

Mfg. by Ballistic Aircraft Co., LLC  
Wentzville, Missouri, USA

## LA-1 ASSEMBLY INSTRUCTIONS

### INTRODUCTION

The LA-1 is designed primarily as a competition pattern aircraft. The LA-1 will accept any of the current 60 sized engines. Construction of this kit should not prove difficult for anyone having previous experience with fiberglass and foam kits. If this type of construction is new to you, it is recommended that you seek the help of an experienced builder in your area. Most modelers have their own "tried and true" methods of construction; the recommendations included in these instructions are intended as guidelines, and not as the only way to get the job done. We recommend that you read through the instructions, and study the plans to familiarize yourself with the building sequence and options before starting construction. If you still feel unsure, we suggest purchasing a copy of our video tape "WING SKINNING" to help you with working with Foam Cores.

### GENERAL INSTRUCTIONS

The fiberglass parts in this kit are epoxy; only epoxy glues should be used as an adhesive. Areas to be bonded should be thoroughly sanded with 80 or 100 grit paper to remove surface glaze, or a weak bond will result. E-Z Lam or an equivalent slow curing epoxy is recommended for areas where maximum strength is required.

Dremel carbide burrs are recommended for making cutouts in the fiberglass.

A polyester body filler generically referred to as Bondo is recommended for blending the seams on the fuselage and for filling surface imperfections. This filler may be applied directly to sanded epoxy or over top of primer.

For best performance the LA-1 should be as light as possible. A finished weight of 8 pounds or less is possible with a painted fuselage and monocoated wings and stab.

Correct side and down thrust is molded in the front of the fuselage for engine alignment. Wing dihedral  $\frac{1}{4}$ " difference between the root and the tip as measured at the trailing edge.

### FIREWALL AND ENGINE INSTALLATION

The firewall is  $\frac{1}{4}$ " plywood and is intended to fit approximately 4- 13/16" from the spinner ring. This distance may vary depending on your particular engine setup. A soft mount is recommended.

1. Cut out fuselage as necessary to install motor mount and engine.
2. Sand the area where the firewall will be attached.
3. Drill and tap motor mount for your engine.
4. Place the motor mount inside the fuselage opening and install engine on mount.
5. Make up a spacer from 1/16" balsa sheet and tack glue the spacer to the back of the spinner back plate, the spacer should be the same diameter as the spinner.
6. Install the prop and spinner on the engine.

7. Stand the fuselage on its tail and align the spinner with the nose ring. Securely glue and/or tape the spinner in place. The assembly should be fastened firmly enough to permit turning the fuselage over and standing it on the spinner.
8. Trial fit the firewall by dropping it on the motor mount. It should lay easily on the mount without requiring any pushing. This prevents bulges in the fuselage caused by the pressure of the firewall edges. At this time you may wish to locate and drill the holes for the throttle cable and the fuel lines.
9. Re-check the spinner alignment and rotate engine so that the glow plug will be in the center of the belly pan and secure engine alignment with masking tape.
10. Tack glue the firewall in place against the motor mount with 5- minute epoxy. The firewall may now be permanently glued in place with filled epoxy or E-Z Lam and glass cloth.
11. Turn the fuselage back on its tail and spot glue the motor mount to the firewall using C.A. or epoxy glue.
12. After the glue has cured, unbolt the motor from the mount and carefully cut the spacer loose from the fuselage. Remove the engine from the fuselage and drill the mounting holes through the mount into the firewall using a long drill bit. In a pinch you can sharpen a piece a 1/8" music wire as a temporary drill.
13. Install blind nuts and coat exposed areas of the firewall with a thin coat of E-Z Lam.  
NOTE: You can reduce the viscosity of E-Z Lam and also reduce the set up time by warming the epoxy with a heat gun.

