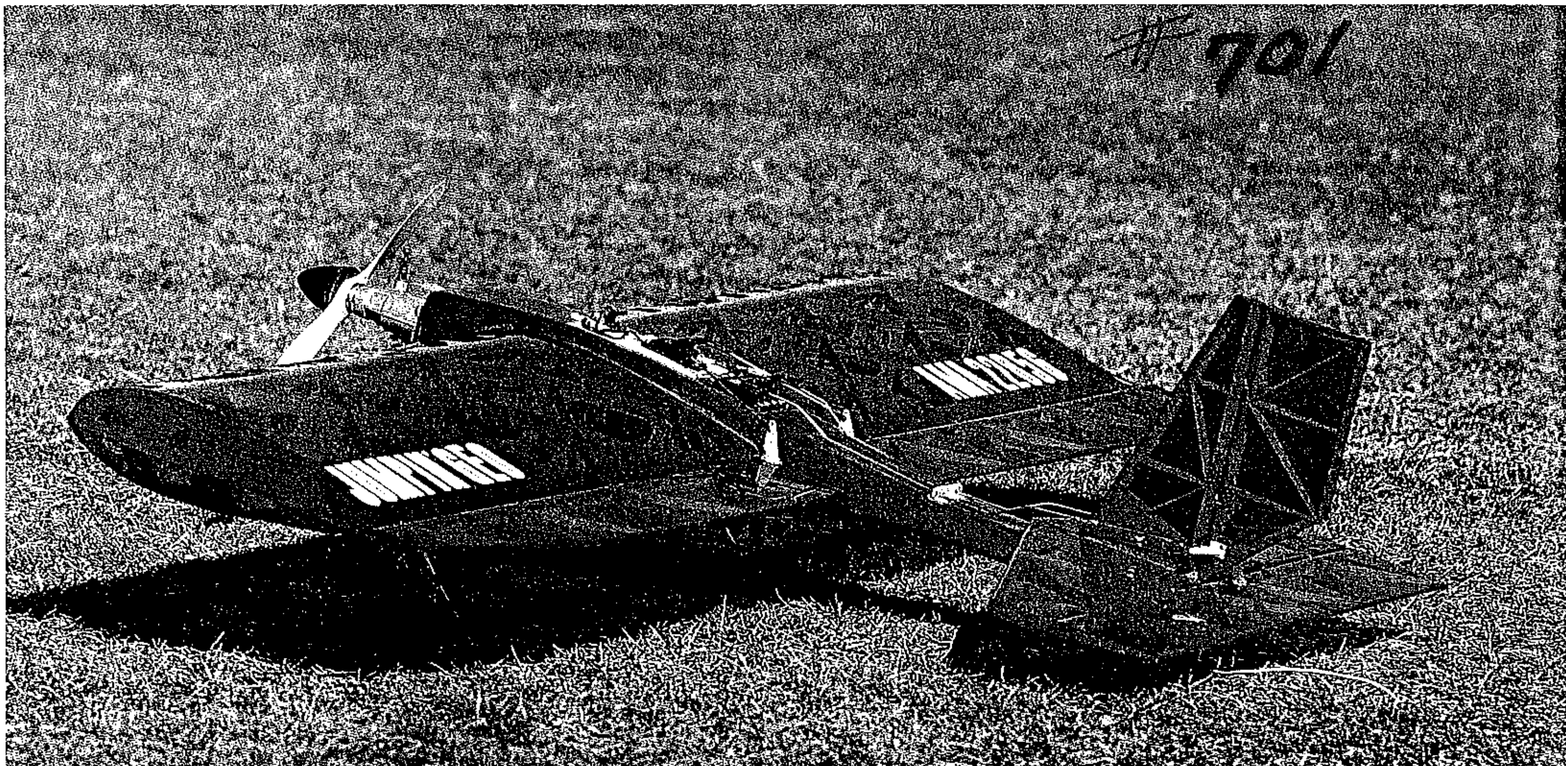
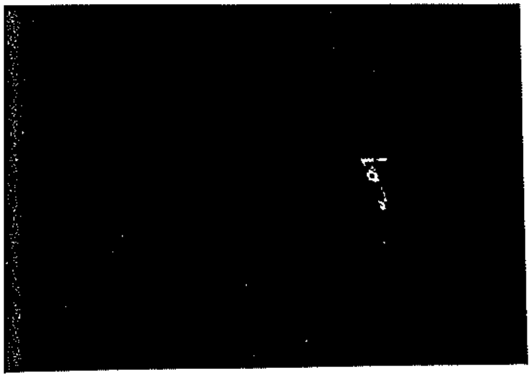
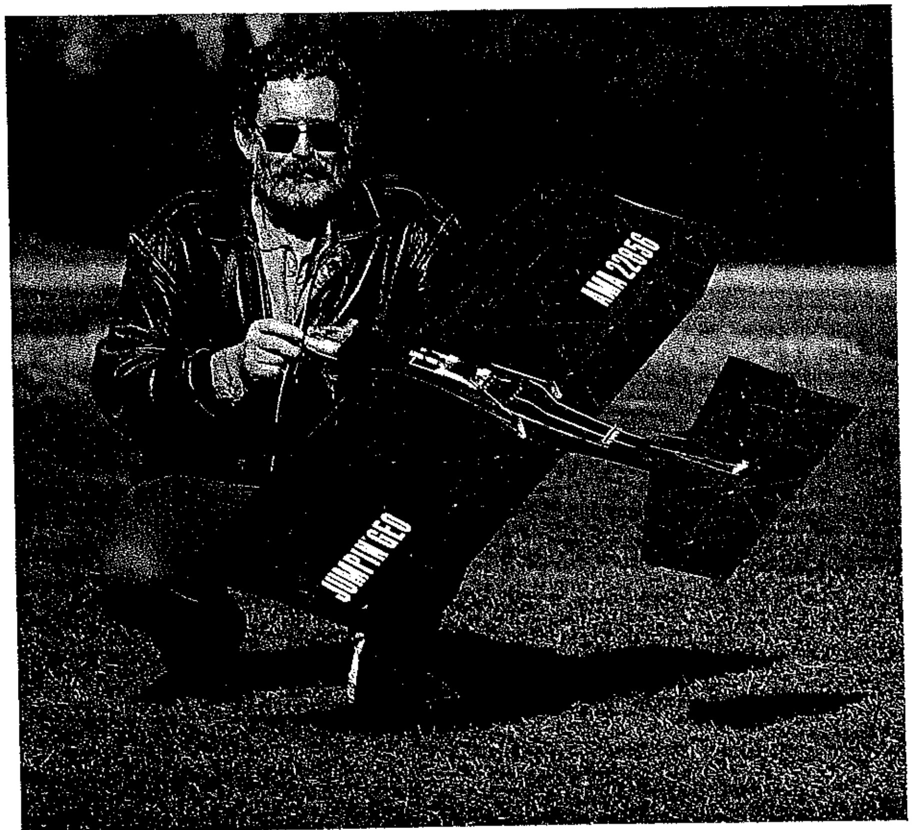


JUMPIN' GEO

Above: Using geodesics for lightness coupled with torsional strength, Jumpin' Geo puts a whole new perspective on competition fun-flying, makes it a challenge again. As fliers learn to use the performance capabilities of this design and its siblings, they will open a new chapter in the sport of RC Aerobatics. Below: A K&B .45 engine spinning a Rev-Up 11 x 4 prop produces over three pounds of static thrust, giving the Geo full vertical capability. Maneuvers are incredibly close-in and tight.



