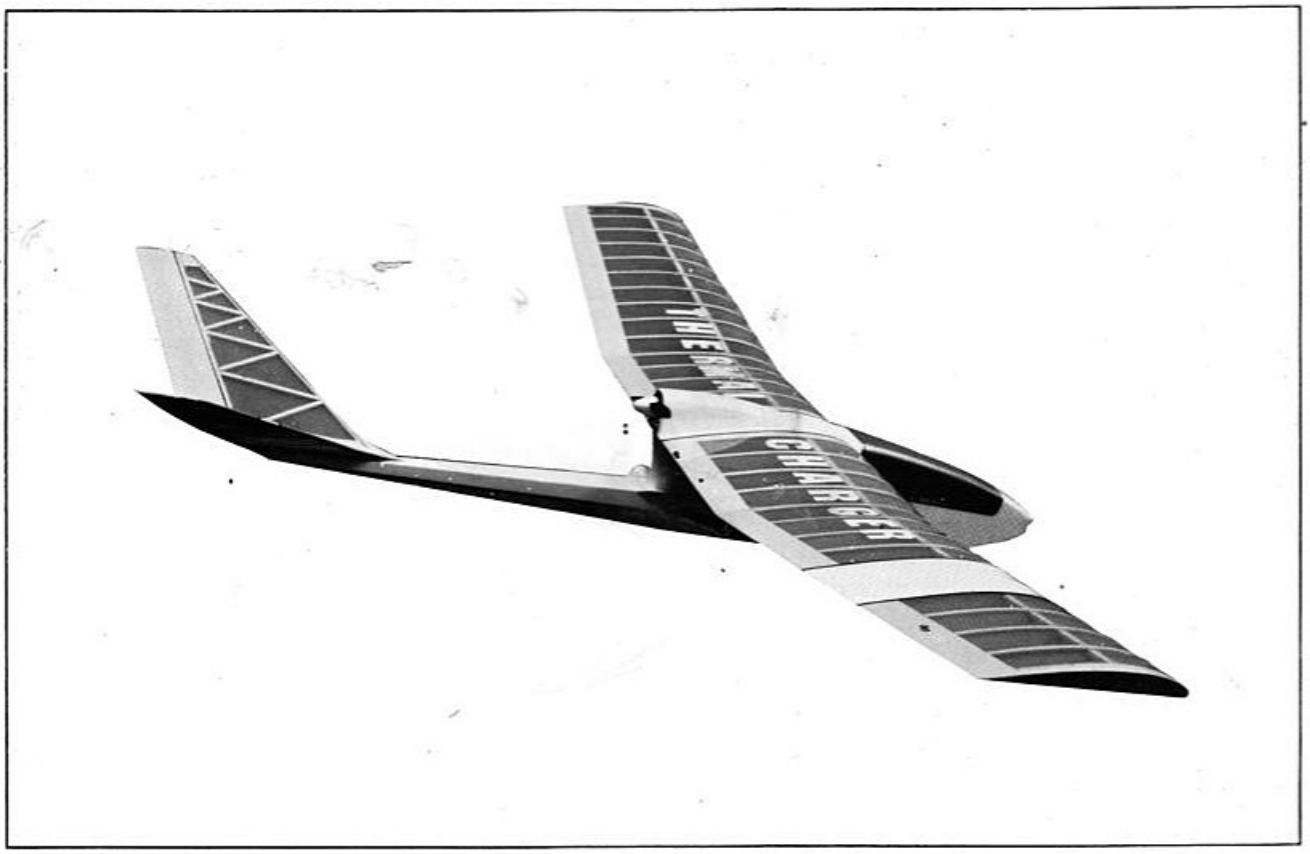
Thermal Charger

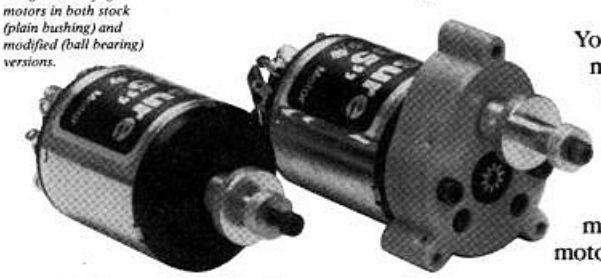
BUILDING INSTRUCTIONS



GM PRECISION PRODUCTS INC.

Leisure Electric Flight Systems and Accessories.

Leisure Electronics offers you everything you'll need to power and maintain the fine electric flying model you have purchased.



Leisure offers direct and gear drive flight motors in both stock (plain bushing) and modified (ball bearing) versions.

Your kit plans may recommend a specific Leisure motor. If a motor has not been recommended or included, just check the charts below for the stock number of the appropriate system. Leisure prepackages the appropriate motor with a matched 7 cell, 800 MA NiCd battery pack and switch harness. You'll find through experience that while reasonably priced, Leisure "05" motors deliver power competitive with much more expensive motors. Of course, you can also purchase Leisure motors, batteries and switch harnesses separately.

05 Flight Systems (stock)

Stock No.	Drive Systems	Battery	Switch Harness Included
502	Direct Drive	7 Cell/800MA	Yes
503A	2.5:1 Gear Drive	7 Cell/800MA	Yes
503B	3.8:1 Gear Drive	7 Cell/800MA	Yes

LT50 Flight Systems (modified)

Stock No.	Drive System	Battery	Switch Harness Included
601	Direct Drive	6 Cell/1200MAH	Yes
603A	2.5:1 Gear Drive	7 Cell/800MAH	Yes
603B	3.8:1 Gear Drive	7 Cell/800MAH	Yes

Performance Characteristics of Direct Drive 05 Motors

Part	Description	Displ.	Glow Eq.	Prop	RPM	Duration	WT
5002	Stock 05	9.3CC	10	7x3½	13,000	5 min.	15 oz.
6002	Modified 05	9.3CC	10	6x4	14,500	5 min.	15 oz.
6002*	Modified 05	9.3CC	10	6x4	13,000	10 min.	18 oz.

*With 6 cell 1200 MAH battery pack

Performance Comparison of Stock and Modified Motors geared 2.5:1, varying prop sizes.

Part	Description	Prop	RPM	Current	Motor Run
5003A	Stock	9x6	6500	10 AMP	8-10 min.
5003A	Stock	10x6	6000	12 AMP	5-8 min.
5003A	Stock	11x6	5500	16 AMP	3-5 min.
6003A	Modified	9x6	7600	14 AMP	4-5 min.
6003A	Modified	10x6	6700	18 AMP	3-4 min.
6003A	Modified	11x6	6100	24 AMP	2-3 min.

Leisure motors operate with most popular speed controls. Generally, you should check with the manufacturer of your radio to insure compatibility. In addition, to be safe, it is advisable to provide air flow over the cooling fins of your speed control.

Replacement Parts & Service

Replacement brushes, armatures, switches, fuses, gears, shafts, connectors and screws are available through your R/C hobby dealer. In addition, Leisure provides a complete technical information hot-line service to answer questions about Leisure products.

Chargers

There are four Leisure chargers designed to obtain maximum performance from your Leisure flight system. These chargers have the design features you want built-in including trickle charge circuits, fuse protection and discharge testing. See your R/C dealer for the one that fits your application best.

Leisure Charger Model	Input	Charge Rate
104	12VDC	6 cells-15 mins.
105	12VDC	6 or 7 cells-15 mins.
106	117VAC	6 cell-15 mins. 7 cell-20 mins.
107	12VDC/117 VAC	6 cell-15 mins. 7 cell-20 mins.
12VDC (Auto battery), 117VAC (household voltage)		

Leisure's 7 cell matched Sanyo Battery Pack 800 mah (stock #6001C).

Leisure's 6 cell matched Sanyo Battery Pack 1200 mah (stock #6001A).

Leisure offers a complete line of easy-to-use chargers designed to maximize the performance of your NiCd battery packs.

NEW! Gearbox with streamlined extension shaft for sailplanes #6015, with stock motor; #503L, with competition ball bearing motor; #603XL.

Leisure

22971 Triton Way, Unit "B", Laguna Hills, CA 92653
(714) 581-1198

Leisure Electronics

Instructions

SEATING THE BRUSHES

For best performance and long life it is important to run your motor without a prop for about one hour to seat the brushes. To do this simply charge your battery fully, turn on your motor and let it run until the battery is exhausted. This will take about 1/2 hour with a modified motor and a little longer with a stock motor. Do not oil your motor bearings as they are pre-lubricated.

INSTALLING THE MOTOR

Mount the motor in your model using two 3mm screws bolted into one of the two pairs of holes in the front plate. (If you have a gear motor use #4 screws through the mounting lugs provided.) If you plan to install your motor in a model plane be sure to provide air flow through the motor. Balsa wood and foam are good insulators and your motor will become over-heated and fail if proper cooling is not provided.

MAINTENANCE

If kept clean and properly cooled and if it has not been overloaded your leisure 05 can give you years of useful service. If you inadvertently get dirt in your motor blow it clean with high pressure air. Clean the commutator with a good grade of TV contact cleaner. If the commutator is badly scored you may have to disassemble your motor and polish the commutator with 400 grit sandpaper. Before disassembly be sure to mark the exact location or the rear endbell. It is important to reassemble your motor with the factory timing. Improper timing will cause excessive arcing at the brushes and will reduce motor efficiency.

OPERATING YOUR MOTOR

After break-in your motor is ready to use. Mount the suggested propeller, install it in your model and use normally. Your motor is cooled by the air flow caused by the natural motion of your model. This air flow is not present when running your motor on the bench. Do not run on the bench with a prop installed for more than a few seconds at a time. If you do it will overheat the commutator and warp it. This will ruin it. Don't do it.

Replacement Parts

"05" REPLACEMENT MOTORS

Plain Bushing and Ball Bearing Rewound (modified) Motors.
35mm Dia X 49mm Length. 10CC Armature Displacement.

5002	Stock Airplane Motor Direct–Dr	22.00
5003A	Stock Airplane Motor 2.5:1	40.00
5003B	Stock Airplane Motor 3.8:1	40.00
5003L	Stock Sailplane Motor 2.5:1	40.00
6002	24T BB Airplane Motor Dir Dr	40.00
6003	24T BB Airplane Motor 3.0:1	60.00
6003A	24T BB Airplane Motor 2.5:1	60.00
6003B	24T BB Airplane Motor 3.8:1	60.00
6003X	19T BB Airplane Motor 3.0:1	60.00
6003XL	19T BB Sailplane Motor 3.8:1	65.00

GEAR BOXES FOR "05" MOTORS

6005	Gear Box Short 3.0:1	19.95
6005A	Gear Box Short 2.5:1	19.95
6005B	Gear Box Short 3.8:1	19.95
6015	Gear Box Long 3.0:1	25.00
6015A	Gear Box Long 2.5:1	25.00
6015B	Gear Box Long 3.8:1	25.00

ELECTRIC FLIGHT ACCESSORIES

6004	Deluxe Switch Harness	10.00
6006	Micro Switch 15 Amp	6.00
6007	Charge Jack And Adapter	5.00
6009	Motor Brushes	5.00
6010	Short Shaft & Gear 3.0:1 Blue	3.00
6010A	Short Shaft & Gear 2.5:1 Black	3.00
6010B	Short Shaft & Gear 3.8:1 White	3.00
6011	Prop Adapter 1/8 x 3/16	5.00
6011A	Prop Adapter 3/16 x 1/4	5.00
6012	3/16 x 3/8 Ball Bearing	5.00
6013	Long Shaft & Gear 3.0:1 Blue	3.00
6013A	Long Shaft & Gear 2.5:1 Black	3.00
6013B	Long Shaft & Gear 3.8:1 White	3.00
6014	Gear Box Housing Short	3.00
6014L	Gear Box Housing Long	5.00

NiCad BATTERIES & CHARGERS

105	6/7 Cell Charger 12V DC input	38.00
107	6 Cell Charger AC/DC Input	58.00
6001C	Wired AR Batt 7Cell 800 MAH	38.00

Leisure Electronics 22971 B Triton Way, Laguna Hills, CA 92653 (714)581-1198

INTRODUCTION

Thank you for choosing the Thermal Charger as your next RC building project. We at GM Precision Products realize the investment of time and money an RC project represents and have worked very hard to produce the finest line of premium quality balsa kits available.

We believe that the construction of a radio controlled aircraft should be an enjoyable part of the modeling experience, and to this end, we strive to eliminate the frustrations of building by providing you with only the highest quality materials, hardware packages, plans, and instructions.

The Thermal Charger has been designed and engineered to provide you with an electric powered sailplane that is not only beautiful and unique in appearance, but one that has truly outstanding performance.

The Thermal Charger has a look all of its own, and because it was designed right from the beginning to be an electric powered sailplane, many of the problems associated with electric powered aircraft simply do not exist with the Thermal Charger.

For example, instead of placing the electric motor in the front as with most electric powered sailplanes, the motor in the Thermal Charger is placed behind the wing, thereby protecting it and making it almost impossible to bend the propeller shaft.

Also, due to the motor location and the unique design of the fuselage, there is absolutely no problem placing the battery pack up front where air can flow through the front of the fuselage, over the batteries, and on out through the electric motor, thereby cooling the batteries and motor and eliminating one of the major drawbacks in electric powered aircraft.

In helping to ensure your success and complete enjoyment in flying an electric powered sailplane, a leisure .05 electric motor, complete with switch harness and plugs, has been provided as part of this kit.

The motor batteries recommended for this combination are seven 800 milliamp cells, which should provide approximately four minutes of motor-running time with 6 x 2 ½ to 6 x 3 propellers. Large or smaller battery packs, of course, can be used, but through our testing and development, we found this battery pack combination to give optimum results.

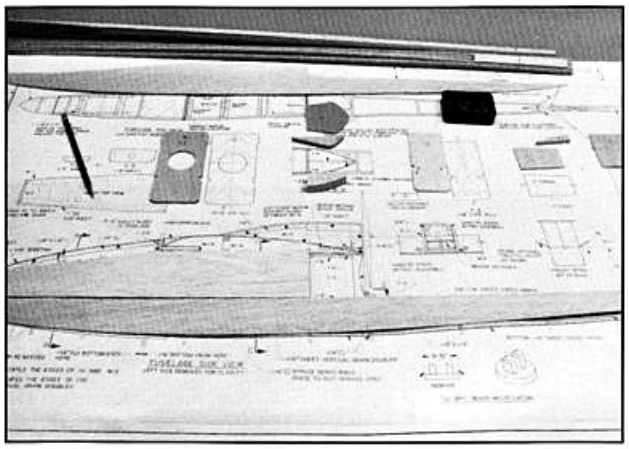
To assist you in your construction, we have called out the types of cement that we used in building our prototype of the Thermal Charger. Other glues can be used, of course, but keep in mind that strength and weight are both extremely important in all model aircraft construction.

Good luck in building your Thermal Charger, and remember, if you should have any questions during construction, please feel free to contact us here at GM Precision Products, phone (714) 592-5144.

FUSELAGE

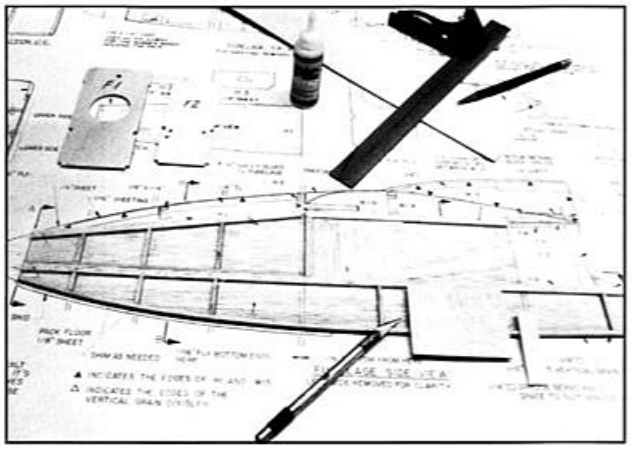
1. Begin construction of the Thermal Charger by placing the plans on a cork board or piece of celotex large enough to accommodate all of the structure during building. With the plans laid out, place a piece of waxed paper over the top of the fuselage structure and pin it into position. Next, locate the fuselage sides and the bundle of balsa that will be used for stringers and vertical braces. Also at this time, locate the package containing the bulkheads and formers used in construction of the fuselage.

