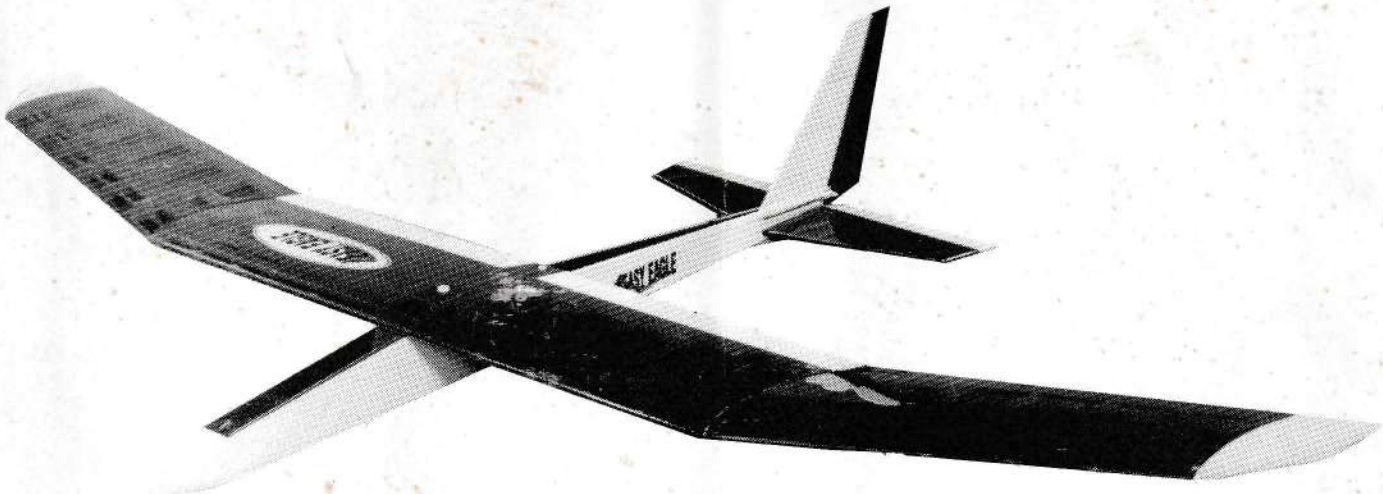
EASY EAGLE

Assembly Manual



DESIGNED BY HARLEY MICHAELIS

I. INTRODUCTION

The Easy Eagle's designer, Harley Michaelis, is a well known modeler with over 50 years of experience doing original designs. We will let his words introduce you to this airplane:

"At first glance, the Easy Eagle may not seem much different from other "entry level" ships. However, it includes several design and construction elements that help make it work very well. May we highlight some of these.

"The saying 'the wing is the thing' particularly applies here. First off, the airfoil employed is the SD7032, one of a new breed. It reflects the merging of contemporary computer airfoil design technology with extensive wind tunnel testing at Princeton University. The characteristics of the airfoil are such to be particularly favorable to R/C thermal sailplanes.

"The wind tunnel tests established that performance of the 'tripped' or turbulated airfoil was improved for sailplanes of similar size and speed as the Easy Eagle. The strips ahead of the main spar were used to assist in this tripping, not to avoid the expense of sheeting. The fact that these little strips avoid the trouble of sheeting is a welcome side benefit.

"The wing is based on the efficient 'Scheumann' planform that comes from full scale sailplane experimentation. This involves a straight trailing edge, with angular breaks only along the leading edge. Tests have shown this to generate straighter chordwise airflow for overall improved performance.

"Clean airflow is augmented by sealed hingelines, made possible with a special rubber used in a unique manner. The absence of hingeline gaps reduces drag for better penetration and thermalling capabilities.

"Greatest altitudes off the winch or hi-start come with a wing that can handle a high stress tow followed by a most spirited zoom release. With a properly built EE, you can 'go for broke' without worrying if the wing will fold. The flat center section employs 1/8" x 3/8" hardwood spars, plus both vertical balsa shear webbing between them and ply webbing behind them. If 'gorilla' launches are your thing, let the tension build up and get set for a near skyrocket-like ascent!

"All of us who test flew the ships found it to be uncannily responsive to lift and have no bad habits. The stall characteristics are very soft. It tracks straight and true. It hangs on a wing tip and the nose stays up well in a turn due to wing design and sweep in the rudder hingeline.

"Whereas simpler kits usually secure the wing with drag-causing, unsightly dowels and rubber bands, here two nylon bolts cleanly do it.

"Ah....then there are the flaps! For beginners, they can be left non-operational and when ready, used. Flaps mean steeper tows, longer and higher zooms, greater penetration, safe vertical descents and slow, controlled landings at your feet.

"While an easy-handling ship well suited to beginners, it can provide a relaxing change of pace for advanced flyers. With flaps, it becomes well-suited to competition events. The Easy Eagle is simply a superb flyer that can be enjoyed at most any level of competence.

"The fantastic world of R/C soaring is out there to be enjoyed. Build your Easy Eagle well and join in the fun that awaits you!"

Harley Michaelis

YIM233040293

Ace R/C assumes many beginners will build an Easy Eagle, so instructions are detailed. Read instructions thoroughly, identifying parts before beginning. There have been several "**Alternate**" methods of construction included in this assembly manual. Be sure to read and understand each method you choose to use before you proceed with building. More experienced builders can quickly review the more familiar steps and move right along.

II. NOTES ON CONSTRUCTION

A. ADHESIVES

Cyanoacrylates (CyA's) are recommended to simplify and speed many procedures. They are available under various trade names and come in different thicknesses/viscosities. We will refer to them in the instructions as "thick or thin CyA." Follow the directions on the bottle and use in a well ventilated area. "Kickers" are available to cure the CyA's on command and it is recommended you use one. There are also "debonders" available to undo a joint. Acetone or fingernail polish remover will work but they are slower.

Epoxy is used in places where strength and some working time is needed. We recommend the 5 minute type.

Contact Cement is used when large surfaces need to be joined. We recommend 3M Spray 77.

Aliphatic Resin (AR) is a wood glue that takes overnight to dry, but offers great penetration and strength. It too, is available under various trade names such as Elmer's Carpenter's Glue or Titebond. We will indicate where we recommend its use.

B. LITE PLY

Much of the material used in this kit is 3mm lite ply. It is a great material for R/C planes...its strength-to-weight is superior and is easy to work with; however, there are some characteristics to keep in mind. First, there is usually some bow involved with the parts. That's OK, because the self-locking construction ensures proper alignment. Also, there is usually one side better than the other...**always keep the best side to the outside of the airplane** so the less than perfect side is hidden to the inside. The material die cuts cleanly, but some cleaning up with a sanding block may be necessary to square up the edges.

C. "PINLESS" TECHNIQUE

For building the tail and wing, we prefer the CyA/3M Spray 77 pinless method of construction; that is, use Spray 77 (lightly applied) to stick the plans to a flat, smooth work surface. Then spray the plans lightly and cover with waxed paper (not plastic wrap). Now a coat of Spray 77 on the waxed paper and you can begin putting the parts down. When you need to remove the wing from the surface, work a thin steel straightedge between the wing and the wax paper and it will come off cleanly.

If you prefer, conventional techniques can be used with pins and a soft work surface.

D. PARTS PREPARATION AND ID

Side views of all of the die cut parts are shown somewhere on the plans. Use the plans to identify the parts. Usually, the parts will punch out of the sheet cleanly, but there may be some cutting and sanding required to clean them up. If the parts do not come cleanly out of the sheet, try sanding the back side of the sheet to help release them.

E. "HARLEY'S HINGES"

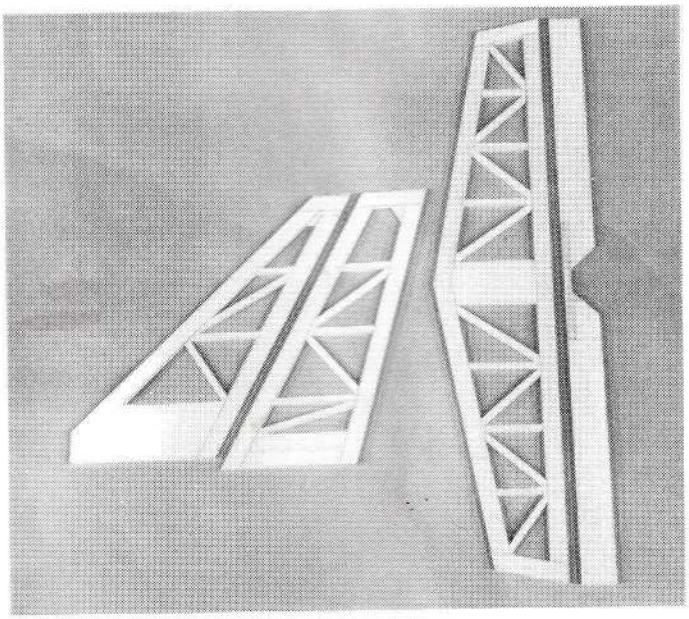
Furnished in the kit and described in instructions are special vinyl rubber hinges that allow for gap-free hinge lines. **DO NOT** round or bevel the hingeline edges like you may be used to doing!

F. FINISHING

We strongly recommend a plastic film-type covering... there are many brand names such as Monokote, Econokote, or Ultracote. Instructions for applying them are furnished with the product, but we will give some hints appropriate for this particular airplane. If you choose to finish the Easy Eagle with some other type covering, you are on your own.

III. TAIL GROUP CONSTRUCTION

[ ] To ease building, the plans can be cut up into sections. One section would be the tail group (fin/rudder and stab/elevator). Second is the left wing tip. Third is the wing center/right tip. Fourth is the fuselage.



[ ] Gather the parts together for the tail: 3/16" x 1/2" and 3/16" sq. balsa stock, the 3/16" balsa die cut parts for the fin plate, stab plate, and elevators, plus the 3/16" sq. x 4" hardwood elevator joiner.

[ ] Using a razor blade, razor saw, or x-acto knife to cut the 3/16" x 1/2" and 3/16" sq. balsa stock, build the tail group over the plans. The "Spray 77" technique described earlier works well here. Keep your joints as tight as possible and make sure the hingelines stay straight, using a straight edge to check. Use CyA or AR glue. Trial fit before gluing.

Building Sequences:

STAB: trailing (rear) edge, stab plate, leading (front) edge, tips, and then the diagonals.

ELEVATORS: Make sure the elevators match the stab. Securely join the elevators with the hardwood joiner. Epoxy should be used here.

FIN: fin plate (two pieces), leading edge, trailing edge, top, then the diagonals and the gusset.