## **NOSE GEAR INSTALLATION**

1. Epoxy a 1/8" plywood plate behind the firewall as shown on the plans. Be sure to sand the Fiberglass thoroughly before gluing. You will have to grind a slot in the middle of the plywood to allow the plate to sit flush because of the raised seam on the fuselage.
2. Make up a 1/4" plywood shim block as shown on plans to center the wheel in the cavity.
3. Temporarily install the header and tuned pipe.
4. Position nose gear so as to clear header when retracted. This will require the gear to be slightly offset to one side.
5. Mark and drill holes for mounting bolts through the shim block and fuselage plate. Install blind nuts.

## **BELLY PAN INSTALLATION**

1. The belly pan is secured by the dowel pins at the rear and an 8-32 nylon screw and aluminum or birch dowel standoff in the front. See the plans for details.
2. Epoxy 1/8" plywood plates at locations where the locating pins and the mounting screw will be used. Drill a 1/8" hole at the required location and epoxy a 1/16" brass tube or music wire pin in the belly pan. Elongate the rear pin holes shown on the plans to allow the pins to locate in the holes when the pan is installed.
3. Install engine and nose gear, (if used)
4. Cut the cooling air intake at the front of the pan using the opening size shown on the plans and trial fit the belly pan on the fuselage.
5. Mark and cut opening for the nose gear and the engine glow plug and needle valve.

## **RUDDER CONSTRUCTION**

1. Sand foam core and vacuum thoroughly.



2. Sheet rudder with 1/16" balsa and add 1/4" balsa frame on all 4 sides. Bevel the leading edge to allow at least 30 degrees travel each direction.
3. Drill hole for 3/8" dowel with a piece of sharpened brass tube and epoxy dowel flush with surface.
4. Drill the dowel for a 4-40 screw and epoxy screw in place. Clip off screw head and thread on plastic horns for rudder cables.
5. Cut slots for 4 hinges. Put the rudder assembly aside for now, the fuselage tail post and rudder is not installed until the horizontal stabilizer is in place.

## HORIZONTAL STABILIZER CONSTRUCTION

1. The wing and stab use the same techniques for construction. We recommend sheeting the stab first since a mistake here will be less costly to correct than on the wing. Virtually everything but epoxy and some contact cements will dissolve the foam. Avoid using any thinner near the cores. If you are not familiar with the technique of sheeting cores using epoxy we recommend you enlist the aid of an experienced builder in your area, it is very easy to add a lot of unwanted weight if this step is not done correctly.
2. Locate a flat surface on which to sheet the cores. The bench must be capable of remaining true with 80 pounds of weight on it. Don't assume your bench is flat, check with a straight edge. The cores have been cut on a ground metal plate and weighted during the cutting operation. Because of the nature of the foam some bowing may occur. This bowing will disappear when the core is weighted down on a flat surface.
3. Keep the cores in the blocks from which they were cut, mark them to avoid mixing them up.
4. Lightly sand the cores to remove the fuzz and vacuum thoroughly.
5. Glue up sufficient matched 1/16" Balsa to cover the surface of the core. Trim sheeting to be flush at the trailing edge and allow approximately 3/16" overhang at the leading edge, root, and tip.
6. At this point you can decide whether you want to slice off approximately 3/16" of the foam at the trailing edge to allow the sheeting to butt together, or cut off the trailing edge after the core is sheeted and add a piece of 1/4" square balsa and sand to contour. Either method works well. Don't try to get a razor edge at the trailing edge, a blunt trailing edge 3/32" to 1/8" thick makes for a softer feel around neutral when flying.
7. Make up a squeegee from 1/32" plywood or use a flexible body filler squeegee and file small notches in the tool about 1/2" apart. This will apply the epoxy in a manner similar to floor tile cement leaving ridges of epoxy every 1/2 inch.
8. Mix up a small batch of E-Z Lam epoxy resin and apply a thin coat to the balsa only.
9. Line up the sheeting on the core and place back in the original blocks.
10. Place the block on the table with the faced side down. One side of the block has been wire cut and will be smoother, this side goes against the bench. In the case of the wing the dihedral is pre-cut and the bottom of the wing goes down.
11. Make sure everything is aligned and place a piece of 3/4" plywood or particle board slightly larger than the block on top of the stack.
12. Now add weights to the board, books or milk jugs filled with water work nicely. Distribute the weight evenly. Approximately 30 pounds will do for the stab and 80 - 90 pounds for the wing.
13. Inspect for bowing or twisting of board or foam - use a good metal straight edge on each side and ends and double check. Take your time and insure everything is straight before you leave.



