LAZY ACE

2,150 square inches of giant biplane . . . just right for flying on a lazy Sunday afternoon. Almost quarter scale to a full size bipe. The Lazy Ace is just pure fun to build and fly.

By Chuck Cunningham

The Lazy Ace is an airplane that is just what its name implies. It is for flying on a lazy Sunday afternoon when you want to fly and fly and fly. In fact, it is one fine flying machine. I have had more pure fun flying the Lazy Ace than from any other aircraft that I have ever designed, or flown, for that matter. The Lazy Ace was designed to be a super biplane, and it is. It was designed to fill the need for a really good flying, realistic looking *big* biplane, and it is. The Lazy Ace is a big airplane, just about quarter scale size of a home-built, although it is not a scale model of anything. On the other hand, a light plane builder could scale the Lazy Ace up and come out with a very fine full size experimental aircraft. My wife keeps wanting me to do this, but I have resisted so far. But, back to the model.

As I mentioned, it is a big bipe, the total wing area is just a bit over 1800 square inches! Both wings span 76" and the fuselage length is 57". It has a lifting horizontal stab for a reason, and this area, coupled with the wing area, gives it almost 2150 square inches of lifting surface. It is a big bipe to satisfy that urge to build a big aircraft and yet it flies perfectly on any of the powerful .61 engines like the Max .60 FSR or the Webra Speed .61. The normal .60 engines will fly it well, but the Schneurle engines really make it perform. You don't need a chain saw engine or a power transmission for this aircraft because, even though it is big, it is light in weight. My Lazy Ace tips the scale at only 9½ pounds, which gives it a wing loading of just a bit over 12 ounces per square foot. This means that the aircraft is flying on the wing rather than just on the engine as do so many of todays pattern aircraft.

The construction of the Lazy Ace has been patterned a bit after the manner in which I have been building and beefing up Old Timers and Antiques, and so far this structure has proven to stand up to any strain. And last weekend, old friends Jim Simpson and Gerry Krause, seemed to be trying to take the wings off of it with outside spins, crazy maneuvers that ended in long power dives, etc., but then you know what it's like when you're flying other peoples aircraft. Or, at least until I told Jim that I had finished drawing the plans so it wouldn't be too hard for him to rebuild it! But, nothing came unglued, and we flew a gallon of fuel through the engine just having a lazy afternoon of fun flying.

I, as yet, have not found any bad tendencies with the Lazy Ace. It can be slowed down until you just know that it is going to fall out of the sky, and yet it doesn't. It can be bounced in for a hard landing, and yet when full throttle is fed to it, it has no desire to torque over and die. Landings are a dream - - - it can be slowed down to a walk with the tail down for a three point landing, or can be brought in fast for a wheel landing with the tail high. The take-off run is true and lift off is in about twenty five feet, all without any urging from up elevator.

Now, to the point about the lifting stab. As many of you will remember, I have written several times that the way to make smooth take-offs with a tail dragger is to get the back end of the aircraft up and flying as soon as possible. With the lifting stab on the Lazy Ace, as soon as you feed in high throttle, the tail lifts off of the ground and the aircraft assumes a perfect take-off attitude. As a matter of fact, on the very first flight of the Lazy Ace, it made this type of a take-off run and soared majestically into the sky, climbing out just like a full scale aircraft at the hands of a competent pilot. A large cheer went up from those who came out to the field to witness the first flights. Just about the only thing that had to be done after the first flight was to get the engine to throttle back to a normal idle. Everything else was perfect. The angles of incidence, in this case, top and bottom wing set at zero, stab at zero, and engine at severl degrees downthrust, were perfect.

In fact, if you think that I am high on this aircraft, I really am. It is the best that I have designed and really the easiest to fly. The flat bottom wing allows this aircraft to fly just like its big brother would if it had a big brother, and yet the Lazy Ace can be flown inverted from horizon to horizon with very little down stick. The only place that the flat bottom wings show up to a disadvantage is in the outside maneuvers. I have yet to do a really good outside loop, as it is a bit tough to tuck under, but other than this, the flat bottom wing makes up for any sacrifice by being so darn flyable, and yet so forgiving that I would not want to put a semi-symmetrical airfoil on it, and certainly not a symmetrical section.

