, as shown.



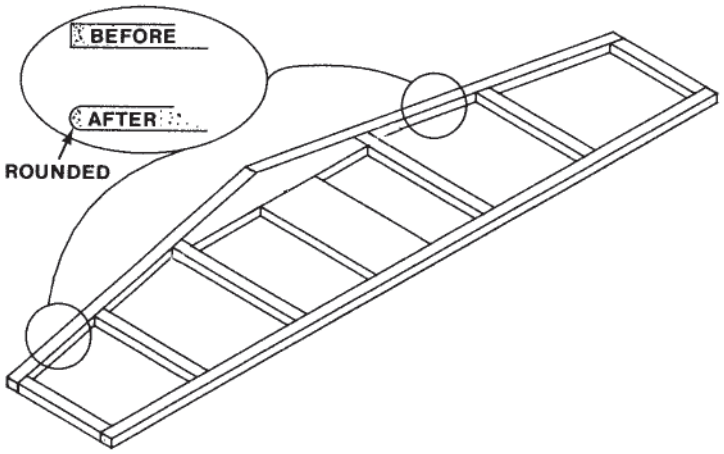
☐ 101. Cut the stabilizer tips and ribs from 1/4" x 3/16" balsa to fit snugly in place between the leading and trailing edges, at the locations shown on the plan. Position each of these parts and apply CA to the joints.



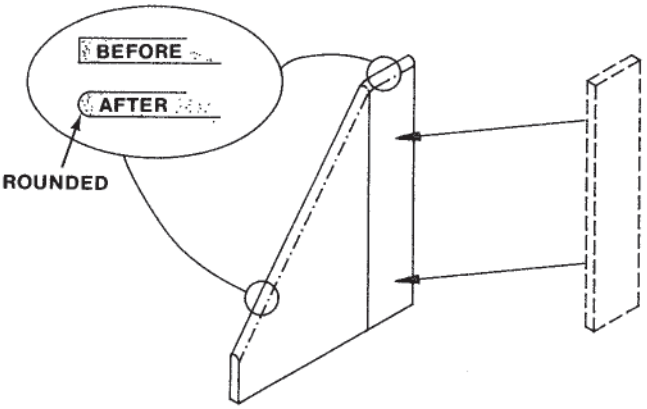
☐ 102. Mark the stabilizer centerline, as shown on the plan.



☐103. Remove the stabilizer from the plan and lay it flat on your building board. Use a sanding block to sand each side of the stabilizer, to ensure that all the joints are flush.



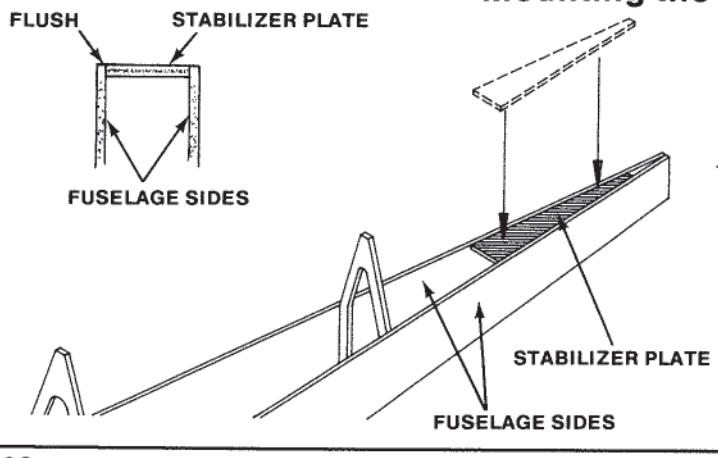
☐104. Use a sanding block to round off the leading edges, as shown.



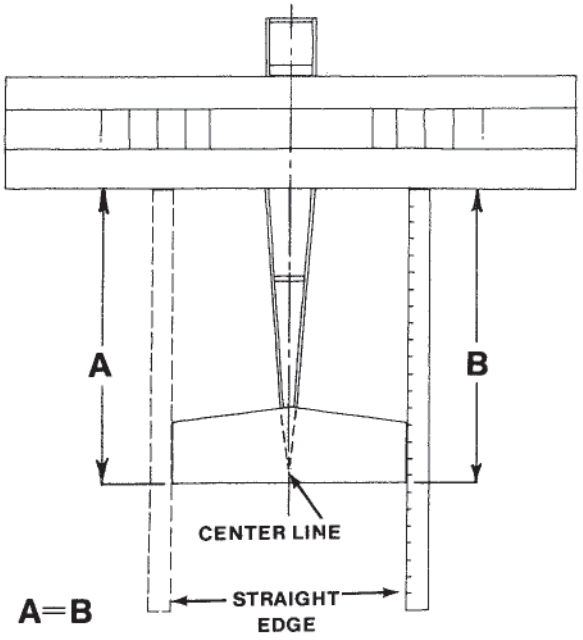
☐105. If necessary, eliminate any gaps by using a sanding block to sand the mating edges of the 3/16" balsa fin parts. Position them on the plan, which has been covered with plastic wrap, and join them with Slow CA.

☐106. Use a sanding block to round off the leading edge of the fin.

Mounting the Tail Assembly

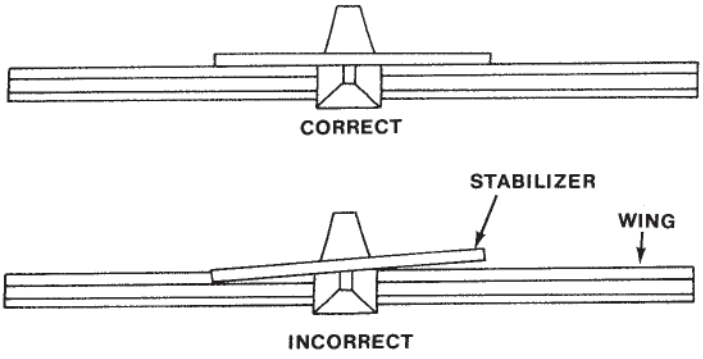


☐107. Sand the edges of the die-cut balsa stabilizer plate so that it fits snugly between the fuselage sides when in contact with the tailpost. Align the stabilizer plate flush with the top edges of the fuselage sides, then bond the stabilizer plate in place with CA.



☐108. Bolt the wing to the fuselage.

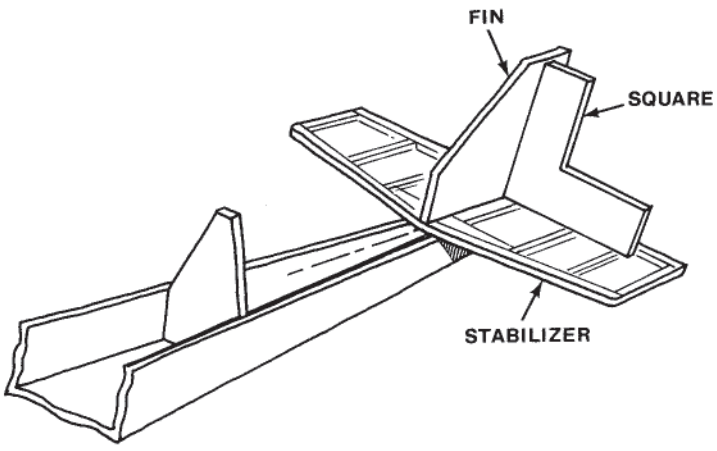
☑109. Lay the stabilizer on the stabilizer plate, so that the centerline mark on the trailing edge is centered on the rear edge of the fuselage. Using a 36" straight edge, measure the distance from the stabilizer trailing edge to the trailing edge of the wing, as shown. When both distances are the same, and the stabilizer centerline mark is centered on the rear edge of the fuselage, push several T-pins vertically through the stabilizer into the stabilizer plate.



☐110. Sight across the stabilizer and the wing to align the stabilizer parallel with the wing, as shown. Make any necessary adjustments to the stabilizer plate with a sanding block.

☐111. With the stabilizer pinned to the plate, check the incidence with an incidence meter. The reading should be the same as the wing and F-1.

☐112. When the stabilizer rests squarely on the stabilizer plate and the incidence is correct, remove the stabilizer. Push the T-pins through the pin holes in the stabilizer so they stick out of the bottom about 1/2". Apply Slow CA to the stabilizer plate, then using the T-pins to locate the pin holes in the plate, press the stabilizer into position. When the Slow CA has cured, remove the T-pins by twisting them to break them out of the CA, then pull them out.



☐113. Apply Slow CA to the bottom of the fin. Position the fin over the centerline on the stabilizer, and then, using a square as shown, press the fin into position. Be certain that the leading and trailing edges of the fin are centered over the centerline on the stabilizer.

Radio and Pushrods

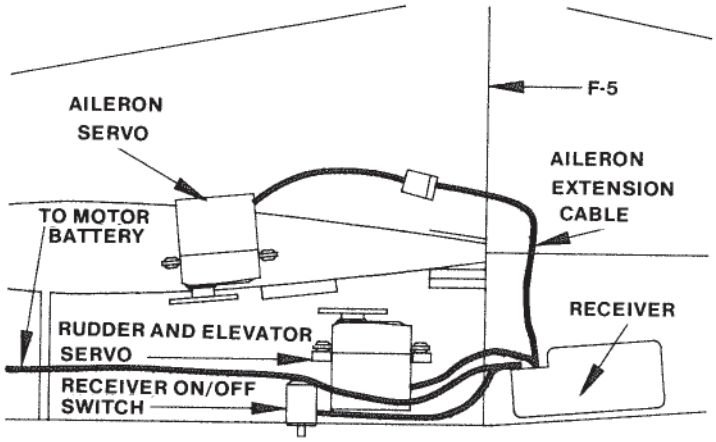
When the fuselage is open on the top side, the radio and the elevator and rudder pushrods can be installed very easily. The following general instructions, illustrations, and the plan will assist you with these installations. Since this is a sport model, it is assumed that the builder has prior experience installing radios and making up pushrods and linkages. Therefore, these instructions only highlight the installation of these components.

Due to space and weight limitations in electric models, the locations of the receiver and the receiver battery can be somewhat different than in gas powered models. Most of the popular brands of radios can be installed in the model without difficulty. However, with some brands of radios you may find it necessary to use extention cords to connect some of the servos, or the receiver battery, to the receiver.

The instructions in this construction manual also cover the installation of radios specifically designed for electric models. There is enough room in the fuselage so that the 8.4 volt motor battery can be positioned to adjust the center of gravity, compensating for either radio installation.

Note: Only the radio, elevator, and rudder pushrods are to be installed now. The motor and switch installation, motor battery, and the aileron pushrods will be covered later in construction.

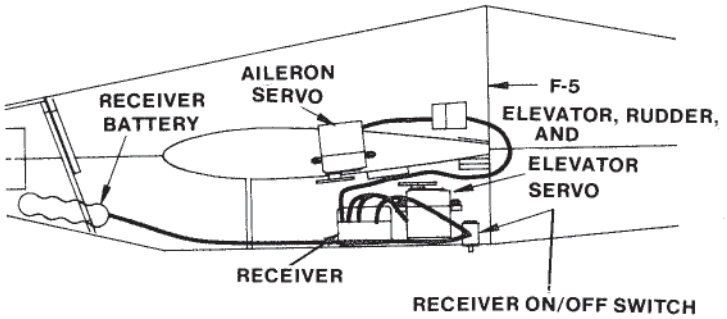
B.E.C./Electronic Throttle Radios



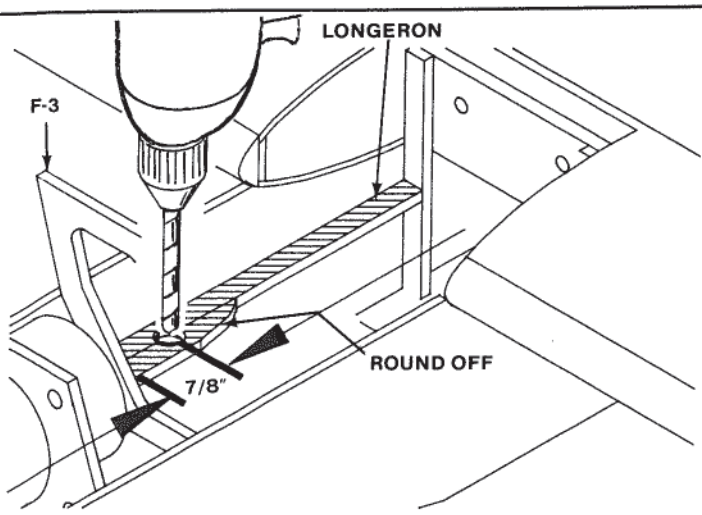
If you are going to install a radio with a built-in electronic throttle and/or B.E.C. (battery eliminator circuit), position the radio components as shown here. Note that the aileron extension is to pass through the upper hole in F-5 and over the top of the wing. This routing will prevent this wiring from fouling the aileron pushrods and will allow you to unplug the aileron servo before removing the wing.

Note: Also, read "Electronic Throttles", pages 56 - 57.

Conventional Radios



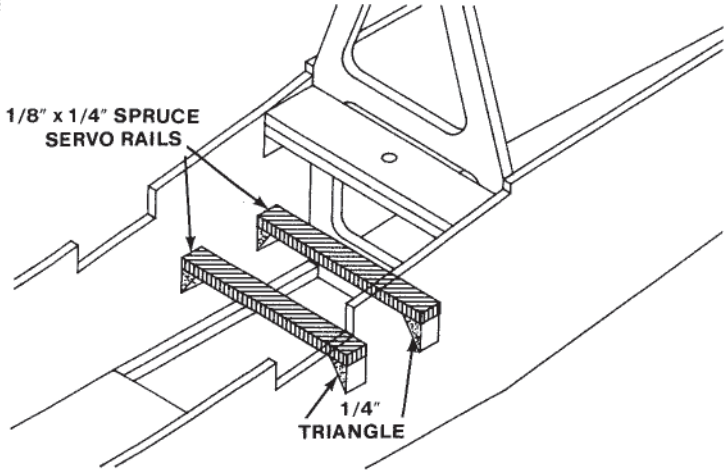
For clarity the receiver and its battery pack are not shown on the plan. Depending on the radio equipment you will use, the position of these components will vary. Shown here is an installation used by Midwest Products in its testing. You should position these components in the model wherever necessary to achieve the balance point (center of gravity), indicated on the plan. In some installations servo extension leads might be necessary. Check the lead lengths of your servos to be certain they will reach the receiver.



The on/off switch provided with the motor will be connected to one servo for motor control (throttle). To make the switch mount, cut a 1-1/4" length from a 1/8" x 1/4" piece of spruce. Use Slow CA to glue it against F-3 and the longeron on the **right** side of the fuselage. Carefully drill a 1/4" hole 7/8" back from F-3 and on the joint, then use an X-acto knife to round off the back edge of the switch mount.

Note: Do not install the motor or switch at this time. These components will be installed later in construction.

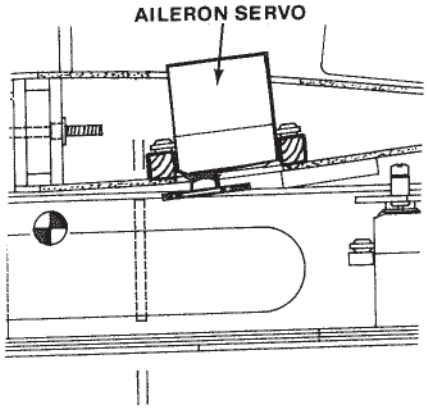
All Radios



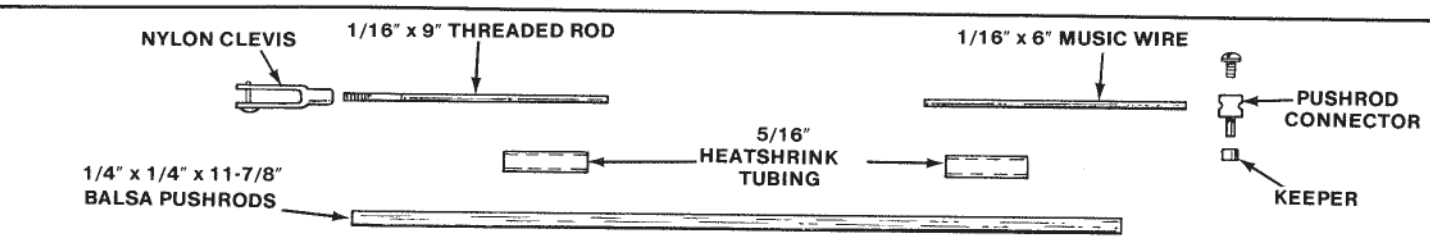
The two 1/8" x 1/4" x 2-7/16" spruce strips are to be used for the servo rails in the fuselage. Glue them into the fuselage with Slow CA at the positions shown on the plan. Then glue 1/4" triangle stock braces under each servo rail with Slow CA, as shown here.