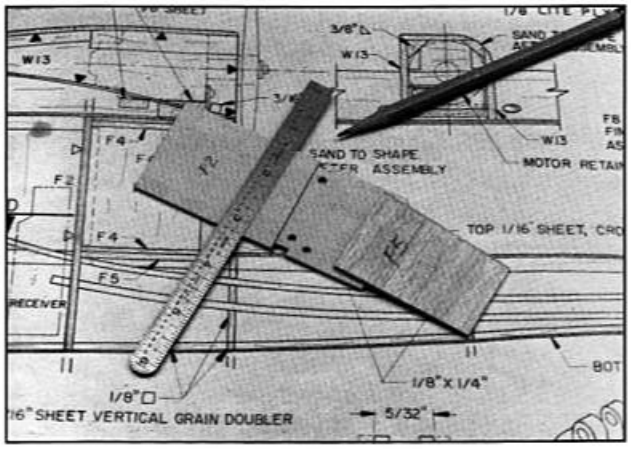
2. With the main parts of the fuselage now located and identified, pin the 1/16" balsa top and bottom fuselage sides to the plans and join them together using thin CA cement.



3. Next, add the 1/8" x 1/4" and 1/8" square balsa stringers that run the full length of the fuselage, using the plans as a guide. At the same time, add the 1/8" square vertical braces in the positions indicated on the plan. Be sure to leave a space for the F1 and F2 formers when installing the top pieces of 1/8" x 1/4" balsa.

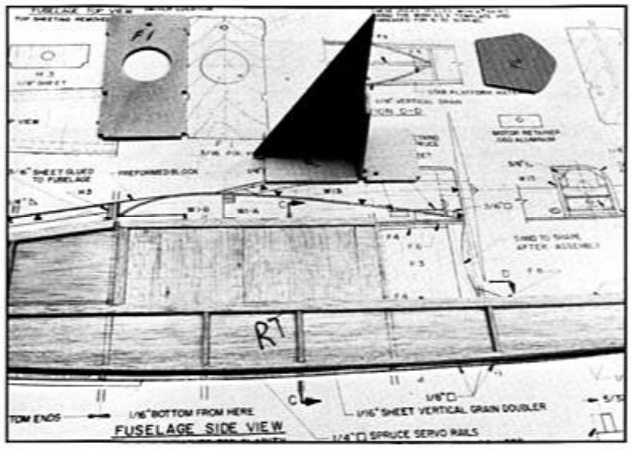
4. Once the balsa stringers have been glued in place, the 1/16" vertical grain balsa can be added to the upper portion of the fuselage between F1 and F2. Be careful to get a good fit when cutting these pieces to size, and glue them in place using thin CA cement.

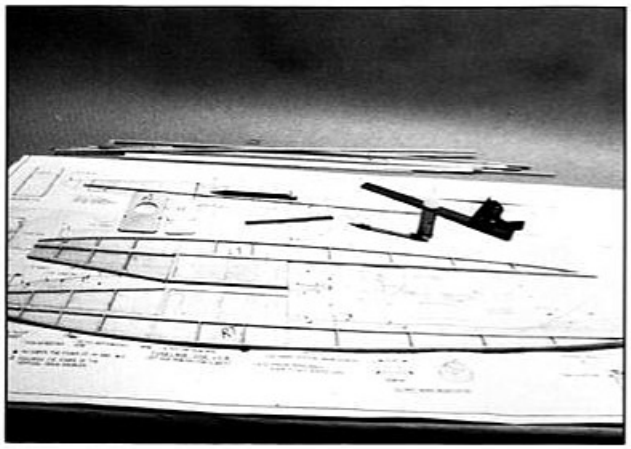


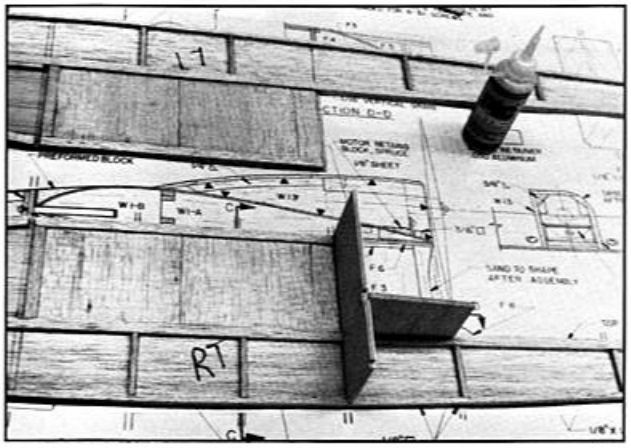


5. When the cement has thoroughly cured on all the joints, you can remove the first fuselage side from the plans and continue fabricating the second fuselage side in exactly the same manner as the first, being sure to make one left side and one right side.

6. After the second side has been completed, allow the glue to completely cure before removing it from the building board. Next, lightly sand all the edges to ensure that they match the outline of the 1/16" balsa sides.







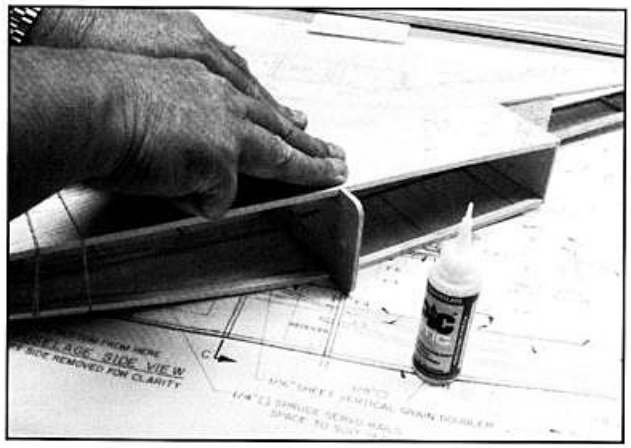
7. To join the left and right fuselage halves together, begin by marking the center location of F5 where F3 will later be glued in place. Draw a line on F2 exactly in line with the top edge of the 1/8" x 1/4" stringer that runs the length of the fuselage sides. Glue F5 into position on F2, being certain that it is perfectly square with F2. With the F2 and F5 now glued together as an assembly, place the F2/F5 assembly into position on the right fuselage side and check for proper fit and alignment. When satisfied with the fit and alignment, use thick CA cement and glue the F2/F5 assembly into position on the right fuselage half.

NOTE: By using thick CA cement, it allows a few seconds extra working time and permits minor adjustments during this phase of assembly.

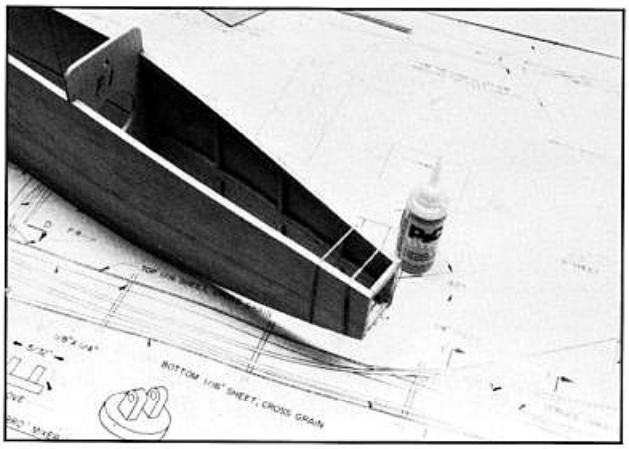
8. When the cement has cured, join the left fuselage half to the right in the same manner, being careful to ensure that the F2 and F5 align properly in their respective positions.

9. You can now place the F1 former into position and check to be sure that it fits properly when the front nose pieces are pulled together to approximately the distance shown on the plans at Section AA. When satisfied with the fit, carefully glue the F1 into position, using thin CA cement.

NOTE: When the glue has been applied to the F1 former, you may find it helpful to lay the fuselage flat on its side and hold a little downward pressure to ensure total contact between F1 and the fuselage sides.

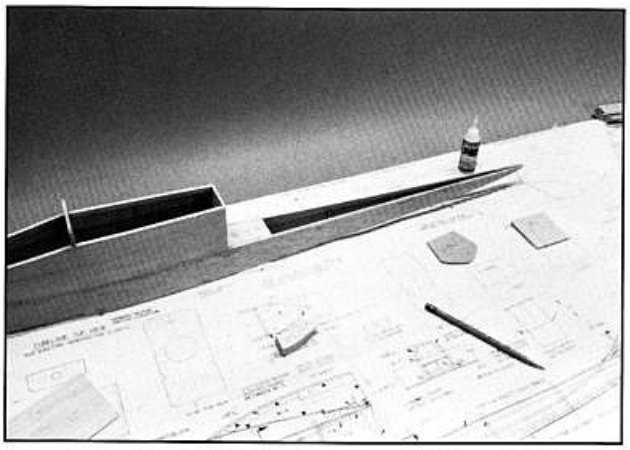


10. Once the F1 former has been glued into position and the cement has thoroughly cured, cut two pieces of 1/8" x 1/4" balsa using the plan's front view Section AA as a guide, and glue the two pieces of balsa into position on the front of the fuselage.

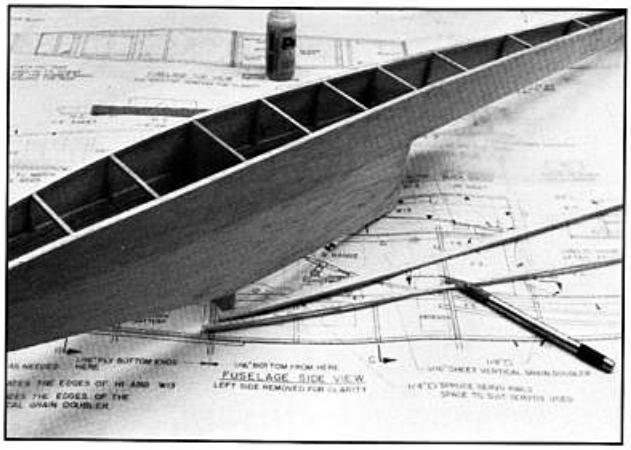


NOTE: Be careful when joining the front of the fuselage together not to allow the sides to become mis-aligned. This is extremely important, as it will affect the alignment of the aft section of the fuselage if it is not straight.

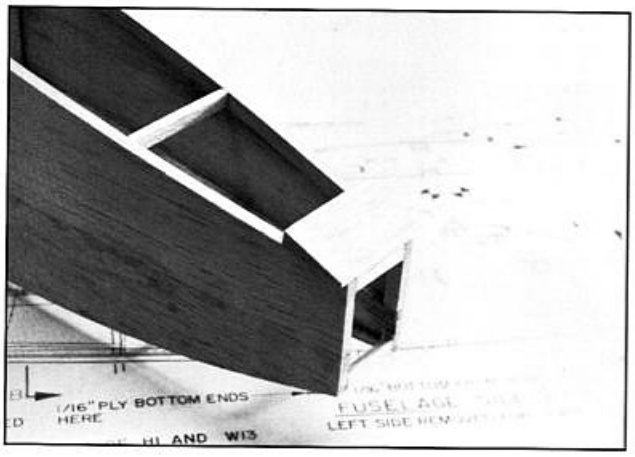
11. With the front section now securely joined together, move to the aft section of the fuselage and join the two fuselage halves together, being careful to ensure accurate alignment before applying the CA cement. NOTE: You may find that it is helpful at this time to set the fuselage assembly directly over the top view of the plans and check the assembly for proper alignment prior to applying the CA cement.



12. Using the plans as a guide, cut the fuselage cross-braces from the 1/8" x 1/8" and 1/8" x 1/4" stock provided and carefully glue these into position as shown on the plans. Remember, as the cross-braces are being glued into position, keep checking the fuselage for proper alignment and make any adjustment necessary at this time.



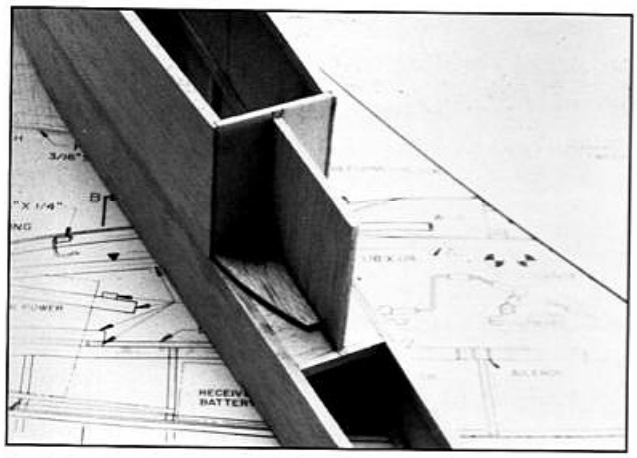
13. With the fuselage sides now joined together, install the piece of 1/4" trailing edge stock used on the top of the fuselage directly in front of the canopy. Also at this time, temporarily install a piece of 1/8" x 1/4" balsa at the top of the canopy rails to be used as a spreader or support piece until the final internal supports in the radio compartment are completed.



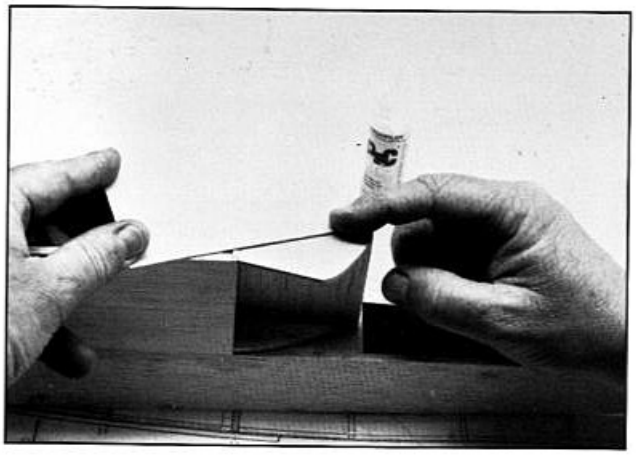
14. The next step in construction of the Thermal Charger is that of assemblying the aft cabin section directly under the electric motor. First, begin by placing F3 in position on top of F5 and aligning it with the marks on F5 and F2. Before gluing F3 in position, carefully check to be certain that F3 is in the center of the fuselage. To do this, place one F4 on each side of the F3 and check that all the parts align exactly correct prior to applying any CA cement.

15. One other check that should be made prior to gluing the pieces in place is to position the F6 on top of F3 and be certain that it is flush with the top of F2, thereby forming a straight surface across the top of the fuselage.

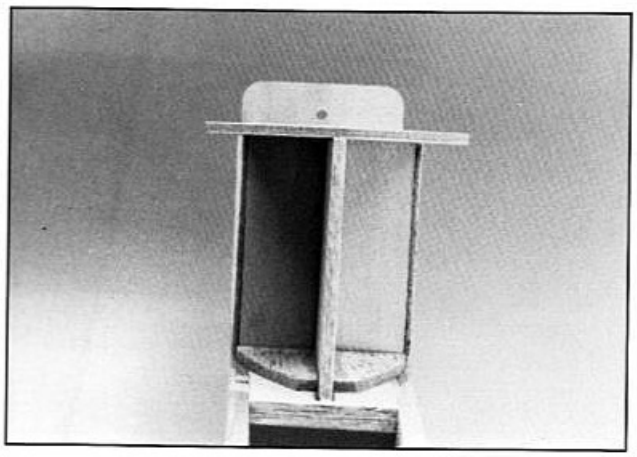
16. When satisfied with the fit, install the F3 using thin CA cement and holding it into position while the cement cures. Next, glue two of the F4 pieces into position on top of F5.



17. To glue F6 into position, use thick CA cement and carefully align F6 on top of F3 and against the F2 bulkhead. To help ensure the F6 is properly aligned with the top of the fuselage, a piece of wood can be held in position on top of the fuselage, thereby helping to align F6 during its installation.

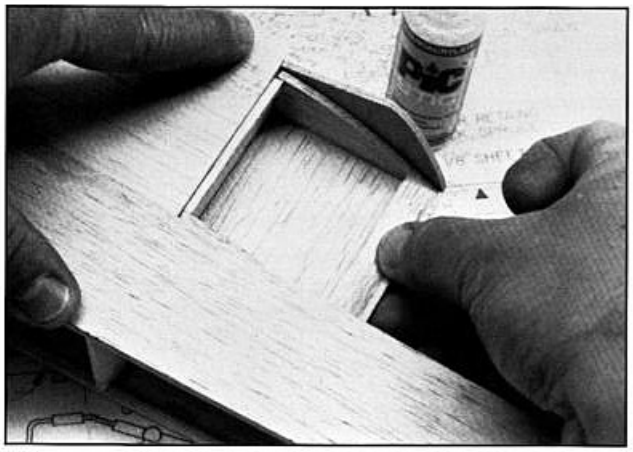


18. When the cement has cured, double check the alignment of F6 to be certain that it is square and true with the top of the fuselage.