Playing cards or poster board shims can be used to correct areas where the sheeting is not down tight or a slight bow is evident. Sometimes redistribution of the weight is necessary. Do one surface at a time until you get the hang of it.

14. Allow assembly to dry at least 24 hours then remove stab and trim left and right halves to exact matched size — especially the chord at root and tips.
15. Lay out elevator on the stab with a fine line marker and mark allowance for the 1/4" balsa frame shown on the plans. Cut out the elevator using a bandsaw or jigsaw if possible. You can also layout the areas to be cut on both sides of the stab and cut through from each side with an Xacto knife.
16. If you are going to use the type of elevator horn shown on the plans cut out an area of foam at this location and glue in a piece of hard balsa to support the wire.
17. Sand the stab and elevator with a long sanding block and glue on the 1/4" facing and 1/16" end caps with Titebond or equivalent glue. Insure the surfaces are straight, it helps to draw a line on the 1/4" facing to insure the surface doesn't bow during the gluing operation.
18. Glue on and shape the leading edges and tips. Trim and sand facings. Bevel the elevator leading edge to allow at least 15 degrees travel each side of center. Use a long block for sanding.
19. Glue the stab halves together with 5 minute epoxy, checking alignment carefully. The stab joint may be reinforced with light Fiberglass cloth and epoxy if desired. 2 or 4 ounce cloth is sufficient.
20. Mark and cut hinge locations, use 4 hinges per surface.
21. If you are not using the adjustable stab mechanism the stab should now be ready for installation.

## **ADJUSTABLE STAB MECHANISM**

1. The advantage of this unit is the ability to remove the stab for shipping or transportation. Adjustment is seldom necessary if the stab is built and installed correctly. If you don't travel long distances to contests or have the need to crate your airplane, you may decide the 6 hours to add this option is not necessary.
2. Cut a slot on the bottom side of the stab at the location shown on the plans. Make the slot wide enough to accept the phenolic sleeve plus 1/8" for the 1/16" facings. Cut out the foam leaving the top sheeting intact.
3. Glue in the 1/16" balsa facings. Cut a piece of 1/8" balsa to fit in the slot and glue in place against the bottom of the slot.
4. Cut the phenolic tube to length and glue in the slot. Fill the remaining slot with soft balsa and trim and sand to contour of stab. A look at the cross section of the stab shown on the plans should make this clear.
5. Cut an opening in the fuselage just large enough for the stab to slide through. A cardboard template may be traced from the stab root before joining for this purpose.
6. Temporarily install the 1/2" square balsa tail post and hold in place with masking tape.
7. Slide the stab in place in the fuselage. Make sure there is sufficient clearance so that the stab does not distort the Fiberglass.
8. With the stab centered and aligned, mark the intersection of the stab and fuselage with a fine line marker. Remove the stab from the fuselage.
9. Draw a line 3/8" outside the line you previously marked. This will be the cut line. Lay the stab in the blocks in which they were sheeted and cut the outboard sections of the stab free of the center. Allow for 1/16" balsa facing when making these cuts.

10. Cut out the foam for the plastic adjustment mechanism at the location shown on the plans and epoxy a 1/8" ply plate at this location. Cut out sufficient foam in the outboard stab half to install a full depth wood block to hold the brass tube.
11. Install the adjustment mechanism with the adjusting screw facing the bottom of the airplane and provide a small hole for access to the screw head.
12. Glue on the 1/16" balsa facings with Titebond and open the hole for the aluminum tube. Slide a short length of brass tube in the plastic mechanism and slide the outboard stab half up to the tube to mark the tube location. Drill a hole in the outboard stab half for the brass tube and epoxy the tube in place.
13. Slide the tube in place on the center section and reassemble the stab halves on the tube.
14. The stab halves may be held in place by a small screw installed approximately halfway out the tube on the bottom side of each stab half.
15. The stab should now be ready for installation in the fuse.