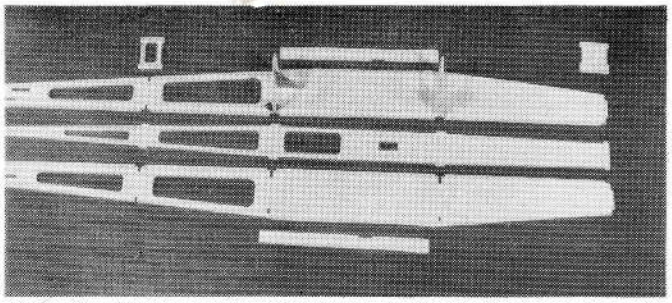
RUDDER: bottom (two pieces), leading edge, trailing edge, top, then the diagonals and the gusset.

[ ] After the glue is set, remove the tail group from the plans and check all your joints. Fill in any gaps with medium CyA. Wick thin CyA in the area where the control horn will go on both the rudder and the elevator. Using a sanding block, sand off the top and bottom surfaces. Round off the front, rear, and end edges: **DO NOT round off the hingeline edges....they stay square.** Round off the rear edge of the

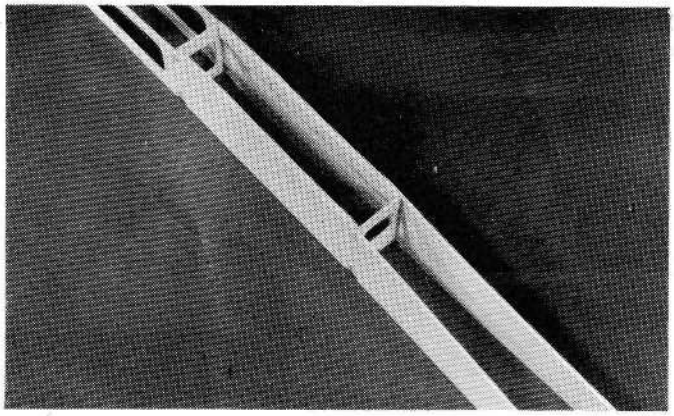
elevator joiner. In shaping the stab and elevator, just round the outer edges. **Do not** inadvertently make it a lifting airfoil and cause the ship to dive when balanced at the bolt.

Set the tail group parts aside for now. We will hinge and cover them later.

IV. FUSELAGE CONSTRUCTION

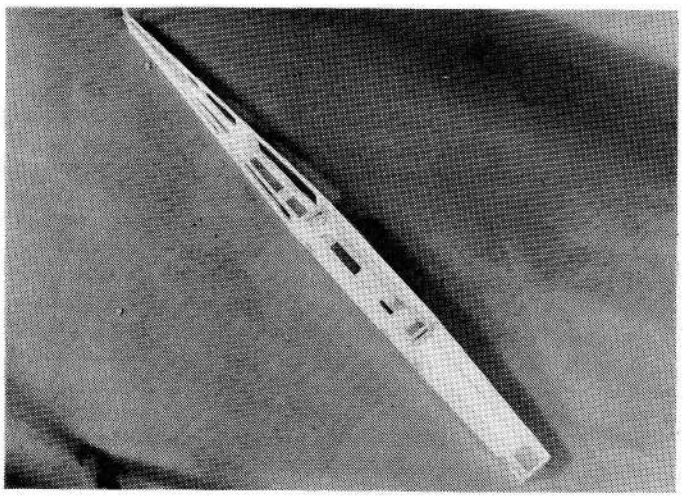


[ ] Gather the following parts together: both fuse sides, the fuse bottom, both wing saddles, F1, F2, F3, and F4. Test fit the formers to the fuselage sides to make sure the tabs seat fully into the notches. Using a triangle to keep them square, glue F2 and F3 to the left fuselage side. Remember to keep the best surface of the wood to the outside of the fuselage.



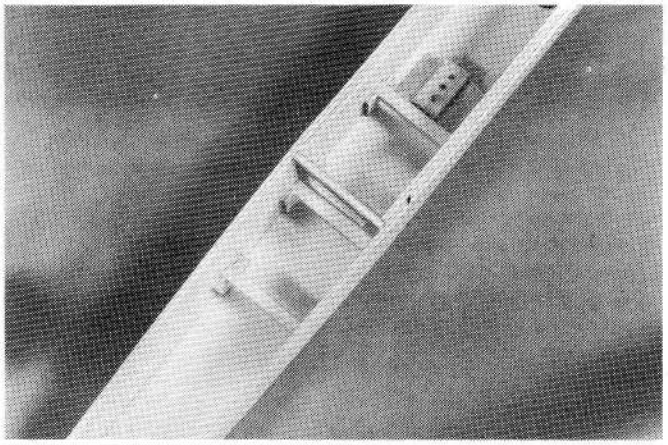
[ ] Glue the right fuselage side to F2 and F3, again keeping the assembly square.

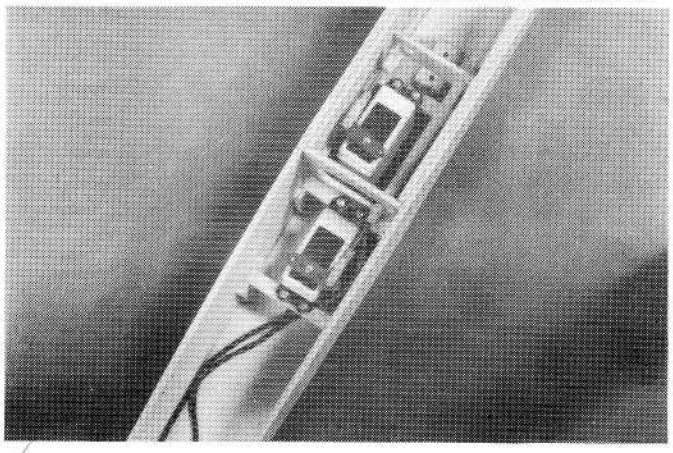
[ ] Now add the wing saddles to the **inside** of both fuselage sides, keeping them flush with the top edge of the fuselage sides.



[ ] Holding things together with tape, install (don't glue) F1, F4, and the fuse bottom. Note there is a 'tic' mark on F1; keep it on the outside of the assembly. (It marks a hole location you will drill later.) Put a scrap of 3/16" sq. balsa between the sides at the rear to keep it spaced properly.

[ ] Check to make sure everything is fitting properly and the fuselage is square. Now glue everything together by running a bead of CyA on the inside of the joints. Allow the glue to 'wick' into the joint. **Don't** glue the scrap of 3/16" balsa in at the tail. Remove it after the glue has set.





[ ] It is now time to install the Rudder and Elevator Servos. Any small servo can be used. Refer to the side and top view of the fuselage plans and check the installation section of your radio's instructions. We use 1/4" square hardwood rails for servo mounting, secured with doublers on the inside of the fuselage sides. The elevator servo is installed in front of F2 and the rudder servo is installed behind F2. Begin by cutting four servo rails 1-3/4" long out of the 1/4" sq. x 12" hardwood furnished.

[ ] Gather together your four "A" and four "B" servo rail doublers. Check the height of the servo rail doubler ("H") relative to the servo you are using. If need be, the servo rail doubler may need to be elevated off the fuselage floor (when glued in) to allow for servo clearance.

[ ] Install the servo rails in the following sequence: Glue servo rail doublers "B" to the sides and up against F2. Now glue in the two rails that go against F2. Slip two of the "A" servo rail doublers on the ends of one of the remaining servo rails. Temporarily position this rail in fuselage. Using the servo itself to gauge the distance between the rails, now glue servo rail doublers "A" and servo rail in place. (If you want the servos to be removable, you will have to notch the rails to clear the wires.) Repeat for the other servo. **Don't screw**

the servos onto the rails yet. We have to determine their location left and right first. Notice that there is a cutout in F2 for the rudder servo cable to pass through.

[ ] **Towhook block installation**: Refer to Section B-B on the plans. Glue the 1/2" x 3/4" x 1" hardwood towhook block into the cutout in the fuselage bottom, flush with the outside bottom surface of the fuselage. Brace on both sides with 1/2" x 1" triangular balsa. Note: some trimming of these components may be necessary for clearance with the servo rail and doublers.

[ ] From the bottom of the fuselage, mark and drill three 3/32" D holes in the towhook block; first, one in the very center, the next 1/4" directly in front of center, and the last directly behind the center hole. Keep your drill perpendicular to the fuse bottom while drilling. Tap out these holes to 4-40. After the plane is completed, the towhook with jam nut can be installed; the three holes gives 1/2" range of adjustability.

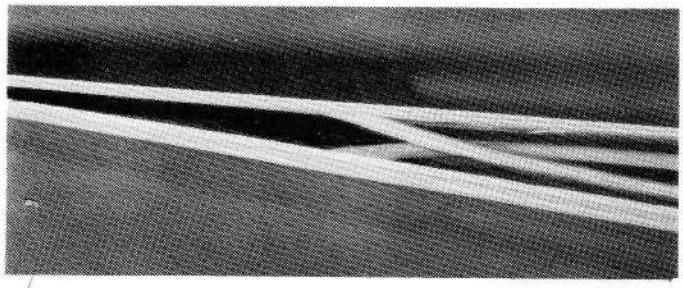
[ ] Temporarily slip the two nyrod brace doublers on the ends of the nyrod brace and position (don't glue) in the fuselage in the approximate place as shown on the side view.

[ ] **Outer Nyrod installation:** you are furnished two 36" lengths of the larger outer nyrod (usually yellow). Cut one to 22-1/2" long and the other to 24-1/2" long. Using sandpaper, roughen up the outer surface of both outer nyrods. Always "pull" while sanding, don't "push" or you'll kink the nyrod.

[ ] Slide the longer of two outer nyrods into the slot in right side of the rear of the fuselage; it is for the elevator linkage. As you reach the wing compartment, thread the nyrod through the nyrod brace that you have loosely installed then through the cutout in F2. Leave about 1/2" sticking out of the rear.

[ ] Slide the shorter outer nyrod into the slot in the left side of the rear of the fuselage and through the brace when it gets to the wing compartment. Leave 1/2" sticking out. Note that the outer nyrods cross at the rear on the inside of the fuselage.

[ ] Using thick CyA or epoxy, securely glue both outer nyrods where they exit the fuselage. Make sure you get a good coat of glue on the inside joint. When dry, trim the outer nyrod off flush with the outside surface of the fuselage.



[ ] Get the two 36" long inner nyrods (usually white or clear in color). Into one end of each of the inner nyrods, thread a 2-56 x 1" stud so about 3/8" of thread is screwed in...an easy way to do this is to gently chuck the stud up into a drill and run it in. Now screw a nylon clevis onto each stud. If you tap the clevis out first, it will screw on a lot easier.

