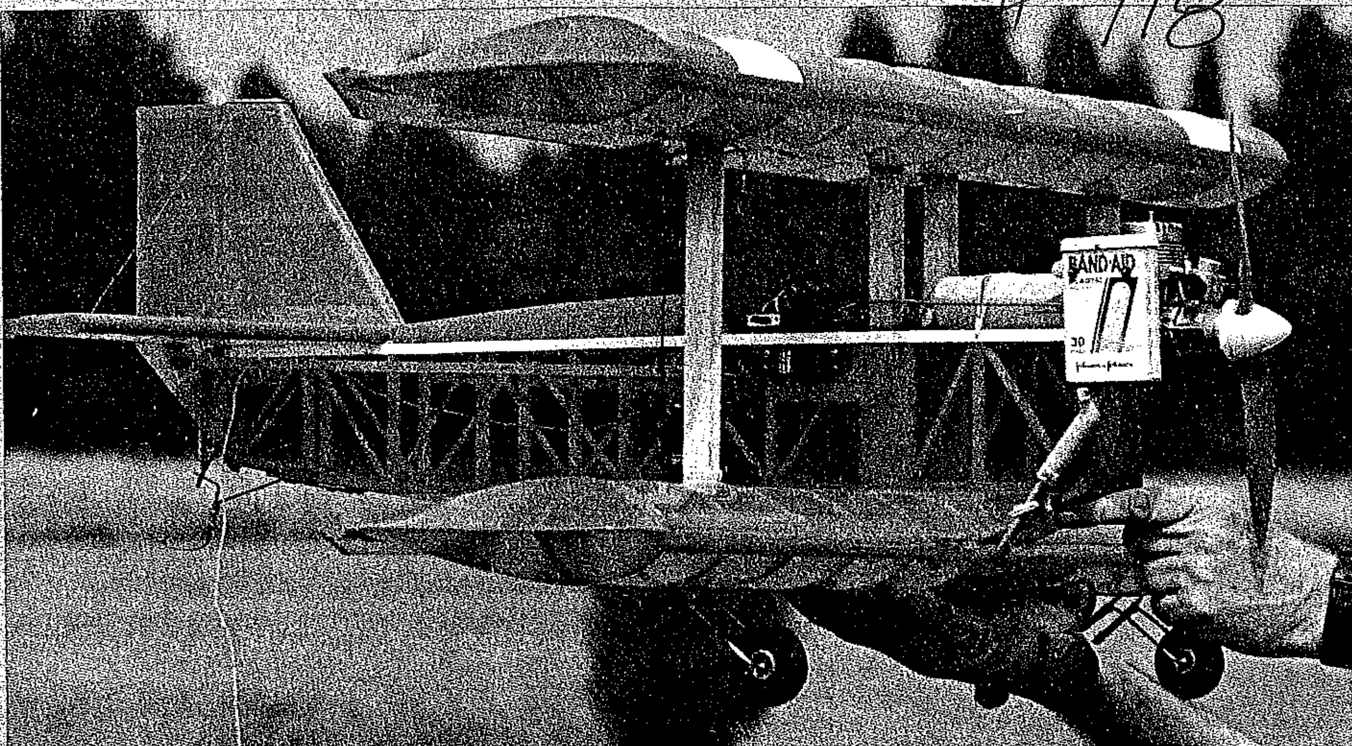
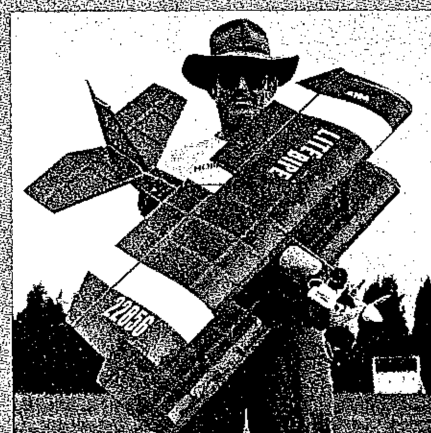
FULL-SIZE PLANS AVAILABLE: SEE PAGE 186



Big picture: Lite Bipe on approach. The model lands on tippy toes on low aileron rate—but watch out on high rate! Above: Design was changed from tri-gear to tail-dragger configuration the night before its first competition fun fly. Bernie Stuecker photo. Below: The author with his model in its original tri-gear configuration. Kent Larson photo.

LITE BIPE



Biplanes present a special design challenge. Typically using cantilevered wings and decorative struts, these models seldom match the structural efficiency of the light, wire-trussed wings and fuselages of the World War I biplanes they replicate. By combining moment-jointed interplanar struts for torsional stiffness with the trussed main spars and fuselage sides noted above, Lite Bipe proves that much lighter design is possible.