## WING CONSTRUCTION

1. With the exception of the dihedral brace and the landing gear, the wing construction uses the same techniques for sheeting and framing the control surfaces as the stab. Therefore, we will not repeat the instructions for the sheeting process.
2. Use the recess in the foam for the 1/4" plywood and balsa wood landing gear plates. Epoxy the plywood gear plates to the foam, then epoxy the balsa gear plates flush with the surface of the foam. Of course, you may have your own techniques for the landing gear. There are many variations - rails, plywood box, carbon fiber angles, etc.
3. Sheet the wing, frame the ailerons, install the leading edge and tips using the same procedures as the stab.
4. Cut out a recess for the aileron servo on the bottom of each wing, glue in mounting rails, and install the servo so the control wheel just protrudes above the surface. Section AA on the plans should make this clear. The opening may be covered with Monocote, or a thin plywood hatch as desired.
5. Cut out the sheeting above the landing gear plate to allow installation of the retract mechanism.
6. Tunnels for the aileron wires and the landing gear linkage, or air lines may be made by heating a length of music wire. Place the wing half back in the lower block. Cut 2 pieces of scrap wood to the height you want the hole and space them a short distance from the wing root. They will support the wing and keep the hole parallel with the bench. Heat the end of the wire with a candle and carefully melt a hole to the desired location. Re-heat the wire as necessary.
7. Once you have both wing halves completed, it is time to join the wings.
8. The dihedral has been pre-cut in the foam cores for you. This allows you to join the wings in the foam blocks.
9. Tape the top wing shucks together at the center and lay a piece of wax paper across shucks. At this time you will want to check the fit of your dihedral brace which you made before sheeting the wings. Once you are satisfied, you may proceed with joining the wing halves.
10. When you are joining the wings you will need to use a slow dry epoxy and a 5 minute epoxy. Mix up some 5 minute epoxy and put on the root of each core. Wipe excess epoxy off and make sure you get the cores pressed tightly together. Align cores in wing blocks and allow to dry over night.



11. The next step will be to mount the wing to the fuselage. The prototype used 4 1/4-20 nylon wing bolts to hold the wing in place.

12. You will need to cut a flat on the center leading edge of wing to fit wing saddle. Cut this flat approximately 2-1/16" from the center of the wing out, or 4-1/8" long on center. Trial fit the wing to the fuselage.

13. Epoxy the plywood wing mounting blocks to the fuselage as shown on the plans. Align the wing in the fuselage saddle. Drill holes for 1/2" hardwood dowels with sharpened brass tubing. Cut dowel to length and center drill for a 1/4" bolt. Epoxy dowels in place. Note: An alternate method is to use hollow Fiberglass arrow shaft in place of dowels.

14. Re-check wing alignment and drill through dowels into the plywood wing mounts; install blindnuts and bolt wing to the fuselage using 1/4-20 nylon bolts.

15. With the wing on the fuselage and all retracts installed, adjust the length of the gear wires so that the fuselage sits level as measured at the thrust line. The gear length shown on the plans will allow 2" prop clearance with a 11.5" prop.

16. Remove the wing and cut out the wheel wells. Allow at least 1/4" clearance between the wheel and the wheel well. If desired, the wheel wells may be lined with 1/16" balsa.

17. The next step is to cut the pipe channel in the wing. The pipe channel should be about deep enough to allow 3/16" clearance between the pipe and the foam. We recommend taking a piece of 80 grit sandpaper and wrapping it around a round tube or glass jar with a diameter of 2" to 2-1/4". Sand pipe cutout to fit your tuned pipe. Once you have it to shape, sand channel with some 220 grit paper to get a nice smooth surface. It is very important to have a smooth surface.

18. Once this is done, you will need to glass the center section of the wing. We recommend 6 ounce glass cloth for this procedure. Use a 5" wide piece on the top of the wing. On the bottom, you will use 3 layers of 6 ounce cloth. The first layer will be 5", the second will be 4", and the third layer will be 3".

