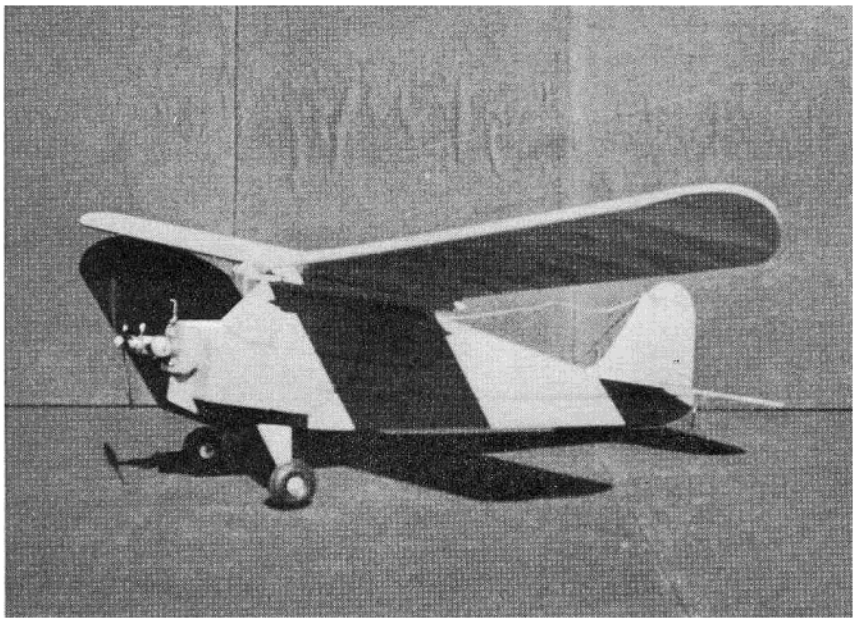
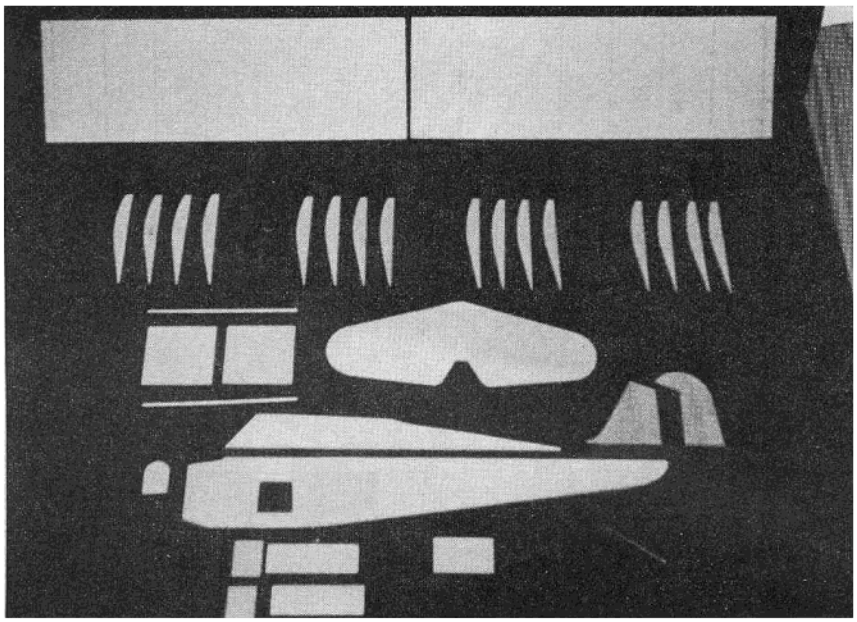


CHAMPION EVERY SUNDAY

A quickly built profile Aeronca Champion, ala control line style, for the R/C beginner, sport flier, or just for a change of pace.

BY HERMAN GELLER



THE past few years have seen some significant steps forward in the development of new construction methods and materials in order to eliminate much of the work in an R/C model. Unfortunately, almost all of this effort has gone into the larger multi ships. As the building time was reduced, the cost increased. The average Sunday flier has been left high and dry in the new era. Except for champions of the cause such as Ken Willard and Ted Strader and a few others, the emphasis has been on the larger, more expensive, aircraft.