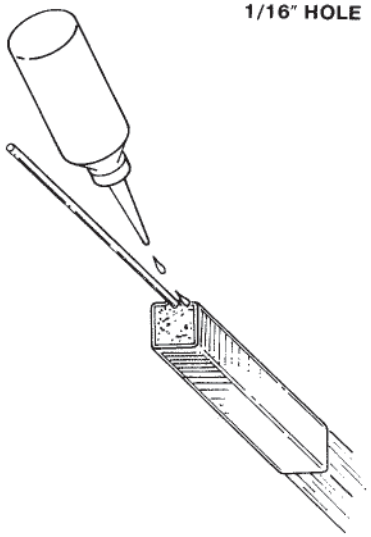
Note: For clarity, these triangle braces are not shown on the plan.

If you intend replacing the throttle servo with an add-on electronic throttle, this component should be installed in the same position as the throttle servo.



The aileron servo rails are already installed and the installation is shown on the plan. This is a non-standard installation that positions the aileron servo's output arm at a level that will allow the pushrods to have a fairly straight run through the fuselage sides, and provide clearance from the motor battery. Fit the aileron servo at this time. However, **do not** make the aileron pushrods. They will be made and adjusted later in construction.

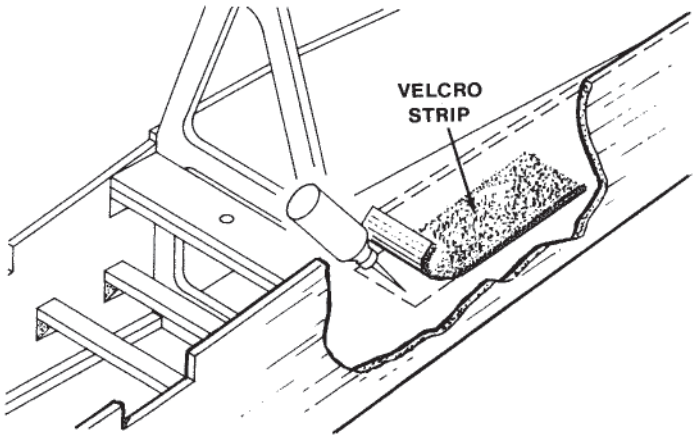




The rudder and elevator pushrods are made as shown here and on the plan. For now, make them long enough, so that the pins in the clevises are located in line with the fin and stabilizer trailing edges when the clevises are screwed onto the pushrods and the pushrods are connected to the pushrod connectors on the servos. This will provide enough length to adjust the clevises later in construction, after the control surfaces are installed.

Drill 1/16" diameter holes in the balsa pushrods. Cut and bend the music wire and threaded rods, as shown at left, then insert the wire and rods into the holes.

Note: After shrinking the heat shrink tubing around the pushrod ends, run CA into the ends of the wood pushrods to bond the parts together.

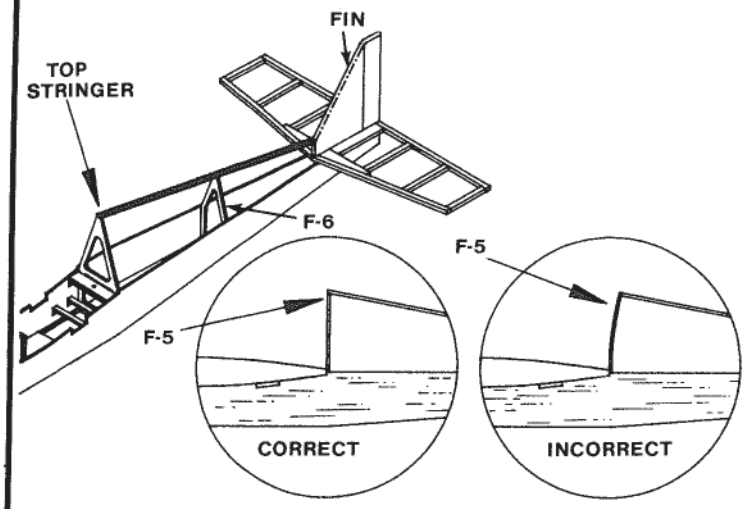


The Velcro supplied with the kit is to used to mount the receiver, receiver battery (if used), and motor battery, as shown on the plan. Although it has a self-adhesive backing, we recommend that you apply Slow CA to the adhesive side of the pieces that contact the wood in the model.

Fuselage Upper Decks

The removable cockpit provides quick access to the flight battery, wing bolts, and radio. Careful attention must be payed to fitting the upper bulkheads, forward fuselage cap, and the turtle deck stringer if the cockpit is to fit properly. Study the plan and instructions before starting assembly to be certain you understand how these parts relate to one another.

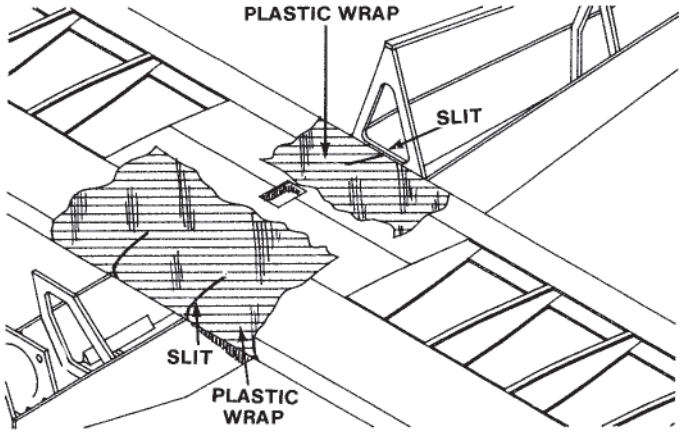
Removable Cockpit



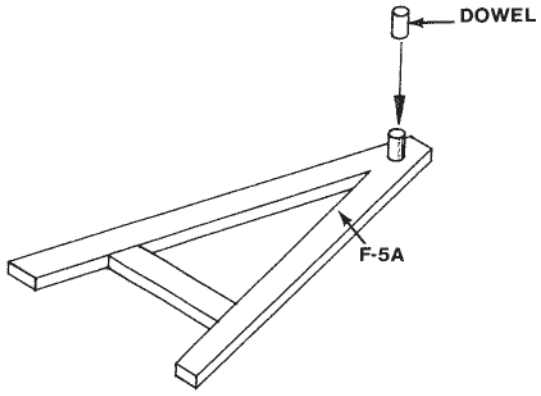
☐114. Remove the pushrods and radio components from the model.

☐115. Cut the 1/8" x 3/16" x 13-1/2" balsa top stringer to fit on top of F-5 and butt against the front edge of the fin, as shown here and on the plan. Sand, or build up the top of F-6, so that this stringer is straight when in position and resting on F-6. Then, glue the top stringer in position with CA, centered on the bulkheads and flush with the sides of the fin, as shown.

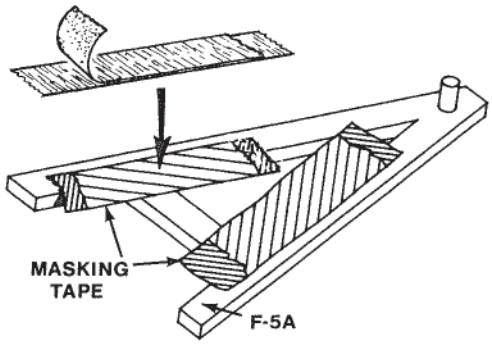
Note: Be careful not to bend F-5 when fitting and gluing the top stringer. F-5 is to remain straight and perpendicular to the upper fuselage edges, as shown.



☐116. Wrap a piece of plastic wrap around the wing center section. Cut a slit in the plastic wrap to provide access to the bolt holes, then bolt the wing to the fuselage. **Do not** remove the wing again until told to do so.

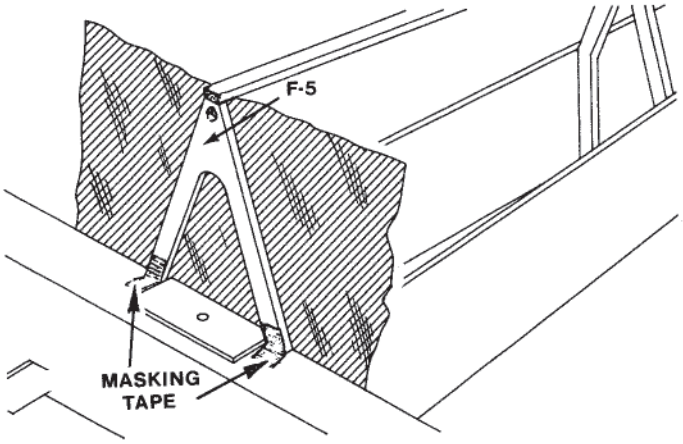


☐117. Fit the 3/16" x 3/8" dowel into the hole in F-5A. Glue it in place with CA.

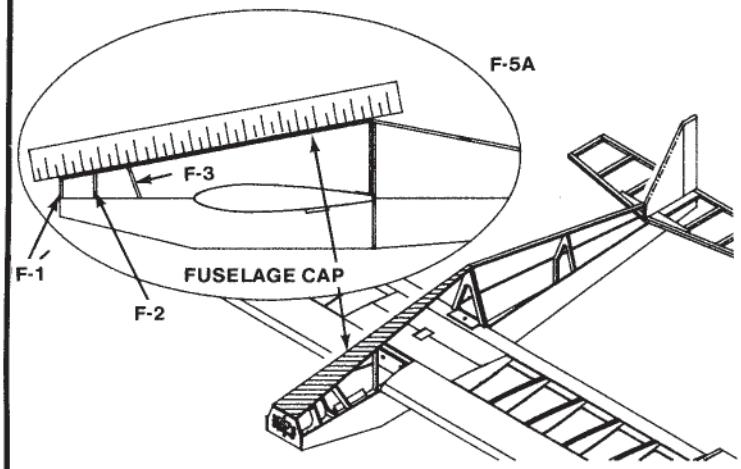


☐118. Apply two layers of masking tape to each side of the back of F-5A, as shown here. Be certain that the masking tape does not overlap the outside edges of this part.

Note: The masking tape will act as a spacer to provide a gap between the cockpit and the fuselage. This gap provides the clearance necessary to remove the finished cockpit.

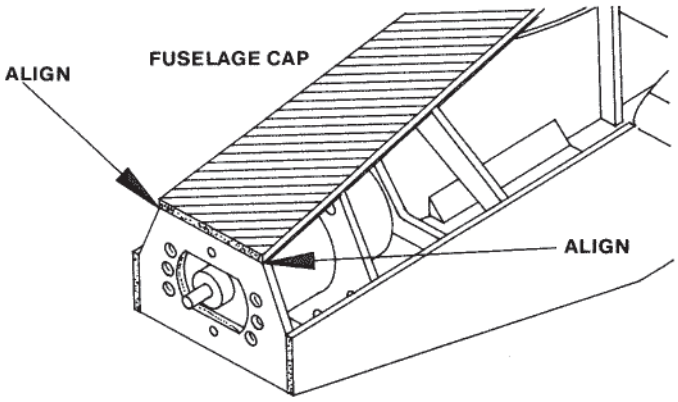


☐119. Cover F-5 with a small piece of plastic wrap. Cut a slit in the plastic wrap over the dowel hole and insert the dowel in F-5A into the hole in F-5. If necessary, trim the bottom edge of F-5A to just clear the wing. Align the edges of the two bulkheads flush. Then, press **small** pieces of masking tape into the corners of F-5A and the wing to hold F-5A against F-5, as shown.

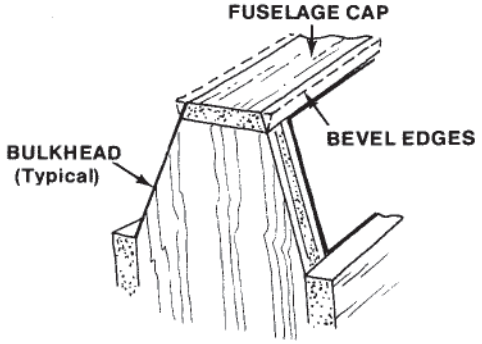


☐120. Use a sanding block to sand the top edges of F-1, F-2, and F-3, so that the 3/32" balsa die-cut forward fuselage cap lays flat on these bulkheads when in place and contacting F-5A.

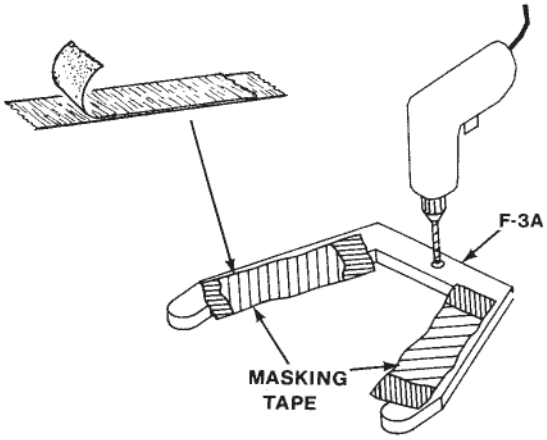
Note: Use a straight edge to check the alignment of these edges, as shown here.



☐121. Glue the forward fuselage cap to F-1, F-2, F-3, and F-5A with Slow CA. Align the edges of the forward fuselage cap with the corners of the bulkheads, as shown.

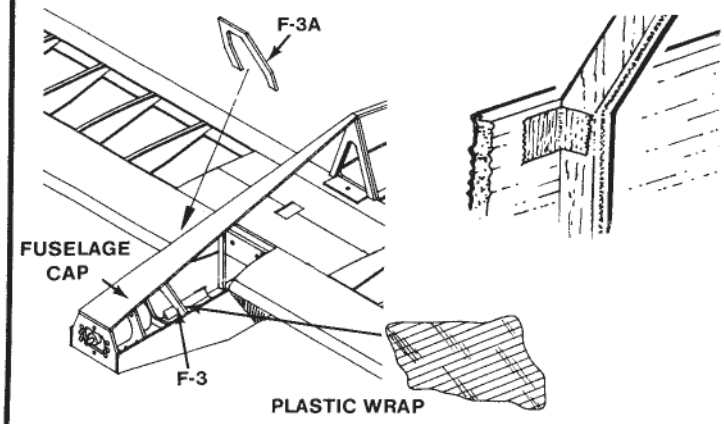


☐122. Use a sanding block to bevel the edges of the forward fuselage cap flush with the angled edges of the bulkheads.



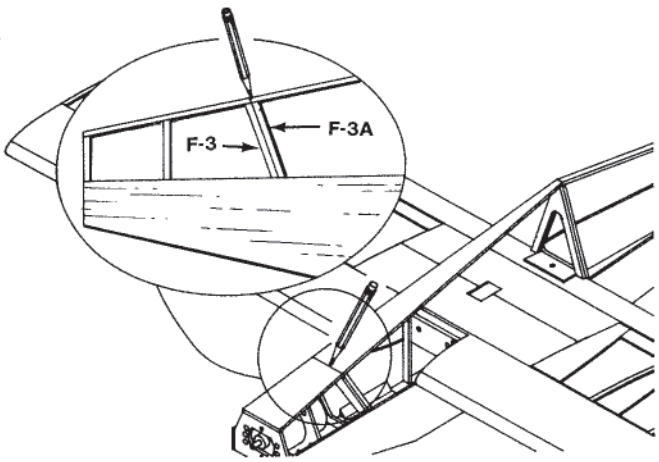
☐123. Drill a 5/32″ hole through the indented mark on F-3A.

☐124. Apply two layers of masking tape to one side of F-3A, as shown here. Be certain that the masking tape does not overlap the outside edges of this part.

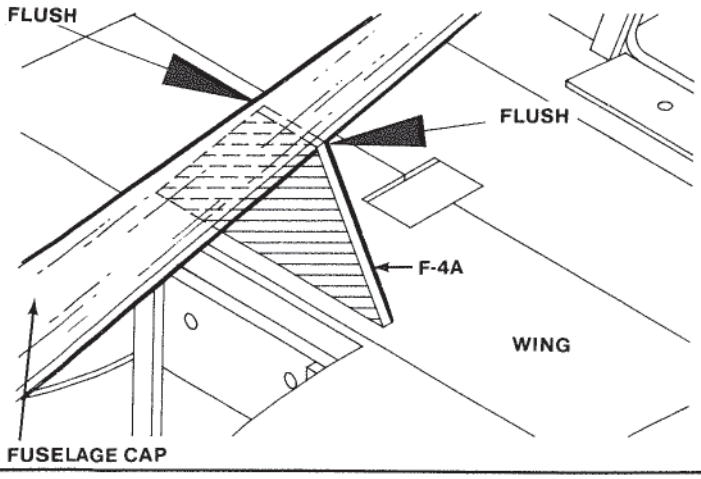


☐125. Cover F-3 with a piece of plastic wrap.

☐126. Apply Slow CA to the top edge of F-3A. Insert F-3A between the fuselage sides, with the masking tape facing F-3. Press F-3A against F-3 and up against the forward fuselage cap. Press **small** pieces of masking tape into the corners of F-3A and fuselage sides to hold F-3A against F-3, as shown.