The structure of the Lazy Ace is strong, and yet very light, and it is super easy to build. It does take a good amount of balsa wood, and about four or five rolls of MonoKote to cover it.

It has been engineered to be constructed from standard size materials, 3" and 4" wide balsa sheets, and 36" lengths of balsa and spruce strips except for the two 1/4" x 1/2" x 48" spruce longerons. Being from a long line of Scottish ancestors, I've tried to work out all of the structure to be stong, light and economical.

Just about the only change that I would make to the original prototype would be to install a 16 ounce tank, rather than the 13 ounce one that is in it, just so that I can keep it up in the air longer on each flight. I am using a 12/6 Top Flite prop on the Webra Speed and this pulls the bird along very nicely. Perhaps a 13" or 14/4 or 4 would do well also, but I haven't tried either of them yet.

If you really want to enjoy your flying, and be the envy of all of the other pilots

who are still flying small aircraft, then give the Lazy Ace a try. I know that you will be just as high on it as I am.

Before we get started on the construction details, one or two words are in order about the glues to use. I use a mixture of all three popular aircraft adhesives, and recommend that you do also. I use cyanoacrylates to tack everything in place, and then go over all of the glue joints with Titebond, not because I don't trust the super glues, but because I have a hard time making a perfect joint in the wood, so brush on a bit of Titebond with a dime store paint brush just to be double sure. Use epoxy around the firewall, at the wing dihedral braces, when gluing the plywood pieces in the elevator and rudder and, in general, all places that are subject to a lot of stress and strain. Be generous with the glue when you need to be. It's a big aircraft and needs strong joints.

CONSTRUCTION

Wings: There are two wings so we might as well get started on them first. The very first step is to make a tracing of each wing rib on to a piece of thin typing paper, or drafting paper if you have it. Then, carefully cut out each rib from the paper and glue each to a piece of hard balsa sheet. Leave the lower rib all in one piece, and cut the aileron parts loose later. When the paper pattern is dry, cut out the two pattern ribs and mark them with a felt marker as your master ribs. Next, select several (lots) of 3" x 1/8" x 36" balsa sheets, all having about the same weight, grain and hardness. Trace the master rib for each wing 26 times (giving you a total of 52 ribs) and start cutting the ribs from the sheet. I do not cut out the spar slots until later, but you can do as you please. Keep the two stacks of ribs separate. Now, make a bundle of the ribs for the top wing. As a matter of fact, it will take two bundles, so pin each bundle together. Line up the ribs as carefully as you can, so that each stack is as nearly perfect as it can be. Then sand the ribs in each stack until the entire stack looks like one block of wood. Use the master rib to be sure that you do not over-sand the stack. Mark the outside ribs of each stack as to Top wing, left; Top wing, right; Bottom wing, left; and Bottom wing, right. Keep the blocks and ribs this way and use only the ribs marked for each wing panel in constructing that panel. Now, take a small carpenter's square and mark off the location for the wing spars. Use a razor saw to saw these notches, and then use a sharp razor blade or a knife point to clean out each slot. You may need to shape the slots just a bit, so use a small metal cutting file for this. When you have finished sanding and notching the ribs for the lower wing, then make the marks

for cutting the aileron section loose from the main part of the rib. Cut with a razor saw, and keep in the same stack so that each piece can be used in the corresponding place.