It seemed only logical that an Aeronca Champion be chosen to further the cause. Ken Willard has pioneered simplified small R/C model construction. This one carries on by eliminating the built up fuselage insofar as possible. A person who has never built a flying model airplane before should be able to build this one in a short time with no trouble. For the old-timer it is a model that will go together very fast for small field flying or to get your kids started with this obsession. Further, I think it is a good place to start the wife if you have already gotten her to the point where she is convinced that "if you can't beat 'em, join 'em."

FUSELAGE

Since the installation of the R/C gear in the fuselage is the most time consuming part of the job this seems like the logical place to start. Fuselage is cut from two pieces of 3/16" or 5/32" thick medium hard balsa. A 3" wide x 36" long sheet is more than enough for the fuselage profile with plenty left over for the center ribs in the wing. If your local hobby shop has the 5/32" material, it will be helpful to reduce the finished weight. If you want to take the time and make the mess, you can sand down the completed fuselage profile to 5/32" thick. The joint line shown on the plan is coincident with the bottom of the stabilizer. Pick out a sheet that is flat and straight and has clean cut square edges. Trace the plan using carbon paper to make a template for the bottom half and the top half of the profile. Include the escapement cut out and the landing gear hole in the bottom half template. I find the cardboard from a manila file folder is ideal for template making. It is thin enough that you can cut sharp radii with a scissors and not deform the edge. It is heavy enough that you can trace around it a number of times without wearing it out.

Align the bottom half of the profile so that the joint line coincides with the edge of the sheet and the front end coincides with the end of the sheet. Trace the profile onto the wood using a ball point pen with very light pressure. The top half of the profile is made in the same manner with its joint line coin-

ciding with the opposite edge of the sheet. If your sheet has good edges you now have a factory made square joint that should fit very tightly. I like Ken Willard's method of butting two sheets together. That is, you carefully put the two sheets together on your bench top and apply a piece of masking tape the length of the joint to hold the pieces tight. Now turn it over and "open the hinge." Apply a bead of glue in the opening. Close the joint and wipe off the excess glue. Lay it flat on the table and apply another strip of masking tape to this side to hold the pieces tightly together. If you desire, you can pin them to the bench. When this is dry remove the tape from both sides and you have a construction that is stronger than the wood. Add the 1/32" sheet doublers to each side. Use of epoxy will provide additional strength but cement is adequate. Sand the edges of the profile to shape. Do no sanding on the front end where the firewall mounts or at the tail on the surface where the stabilizer mounts. We want to keep these surfaces square, which is what they should have been when you bought them. Be careful when sanding the area for the wing mount so that it remains square with the fuselage. Use a sanding block for this and check your work with a square.

If you have to do a little extra sanding so that the wing support area is lower than shown on the plan, it will not matter providing you maintain the same angle between the wing mount and the joint line. This can be checked by measuring from the joint line to the leading and trailing ends of the wing mount. Cut out the escapement opening and sand it so that the back edge has the slope shown and is at right angles to the sheet. This will give you the proper mount for the 1/16" plywood escapement bulkhead. The slope avoids binding of the torque rod and rubber shaft. Drill a 1/16" diameter hole as marked from your template for the wire landing gear. You will have to elongate this hole by additional drilling and cutting in a rearward direction about 3/16" in order to install the gear which will be done at a later time.

Make a template and cut out the firewall from 3/32" plywood, mark the center lines on it in both directions and lay out the engine mounting holes. Drill these approximately 1/32" diameter through the plywood. Rough shape some soft balsa block or build up one from laminations of scrap left from the fuselage sheet. Rough shape these blocks per the plan leaving them slightly over size to finish after gluing. Glue the firewall and support blocks in place using white glue or hobby-poxy. You can block the fuselage in a standing position on your bench and block the firewall in place while it dries. Make sure that it is square with the fuselage. When the firewall and support blocks are dry you can bring them to final shape with sandpaper.

Bend the landing gear from 1/16" music wire. The front view of the plan shows the gear in its actual size. I find it easier to start with the "U" bend that goes through the fuselage and work from the center towards both axles. If you have a pair of pliers with narrow jaws or some other piece of steel or wood 3/16" thick, it will help in making this bend. Check the "U" bend on the finished gear to make sure that it grips the sides of the 3/16" sheet snugly before inserting it. Insert the gear into the hole and enlarge the hole if necessary working in a rearward direction with the gear pointing either forward or aft during insertion. Once the gear is inserted bring it to the vertical position as shown on the plan and using a sharp pencil, scribe a light line on both sides of the wire on one side of the fuselage. Rotate the gear out of the way and drill a series of holes along each line at about 1/16" to 1/8" centers. These holes should be about .020" in diameter or the closest thing you have to it. The gear is sewn in place using heavy thread. I like to use dacron control line which is sold at most hobby shops. It is a little tough to push a needle through 3/16" balsa; hence, the drilling. When the landing gear is sewn securely in position thoroughly coat both sides of the gear and fill the elongated hole with hobby-poxy. Apply enough at the gear so as to provide a coating over the wire in addition to a fillet on each side of the wire. This gear has withstood numerous hard landings with no damage and I believe the success is due to a tight sewing job and the hobby-poxy glue. A good model cement may be used if you coat it two or three times allowing each coat to dry thoroughly. The landing gear fairings are installed at a later time if you want to use them.