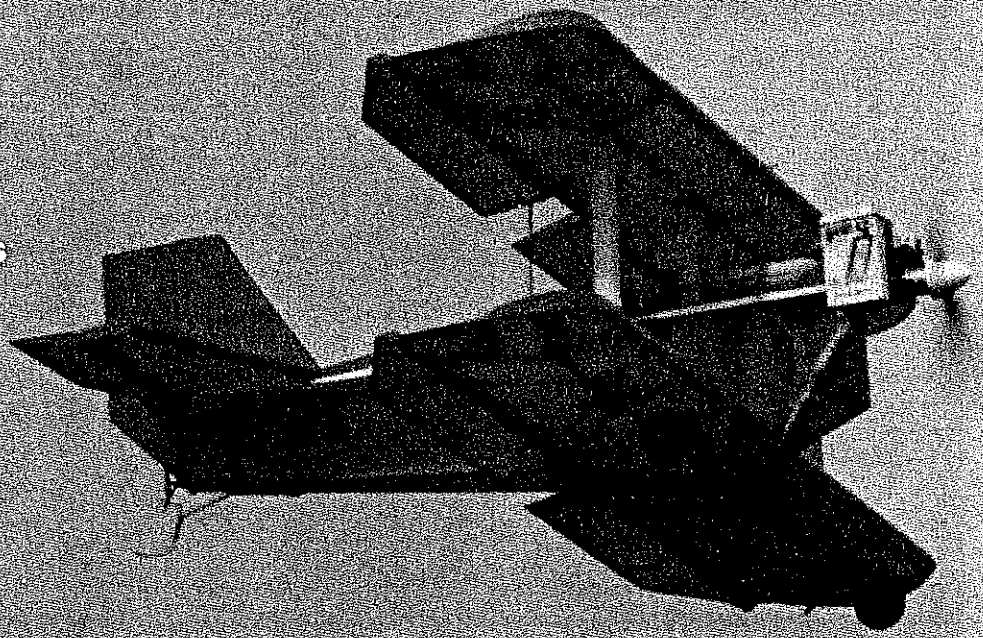
The wide-apart main landing gear gives excellent ground handling in taxi events. I used a tricycle gear originally, but even the few ounces of extra weight proved unwelcome—and the tri-gear just didn't look right on a bipe. Not only that, but Northern Virginia RC (NVRC) fun fly rules mandate a tail-dragger. So I changed the configuration the night before the first NVRC biplane fun fly—and won the event.

Here it is, folks—probably the ugliest model airplane ever designed, and an excellent example of "form follows function." Every iota of crudity and ugliness is there to make this aircraft a competition fun fly winner. ■ John Hunton

THE NEXT time someone asks you what building model airplanes has to do with modern life, just tell them that we modelers are way ahead of the rest of the country when it comes to thinking light. While everybody else loafs around feeling virtuous consuming their lite colas, lite ice creams, and lite beers, we get to fly light airplanes. That's light as in ultralight, high-performance models. That's light as in Lite Bipe.

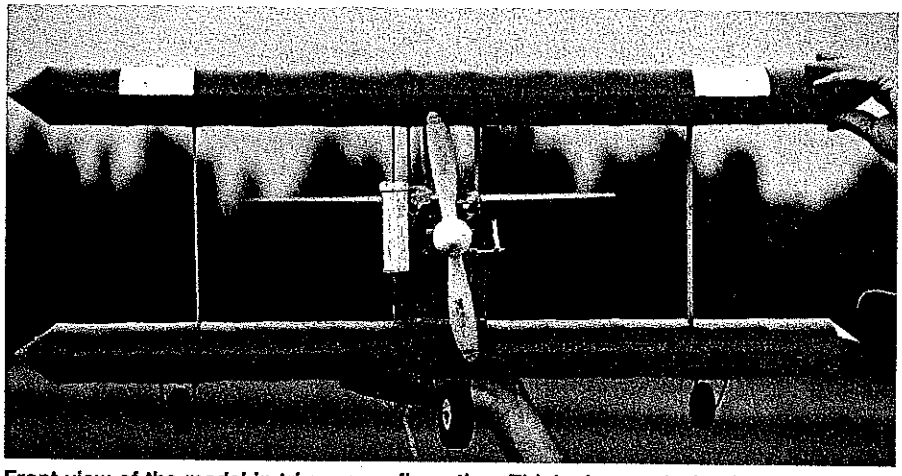
Just how light is Lite Bipe? If you take off the low-cholesterol items like the engine and landing gear wires, you're left with only about two pounds of balsa and MonoKote. There's no fat in this 3 1/2-lb., .40-powered competition fun fly biplane, just a whole lot of performance.

Lite Bipe uses a conventional, old-timey trussed-balsa frame. While this may seem like a bit of trouble, it's definitely the way to go if you want things light. And for all its dynamite performance, Lite Bipe is a simple model to build. The external control system (a la Ford Trimotor) is the time-saver. There are no hatches, no removable wing, no complications to worry about—and the extra drag is actually an asset with this type of model. More about that later.

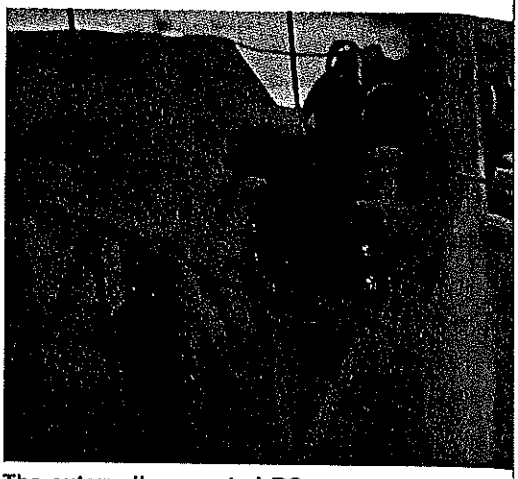


There's a revolution going on in fun fly model design. Whether we like it or not, the new high-performance, ultralight machines have finally made the ubiquitous Ugly Stick obsolete after years of dominance. Even trainer designs are no longer competitive in most fun fly events.

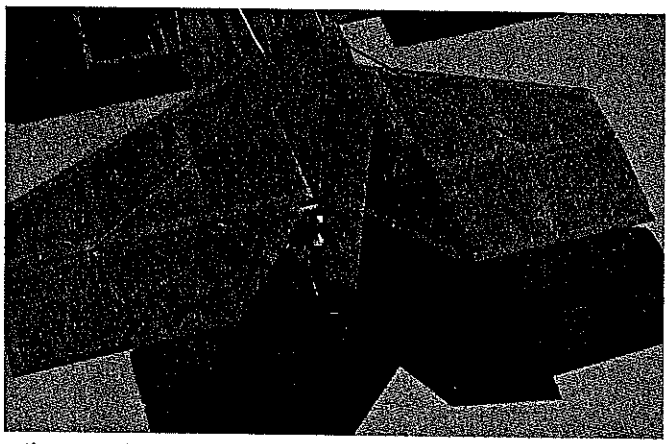
FULL-SIZE PLANS AVAILABLE. SEE PAGE 186.



