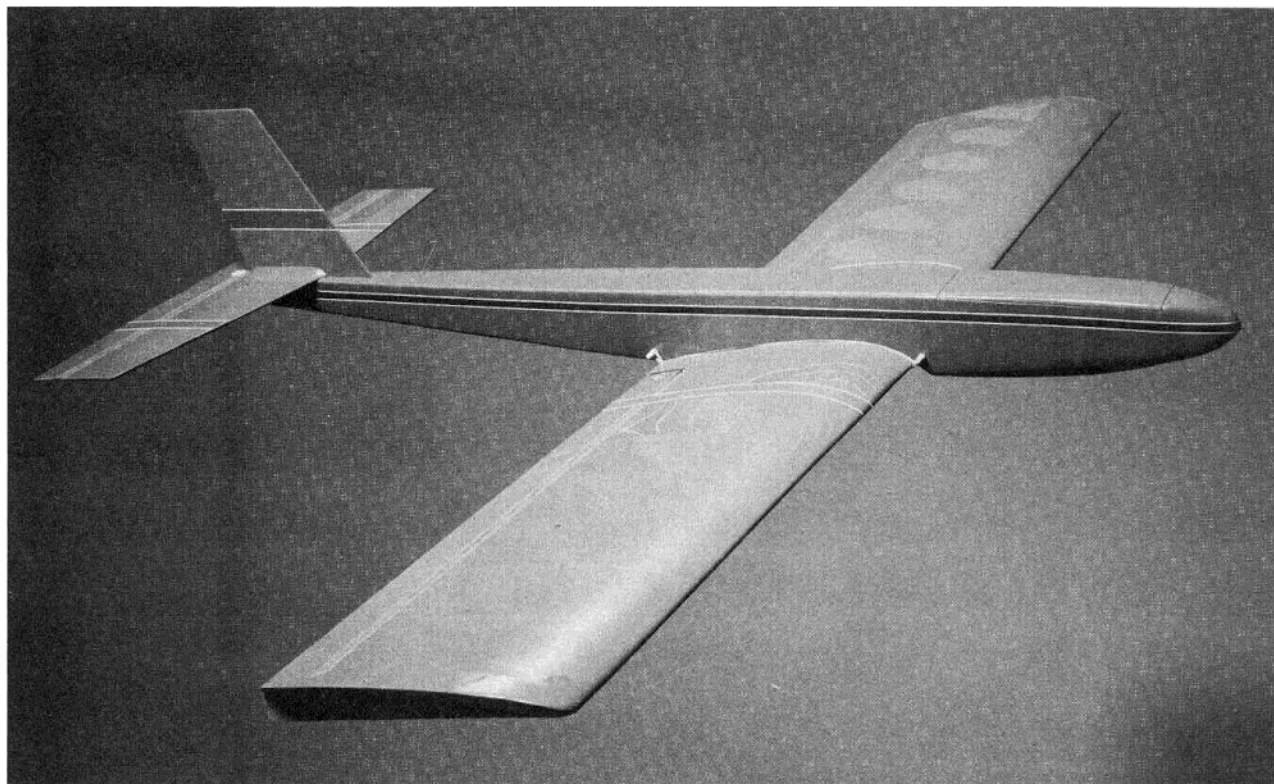


# RIDGE



If slope soaring is your bag, you're in for a whole new world of excitement with the Ridge Rat, an easy to build, easy to fly machine that can virtually turn itself inside out with aileron and elevator control. And, if you want a surprise, put a tow hook on it try a winch or hi-start - - - you'll really be amazed at what you can do with the next thermal that comes along.