The wing mount is made from 3/32" medium hard sheet balsa. Cut two pieces 3" long from a 3" wide sheet and cement them together edge to edge to give you a 6" long platform with the grain running the short way. Sand or cut a piece of hard 3/16" square to a triangular cross section and cement it in place as a brace on each side of the fuselage. Have this ready when you initially glue the platform so that you can put them in place while the glue bead from the platform is still wet. When this is dry apply glue to the fuselage and block it in place vertically with the wing platform on the bench top. Check this with your square to make sure it is correct. Check again with the square and if all is okay, allow to dry. Cut two pieces of 1/8" dowel x 6 3/4" long, round off the ends. Glue these in place on the wing mount platform as shown. Make sure they are reasonably parallel to each other and to the fuselage or they will interfere with your wing alignment.

R/C GEAR

Trace and cut the escapement mounting bulkhead from 1/16" plywood. The plan gives the layout for both the Citizenship SE II and the O. S. Minitron K II. Any other escapement will do. If your escapement is larger than these, you will have to enlarge the R/C box accordingly. Make sure that you do it equally on both sides of the fuselage so that the drag will remain symmetrical. Lay out and drill all mounting holes. It will be necessary to remove the rubber hook shaft from the escapement in order to install it. The two escapements have threaded shafts for easy removal. Remove the shafts, being careful to note the direction in which the parts re-assemble and making sure that any washers in the mechanism go back to their proper places. Mount the escapement to the bulkhead with the screws provided or with 2-56 machine screws and nuts. Reinstall the rubber shaft. Fit the bulkhead into the opening and fuselage and line it up so that its center is where it should be. Make sure that your escapement clears all around, if not enlarge the opening. With the Citizenship escapement you will need to notch the back of the opening in the fuselage to clear the head of one mounting screw. It will be more convenient if you solder the receiver leads to it before putting the assembly into the fuselage cut out. When all is ready glue the bulkhead with the escapement installed into the fuselage with white glue or hobby-poxy and let it dry.

The installation of the torque rod bearing comes next if you are using a Citizenship escapement. Bend a loop in the end of a piece of .045 music wire as shown on the plans to fit over the pin on the escapement. For best performance this pin should be insulated by sliding a piece of plastic tubing or wire insulation over the pin. Make the loop large enough to go over this insulation and run free but without too much play. Slip a Perfect 1/2 A lead out eyelet (copper colored) onto the wire with the flange end facing the loop. Insert the wire through the torque rod hole in the bulkhead and engage the loop on the escapement pin. Push the eyelet into the bulkhead hole about half way as shown on the plan. Slip another eyelet onto the wire and clamp or pin it to the tail of the fuselage as shown on the plan. Rotate the torque rod to make sure everything is free, then thoroughly cement both sides of the bulkhead eyelet and the one at the tail. Give these two coats of cement. When they are dry

remove the torque rod. The push rod for the O. S. escapement is not installed until the fuselage and tail assembly are complete.