Vertical performance is impressive. The model takes off in a couple of feet and has even been known to sprint unexpectedly into the air during taxiing. And how many models can you take straight up rolling?



The author with his highly competitive fun flier, which traces its design roots to such CL innovations as H.A. Thomas's coupled flap/elevator concept for Stunt models, introduced in 1947. Hunton's may be the only geodesic fun-fly RC that will hold together at full bore.

Put a good .45 glow engine in this 3-lb. RCer, and start blowing away the competition in fun-fly events.

■John Hunton
■Bill Winter

TO EXCEL in fun-fly events, a model must be able to maneuver quickly and tightly about all axes. That means it must weigh very little and have a low wing loading.

Jumpin' Geo not only excels at fun-flying, but points to a new direction in RC airplanes designed for such events. Overall performance and maneuverability are incredible—unlike anything ever seen in an RC model. Maneuvers are remarkably close-in and tight—loops and rolls take about a second—and turns are unbelievably quick. The plane has full vertical capability.

To achieve the desired lightness without sacrificing strength, I used geodesics for torsional rigidity in all flying surfaces and in the fuselage. This eliminates the need for the usual D-tube sheet on the leading edge. Also, since the front of the wing is nonstructural, it can be cut out for the fuel tank.

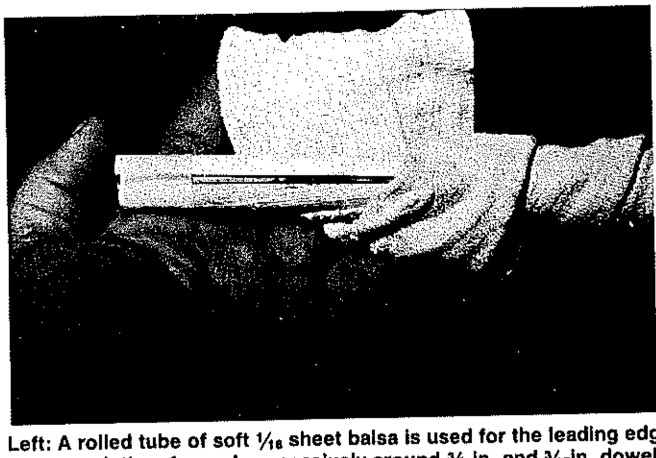
Taking advantage of the lack of emphasis on high velocities in fun-fly events, I designed an economical structure with considerable thickness in all flying surfaces. The interdependent spaceframe-like members produce an extremely light structure that still allows for a full range of speed in flight. Because of this lightness and the coupled elevator and aileron/flaps, the model can also be flown remarkably slowly.

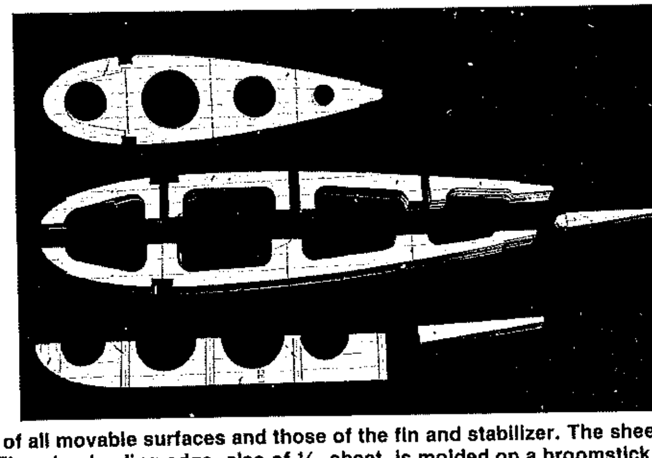
Jumpin' Geo weighs in at close to three pounds, if built with care, and uses a .40 to .45 engine. A K&B sport .45 swinging a Rev-Up 11 x 4 propeller produces well over three pounds of static thrust, giving spectacular vertical performance. Take off, point the airplane up, and it will reach for the sky.

Construction

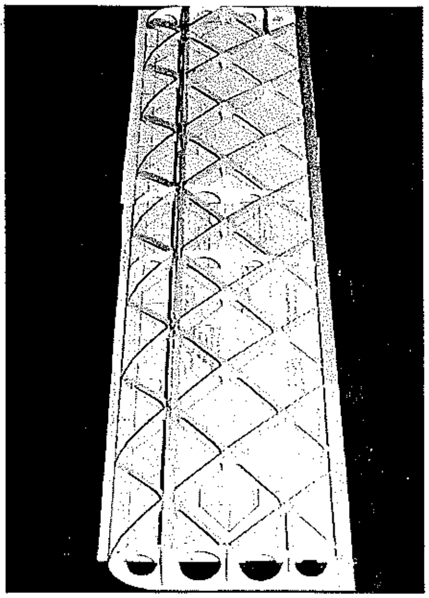
Since very lightweight models require simplified structures, they're relatively fast and easy to build.

You can save a few ounces by using the optional rolled sheet leading edges for all flying surfaces, or substitute relatively soft ½ x ½-in. rounded balsa. If you're using the rolled sheet, it's a good idea to begin by preforming these surfaces.

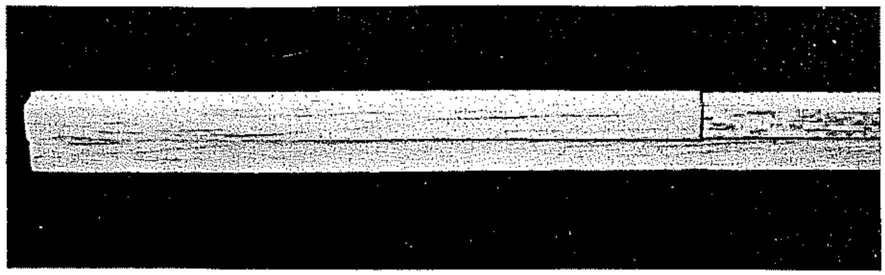




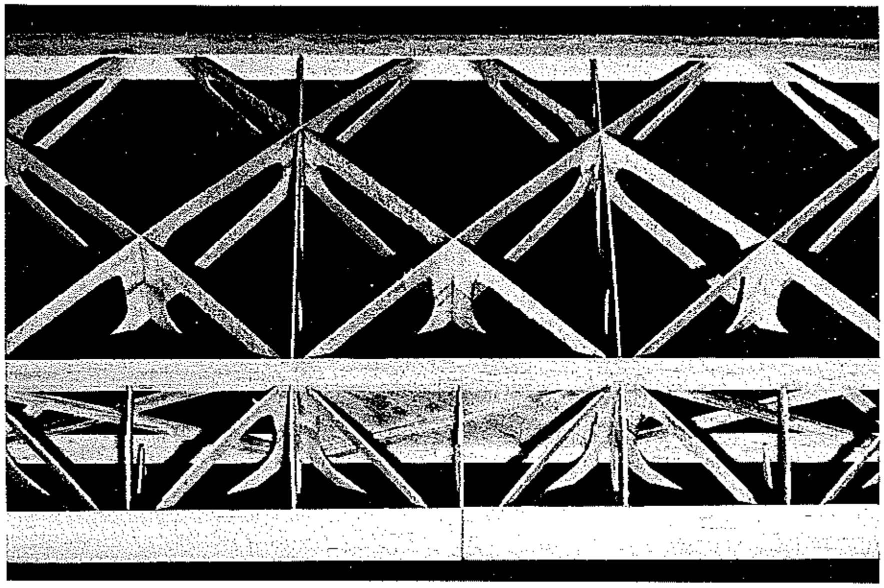
Left: A rolled tube of soft 1/16 sheet balsa is used for the leading edges of all movable surfaces and those of the fin and stabilizer. The sheets are wetted, then formed successively around ¾-in. and ⅜-in. dowels. The wing leading edge, also of 1/16 sheet, is molded on a broomstick in a single step. Sections are made by wrapping the wetted sheet around the form with an elastic bandage. Right: The wing ribs can be stack sawn. The full-length ribs are installed on one bias, the interrupted ribs on the other. Start in the center and work toward each tip.