[ ] Starting at the front, slip the unoccupied end of each of these inner nyrods into the outer nyrods you have already installed. **Remember,** the nyrod brace remains loose and unglued. Let the excess inner nyrod run out the end. We will shorten it later, after the tail has been installed.

[ ] If your servos aren't in place, put them there. Thread the rudder servo cable through the hole in the bottom of F2.

[ ] If you **have servo reversing** switches in your transmitter, the next step is easy. Just hook the clevises up to the servo output arms and position everything so the linkage runs straight and true. When satisfied, drill 1/16" pilot holes for the servo mounting screws and mount the servos.

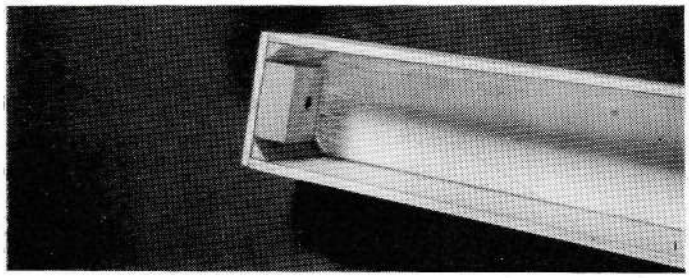
ONE CAUTION: make sure the nyrod brace doublers are forward of the notch in the wing saddle. Using CyA, glue the nyrod brace doublers and the nyrod brace in place and then glue the outer nyrod to the nyrod brace. **Be super careful** not to get any CyA between the inner and outer nyrod! You may want to take the inner nyrod out before gluing.

[ ] If you **don't have servo reversing** switches in your transmitter, you need to determine proper hookup of the linkage so the surfaces move properly in relation to the transmitter stick motion. Think of it in these terms: to get proper rudder action, a 'right' transmitter command needs to push the inner nyrod rearward; a 'left' transmitter command needs to pull the inner nyrod forward. Hook the clevis to the side of the rudder servo that gives you that action. For the elevator, when a 'down' transmitter command (moving the stick upward) is given, the inner nyrod needs to be pushed rearward and for an 'up' transmitter command (moving the stick downward) the inner nyrod needs to be pulled forward. Hook the clevis to the proper side of the servo to achieve this.

Now position the servos and the nyrods so everything runs straight and true. Some trimming of the nyrod brace may be needed. When satisfied, drill 1/16" pilot holes for the servo mounting screws and mount the servos.

ONE CAUTION: make sure the nyrod brace doublers are forward of the notch in the wing saddle. Using CyA, glue the nyrod brace doublers and the nyrod brace in place and then glue the outer nyrod to the nyrod brace. **Be super careful** not to get any CyA between the inner and outer nyrod! You may want to take the inner nyrod out before gluing.

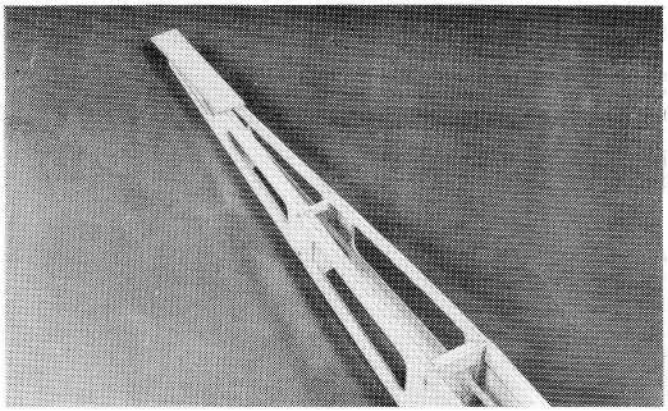
Now glue the outer nyrod to the fuselage formers F3 and F4. This will help stiffen the linkage.



[ ] There are two 1/4" x 18" balsa triangular stock. Take one and cut it up into the following lengths: 1-3/4", 7", 8". Repeat for the other one.

[ ] Glue the two 1-3/4" lengths of triangular stock into the nose of the fuselage as shown to brace F1.

[ ] Glue the 3/8" x 7/8" x 7/8" hardwood hatch mounting block to the inside of F1, flush with the top of F1. Using the 'tic' mark on the front of F1 as a guide, drill a 3/16" hole through both F1 and the hatch mounting block.



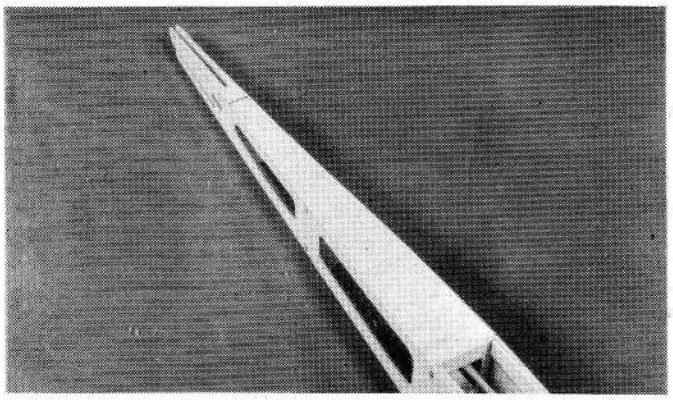
[ ] Glue the two 7" long lengths of triangular stock to both top inside edges of the fuselage sides between F3 and F4.

[ ] Glue the two 8" long lengths of triangular stock to both top inside edges of the fuselage sides from F4 rearward. The triangular stock will have to be trimmed up at the rear to fit. Keep a piece of scrap 3/16" balsa between the sides at the rear to maintain proper spacing.

[ ] Glue a short piece of left over triangular stock to the rear of F3, 1/16" down from the top edge of F3.

[ ] Sand the top rear surface with a sanding block to true it up.

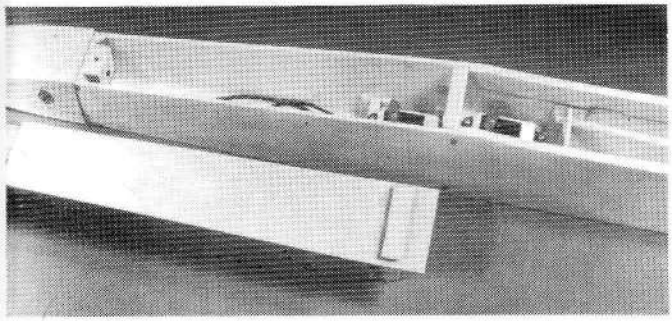
[ ] From the 1/16" x 3" x 24" balsa sheeting provided, cut a 1" wide x 5-1/2" long piece and glue it to the rear top of the fuselage, flush with the rear edge. The grain will run lengthwise. (Keep a scrap of 3/16" balsa between the sides at the rear.)



[ ] Continue to sheet the rest of the rear top of the fuselage with the 1/16" balsa, running the grain cross ways.

[ ] Trim up the rear top sheeting and true with a sanding block.

[ ] We will now cut a slot in the rear of this top sheeting to accommodate the fin. It needs to be 3/16" wide and run forward from the very rear edge of the fuselage for 4-1/2" and be exactly centered in the fuselage. Measure, mark carefully, and cut using a straightedge, keeping the blade perpendicular to the top. Cut through the balsa triangular stock at the front of the slot as well.

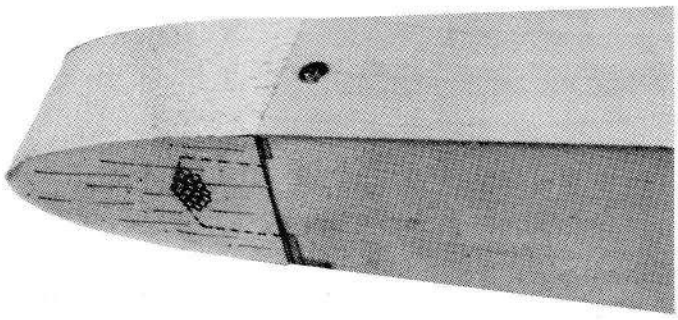


[ ] **Hatch lock mechanism:** glue one of the two 1/8" x 1/4" x 1-3/4" hardwood lock rails to F2, keeping it flush with the top of the fuselage. (See Hatch Lock Detail.) Now glue the 1/16" x 7/16" x 1-3/4" plywood tongue to the other 1/8" x 1/4" x 1-3/4" hardwood lock rail. Now with the 1/16" ply hatch taped in place with the front of the hatch flush with the front of the fuselage, glue the hardwood lock rail assembly to the inside surface of the hatch so the tongue engages the lock rail that is glued to F2....be careful not to glue to this rail! You'll have to work through the opening in F2 to accomplish this.

[ ] With the hatch still taped in place, mark and drill a 3/32" hole through the front of the hatch and into the hatch mounting block. The location of the hole is centered left to right and 5/16" back from the front edge. Now remove the hatch and drill the hole out to 1/8". The removable hatch can now be secured with the #4 x 1/2" self tap screw and washer.

ALTERNATE; Hatchfront Retainer

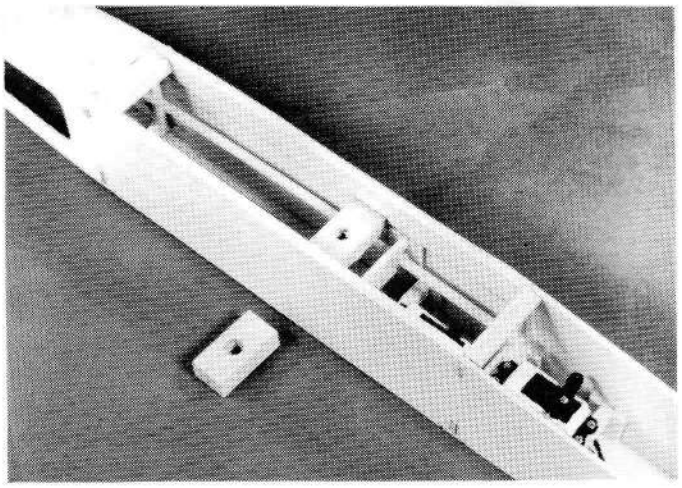
The hatch can be put on or taken off by bending. Simply slot its front to slip under the screw head. When the wing is on, fit the hatch in the rear lengthwise to go snugly under the wing. To key it side to side, glue the switch to the fuse side near the elevator servo and have the slider protrude through a slot cut in the hatch.



[ ] On the plans, templates are furnished for rough-cutting the shape of the nose block. Cut them out and paste them to both sides of the drilled noseblock so the hole is appropriately positioned. Using the templates as a guide, rough-cut the noseblock with a band saw, jig saw, or coping saw. If you don't have any of these type tools, don't shape the block until after it has been glued on to the fuselage.

[ ] With the hatch in place, glue the nose block to the front of F1. The top of the block needs to be flush with the top of the hatch....don't glue the block to the hatch, though.