Now, you're ready to start building the wings. The easiest way to do this is to build one top and one bottom at the same time, then turn the plans over and construct the other wing panels on the back of the plan. Both wing sections are constructed in a similar manner, so we will quickly run through the construction of the top wing. Cover the wing plan with a piece of wax paper, and then pin down the bottom leading edge sheet. Make sure it is in the correct position and then glue the bottom spruce spar to the leading edge sheet and pin in place. Pin down the trailing edge sheet, and pin the rear spar to the plan. Now, starting with the tip rib, work your way to the center in the following manner: Glue the tip rib in place. Then glue in the first piece of webbing. Glue the next rib, then the next piece of webbing, then the next rib, webbing, rib, etc., until you have come to the center rib. Glue this one in place with the correct dihedral angle built into it. In the case of the top wing, there is almost no dihedral. Now, glue the top spruce spar in place to all of the ribs and to the webbing. Try to build each wing panel without interruptions so that you can be sure everything is fitting into place while the glue is still wet — use Titebond for all of this. Next, glue the top trailing edge sheet to the wing ribs and to the lower sheet. Pin it all in place, and don't spare the pins. Now, glue the 3/8" square leading edge in place and, again, use plenty of pins. Glue the top leading edge sheet to the ribs and to the leading edge, and pin firmly. Glue the wing tips in place, along with all of the gussets. Don't put the center section top sheeting in place until after you have glued both wing panels together so that you can get lots of epoxy on the dihedral brace joints.

Let the wing panel dry for about 24 hours, and then tackle the next set of wing panels. I get everything set up so that I can build both top and bottom halves in one night, and then let dry until the next night so that I know that the glue has been well set up and that a warp won't develop. By the way, use Titebond glue for all of the wing joints except the dihedral brace.

A word about the lower wing - - - it's constructed in the same manner as is the top wing, but the ailerons are built independently from the wing, but it's easy to build them as you're building the wing. Install the leading edge pieces of each aileron after removing from the building board, and then sand to shape.

When it comes time to join the wing panels, do this very carefully so that you won't build in a twist or a warp that you will never be able to remove. Use lots of epoxy and, after the joint is set up, install the center section sheeting. Don't forget to trim the center ribs for the sheeting before you glue them in place.

LAZY ACE

Designed By: Chuck Cunningham

TYPE AIRCRAFT
Sport Bi-Plane
WINGSPAN
76 Inches
WING CHORD
12 Inches
TOTAL WING AREA
1800 Square Inches
WING LOCATION
Bi-Plane
AIRFOIL
Flat Bottom
WING PLANFORM
Constant Chord
DIHEDRAL, EACH TIP
Top 1/4" — Bottom 2½"
O.A. FUSELAGE LENGTH
57 Inches
RADIO COMPARTMENT AREA
(L) 11" X (W) 4¼" X (H) 3½"
STABILIZER SPAN
32 Inches
STABILIZER CHORD (incl. elev.)
11 Inches
STABILIZER AREA
350 Sq. In.
STAB AIRFOIL SECTION
Flat Bottom
STABILIZER LOCATION
Top of Fuselage
VERTICAL FIN HEIGHT
10 Inches
VERTICAL FIN WIDTH (incl. rudder)
8" (Avg.)
REC. ENGINE SIZE
.61 Cubic Inch
FUEL TANK SIZE
13 — 16 Ounce
LANDING GEAR
Conventional
REC. NO. OF CHANNELS
4
CONTROL FUNCTIONS
Rud., Elev., Ail., & Throt.

BASIC MATERIALS USED IN CONSTRUCTION

Fuselage	Balsa, Spruce & Ply
Wing	Balsa, Ply & Spruce
Empennage	Balsa & Spruce
Wt. Ready-To-Fly	152 Oz.
Wing Loading	12.2 Oz/Sq. Ft.

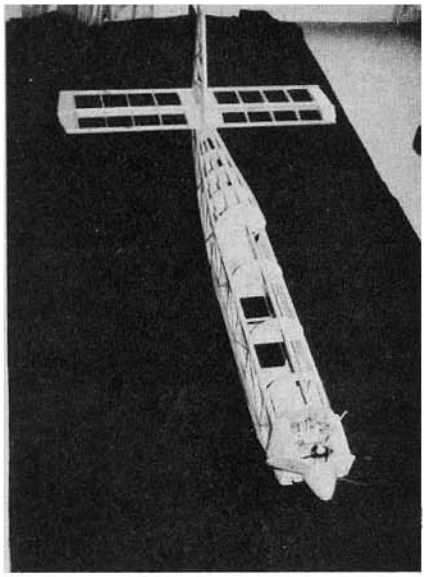
If you have worked carefully, you will have two very strong, but light, wings that will withstand lots of G-loads. Install the aileron, bellcranks and pushrods in the bottom wing, and the servo well, then set aside for covering later.