The first wing half is built flat on a board over the plan. Installing the ribs from the center outward prevents compounding errors.



The wing spars are of constant cross section and variable density to accommodate differing structural loads. Firm wood is used at the center section, with soft wood at the tip.



The wing center section with spar webbing. Bias balsa filler is installed in the center bay to help distribute flight loads between the top and bottom spars.

Special construction features. Build the wing leading edge fairing by soaking a two-inch wide strip of 1/16 medium-soft balsa strip, then rolling it around a broomstick. Soak the strip in *hot* water for at least an hour, and tape each end to one side of the broomstick. Wrap the balsa around the broomstick with an Ace bandage. Allow this assembly to thoroughly dry by leaving it in a warm place overnight. Remove the bandage, and you have a nicely formed leading edge fairing.

Use 36-in.-long hardwood dowels, one at ¾-in. and two at ⅜-in. diameter, for the leading edges of all other flying surfaces. Soak a 1-in. strip of soft 1/16 balsa, wrap it around the ¾-in. dowel, and allow the assembly to dry overnight. Remove the balsa, soak it again, and wrap it around the pair of ⅜-in. dowels glued together. Roll another strip on the ¾-in. dowel, and repeat the two-step procedure. If the balsa cracks, use softer strips the next time. Make enough leading edge material for the entire model, plus a reserve.

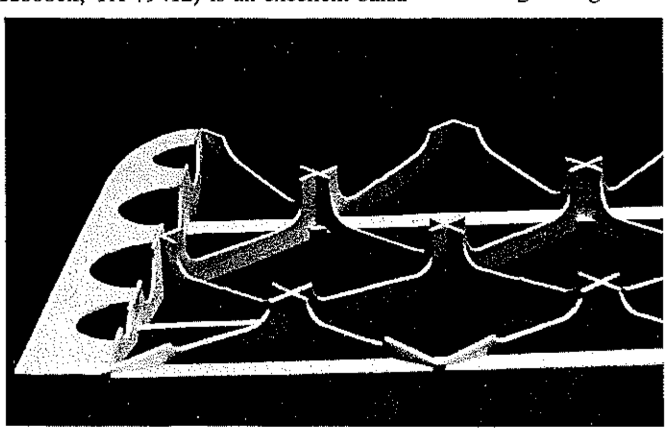
Lone Star Models (1623 57th St., Lubbock, TX 79412) is an excellent balsa supplier. The following order will provide almost everything you need: 26 sheets of 1/16 x 3-in. selected soft (6-9 lb./cu. ft.; selecting costs an additional 15%); two sheets of ⅛ x 4-in. selected soft; four sheets of 1/16 x 4-in. unselected; 12 sheets at ¼ in. sq. and eight at ⅛ x ¼ in., also unselected. (You're provided a surplus from which to select.) You'll also need some ¼-in.-thick plywood for the firewall, and other thicknesses for the aileron/flap servo mechanism and wing skid shear plates.

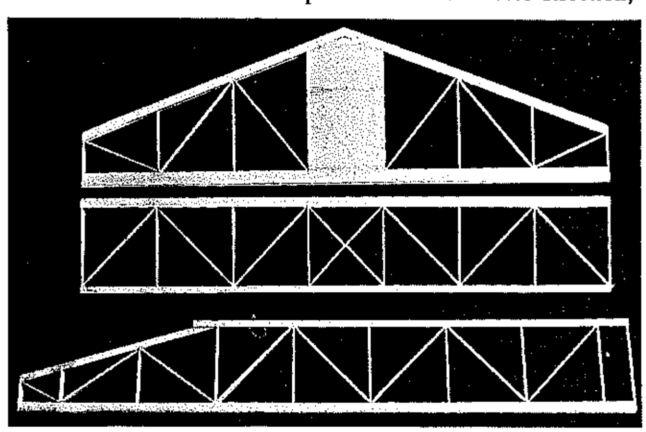
Go through the balsa and do your own selecting. Holding each sheet up to a bare light bulb allows its characteristics to come shining through. Save the wood with the straightest and clearest grain for rolling the leading edges, and use the rest for the ribs.

Wing. Building the geodesic wing looks a lot more challenging than it is. It's an interesting task and not really difficult.

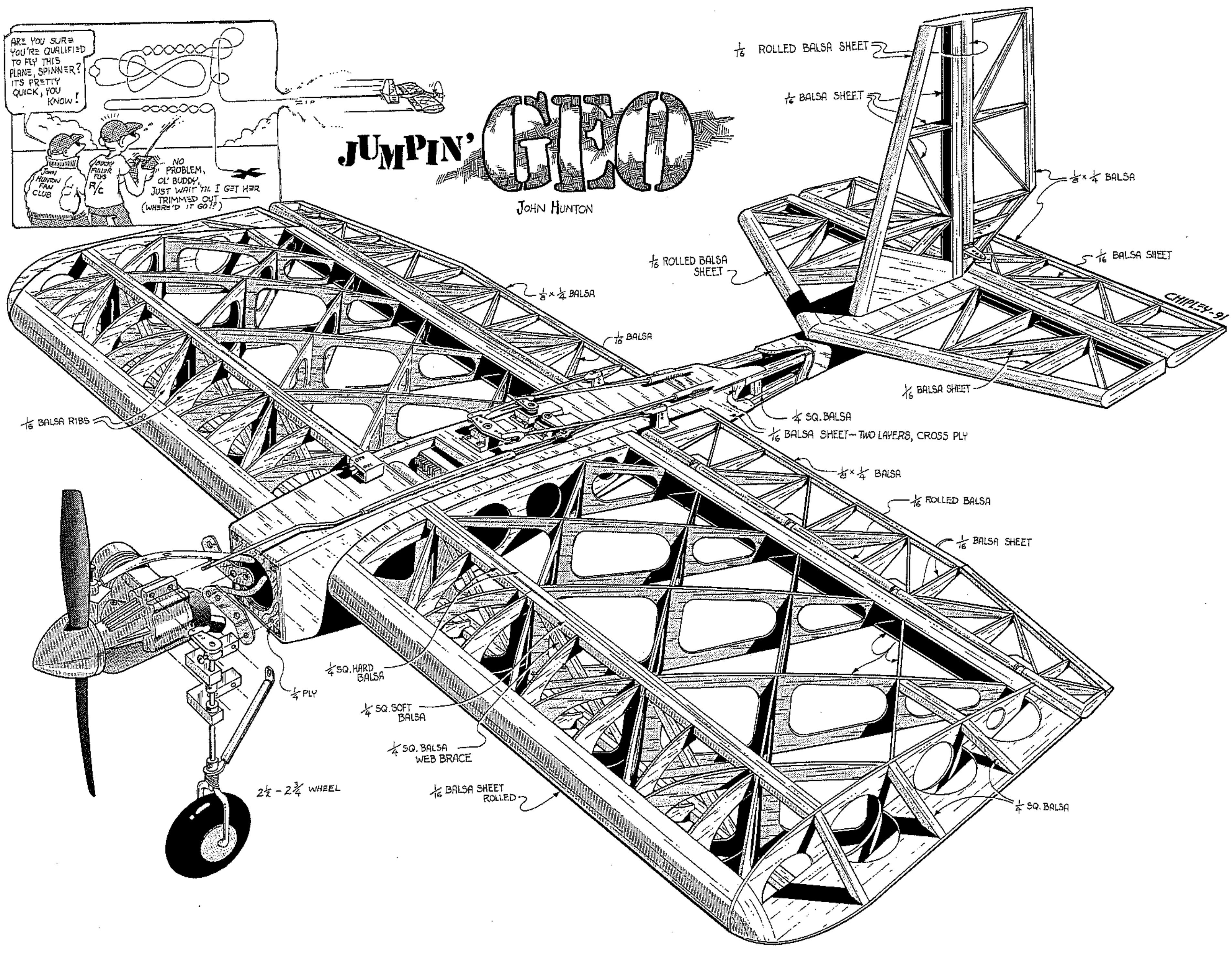
If a jigsaw or band saw is available, stack saw the ribs. Why not cut a few extra ribs and parts so you'll have them on hand for easy repairs? Battle damage tends to be limited in a structure as lightweight as this one.