[ ] Now round and shape the nose block as desired.



[ ] Find the 3/8" x 3/4" x 1-3/4" hardwood main wing mounting block. Mark the center of this block and drill a 9/32" hole through the block. Install the 1/4"-20 blind nut furnished in this hole. Tap the nut lightly with a hammer to mark the wing mounting block for the legs of the blind nut. With a 1/16" drill bit, drill the holes for the legs of the blind nut. Tap the blind nut into the hole of the mounting block to seat it. If the blind nut splits the main wing mounting block, make a new one from 3 layers of 1/8" ply. You may glue an ordinary nut on the bottom or use a flanged nylon nut as sold by Ace (PN#**50L748**).

[ ] **ALTERNATE WING MOUNTING BLOCK METHOD:** If you have a 1/4" x 20 tap, the blind nut can be omitted. Drill a 3/16" hole in the block provided and tap it. Or, make a lighter block by gluing four layers of 1/16" scrap ply together and tap as above. The threads should be hardened by treating with CyA glue and retaped.

[ ] Slide the wing mounting block into the fuselage and position it into the notches in the wing saddles (make sure the flange on the blind nut is down!) and glue in place.

[ ] Locate the 1/2" x 3/4" x 1-1/2" balsa spacer block and drill a 3/8" hole in the middle of it. Glue it in place on the top of the front wing mounting block.

[ ] Locate the 3/8" x 1/2" x 1-9/16" rear wing mounting block and glue it between the wing saddles flush with the top of the fuselage.

[ ] Set the fuselage aside for now.

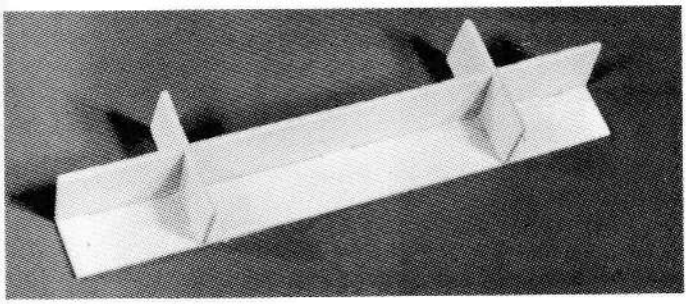
V. WING TIP PANEL CONSTRUCTION

[ ] The wing can be built with or without flaps. The instructions will indicate flap construction. If you don't **ever** want flaps, simply glue them in place and disregard the hinging and linkage. If you don't want to use them at first, we recommend you build them and install the linkage and hinges as shown and then in some fashion lock them in position. That way, you can simply add the servo later.

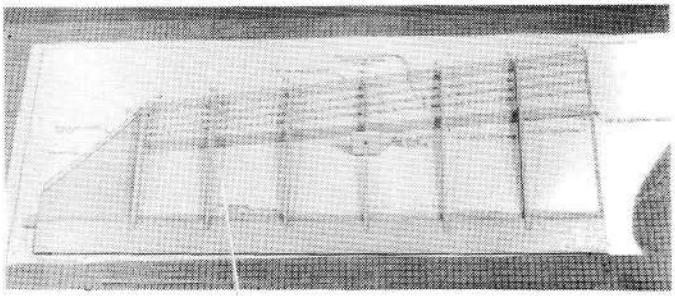
[ ] When punching out the ribs, make sure all the slots are properly sized for the main and turbulator spars by slipping one of the spars into each slot to make sure the slot isn't too tight. Also, as you punch them out, identify them by using the side views and write their numbers on them with a soft pencil.

[ ] The Spray 77 "pinless" method of construction is recommended for the wing. (See the introductory material.) You can also use the traditional "straight pins into a soft surface" technique. In any event, make sure you have a **flat** work surface. An inexpensive hollow core door always makes a nice worktable if you don't already have something.

[ ] Begin by gathering together the material to build the Left Wing Tip: one each of rib **7T** through **13** and two rib **14**'s. Also, two 1/8" x 3/8" x 18" balsa spars, four 3/32" x 3/16" x 18" turbulator spars, an 18" shaped balsa leading edge, a 1/16" x 1-3/8" x 22" balsa trailing edge bottom sheet, a 1/16" x 1" x 22" balsa trailing edge top sheet (note the bevel cut), five 1/16" x 15/16" x 3" balsa shear webs, two 1/16" x 15/16" x 2-3/4" die cut ply shear webs (the ones with an angled end), the 1/16" x 3" balsa sheeting left over from the fuselage, the 3/8" x 12" triangular balsa tip cap, a roll of 1-3/8" wide mylar plastic, the 1/32" x 1/2" x 24" ply shim, and the four die cut Dihedral Jig parts.



[ ] Assemble the Dihedral Jig referring to the Detail on the plans.



[ ] Lightly spray the back side of the plans for the left wing tip with Spray 77 and stick down to your work surface. Now lightly spray the plans at the rear of the wing and stick the 1/32" ply shim in place...there is a line that marks the location of the front of the shim...let the excess material go out the end. Now spray a two foot long piece of waxed paper and stick it down over the plans and the shim. A final spray of '77' over the waxed paper and we're ready to build.

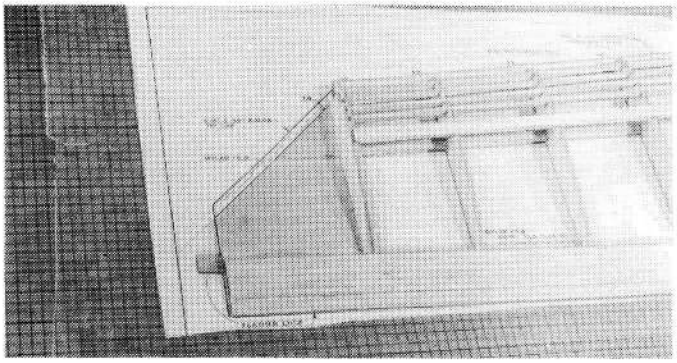
[ ] Next, laminate the furnished mylar plastic to the 1/16" x 1-3/8" balsa bottom trailing edge sheet. Epoxy is the recommended glue. Roughen up the mylar and smear a thin layer of epoxy on the wood, apply the mylar and rub with an alcohol-wetted rag to keep the mylar in contact with the wood as the epoxy sets.

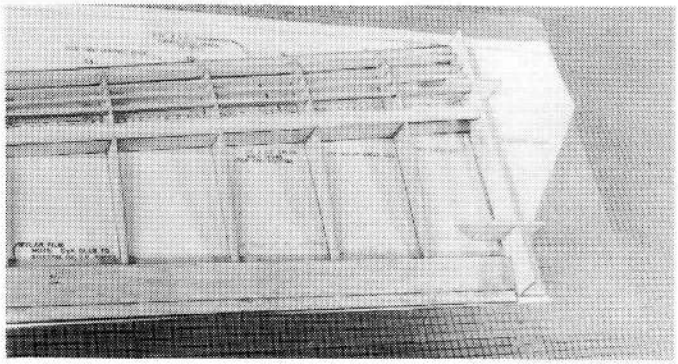
[ ] Put one of the 1/8" x 3/8" balsa bottom spars down on the plans. It is furnished longer than needed and will have to be trimmed to fit the plans.

[ ] Using ribs **8** through **13** to get the spacing correct, put the laminated bottom T.E. sheet down on the plans with the mylar downward; it, too, will have to be trimmed to fit the plans.

[ ] Using the 1/16" x 3" balsa sheeting furnished, cut out the bottom sheeting for the tip; note the joint line and the direction of the grain. Glue a short piece of mylar on the bottom surface of the wing tip sheeting at the very end of the wing. Join the tip sheeting to the bottom T.E. sheet and rib 13.

[ ] Glue ribs **8** through **13** to the bottom spar and the bottom T.E. sheet. **Do Not** install ribs **7T**. Keep the ribs perpendicular with the guide furnished.





[ ] Now position the Dihedral Jig in place. Its purpose is to allow you to shape and install the top main spar, the turbulator spars, and the leading edge in such a way that they will accommodate the dihedral angle later.

[ ] Install the top main spar and the four turbulator spars in the ribs. Glue them with CyA. Let the excess go past the tip rib and trim off after the glue has set.

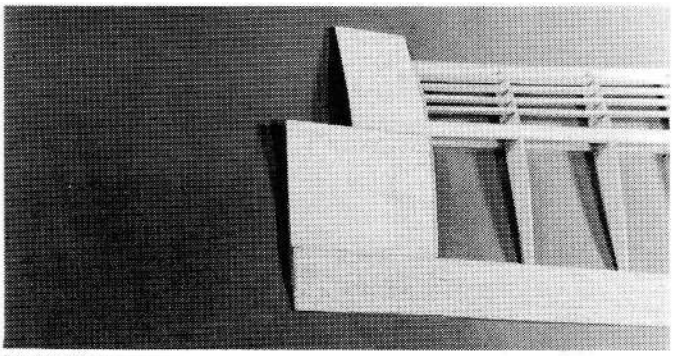
[ ] Using a sharp razor blade, trim Rib **13** back 1/16" at the leading edge. See the detail on the right wing tip plans. This has to be trimmed by hand after the turbulator spar is glued in, otherwise the rib would have broken out at the front.

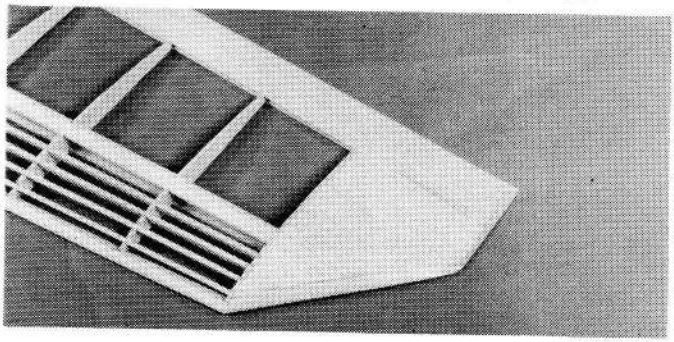
[ ] Now install the specially shaped balsa leading edge. Note that it can only go on properly one way. Let any excess go out the tip and trim off after the glue has set.

[ ] Next, glue the specially beveled top trailing edge sheet in place with the beveled surface against the bottom T.E. sheet. Let excess go out the tip and trim off when set.

[ ] Glue in five 1/16" balsa vertical grained shear webs on the rear face of the main spars between outermost ribs. They will have to be trimmed to fit. Make sure they are glued securely and there are no gaps. Use medium CyA or AR for this. **DO NOT** glue in the plywood shear webs between ribs **7T** and **8**.