Cut out the 3/32" thick balsa bottoms and front ends of the R/C box. Also cut the 1/16" sheet tops for the R/C box. Check these parts for fit, sanding if necessary to bring them to final shape. Glue them in place. The receiver can be installed next. Cut a piece of 1/2" foam rubber to fit the receiver compartment. You may cement this with contact cement directly to the bottom of the receiver leaving approximately 1/2" sticking out at the front end. If you would rather not do this, tie the foam rubber to the receiver with string or thread at two places by threading it through the leads on the receiver components so that when it is pulled up tight the thread will be against the printed circuit board and not on top of the receiver components. Coat the area on the side of the fuselage just forward of the escapement opening for a width of 3/4" with contact cement. Coat a similar area on the foam rubber with contact cement. When this is dry to the touch, carefully locate the receiver in the compartment and bring the two cemented surfaces into contact. Cut another piece of 1/2" foam to fill up the space between the front end of your receiver and the front bulkhead of the R/C box. I have found this gives a good mounting. By omitting the cement at the front end of the foam you can readily take it out of the compartment when you want to. You would be surprised at how tough it is to get a receiver out of a tight compartment without damage if it is cemented to the foam rubber and the foam is completely cemented to the fuselage. Mount the switch in the bottom of the R/C box on the left hand side as shown. This is the least crowded area. The small, single pole single throw, switches which are available in the hobby shops can probably also be mounted on the right if you prefer that side. Make sure that the wires will not interfere with the escapement operation. I tie the loose wires together with thread and glue them to the bottom of the box with contact cement so that they cannot move around and get into the works. The batteries are installed in the same manner as the receiver. Since I follow the practice of recharging dry cells, I use a two prong plug and receptacle cut from the six prong variety that is available at the hobby shop. I solder the female end to the batteries to avoid accidental shorts, and the male end to the receiver and switch leads. The wiring is done in accordance with the receiver and escapement instructions. Make sure you have good solder connections. I used a Controlaire 5 receiver and two alkaline pen cells. I taped the pen cells together with a double wrap of plastic electrical tape. Make sure that they are turned end for end so that by soldering the lead across one end you will end up with a positive and negative on the other end and have two cells in series to give you the three volts required by most receivers. The alkaline batteries are well worth the additional cost and you can get a full day's flying out of them. If you do not recharge your batteries, bend three small "J" shaped hooks from .030 music wire. Cement two to the forward bulkhead and the other to the fuselage at the forward edge of the escapement opening. Leave this one sticking out just past the foam. Tie the batteries in securely with a husky rubber band between these hooks. The batteries have a great tendency to go flying forward when the model comes to an abrupt stop, so if you do not glue them in securely, make sure you strap them in securely.

Make the doors for each side of the box from 1/16" sheet. Bend a small "J" shape hook from a pin or music wire and cement it to the bottom edge of the door about 1/4" forward from the landing gear. These hooks are used to keep the door shut. A small rubber band stretched from the hook on one side under the fuselage in front of the landing gear to the hook on the other side keeps both doors closed. The objective, of course, is to keep dirt out of the escapement.

The fuselage assembly is now ready for doping.

TAIL ASSEMBLY

The elevator, fin and rudder are cut from medium hard 1/16" sheet balsa. The elevator is 12" tip to tip and about 4 3/8" wide at the center. If you have a 4" wide sheet, measure off about 12 1/2" and locate the center. Glue an additional strip of 1/16" about 3/8" wide or larger and 2" long to the edge of the sheet symmetrical about the center line. When this is dry you can trace out the complete elevator and cut it in one piece.

The fin and rudder should be cut with the grain running vertical. Cement the 1/16" x 1/8" braces to each side of the rudder as shown on the plan. Locate and drill the hole for the 2-56 bolt if you are using an escapement yoke. If you are using the O. S. escapement, cut the rudder horn from 1/32" plywood and white glue it in place. The tail pieces are now ready for doping.