Cut the wing ribs in half. Begin by building either the top or bottom wing half flat on a board. Do not pin all the full-length ribs in one direction, then fill in with the partial ribs in the other direction;



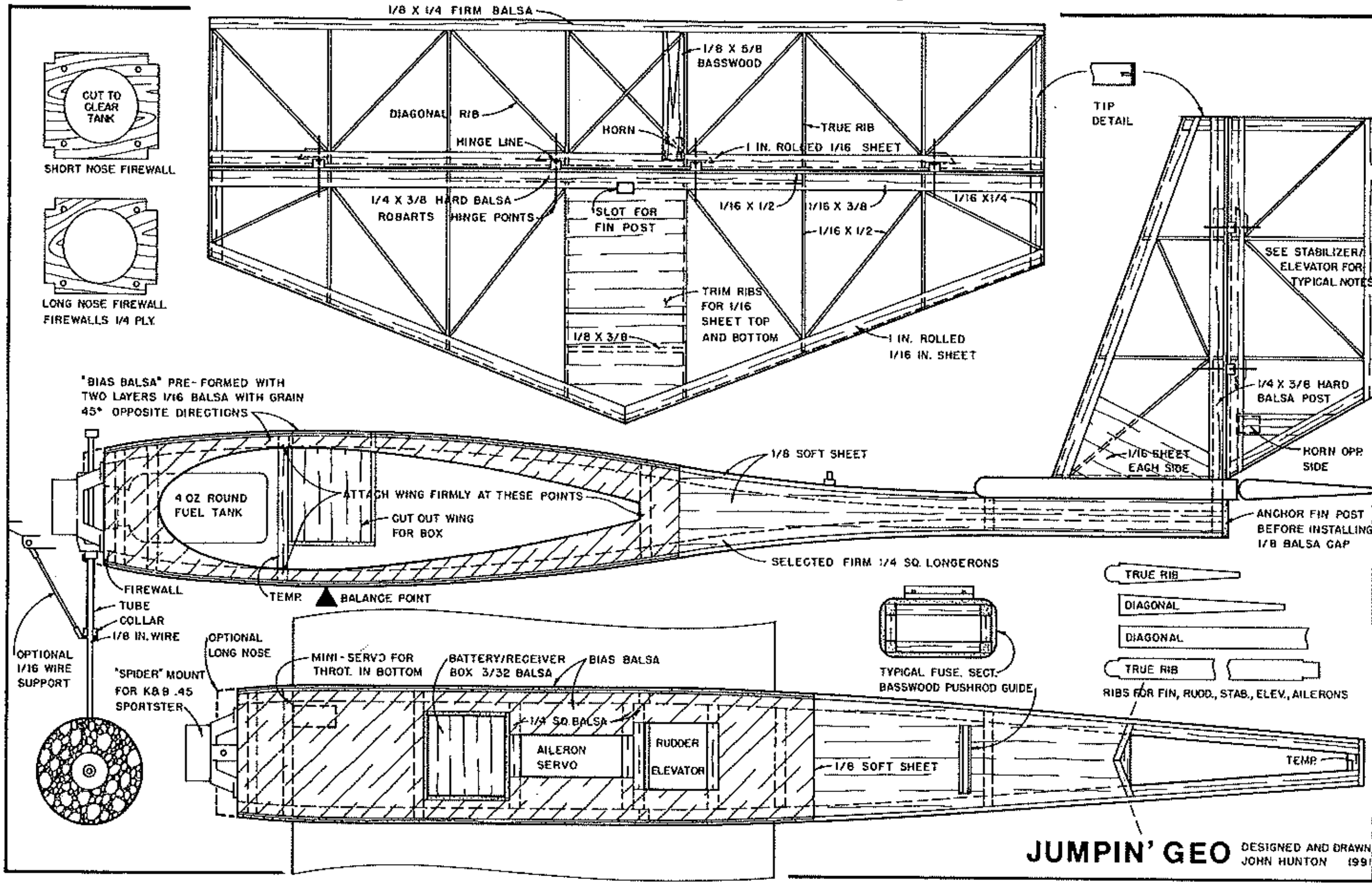


Left: Note the sculptural quality of the completed wing half. The second half can be built directly atop the first by pinning the latter down at the spar and bracing up the trailing edge. Right: The aileron/flaps, elevator, and rudder are of identical cross section and use the same ribs and diagonals. The diagonal bracing greatly improves torsional stiffness. Ultralight rolled balsa leading edges can be used.



ARE YOU SURE YOU'RE QUALIFIED TO FLY THIS PLANE, SPINNER? ITS PRETTY QUICK, YOU KNOW!
NO PROBLEM, OL' BUDDY, JUST WAIT 'TIL I GET HER TRIMMED OUT (WHERE'D IT GO!?)
JOHN HUNTON FAN CLUB
BUCKY FULLER FLYS R/C
ZIP
JUMPIN' GEO
JOHN HUNTON
1/16 ROLLED BALSA SHEET
1/16 BALSA SHEET
1/8 x 1/4 BALSA
1/16 BALSA SHEET
1/16 ROLLED BALSA SHEET
CHIPLEY-91
1/8 x 1/4 BALSA
1/16 BALSA
1/16 BALSA SHEET
1/4 SQ. BALSA
1/16 BALSA SHEET—TWO LAYERS, CROSS PLY
1/16 BALSA RIBS
1/8 x 1/4 BALSA
1/16 ROLLED BALSA
1/16 BALSA SHEET
1/4 SQ. HARD BALSA
1/4 PLY
1/4 SQ. SOFT BALSA
1/4 SQ. BALSA WEB BRACE
2 1/2 - 2 3/4 WHEEL
1/16 BALSA SHEET ROLLED
1/4 SQ. BALSA

Full-Size Plans Available . . . See Page 196



that would lead to cumulative errors. Instead, start in the center and work toward each tip. If errors begin to creep in, just make sure to keep the ribs absolutely parallel to the plan position and eventually they'll work out.