[ ] Laminate the two rib **14**'s together. Glue the two rib **14**'s in place against rib **13**. Note that the top edge of the rib **14**'s are 1/16" below the top edge of rib **13**. The front of the rib **14**'s need to be beveled to accommodate the 3/8" triangular balsa tip cap which is installed later.





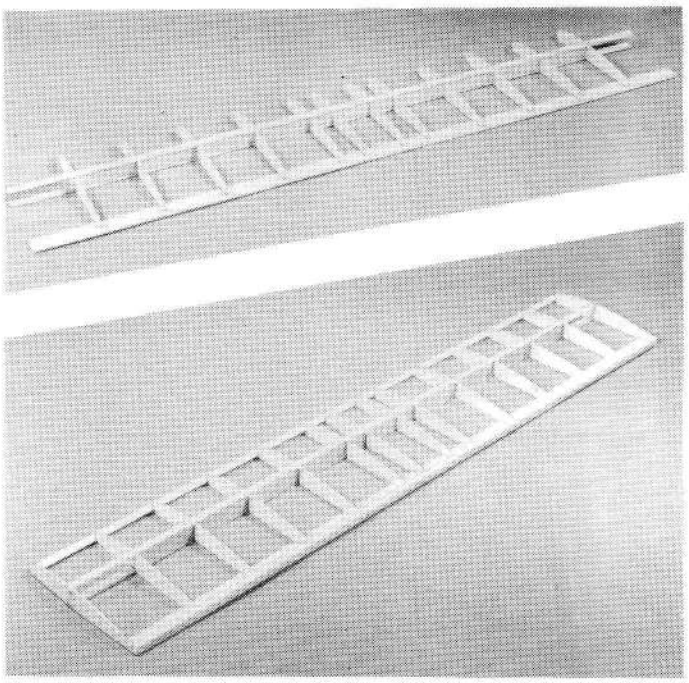
[ ] With the 1/16" x 3" balsa sheeting furnished finish sheeting the tip as follows. Cut a 3" x 3-3/4" long piece of sheeting and glue it to the top trailing edge and on the top of rib **14** butted against rib **13**. Glue the end of this sheeting down to the bottom sheeting at the outside edge. Add another piece of sheeting 2" long to the front of this piece. Now remove the wing from the work surface and turn it over; trim the top tip sheeting to match the bottom at the front.

[ ] Cut the 12" piece of 3/8" x 3/4" balsa in half and take one of these pieces and bevel the end to match the sweep back of the wing so it butts up to the end of the leading edge. Glue this block to the front edge of the top and bottom sheeting to cap it off. Trim and sand the leading edge block to match the air foil of the top sheeting. The tip should feather to the mylar on the very end of the wing. Keep the leading edge at the extreme tip nicely rounded, **NOT SHARP**, for best stall characteristics.

[ ] Using a long sanding block and referring to the rib side views, sand the top surface of the bottom trailing edge sheeting to match the contour of the wing. Work with the rear edge of the wing along the edge of your work surface. The mylar is there to allow you to sand until the very rear edge of the wing has been feathered to practically nothing, an important factor in the performance of the Easy Eagle.

[ ] Repeat this construction process for the Right Wing Tip Panel.

VI. WING CENTER SECTION CONSTRUCTION



[ ] Now it is time to build the Center Section. The "Spray 77" technique works great here, too. Study the plans at this point to get in your mind how the wing is constructed. If you haven't already, punch out the ribs, check the sizing of the notches. Identify and label them with a pencil.

[ ] Lay the 1/8" x 3/8" x 36" hardwood bottom main spar down on the plans. Make sure it is straight. **ALTERNATE SPAR METHOD.** If you plan to regularly make agressive tows by winch, consider making the spars as two strips of 1/16" x 3/8" x 36" harder balsa with .007 or .014 carbon fiber laminate EPOXIED BETWEEN THEM. Carbon fiber may come with a shiny side. Use coarse sandpaper to dull it for good bond. Epoxy the carbon fiber to one strip and rub with an alcohol-wetted rag to keep the carbon fiber flat against the wood as the epoxy sets. After coating the carbon fiber to add the second balsa strip, again rub to get all flat, but also stand the assembly on an edge to get the strip edges squared to each other. Press, pinch and pull with the fingers toward each end as the glue sets. Although the dihedral braces are provided as ply, for heavy winch usage you may want to make the dihedral braces as two layers of 1/16" ply with carbon fiber epoxied between them. Carbon fiber is available from sources specializing in composite materials and not furnished in your kit.

[ ] Using ribs **3** through **6** as spacers, lay the 1/16" x 1" x 36" trailing edge sheet on the plans.

[ ] Take two of the twelve 1/4" x 21/32" x 3" shear webs and cut one up into two pieces, 1-1/4" long. Take the other and cut it to 2" long. Make sure you make square and perpendicular cuts.

[ ] Find both rib **1**'s. Put them in position in the center of the wing, using the 2" long 1/4" shear web you just cut as a spacer. With the exception of the 1/4" webs between ribs **6** and **7C**, all of the 1/4" shear webs are placed flush with the **rear** of the main spar. Glue both rib **#1**'s and the 1/4" x 2" web in place keeping the ribs parallel. For joining both the balsa and ply webs to the center section spars we recommend you use epoxy for strength plus it will give you some working time. Special care must be taken to get really strong joints. CyA is brittle and subject to parting along a spar, both from towing and landing stresses. Quick epoxy, having some flex, is recommended. Working with one 1/4" web at a time, coat the open grain, let soak in for a bit, then press to the bottom spar. Be sure the 1/4" webs are FLUSH WITH THE EDGE OF THE SPAR, so the 1/16" ply facing webs will contact ALL THREE SURFACES well. As you add a 1/4" web, clean off any epoxy ooze at its rear edge, so there are no glue bumps to prevent good contact when you add the dihedral brace and facing webs. Epoxy is again the recommended adhesive as it has some gap filling ability and also does not cause curling as water-based adhesives would.

[ ] Now continue by finding both rib **2**'s and glue them and the two 1-1/4" long webs in place, once again using the webs as spacers and gluing them flush with the rear edge of the main spar. Keep the ribs parallel.

[ ] Now find two more of the 1/4" x 21/32" x 3" shear webs. Use them as spacers and glue them and the two rib **3**'s in place....**remember**, the webs go flush on the rear edge of the main spar. Keep the ribs parallel.

[ ] Continue out the wing, installing ribs **4, 5, and 6** in the same fashion. **DO NOT** install rib **7C** and its shear web yet.

[ ] Test fit the top main spar. Remove it and apply epoxy to the top edge of the 1/4" shear webs and the rib slots. Install the top main spar, making sure the ends are positioned properly relative to the bottom main spar (use a triangle). Make sure the top main spar stays seated in the ribs and contacts the shear webs while the glue sets; you may need to use some weights.

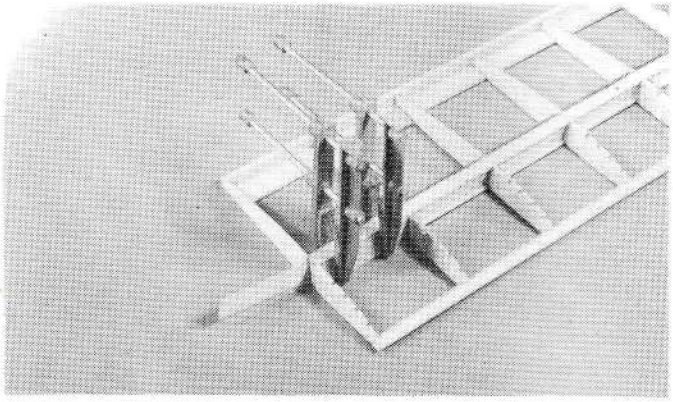
[ ] Now install the 1/16" X 29/32" X 3" ply shear webs on the rear face of the main spars between Ribs 2, 3, 4, 5, & 6.

[ ] Find the three 1/16" ply shear webs for the center section. There are two of them that measure 1/16" x 29/32" x 1-1/4" and one that measures 1/16" x 29/32" x 2". The long one goes on the rear face of the spars between ribs **1** and the other two go between ribs **1 and 2**. Before gluing in place, make sure they are the proper height and sand if necessary. The top edge of these webs should be 1/16" down from the top surface of the main spar or flush with the top edge of ribs **1**.

[ ] Find the specially shaped 1/4" x 3/8" x 36" balsa trailing edge cap. It goes on top of the trailing edge sheeting butted up to the ribs. Note that it has a top and bottom to it and will fit properly only one way. Slot the trailing edge cap for the rubber hinges in the center of each bay as indicated on the plans. This slot is machined into the bottom of the cap by gluing a 1/2" wide strip of 50 grit sandpaper to a 1" X 2" block of wood. Use this as a tool to make the notches in the bottom of the trailing edge cap at the hinge locations. When the cap is glued into place, you have a clean, uniform slot about 1/32" deep that the hinges easily slip through.

[ ] Glue the trailing edge cap in place using a straight edge to keep it true. You can also use the rear portion of rib **7C** for alignment, but don't glue it yet.

[ ] Now find the specially shaped 3/8" x 36" balsa leading edge. Glue it in the notches in the front of the ribs, making sure it is fully seated and is lined up properly. Here again, it can only be installed properly one way. You can use the front portion of rib **7C** for alignment but don't glue it in yet.

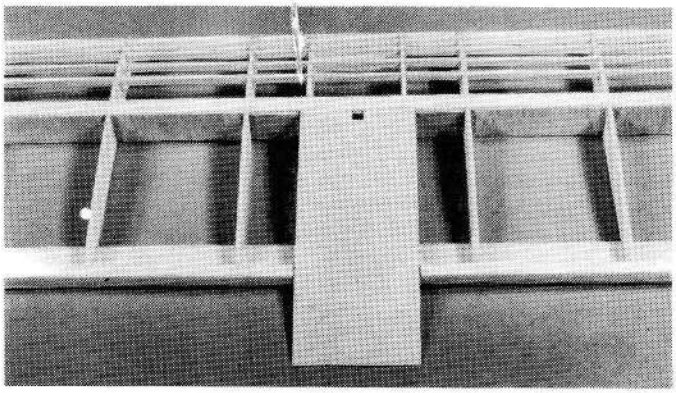


[ ] We will now install the 1/8" ply dihedral braces, the 1/4" balsa and the 1/16" ply shear webs in the outer bays, and ribs **7C.** We recommend you use epoxy for strength plus it will give you some working time. Also, 'dry fit' the parts together before gluing so you're sure everything is going to work OK. Look at the two dihedral braces and note that there is a 'tic' mark on one end of each brace. The end with the 'tic' mark is the end that goes toward the tip of the wing.