19. Brush a coat of slow dry epoxy on the wing approximately 5" wide at the center of the wing. Brush this epoxy into the foam and wood thoroughly. Let this epoxy stand for about 15 minutes. Then put your first layer of cloth on. At this time you want to get a good bond between the Fiberglass and the foam. Try to keep all air bubbles out. Once you have worked this layer down, brush a little extra epoxy on and add the second layer, and then the third layer. It is very important to keep a good bond between all surfaces. Work the cloth down where needed. Don't rush this procedure, it takes about one hour. Be sure the 3-1/2" and the 3" wide layer of cloth don't extend too far fore and aft. There is only enough clearance between the fuse and the pan for the wing and one layer of 5" cloth on the top and the bottom of the wing.

## **HORIZONTAL STAB INSTALLATION**

1. The stab installation is the same whether you install the adjustable stab mechanism or not.
2. The stab is located on the fuselage by placing the elevator hinge line 2-1/2" forward of the rudder hinge line.
3. At this point you should have a completed stab and an opening in the fuselage made by tracing a template from the stab root before it was joined. The rudder post should be temporarily installed and held with masking tape.
4. Slide the stab in position, block the fuselage level, and check stab alignment by measuring from the stab tips to the wing tips, the stab tips to the bench, and using your trusty eyeballs.

5. When you're satisfied the alignment is correct, tack glue the stab to the fuselage with dabs of 5 minute epoxy. Of course I'm sure you roughed up the glass both on the inside and the outside of the fuselage.
6. Remove the rudder post and glue the stab permanently with epoxy. Don't get carried away with the glue unless you think you need a lot of tail weight. A few pieces of glass cloth on the inside are sufficient. Form a small fillet on the outside of the fuselage using epoxy and microballoons.

## **RUDDER INSTALLATION**

1. Epoxy the 1/2" square balsa tail post to the fuselage, hold in place with strips of masking tape until the glue has cured.
2. Glue in a 1/8" balsa rib to close the opening above the rudder.
3. Hinge the rudder to the tail post and fair in the balsa skins and lower rib with a sanding block.

## **EQUIPMENT INSTALLATION**

1. Size the fuel tank to your particular requirements, a 12 ounce tank is sufficient for the current FAI pattern. For sport or practice you may want to use the larger tank shown on the plans. To place the tank as far back as shown on the plans it will be necessary to use an engine with a built in pump or add a Perry fuel pump.
2. Only one retract servo is required; however, the prototype used a separate servo for the nose gear. This servo can be a standard 90 degree servo.
3. Sullivan cables were used for the rudder linkage on the prototypes.
4. The elevator pushrod is a Fiberglass arrow shaft captured by a slip fit brass tube installed in the rudder post. This prevents side motion and makes for a extremely firm elevator. Refer to the plans for the details.
5. Receiver and battery pack location of course is dependent on center of gravity requirements.
6. Use an extension on the rear of the tuned pipe to route the exhaust outside the opening at the rear of the belly pan.
7. The adjustable stab mechanism shown on the plans is available from R/C City.

## **FINISHING**

1. Prepare the fuselage for paint by sanding the fuselage thoroughly with 320 grit sandpaper to remove gloss. Fill imperfections in the glass and the seams where necessary with a polyester body filler.
2. K&B Superpoxy primer is recommended as a base for painting.
3. To keep the weight down, it is recommended that the wings, stab, and rudder be covered with Monocote or equivalent film.
4. Seal the gap on the ailerons with Monocote or tape applied to the lower surface.
5. After the painting is completed, wipe a thin coat of silicone on the belly pan flanges. This will eliminate vibration and chafing.