Except as otherwise noted, use medium-density balsa. Since variations will occur in balsa, put this to advantage by using the harder ribs in the middle and the softer ones toward the tips. Use CyA (cyanoacrylate glue) for all assembly except where another adhesive is specified.

The wing spars are laminated of different densities of balsa, with hard wood in the middle and a lighter density at the tips. This wood should be selected carefully.

Join the spar pairs. Install one spar and one trailing edge surface sheet to your rib assembly, then remove it from the building board. You'll note that the assembly already has high torsional strength. Strength in bending, however, is poor.

Pin down the completed wing half at the spar, brace up the trailing edge, and build the second half over the first. Install the remaining ribs, the second spar, and the trailing edge piece.

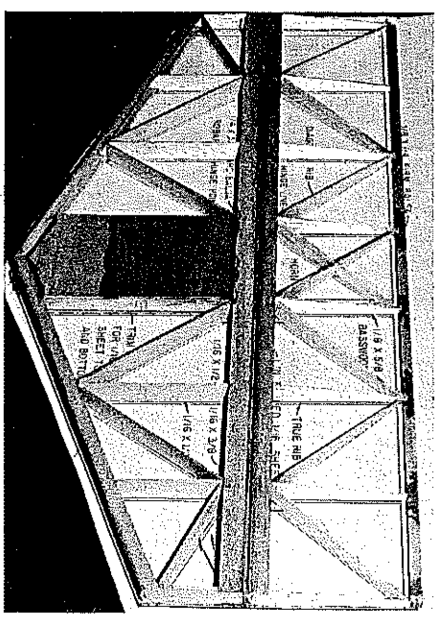
Reinforce the center bay of the wing spar with a layer of bias-grained balsa (or bias balsa)—sheets of $\frac{1}{16}$ balsa glued together with the grain at opposite 45° angles. This material is very light, yet provides good diagonal stiffness and rigidity. Add all the diagonal spar bracing.

Add the trailing edge vertical sheet and the rolled leading edge. Shave the necessary ribs, and add the center section sheet. Build up the tips.

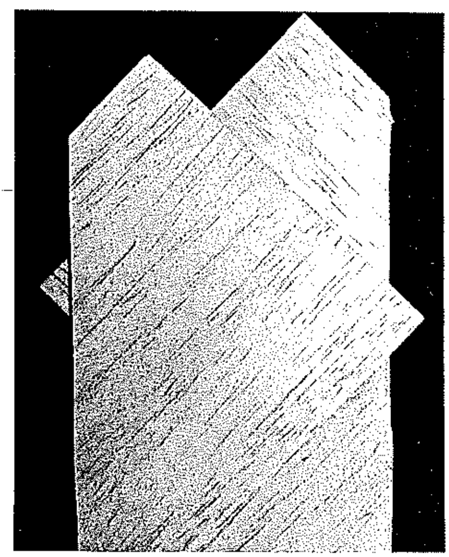
Fit in the $\frac{1}{16}$ skid shear plates under the wings. Cover these sheets and the spar in that area with lightweight fiberglass and CyA. Drill for and install the $\frac{3}{32}$-I.D. brass tubes. Coat these tubes and the rib intersection with baking soda and CyA.

Block sand the wing using a large sanding block. Take care not to overdo sanding the ribs between the joints. Check for and reglue any open joints. Add about ½ oz. of weight in the left tip to counteract the offset weight of the engine cylinder and muffler. You may have to adjust this amount later.

Build the remaining flying surfaces. Pin down the leading edge, then add the true ribs and the trailing edge. Fit in the diagonals while the assembly is flat on the bench. All diagonal members are cut from the same basic shape.

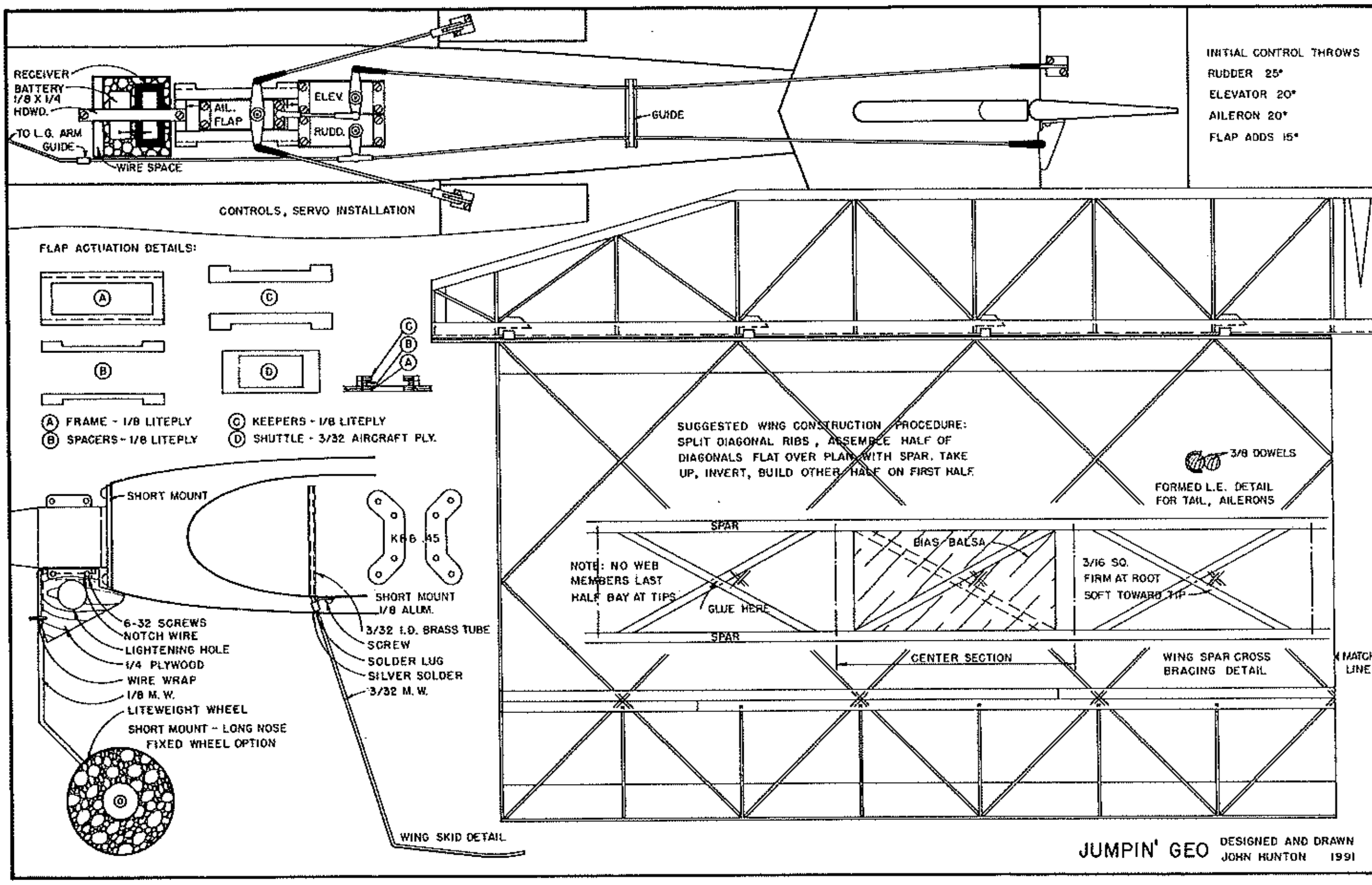


The stabilizer and elevator under construction. The stab and fin are built up of ½-in.-thick ribs. The root sections are reinforced by firm, solid balsa stub spars.