[ ] Referring to the "Dihedral Brace Detail" and without gluing, assemble the right end of the center wing panel as follows: The dihedral brace goes between the spars flush with the REAR edge and with the 'tic' marked end going out the tip. The 1/4" shear web goes between the spars on the FRONT of the dihedral brace. Next, the two 1/16" x 29/32" x 3" ply shear webs go on both the front and rear face of the main spars flush against rib **6** to sandwich the assembly together. Now, install the front and rear halves of rib **7C** so they are against the ply shear webs and they are perpendicular and in a straight line. When you are satisfied that everything fits properly, disassemble, glue, reassemble, and clamp together until the glue sets.

[ ] Repeat for the other end of the center panel.

[ ] Now glue in the four 3/32" x 3/16" x 36" balsa turbulator spars and let it dry completely.



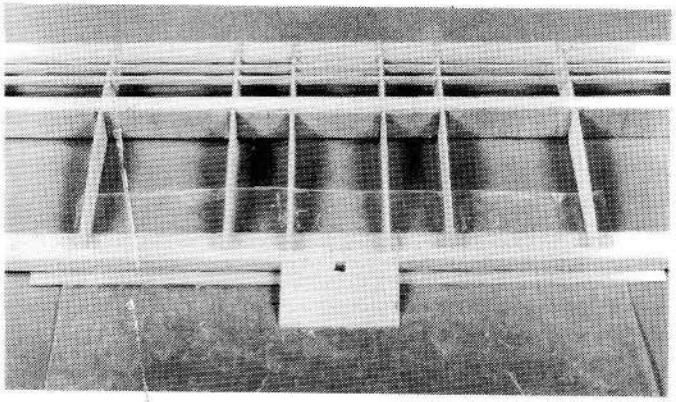
[ ] Find the 1/16" x 2-1/2" x 6" ply wing top plate. Cut a notch 1/4" x 1/4", centered in one end of this plate. (See top view of the wing center section...this notch is to accommodate the main wing bolt later.) Also, on the rear of this plate, bevel the bottom surface for about 1/2" down to a feather edge at the rear. Refer to the side view of the rib **1** and the fuselage.

[ ] Place the ply wing top plate in position on the center section of the wing and, making sure the top plate is centered, mark the T.E. cap on either side of the wing top plate.

[ ] Remove the wing from your work surface. With the rear edge of the wing on the edge of your work surface, use a sanding block to notch the balsa T.E. cap back for the wing top plate. See Section D-D. The T.E. cap's surface where you have notched away should conform to the top edge of ribs **1**.

[ ] Now put the wing center section back over the plans. Locate the tapered balsa filler block. It is a specially cut triangle that measures 5/16" x 1-1/2" x 2-1/2" and has a 1/8" sq. notch cut in the bottom of it. In order to get the proper undercamber to the airfoil, it is necessary to shim up the rear edge of the T.E. cap 1/32" while this filler block and subsequently the ply top plate are glued on. Use the 1/32" ply shim that you used for the tip panels to do so. Make sure you cover the shim with waxed paper so you don't glue it to the wing.

[ ] Making sure the filler block is positioned correctly and the shim is in place, glue the filler block onto the rear of the wing.



[ ] Follow up by gluing the 1/16" ply wing top plate in place.

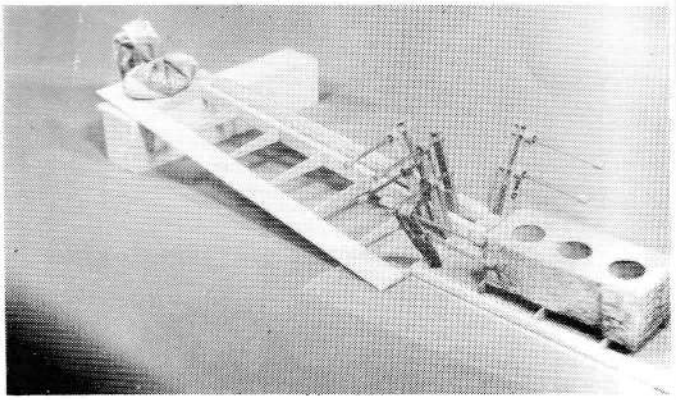
[ ] Turn the wing over and add the 3/16" x 13/16" x 2-1/4" balsa sheeting in the notches in the front of ribs **1**. The front of this piece will have to be beveled to fit the leading edge. After it's glued in place, sand it to conform with the airfoil.

[ ] Locate the fabricated flap actuator assembly and test fit it into the slot in the balsa filler block at the rear of the wing. You will need to notch out the trailing edge of the wing and the tapered balsa block to clear the collar on the actuator assembly. Now roughen up the outer surface of the nylon tubes with sandpaper. Carefully put a drop of oil on each end of both nylon tubes, letting it wick into the tubing.

[ ] Cut a piece of the 1/16" balsa 3" x 5"; sheet the bottom of the wing between ribs **2** from the spar to the trailing edge sheet.

[ ] Make a 1/4" square cutout in the center of the front of this sheeting to clear the wing bolt.

VII. JOINING THE WING PANELS



[ ] You will need a flat work surface at least 3 feet long. Let's begin by joining the left wing tip panel to the center section. Place the wing center section on the work surface flat. Shim up the rear edge of the wing with the 1/32" ply shim piece. (Have the shim extend somewhat past rib **7C**.) Cover the shim with waxed paper and weight the wing down with a few books or bricks to hold it in place.

[ ] To block up the wing tip panel, you will need to obtain a block that is 3-1/8" tall and at least 7" long. (Use an Ace Dihedral and CG Stand or a couple 2x4's and a piece of 1/8" scrap will work OK, too.)

[ ] Slip the front and rear rib **7T** in place on the tip panel and slide the tip panel on the dihedral brace that is already glued into the center panel. Put your 3-1/8" tall block under rib **13** in such a way that the wing is supported from leading edge to trailing edge. Hold the tip down on the block with a little weight such as a bean bag or a couple magazines.

[ ] Now check the fit of every thing at the joint, pushing ribs **7T** against **7C.** The exposed face of the back part of rib **7T** should be perpendicular to the trailing edge of the center section. Check with a triangle. Also put two of the 1/16" ply shear webs in place on either side of the main spars....these are the ones with the angle cut in one end. When everything is fitting up OK, remove the shear webs and tack glue rib **7T** in place to the leading edge, turbulator spars, main spars, and trailing edge. **Do not get any glue on the dihedral brace or between the ribs.**

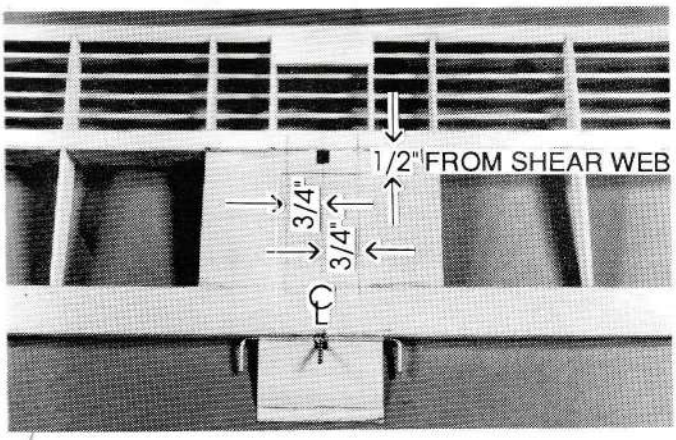
[ ] Now disassemble the parts and reassemble, this time gluing the joints with epoxy. Include the 1/16" ply webs on the front and rear of the main spars. Be sure to get a good glue joint and clamp together until set. A small fillet of epoxy to reinforce the leading edges to the ribs 7C and 7T will add strength to this area.

[ ] From scrap balsa left over from the die cut ribs, cut, fit and install the triangular gussets at the rear of 7T. Note the gusset fits between the upper and lower outer trailing edge sheeting and extends in front of the center section balsa trailing edge cap.

[ ] Repeat for the other side.

VIII. INSTALLING THE FLAP SERVO AND FLAPS

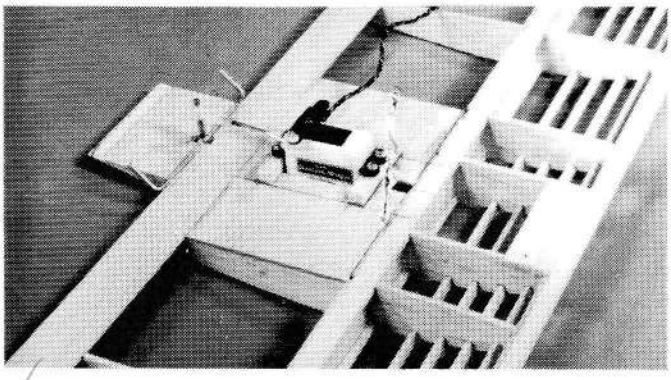
[ ] Place the wing upside down on the work surface and support it in the center section with a box or other suitable material so that the wing tip panels are raised about an inch off the table while the flap servo and flaps are installed.



[ ] Mark a center line on the bottom center section sheeting perpendicular to the leading edge....now mark two more lines 3/4" on either side of this center line; these lines indicate the inside of the fuselage sides when the wing is mounted. Make another line 1/2" back from the front edge of this sheeting perpendicular to the center line. This line marks where the balsa spacer block will hit the wing when it is put on the fuselage.

[ ] Now carefully glue the flap actuator assembly into the wing, making sure you get glue on the outside of the nylon tubing only....**don't let it wick down between the wire and the tubing.**

[ ] **ALTERNATE FLAP ACTUATOR INSTALLATION METHOD.** The flap actuator can be left to float freely as the flaps move by removing the nylon tubes from the actuator assembly. The actuator assembly is then held in place by the flaps when installed and will float in the groove of the filler block. If you choose to glue in the flap actuator assembly with the nylon tubes and do not achieve full free flap action, removal of the nylon tubes so the actuator assembly floats will help free up the flap action.



[ ] Cut two hardwood servo rails 1/4" sq. x 1-1/2" long. Glue one on top of the sheeting with its front edge on the line that is perpendicular to the center line.

[ ] Make a cut-out in the sheeting to clear the servo you will use for flaps (it needs to be a mini servo) and then glue the other rail on the sheeting, spaced appropriately for your servo.

[ ] Mount the flap servo to the rails, fabricate and install the linkage with the hardware furnished as shown in the photo. (When the threaded arm on the flap actuator is perpendicular to the bottom of the wing, the servo should be in neutral.)

ALTERNATE FLAP SERVO MOUNTING METHOD

[ ] If you have a small squat servo, mount it flat with the case bottom against a rib. Place a 1/4" x 3/8" rail at either end. Secure it with a bracket of 1/32" sheet aluminum, about 1/2" wide, to go around the case and on the rails. Use #2 x 1/4" sheet metal screws to attach the bracket. If a bit of the case or bracket rides on the saddle, trim the saddle. Move the collar for the best alignment with the output arm.