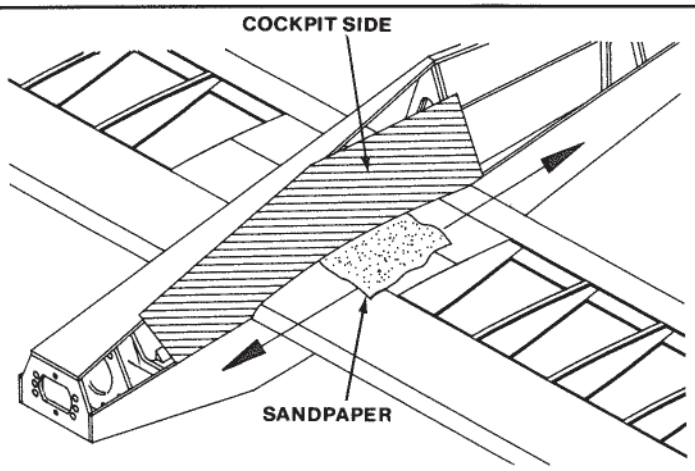


☐127. Use a pencil and straight edge to lightly draw a line across the forward fuselage cap between F-3 and F-3A. Later in construction, the forward fuselage cap and cockpit will be cut from the fuselage **on** this line. The position of this line is critical; mark it carefully.



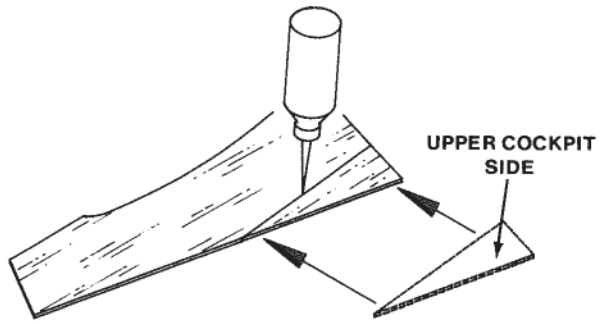
☐128. Test-fit F-4A between the wing and forward fuselage cap, at the position shown on the plan. Glue F-4A to the forward fuselage cap with CA, so that its top corners are flush with the edges of the top cap, as shown.

Note: If necessary, sand the **bottom edge only**, so that this part fits snugly, without bending the forward fuselage cap.



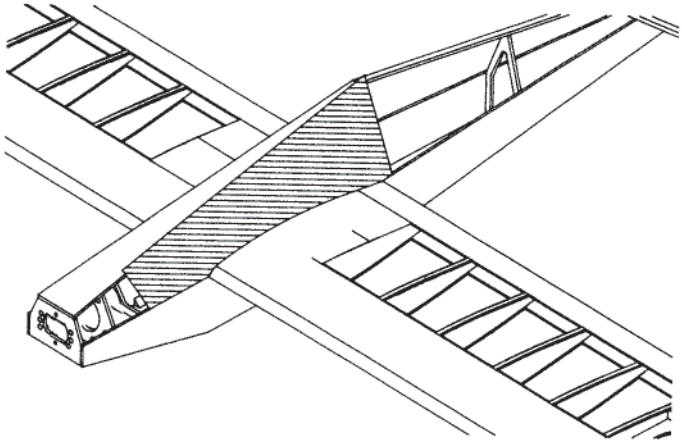
☐ ☐129. Test-fit one die-cut 3/32" balsa cockpit side against the wing and fuselage cap, between F-3A and F-5A. Lay a piece of #80 grit sandpaper, grit side up, between the wing and cockpit side to contour and bevel the edge of the cockpit side for a close fit against the wing. When properly shaped, the cockpit side should be in contact with the wing and the upper edge of the fuselage side. The cockpit sides are longer than necessary to allow for fitting. The ends will be trimmed later in construction.

Note: There may be a small gap between the cockpit side and the wing leading edge sheeting. This will be filled later in construction.



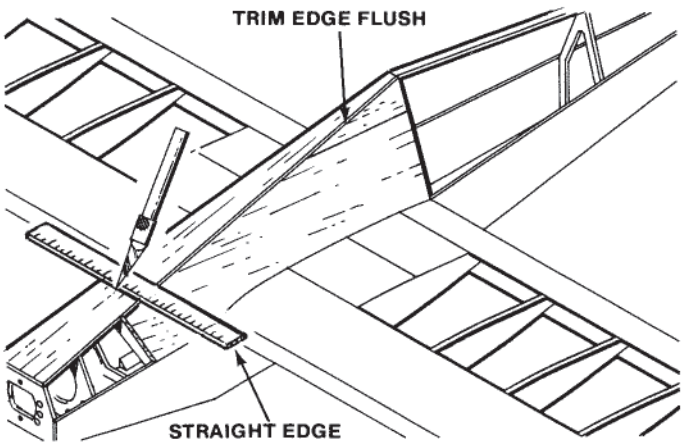
☐ ☐130. Cut an upper cockpit side from the 3/32" x 3" x 11-7/8" balsa sheet to fill in the area at the top of the cockpit side. Lay the cockpit side and this part on a piece of plastic wrap. Butt them together and run CA into the joint, as shown.

Note: All of the cockpit and turtle deck upper sides, and the forward fuselage upper sides are to be cut from this 3/32" x 3" x 11-7/8" balsa sheet.

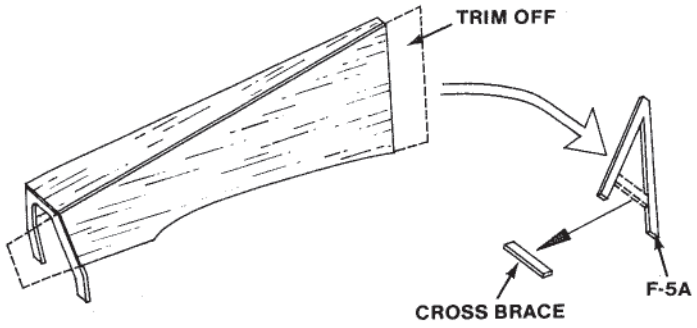


☐ ☐131. Fold the plastic wrap between the bulkheads over F-3 and F-5. Carefully apply Slow CA to the edges of F-3A, F-4A, F-5A, and the forward fuselage cap. Position the cockpit side on the wing and fuselage and press it into place.

☐132. Repeat Instructions #129 through #131 to fit and install the opposite cockpit side.



☐133. Use an X-acto knife to trim the top edge of the cockpit sides flush with the forward fuselage cap. Use a straight edge and X-acto knife to cut through the pencil line on the forward fuselage cap.

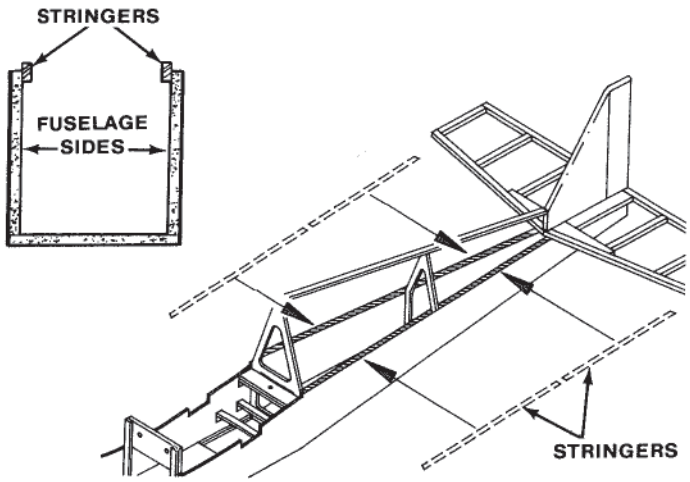


☐134. Lift up on the front portion of the cockpit and remove it from the fuselage.

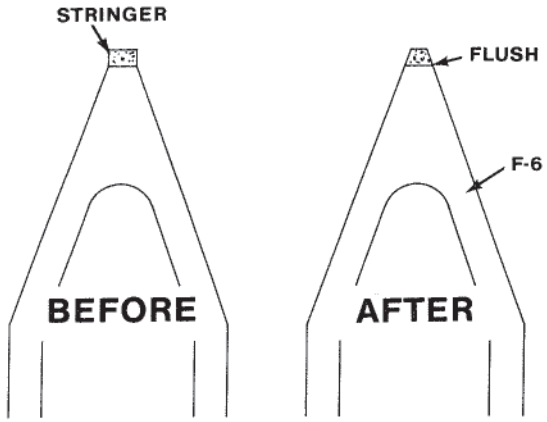
☐135. Use an X-acto knife and sanding block to trim the ends of the cockpit sides flush with F-3A and F-5A, as shown, then remove the cross brace on F-5A with a sharp X-acto knife.

☐136. Remove the wing from the fuselage. Remove any remaining plastic wrap and masking tape from the wing and cockpit.

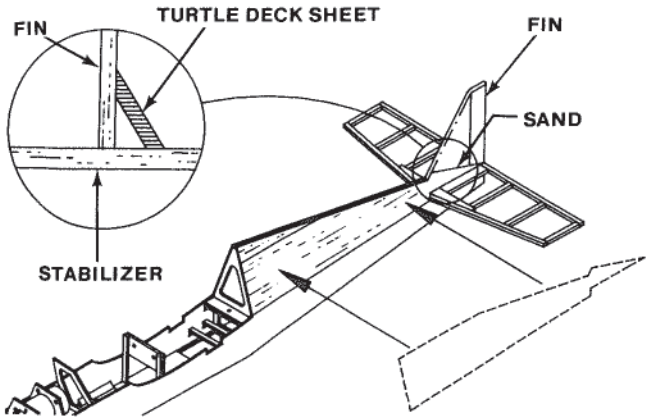
Turtle Deck



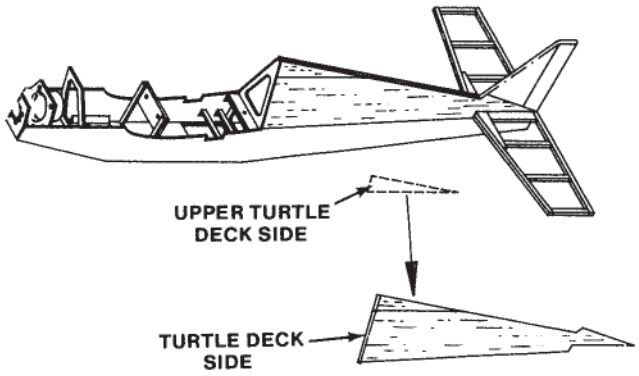
☐137. Cut and fit the two balsa fuselage stringers from the remaining 1/16" x 3/16" balsa strips. Use Slow CA to glue them to the top inside edge of the fuselage. They are to be positioned slightly above the top edge of the fuselage, as shown on the plan. These stringers will provide a step to help position the turtle deck sheeting.



☐138. Sand the edges of the stringer flush with the edges of F-6.



☐ ☐139. Fit a die-cut 3/32" balsa turtle deck sheet to one side of the fuselage and tail assembly. Sand a bevel in the portion of the sheet that contacts the fin, so that the sheet blends into the fin. Temporarily pin this sheet in place.



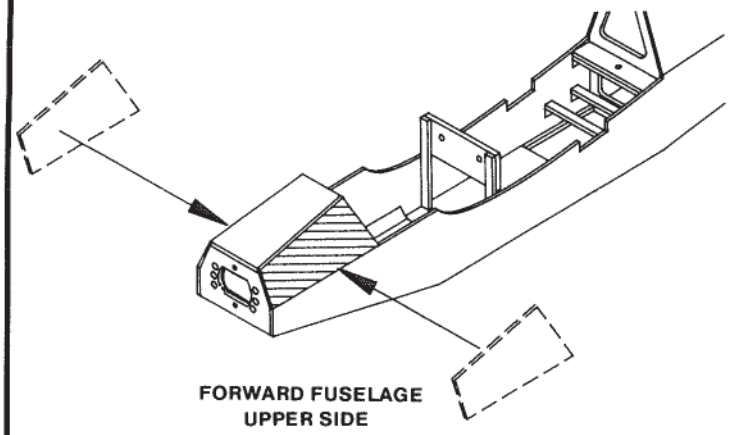
☐ ☐140. Cut an upper turtle deck side, as shown, from the 3/32" x 3" x 11-7/8" balsa sheet used in Instruction #130.

☐ ☐141. Remove the two turtle deck sides from the fuselage and lay them on a piece of plastic wrap. Butt them together and run CA into the joint.

☐ ☐142. Glue the assembled turtle deck sides in place on the fuselage with Slow CA. Sand the edges flush with the front of F-5 and the top stringer.

☐143. Repeat Instructions #139 through #142 to fit and install the turtle deck sheeting on the opposite side.

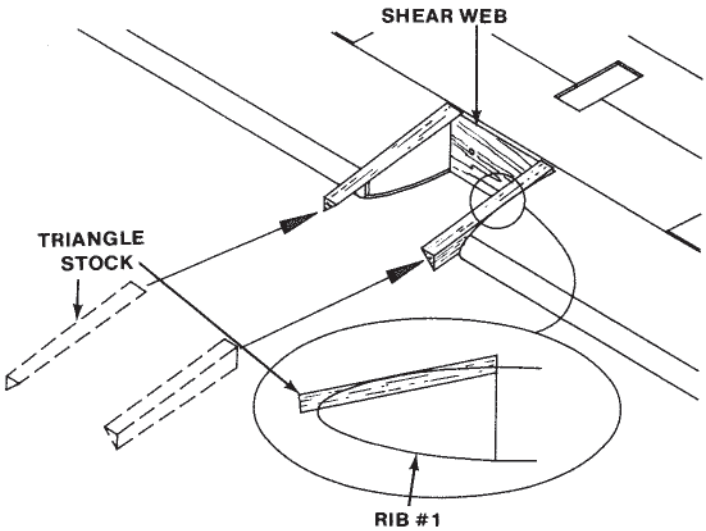
Forward Deck



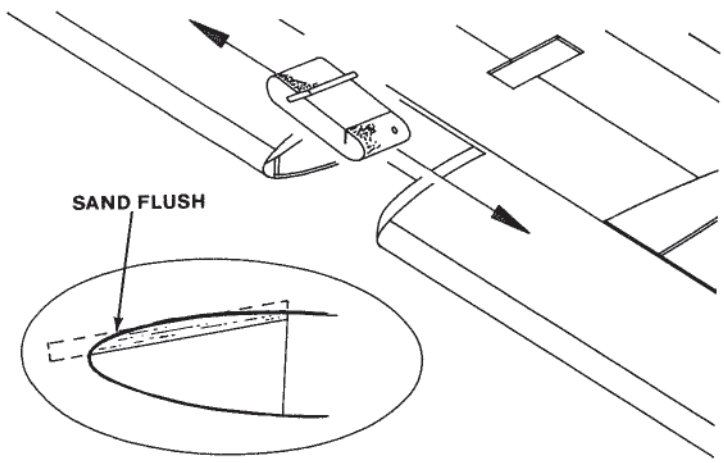
☐144. Use the remaining portion of the 3/32" x 3" x 11-⅞" balsa sheet to make the forward fuselage upper sides. Glue these parts in place with Slow CA. Then, trim their edges flush with F-1, F-3, and the forward fuselage cap.

Wing Fairing

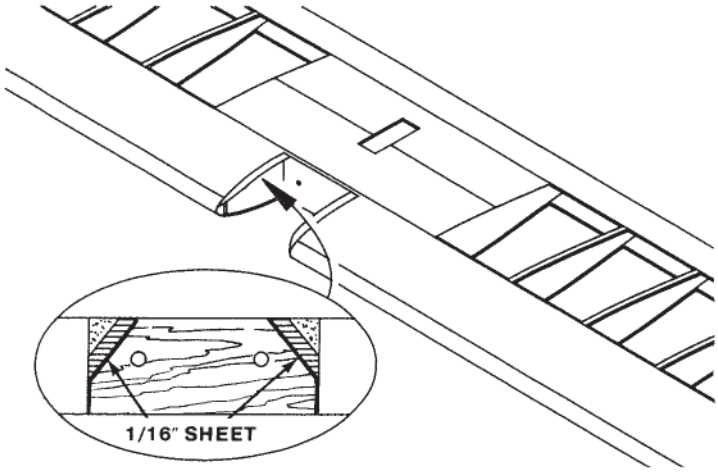
Due to slight differences in construction techniques, there may be a small gap between the wing leading edge and cockpit. This sub-assembly will show you how to fill that gap.



☐145. Cut two pieces of 1/4" triangle stock to fit between the Micro-Lite plywood shear web and the leading edge of the wing, as shown on the plan. Use Slow CA to glue these parts to the #1 ribs. They are to be positioned so they are flush with the upper leading edge sheeting in the middle with their ends sticking up above the leading edge sheeting.