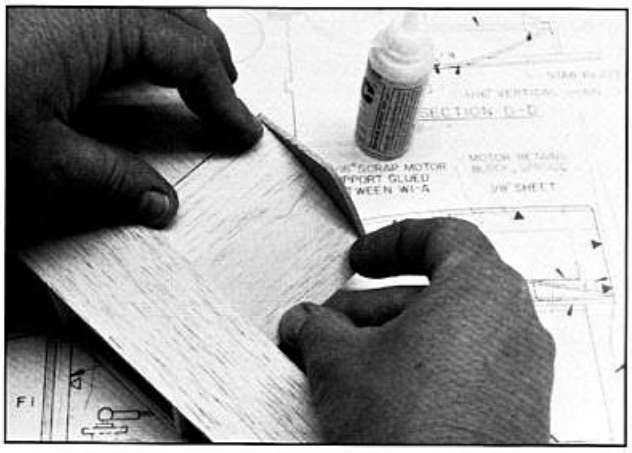


19. Install the two remaining F4's on the bottom of F6, as shown on the plans. Next, cut two 1/8" square strips to the length shown on the plans and glue them into position on the back side of F2 between the two F4's, as shown on the plans. These two vertical pieces will be used as supports for the front edge of the 1/16" balsa, which will later be formed around the F4's.

20. Locate the 30 degree beveled stick of balsa that is used for the aft edge of the fuselage cabin area, and also for the stabilizer platform pieces. Using the plans as a guide, cut two pieces of the 30 degree balsa to the proper length and glue them into position on the aft edge of F3, again using thin CA cement and holding the pieces into position while the cement cures.

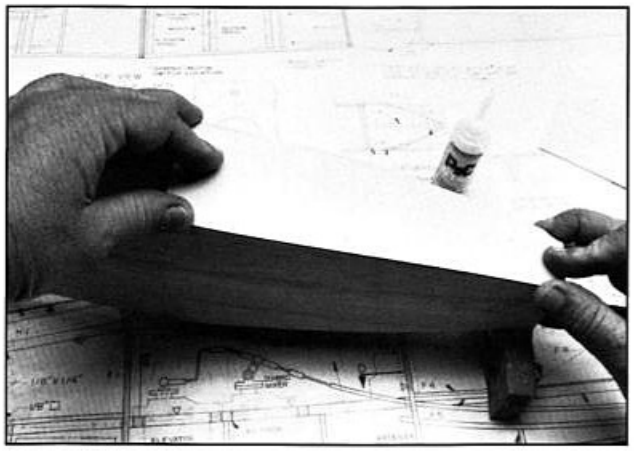


21. Using the 1/16" sheet balsa supplied, cut two pieces approximately 2 1/2" long. Carefully fit one piece on each side of the aft cabin section, and when satisfied with the fit, glue them into position using thick CA cement. Here again, the thick CA cement will allow a little extra working time and makes the job much easier.

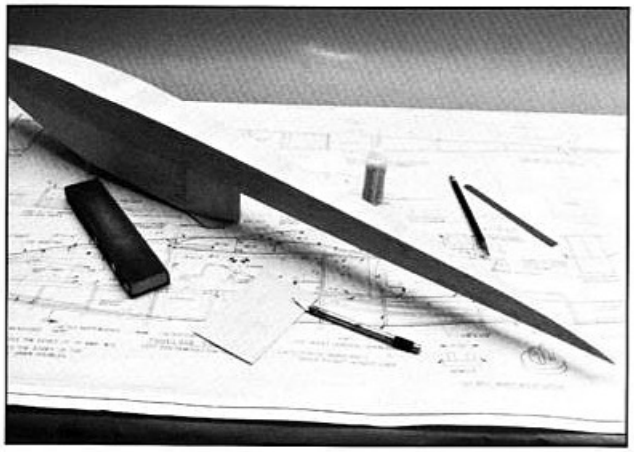


22. With this completed, we are now ready to start sheeting the top and bottom of the fuselage. First, lightly sand all the edges of the fuselage where the sheeting will be glued into position, making sure that all edges are flat and square so that the sheeting will have a good surface to bond to.

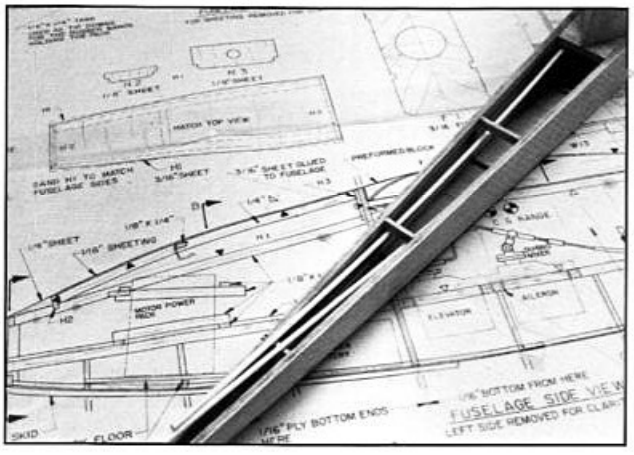
23. Begin installing the sheeting with the 1/16" plywood floor, which is placed on the bottom front section of the fuselage. Using thick CA cement, glue the plywood fuselage bottom into position and hold it in place while the cement cures. Continue installing the balsa sheeting cross-grain, being careful to get a good fit at each joint.

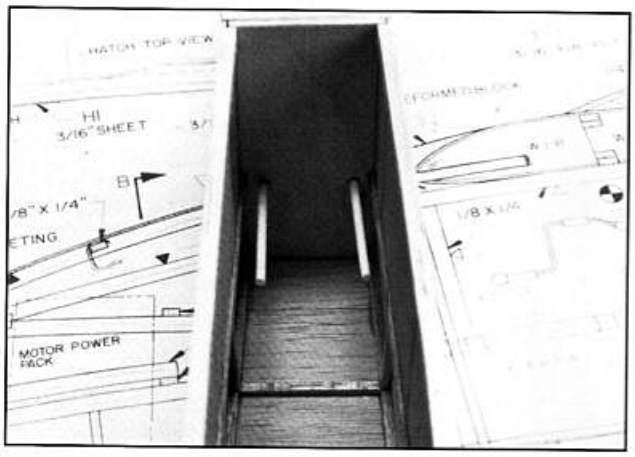


24. When all of the sheeting is installed on the bottom, trim the excess balsa from the sides and using a sanding block with coarse sanding paper, rough shape the bottom to match the sides.

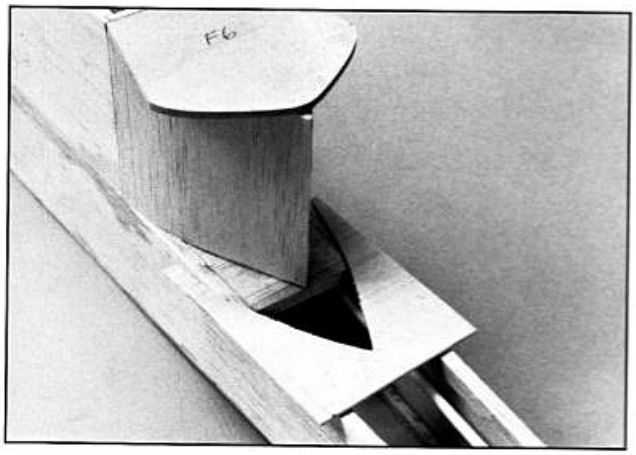


25. With this completed, the fuselage is now ready to turn over and install the flexible nylon cables for the ruddervator controls and the antenna outlet. NOTE: At this time, do not glue the ruddervator pushrod outer housing to the F2 bulkhead or at the tail section. These outer rods will be glued in position after trail fit of the radio gear and stabilizer assembly.





26. Begin sheeting the top rear section of the fuselage by notching a piece of the 1/16" sheet balsa so that it will fit snuggly against the top rear section of the fuselage. To help make this job a little easier, trace the outline of this assembly from the plans onto a piece of paper and then use that as your guide for notching the 1/16" balsa.



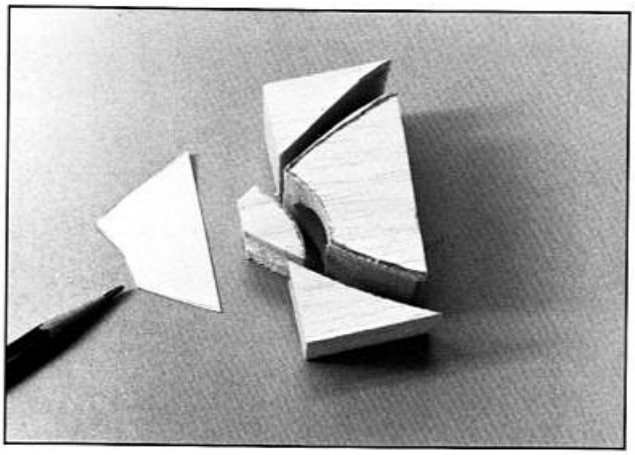
27. When satisfied with the fit, begin by installing the notched piece of balsa first, and then continue aft installing each piece in the same manner as used on the bottom sheeting.

NOTE: The 1/16" balsa sheeting stops approximately 1 1/2" in front of Section EE as shown on the plans.

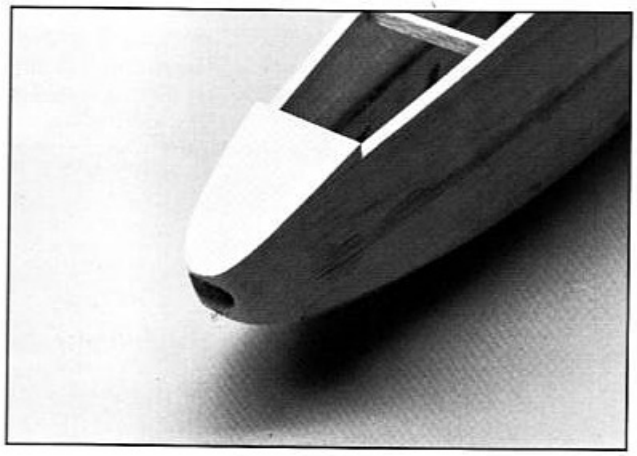
28. With the sheeting now completed, we can shape the noseblock to the outline shown on the plans and install it on the front of the fuselage. Here again, tracing the outline of the noseblock onto a piece of paper and then transferring that to the noseblock will make the shaping of the noseblock much easier.

29. Remember, when shaping the noseblock, the air inlet hole is located below the center line, thereby allowing air to flow in, across the battery packs, and on up through the fuselage and out the motor, thereby forming a good ventilation system for cooling the batteries and the motor.

30. Also, you will find it helpful to make the outline on the noseblock slightly oversided and then trim it to the exact outline during final shaping.

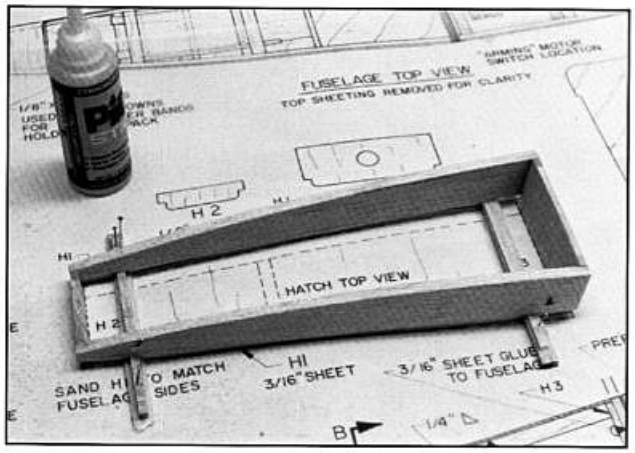


31. With the noseblock glued in position on the front of the fuselage, use a sharp knife and shape the noseblock to match the top view shown on the plans. When the noseblock is approximately the shape shown on the plans, begin using a sanding block with coarse sand paper and complete the shaping process. Work very carefully so that you don't remove any of the 1/16" balsa from the sides of the fuselage.



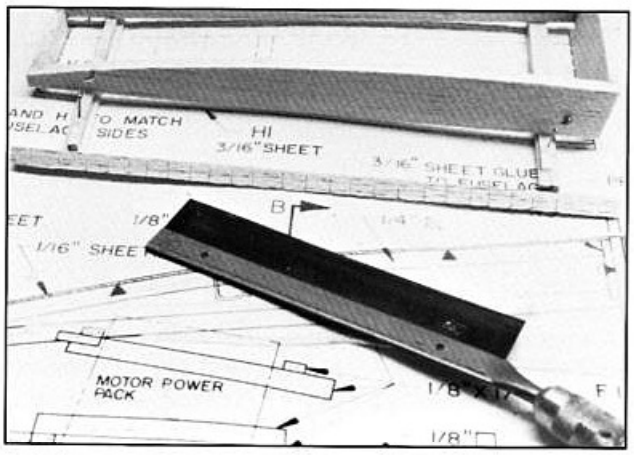
32. With this completed, we are now ready to make the canopy section and will need to locate the two H1 pieces, the H2, and the H3 from the parts bag containing the balsa pieces for the canopy.

33. Using pieces of scrap 1/16" and 1/8" material, support the canopy sides (H1) 3/16" above the plans on spacers. Carefully bevel the inside edges of H2 and H3 very slightly so that they will conform to the shape of the fuselage sides and match perfectly.

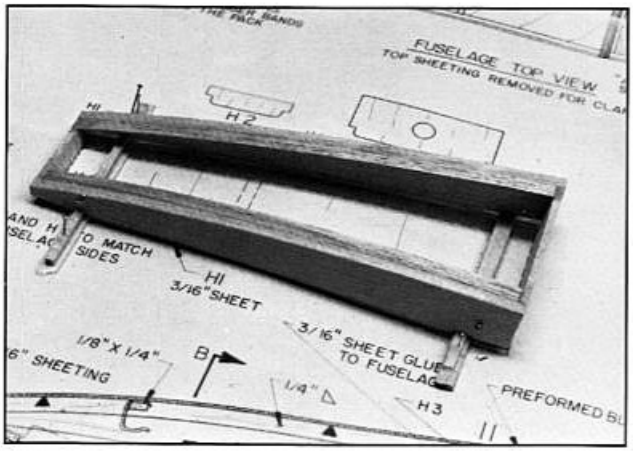


34. When this is done, carefully hold the H2 and H3 bulkheads in position and glue them to the canopy sides, using thin CA cement. Next, locate the 1/4" triangular stock and cut two pieces to the approximate length as shown in the illustration on the plans.

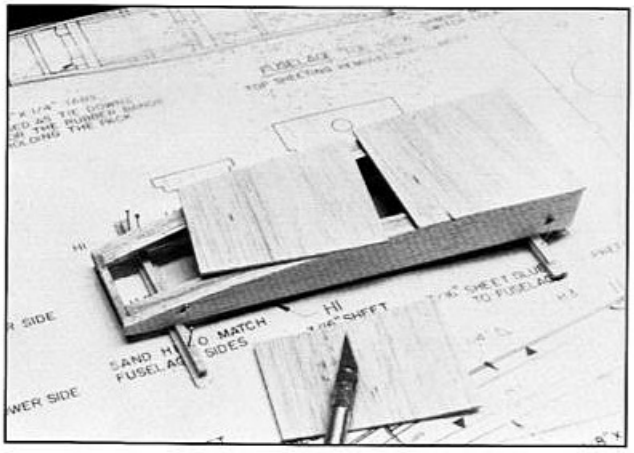
NOTE: To help make the two pieces of triangular stock form to the shape of the canopy more easily, the triangular stock can be notched on the bottom side using an exacto saw as shown in the photograph. Be careful when making these notches not to cut all the way through the triangular stock and to be certain to make them on the bottom side so as to allow more flexibility in the triangular stock.



35. Once the two pieces of 1/4" triangular stock have been glued to the inside of the H1 canopy sides, use a sanding block with a piece of coarse to medium grit paper and carefully sand the top edges of the canopy where the 1/16" top sheeting will be glued in place.



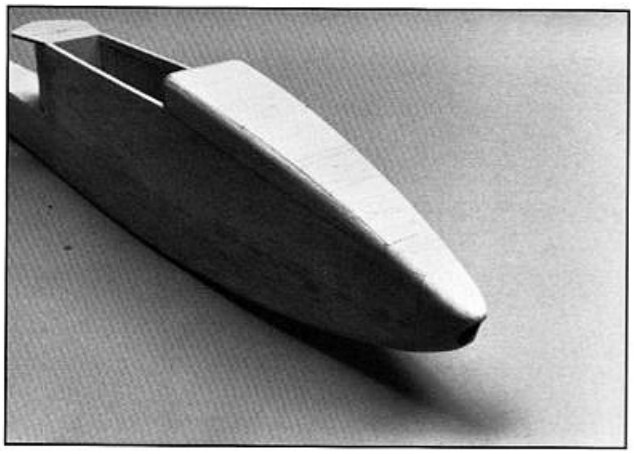
36. Next, cut three pieces of 1/16" balsa sheeting from the material supplied and glue them in position on the top of the canopy. Here again, thick CA cement will allow a little extra time to ensure accurate alignment during this phase of construction.



37. Once this sheeting has been installed, the canopy can be removed from the building board and the excess balsa trimmed flush with the sides of the canopy.