## RAT

By Ed Slobod

**T**his is a construction article for an R/C sailplane designed for slope (or ridge) soaring, so if slope soaring is not your bag, pass us by and pick up on the "lotsa" other good stuff in this month's issue. However, if you are a slope nut, stick around. This just might be what you have been looking for. Now we all know that if the slope is a good one, and if the wind blows hard enough, just about anything will fly. If you've spent any time at all on the slopes, you know what I mean. It is also true that some machines fly better than others. If you have the capability to design and scratch-build your own, you can tailor the ship to your needs. If, however, your experience in these areas is limited, you are stuck with what is available on the market. When I say stuck, I am not maligning the many fine kits available but if you look on your dealer's shelves, you will find that most are thermal sailplanes, and the very few slope sailplanes available are usually too expensive, too hard to fly, or are compromise sailplanes that won't do much more than the thermal ships. What

has been needed for some time is an easy to build and fly aileron-elevator slope machine and we feel the Ridge Rat should fill the bill. It was designed for the slope flyer who has been flying a thermal machine on the slope and would now like to step up to a machine that will do more than turn and loop, yet is not too fast or tricky for him to handle. The Ridge Rat was designed with you in mind.

It is light enough to fly in 6 mph wind, will fly inverted easily, does inside and outside loops, rolls, etc., but is docile enough for the transition from rudder-elevator to aileron-elevator to be an easy one. To verify this, we had a number of people who had never flown an aileron ship before try it out and all managed very well. Interested?

Okay, the first step is to send to RCM for a set of full size plans. While you are waiting for the plans, you can check the magazine plans for the materials that you will need. Clean off your workbench and put fresh sandpaper on your sanding blocks. A building aid that I find useful when scratch-building a new ship is to get a few square feet of drafting

mylar (the transparent frosted kind) from the local drafting material shop. If I want to copy something from the plans without tearing them up I just tape the mylar over the object to be copied, carefully trace it on the mylar and then cut it out with scissors. The mylar is thick enough to be traced around and if you make up a supply of mylar templates you will always have them if you should ever want to build another or replace a broken part.

#### The Wing:

(1) Cut the wing portion of the plan away from the rest of the plan. Tape it to your flat building board, and cover it with Saran Wrap or equivalent.

(2) Place 1/16" spacers on the location for the spar. Put the spars for both wings down on top of the spacers and hold them in place with pins. Don't pin through the spars!

(3) Glue all W-2 ribs to the spar, straight and vertical, with the rear half of the ribs flush with the building board.

(4) On top of 1/16" spacers, glue the outer two W-1 ribs in place.

(5) Glue in the top spar, flush with the forward top surface of the rib.

(6) Glue the rear spar and the leading edge on, using pins and rubber bands, as in the photo, to hold everything tight. Make sure at this point that the ribs are still flush with the board.

(7) Remove the wings from the board, and trim by cutting and sanding the ends to the proper angle. Make sure that the wing has no sweep to it.

(8) Glue the wing halves together, using the ply dihedral braces as a dihedral guide. Clothespins make an excellent clamp here.

(9) Glue in the partial center ribs per plans, forming a box for the aileron servo.

(10) Tack one panel down flat. Glue a pre-cut leading edge sheet to the leading edge only. Pin it if it is necessary. Let this joint dry completely.

(11) Put glue on the rib tops and the spar and roll the sheeting down. Hold it with drafting tape, two pieces per bay, or, lay a spare piece of say 1/4" square along the sheeting above the spar as a pressure distributor and clamp the arrangement down with model clamps.

(12) Do the top of the other wing.

(13) Remove the wing from the board, and do the bottom sheeting in similar fashion. Try to watch out for building in twist at this point, but don't worry, it is easy to get it straight.

(14) Sheet the center section top and bottom, covering over the servo box for the time being. Do mark the approximate corners of the box on the sheeting so that after the center is glassed, it will be easier to cut the box open.

(15) Glue on the fixed trailing edge pieces at the wing center.

(16) Glue on the 1/8" ply tip ribs (W-3).

(17) Glue the 1" triangle stock on to the ply tip ribs. Plane and sand to shape

when dry.

(18) Shape the leading edge and the rear spar with a razor plane and 100 grit.

(19) Notch the wing as per plans for aileron torque rods. A Dremel tool is ideal for this.

(20) Bend the torque rods as per plans with the plastic tube in place.

(21) Rough up the plastic tubes and press fit the assembly into the notches without getting too much skin oil on the tubes.