The fuselage sides are made of bias balsa—sheets of $\frac{1}{16}$ balsa glued together with the grain at opposite 45° angles. Half the weight of Lite Ply and of good strength, these sheets are preassembled with slow-setting cyanoacrylate, then installed on the fuselage frame and trimmed.

Full-Size Plans Available . . . See Page 196



The only complicating factor in the otherwise straightforward wing construction is the sanding of the aileron/flap tips.

Build the tips flat on the bench. Sand the top surfaces to the proper thickness, and then bring these surfaces into alignment with the rest of the structure. The bottom surfaces of the tips will sweep upward, giving the appearance of being warped. Place the flat area at the top and the apparently warped area at the bottom. In addition to producing the tapered tips, this irregularity creates a certain amount of washout in the upright wing and improves stall characteristics.

The stabilizer and rudder are built with ½-in.-deep ribs and diagonals.

Fuselage. Builder's options are either a fuselage with a long nose and short mount, or a short fuselage with a spider mount. The spider mount permits installation of a simple, lightweight, steerable nose wheel. (See the "Flying" section for our viewpoint and opinions on this.)

Begin fuselage construction by building up bias-grained sheets from $\frac{1}{16}$ stock as outlined in the wing construction section, using slow-cure (thick) CyA. Select hard, straight-grained wood for the longerons.

Soak four longerons in hot water. Pin them down over the plans, and add the uprights (note the temporary verticals). Allow this assembly to dry overnight, then remove it from the board.

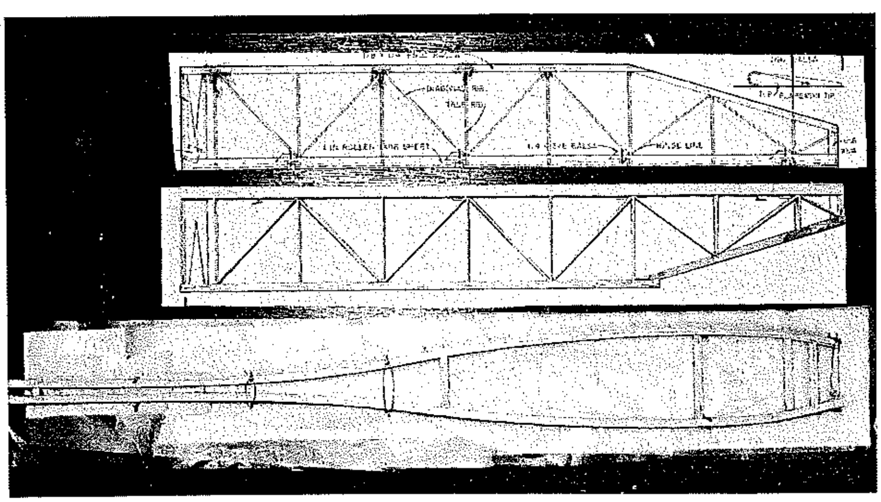
Add the top and bottom crosspieces. Install the firewall with the 6-32 blind nuts in place for engine mounting. Cover the fuselage with the bias-grained sheeting in the front and ⅛-in. sheeting toward the rear. Round the fuselage corners by carving and sanding. Cut the openings for the wing-fuselage joint. As a final step before assembly, add baking soda fillets fortified with CyA inside the nose area.

Landing gear system. Jumpin' Geo uses a combination of nose wheel and wing skids. Although this saves weight, it makes for very poor taxiing characteristics at low speed. Taxi in grass with extreme care.

The nose wheel/wing skid system does give excellent performance at high ground speeds. That means you can plant the model without having to stall it in on landing or touchdown (great for touch-and-goes over a line). The skids literally grab the grass; you can keep power on and steer with confidence, then pull up and go again at will.

You could add wheels for the skids at only a small weight penalty. Tailor your Geo to the way you'll be flying it in competition.

Covering. Cover all surfaces, using the lightest material practical. I used transparent MonoKote on the prototype since it seems to be lighter than the solid-colored variety. The first prototype was covered in a single color for



The fuselage sides are built directly atop each other for the sake of accuracy. Use waxed paper over the plan and betwen the sides to prevent unwanted adhesion.

Bill Winter's Notes on Jumpin' Geo

WHEN John Hunton and I recently updated two of my earlier designs, the RC Special (*Model Aviation*, March and April 1990) and the Krackerjac (Cloud Niner, to be published in *RC Modeler*), we concentrated on expanding the low-end flight envelope by using flaperons, split flaps, and trim mixing. The result: lightly loaded airplanes with good stall characteristics. John was inspired to take them into the fun-fly arena, where they did some interesting things.

(Note: *Bill Winter coauthored, with Bill Evans, a construction article about his Krackerjac design. "Krackerjac Mk.1 and Mk.2" can be found in the November 1990 issue of* Model Aviation.—Editor)

John wanted to see how far this concept could go. Jumpin' Geo tests the boundaries. Actually, the model capitalizes on a long lineage of technical advances rooted in Control Line and reaching back to the years after the Second World War.

The coupled flap/elevator concept for Control Line Stunt models was described in an illustrated article by H. A. Thomas published in 1947. (This article was cited—not by Thomas—in a 1956 legal dispute to disclaim all patents on coupled flaps/elevators.)

According to George Aldrich, the first Stunt kit with flaps was Hi Johnson's Go-Devil Jr., manufactured from late 1947 to 1948. Hi Johnson and Bob Palmer joined Henry Engineering to produce the Warrior, the first full-span coupled-flap Stunt kit, under the Heco label.

Renamed Veco, the company showed Joe Wagner's Chief at the 1949 Nationals in Olathe, Kansas. This represented a giant step forward in Stunt model capability. In addition to coupled controls, the Chief had very light wing loading, a tadpole-style airfoil, and an offset wing. Wagner credits me with the linkage he adapted from my model design published in a 1948 issue of *Mechanix Illustrated*, or its annual for that year. Actually, I had simply improvised on what I had recently seen demonstrated (or on my interpretation of what I had seen), guessing at a lesser amount of flap travel in relation to elevator.

John Hunton (holding model) and his coauthor, noted designer and former MA publisher Bill Winter, recently collaborated on updating two of Winter's designs, concentrating on expanding the low-velocity flight envelope. Hunton took these concepts into the fun-fly arena, then merged them with his ongoing experiments with geodesics to create Jumpin' Geo.

If it was flown properly and at least some wind was present, the Chief would perform dead-stick maneuvers. (I saw George Aldrich fly a full dead-stick pattern alone at sundown on a ball diamond when he was a "kid" newcomer flier and a protege of Bob Palmer.) John later picked up on the dead-stick concept with a special-purpose design called the Negative Pres. Intending the model to fly without power, he used lightweight, geodesic construction. (See John's article "Wind Flying" in the September 1972 *American Aircraft Modeler*.)

Before long, an engine was tried in the Negative, and John was amazed to discover what a very lightweight model can do. The performance was remarkable. This geodesic design was built by several East Coasters, including Maurice Albritton and his son J.E.

About the same time, in the early 1950s, Hal deBolt drew on his Control Line background to pioneer the use of a symmetrical airfoil and full-strip ailerons in RC designs.

John Hunton explored the possibilities of geodesic design further with a powered wind flier Control Line model, Haboob (December 1985 *Model Aviation*); a competition Combat plane, Geophysica (May 1985 *Model Aviation*); and a sport model, Apiary (August 1989 *Model Aviation*).