38. With the canopy removed from the building board, set it on top of the fuselage and check it for proper fit. If the canopy is slightly oversized, you can set it on the edge of your building board and then carefully use a sanding block and coarse grit sandpaper, remove the small amount of material necessary to achieve a good fit.

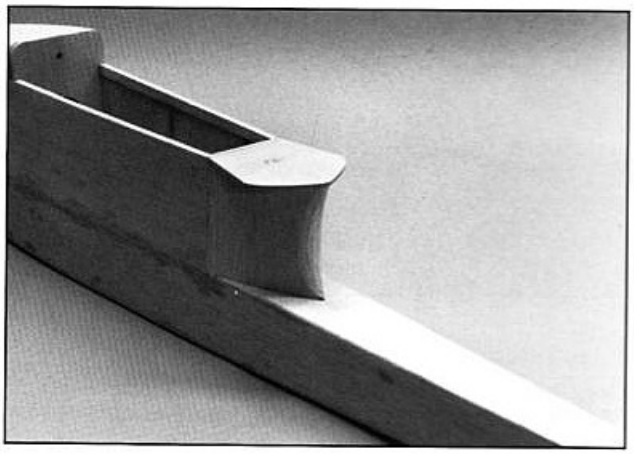
39. When the canopy fits the fuselage snugly and evenly, you can then use one small drop of thin CA cement at both the front and rear edges of the canopy to join the canopy temporarily to the fuselage so that the canopy can be shaped to match the F1 former and the nose contour as called out in Section AA on the plans.



40. A sanding block with coarse grit sandpaper on it will allow you to quickly and easily shape the canopy to match the fuselage radiuses and contours.

NOTE: Refer to Section AA (the front view) to achieve the correct radius for the nose section.

41. With that completed, you can now also radius the bottom of the fuselage and the area below the motor in the same manner. When completed, set the fuselage aside until later when we will install the radio gear and ruddervator assembly.

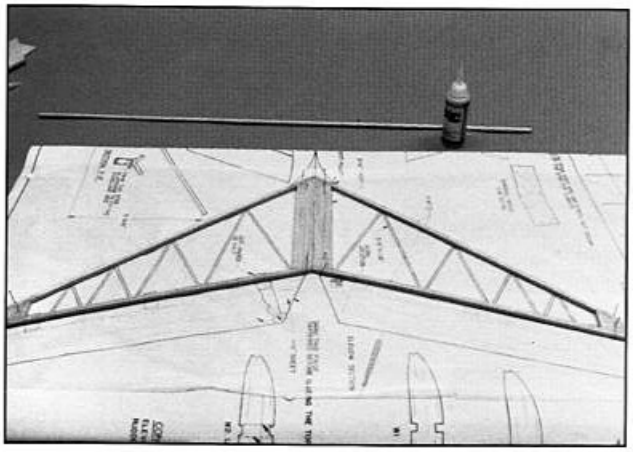


42. This completes the basic construction of the fuselage. The remainder of construction that takes place within the fuselage deals with radio, motor, battery pack installation, and stabilizer installation, and all of these sections will be covered a little later.

STABILIZER ASSEMBLY

1. Begin construction of the stabilizer assembly by again placing waxed paper over the plans. Locate the 3/16" balsa stabilizer parts in the plastic parts bag and lay them out on the plans in their respective positions.

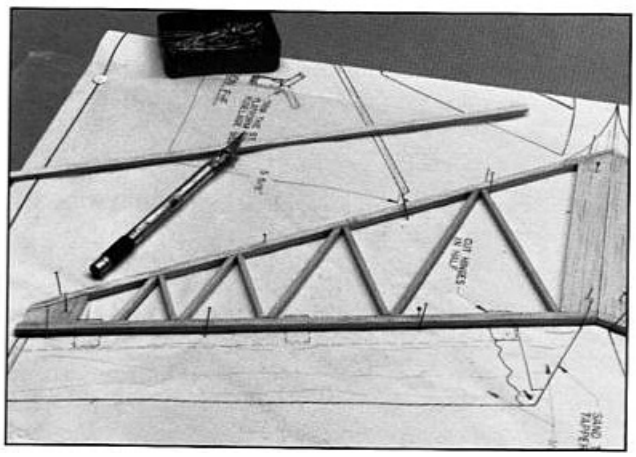
2. Pin the center section and tip blocks into position on the plans. Using the 3/16" square balsa provided in the kit, cut the leading and trailing edge pieces of the stabilizer assembly to the correct size and angles and glue them to the 3/16" balsa blocks at the tip and center section.



NOTE: Be very careful not to allow the left and right halves of the stabilizer assembly to be glued together during this phase of construction.

3. Using the 1/8" by 3/16" balsa sticks, carefully cut to length and shape the diagonal braces, which comprise the center section of the stabilizer assembly.

4. During this phase of construction, you may find it helpful to use thick CA cement and to carefully form a small fillet around the joints between the diagonal pieces and the leading and trailing edge.



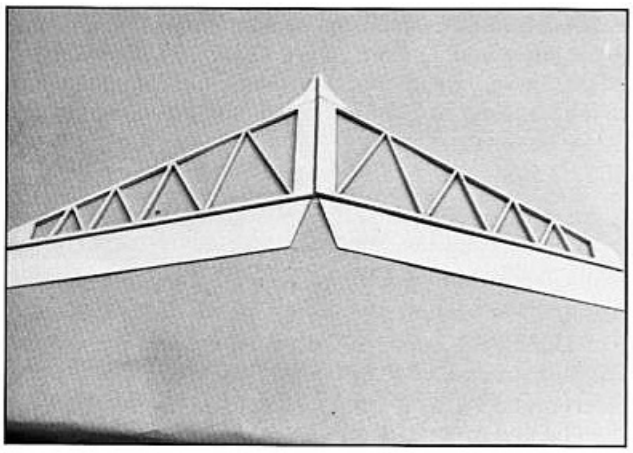
5. After the cement has thoroughly cured, the two stabilizer halves can be moved from the building board and shaped to the outline shown on the plans. Also at this time, install the 3/16" fillets on the front of the stabilizer.

6. Again using the plans as a guide, make a template by tracing the shape on the plans onto a piece of paper and then transfer that shape to the 3/16" balsa supplied in the kit.

7. When satisfied with the shape and fit, cement the two fillets into position using CA cement. After the cement has cured, shape the leading edge of the fillets to match the leading edge of the stabilizer.

8. With the stabilizer halves now completed, we can assemble the ruddervators using the 3/16" sheet ruddervators supplied, and install the 3/16" square tip blocks on each end.

9. When the glue has cured on the end pieces, shape the ruddervators to the outline shown on the plans using a small block plane or razor plane and a sanding block with a coarse grit sandpaper.

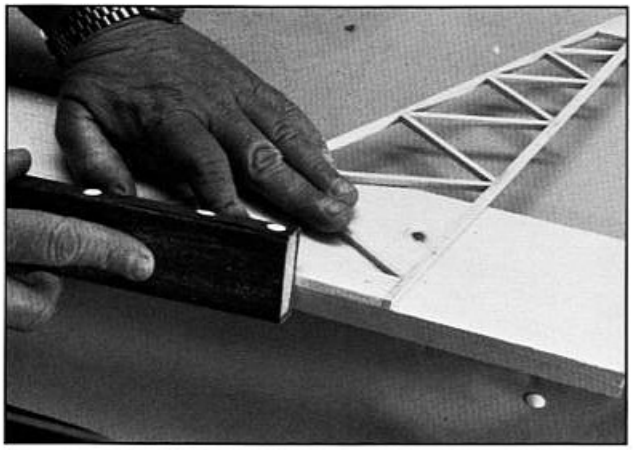


10. With the stabilizer and ruddervators now complete, mark the location for the hinges as shown on the plans.

NOTE: The hinge material supplied in the kit is to be cut in half lengthwise, forming six hinges.

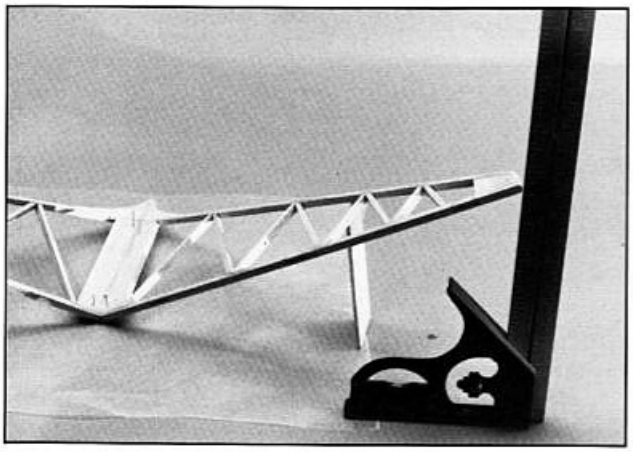
11. Carefully notch the stabilizer and ruddervators to accept the hinges and temporarily place them in position on the stabilizer. Check the fit to be certain that there is not an excessive air gap between the ruddervators and stabilizer.

12. To form the angle between the two stabilizer halves, it will be necessary to block the stabilizer up above your work surface or place it on a sharp edge where the inner edge of the stabilizer can be held firmly in position while the correct angle is sanded onto the stabilizer half, using a sanding block and a piece of coarse grit of sandpaper.



13. It is very important to achieve the correct angle so that the center joint between the two stabilizer halves is a perfect match with the dihedral angle at 5 5/8" at each tip.

14. When satisfied with the joint, pin the center section of each of the stabilizer halves to the table and prop the ends of the stabilizers up 5 5/8" at each end.



15. Using thin CA cement, glue the center section together where the two halves are joined.

16. After the assembly has been cemented together, remove it from the building board and ensure that the center section joint is thoroughly joined over the full length.

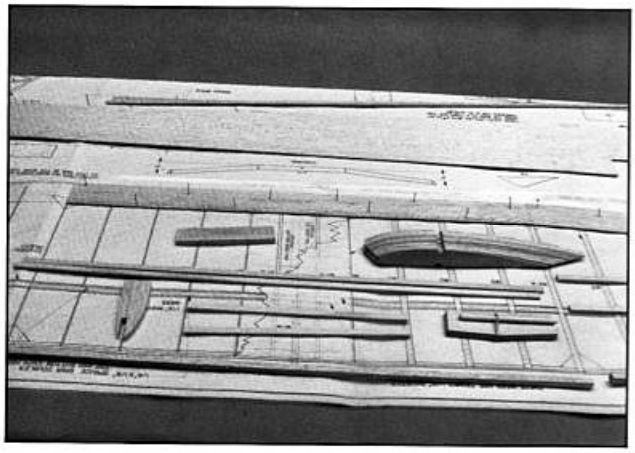
NOTE: If necessary, add additional CA cement to the center section joint at this time and allow it to cure thoroughly.

17. Next, give the entire stabilizer assembly a light sanding using a fine grade of sandpaper on a sanding block. When completed, set the stabilizer assembly aside and we are now ready to assemble the wing.

WING

1. Begin construction of the wing by covering the plans with waxed paper. Since the wing for the Thermal Charger is built in three sections and then assembled into one unit at the completion of construction, we will begin our construction with the center section and then build the left and right tips accordingly.

2. First, begin by locating the spruce spars and spar doublers, leading edge and trailing edge components. Also, locate the wing ribs and identify each of the ribs as to its proper location.



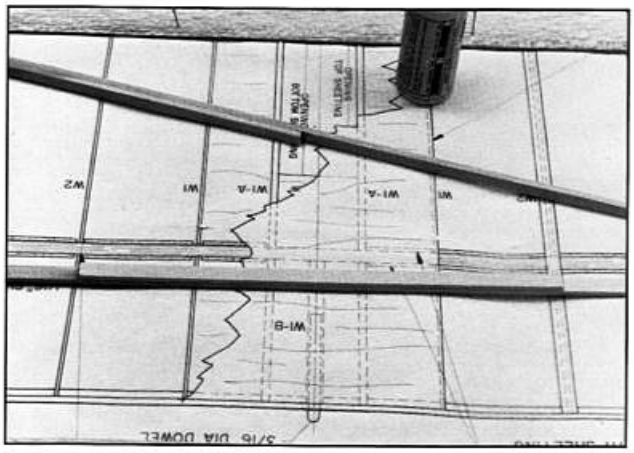
3. Note that on the plans there are call outs for several ribs to help you identify these parts, since there are special differences in these items.

4. Prior to pinning the materials to the work bench, study the plans thoroughly and become familiar with the locations of the parts that will be covered up by the wood during assembly.

5. To help keep this from being a problem during construction, we will take you step by step through the wing construction to help eliminate any questions you might have.

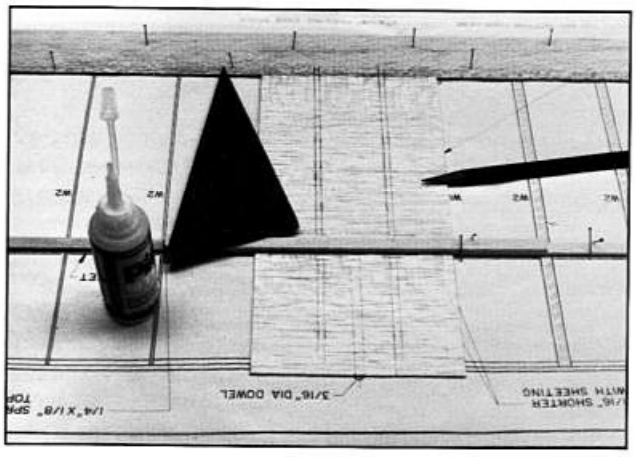
6. Begin construction of the center section by first assembling the top and bottom spruce spars. Locate the 1/8" x 1/4" spruce spars and doublers, and then placing them in position over the plans.

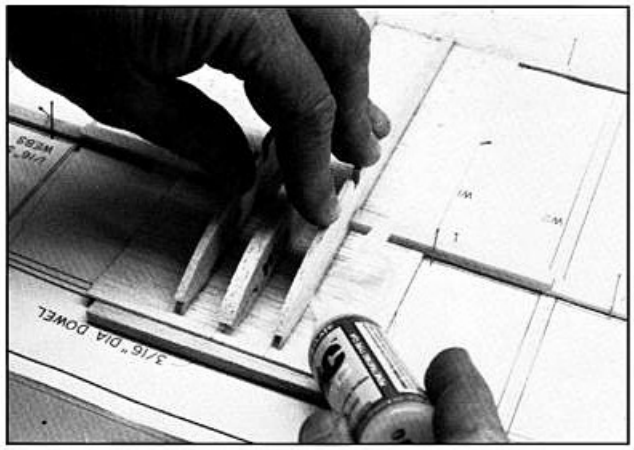
7. Carefully mark the location for the spar doublers, and join them together using thick CA cement. It is very important to hold these parts together firmly during the time that the CA cement is curing.



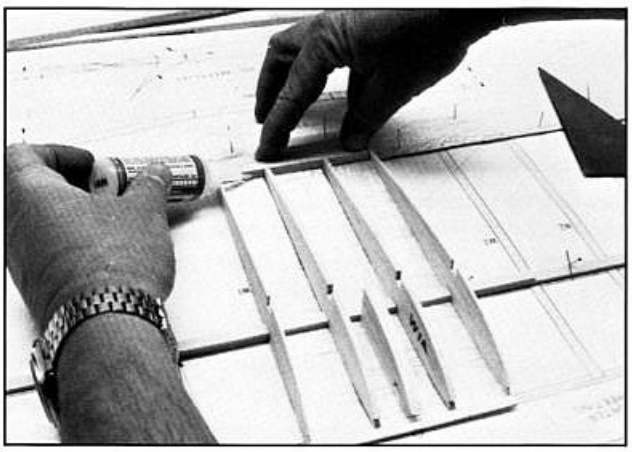
8. With the top and bottom spar assemblies now completed, set the top spar aside and locate the bottom spar in position over the plans, using pins placed at an angle (not pinned through the spar).

9. At this time, you can also pin the 1/16" balsa trailing edge sheet in position on the plans. Next, install the 1/16" balsa center sheeting in position between the spar and trailing edge, and the spar and the leading edge and carefully mark the location of the W1A ribs directly on the sheeting. To do this, transfer the position of the ribs from the plans to the balsa sheeting before gluing the 1/16" sheeting into position over the plans. Next, locate the W1A and W1B ribs and place these in position on top of this sheeting.