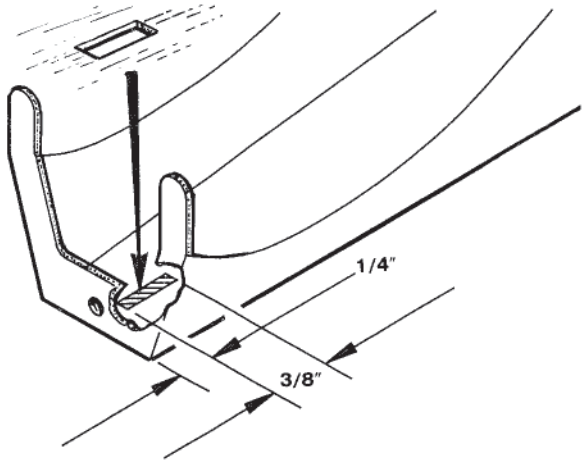
☐146. Use a sanding block to sand the triangle stock flush with the leading edge sheeting.



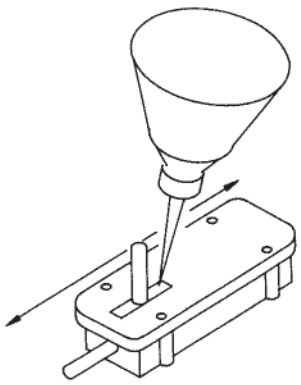
☐147. Bolt the wing to the fuselage.

☐148. Place the cockpit in position on the fuselage and wing. If a gap still exists between the wing and cockpit sides, use Slow CA to glue strips of scrap 1/16" sheeting against the sides of the triangle stock, as shown. Sand this sheeting flush with the wing, as explained in Instruction #146.

Cockpit Latch

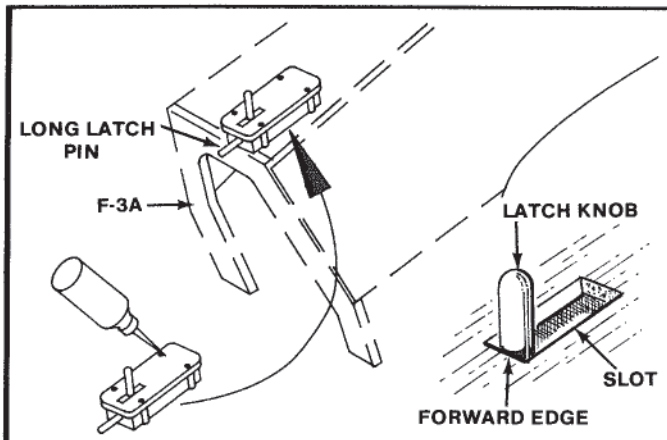


☐149. Working from the **inside** of the cockpit, cut a 3/32" x 3/8" slot through the top cap. This slot is to be located 1/4" behind F-3A. Be certain to align the slot with the hole in F-3A, as shown.

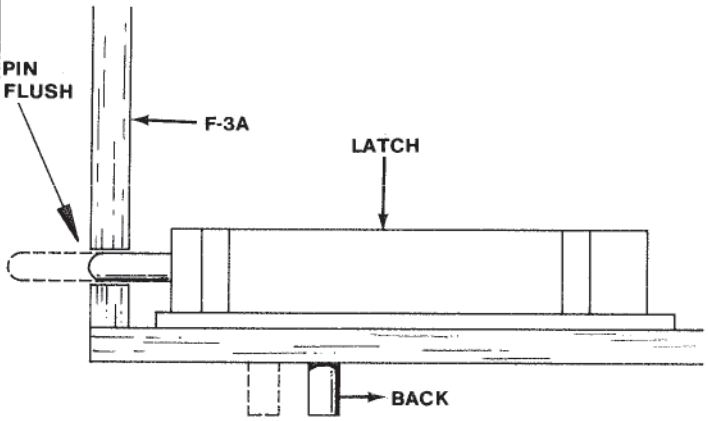


☐150. Run a small amount of light oil into the slot in the cockpit latch. Work the latch knob back and forth to distribute the oil in the slot, then wipe any excess oil from the latch.

Note: The oil will prevent the latch mechanism from accidently being bonded to the wood when the latch is glued in place. **Do not** omit it.

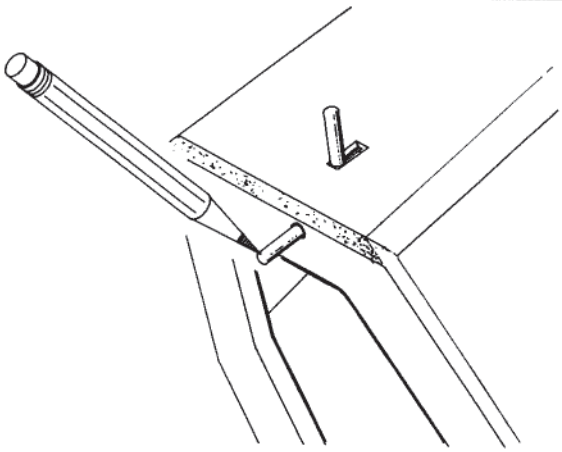


☐151. Place a small drop of Slow CA on each corner of the underside of the latch as shown. Insert the long latch pin through the hole in F-3A. Insert the short latch knob through the slot in the top cap. Position the latch so that the latch knob touches the forward end of the slot. Align the latch perpendicular to F-3A and press it into contact with the top cap.



☐152. Move the latch knob all the way back, checking for free operation of the latch. Also check that the long latch pin retracts flush with the front side of F-3A, as shown.

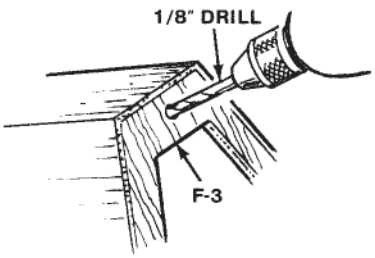
Note: If any portion of the latch pin sticks out of F-3A when the latch knob is pulled all the way back, use a razor saw to trim the excess material flush with the front side of F-3A.



☐153. Bolt the wing to the fuselage.

☐154. Rough-up the end of the latch pin with a piece of #220 grit sandpaper, then rub pencil lead on the end of the latch pin.

Note: Sanding the point of the latch pin will provide a surface that will accept and hold the pencil lead. The pencil lead will be needed to mark the latch pin location in the next instruction.



☐155. While holding the latch knob all the way back, fit the cockpit in position on the fuselage and wing. Align the front edges of the cockpit flush with the forward fuselage. Release the latch knob. Push forward on the latch knob, so that it leaves a mark on F-3, then pull the latch knob all the way back and remove the cockpit.

☐156. With a 1/8" drill bit, drill through the pencil mark left by the latch pin on F-3.

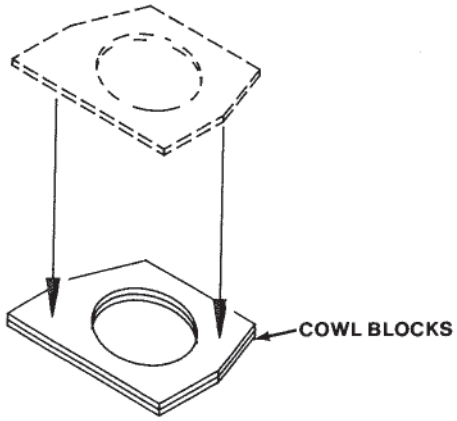
☐157. Re-install the cockpit on the fuselage, checking that the latch knob moves all the way forward when it is released.

Note: Due to slight dimensional differences in latch pins, it may be necessary to enlarge the hole in F-3 slightly to allow the latch pin to enter the hole.

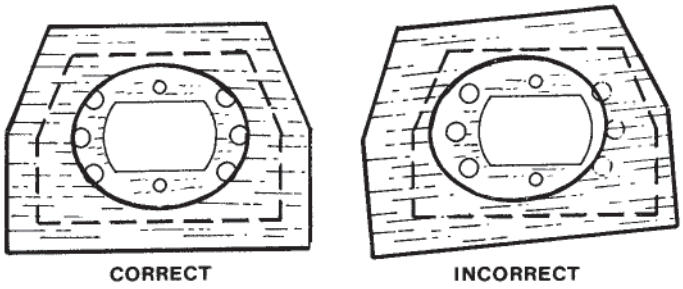
☐158. Remove the cockpit and wing from the fuselage.

Details

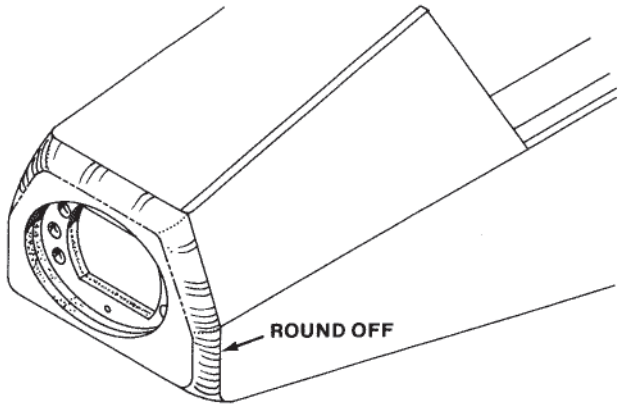
Cowl



☐159. Glue the two die-cut 3/32" balsa cowl blocks together with Slow CA.

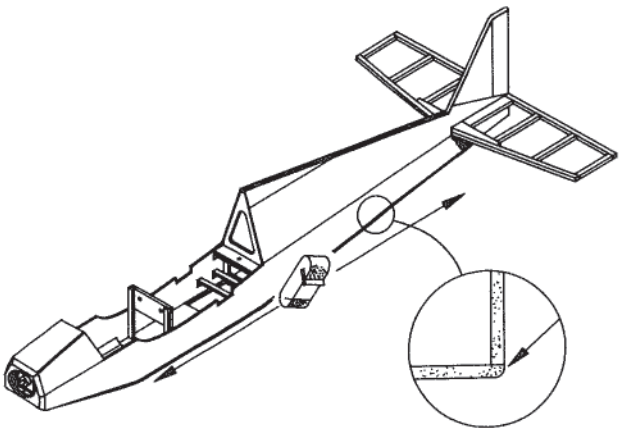


☐160. Glue the assembled cowl block to F-1 with Slow CA. The cowl block is oversize to allow for fitting. Position it so that its edges overlap the fuselage on all sides, making sure that none of the holes in F-1 are covered by the cowl block.



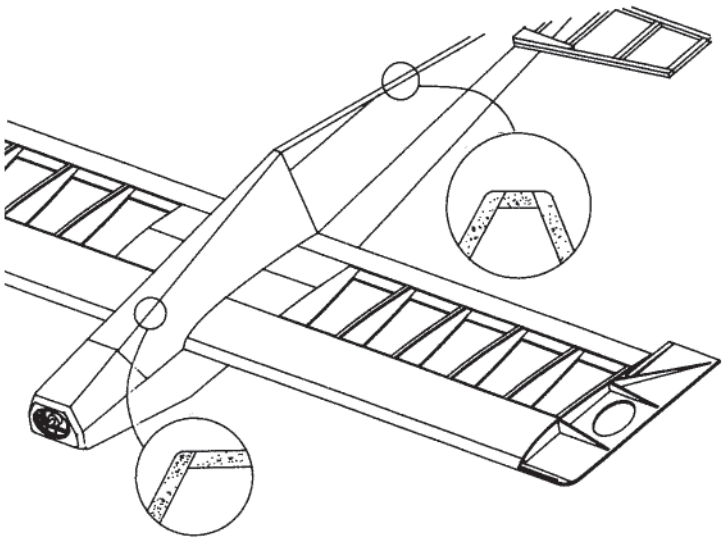
☐161. Use a sanding block and a piece of #80 grit sandpaper to trim the cowl flush with the fuselage and to round off its edges, as shown here and on the plan.

Sanding the Fuselage



☐162. Use a sanding block to sand the bottom sheeting flush with the fuselage sides and to round off the corners **slightly**, as shown.

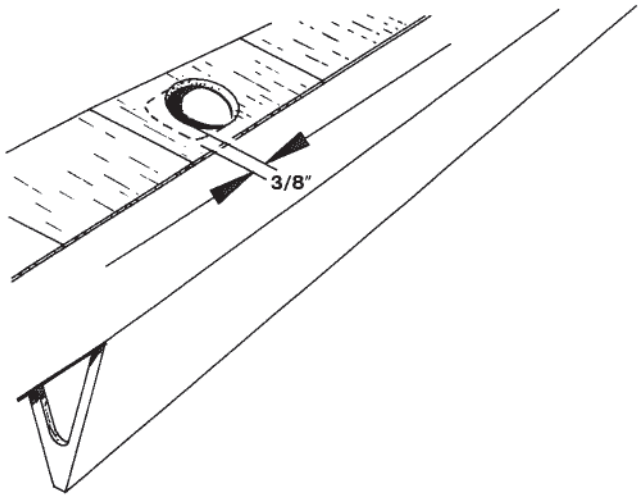
Note: Do not sand a large radius into the bottom sheeting as you could sand through the joints.



☐163. Place the wing and cockpit on the fuselage. Use a sanding block to round off the corners of the fuselage cap and top stringer. Also, sand the cockpit sides flush with the turtle deck and forward sheeting.

Cooling Air Exhaust

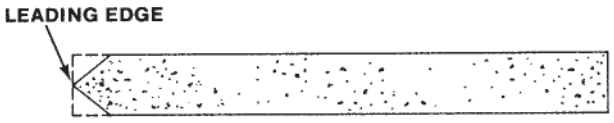
Electric powered models require cooling air to be ducted through the fuselage to dissipate heat generated by the motor and motor battery during flight. The holes in F-1 and F-2 allow air to enter the fuselage. However, an exit hole must be provided for this air to escape. Otherwise, the motor and motor battery could overheat; causing failure of these components.



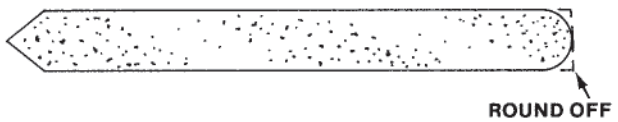
☐164. Use an X-acto knife to cut the cooling air exhaust hole into the bottom rear fuselage sheeting, at the location shown on the plan.

Note: If you intend using a radio equipped with an electronic throttle, we recommend that you enlarge the cooling air exhaust hole shown on the plan about 3/8" to insure adequate airflow.

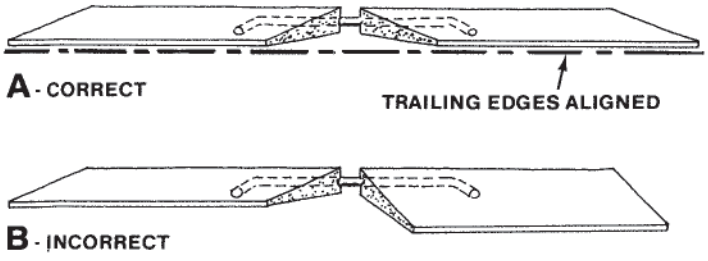
Control Surfaces



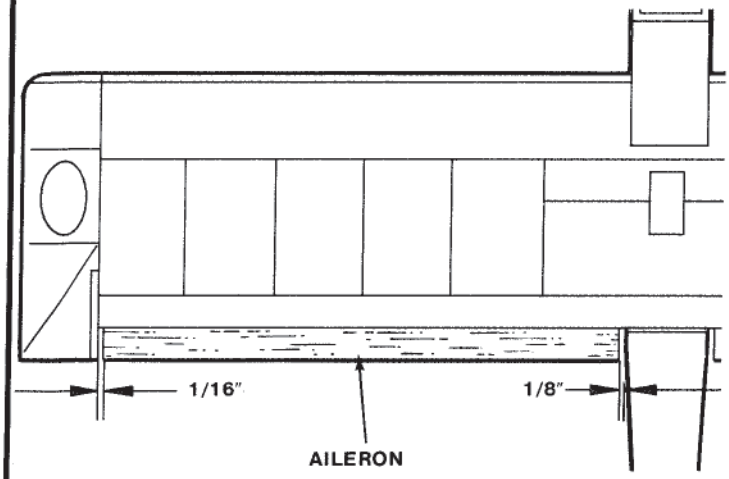
☐165. Bevel the leading edges of the pre-cut elevators and rudder with a sanding block, as shown on the plan.



☐166. Round the trailing edges of the elevators and rudder with a sanding block, as shown on the plan.



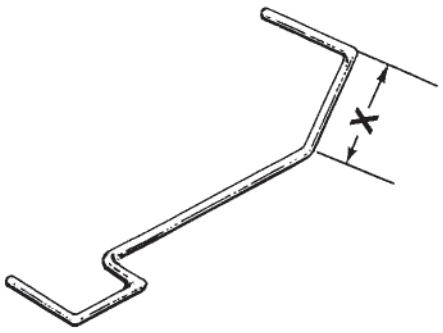
☐167. Cut a slot and drill a 1/16" hole in each elevator at the positions shown on the plan. Fit the elevator connector wire to the elevators. Make sure that the elevator trailing edges are aligned as shown in (A) with the connector wire in place. If necessary, bend the wire to get the correct alignment. Bond the wire to the elevators with CA.