John's lightweight, geodesic RC fun-fly design, perhaps the only such model that will hold together at full bore, brings us full circle. Having watched Jumpin' Geo in action, I can report that all knowledgeable witnesses experience a sensation of viewing the impossible. Words can't convey it. □

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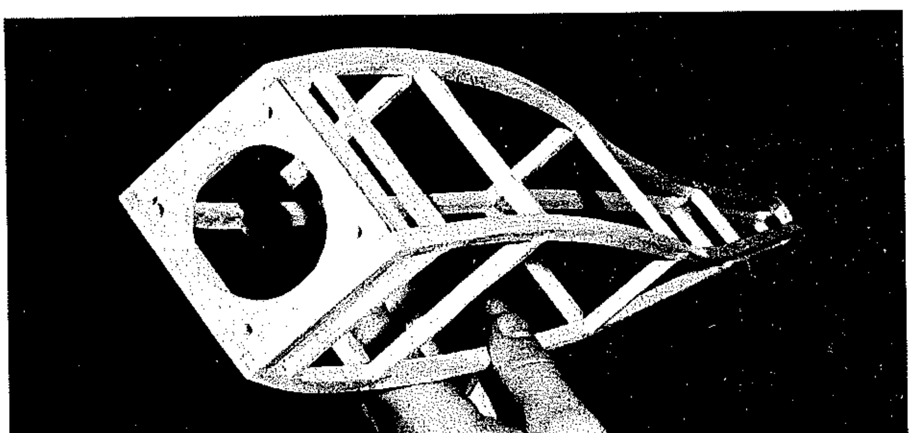
photographic purposes. For easy and quick orientation, however, it's a good idea to put large identifying color swatches on the top and bottom or to cover the top and bottom in different colors.

The second prototype is covered with Micafilm, which is even lighter weight than MonoKote.

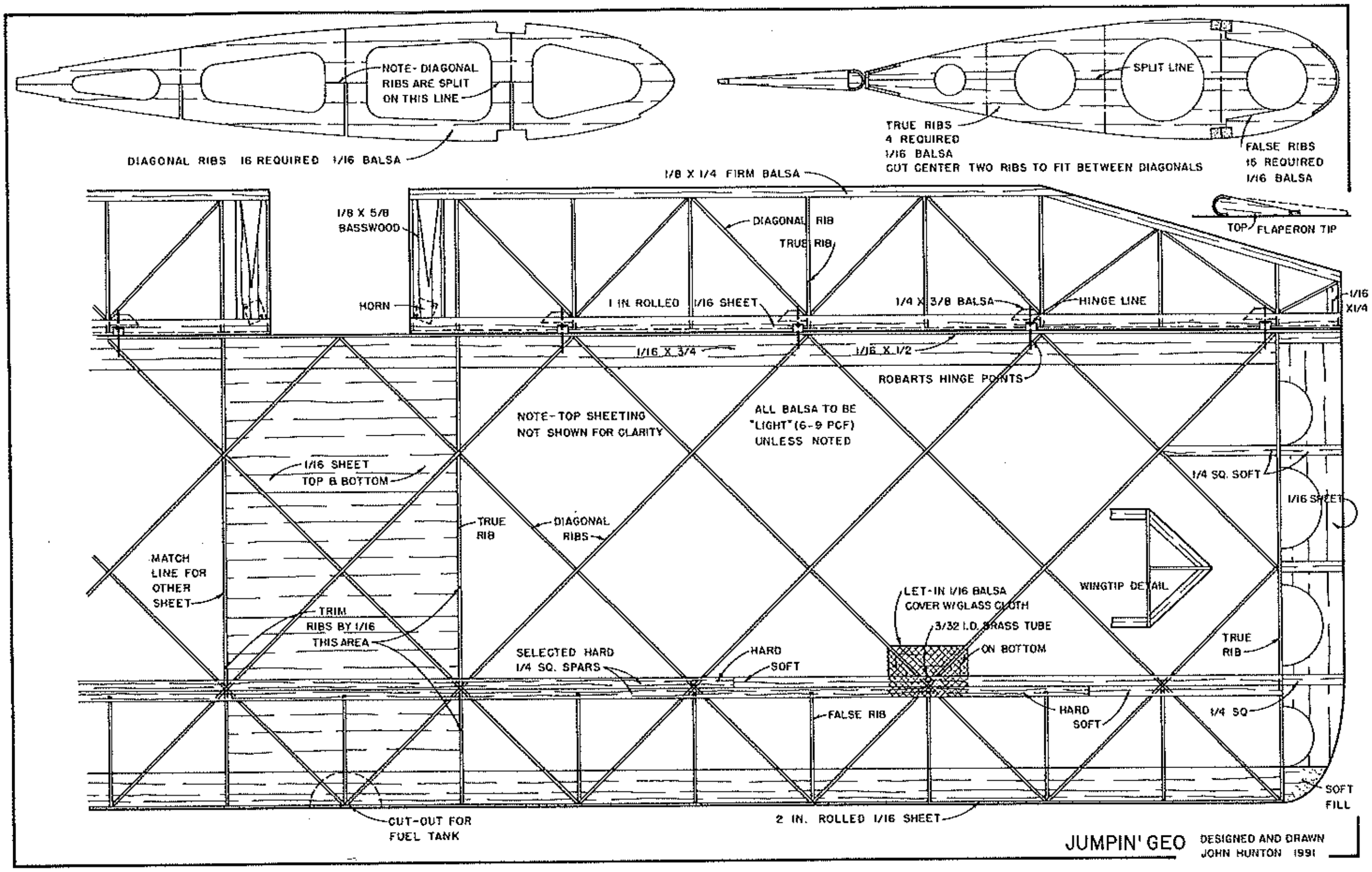
Cut the covering material from the mating surfaces, and assemble all parts. Use baking soda fillets and CyA at such critical areas as the wing and stab installations. Since the wing is not removable, do not hinge the ailerons until wing installation has been completed. Complete all hinging installation with epoxy, and install the control horns.



The fuselage side frames are ready to be covered with bias-grained balsa. Bias balsa provides good diagonal stiffness and rigidity while adding little weight.

Final assembly. Install a round four-ounce fuel tank in the front of the fuselage/wing area. Cut a disc from the plastic top of a margarine container to cover the fuel tank hole in the firewall. Drill the disc for the engine mount holes and the fuel lines. Seal the plastic to the firewall with silicone sealant.

Install the radio control gear directly through the top of the fuselage. The linkages will all be exposed (not routed into the interior of the fuselage). Note the directions for the optional coupled aileron/flap and elevator. Stack the receiver and battery, and wrap them with thin foam. Measure this assembly to size the RC box. Build the box from $\frac{3}{32}$ balsa, and cut an opening for it in the fuselage top sheeting just behind the wing spar.



Cut openings for the rudder and elevator servos in the top of the RC box. If you choose the optional coupled flaperon/elevator function, you'll also need to cut a hole for the aileron servo.

With the coupled aileron/flaps-elevator, the aileron servo slides in a shuttle actuated by the elevator servo, so that the ailerons move in opposition to the elevator for increased lift. When the elevator moves up, the elevator servo pulls the aileron servo aft to droop the flaps; when the elevator moves down, the flaps are raised.

Use ¼-in.-sq. members to mount the servos, positioning them across the fuselage under the top sheeting. Predrill holes for the servo screws, and prepare the holes with CyA.