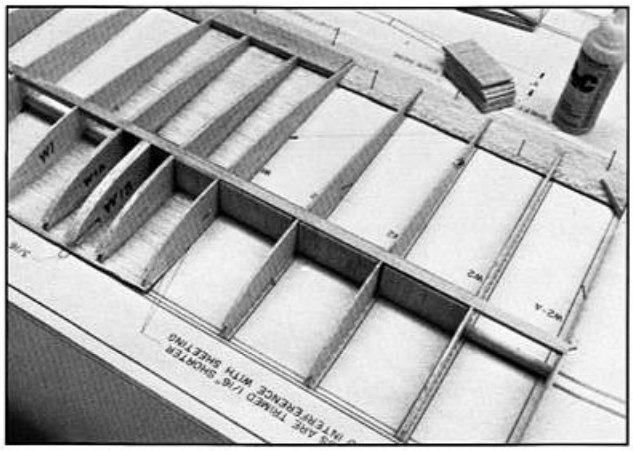
10. Locate the piece of trailing edge stock that will later be installed to reinforce the trailing edge, and place the trailing edge stock underneath the front portion of the bottom sheeting at the front of the W1A and W1B ribs, and glue the ribs in position using thin CA cement. Install the W1 ribs in position on the center section sheeting and glue them in place. Next, remove the piece of trailing edge stock from below the front edge of the center section and glue it into position behind the W1A ribs.

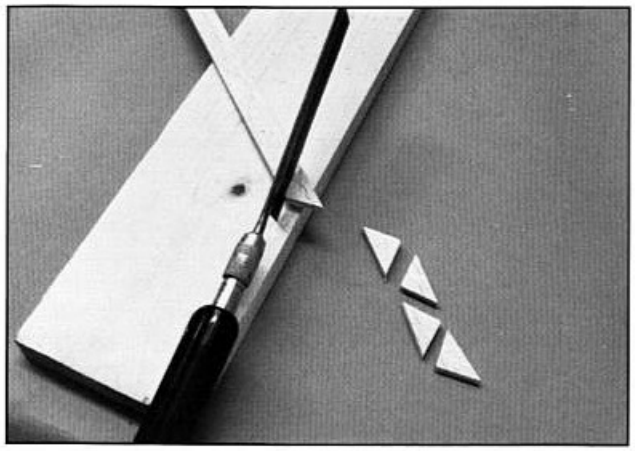


11. With the center section now framed up, install the W2 ribs on each side of the center section. Be certain when gluing the outermost W2 rib in position that it is square to the building surface. This rib will later be notched to accept the dihedral braces as shown on the plans (rib W2A).

12. With all the center section ribs glued in place, you can now add the top spar assembly, shear webs, and 3/16" balsa gussets at the trailing edge position, as shown on the plans.

NOTE: When making the gussets from the 3/16" balsa stock provided, you will find it helpful to cut 12 of the gussets at one time since this is the total number of gussets required during wing construction. To help simplify this operation, cut one gusset to shape using the plans as a guide and then, using that one gusset as a pattern, cut the additional 11 gussets and set them aside until needed during construction. Also, in the areas where the gussets are used for support in the trailing edge area, you may find it necessary to slightly chamfer the aft edge of the gusset so that it will clear the top trailing edge sheeting when it is installed.





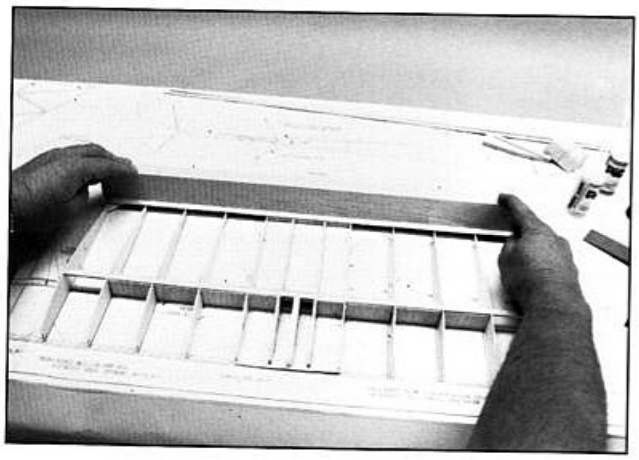
13. When installing the 1/16" vertical grain balsa sheer webs, begin at the center of the wing and work your way out to the next to the last rib bay, being sure to install the 1/16" shear webs on both the front and back of the main spars.

NOTE: When installing the shear webs, try to hold the shear webs just slightly above the bottom surface of the wing where it meets the waxed paper on the plans, and just below the top of the spar, as allowing a small gap at the bottom and at the top will make sanding the wing much easier later on. Also, using thick CA cement will make this job much easier and allows a little extra time in aligning each piece of the shear web material.

14. Prior to installing top trailing edge sheeting, lightly bevel the bottom edge of the sheeting using a sanding block with medium grit sandpaper. By tapering the bottom surface of the upper trailing edge sheeting, it will allow a better fit where the two pieces of sheeting meet, thereby providing a much stronger trailing edge.

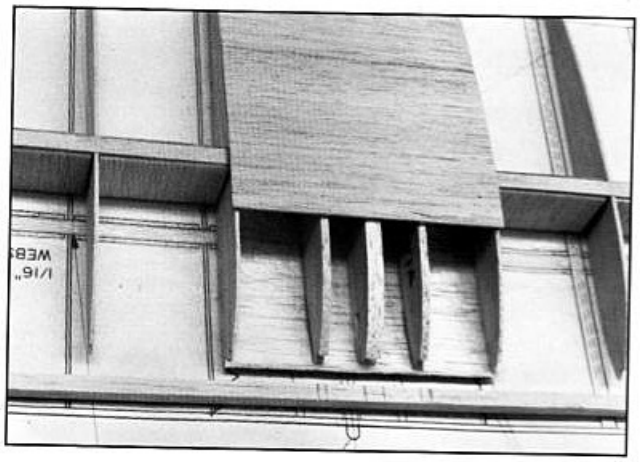
15. Also, during assembly of the upper and lower trailing edge pieces, using a yardstick or other suitable piece of material to press down on the trailing edge will help ensure that the trailing edge will be straight without any deviation.

16. For this phase of assembly, use a slow curing or thick CA cement and work quickly and be certain that all the sheeting is properly aligned before the cement cures.



17. Once the trailing edge sheeting has been installed, you can begin sheeting the top center section, starting at the trailing edge stock and working forward.

NOTE: Do not install the final piece of sheeting on the front as this will be installed after the leading edge has been glued into place.



18. Temporarily remove the wing center section from the building board.

19. Using the 1/4" square leading edge material supplied in the kit, mark the location of the two W1A ribs on the leading edge using the plans as a guide.

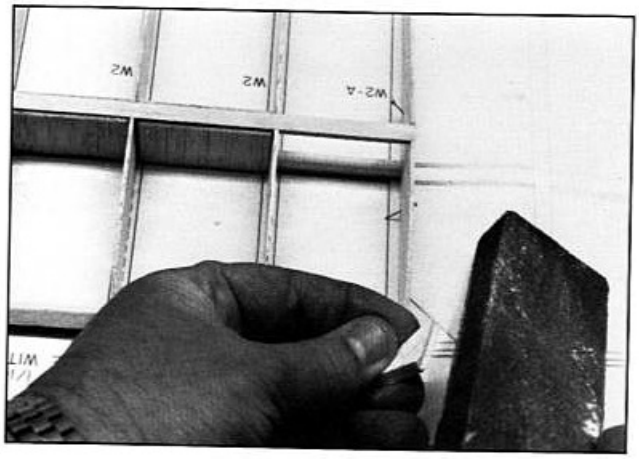
20. Next, check the fit of the leading edge against the bottom of the center section sheeting and shape the center section sheeting to mate with the leading edge when placed in position.

21. When satisfied with the fit, carefully glue the leading edge into position. Here again, thick CA cement will allow a little extra working time to ensure proper alignment.

22. With the leading edge now installed, pin the center wing panel back on the plans as it was prior to installing the leading edge.

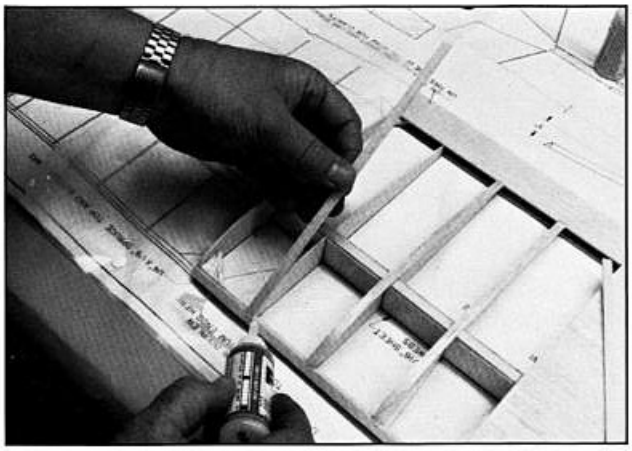
23. With the wing securely pinned to the board (this ensures that the wing will be flat and true), install the remaining sheeting on the front portion of the center section and install the cap strips over each of the ribs except for the outermost rib where the wing tip panel will join the center section. Also at this time, install the gussets on the leading edge at the W2A rib position.

NOTE: When fitting the triangular gussets to the leading edge, the front edge of the gusset should be shaped to match the back side of the leading edge. To do this, use a sanding block with coarse grit sandpaper and carefully notch the leading edge of the gusset.



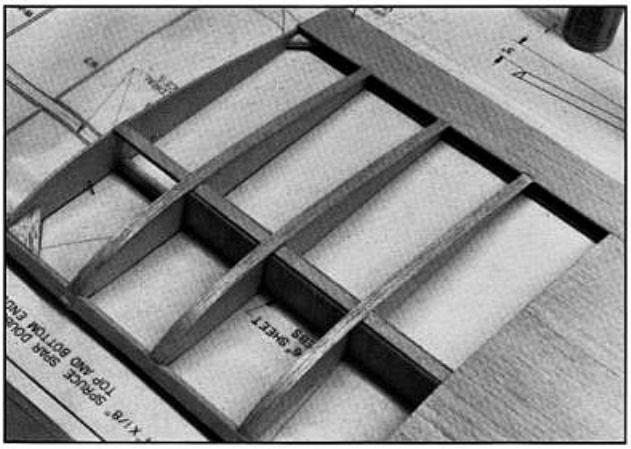
24. When installing the cap strips, cut the cap strip to the approximate length required to go from leading edge to trailing edge. Beginning at the leading edge, tack the cap strip in position using CA cement and allow it to cure thoroughly before proceeding any farther.

25. Next, push the cap strip down against the rib and accurately cut the end so that it will meet the trailing edge properly. Then, using thick CA cement on top of the rib (below the cap strip), push the rib down into position and hold it in place until the CA cement cures.



NOTE: You may find it helpful to moisten the front portion of the cap strips so they will follow the rib contour more easily.

26. When all the cap strips have been installed, this portion of the wing assembly can be removed from the building board and set aside while the two tip panels are constructed.



27. Begin assembly of the tip panels by pinning the 1/16" trailing edge sheeting and 1/8" x 1/4" balsa spar in position on the plans. Next, install each of the ribs in its position and glue it in place using thin CA cement. When the cement has cured, the leading edge and top balsa spar can also be glued in place.

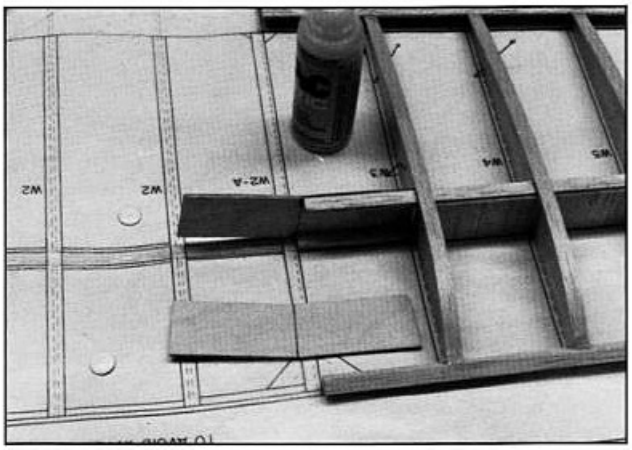
28. Next, install the shear webs on the front side of the main spars.

NOTE: It will be necessary to trim each of the shear webs for the proper height prior to installing them on the wing. Also at this time, you can install the wing tip gusset blocks in the same manner as used with the center section.

29. Once the tip gusset blocks have been installed, the top trailing edge sheeting and cap strips can be glued in position.

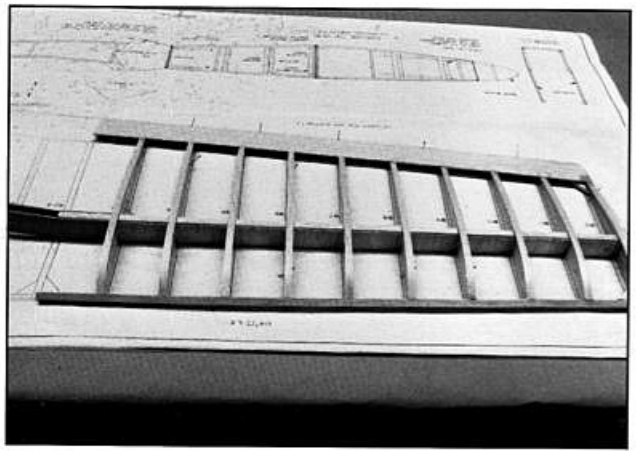
NOTE: When installing cap strips, you may find that using a little accelerator will help speed the curing action of the thick CA cement and thereby make the job a little quicker and easier.

30. Locate the 1/16" dihedral braces from the plywood parts bag, and using the plans as a guide, mark the center location on each of the dihedral braces.



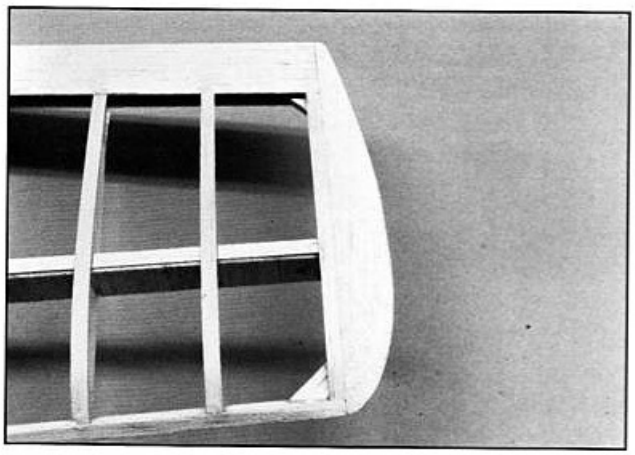
31. Next, with the wing still firmly pinned to the building board, check the fit and alignment of each dihedral brace when it is positioned on the main spars. Be sure that the center line on the dihedral brace aligns properly with the end of the spars, as this joint will become critical when the tip panels are joined to the center section.

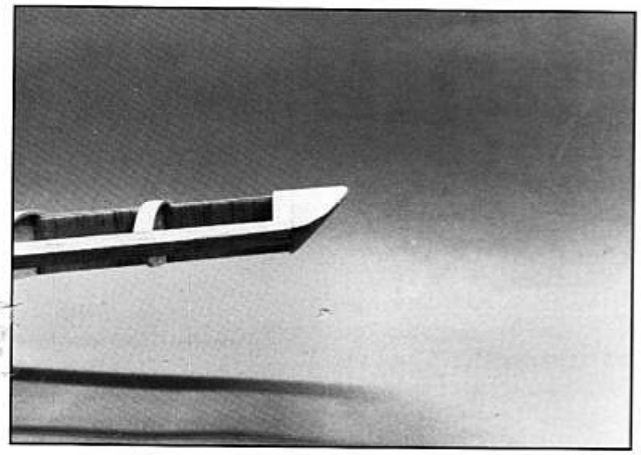
32. When satisfied with the fit of the dihedral braces, glue them into position using thick CA cement and hold them securely in place while the cement cures.



33. With this completed, we can now remove the tip panel from the building board and set it aside while we build the opposite tip panel in the same manner as the one just constructed.

34. After both tip panels have been removed from the building boards, the balsa tip blocks can be secured to each of the tip panels and shaped to the outline shown on the plans using a sharp knife and a sanding block with coarse grit sandpaper.