(22) Mask the ends of the tube to prevent resin from fouling the action.

(23) Cut 2 oz. glass for the top of the center, leaving holes for the torque rods to emerge.

(24) Apply the glass to the top side using your favorite resin.

(25) When hard, trim, and glass the bottom. When dry, trim, and sand the top and bottom lightly. If you apply the resin out past the glass an inch or so, then the edges of the glass can be feathered in without sanding a dent in the balsa.

(26) Prepare the ailerons. Cut them to length, and bevel the "leading edge" to allow them to pivot from the top edge. A razor plane does the job beautifully. Notch the inner end for the plastic receiver tube. Rough up the tube and epoxy it accurately in place.

(27) Open a hole in the wing center sheeting where the servo box is to be. Carve away at the sheeting until it is flush with the walls of the box.

(28) Smear epoxy on the bottom of the servo box so that the servo tape will stick better.

(29) Finally, sand the wings to your standards.

(30) Cover with your favorite material: If your slope has a nice grassy area to land in, you may safely use MonoKote on the wing. If, however, your landing area is rough, as most are, you should cover the wing with Coverite. It is much tougher and your wing will not require frequent puncture and rip patches. Cover the bottoms of the wing and ailerons first, and fold the covering over the rear spar and the leading edge of the aileron. Do likewise with the top covering. This will prevent the tape hinge from peeling the covering off.

(31) Slide the aileron over the torque rod stub, and apply the tape hinge as per plans.

(32) A note on color selection: If you often fly in front of the sun, it is prudent to make the top of the wing a different color from the bottom so that you can tell the top of the plane from the bottom. I would recommend a light color on top and a dark color on the bottom.

#### Fuselage:

(1) Cut out all the parts.

(2) Glue the fuselage doublers to the fuselage sides. Position accurately since the doublers locate the bulkheads which determine the alignment of the fuselage. Trim the doubler to size after the glue dries.

### RIDGE RAT

Designed By: Ed Slobod

#### TYPE AIRCRAFT

Slope Soarer

#### WINGSPAN

49 3/4 Inches

#### WING CHORD

8 7/8 Inches

#### TOTAL WING AREA

430 Square Inches

#### WING LOCATION

Low Wing

#### AIRFOIL

Semi-Symmetrical

#### WING PLANFORM

Constant Chord

#### DIHEDRAL, EACH TIP

1 Inch

#### O.A. FUSELAGE LENGTH

36 Inches

#### RADIO COMPARTMENT AREA

(L) 6 1/2" X (W) 2 1/8" X (H) 2"

#### STABILIZER SPAN

20 1/2 Inches

#### STABILIZER CHORD (incl. elev.)

4 3/8" (Avg.)

#### STABILIZER AREA

93 Square Inches

#### STAB AIRFOIL SECTION

Flat

#### STABILIZER LOCATION

Top of Fuselage

#### VERTICAL FIN HEIGHT

6 1/4 Inches

#### VERTICAL FIN WIDTH

4 1/8" (Avg.)

#### REC. NO. OF CHANNELS

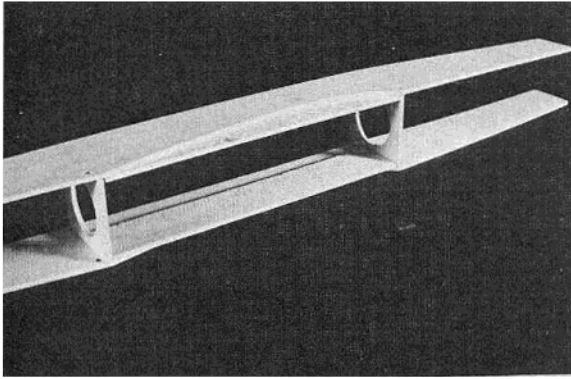
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#### CONTROL FUNCTIONS