Horizontal Stab: This is really a snap to build, especially after building the two wings! Pin the leading and trailing edge in place, set the spar in position, but don't pin it yet, then start dealing the ribs into position (after cutting them out and sanding them just like the wing ribs). And, when you're sure that the lower spruce spar is in the correct position, pin it in place, glue all of the ribs in place along with the center section sheeting, glue the tips and gussets in place, glue the top spar in place, and set aside and let dry for 24 hours.

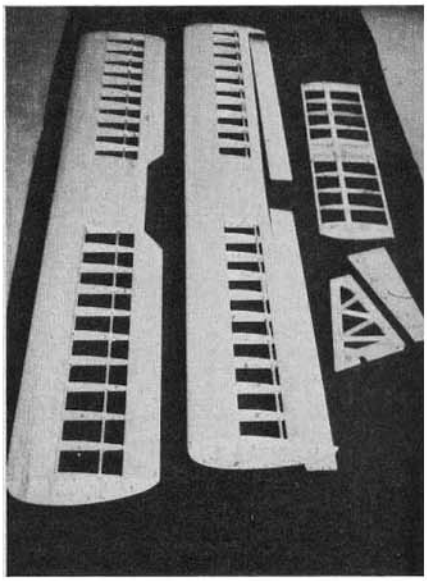
The elevator is a bit more of a problem. If you can locate some tapered stock, then you won't have to sand it to a tapered shape, but if not, then do like I did - - - build a jig of 1/4" x 1/2" spruce leading edge, and 1/4" square spruce trailing edge, put in a 1/8" x 3" sheet on the bottom to block up the 3/8" sheet to the correct height, then get out the orbital sander and sand the elevator piece to a tapered cross section. It really doesn't take too long.

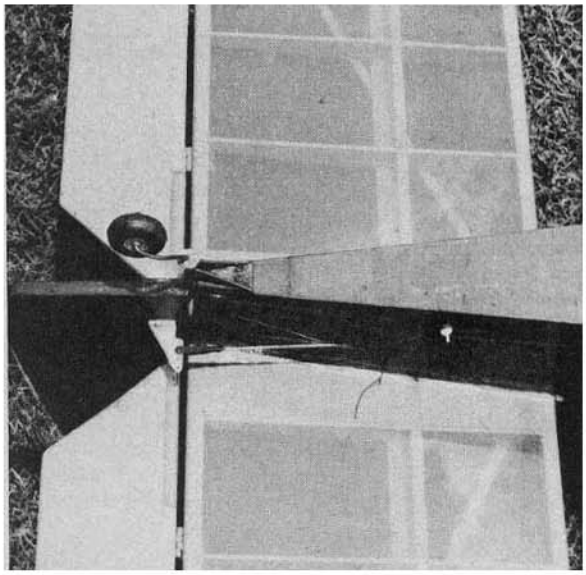
Vertical Stab: This is simple, just build it from 3/8" sheet pieces and 3/8" square pieces, and let dry. The rudder, cut from 3/8" sheet, need not be tapered too much, so sand it by hand. Glue the laminated 3/16" plywood pieces to the rudder with epoxy, and groove them to accept the tail wheel wire.