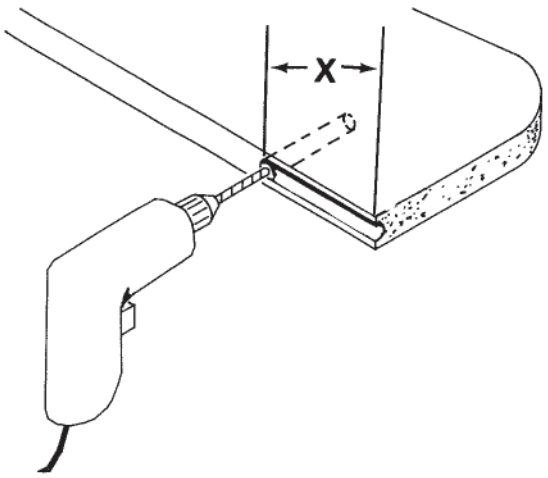
☐168. Both ailerons are to be made from the 1/4" x 1" x 36" pre-shaped balsa aileron stock. With the wing bolted to the fuselage, cut each aileron to a length that will clear the wing tip by 1/16" and the fuselage by 1/8", as shown on the plan.

Note: If you do not intend using the hinges supplied with the kit, we recommend that you cut the hinge slots and fit your hinges at this time. However, we recommend that you use the hinges supplied with the kit as they are very light, strong, and easy to install. Their installation will be covered later in construction.

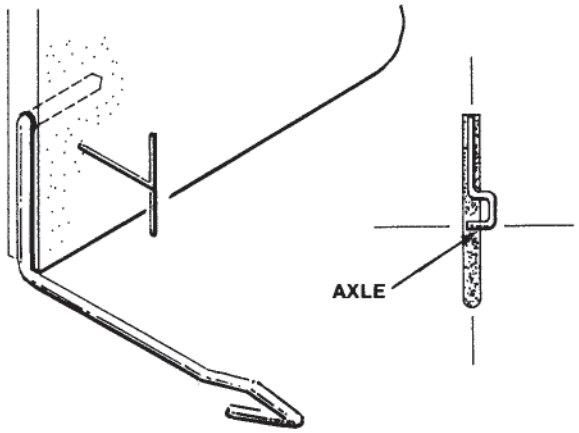
Tail Wheel Wire



☐169. The drawing of the tail wheel wire on the plan should be used as a pattern to make the final bends in this part.



☐170. Cut a slot and drill a 1/16" hole in the base of the rudder. The distance X is also the distance X shown in Instruction #169.

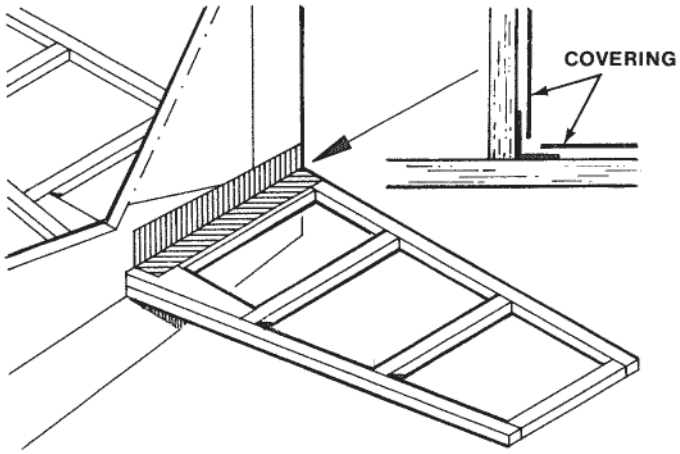


☐171. Fit the tail wheel wire into the slot and hole in the rudder. Align it so that the axle is perpendicular to the rudder, as shown. Bond the wire in place with CA, then use a T-pin to punch holes **half-way** through the rudder, around the area of the tail wheel wire, as shown. Do this on both sides of the rudder and run CA into these holes. This will saturate the wood with CA, making the wood around the tail wheel wire very strong.

Finishing

Materials

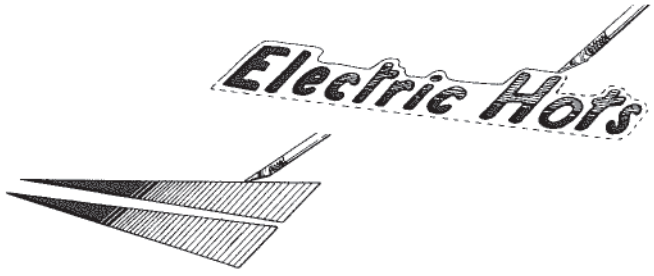
As mentioned earlier in this manual, weight is critical to performance in an electric model. In order to keep the maximum weight of your model at, or below 44 ozs., we recommend that you finish it **only** with one of the iron-on covering materials, such as Top Flite's Super Monokote.



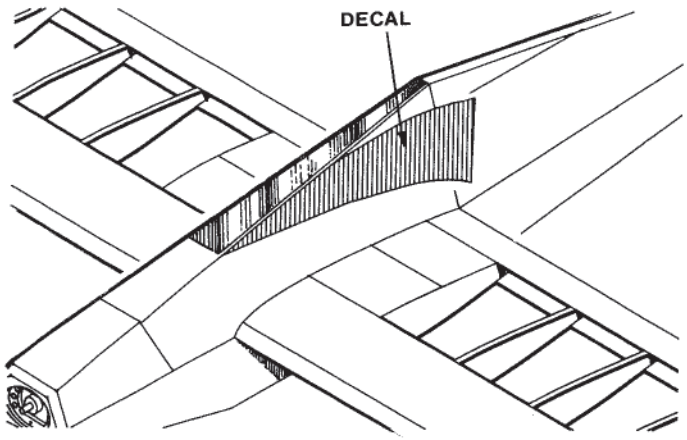
Some iron-on coverings will pull away from inside corners. To avoid having this happen, iron a strip of the material into the corner as shown, then butt the adjoining pieces into the corner. Avoid applying heat to both of the adjoining pieces at the same time.

Decals

The decals supplied with the kit are made of self-adhesive mylar. They are to be positioned as shown on the plan. Prior to applying them, it would be a good idea to clean the finish with rubbing alcohol to remove any oil or dirt that might prevent the adhesive on the decals from bonding. Decals are easier to apply if the area is swabbed with a solution of dishwashing liquid and water, applying the decals over the wet area which will allow them to be slid into final position. When satisfied with the position, use a credit card or similar squeegee to work the solution out to the edges of the decal, finally blotting the area dry and burnishing down the decal with soft tissue or cloth.



Decals should be cut from the sheet with a **new** X-acto knife blade to avoid tearing the film. The model's name should be trimmed around close to the letters, but the windows **must** be cut along the edge of the color.



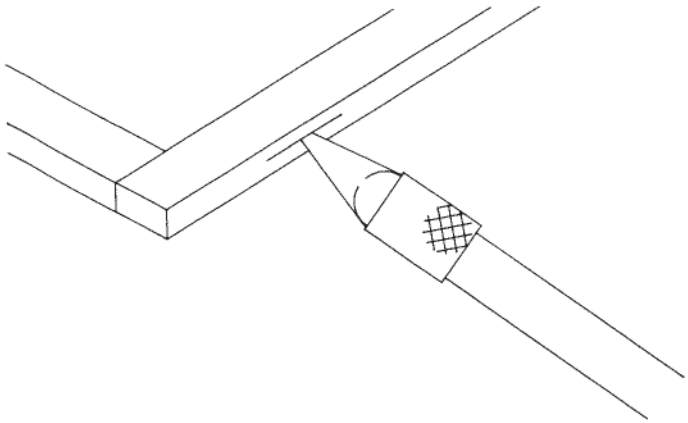
The canopy will be easier to do if you first position the **top** decal, followed by the left and right side decals. Refer to the photo on the box lid for the position of the remaining decals.

Final Assembly

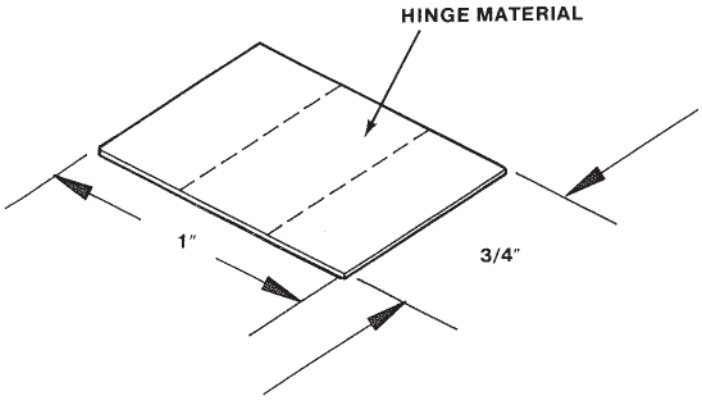
Hinging the Control Surfaces

Note: Before permanently installing the hinges, **all** finish and trim colors should be applied.

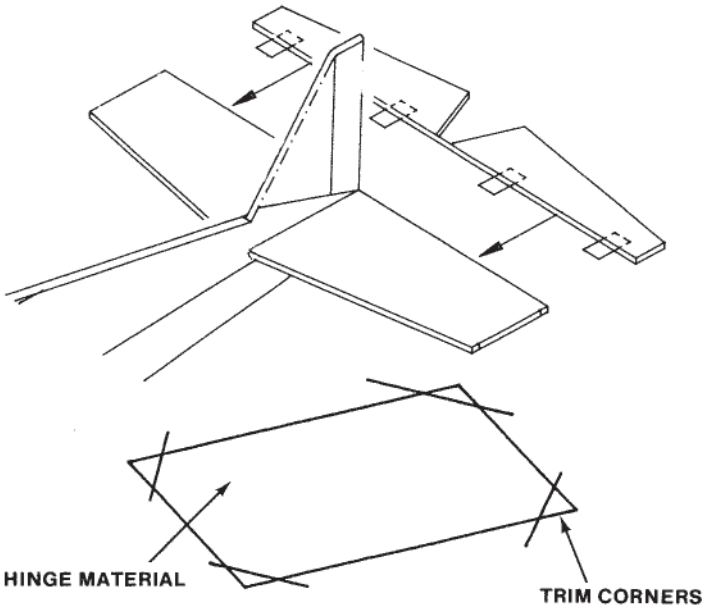
The control surfaces should be hinged so they move freely, without binding or sticking. Also, the gap between the control surfaces and their mating surfaces must be kept to a minimum; nominally 1/64". If the gap at the hinge line is large, air will flow through it and reduce the effectiveness of the controls.



☐ ☐172. Use a sharp X-acto knife to cut the hinge slots into the control surfaces, wing, stabilizer, and rudder; at the positions shown on the plan.

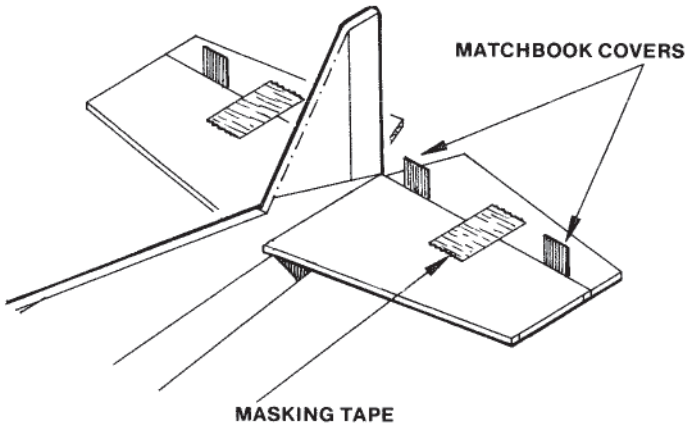


☐ ☐173. Use a sharp X-acto knife or scissors to cut the hinge material into three pieces of equal width and 3/4" long, as shown.



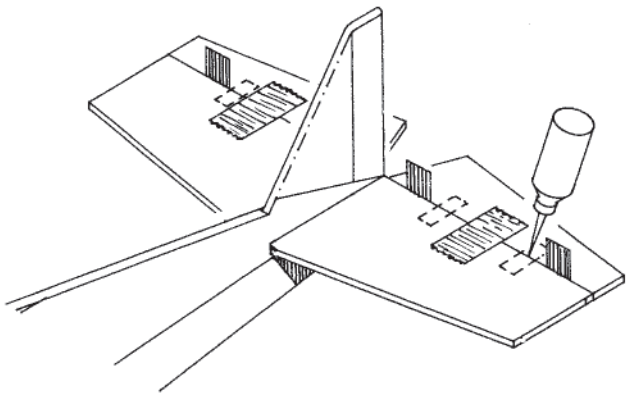
☐ ☐174. Insert the hinges half way into the elevator, as shown. Then slip the hinges into their mating slots in the stabilizer and push the two parts into contact with each other.

Note: If the hinges bend while inserting them into the slots, then widen the slots slightly with your X-acto knife. Also, cutting off the corners of the hinges, as shown, will ease their installation.

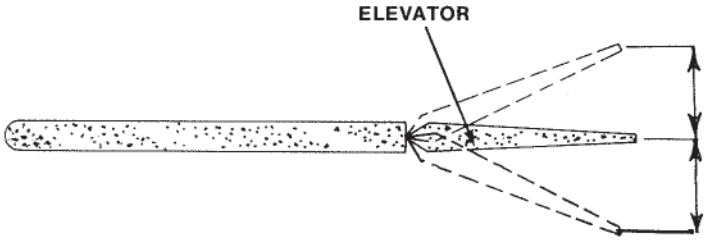


☐ ☐175. Push the elevator into contact with the stabilizer. Insert single thicknesses of matchbook cover between the elevator and the stabilizer, as shown. The card shims will establish a constant width gap that will allow the control surfaces to pivot without binding.

☐ ☐176. Gently press the elevator and stabilizer together against the card shims. Then, with the elevator control surface at neutral, pull masking tape across the hinge line at two points on both sides, as shown. Do not cover any hinges with the tape. Position the matchbook shims midway between the hinges, as shown, so they will not accidently be glued to the control surfaces.



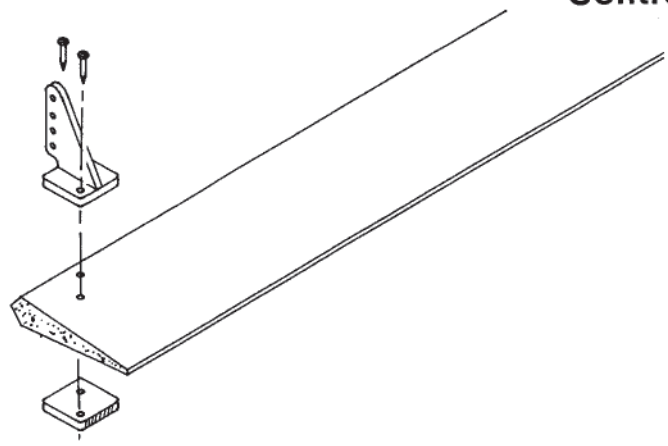
☐ ☐177. Run CA into each hinge on one side of the elevator and stabilizer. Then, turn the surfaces over and run CA into each hinge on the opposite side.



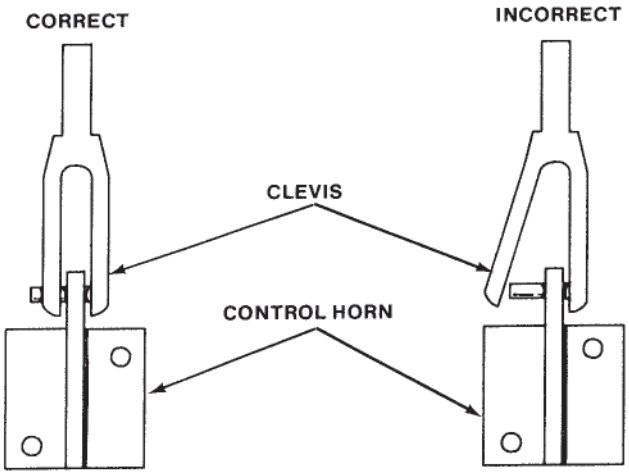
☐ ☐178. Remove the masking tape and matchbook covers. Flex the elevator up and down to free up the hinge movement.

☐179. Repeat Instructions #172 through #178 to hinge the rudder and ailerons.

Control Horns



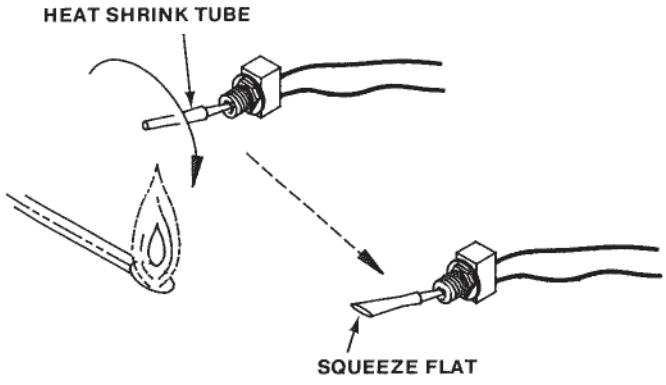
☐180. Position the control horns on the control surfaces at the locations shown on the plan. Mark and drill the locations of the screw holes with a 1/16" drill bit. Attach the control horns with the #2-56 x 1/2" machine screws. Tighten the screws down until the control horns make firm contact with the control surfaces, then turn each screw one-half of a turn further down. By tightening the screws in this manner, the control surfaces will not be crushed.