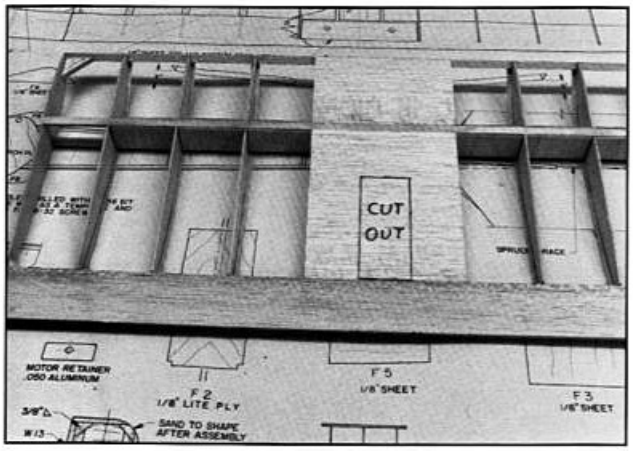




35. Be careful during this phase of assembly not to cut in to the tip rib or cap strip material.

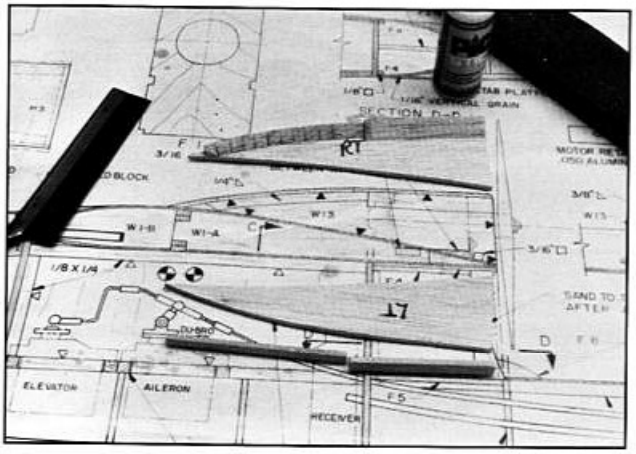
36. With the tip panels now completed, we are ready to construct the motor mount assembly, which will fit on the top of the center section of the wing.

37. Begin this phase of construction by locating the openings in the top and bottom sheeting of the center section through which the air will flow to cool the electric motor and batteries. The opening in the top sheeting is slightly smaller than that in the bottom sheeting and the size and location of both these holes can be gaged by referring to the center section wing plans.

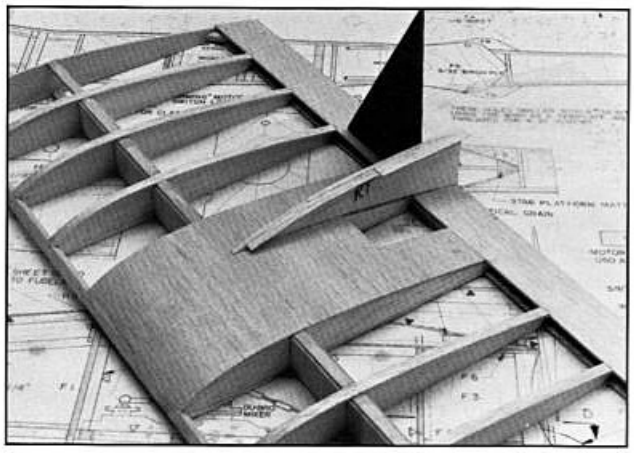


NOTE: Be very careful when making these openings in the wing sheeting not to cut into the two W1A ribs.

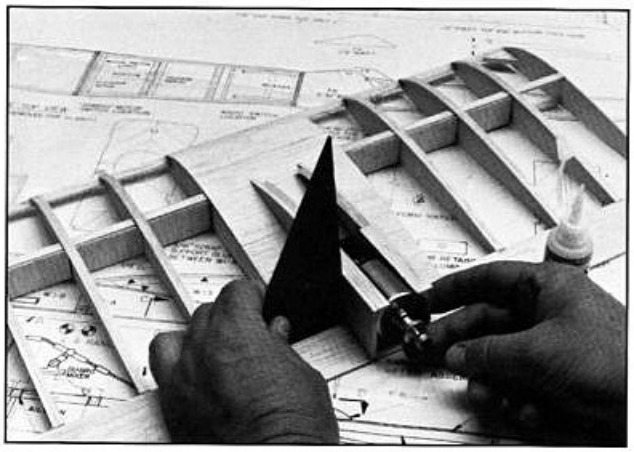
38. Locate the two side pieces for the motor mount nacelle (W13) and mark them with a left and right. Next, using the 3/8" and 1/4" balsa triangular stock, assemble one left side and one right side.



39. After the two W13 sides are assembled, place one of them directly over one of the W1A ribs and align the aft edge of the W13 with the rear edge of the trailing edge sheeting and glue it in position using thin CA cement, making sure that it is square with the wing surface.



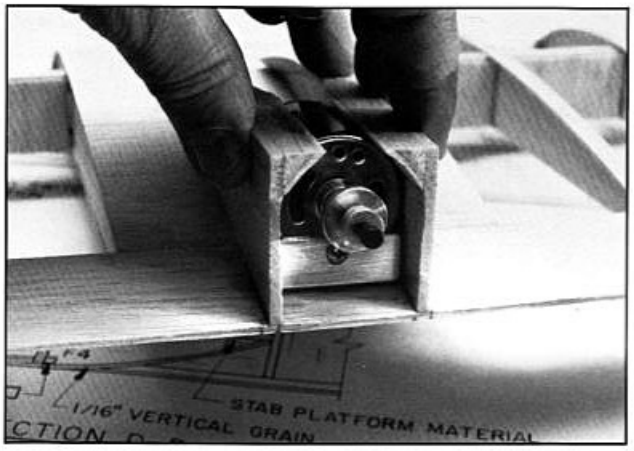
40. Next, using the motor as a spacer, place the opposite side of the motor nacelle in position on the top of the wing and firmly hold that side against the motor so that it will have a snug fit when glued in position. Then holding the side firmly in place, cement it into position using thin CA cement.



41. When the cement has cured, slide the electric motor into position and place the spruce motor retaining block under the motor. Note that the position of the retaining block is approximately 1/2" from the aft edge of the wing.

42. Remember, the key points here are to have the motor installed with an absolutely zero thrust line and for the propeller thrust plate (attached to the electric motor) to extend approximately 1/16" to 3/32" beyond the aft edge of the nacelle to provide adequate propeller clearance.

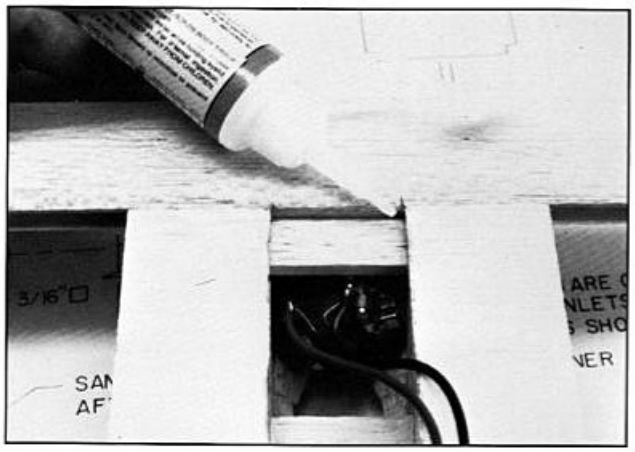
43. Also of importance is to ensure that the motor is a snug fit in the nacelle and that it does not extend above the top edge of the sides.



44. If necessary, you could add shims to the surface of the 3/8" triangular stock where it will contact the motor to help ensure a snug fit, or if necessary, you could relieve the 3/8" balsa stock slightly if the fit is a little too tight.

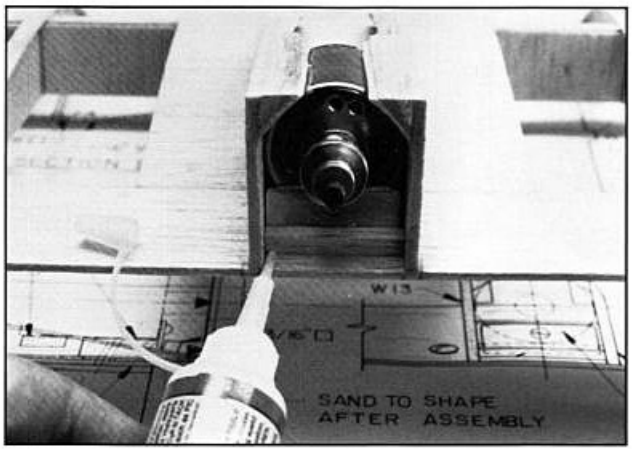
45. Remember, you must be able to remove and install the electric motor after the nacelle assembly is finished.

46. When satisfied with the fit, glue the spruce motor retaining block in place using CA cement. When the cement has cured, turn the wing over and install the motor support made from 3/16" scrap material leftover from the stick used for making the wing gussets.



NOTE: Be sure that the motor is level before gluing this brace in place.

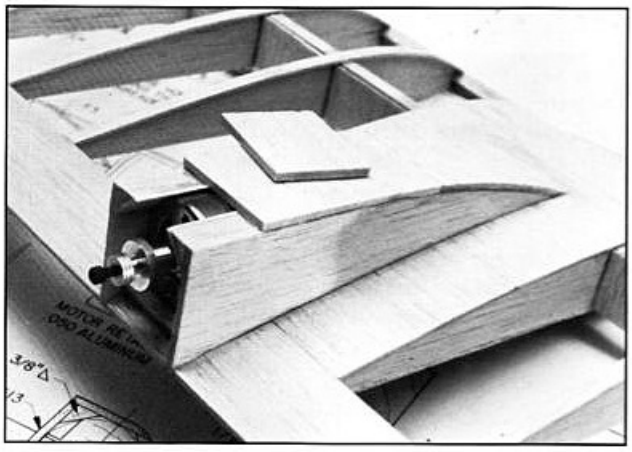
47. Next, cut a piece of 3/16" square balsa (leftover from the stabilizer assembly) and glue it in place at the bottom of the motor retaining plate. The motor retaining plate and retaining screw can both be found in the hardware package supplied with the kit. If you have any questions about this installation, refer to the detailed drawings on the plans.

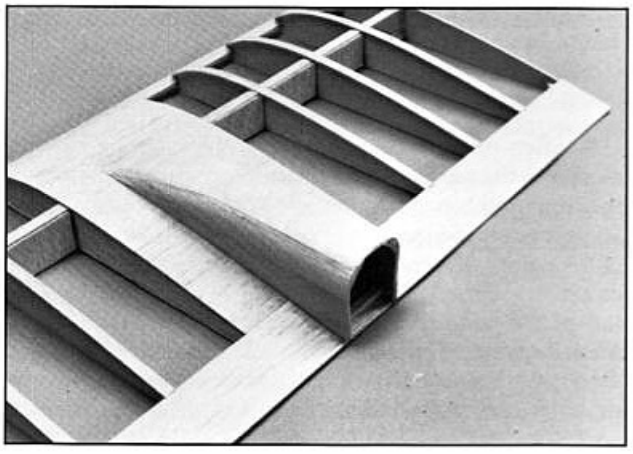


NOTE: Be sure to attach the retaining plate to the motor before the 3/16" square balsa is glued in place.

48. At this time, the top sheeting can be glued in place on the nacelle. During installation of the top sheeting, leave the motor in place and press the sides of the nacelle against the motor to help ensure that when the top sheeting is installed, the motor will be a tight fit.

49. After all the sheeting has been installed and the cement has thoroughly cured, remove the electric motor and shape the nacelle to the outline shown on the plans.

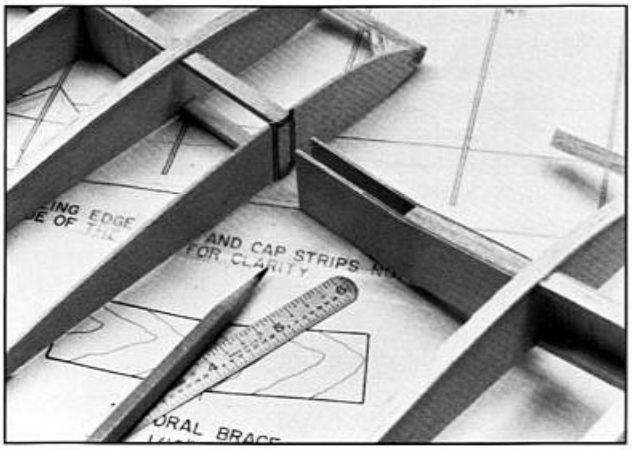




50. With the construction of the motor nacelle now completed, we are now ready to join the tip panels to the center section.

51. Do to this, begin by carefully indexing the area of the W2A ribs that must be removed in order to install the dihedral braces and join the wing halves together. Since the dihedral braces are 1/16" thick, it will be necessary to remove 1/16" of balsa each side of the main spars.

52. Be very careful when removing this material not to break the glue joints on the rib at the leading and trailing edge.



53. With the balsa trimmed away from the center section of the rib, securely pin the center section of the wing to the building board, again placing waxed paper beneath the wing where the center section will be joined to the tip.

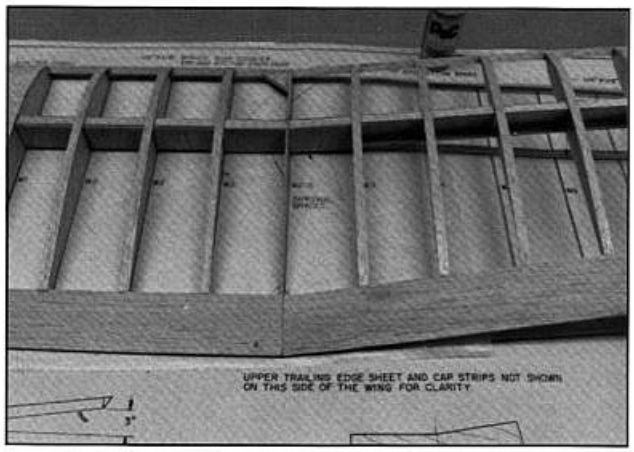
54. Carefully check the fit of all the pieces, being certain to get a tight joint where the spars from the center section and tip panel meet, as well as at the leading edge and trailing edge.

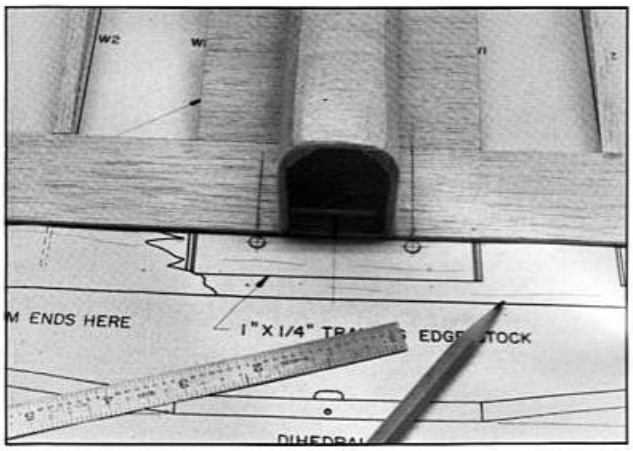
NOTE: It may be necessary to remove a small amount of balsa from the tip panel spars and to lightly sand the tip panel leading edge and trailing edge so that the panels will meet at the proper dihedral angle when joined together.

NOTE: THE PROPER DIHEDRAL ANGLE IS 3" MEASURED AT THE BOTTOM OF THE TIP RIB AS SHOWN ON THE PLANS.

55. When satisfied with the fit, join the two panels together using thick CA cement or epoxy.

NOTE: Begin by joining only the spars and dihedral braces and then after the cement has cured on these pieces, you can glue the leading edge and trailing edge pieces securely in position.





56. When the cement has thoroughly cured, install the two gussets that reinforce the tip panel when joined to the center section in the same manner as the previous gussets were installed.

57. Next, install the cap strip over the W2A rib.

58. Join the other wing panel to the center section in the same manner as the one just attached.

59. After the cement has thoroughly cured, remove the wing from the building board and round the leading edge, using a sanding block and coarse grit sandpaper. After the leading edge has been rounded, use the sanding block and a medium, then fine grit sandpaper and thoroughly sand the entire wing.

WING DOWEL AND WING BOLT LOCATIONS

1. To locate the wing dowel and bolt locations, place the wing back over the plans and carefully align the structure so as to ensure that it is positioned exactly in the center of the plans.

2. Using a pencil or a felt tip pen, mark the locations for the center line of the wing panel on both the leading edge and trailing edge positions.

3. With the wing still in position on the plans, move it forward, keeping the center section aligned with the center line on the plans and carefully mark the location for the two wing hold-down bolts.

4. If you have any doubts about the exact locations for the bolt holes, they are approximately 1/4" out from the sides of the motor nacelle and 15/16" forward of the trailing edge.

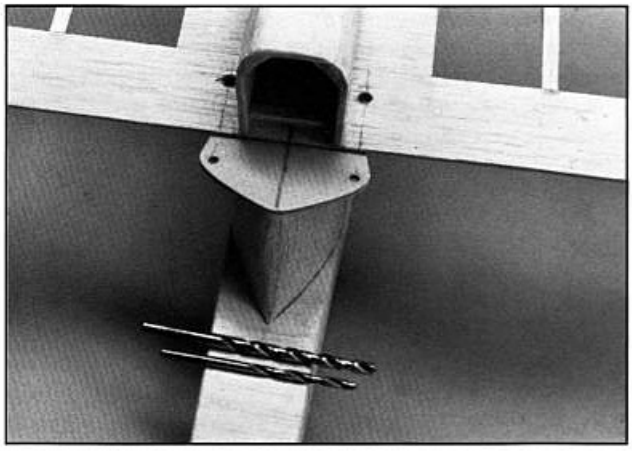
5. Once these locations have been accurately marked, the leading edge dowel position and wing hold-down bolt holes can be drilled.