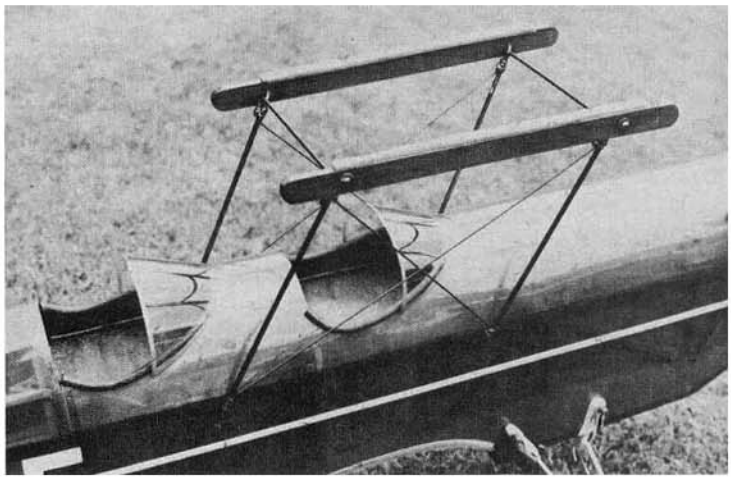
Fuselage: Now, we're getting somewhere, and your Lazy Ace is beginning to take shape in your workshop. Cover the plans with wax paper and pin down the 1/4" x 1/2" x 48" spruce longeron. You will note that it is just a bit short, but this is taken care of by the rear 1/4" balsa sheet. Pin the bottom longeron in place along with the 1/4" bottom edge sheeting. Notch it to accept the uprights. Glue all of the uprights and diagonals in place with Hot Stuff. When everything is in place, go over the entire structure with the little paint brush and Titebond. Remove the pins, but leave the side in place, spread another sheet of wax paper over the first side, and build the second side right on top of the first. This may seem like a lot of work to those of you who are used to building slab sided aircraft, but the work is worth it both in strength and light weight, and if you use transparent MonoKote to cover, the sight of the structure through the covering on a sunny day is beautiful. Let both sides dry for a good long time (24 hours is best), then remove from the building board and put in the inside doublers. I glued all of these in place with Hot Stuff, so no drying time is needed. Glue the 1/16" ply doublers in place with 5-minute

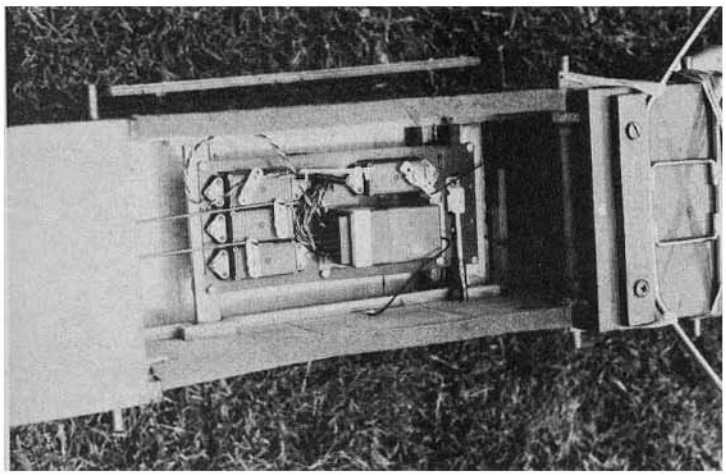


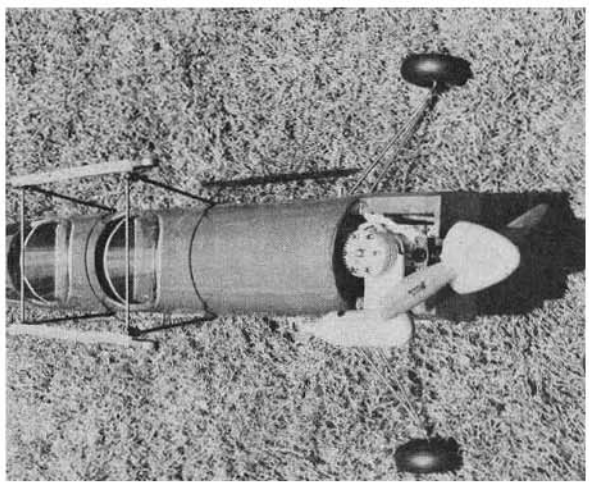
TOP LEFT: Fuselage before 1/32" ply top sheet installed. TOP RIGHT: Wings and tail group ready for covering. CENTER LEFT: Rudder and tail wheel controls. CENTER RIGHT: Close-up of cabane struts. BOTTOM LEFT: Room for whatever radio you have. BOTTOM RIGHT: K & B .61 is ample power for this big bipe.