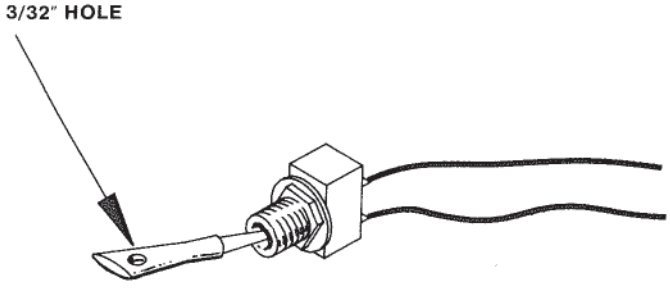
☐181. Re-install your radio, rudder, and elevator pushrods. Connect the clevises on these pushrods to the control horns on the elevator and rudder.

Throttle Pushrod

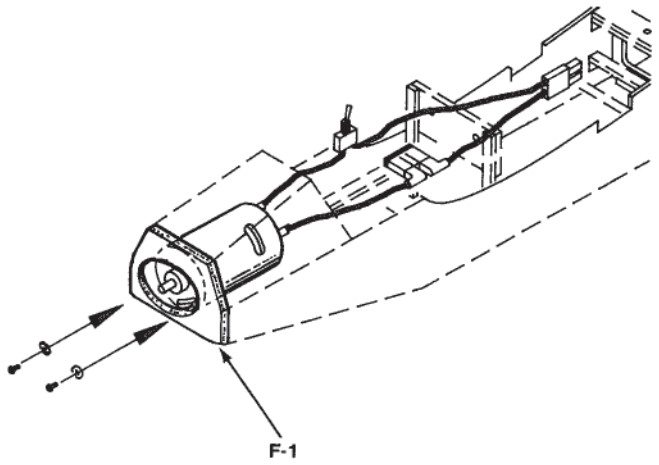
Note: If you are installing a radio equipped with a built-in electronic throttle, skip Instructions #182 through #188. Go directly to "Motor Battery".



☐182. Slip the small diameter shrink tubing over the switch handle on the motor switch. Rotate the shrink tubing about 2" above a match flame to shrink the tubing around the switch handle. Then, while the tubing is still hot, gently squeeze the end flat with a pair of pliers.

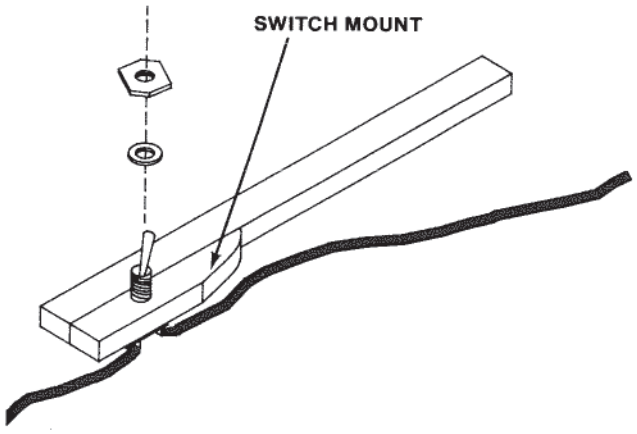


☐183. After the shrink tubing cools, drill a 3/32" hole through the flattened end of the tubing.



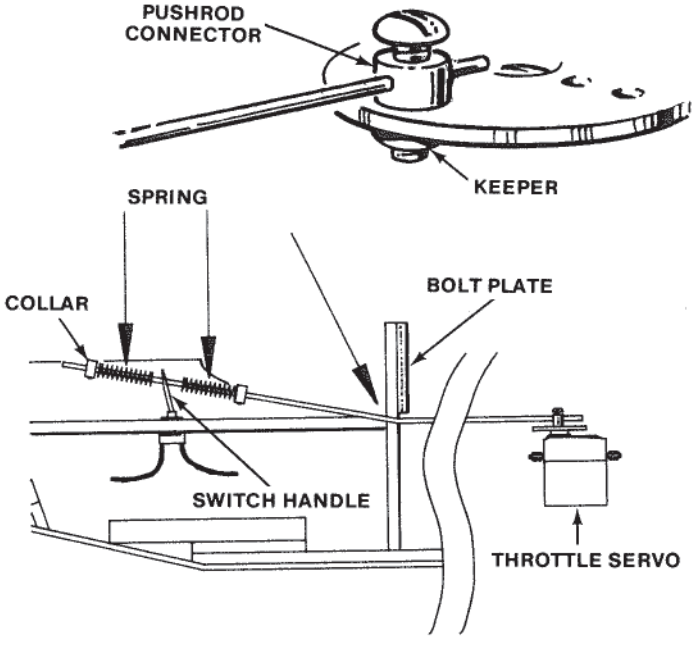
☐184. Push the motor through the hole in F-2 and against the back of F-1. Align the mounting holes and fasten the motor to F-1 with two 3mm x 10mm machine screws and two washers.

Note: For safety reasons, **do not** attach the propeller to the motor until told to do so.



☐185. Remove the nut and washer from the switch. Fit the switch into the hole in the switch mount and re-attach the washer and nut, as shown. Gently tighten the nut with a pair of needle nose pliers.

☐186. Bend the 1/16 " x 12" unthreaded wire throttle pushrod, as shown on the plan.



☐187. Use the .050 Allen wrench to start the set screws into the two 1/16" collars. Slip one collar and spring over the throttle pushrod.

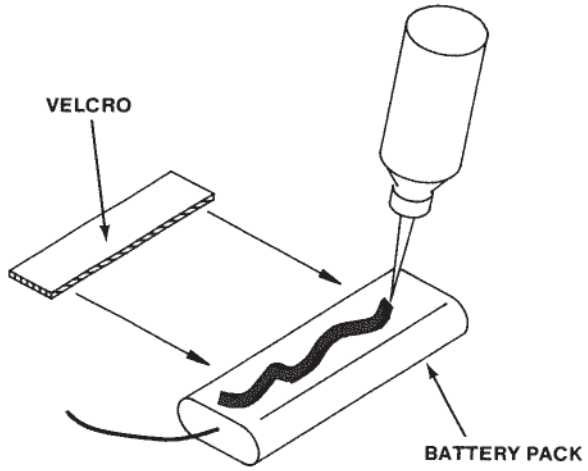
☐188. Slip one end of the throttle pushrod through the pushrod connector on the throttle servo. Slip the other end of this pushrod through the hole in the shrink tubing on the motor switch handle. Then, slip the remaining spring and collar onto the end of the pushrod and tighten the set screw in this collar.

Note: If necessary, adjust the bend in the pushrod to allow it to pass below the wing bolt plate and align with the pushrod connector.

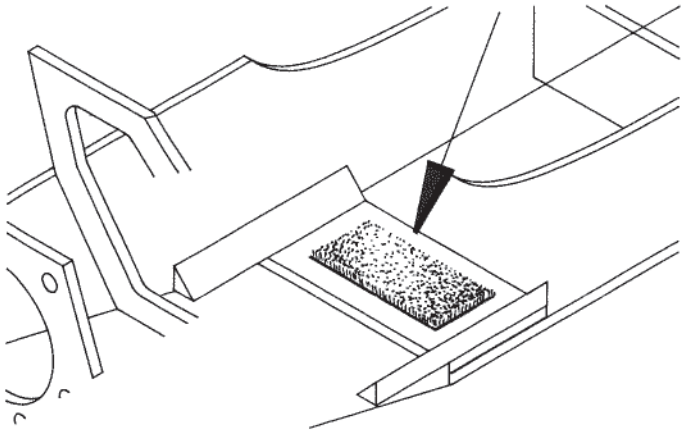
Motor Battery

Caution: To adjust the throttle pushrod, you will need a fully charged motor battery. Observe all warnings and cautions in this sub-assembly and while working with the motor, motor battery, and electrical wiring. If improperly handled, these components can cause a fire, or serious burns. Read through the instructions that came with your battery charger and motor battery before proceeding. Observe all warnings and cautions in those instructions.

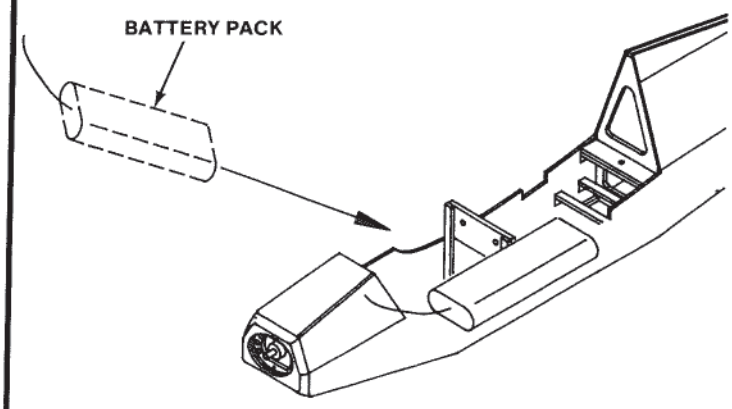
Warning: The motor battery stores a great deal of electrical energy. It can cause serious burns and could start a fire if shorted out. Be **very careful** not to allow metal parts or tools to contact the metal pins inside of the plug on the motor battery, as this could cause a short circuit.



☐189. Cut a long piece of Velcro to fit one side of the motor battery, as shown. Peel the paper backing from the velcro strip and apply a thin layer of Slow CA to the adhesive on the strip before pressing it into contact with the battery.



☐190. Cut a strip of Velcro about 1-3/4" long. Peel the backing from the strip. Apply a thin layer of Slow CA to the adhesive on the strip and press it into place on the landing gear block.



☐191. Slip the motor battery under the wing bolt plate and press it against the landing gear block. It should be centered on the block and close to the receiver on/off switch, as shown on the fuselage plan.

Note: When installed, the motor battery will be able to move slightly inside the fuselage. **Do not** add any other Velcro strips to the bottom of the fuselage in an attempt to securely hold the battery down as this would make it very difficult to install and remove the battery when the wing is in place.

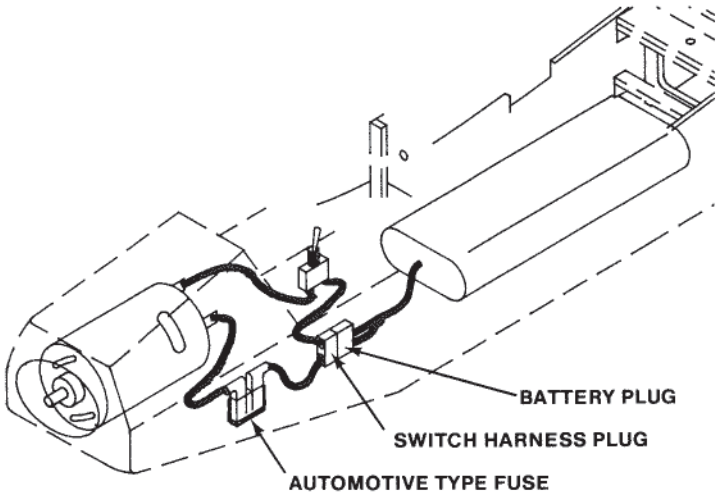
☐192. Remove the motor battery from the fuselage.

☐193. Following the instruction for your battery charger and motor battery, charge the motor battery.

Throttle Pushrod Adjustment

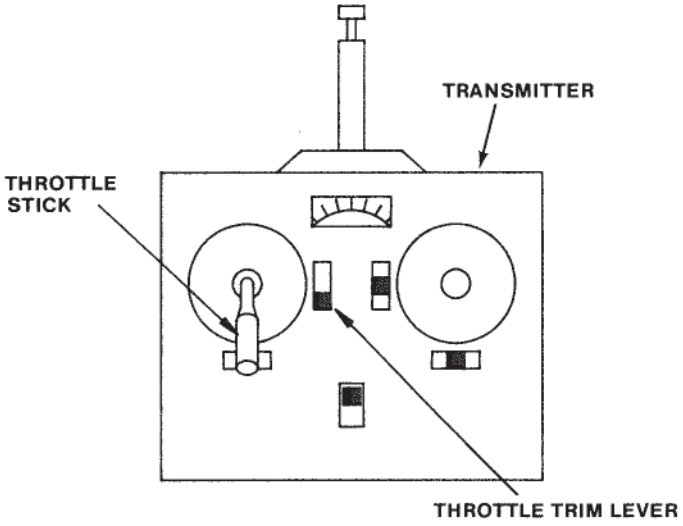
Note: If you are installing a radio equipped with a built in electronic throttle, skip Instructions #194 through #204. Refer to **"Electronic Throttles"**, page #34.

Caution: Keep fingers, tools, loose clothing and hair away from the motor shaft while performing the following instructions.



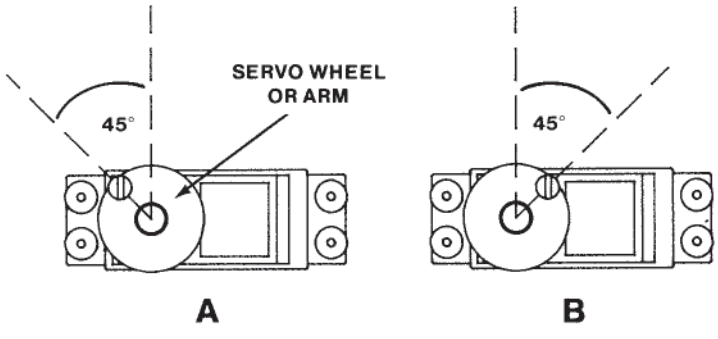
☐194. After the motor battery is charged, press it into place on the Velcro strip in the fuselage. Connect its plug to the plug on the end of the switch harness.

Note: If the motor starts, turn off the motor switch to stop it.



☐195. With the radio turned on, set the throttle trim lever and throttle control stick all the way back as shown. This is the closed, or **motor off**, position. Note which way the throttle servo rotates when doing this.

☐196. Look into the fuselage and note the position of the motor switch handle when it is in the **off** position.



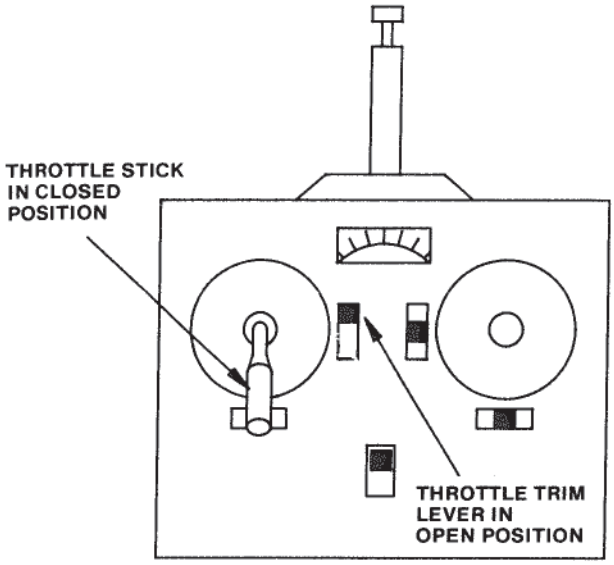
If the motor switch handle leans **forward** in the **off** position, adjust the throttle servo's output arm or wheel on the servo's output shaft, so that it faces about 45° **ahead** of the pivot point, as shown in **A**.

If the motor switch handle leans **back** in the **off** position, adjust the throttle servo's output arm or wheel on the output shaft, so that it faces about 45° **behind** the pivot point, as shown in **B**.

The switch must be in the **off** position when the throttle stick is all the way **back**. If the switch is not **off** with the throttle stick back, remove the switch, rotate it 180° and re-mount it in the switch mount.

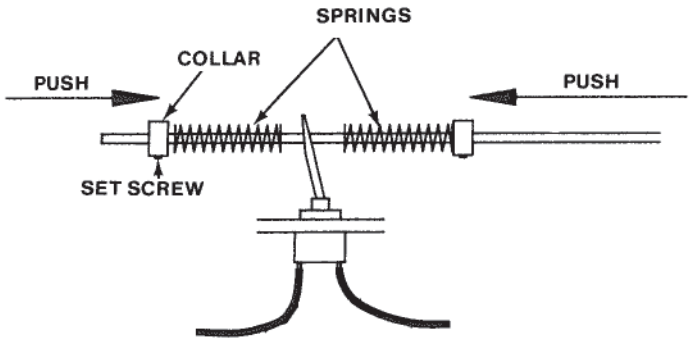
If you have a radio with servo reversing, these adjustments can be simplified by reversing the servo direction using a switch on the transmitter.