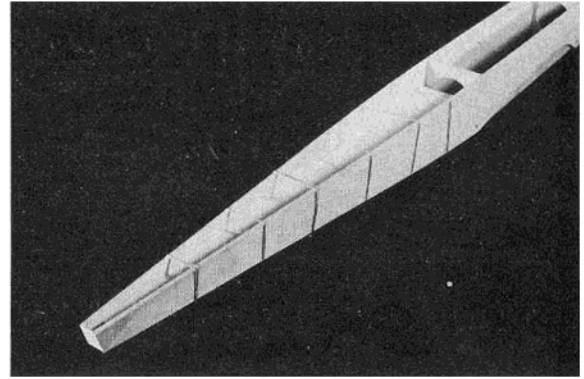
Elevator and Ailerons

#### BASIC MATERIALS USED IN CONSTRUCTION

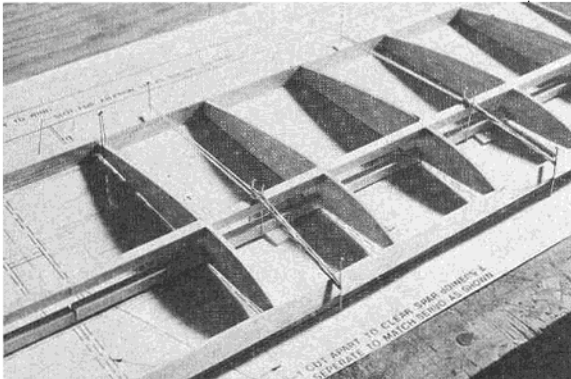
Fuselage	Balsa and Ply
Wing	Balsa and Ply
Empennage	Balsa and Spruce
Weight Ready-To-Fly	31 Ounces
Wing Loading	10.38 Oz./Sq. Ft.



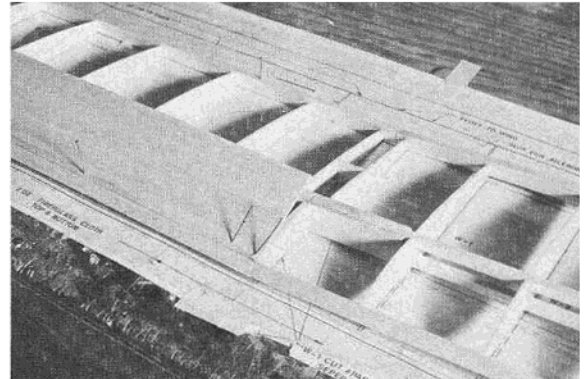
**Fuselage sides shown with doublers and F-2 and F-3 glued in position. Make sure sides are aligned precisely.**



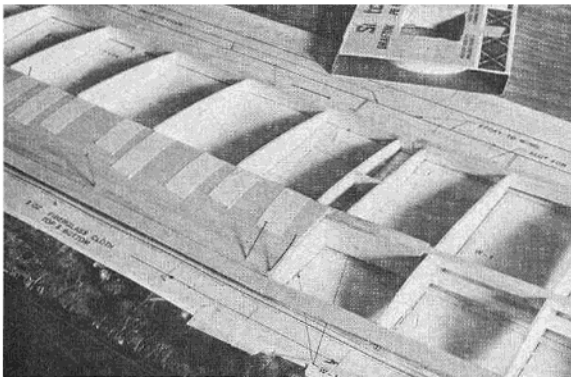
**View showing fuselage being aligned by using a simple cardboard template of the fuselage interior from F-3 rearward.**



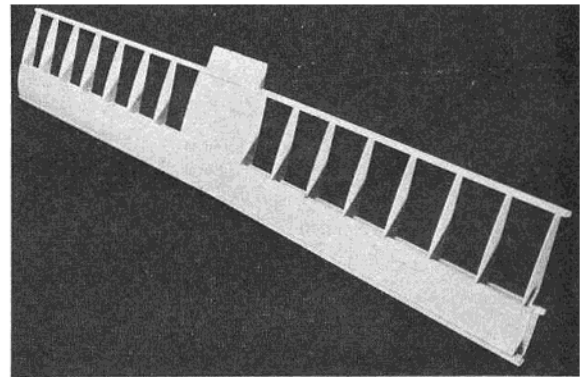
**Shows the use of pins and rubber bands to hold everything tight. Note 1/16" spacers to raise spar and ribs for sheeting.**



**Panels are joined with ply dihedral braces which are used as dihedral guides. Pre-cut L.E. sheeting is pinned and glued to L.E. and left to dry.**



**L.E. sheeting shown pulled down and held in place to dry with drafting tape.**



**Wing panels sheeted top and bottom with fixed trailing edge pieces at center.**

(3) Glue F-2 and F-3 to one of the fuselage sides. They should be perpendicular to the surface. Try to arrange the fuselage sides so that the best sides are facing outwards.