epoxy. Now, cut out and pin all of the 1/4" cross braces in place on the top view. Make another set of cross braces to be used at the lower longeron. Set each side into position over the top view, and glue it to the cross pieces as far back as the place where the sides begin to slope to the rear. Glue these joints with 5-minute epoxy. Use lots of pins, and use a drafting triangle to see that the sides are square with the building board. When this is dry, bring the two sides together over the center mark at the rear, glue to the cross pieces and to each other with epoxy. Use several clothespins to hold the joint in the rear, and make sure that the two sides join exactly over the center line. Glue the bottom cross pieces in place and hold the sides together with masking tape. While everything is on the building board, install the lower bulkheads and then make 1/4" x 1" x 1" 90 degree angle gusset pieces and glue in place at each intersection of the side with the top and bottom cross brace. This little extra bit

will make the fuselage extremely strong, and yet adds very little weight.

When everything is dry, remove it from the building board. Install the firewall with epoxy, and then all of the bulkheads with Titebond. Install the rear stringers with Titebond, as well as the front top stringer. Now, cut out a piece of 1/32" plywood for the turtledeck. Make sure that it fits in place, trim where you have to, but before gluing it in place, mark the cockpit cut-outs and cut them out with a pair of scissors. The plywood turtledeck can be dampened on the inside to make it curl in, so dampen it with a sponge along the inside center and set it aside. Very shortly it will start to curl, and will just about take the correct shape. Glue it in place with Titebond, and hold it in position with masking tape and pins. Some of you may rather plank the turtledeck, or use balsa sheet, but I have used 1/32" ply on lots of aircraft and it is quick, easy and very strong to use, so give it a try. Install the soft balsa nose blocks and sand to shape. Glue in place the 3/8" x 3/4" landing gear blocks that serve to hold the wing cabane struts in place. Install the brass tubing with epoxy and J-bolts to the hardwood blocks before installing in the fuselage. Make sure that you don't clamp the J-bolts too tight, as you want to be able to slip the wire struts into place after everything is completed. Also, make sure that these braces are in exactly the right place and square with the fuselage.

Now, it's time to build the cabane struts or the "birdcage". This one is easy. Make the top pieces from 1/4" plywood and drill 1/8" holes where shown. All of the wire struts are exactly the same length, so bend them from music wire. Sounds simple, but have you ever tried to bend wire and get one piece exactly the same length as the other? Well, I can't, so I used a combination of brass tube and 1/8" wire. I made the wire to the correct bends, but cut it in the middle and then slipped it into the tubing, and soldered in place. I used a simple jig made of nails to make sure that each piece was exactly the same length. Once it's painted, you can't tell that it's not one piece. Now, slip the top parts of the wire through the plywood piece, slide a washer over the wire, and solder in place. Trim off with a Dremel cut-off wheel. (Make sure you make a right and a left piece.) Next, make another simple jig with a few straight lines and a couple of nails, and a carpenter's square to build each half of the cabane assembly exactly like the other side. Solder the 1/16" cross wires in place. Check the accuracy of the assembly by slipping into place in the brass tube in the fuselage. If you have been careful, it will slip exactly into place. Don't install it yet, wait until the fuselage is completely finished, and then slip the cabane assemblies into place. If it is still okay, remove and fill the brass tube with epoxy and again slip the wires into place. Hold in position with rubber bands until the epoxy sets, and then solder the fore and aft cross pieces at the top. It is strong, light, and really easier to build than it sounds. I painted my Lazy Ace cabane struts with automobile acrylic enamel, but you can use dope, epoxy, or whatever you choose.