Front view of the model in tri-gear configuration. Thick, draggy design is an advantage in a light plane and helps in slowing down quickly for landing. Kent Larson photo.



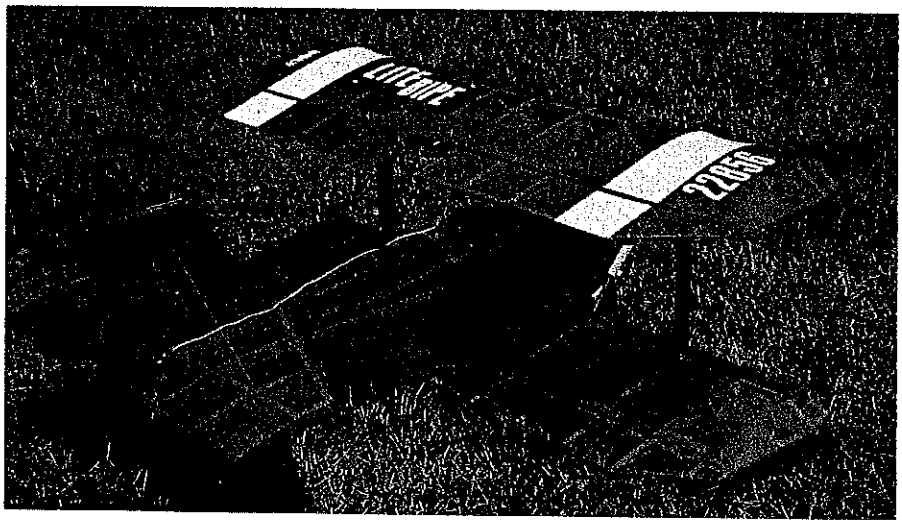
The externally mounted RC gear saves weight, and the extra drag helps rather than hinders. John Hunton photo.



Left: The metal Band-Aid box replacement muffler, with the exhaust outlet extended below the wing to protect the RC gear. Right: The very light tail has a rolled balsa leading edge and built-up ribs. Photo was retouched to amplify wire bracing. John Hunton photos.

It has been my good fortune to collaborate with Bill Winter in publishing his Cloud Niner and RC Special designs. Bill has an outstanding sense of design, a blend of good scale and proportion that he's refined over many years. If Bill's designs are the lookers among high-performance designs, does that make Lite Bipe one of the thorns?

I didn't name the prototype Double Ugly for nothing. Lite Bipe is like a long-distance runner—skinny, bony, and raw, with all the ribs showing through. A purely functional model with no gut and no fat, Lite Bipe eschews any sentimental ties to full-scale design. Still, Winter saw beauty when I showed him the finished prototype. "Refined ugliness *is* beautiful!" he allowed, citing the Ugly Stick, perhaps the most popular RC model of all time. You be the judge.



Three-quarter rear view shows low, squatty, stable landing gear. Low-slung design eschews cowling and top deck since they wouldn't boost performance. Hunton photo.

Aerodynamically, Lite Bipe is identical to my RC Jumpin' Geo (see John Hunton and Bill Winter, "Jumpin' Geo," November 1991 *Model Aviation*). It has the same moments, same wing area, same aspect ratio, and same wing loading. The wing scale, however, is different, and, perhaps because of the short wingspan, the roll rate is *much* higher. In fact, it's a whirling dervish at the rate of almost two rolls per second. That's unmatched in my experience, and downright phenomenal. The model loops tighter than a tick, although the rate—one loop every two seconds—is somewhat less than the Geo's.