6. During this phase of assembly, it is critical that the wing be perfectly aligned with the fuselage assembly. Before you drill any holes, check alignment of all pieces.

7. Once the wing and fuselage are properly aligned, you can pin them in place using straight pins to hold the wing and fuselage in alignment during the initial drilling.

8. After one side has been drilled, carefully hold the wing in position and with the pin removed, drill the opposite side in the same manner.

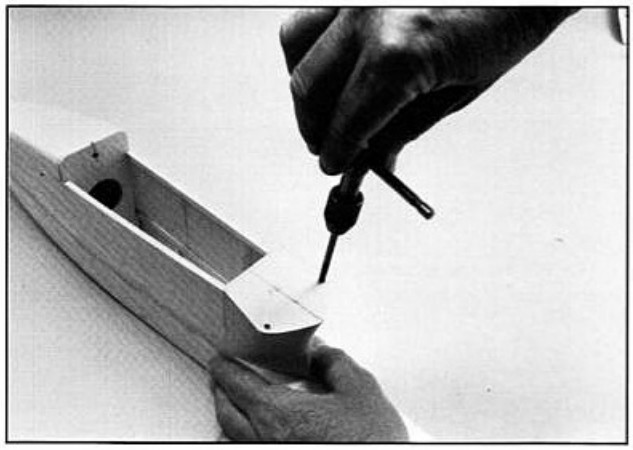
9. When drilling the hole, the drill should be perpendicular to the top surface of the trailing edge stock. This is very important so that the screws will be installed at a slight angle forward, thereby providing a flush surface for the heads of the nylon wing mounting screws. The original hole will be drilled with a 5/32" drill bit and will be drilled from the top of the wing directly through the F6 plywood wing mounting plate. The second hole will be drilled only through the top of the wing and will provide clearance for the wing mounting bolts. The correct sized drill bit for this hole will be 7/32".



10. Once all the holes have been drilled, apply one or two drops of thin CA cement to each hole and allow the cement to penetrate thoroughly into the wood. After the cement has cured, re-drill each of the holes using the respective drill bit for each.

11. By applying the thin CA cement to the wood after the hole was drilled originally and then drilled again, it will ensure accuracy of the hole size and help prevent the wood from splintering around the hole.

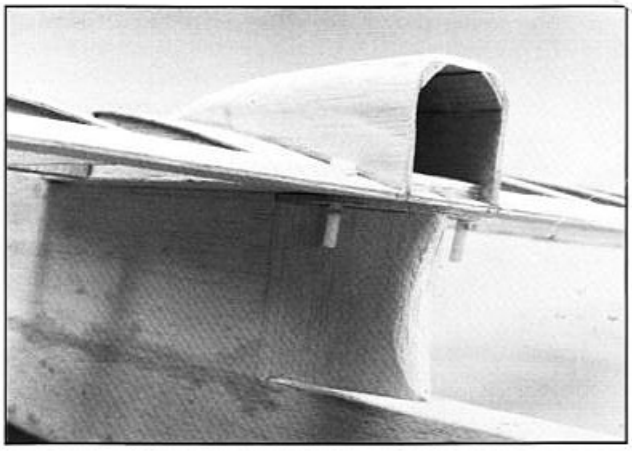
12. Using a 10/32" tap, carefully tap the holes in the F6 plywood plate, being certain to maintain the angle that the hole was originally drilled at.



13. After tapping the hole, carefully remove any burrs or splinters that may have developed during the tapping process. Trial fit the 10/32" nylon bolts to be certain that they thread into the hold-down plate smoothly.

14. Place the wing in position on the fuselage and instll the nylon wing bolts. With the wing securely held in position with the nylon bolts, mark the bolts approximately 1/16" below the bottom surface of F6.

15. When the bolt is removed, cut the bottom portion of the nylon bolt off and carefully dress the threads to be certain that they will screw into the plywood plate without any binding.



STABILIZER ASSEMBLY INSTALLATION

1. With the wing installation now complete, the stabilizer assembly can be positioned in place on the fuselage.

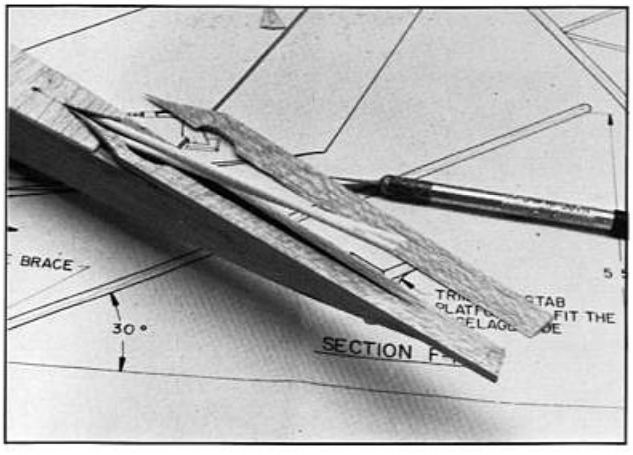
2. Begin by marking the location where the two pushrods will exit the fuselage and extend through the fillet section on the front of the stabilizer assembly.

3. Using the plans as a guide, carefully mark the pushrod exit location and remove this material using a sharp exac-to knife or dremmel tool. When making the hole, be careful not to make it too large. The two nylon pushrods should just fit through the hole with a small amount of room around each of the nylon tubes to allow proper alignment during final assembly.

4. Using the 30 degree angle balsa stock provided for the stabilizer platform, cut two pieces to size using the stabilizer assembly as a guide.

5. Remember, the stabilizer platform pieces go from the aft edge of the main stabilizer assembly all the way forward to the tip of the fillet blocks.

6. After the two stabilizer supports have been cut to the proper length and shape, carefully notch both pieces to allow the nylon pushrod material to pass through the center of the two pieces.

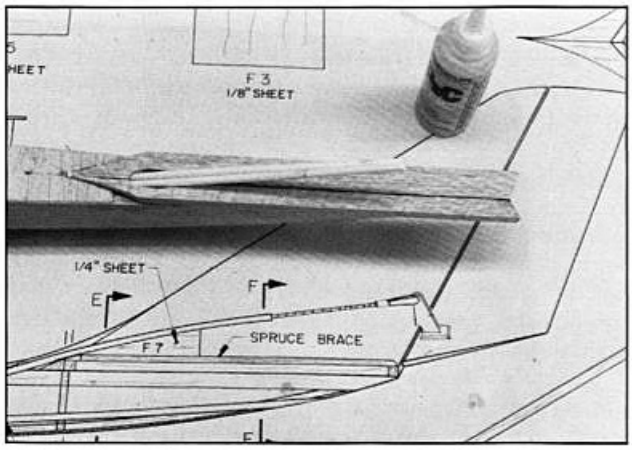


7. Using a ruler, draw a line in the center of the fuselage at the EE location.

8. Next, place the stabilizer platform pieces on top of the fuselage and carefully align them with the center line at the front and the center of the fuselage at the rear where the two fuselage sides come together.

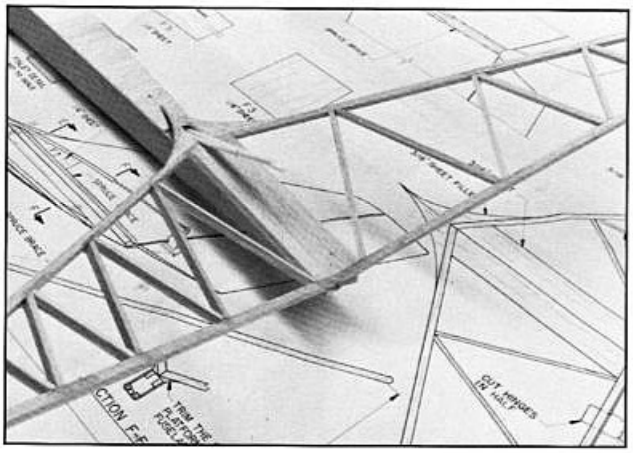
9. Place the aft edge of the stabilizer support even with the aft edge of the fuselage and carefully outline the shape of the front portion of the stabilizer support on top of the 1/16" balsa sheeting. Using a sharp exacto knife, remove that center section of sheeting so that the two stabilizer support platforms can be mounted flush with the top of the fuselage.

10. When satisfied with the fit and alignment, glue the two stabilizer platform support pieces into position on the top of the fuselage, using thick CA cement.



NOTE: Be very careful during this phase of assembly to ensure that the stabilizer platform support pieces are directly in line with the center line of the fuselage or the stabilizer assembly will be out of alignment and thereby cause the airplane to turn one direction or another.

11. Test fit the stabilizer assembly onto the fuselage and check to be certain that is is square with the fuselage and that both tips are the same distance from the building board.



12. Using scraps leftover from the 1/16" sheeting, fill the corners between the front edge of the stabilizer platforms and the top rear fuselage sheeting. Also at this time, shape the stabilizer platform blocks to the shape shown on the plans. Be very careful not to remove any of the wood from the 1/16" fuselage sides when doing the shaping.

13. With this completed, we are now ready to begin installation of the radio equipment.

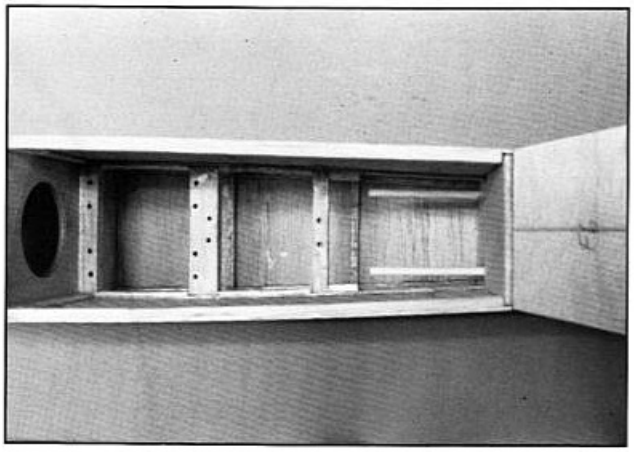
RADIO INSTALLATION

1. Locate the 1/4" x 1/4" spruce servo rail material and begin by cutting the four servo rails to the approximate length necessary.

NOTE: Depending on the type of servos used, the length of these servo mounting rails will change as the length of the servos changes. The important thing, however, is to keep the servos as far forward in the fuselage as possible. Whatever type of radio equipment you wish to install, just keep this in mind.

2. Also, when installing the servo mount rails, use scrap 1/16" x 1/4" balsa material between the servo mount rails to support them and help prevent them from breaking loose in the event of a hard landing.

3. With the servo rails installed, carefully locate and drill all the holes for the servo mounting screws.



NOTE: Be certain to leave approximately 1/8" clearance between the sides of the two forward servos and the side of the fuselage. Also, you must allow enough space between the front two servos to allow the installation of the on-off motor switch. Refer to the plans for the general location of each of these items.

4. With the servos installed in their respective positions, fabricate the linkage which connects the elevator servo with the rudder servo.

5. To do this, refer to the plans for the approximate angles and lengths of this linkage assembly and fabricate it using the parts supplied with the dubro mixer assembly.

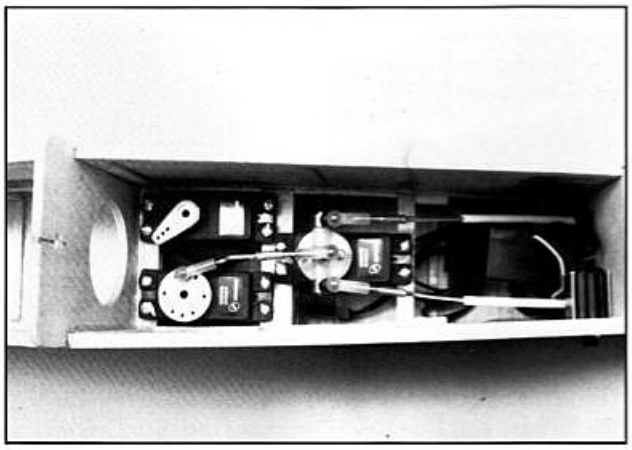
6. Next, assemble the dubro mixer as shown in their instructions and attach it to the servo output wheel using two sheet metal screws.

NOTE: Depending on the type of servos used and whether or not the servo travel can be adjusted on the radio (dual rates), you may need to trim the dubro mixer assembly as shown on the plans to reduce the amount of travel going to the ruddervators during the rudder function of operation.

7. With the mixer assembly temporarily placed in position on top of the servo, the threaded brass couplers can be soldered to the steel pushrod cables included with the kit.

8. After the couplers have been securely soldered to the pushrod cables, screw the nylon ball-link cable ends onto the adjuster approximately midway and install the cables into the outer nylon housing and install the ball-link ends onto the mixer assembly. Next, attach the linkage between the elevator servo and the mixer assembly at the center location.

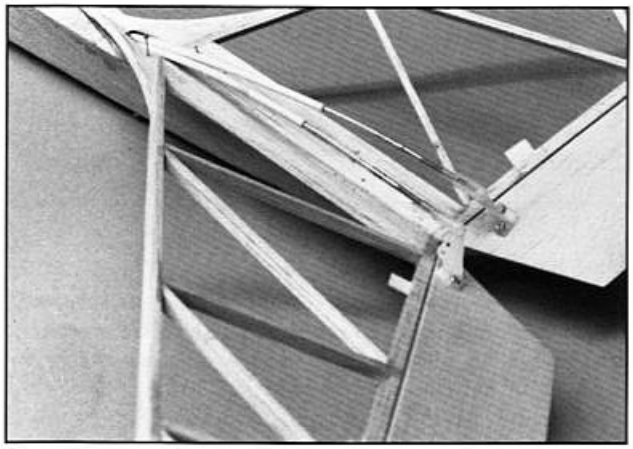
9. For the next step, it is best to install your receiver and hookup all of the servos. With the radio turned on and the servos in their neutral position (all trim switches also in their neutral position), attach the servo wheels to the servos and adjust the linkages as necessary to achieve the approximate angles shown on the plans.



NOTE: These angles are very important as they allow all of the moving parts to work very freely and provide excellent response.

10. With the servos and ruddervator mixer assembly attached and adjusted, we can now trim the two steel pushrod cables to the proper length at the ruddervators and solder the two threaded brass couplers to the cables.

11. Be very careful when trimming the cables to length and that both ruddervators are pinned in the neutral position. Also, be certain that both the left and right pushrods are correctly attached to the proper side of the servo output arms. For example, the left ruddervator cable is attached to the left servo output arm.



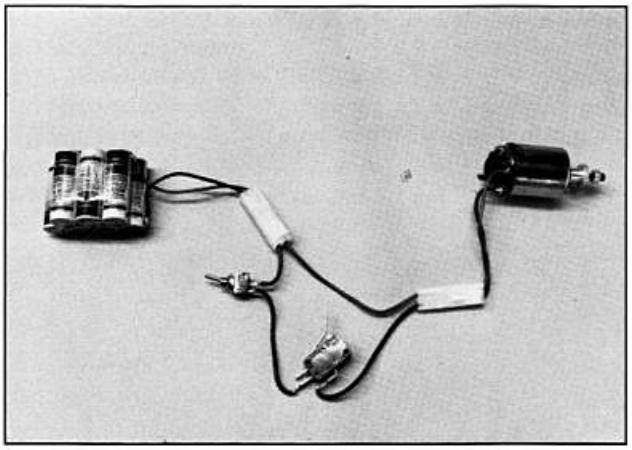
12. With all of the controls hooked up, removed the pins from the ruddervators and turn on the radio and check control surface for proper movement.

13. Remember, to make a left turn with a V-tailed airplane using ruddervators, the left ruddervator must go downward and the right ruddervator go upwards. To make a right turn, the right ruddervator must go down and the left ruddervator must go up. Obviously, the up and down movement is still the same.

14. If your controls are not working in the proper directions and the radio you are using does not have servo reversing capability, the pushrod position must be swapped in the fuselage between the F2 bulkhead and where they exit at the stabilizer assembly. This is very simple and only requires reversing the pushrods with the elevator assembly not installed, then re-installing the pushrods through the stabilizer and attaching them to the ruddervators.

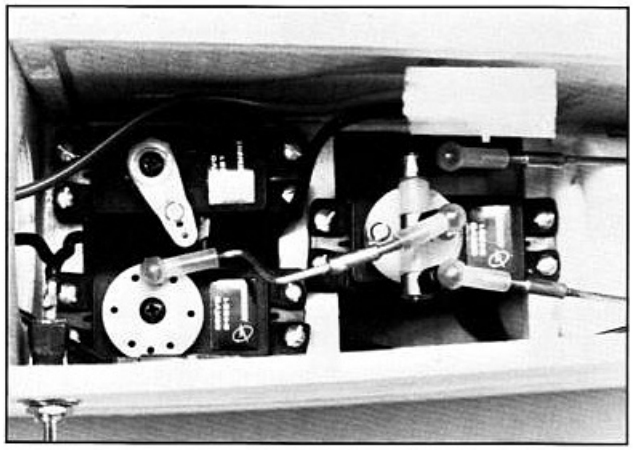
15. When all of the controls are working properly, the electric motor switch and battery harness can be installed in position.