Completing the fuselage is a simple matter of installing the bottom sheeting, making holes for the wing dowels, installing the tail wheel bracket, and then lightly sanding everything, getting it ready to cover. One thing that I forgot to mention earlier, install your motor mount to the firewall before it is glued in place. Make sure that the blind nuts are securely glued to the back of the firewall with epoxy, then remove the motor mount and then glue the firewall in place. Also, before covering, in fact before installing the front turtledeck, build a floor for the fuel tank to sit on. Make it large enough for the tank to be padded on all sides with foam rubber. The fuselage is so large that you can slip the tank into position after the aircraft is completed, so don't worry about a hatch, or installing the tank as you build.

Covering: After all of the structure is completed, sand it lightly, whisk off all of the dust with a vacuum cleaner, and then cover with your favorite plastic film. I like to use Super MonoKote since it is strong and easy to apply. Frankly, only a nut would want to go to all of the trouble to silk and dope an aircraft of this size, and in so doing, would probably add two or three pounds to the flying weight. Cover and dope the fuselage if you want to; but, at least cover the wings and stab with plastic. It looks great, and can be done in one evening.

Landing Gear: I used an IM Products wide landing gear bent down to the dimensions shown on the plans and added a spreader bar to it. If you have to bend your own, then follow the drawing. 5/32" wire is all that is needed for the Lazy Ace, heavier wire isn't required.

Radio Installation: Many words could be written on this subject and, in fact, I've written several thousand on this before, but keep the installation simple. I used 1/4" square spruce pushrods, but you can use fiberglass shafts, or what-have-you. Just make sure that whatever you use is free acting, and does not bind.

Rigging and Flying: The interplane, or 'N' struts are just about the simplest that I could dream up. Make each out of 3/16" plywood. Drill a 1/16" hole where shown, and install a small finish nail and glue with epoxy. Trim off the end after you have fitted them in place. The small clips that are screwed to the wing work well and yet are strong. Hold the 'N' struts to the clips with 3/32" wheel collars. When getting ready to fly the aircraft, install the bottom wing with all of the rubber bands that you're going to use, at least six on each side. Then put on the top wing with only one rubber band on each side. Now, lay down on your tummy, slip the 'N' struts in place, lock them to the wing with the wheel collars, and then install the remainder of the rubber bands. It's a good idea to mark the wings so that they can be installed exactly in the same place each time.

Be sure that everything is square and that the horizontal stab has been epoxied to the fuselage in exactly the correct position. Note that the wings and stab are all zero-zero with each other and with the center line, or datum line of the aircraft. Do *not* use any positive incidence in either wing, this would be a detriment. Make sure that, without fuel, the aircraft balances where shown on the plans. You can shift the battery around some to accomplish this, but with the battery forward, and the radio just about centered in the wing opening, the balance should just about be in the right place. If not, add weights, or shift the battery until it is in the correct position.

For best flying results, set the controls up as follows: elevator 1" up and down, rudder 1½" to 2" right and left, and ailerons 3/4" up and down. By the way, I used full span MonoKote hinges on the ailerons and they have worked perfectly, but if you're not sold on this method, then use normal hinging. I used Klett hinges on the elevator and rudder.

Test flights should be made with a well broken-in engine. For the first flights, if the balance is as shown, the elevator should be at zero. Start the take-off heading into the wind. Slowly advance the throttle and watch the bird spring down the runway. You may need just a bit of right rudder at first, but not much.

As she picks up speed, the tail will come up without any down elevator pressure. In just a few more feet, you will notice that the wheels are off of the ground and she is moving majestically into the air. Hold just a little back stick and the Lazy Ace will climb out in the most realistic take-off that you have ever seen. The rest of the flight will be the same way. You may want to increase the aileron throw a bit, and you can do this by moving to the inner hole on the control horn, I have mine on the second hole from the bottom. You can also move to an inner hole on the aileron bellcrank to get more movement, but the amount shown gives very realistic flight. After all, the purpose of building an aircraft this large is to achieve a more scale-like flight. If you want to go zip-zip, build a small bipe.

I know you're going to like the Lazy Ace, it's your kind of airplane. □

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