Build up the aileron servo shuttle and track, and install it in the fuselage. Cut an opening for the throttle servo. Install all servos.

If you have a super transmitter, you may want to use spoiler function with a servo in each wing rather than the coupled aileron/flaps-elevator function with a single servo.

Install the front wheel, side skids, and engine. The K&B Spider mount offers a simple, lightweight, steerable nose wheel option. At this point, provided you've been thinking light, the model should weigh in ready to go at slightly over three pounds.

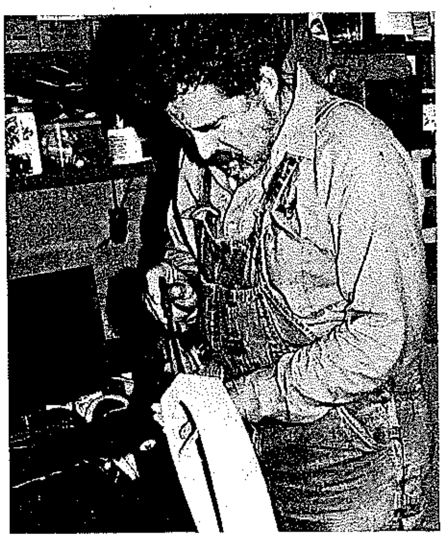
A K&B .45 engine spinning an 11 x 4 Rev-Up propeller is the recommended power setup.

Carefully check the center-of-gravity. Later, the balance point can incrementally be moved rearward for the desired control response. Begin slowly by using the recommended control throws, then build up gradually to as much control motion as you can handle.

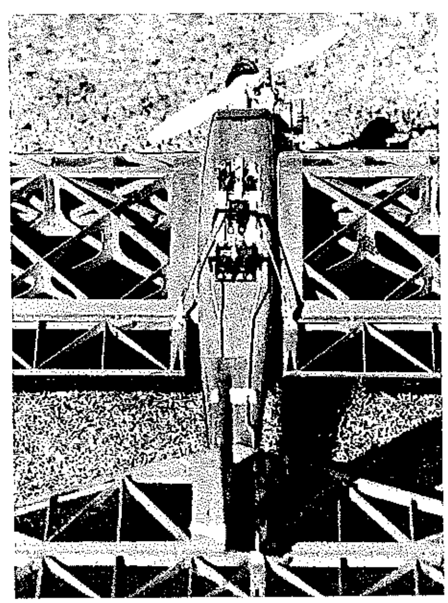
Flying. As mentioned, this model will fly successfully with either a fixed or a steerable nose wheel. If you use a spider-type mount as does the prototype, a steerable nose wheel can be added at little additional weight. With a fixed nose wheel, Jumpin' Geo can be steered by using elevator to keep the nose light, then using the prop blast over the rudder to make a turn. It's important to practice this repeatedly before taxiing out around people or planes. If you taxi too fast, the model will take off prematurely.

Any model design has built-in structural limitations. With Jumpin' Geo, don't use full control stick deflections while flying fast. If you want to turn tight, slow down first; loops and turns are actually tighter if you start relatively slowly. Use a

Continued on page 93



The author bolts on his K&B .45 engine. The K&B spider mount permits installation of a lightweight, steerable nose wheel.



Exposed RC gear (*gasp*)? Why not? The Geo sacrifices frills for lightness. The aileron servo is mounted in a shuttle that is actuated by the elevator servo for the coupled aileron/flaps-elevator function.

say about the product:

"We call it the Ernst Ni-Cap. It is a protective cover that fits all brands of Ni-Cd glow plug igniters. I and many thousands of other modelers have at one time or another dropped our glow plug igniters in the dirt or have watched them roll off the table or have put them in our pockets only to have them short out against keys or some other metal object.

"I had one short out in my pocket a few years ago after I had started my Pylon Racer and pitched it into the air. About five laps into the race, I felt something burning my leg. I was lucky enough to get it out before it burned me, and I was able to finish the race.

"The Ni-Cap does three things: 1) prevents shorting; 2) eliminates the rolling glow plug igniter syndrome; and 3) keeps the plug end clean of foreign objects."

The Ni-Cap is an orange plastic cap that is molded to a tether which has a loop on the end that slips over the shank of a glow plug igniter. The tether prevents you from losing the cap and also serves to prevent the glow plug igniter from rolling off the top of your field box and landing in the dirt.

I have one word of caution. When the igniter is in use and the cap and tether are sticking out at right angles to the shank of the igniter, make sure they are facing away from the prop. Should you want to buy a Ni-Cap, contact Ernst Manufacturing, Inc., 37396 Ruben Lane, Sandy, OR 97055; phone (503) 668-5597.

I usually end up this column by wishing you a safe month. I now believe that a safe month is one in which you don't feed your body parts through a rotating prop! □

Fun-fly model design is entering a golden age. Most of these innovative aircraft use an O.S. .32 engine. With Jumpin' Geo, we've climbed to .45 power yet still kept within the three-pound wall.

While the Geo flies slowly and unbelievably tightly, it also penetrates winds in macho style. This airplane bridges the gap between the ubiquitous traditional Ugly Stick types and more delicate new-generation models—the sort that usually employ at least some high-tech materials and purposely marginal design. As fliers learn to use the capabilities of Jumpin' Geo and its siblings, they will be opening a new chapter in the sport of RC Aerobatics.

For information about more specialized fun-fly models, have a look at Jerry Smith's built-up design in the December 1990 *RC Report*, or see Dan Stevens's hollowed-foam wing design in the February 1991 issue of the same magazine. These articles also provide a good reference for options in building Jumpin' Geo.

This model really is something else to fly. Its responsiveness will amaze you. At its first contest, the FARM fun fly near Warrenton, Virginia, Jumpin' Geo placed first in time for takeoff and climb for 15 seconds to spot landing, first in Fast-Slow, and first in takeoff and number of loops in 30 seconds. The Geo is unlikely to excel

Jumpin' Geo/Hunton

Continued from page 19

four-pitch propeller to keep airspeed down and vertical capability up. Models that turn this tightly produce considerable G-forces at high speeds, so you'll need to exercise good sense.

in a beauty contest, but otherwise it's probably unmatched.

Jumpin' Geo puts a whole new perspective on RC flying. It makes fun-flying a challenge again. Build one for yourself—and enjoy. ☐

Show Begin/Iden

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Circlemaster AST in Sussex, Wisconsin.

Safety is number one. When you have show teams performing before hundreds and even thousands of people, safety is primary. Sometimes these lessons are learned away from the show and at the practice field.

The pretty ⅙-scale Sig Cub shown in one of the photos belonged (note past tense) to yours truly. While the Cub had yet to fly at an air show, that was in the offing.

The little yellow O.S. .40 four-cycle-powered ship, one of my favorites, had made some 30 flights when it cartwheeled several times in nasty crosswinds before two successful takeoffs. Then, during a *slow* roll, the wings suddenly snapped right in the center, and the model streamed straight into the hard, drought-baked ground while two wing panels fluttered to earth.

That drove home a safety lesson. Check your aircraft *thoroughly*, even after a seemingly minor toss-around. I *had* checked the wings and various other important parts after the cartwheels, and all *appeared* to be in order. Struts were secure at all points, landing gear unscathed, tail section solid, no flex in the wings, etc.

Had I taken the time to remove the wings from the cabin, however, and examined the center section, I would have found a fracture—probably very small—in the front center section where the cabin stress wires attach the front of the wing to the fuselage. That's where the structural failure apparently occurred. It's only my