(4) When the bulkheads are dry, glue the other fuselage side on. To assure good alignment, place the dry side on a flat surface. Once the second side is in approximate position, go around the perimeter with a right triangle to align the

sides precisely.

(5) When dry, glue in F-1, and clamp with tape. Try to eyeball the alignment and if it is skewed to one side, put some pieces of tape on diagonally to pull it into shape.

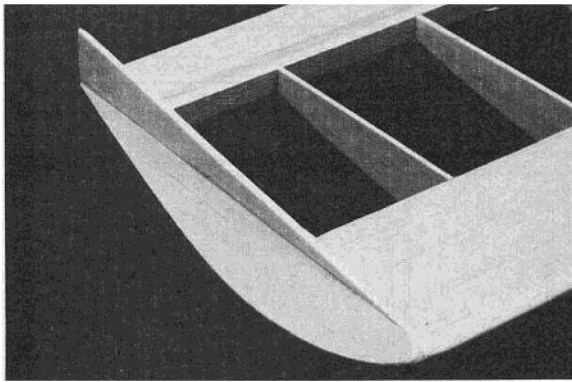
(6) Glue in the 1/4" ply ballast platform.

(7) Sheeting the fuselage top and bottom may be complicated by warps in the ply fuselage sides. If this is the case,

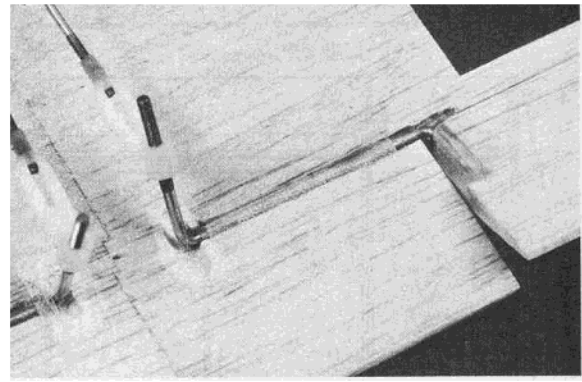
make a simple cardboard template (from ordinary corrugated box cardboard) of the fuselage interior from F-3 rearward. Place this template between the fuselage sides, and clamp the sides with rubber bands. Check for alignment. Glue 3/32" sheet on, crossgrain. Be sure to leave a gap near F-3 so you can pull out the template.

(8) Install 1" triangle stock at F-1.

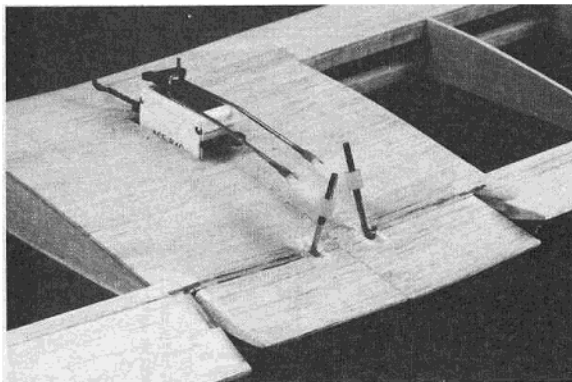
(9) Notch the 1/2" balsa block for the



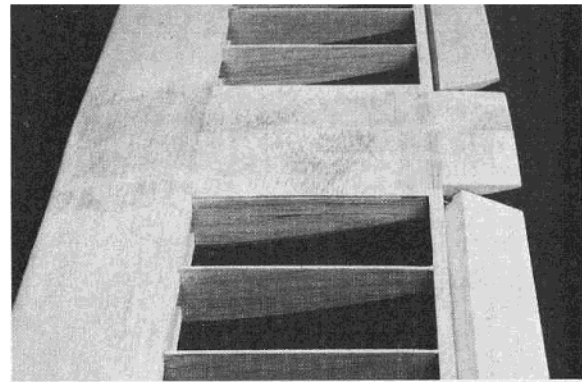
**Wing tip with 1/8" ply tip rib W-3 and 1" triangle stock glued in place and sanded to shape.**