[ ] If using a large servo that must be mounted inverted, position the case bottom against the top ply sheeting, surrounded by rails with screw eyes in two places to secure it with small rubber bands. Trim the sheeting away for easy access.

[ ] Locate your preformed balsa flaps (3/8" x 1-7/8 x 16-3/4"). Note there is an 1/8" slot machined into the bottom of each flap....there is a right flap and a left flap.

[ ] Cut two pieces of 1/8" OD nylon tubing 3/4" long. Roughen up the outside surface. After putting a little oil on the wire, slip them on to the exposed legs of the flap actuator mechanism. (If you still have your flap servo installed, move it until you get neutral flaps.)

[ ] Put one of the flaps into position on the wing and trim away the small notch needed to clear the actuator arm. The flap should line up with the trailing edge and be square up against it.

[ ] With every thing lined up, glue the nylon tube into place in the groove in the flap. **Be careful not to let glue wick inside the tubing!** Repeat for the other flap.

[ ] Remove the flaps from the wing and laminate a length of the furnished mylar plastic to the bottom surface of the flap at the very rear edge. The mylar will protect the thin edge from getting dinged. Epoxy the mylar on, keeping flat.

[ ] Now final sand the wing and flaps in preparation for covering. Check the contour of the wing's leading edge with the die cut guide furnished and shape as needed. Check the length of your flaps to make sure they fit OK. If desired, lightening holes can be cut into the flaps to save some weight. Simply add rectangular holes **between** the hinges, leaving at least 3/8" at the leading edge of the flap and at least 1/2" at the trailing edge of the flap and at least 1" between holes.

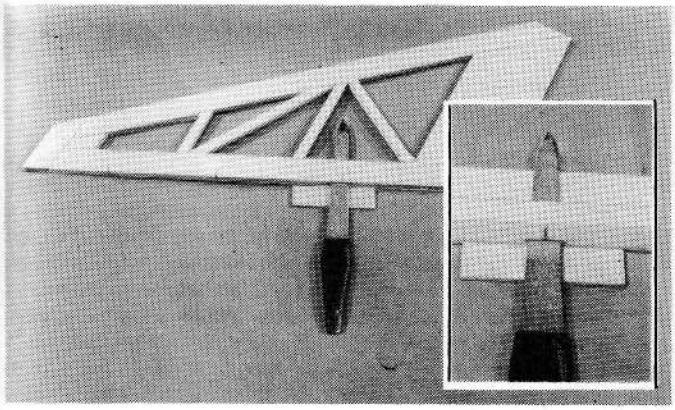
IX. HINGING THE SURFACES

[ ] Special rubber hinges (Ace packages them as "Harley's Hinges") are used throughout the Easy Eagle. That way, the surfaces can be butt-fitted without rounding, beveling, or spacing for the absolute cleanest airflow. Locate the 18" long strip of hinge material furnished and wash it thoroughly with soap and water. Dry. With a sharp scissors cut the material in thirds, lengthwise; this leaves you three strips about 3/8" wide and 18" long.

[ ] For making the slots for the hinges in the tail surfaces (not the flaps), it is highly recommended that you use either a Dubro or Goldberg Hinge Slotting Kit. If you don't have either, you will need two metal fingernail files (not furnished). The cheap 'Jonel' files work fine. Cut one of the files off square so it is about 3/8" wide; use a Dremel cutoff wheel or tin snips to cut it off. With a file or grinding wheel, sharpen the edge.

[ ] If you don't use the Hinge Slotting Kit, a bit of practice is in order. Use some of the scrap 3/16" balsa left over from building the tail. Use a piece of 3/32" balsa left over from the rib sheets as a shim to rest the tools on while slotting. Slowly work a slot through the material using the fingernail file. Learn to make neat, uniform slots. The rubber hinge material should be JUST insertable with the fingers without ANY fight. If the slots are too thin and the hinge cannot be easily inserted, add a business card, etc. under the original shim and slot again. As long as the slots mate up when the surfaces are joined, they don't have to be exactly in the center.

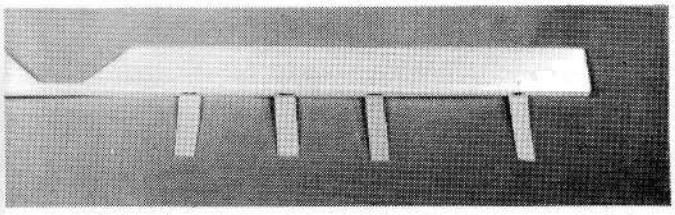
If you use the hinge slotting kit, a centering device is furnished for getting the slots in the center of the tail surface edges. Use the small (3/8" wide) fork.



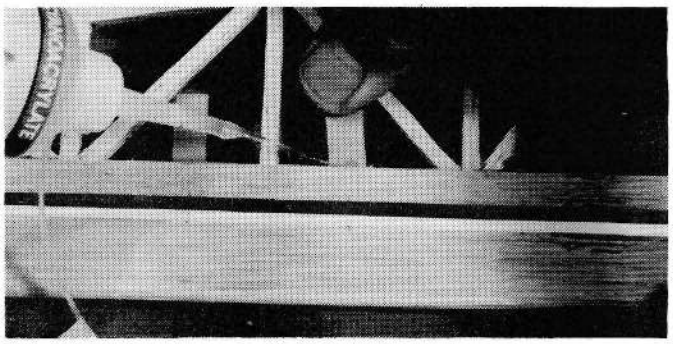
[ ] Slot the tail surfaces for the hinges in the locations indicated on the plans. Make the slots in the elevator about 3/8" deep.

[ ] Referring to the Flap Hinge Construction detail, slot the flaps in the correct places to match the slots in the T.E. cap previously installed. Note that the hinges are centered in each rib bay. Also, the slots are 1/16" up from the bottom surface of the wing; use a 1/16" shim to rest the tools on while slotting.

[ ] Now it is best to cover all the hingeline edges with the covering material you are going to use. This includes the back of the fin, the front of the rudder, the back of the stab, the front of the elevator, the back of the wing center section, and the front of the flaps. Also cover the ends of the flaps and the surfaces on the wing that face the ends of the flaps. Overlap the covering about 1/8" onto the top and bottom surfaces. Trim the covering to clear the hinge slots and reseal the edges. You are now ready to hinge.

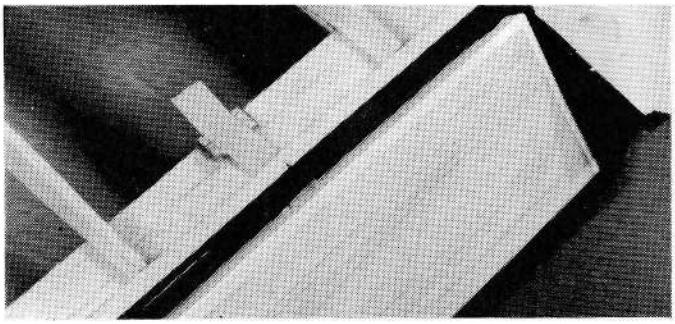


[ ] Now cut eight hinges 1-1/2" long and make a mark 1/4" from one end of each of them. Slip each of these into the elevator and, when the hinge is squared up and inserted 1/4", put a drop of thin CyA on the hinge right at the slot (use a fine applicator tube.) Let it wick into the joint. Wait a bit, then pull **gently** to check the bond. All hinges must be floppy! Remove any excess CyA from the exposed part of the hinge with 'debonder' or fingernail polish remover.



[ ] Insert all the hinges through the stab slots. Use some masking tape to hold the elevator in place up against the stab. One by one, grab the exposed hinge and put a bit of tension on it....about 1/8" of stretch. Put a drop of thin CyA on the hinge where it exits the inside of the framework and let it wick in. The tension pulls the surfaces in contact, but leaves the rubber free to stretch. Repeat for the other hinges and check operation. Trim off the excess after everything has been checked out.

[ ] Repeat for the fin and rudder by gluing four hinges into the fin first and then the rudder.



[ ] Cut ten pieces of balsa 3/32" x 1/4" x 1/2" from the scrap balsa left over from the ribs. They will serve as hinge cleats for the flap hinges.

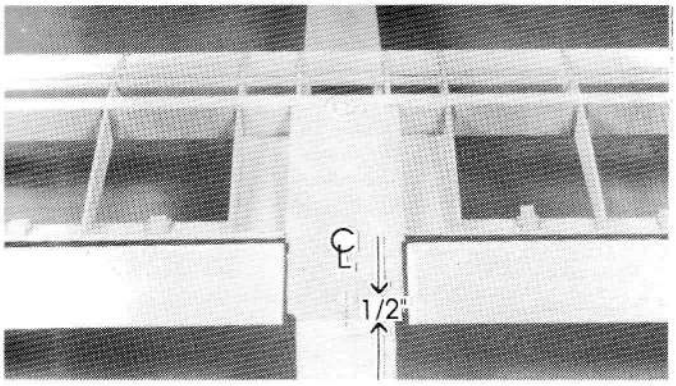
[ ] Glue a balsa hinge cleat on top of the T.E. sheeting at the center of each rib bay at the front edge of the sheeting. The flap hinges will glue to these cleats. (See the rib #3-#6 side view.)

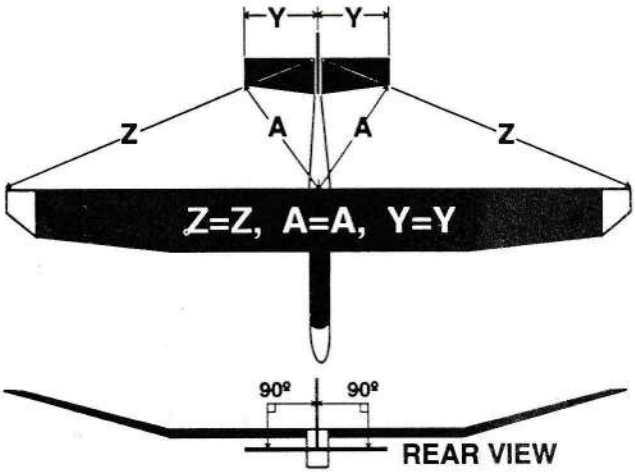
[ ] As you did for the tail surfaces, glue five 1-1/2" long hinges into one of the flaps.

[ ] Thread the hinges into the appropriate slots in the wing trailing edge; you need to insert the flap actuator arm into the receptacle in the flap as you move the flap into position. Tape the flap into position with a few pieces of masking tape.

[ ] Now glue each flap hinge to its cleat, putting a bit of tension on the hinge as you do so. When you get all of them glued, check for proper flap action. Don't trim away any excess hinge material in case the hinges ever need to be peeled off and replaced.