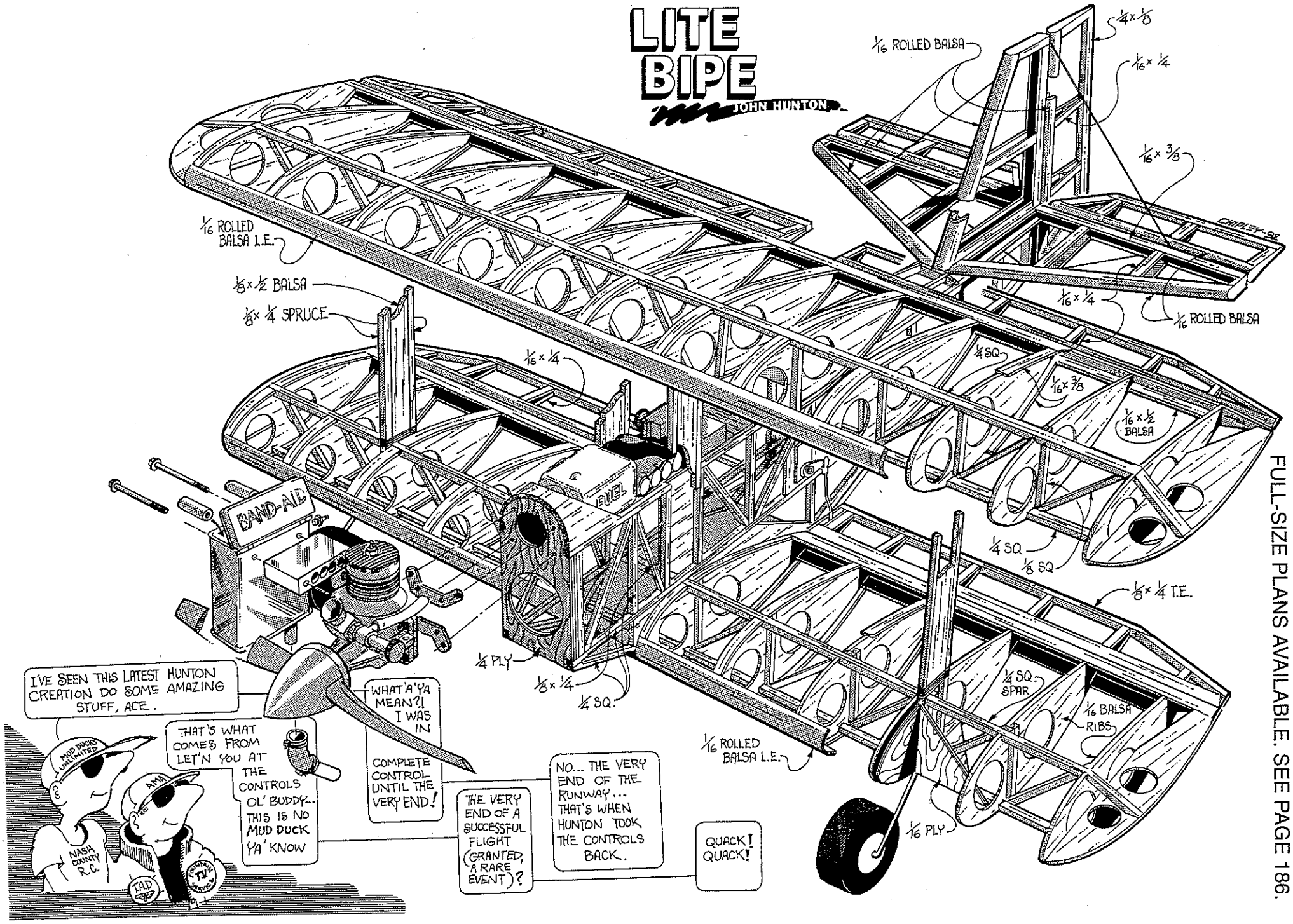
That said, it should come as no surprise that Lite Bipe is something else to fly. Spirited? That's an understatement. Lite Bipe approaches a thought-controlled aircraft.

Just remember, though, to keep your thoughts on or ahead of the model until you've gotten used to it. In the beginning, fly on low rate for roll; control will be normal. When you're ready, flip into high rate and stay at least one split-S high, since it's very difficult (at first, anyhow) to judge when to roll out level.

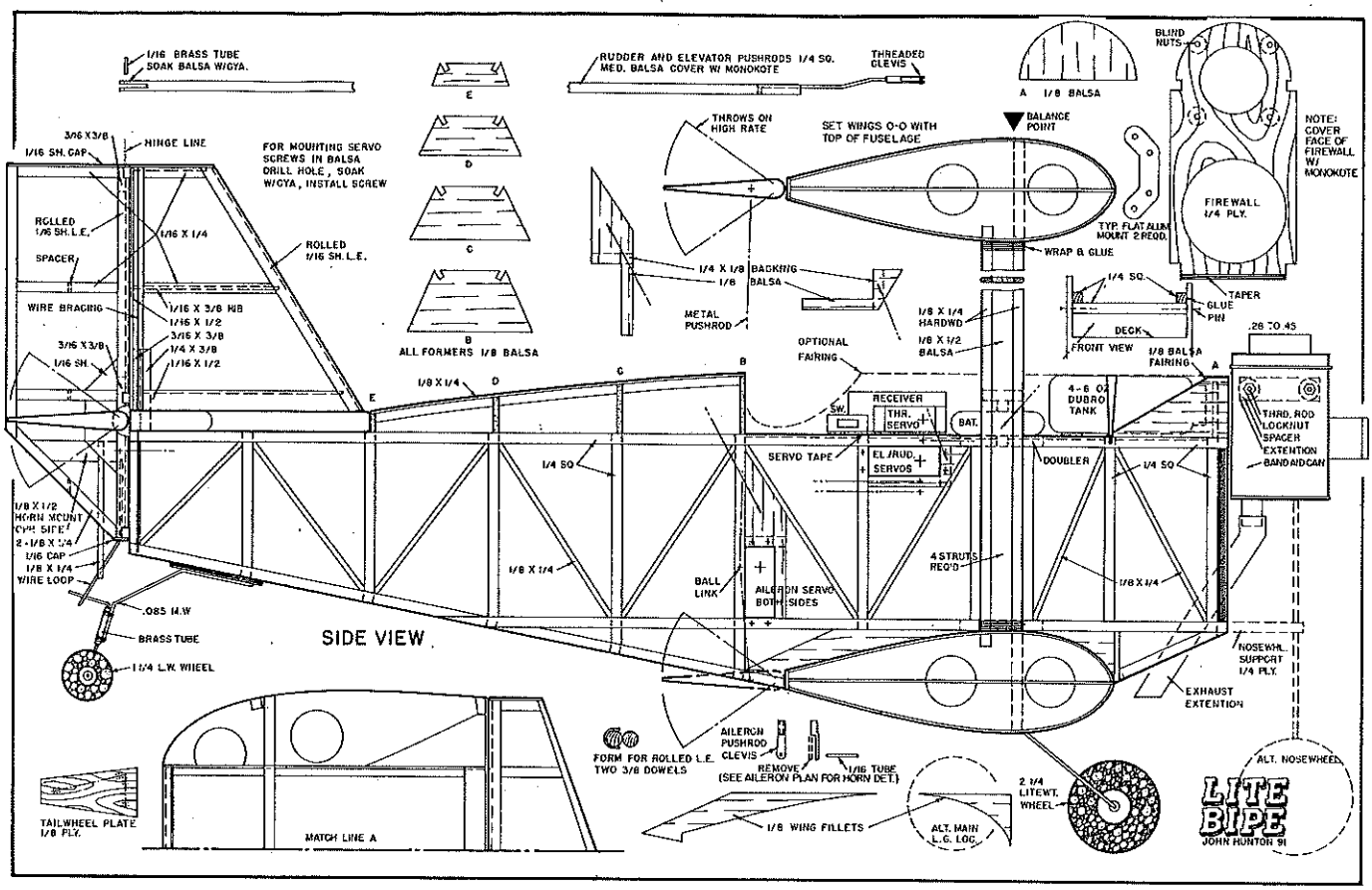
Even after you've gotten some experience, stay well attuned to the model on high aileron rate. Lite Bipe *is* twitchy and rolls violently. Here's how I like to roll:

LITE BIPE

JOHN HUNTON



FULL-SIZE PLANS AVAILABLE. SEE PAGE 186.