☐197. Un-plug the motor battery from the switch harness.



Note: The remaining illustrations in this sub-assembly assume that the motor switch leans **forward** in the **off** position.

☐198. Set the throttle stick in the **closed** position. Set the throttle trim lever to the **open** position, as shown. Position the throttle pushrod so that about 1/2" of this rod extends behind the pushrod connector on the servo wheel or arm, then tighten the set screw on this connector.



☐199. Set the motor switch handle in the **off** position. Push both collars towards the switch handle until both springs **just** make contact with the shrink tube handle, as shown. Then, tighten the set screws in both collars.

☐200. Move the throttle control stick all the way up to the open, or **on**, position, then move the throttle control stick back to the **closed** position. You should hear the motor switch **click** on and off. If necessary, adjust the positions of the collars to achieve this control.

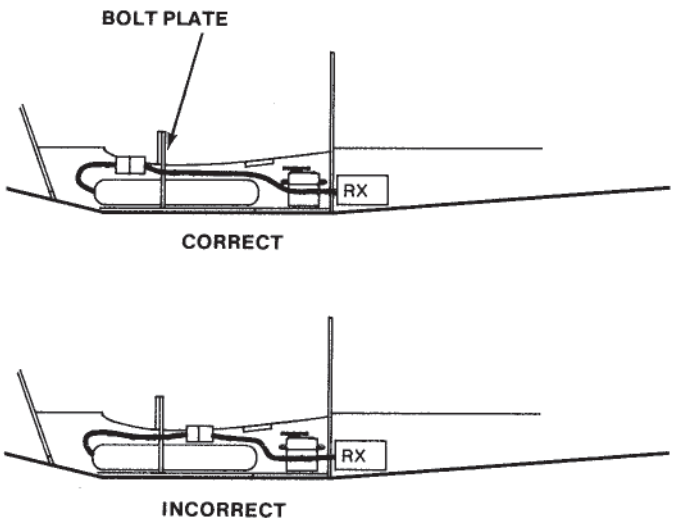
☐201. Move the throttle control stick to the **closed**, or **off**, position.

☐202. With the throttle control stick in the **closed** position, connect the motor battery to the switch harness. Open and close the throttle control stick several times. The motor should start when the throttle is near the fully open position and it should stop when the throttle control stick is near the fully closed position.

☐203. Move the throttle **trim** lever **back** to the closed position, then move the throttle **stick** forward to the **open** position. The motor should **not** start. If it does, adjust the collars, so that the motor will only start when both the throttle control stick **and** the throttle trim lever are **both** in the open positions. This adjustment will allow you to use the throttle trim lever as a safety switch which will prevent the motor from accidently starting if the throttle stick is opened unintentionally.

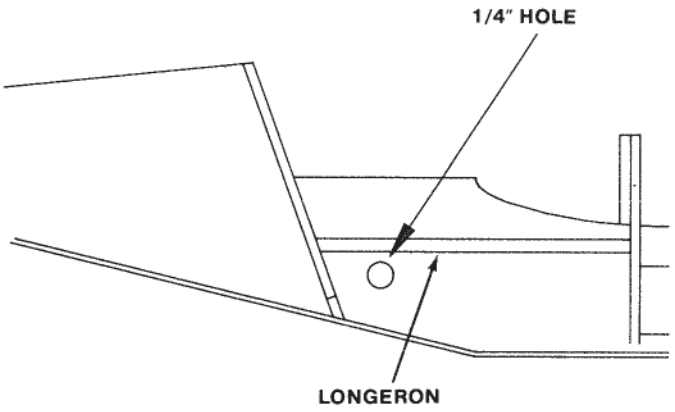
☐204. Disconnect and remove the motor battery.

Electronic Throttles



Note: If you are installing a radio equipped with an electronic throttle that is built into the receiver, follow the radio manufacturer's instructions for connecting the motor and battery wires and for adjusting the throttle. The receiver is to be positioned in the fuselage as shown in the illustration under, "Radio Installation", page #34. Due to differences in the connectors and the wire lead lengths between different brands of radios and batteries, your receiver's battery leads (wires) may have to be lengthened to allow the connector to extend forward of the wing bolt plate. If this connector does not extend forward of this plate, it will be necessary for you to remove the wing in order to install and remove the motor battery.

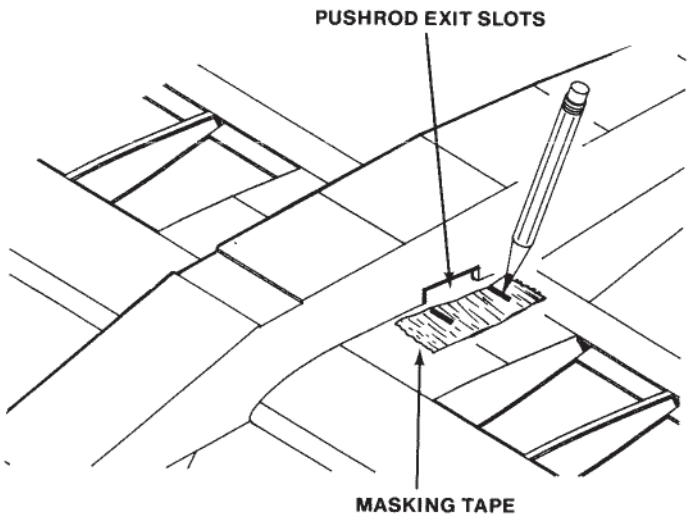
It may also be necessary for you to lengthen the motor lead wires between the receiver and motor. Since the location of this connector is unimportant, either the switch harness or the receiver's motor lead wires can be lengthened. In either case, be certain that none of the wires or connectors interfere with the aileron pushrods.



☐205. Install the motor as explained in Instruction #184.

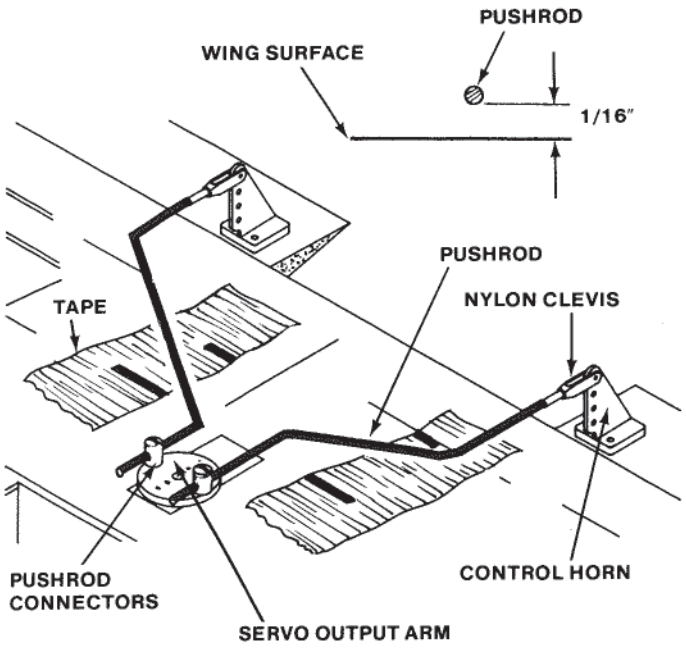
☐206. Drill a 1/4" hole through the right fuselage side, near F-3 and just below the longeron. Remove the nut and washer from the switch. Pass the switch through the hole and re-install the washer and nut. Gently tighten the nut so as not to crush the wood. This switch can now be used as a **master** arming switch.

Note: If your radio is equipped with an arming switch, the switch on the motor switch harness can be left in the **on** position and simply pushed forward behind the motor. In this instance, the switch could also be removed from the switch harness. However, **do not remove the fuse** from the switch harness.



☐207. Re-install the aileron servo in the wing.

☐208. Place the wing on the wing saddle, then invert the model. Place strips of masking tape on the underside of the wing next to both aileron pushrod exit slots in the wing saddle. Mark the location of these slots on the masking tape with a pencil, then remove the wing.



☐209. Install two pushrod connectors on the aileron output arm or wheel.

☐210. Screw a nylon clevis onto two 1/16" x 6" threaded wire pushrods.

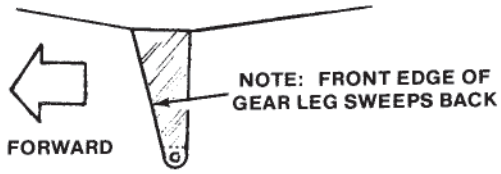
☐211. Connect the clevises to the control horns on the ailerons, then use a pair of pliers to bend the pushrods so that they are centered between the pencil marks on the masking tape when the ailerons are in their neutral positions. Bend the pushrods so that the portions of the rods that pass through the aileron slots are about 1/16" above the wing when the pushrods are inserted into the pushrod connectors.

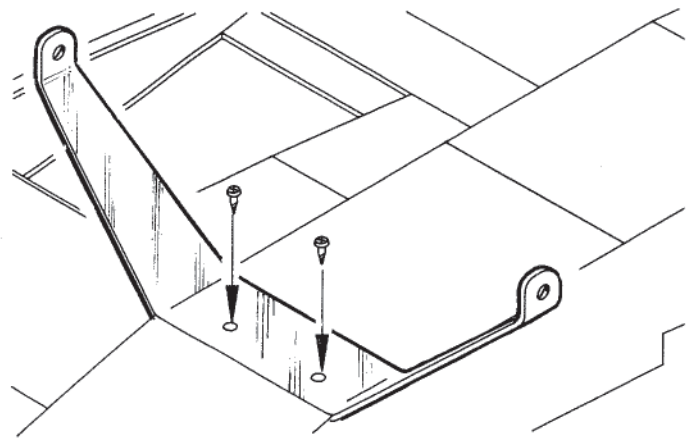
☐212. Remove the masking tape from the wings.

☐213. Place the receiver battery in the fuselage.

☐214. Plug the aileron servo into the receiver and place the wing on the wing saddle. Check the operation of the ailerons; they should move freely without binding on the aileron pushrod exit slots.

Landing Gear

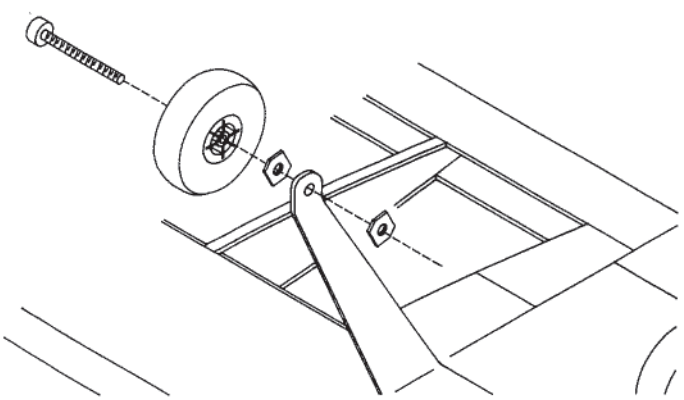




☐215. Remove the motor battery from the fuselage.

☐216. Center the main landing gear on the fuselage. Note which way the gear faces. See sketch at left.

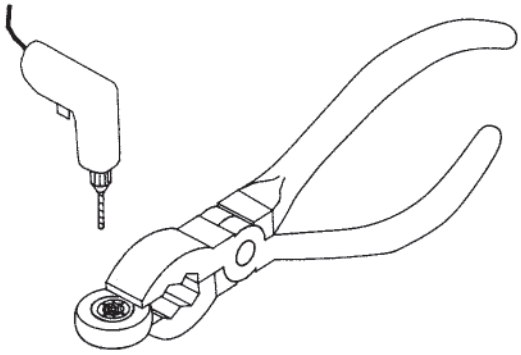
☐217. Using the pre-drilled holes in the main landing gear as a drill guide, drill 1/16" holes through the battery floor and the landing gear block. Fasten the landing gear to the fuselage with two #4 x 3/8" sheet metal screws.



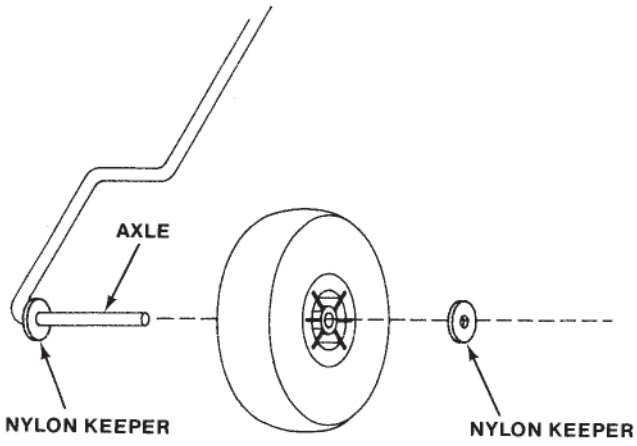
☐ ☐218. Insert a 6-32 x 1" bolt through one wheel, then turn a 6-32 hex nut onto the bolt far enough to allow the wheel to turn freely, but preventing it from moving sideways.

☐ ☐219. Insert the bolt through the axle hole in the main landing gear and install another 6-32 hex nut. Hold the hex nut between the landing gear and wheel with a pair of needle nose pliers while tightening the other hex nut with a wrench, checking that the wheel rotates freely.

☐220. Repeat Instructions #218 and #219 to install the other wheel.

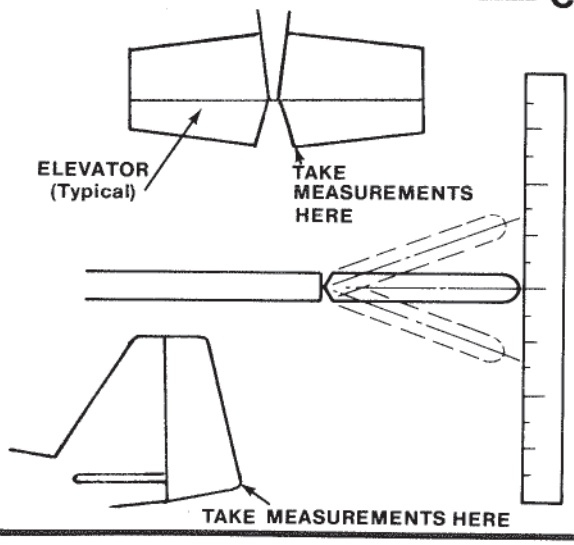


☐221. Hold the tail wheel **hub** securely against your building board with a pair of pliers, as shown. Enlarge the hole in the tail wheel hub with a 1/16" drill bit.



☐222. Hold one nylon keeper with a pair of pliers and push it onto the tail wheel axle as far as it will go. Slip the wheel onto the axle and install a second nylon keeper. Adjust the nylon keepers so that the tail wheel rotates freely.

Control Throws



☐223. The following control throws are recommended starting points. They can be increased or decreased to suit your preference. They are measured at the **widest** point of each control surface with a ruler, as shown.

Ailerons - 1/4" up, 1/4" down

Elevators - 3/8" up, 3/8" down

Rudder - 3/4" left, 3/4" right

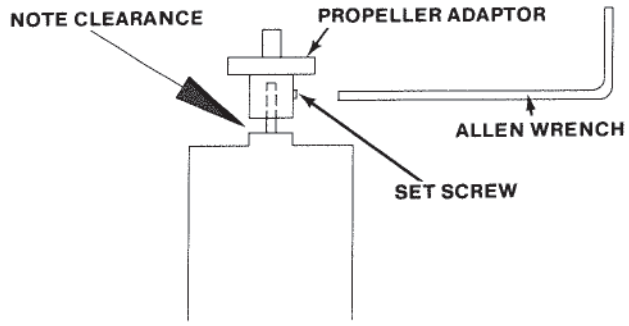
Propeller

Warning: A spinning propeller is capable of inflicting serious bodily injury. Read "Safety" under "Radio and Model Operation", page #61, before going on.

Important: Unlike models powered by gas engines, the motor in an electric model can **accidently** be started simply by turning on the radio. For this reason, it is very important that you check to be sure that:

1. The throttle control stick **and** the throttle trim lever are in the **closed** position prior to turning on the radio.
2. Tools, clothing, all loose objects, and fingers are clear of the propeller.

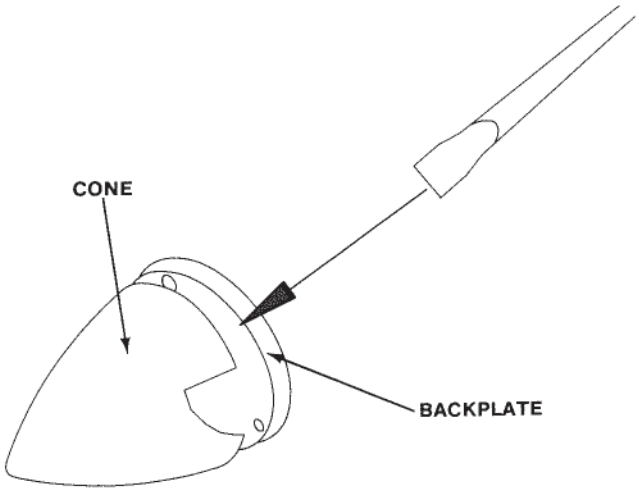
Develop the habit of checking the position of the throttle controls and the area around the propeller **every time** you get ready to turn on the radio.