X. FINAL COVERING AND ASSEMBLY





[ ] Place the hatch into position on the fuselage. Bevel the top of the rear of the hatch to match the wing saddle angle.

[ ] Mount the wing onto the fuselage with the 1/4"-20 x 2" nylon bolt and washer. Make sure the hatch clears the wing and fit if needed.

[ ] Align the wing by measuring from the rear point of each wing tip to the tail end of the fuselage and position the wing so these two dimensions are the same. Mark a center line on the top rear of the wing and the fuselage.

[ ] With the wing in position (1/2" forward of the very rear edge of the wing top plate and in the center), mark and drill a 5/32" hole through both the wing top plate and the hardwood rear wing mounting block. Keep the drill perpendicular to the top surface of the wing.

[ ] Remove the wing and with a 10-32 tap, tap out the hole in the rear wing mounting block. Impregnate the threads with thin CyA and retap.

[ ] Drill the hole in the wing out to 3/16". Now you can use the furnished 10-32 x 1/2" bolt to secure the rear of the wing.

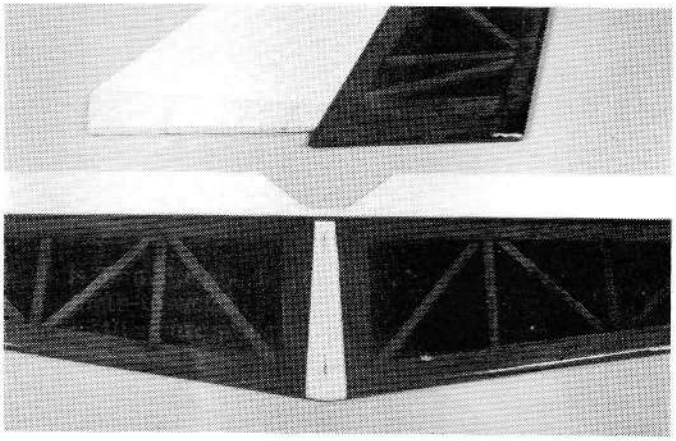
[ ] The following step is optional. To dress the airplane up, you may want to install a balsa wing fairing block. (See the fuselage side view.) It is made from the 1/2" x 2" x 2" balsa

furnished. If you do so, it should be covered separately and just tack glued to the hatch. That way, if the wing gets knocked around, the fairing block won't get busted up, it'll just pop off the hatch.

[ ] Now slip the stab/elevator into place in the slot in the rear of the fuselage. Also, slip the fin/rudder into the slot in the top of the fuselage so base of the fin contacts the stab.

[ ] Check alignment of the tail relative to the wing; refer to the alignment illustration. Sand the slots for the tail if needed for proper alignment. When things are lined up, use a soft pencil and mark the stab where the fuse sides contact the stab top and bottom and mark the fin where the fuse top hits the fin on both sides. Now slide the tail out of the fuselage.

[ ] Now do the final sanding of the fuse and wing in preparation for covering. Fill in any dings or voids with a light weight filler material. Sand all areas smooth with fine sandpaper (320 grit). Before covering, vacuum your work area and the airplane to remove dust which can ruin a good covering job.



[ ] Now you can finish covering the tail surfaces. Since glue does not stick well to the covering material, you don't want to cover the area that you have just marked off (which denotes where the fuselage contacts the tail.) Just barely cover over your marks.

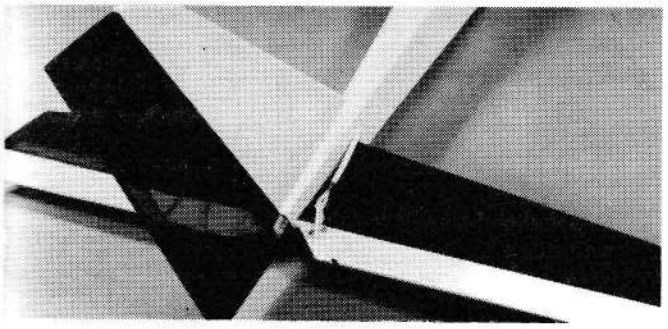
[ ] Before gluing the tail in place, cover the fuselage. It is easiest if the tail skid is covered separate to the fuselage and then glued on. Cut the covering back where it glues to the bottom of the fuselage and securely glue it on.

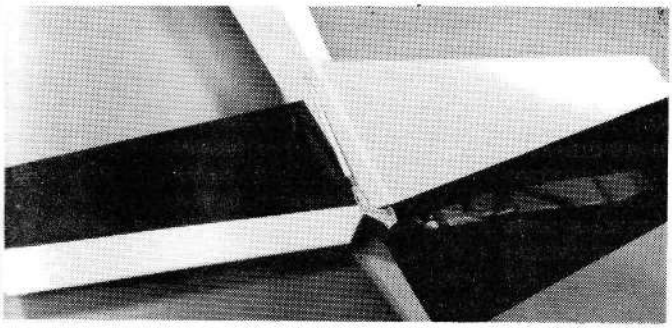
[ ] Cover the wing. While covering the wing, support it in the center section while covering the bottom to prevent damage to the outer tip panels Before shrinking tight, be sure the covering is attached to all structure on the bottom to preserve the undercamber of the airfoil. Tip Washout: when shrinking the covering on the tips, twist the tips so the trailing edge gets progressively higher towards the ends....go for about 3/8". Both tips must match. This washout helps tame any tendency to stall at low speeds in a tight turn.

(If you use transparent covering, you should somehow shade the exposed flap hinges from direct sunlight. Use trim Monokote or tape.)

[ ] Now using epoxy or AR so you've got some working time, glue the stab and fin to the fuselage. The fin should also glue to the stab in the same process. Recheck the alignment before the glue sets.

[ ] Reinstall the rudder and elevator inner nyrods and hook them to the servos.





[ ] Referring to the plans for the tail and the Control Horn Detail, trim one of the control horns back as shown using side cutters or carefully using an x-acto knife. Position this control horn on the rudder on the side that corresponds with the rudder nyrod. (That should be on the left side.) With the control horn in alignment with the rudder nyrod and the holes over the hinge line, mount the horn with two 2-56 x 1/2" bolts (drill 3/32" holes).

[ ] Keeping the servo in neutral, determine the proper length of the rudder nyrod so it hooks up to the control horn with a clevis and threaded stud ....allow enough to have the clevis threaded onto the stud at least 3/16" and have the stud into the nyrod at least 1/4". Cut the nyrod off and thread together.

[ ] Repeat for the elevator linkage....you don't need to trim away part of the control horn.

[ ] Finish installing the radio according to the manufacturer's instructions. Make sure the battery pack is in front of the receiver and as far forward as possible.

XI. FLIGHT PREPARATION AND FLYING

[ ] Measuring at the rearmost edge of the surface, set up the **Control Throws** as follows: elevator, 3/8" up, 3/8" down. Rudder, 1-1/2" right and 1-1/2" left. Flaps, 70 to 90 degrees down and 3 or 4 degrees up (reflex). The up flap or reflex should be controlled by the trim lever on your radio's throttle channel so that you can easily return to neutral, or zero degrees flap.

[ ] **Balance:** Put the wing on and check the balance of the plane. The balance point (Center of Gravity or CG) is shown as the center of the wing mounting bolt. Place the tips of both your index fingers an inch or so away from the fuselage sides directly in line with the center of the wing mounting bolt. If weight in the nose is needed for balance, add some lead shot to the nose through the hole in hatch mounting block. When balanced, cover the hole with tape. If the plane is nose heavy, move the battery pack towards the rear until

balance is achieved. When balanced at the bolt, the ship should glide in a flat attitude and turn very nicely with rudder alone.

High Performance Note: This balance point provides a comfortable rate of automatic, hands off, self-recovery from a dive. After getting acquainted, this can be reduced for even better penetration. In 1/8" increments, balance further rearward. Retrim the elevator for level hand glides. At altitude, do dives and observe the recovery rate. Repeat until the ship has almost none. At most, the new balance point will be about 1/2" further rearward. As you move the CG rearward, the sensitivity to elevator control will increase, so you may want to decrease the throw.

[ ] **Test Glide** the model into the wind in very light or calm winds. Firmly toss the plane with the nose slightly down....aim the nose of the plane at a point on the ground about 30 or 40 feet in front of you; don't throw the plane up! Adjust the elevator clevis for a steady flat glide path. If the plane veers off to one side or the other, there are several possibilities: the tail could be warped or out of alignment, the wing could be warped, or there may be more washout in one tip than the other. Fix as needed by restretching the covering material. If when doing initial hand glides it wants to dive, see that the elevator is neutral and that washout DOES NOT EXCEED 3/8". Excess causes the ship to dive and tend to spiral down in turns. If it still wants to dive, you might reduce the washout a bit; but if it is insufficient, the ship will tend to porpoise and never settle into a flat glide. If necessary, add a shim under the leading edge of the wing to get level flight with the elevator neutral.

[ ] **Launch** the plane with the towhook in the forward location initially for a less steep tow.

High Performance Note: As you get acquainted, move it rearward. The tow should be steep, but straight and true.

[ ] **Flap Usage**: Flaps dramatically expand the ship's capabilities. A little down flap will steepen the launch or slow the ship down in flight. Full down will safely permit nose down, straight vertical descent. Pull the nose up and it slows to a walk in a few feet. Varying amounts of down flaps can be used in making precision landings. Airspeed can be increased with a little up flap. If flaps are down, abrupt neutralizing just before touchdown will pancake the ship to help stop it at the desired spot. Always EASE flaps in or out, rather than moving abruptly. Abrupt changes will cause the the plane to nose up unless down elevator is simultaneously employed. Elevator input can be done manually, simply using what it takes to keep the ship from stalling. Abrupt flaps at high airspeed can damage the flap servo.

High Performance Note: If you have a transmitter with mixing capabilities and you want to mix compensating elevator into flaps, start with about 1/8" down elevator with 90º flaps. Always play with flap adjustments at plenty of altitude so you have room to neutralize before hitting the ground. If a crash is imminent, neutralize the flaps to minimize damage if the wing gets knocked around.

This airfoil is designed for use with flap reflex ("up" flaps). 3-4º of up flap will noticeably increase airspeed to get out of sink and to search for lift. Expert fliers will reflex as they 'top out' on the tow to build speed, then dive to release at high speed and 'zoom' up for the most altitude.

[ ] **Rudder Usage**: The swept rudder post causes an up elevator effect in a turn. Very little elevator movement is thus needed in normal flight. Reduce your elevator travel if the ship is pitch sensitive. More movement will be needed with down flap to descend vertically, so set your elevator up with a dual rate (if available on your transmitter).

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