Approaching the field and kicking the nose up a little, I roll with torque, letting the craft go ballistically across the field, then stop the roll and guess where the plane ended up.

Given the all-up weight of just over three pounds (the prototype is 3 lb. 5 oz.), any good .30- to .45-size engine will provide four to five pounds of thrust. This translates to vertical performance. Ever flown a model with vertical climb capability? It's great.

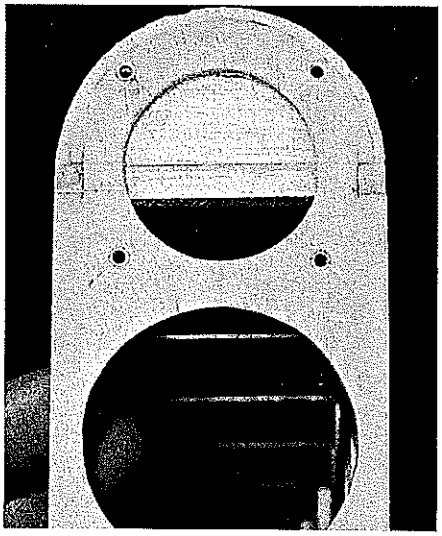
The prototype uses an APC 11 x 6 propeller.

Here's why draggy is good. Biplanes are draggy. Boxy designs are draggy. Thick wings are draggy. Blunt noses are draggy. Controls hanging out all over the model are draggy. Lite Bipe is draggy. If you decide from the start that top speed is unimportant (even fast-slow events are nearly always won by the model that can fly the slowest, not the fastest), you're ready to build lighter and simpler. In the case of Lite Bipe, that means boxy with exterior controls.

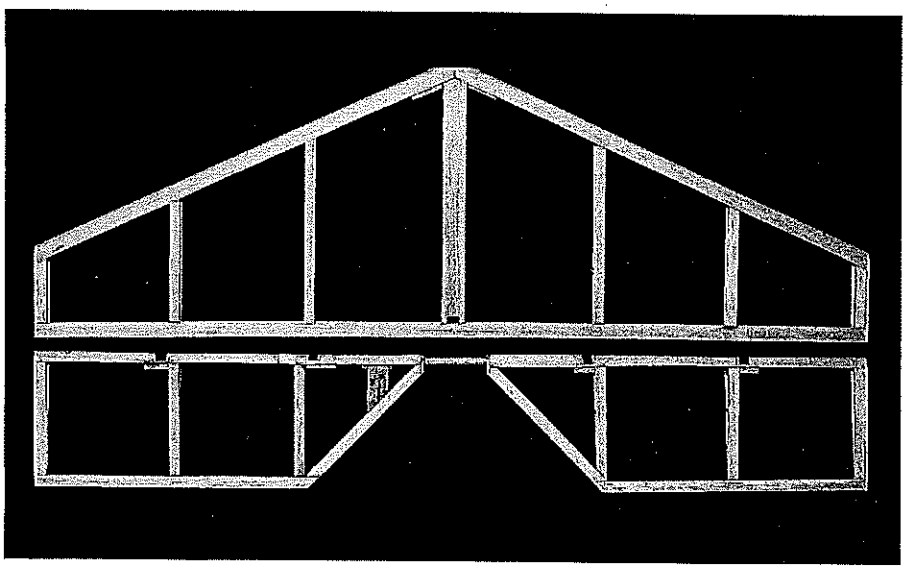
Ever see a model land vertically? No. With Lite Bipe, however, the angle of descent is exceptionally steep. Payoff is quick. Landings can be made very short. This actually helps to bring the landing pattern in close and can be an advantage in fun fly competitions.

Stall characteristics are good as well. Perhaps because of the washout provided by the tapered flaps at high alphas, Lite Bipe won't stall and drop out of the sky; it'll just mush. You can get behind the power curve with no problems, and you can turn on a dime.