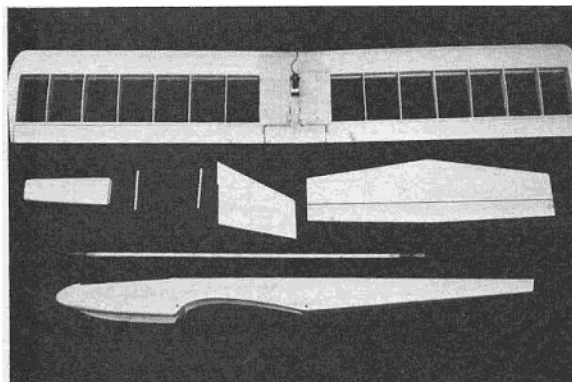
**Wing center section shown with torque rods held in place by glass cloth and resin.**



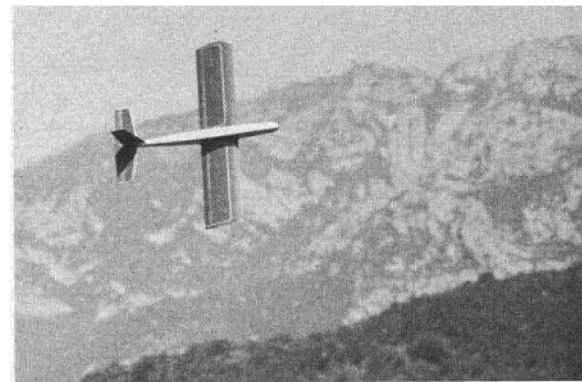
**Servo installed in wing and connected to torque rods.**



**Bottom view of completed wing center section.**



**Completed Ridge Rat sanded and awaiting your favorite covering material.**



**Ridge Rat doing its favorite thing it was designed for.**

nose skid.

(10) Complete fuselage top and bottom sheeting. Tack glue the 3/8" radio hatch at the corners only.

(11) Sand the front of the fuselage flush with F-1.

(12) Glue the noseblock on, being careful to avoid gluing it to the radio hatch.

(13) Shape the noseblock with a saw. Trim the nose further with a razor plane,

then rough sand the whole fuselage.

(14) Pry loose the lightly glued hatch, and glue the canopy hold-down gizmos to it and the fuselage.

(15) Make up the elevator pushrod from 3/16" square balsa.

(16) Make and glue in the elevator spacer.

(17) The finished fuselage may be primed and painted or covered with plastic iron-on material, but if your

landing area is rough, you should at least cover the bottom of the fuselage with 2 oz. fiberglass. I use 2 oz. fiberglass on my entire fuselage. The weight won't hurt and it makes the fuselage much stronger and scuff resistant as well as providing an excellent paint base.

(18) Install the radio and the elevator pushrod. Run the antenna out the rear of

the fuselage into the breeze.

#### **Stab and Fin:**

(1) The stab and fin are assembled from 1/8" balsa and 1/8" square spruce strips in the simplest fashion. Trim the edges of appropriate length sheets and glue them together. Use drafting or masking tape to hold the pieces together and then put the pieces down on a piece of Saran Wrap weighted with an old book on top to make sure they dry flat.

(2) When the pieces are dry, slip them under the plan and use a pin to mark the corners. Leave the elevator attached until after sanding, and cut out to the outline.

(3) You might do a bit of shaping if you like that sort of thing, but be careful to keep the underside of the stab flat where it connects with the fuselage. In any case, at least sand the stab and fin smooth, with a rounded leading edge.