WING CONSTRUCTION

The wing construction is quite simple and goes together very rapidly. If you cannot buy a 6" x 36" sheet of 1/16" medium balsa, buy two 3" wide sheets and make sure that the edges are straight and will match together. Glue them up using the same technique described for the fuselage. Fourteen ribs are traced and drawn on medium soft 3/32" thick sheet stock. The two center ribs are cut from the leftover fuselage material. They are all the same shape. Stack the ribs together in two groups for easy handling. The idea is to line them up at the leading edge and the bottom and hold them together in a group for sanding. This will make them all the same size and shape. Obtain a straight hard piece of 5/16" square for the leading edge and mark a line with a ball point pen 1/8" from one corner for the full length of the 36" strip. Cut the leading edge into two equal lengths. Using a razor plane or sanding block, taper the entire strip to give the cross section shown in the plan. Try to stay away from the inside edge so that it will remain the full 5/16" deep and will match the height of the ribs. Find the center of your 6" wide 1/16" sheet and draw the center line with a square. Cut it into two equal pieces. Pin the leading edge for one-half of the wing onto the plan. Cement the leading end of each rib to the leading edge and pin them to the plan and allow to dry. The rib should be flush with the top of the leading edge. If you have some variation here when the assembly is dry, you can take out the bump with a sanding block. Coat the bevelled surface of the leading edge and the top curved surface of each rib with contact cement. Using a square, mark a light line on what will be the underside of the 1/16" sheet at 2 1/2" centers. Apply a coat of contact cement about 3/16" wide along each line and along the leading edge about 5/16" wide and allow to dry. Lay the leading edge and rib assembly, bottom down, flat on the bench, using a strip of wood or other flat object to butt the leading edge against. This will serve as a guide for placing the 1/16" covering. Keep in mind that once the two surfaces covered with contact cement come into contact they have made a permanent joint, so it is necessary to have everything lined up before letting them touch. Hold your prepared sheet, contact cement down, with the leading edge against the alignment block and about 1/4" above the wing framework. Make sure the end of the sheet is lined up with the face of the 3/16" rib and is in line with the front of the leading edge. Lower the sheet in place at an angle so that the leading edge makes contact first. Run your finger along the leading edge of the sheet, pressing it down firmly against the leading edge of the framework. Run your hand across the sheet from front to rear, pressing it down against the top of each rib. The wing panel assembly is now ready for trim. Turn it over and check to make sure that all the ribs are in contact. Make a template of the wing tip, lay it on top of the wing so that it is tangent to the tip of the sheet and mark the outline with a ball point pen. Trim to the line and finish with sandpaper. Taper the leading edge and the bottom of the tip rib to blend in. You are now ready to sand the dihedral angle into the thick rib.

The best way to do this is to block up the wing so that the tip has the proper height and thick rib is at the edge of your building board or work bench. Using a sanding block with medium or coarse sandpaper and holding it vertical, sand the thick rib. This will produce the proper angle. Be careful that you sand it at right angles to the leading edge so that you don't end up with a swept wing or a reversed swept wing. Make the other panel in the same manner but opposite hand. One wing tip template does for both. Block up the two halves on your bench and check the fit of the center joint. Make any corrections necessary with the sanding block. Get as much area in contact as possible between the two halves as this will determine the strength of the joint. Place a piece of wax paper on your bench, coat the ribs with cement, bring the two halves together and block them in place for a tight fitting joint and the proper dihedral. When this is dry cover the bottom of the wing from the center to the first rib out with hard 1/32" sheet, the grain running parallel to the span. Complete the shaping of the leading edge top and bottom to the finished contour shown. You can do this by eye or make a template and check it along its length. The wing is now ready for finishing.

FINISHING

Weight is the main consideration with regard to the finish. I have found that at least three coats of dope thinned 50% are necessary over a contact cement joint to protect it from the fuel. If you want to leave it natural, three coats clear thinned about 50% and sanded lightly after the second coat should be enough. I wanted a little color on mine so I used two coats of thinned clear and one coat of colored thinned about 50%. If you brush this on evenly it will not cover the grain but will give the model an attractive coloring. I used the standard Aeronca colors, that is, an orange fuselage, rudder and fin with a yellow wing and elevator.

I use a particular technique for doping thin balsa parts to avoid warpage. The idea is to apply the dope to both sides simultaneously so that the shrinkage is equalized. I start at one end of the part for the length of about 2" then turn it over and dope the opposite surface for a length of about 4", then back to the first side and repeat. By alternate doping one side and then the other, warpage is avoided. I use pins for legs on thin parts so they can be stood up for drying. Another scheme is to insert a pin into the edge of the piece and suspend it using a spring type clothespin tied to whatever is available.

Examine the engine mount carefully prior to doping and fill or close any openings with cement so that the fuel and exhaust oil cannot find its way into glued joints. I use an extra coat or two of clear dope on the firewall and bracing area for improved protection against fuel. Additional trim may be added to improve the appearance. You can use the trim tapes that are available or do the following: make templates of the window and door outlines, locate them on the finished doped fuselage and go around them with a black ink ball point pen. You will find that this will leave a nice heavy line without much pressure. Now very carefully give this area a coat of clear dope. The dope will run the ink so it must be put on without much brushing. It is much safer to use a spray can.

FINAL ASSEMBLY

Using a needle and thread sew the rudder to the stabilizer with a figure eight stitch. I pick out a thread that closely matches the color and apply cement only to the ends of the hinge so that the thread will not unravel. Don't get any cement near the hinge joint or it will stiffen. Mount your rudder yoke if you are using one and then glue the fin and rudder to the elevator, blocking it up to maintain it at right angles. When this is dry, cement the entire tail assembly onto the fuselage making sure that the elevator is perpendicular to it. You may want to add a triangular brace between the rudder and the elevator. I haven't found this to be necessary yet.