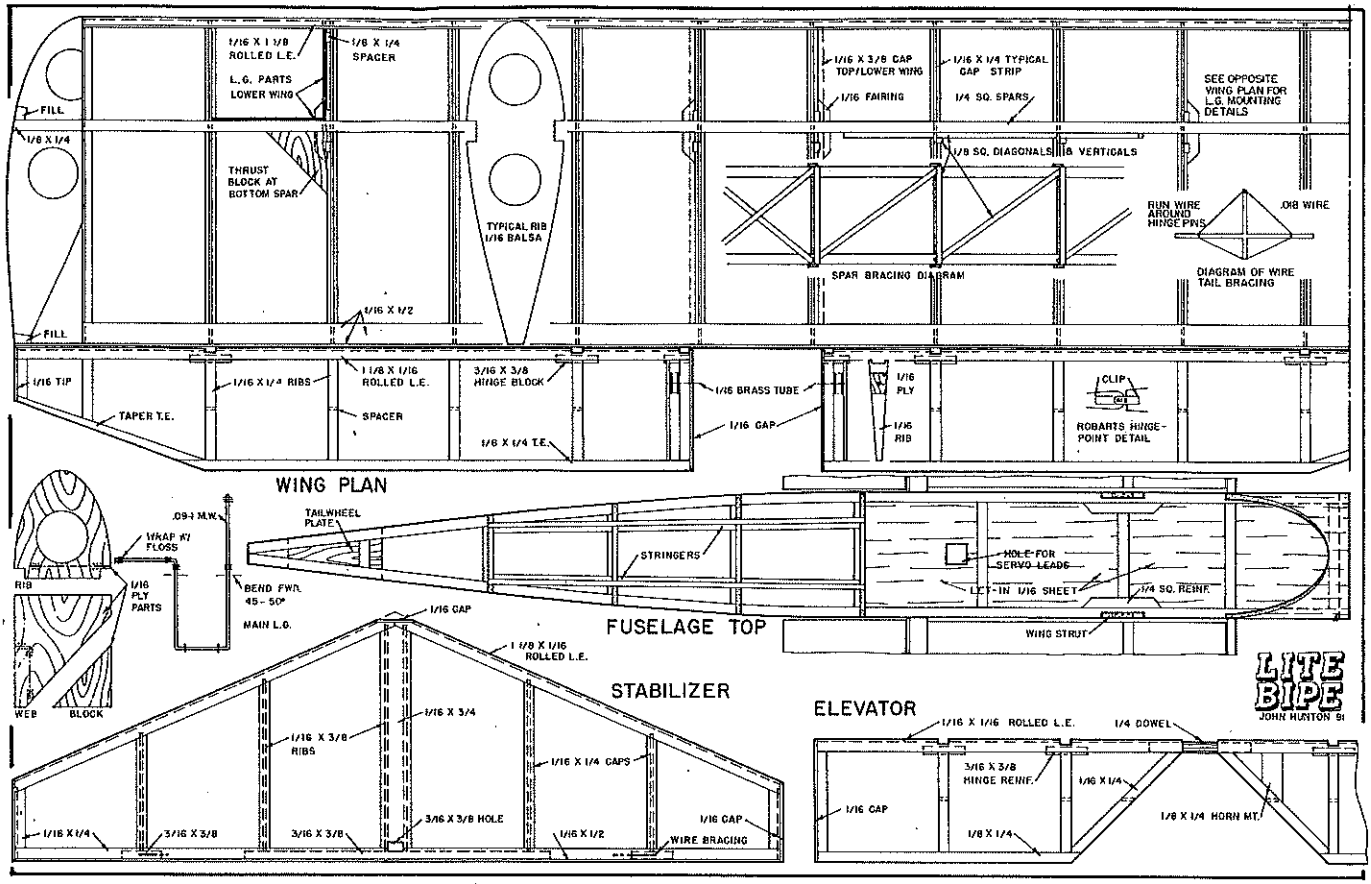
Any unusually shaped design takes getting good and used to before you know what it's doing every moment you're flying it. Though very responsive to the controls, Lite Bipe does have its quirks. If you know what to expect, you'll be more successful and enjoy the flying more.



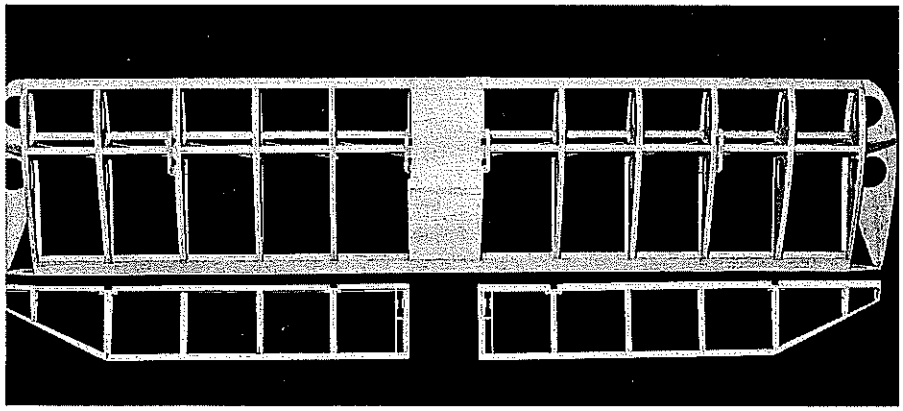
Lightweight built-up structure half-hides behind the firewall. Cavernous fuse is designed for structural efficiency.



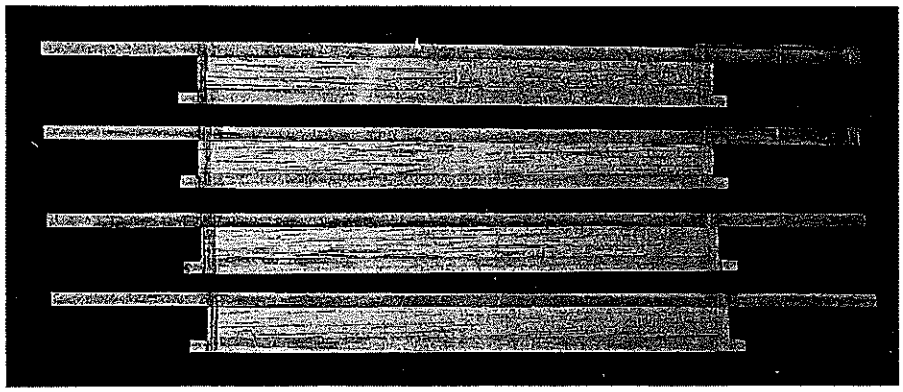
Horizontal stabillzer is structurally complete. A piece of 1/4-in. dowel stock is used to join the elevators. Photos at left and above by Bernie Stuecker.