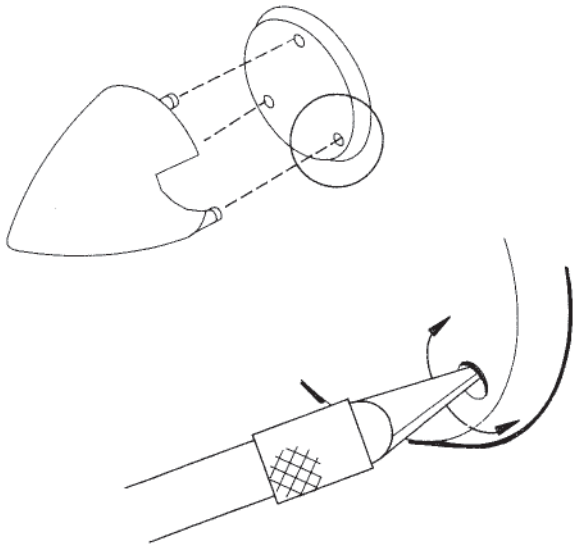
☐224. Disconnect the motor battery from the switch harness.

☐225. Start the set screw into the hole in the side of the propeller adaptor. Position the propeller adaptor on the motor shaft so that it just clears the motor case without rubbing against it, then tighten the set screw with the Allen wrench.

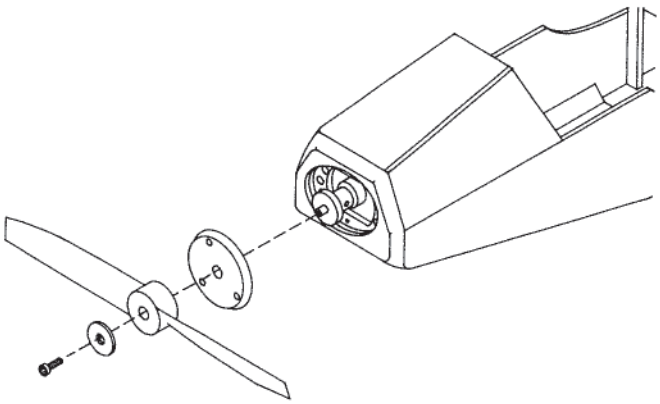
Note: Be certain that the set screw is **tight**. This screw secures the propeller adaptor, propeller, and spinner to the motor.



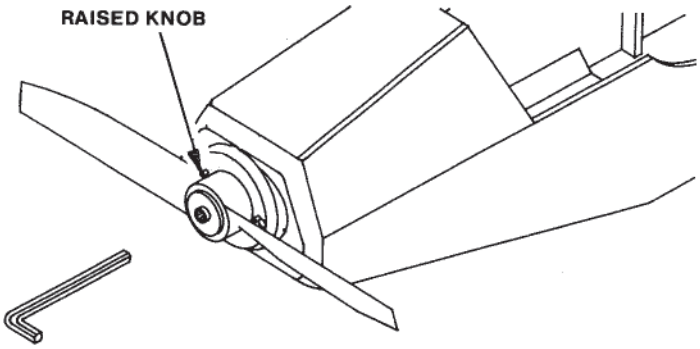
☐226. Separate the spinner backplate from the spinner cone by inserting a screwdriver into the slots in the joint and prying the backplate free.



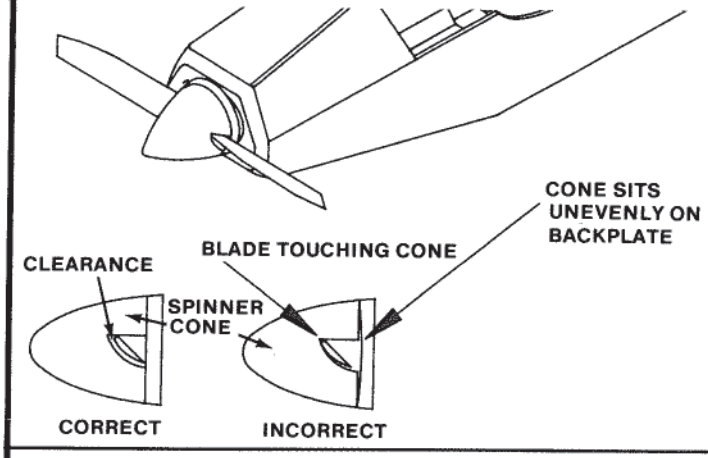
☐227. Lightly scrape the ridges in the holes on the backplate with a sharp X-acto knife. This will help to make it easier to assemble and disassemble the spinner, then assemble and pry open the spinner several times. When the spinner is new it is often difficult to separate the spinner cone from the backplate. This will become easier after the spinner is scraped and assembled several times.



☐228. Place the spinner backplate on the propeller adaptor so that the shoulder on the propeller adaptor is in the hole in the backplate. Position the propeller on the backplate so that the hole in the propeller is over the shoulder on the propeller adaptor and the printing on the propeller faces forward. Now fit the washer and 6-32 x 5/8" socket head cap screw. Tighten the screw with your fingers.

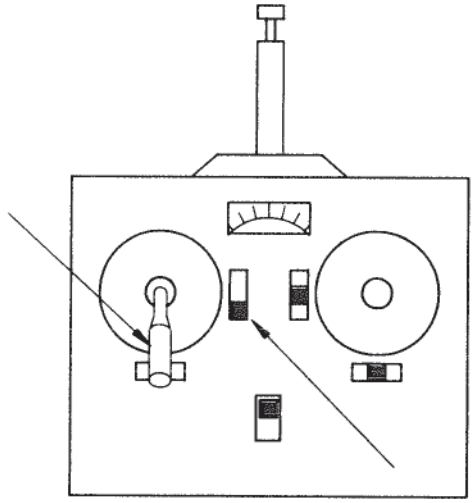


☐229. Rotate the propeller, so that one of its back edges rests against one of the raised knobs on the backplate, then use the 7/64" Allen wrench to tighten the cap screw.



☐230. Press the spinner cone into place on the backplate, as shown.

Note: If the spinner cone will not snap evenly into contact with the backplate, inspect the opening in the spinner cone and the propeller. If the propeller makes contact with the openings in the spinner cone, remove the cone and trim the openings with a sharp X-acto knife so that there is a slight clearance (approximately 1/32") around the front of each propeller blade with the spinner cone installed.



☐231. Inspect the throttle stick and the throttle trim lever to be certain they are in the closed, **off** positions, as shown.

☐232. Connect the motor battery to the switch harness.

☐233. Hold the model firmly and point the nose of the model **away** from yourself and others. Open the throttle for a few seconds to test the security of the propeller and propeller adaptor on the motor.

☐234. Close the throttle to shut off the motor. Turn off the radio and disconnect the motor battery.

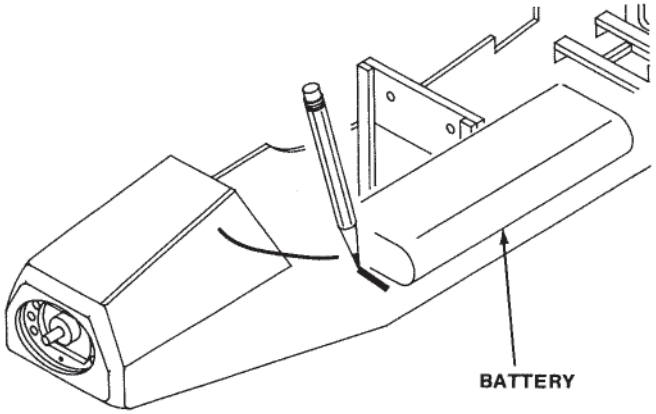
☐235. Insert the radio receiver antenna inside of the fuselage and be certain that the receiver antenna passes out of the fuselage through the cooling air hole and connects to the tail wheel wire with a rubber band, as shown on the plan.

If necessary, re-route the antenna so it is not wrapped around, or in direct contact with, any of the servo or battery wires.

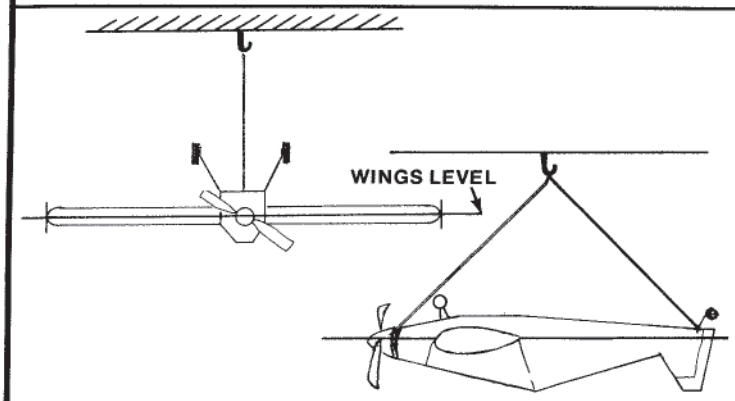
Note: If the receiver antenna is in contact with any of the other wiring, the radio's range could be reduced, and this will cause loss of control and a crash.

Weight and Balance

The Center of Gravity shown on the plan will provide the best all-around handling, and we recommend that you make the first flights with the model balanced at this point. Since excess weight degrades performance drastically, the Center of Gravity should be established by moving the motor battery back and forth in the fuselage rather than adding weight.



☐236. When the motor battery is positioned so that the model is in balance, mark the location of the front edge of the battery on the bottom sheeting, then, whenever you install a motor battery, be sure it is positioned on that mark to maintain the C.G.



Any model's performance in looping maneuvers will be improved if the wings are also balanced. To do this, tie a piece of strong string around the motor shaft and the tail wheel wire. With **all** equipment installed and the model ready to fly, suspend the model from the ceiling. Add weight to the light wing until the model hangs in a wings level attitude.

Note: The best material for wing weight is lead shot material mixed with epoxy. It can be poured through a small hole in the wing's leading edge sheeting, near the wing tip, and the hole covered with a small piece of Monokote. Lead shot can be purchased at most gun shops.

Radio and Model Operation

The safe and proper operation of your radio and model are your responsibility. Read and follow the instructions that came with them. If you have any doubt about their proper operation, seek the help of a qualified individual.

Safety

1. Be certain that your radio is operating properly **before** starting the motor.
2. Be certain that the throttle control stick is **closed, before** turning on the radio.
3. Inspect the propeller **prior** to starting the motor. Do this **every time** you get ready to start the motor. Damaged or loose propellers can fly apart and cause serious injury.
4. Check the security of the propeller before starting the motor. A loose bolt could cause the propeller to fly off the motor.
5. Periodically check the motor bolts to be certain they are tight.
6. Never reach over or around a propeller when it is turning.
7. Always stand **behind** the propeller when the motor is running.
8. Always point the tail of the model **away** from people and other models so that any debris thrown back by the propeller blast will not cause injury or damage.

Flying Sites

Because of their noise, gas powered R/C models have been restricted from public and private flying sites in most areas of the country. With the advent of quiet electric powered R/C airplanes, it is not uncommon to see these models being operated in populated and congested areas. Although this idea may be tempting, we urge you **not** to do this for several reasons.

First, the initial flights of a new or untried model will be much safer for you, and any bystanders, if conducted at an established flying site, where the risks and consequences of mistakes will be minimized.

Second, at the local park or school yard you will have no way of knowing if someone else in the area is operating an R/C model on your frequency. At an established flying site, frequency control will eliminate the possibility of radio interference, which will cause your model to crash.

Preventive Maintenance

There have been several references and warnings in this manual concerning the effects of vibration on various components. On a long term basis, vibration can loosen any screw. With that in mind, it would be wise to periodically inspect all of the screws and linkages in your Electric Hots. If you do this, it is unlikely that you will ever have a model crash because something came loose.

To minimize vibration, propellers can be balanced. There are several brands and kinds of prop balancers available from your local hobby dealer and we recommend that you purchase one. It will last a lifetime and will add greatly to the service life of your models and radio. Also, a balanced prop can add as much as 500 RPM to an electric motor.

Important: In electric powered models, weight, space, and the level of vibration preclude the necessity of wrapping the receiver in foam rubber. This also means that the servo plugs are not trapped in their sockets by any foam rubber. Periodically check the security of the servo plugs in the receiver. **Vibration can cause them to work free.**

The Midwest HP-100 motor in this kit contains maintenance free bearings. However, if you fly your model from dirt or sand, periodically remove the motor from the model and use a vacuum cleaner to remove any dirt that gets into the motor case.

The fuse in the fuse holder on the switch harness is a 25 amp automobile type fuse. Replacement fuses can be purchases at some hobby shops or any auto parts store.

Warning: The purpose of the 25 amp fuse in the switch harness is to protect the motor, motor battery, and electrical wiring. In the event of an electrical overload, such as hitting the propeller on the ground while the motor is running, the fuse will blow, shutting off the electrical power from the battery. **Do not** bypass the fuse, remove it from the circuit, or replace it with a fuse of a greater value than 25 amps, as this could cause a fire in the event of an electrical overload.

Flying

The Electric Hots is a fully aerobatic model, capable of many aerobatic maneuvers when powered by the recommended motor battery and flown at or below its recommended maximum weight of 44 ozs. It is capable of taking off and landing on hard surfaces, hard dirt, and closely cut grass. The model has a fairly fast and flat glide, and is very easy to land.

The landing gear causes some drag. If you are interested in obtaining maximum aerobatic performance, we recommend that you remove the main landing gear and replace it with a 1/4" x 1/4" x 5" hardwood skid attached to the bottom of the fuselage with double sided servo tape.

Midwest Products hopes you have enjoyed building your Electric Hots, and sincerely wish you the best of times flying it. We would appreciate your taking a few minutes to fill out and return the postage-paid Evaluation Card in this manual. We welcome any suggestions or comments you may have for improving our kits and instructional material.

Thank you.

Acknowledgements

Written By: Don Sobbe

Illustrations and Plan By: Tom Herr & Jim Newman

Typesetting and Layout By: Phyllis Kilgore

#9-89-165

Product Evaluation Card/Catalog Offer

What you tell us you like, and don't like, determines what model kits we make and how we make them. We would appreciate it if you would take a few minutes to answer the following questions about this kit and also, tell us a little about your interests. As our way of saying "thank you", we will send you a FREE COPY of our current Micro-Cut Quality® Woods and Wood Model Kits Catalog. Simply fold this form in thirds and staple it so that our address faces out. Postage will be paid by Midwest Products.

1. Kit Name **Electric Hots**

2. Kit Number **165**

3. Where did you learn about this kit?
   - ☐Magazine Ads
   - ☐Friend
   - ☐Hobby Shop
   - ☐Other

4. What influenced you the most to buy this kit?
   - ☐Box Art
   - ☐Recommendation of Others
   - ☐Type of Model
   - ☐Price
   - ☐Magazine Ads
   - ☐Other _____

5. Did you have any trouble using the plans?
   - ☐Yes
   - ☐No

   If yes, please explain. Be specific.

6. Did you have any difficulty understanding any of the written instructions on the plans, or in the construction manual?
   - ☐Yes
   - ☐No

   If yes, please explain. Be specific.

7. Did you have any difficulty understanding any of the illustrations in the construction manual?
   - ☐Yes
   - ☐No

   If yes, please explain. Be specific.

8. Did you have any difficulty identifying any of the parts?
   - ☐Yes
   - ☐No

   If yes, which part(s).

9. If you answered yes to Question 8, which of the following answers best describes the problem?
   Could not identify part(s) from:
   - ☐Plans
   - ☐Written description in manual
   - ☐Isometric views in manual
   - ☐Other _____

10. Were any of the kit parts:
    - ☐Missing
    - ☐Wrong Size
    - ☐Broken
    - ☐Wrong Shape

11. If you checked off an item in Question 10, please list those part(s) and tell us what was wrong with them.

12. Was any part of the model's construction difficult for you?
    - ☐Yes
    - ☐No

    If yes, please explain.

13. What did you like most about this kit?
    - ☐Plans
    - ☐Wood Parts
    - ☐Construction Manual

14. What did you like least about this kit?
    - ☐Plans
    - ☐Wood Parts
    - ☐Construction Manual
    - ☐Other

    If other, please explain. Be specific.

15. Are you satisfied with the finished model?
    - ☐Yes
    - ☐No

    If no, please explain. Be specific.

16. How does this kit compare to similar kits by other manufacturers?
    - ☐Better than
    - ☐As good
    - ☐Not as good

17. Is there anything else you would like to tell us about this kit?

Tell Us About Yourself

18. How long have you been building models?

19. What magazines do you regularly read?

20. Are most of your models built from:
    - ☐Plans
    - ☐Kits
    - ☐Scratch built using your own plans

21. What models would you like Midwest to kit in the future?

22. Kit was purchased from:
    - ☐Hobby Shop
    - ☐Mail Order
    - ☐Other _____

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