If you are using the O. S. escapement, fit the push rod between the escapement arm and the rudder as closely as you can. Cut it in two at a convenient place and snip off about 1/8". Slip a Perfect 1/2 A eyelet about halfway onto one piece and crimp it on with a pair of pliers. Connect the two ends of the push rod to the escapement and the rudder horn. Using a piece of scrap balsa, clamp the rudder to the fin to maintain it in neutral position. I find it best to install the rubber on the escapement and put in a few turns to hold it in its normal neutral position before making the final linkage hook up. Now slip the other half of the rod into the eyelet and making sure that your escapement is in the neutral position, solder this connection. This allows you to make the final neutral setting without having to bend the push rod ends with a high degree of accuracy.

If you are using the Citizenship escapement, you may have noticed that the torque arm and yoke are opposite to the usual installation. If you mount the escapement as shown, it will be upside down, hence the reversed linkage. This keeps the signaling standard i.e. key and hold for right, short and hold for left. Cut off the loop which you bent earlier that fits over the escapement pin. You just can't get the loop with a long piece of wire attached back into the box once all the gear is installed. Cut this to give a 3/8" long shaft. Bend the end of the remainder of the wire to make the arm that engages the rudder yoke.

Fit this wire in from the tail and mark it about 1/4" beyond where it comes out of the bearing eyelet in the bulkhead. Remove the wire and cut it off. Cut it again about halfway from the end to the bend. Reinstall it. Slip a Perfect 1/2 A lead out eyelet over the short shaft on your loop. Crimp it in place. Install the loop in the box so that it is engaged on the escapement pin and push the straight torque rod piece into the eyelet. Move the whole assembly forward as far as you can so that you can solder both pieces of wire to the eyelet without soldering it to the bearing. This eyelet not only makes a splice but makes the thrust bearing in a rearward direction. Now join the two halves of the torque rod together with another eyelet about halfway between the bulkhead and tail bearing. I wrapped a double thickness of aluminum foil around the fuselage to protect it during this soldering operation. This connection allows you to make the final adjustment in the length of the torque rod so that you will have about 1/16" end play. Use the same technique as described for the O. S. equipment to hold this in a neutral position when making this last solder connection. If you end up a little bit off, you can make adjustments by bending the rudder yoke.

I used the Cox Pee Wee .020 engine which is very inexpensive and adequate for the job. You can mount it with the cylinder upright if you prefer, but it breaks up the profile. The Cox TD-.020 will give you improved performance at additional expense. Mount either engine using No. 0 x 3/8" wood screws which are available from Perfect. The Cox three blade prop made for these engines gives the best performance but does not have the scale appearance of the two blade prop. You take your choice!

FLYING INSTRUCTIONS

Before flying, balance the model. It should balance slightly nose heavy at the point indicated on the plan. Since the radio gear is mounted off center, it is advisable to screw a small eye at the center of the wing at the point shown on the plans and suspend the entire model so that the balance can be checked both longitudinally and around the thrust line. If your model does not balance with the fuselage vertical, add the proper weight to a wing tip until it does. I cut a piece of solder which I lay on top of the wing, trimming it until it is the proper weight. Then I flattened it out with a hammer to about 1/32" thick, formed it to the curvature and thoroughly cemented it to the underside of the wing tip. You should be able to achieve longitudinal balance by shifting the wing on the mount until the thrust line is horizontal or slightly downward. If you need to add weight you can add it under the R/C box forward or under the elevator where it will not be visible.

Test glide the model. It should have a fairly long flat glide that should be straight. If it dives, move the wing forward. If you have the wing as far forward as it will go, then add a 1/16" shim under the leading edge to increase the angle of incidence. If it has a tendency to swoop in the glide, move the wing backward. When you have achieved the proper glide you are ready to fly.

One of the old pros in this business, Bill Winter, made a statement in one of his articles; "No one can tell you how to fly, but there are some things that you can try to avoid." He went on to list a number of items which I feel are very excellent although I haven't always been able to follow his instructions. I think it is most important that you keep from making any maneuvers or giving any signals when close to the ground unless you are an expert. My failure to do this has caused more crack ups than any other single thing. A poorly trimmed model will do itself much less damage if left alone than if given the wrong

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