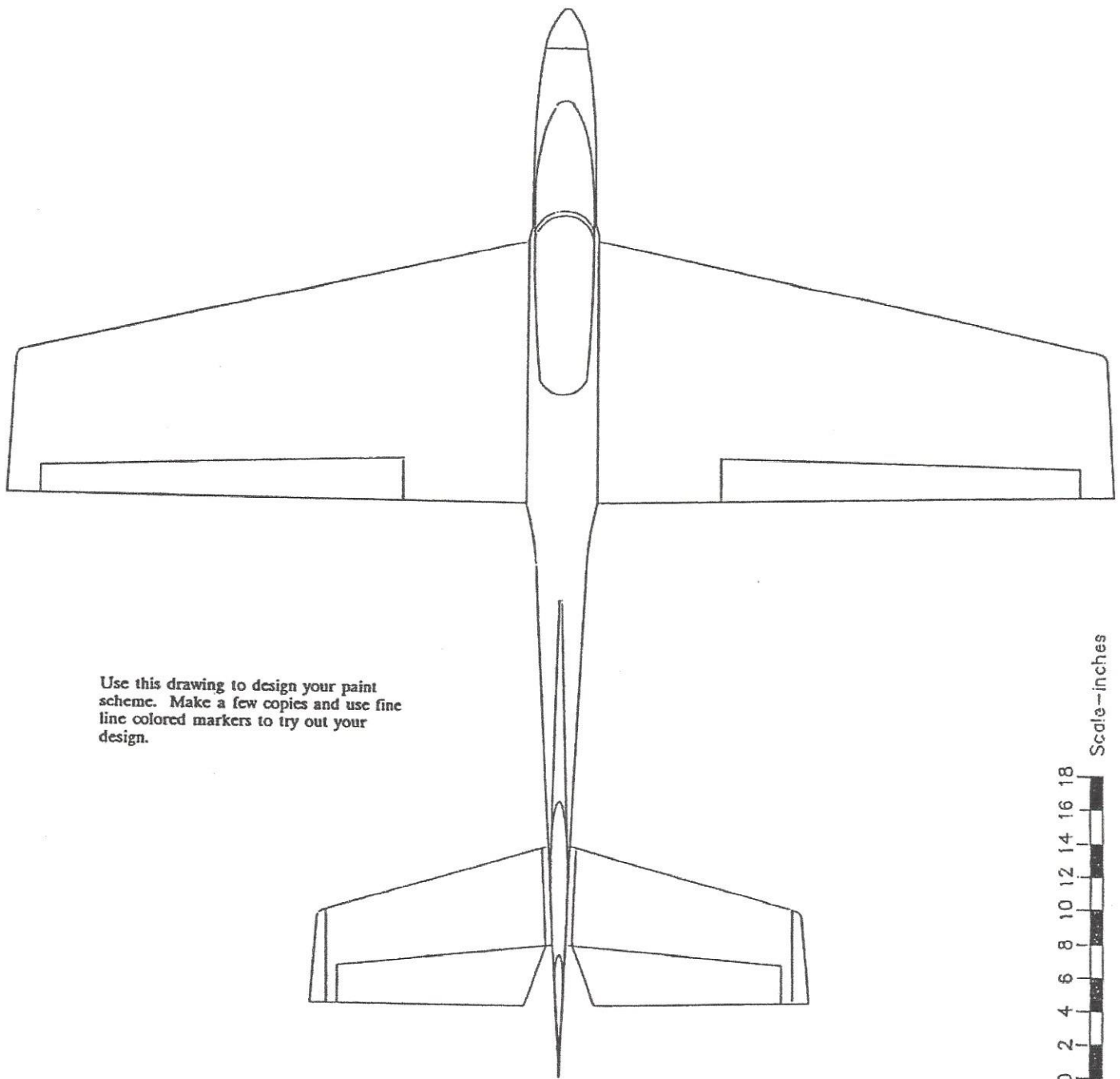
## **FLYING**

1. Check that the balance point is where the plans show. The CG should be located 18-3/4" aft of the spinner backplate. After a few flights, you can experiment by moving the center of gravity and adjusting the control throws to suit your flying style.



2. Be sure to check the lateral balance as well. If one wing is heavy add clay to the other wing and see what happens, once you have it flying right you can add the weight permanently to the wing tip by concealing some lead or nails under the Monocote.
3. It will typically take many flights to trim the plane out perfectly. If you are new at this game, hopefully you'll have an experienced flier to assist you.





Use this drawing to design your paint scheme. Make a few copies and use fine line colored markers to try out your design.