Because the model is so light, it reacts much more quickly to control input than do conventional designs. So you have to stay ahead of the airplane. Yes, you've heard that before. With Lite Bipe, though, it means staying more than one mistake high and within good visual range. The balance point shown on the plan helps to moderate those quick control reactions in pitch and yaw, so it's important to follow it slavishly. Forget for the moment that every known method of achieving lightness has been

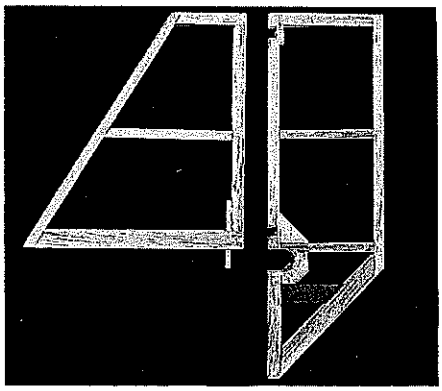


Above: The 1/16 soft balsa strip for the wing LE is rolled over a broomstick. Wing struts are preassembled of hardwood and balsa filler. Bernie Stuecker photos.

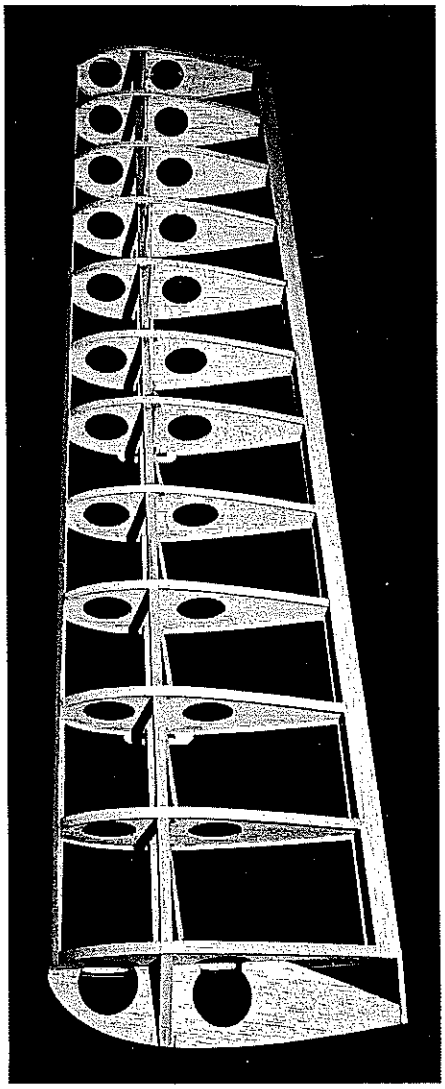


RC Lite Bipe

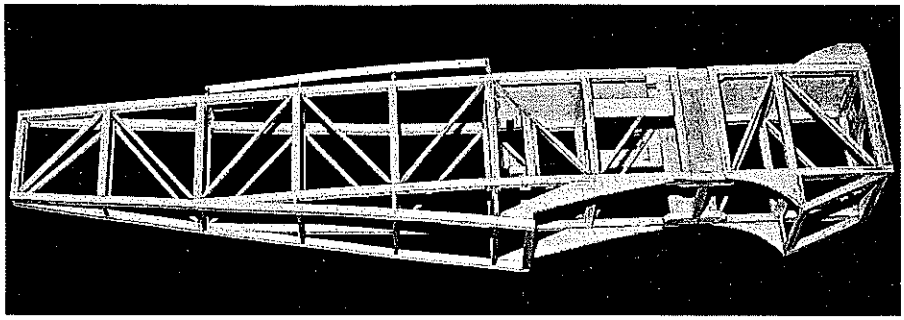
Type: Competition fun fly biplane
Wingspan: 37 inches
Recommended engine size and type: O.S. .40 SF ABC (range: .30 to .40 cu. in.)
Number of RC channels recommended: Four
Expected flying weight: 3 lb. 5 oz.
Type of construction: Built-up, trussed-balsa frame
Type of covering/finish recommended: Transparent MonoKote; clear polyurethane



Rudder and fin have rolled balsa leading edges, stub spar on fin cutout for elevator joiner. Bernie Stuecker photo.



Structurally complete wing. Healthy wing depth helps promote a light structure. Stuecker photo.



Built-up fuselage uses conventional but lightened-up construction. The entire frame weighs only a pound; the finished model, just over three pounds. Stuecker photo.

used, and add ballast as needed to get the model to balance fore and aft. You can refine pitch and yaw sensitivity later by making incremental adjustments in the CG.

Roll rate is a different problem, one that is unaffected by the CG location. Since Lite Bipe has powerful roll controls and short moments, use *dual rates* on roll controls. Use low rate for normal flight, then flip on high rate when you want to roll. You may be able to do a single flip roll and come out relatively level, but try multiple rolls. There's no way to tell where the airplane is, so, again, remember to stay at least one split-S high. I've never seen another model roll like this one.

Lacking dual-rate capability, you'll just have to be satisfied with using half the indicated aileron throw.

Another unusual aspect of Lite Bipe's flight envelope is its low-velocity capabilities. When you reduce the weight of a .30- to .45-powered model by half (say, 6.6 lb. to 3.3 lb.), you bring about a 33% reduction in stall speed (24 mph to 16 mph). Because of the excellent stall characteristics, you can slow the model down considerably in the approach, and it will land more slowly than the typical aerobatic airplane.

The wide-configured landing gear looks just fine and, as noted, provides for excellent ground handling, takeoffs, and landings. Takeoff and landing characteristics are always strongly influenced by the angle of attack at which the "running" gear supports the model. If the angle is too steep, the model will take off quickly but be unstable during landing; it's difficult to get such a model down solidly. If the angle is too low, the airplane will roll on the ground far longer than it should before taking off, but the landing characteristics will be excellent: If the tail wheel contacts the ground before the mains, the wings' angle of attack will be reduced upon touchdown and the model will "stick" without bouncing.