(4) Cut the elevator off, and bevel its leading edge like you did the ailerons.

(5) Attach the stab and fin to the fuselage, with the appropriate 1/4" triangle stock.

(6) The tail group may be primed and painted or covered with light iron-on plastic.

#### **Flying The Ridge Rat**

This discussion assumes that the reader has no experience with an aileron ship, but is fairly capable with a rudder and elevator glider.

**Setting Up The Airplane:** First, put the Center of Gravity in the place shown on the plans. This is important, in fact it is much more important to have the C.G. in the right place than to save a few ounces. For starters, set the aileron deflection to 3/8" down and 1/2" up, and the elevator throw 3/8" each way.

The differential throw in the ailerons can be achieved by using a servo output arm with holes that are swept aft or perpendicular from the pivot point about 30°. The idea of the differential is to cause the inside and outside wings to have equal, or close to equal, drag when starting a turn. Since the drooping aileron causes more drag for the same deflection, it is deflected less. The way to test for a proper relationship is to fly directly away from yourself at eye level, into the wind, and bang the ailerons full one way, and then the other. Note when you do this if the plane yaws one way or the other from unequal drag. It is best to have the plane remain pointed straight or yaw just a bit to the inside of the following turn. If you use too much

aileron differential, then when you roll up for a turn, the nose will be dropped too much. When you get it right, the plane will roll up via ailerons and just wait there for awhile until you pull on the elevator.

For the first flights, select a hill that is not disastrous to crash into, on a day that has a moderate breeze, when other aileron ships can stay up easily, but aren't going really fast.

If you can fly a rudder and elevator glider, then you will have no trouble with a Ridge Rat. There are a few differences between flying aileron ships and rudder and elevator gliders. However, while most rudder and elevator planes can be flown almost without the use of the elevator, you will find with the Ridge Rat that you will use the elevator much more.

On an aileron ship, the ailerons don't make the plane turn, rather, they control the roll of the plane. In order to make a turn, the plane is rolled up via aileron to an appropriate bank angle, and then the ailerons are neutralized as you feed in up elevator to bring the plane around. Too much elevator, and the plane will float up; too little, and it will slide off the inside of the turn. To terminate the turn, neutralize the elevator as you feed in opposite aileron. When the plane is straight and level, all controls are neutralized, or perhaps a bit of down is held in for a moment to counteract the zooming tendency caused by a possible speed increase in the turn.

Start out making big gentle turns, which require very little elevator, so as to stay out of trouble. As you gain confidence and skill you will find that you can roll the plane up to vertical and pull very hard on the elevator to make a sharp beautiful pylon turn. After a little while you will find that your Ridge Rat can be maneuvered at will, like a go-kart of the skies, and you may wonder how you ever even flew that clumsy rudder and elevator airplane.

I like to adjust the aileron throw so that I can use full aileron to roll up for a turn without having such a rapid roll rate that it is difficult to end the rolling in a precise position. I have heard stories about aileron flyers rolling up for a turn the first time doing one or two complete rolls, so start out cautiously!

I like to adjust elevator throw so that the plane can be flown inverted with half to three quarters down stick. I also like to have the elevator response rapid but not jumpy. If you find that inverted flight requires so much elevator that response is jumpy, you might try moving the C.G. back a bit, but watch out because the plane will be less pitch stable, a condition some people favor anyway.

As far as flying the Ridge Rat, there really isn't much to it. It doesn't stall severely, you don't have to worry about breaking it in the air, and it is always responsive. One quirk of low-dihedral aileron ships you should be aware of: In

silhouette from near side view, it is very difficult to tell which direction the plane is rolling. This is very disorienting and scary if you are close to the ground at the time. Usually this happens when flying in front of a bright sky, when you take your eyes off the plane and then come back to it. There are two ways to alleviate this problem. One way is to always follow the airplane carefully so that you can tell what it is doing from what it was doing before. The other way is to make the top and bottom of the wings different colors and lightnesses. I recommend a dark color for the bottom, since it is usually dark anyway. □

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