16. Begin this phase of construction by carefully thinking out the location of all the parts involved and remember that both battery packs (for the motor assembly and for the radio) can be moved forward or aft as necessary to gain the proper balance point during final assembly.



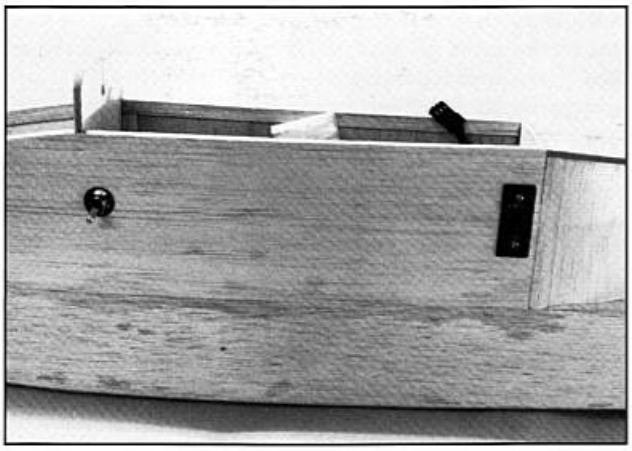
17. When installing the motor on-off switch and the safety switch, you will find that the switch harness wires are just long enough if the on/off motor switch is installed at approximately a 60 degree angle and the wires are routed as shown in the photo. (The switch will be attached to the side of the elevator servo using thin, two-sided servo mounting tape.)

18. Also note that depending on the length of the servo arm and the travel of your servos, it may be necessary to extend the throttle servo arm and to place a small bend in the microswitch operating arm so that the servo arm will contact the microswitch, turning it on at exactly full throttle.



19. When setting this assembly up, check all of the components to be certain that the electric motor wires or plugs are not in any way hampering the movement nor coming in contact with the throttle operating arm or the rudder/elevator operating mechanisms.

20. As can be seen in the photos, both the radio on-off switch and the electric motor safety switch are mounted on the left side of the fuselage. The location for the two holes is approximately 1" down from the top of the fuselage and both switches are mounted close to the inside of the two fuselage bulkheads.



NOTE: An easy way to help remember which direction the safety switch is on would be to mount it so that when the switch is in the down position, it will be off; with it in the up position, it will be on (same as the radio on-off switch).

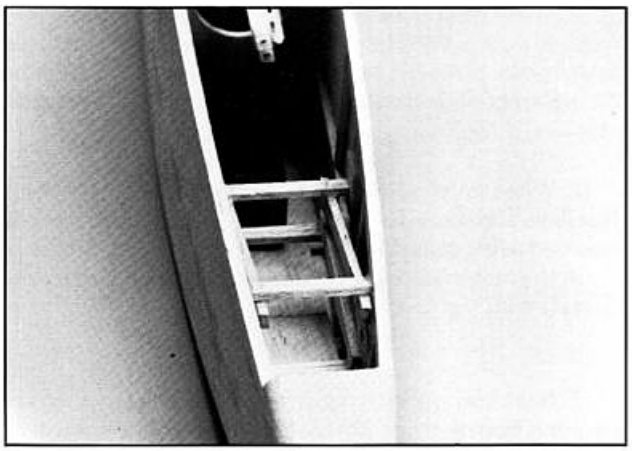
21. With the radio and motor switch harnesses now installed and with **all** of the radio equipment in place, we can now install the wing and adust the motor battery pack forward or aft as necessary to achieve the balance as shown on the plans.

22. By referring to the plans, you will see that the CG range is from the front edge of the main spars to approximately 3/16" behind the main spars. For most pilots and general sport flying, the forward CG point, to the rear of the main spar will provide excellent flight characteristics and stability. Remember, the further aft the CG is located, the more sensitive the aircraft becomes to stalls.

23. With the wing in place, check the balance as previously described and position the battery packs as necessary to achieve the proper balance point.

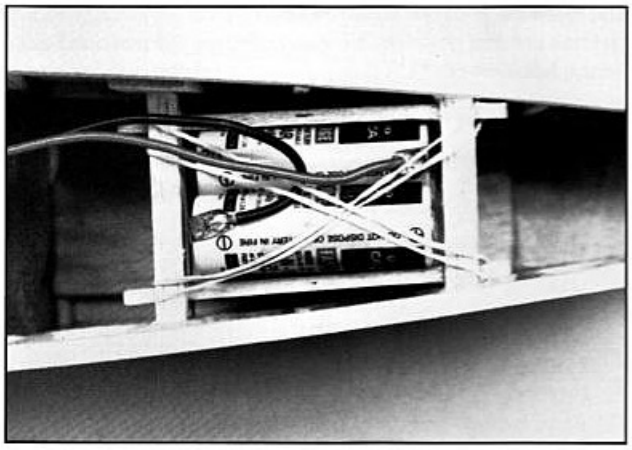
24. When the proper balance point has been located, mark the location of the motor battery pack with a pencil. Using the illustration shown on the plans (Section BB both the forward and side views), fabricate the battery retaining cage, which will hold the batteries in place and yet still allow air to **FREELY** flow around all of the batteries and on out through the motor exit.

25. To assemble this structure, use the 1/8" x 1/4" balsa material and the piece of 1/8" balsa sheeting for the battery compartment floor. The purpose of this box is simply to hold the batteries in place. The airflow must not be restricted or the motor batteries and the electric motor could overheat from lack of airflow.



26. When assembling the battery retaining box, refer to the plans as a guideline. Also, you may wish to add a 1/8" balsa plate at each end of the top rear retainer where the cross brace attaches to the fuselage side. This will reinforce the area where the cross brace joins with the 1/16" fuselage side, thereby helping prevent the possibility of the fuselage side being cracked during the event of a hard landing.

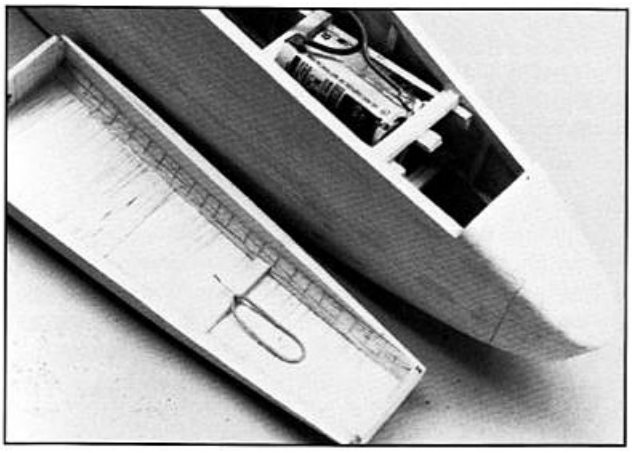
27. Also, remember to allow a little bit of room between the front top side rails and the side of the fuselage so that the battery pack retaining rubber bands can be inserted around the front of the mounts.



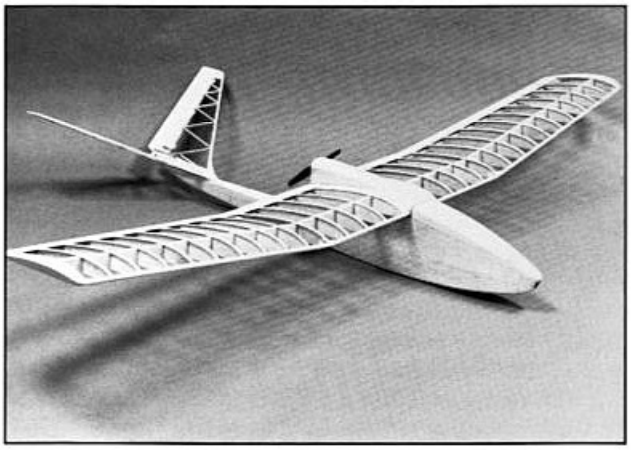
28. With the battery installation completed, you can now install the piece of 1/8" x 1/4" balsa used to hold the cabin hatch (canopy) in place. Here again, refer to the plans and bend a straight pin so that it will act as a hook and attach it to a piece of 1/8 x 1/4 balsa inside the canopy and glue it in place using thick CA cement.

29. Next, install one piece of 1/8" x 1/4" balsa in the center of the battery mount box, to attach the opposite end of the rubber band to, making sure that it does not protrude inward against the battery pack.

30. With the rubber band in place, the canopy hatch will be held securely at the rear by the wing holddown dowel and by the rubber band in the front. This will enable quick and easy access to the battery pack for re-charging of the motor battery.



31. With this completed, you can now remove all of the radio gear, switches, harness, and batteries.



FINAL ASSEMBLY

1. Now that the construction of the wings, fuselage, and stabilizer assembly have been completed and all parts have been fitted together and checked for proper alignment, we can now give the entire airframe one last sanding using a fine grit sandpaper, #320 - #400.

2. At this time, any nicks or dents should be filled using either a spackling compound or one of the super light fillers available on the market today. After the sanding is completed, the airframe is ready for covering.

NOTE: After covering and during final assembly, a few external pieces must still be attached in addition to gluing the stabilizer assembly in place.

3. To cover the Thermal Charger, we recommend using one of the many plastic covering films available on the market and follow the instructions suggested by that manufacturer for applying and caring for their product.

4. One item we would like to mention at this time, is that no matter which brand of covering you select for your airplane, we highly recommend using at least two bright, contrasting colors for the covering, as this will make your aircraft much more visible when in flight.

5. After all the surfaces have been covered and the edges thoroughly sealed, make the slots in the covering to allow for installation of the ruddervator hinges. When installing the hinges, insert all three hinges on one side of the stabilizer assembly to approximately 1/2 the length of the hinge.

6. Next, place the ruddervator in position on the hinges and insert it all the way to the point where it makes contact with the stabilizer.

7. At this time, move the ruddervator through its extreme range of travel as indicated on the plans to provide working clearance between the hinges, stabilizer, and ruddervators.

8. With the ruddervators held in position at full deflection, place approximately three to four drops of thin CA cement directly at the base of the hinge. The thin CA cement will wick or flow up the hinge and penetrate into the wood, thereby providing a secure joint between the hinge and the two surfaces being joined together.

9. After three or four seconds, turn the assembly over and repeat the same process on the other side. Do not flex the control surfaces for approximately three to four minutes to ensure that the CA cement has adequate time to properly join and bond all the surfaces. After that time, you may move the control surfaces.

NOTE: You may notice that there is a slight stiffness in the movement of the control surface after the joining between ruddervators and stabilizer. This is normal and will go away after moving the control surface through the full range of deflection in each direction approximately 25 to 30 times.

CAUTION: When installing the control surfaces, be careful that the CA cement does not run down and onto the plastic covering or into the area between the ruddervators and stabilizer assembly.

10. We are sure that you will agree, after using these hinges one time that they are extremely easy to install and very reliable.

11. After the control surfaces have been attached to the main structure, bolt the wing in place on the fuselage and temporarily place the stabilizer assembly into position on the stab mount, and carefully check for proper alignment.

12. When satisfied with the alignment between the wing, fuselage, and stabilizer, carefully hold the stabilizer in position and using a sharp pencil or water soluble felt marker, mark the bottom side of the stabilizer where it comes into contact with the fuselage.

13. Next, using a **sharp** exacto blade, carefully trim the covering from that portion of the stabilizer where it will be joined to fuselage.

14. Two cautions should be noted here. One, do not forget to remove the covering from this section of the stabilizer prior to gluing it into position on the fuselage. Two, when removing the covering from the bottom of the stabilizer, be **VERY** careful not to cut into the wood, as this can weaken the structure significantly.

NOTE: Prior to installing the stabilizer assembly onto the fuselage, place the two pushrod cable assemblies through the front edge of the stabilizer and be certain that they are in their correct position, for example, the left pushrod goes to the left side of the rudder control, and the right pushrod goes to the right side.

15. After the covering has been removed, the stabilizer assembly can be glued to the fuselage using slow curing CA cement or epoxy. Keep in mind that the stabilizer must be in perfect alignment when its glued in position. Here, you may find that placing the assembled airplane on a perfectly level table and viewing it from the rear as well as measuring from the table surface up to each tip of the stabilizer will help ensure proper alignment.

16. With the stabilizer assembly glued in place, the spruce stabilizer dihedral brace can now be shaped and covered in preparation for gluing the brace in its proper position in the center of the V tail.

17. Refer to side and top views of the tail assembly, Section EE, for the exact location of the brace and the proper exit angle for the pushrods as they exit the fuselage over the top of the stabilizer assembly.

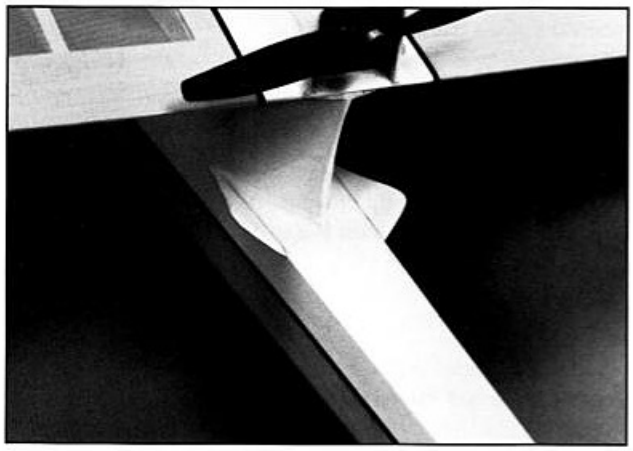
18. Also note that prior to installing the brace, the areas of contact between the bottom of the brace and the top of the stabilizer assembly should have the film removed prior to gluing the brace into position.

19 .With the dihedral brace glued into position, cover and install the F7 pushrod support piece. Securely glue it in place using thick CA cement. When the cement has cured, carefully align the two ruddervator pushrods on top of the F7 pushrod guide piece, and securely glue those to the F7, again using thick CA cement.

NOTE: Refer to the top and side views of the tail assembly if you have any questions concerning installation of F7.

DO NOT OMIT INSTALLING THE F7 PUSHROD SUPPORT PIECE, AS IT IS VERY IMPORTANT IN ENSURING THAT THE PUSHROD CABLES DO NOT FLEX EXCESSIVELY WHEN UNDER LOAD.

20. Also at this time, the two F8 finlets can be installed on the sides of the fuselage in the positions shown on the top and side views of the fuselage. When these are installed, they should point upwards at approximately 30 degrees and can be held in place using thick CA cement.



21. Re-install all of the radio gear and the electric motor, switch harness, and battery packs, and check to be certain that everything is properly connected and securely attached in position.

22. Before placing the radio battery pack and receiver into the fuselage, wrap them in foam to help protect them against vibration or possible damage due to a hard impact.

NOTE: To help in installing the radio antenna into the antenna tube, the antenna can be coated with a few drops of silicone spray, such as Armorall. This will help the antenna wire slide into the tube quite easily and go through the tube completely without binding.

23. When installing the on/off switch for the radio and the arming switch for the electric motor, refer to the switch locations shown on the plans. Remember, the motor switch harness is just exactly the right length to reach the motor on/off switch (microswitch) with the motor arming switch mounted on the left side of the fueslage above the elevator servo.

NOTE: If an external charging plug is used for the radio, it can be mounted any place on the side of the fuselage where it will not interfere with the control mechanisms.

24. Next, with all of the radio gear and electric motor and batteries installed, place the wing in position on the fuselage and bolt it in place. At this time, check the balance point again to ensure that the aircraft is properly balanced within the range shown on the plans.

25. If for some reason, the balance does not fall within this range, it must be corrected prior to attempting to fly the airplane. If the C.G. is off, try to move the batteries fore or aft until the proper balance angle is achieved.

26. With the motor batteries securely held in place using rubber bands, and the radio receiver battery securely in position using the foam padding, attach the canopy as indicated on the plans, also using a rubber band.

NOTE: When installing the propeller onto the electric motor, the propeller should face the forward direction of the airplane just like it would on a normal front-motored airplane. This is because we have already wired the motor to run in the opposite direction, thereby enabling the use of standard propellers.

27. Also, the propeller provided with the motor in this kit should work quite satisfactorily and is one of the propellers used during testing. You may find, however, that depending on the area/altitude in which you live and the actual flying weight of your aircraft, the propeller included with the kit may not give optimum performance for the circumstances in which you fly. If that is the case, there is a large variety of propellers available from various manufacturers which may be used with the .05 electric motor.