Choosing quick landings over quick takeoffs, I rigged the tail wheel for a lower angle of attack. It just seems more difficult to get the model down quickly than to get it off the ground. This philosophy of limiting rotation on takeoff to improve landing characteristics is unusual, but the model does land cleanly even at very high speeds. You may wish to adjust the tail wheel height to suit your own flying style.

A typical short takeoff and landing scenario goes like this: Full throttle, full up. Pop off, off up (neutralize the *up* elevator input), and roll. Hog up again to come around. Level momentarily, chop throttle, bring it right around. Slows up quick. Level wings and be there, because it is slow already, and on the ground. It happens that quickly.

Construction

Be selective in choosing balsa weights. If

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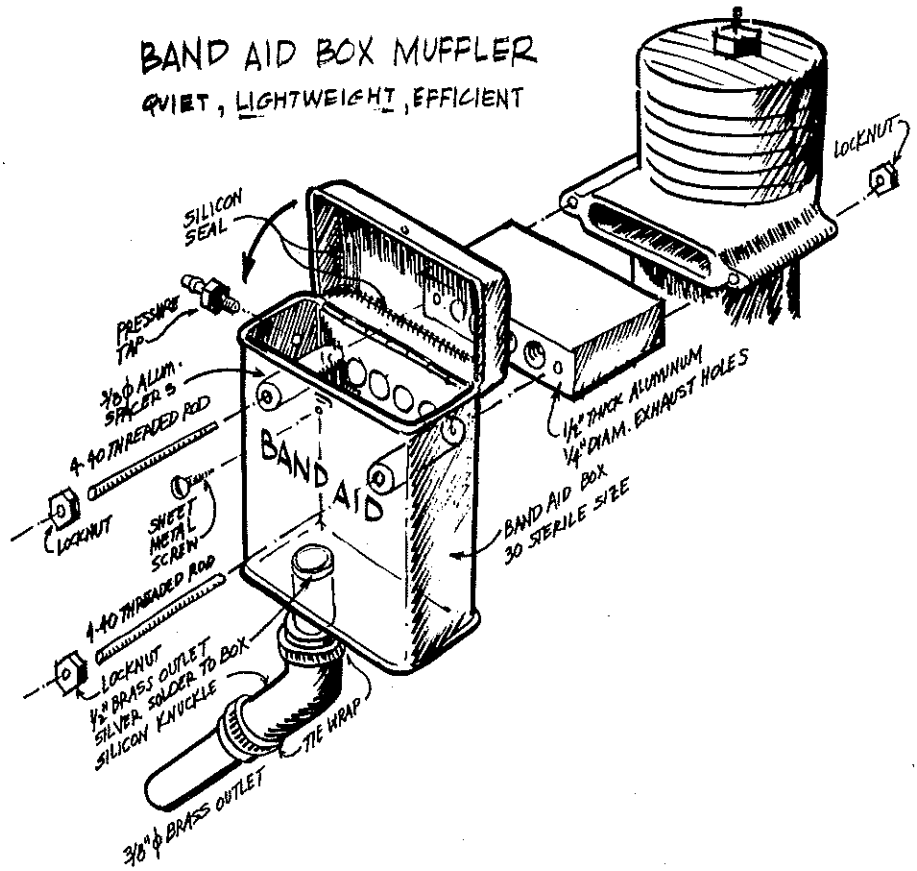

Homemade Band-Aid box muffler saves a few ounces. Silicone exhaust extension carries residue to below the bottom wing, away from the RC gear. Hunton drawing.

Bipe/Hunton Winter

Continued from page 56

you order your balsa by mail, use a company such as Lone Star that will select the wood for a small fee. It's worth it. Lone Star gives industry standards as follows to use when specifying balsa weights: Very light—4-6 lb. (weight per cubic foot); light—6-9 lb.; medium—9-12 lb.; hard—12-16 lb. Use very light balsa for all parts except as noted below, but order half again as much as required so that you can select the best wood. Use medium wood for all spars, fuselage longerons, and fuselage and wing diagonal members. The completed framework should weigh about a pound. Assemble everything with thin CyA (cyanoacrylate glue). Use a mixture of baking soda and CyA for filling.

Fuselage. Cover the plan with waxed paper, pin down the side members, and build the sides as shown. Use selected medium-weight balsa for the main fuselage frame. Longerons should be cut from the very best wood available. Use lightweight balsa for the structure below the main fuselage frame.

Remove the sides from the plan, and cut them halfway through to inset the cabane struts. Install a doubler behind this cutout. It's best to pin the sides down over the plan top view before joining them.

Install all crossmembers. Cut out the firewall, and install blind nuts for mounting the engine. Install the firewall. Cut out and install the other formers. Install the turtledeck stringers, servo and wing mount fairings, and wing fillets. Let in the servo mounting plates and the top deck sheeting. Install the curved top front fairing, which helps to stabilize the engine mount.

Block sand the fuselage sides flush. Smooth off the stringers. Fuelproof all exposed balsa parts, such as the RC equipment mounting deck. Polyurethane is recommended.

Wings. Cut a soft balsa strip for the wing leading edge. Wet the strip, and wrap it around a broomstick with an Ace bandage. Let it dry overnight.

Cut out all the wing ribs, plus four more for the tips. Lightening holes are optional. They don't amount to much of a weight savings considering all the effort, but they *look* neat. Remember, the principle is to think light.

Use medium-weight balsa for the spars and diagonals. Pin the lower spar to the waxed-paper-covered plan, and install the ribs. Install the trailing edge vertical portion, blocking it up accurately and using it to level the rib trailing edges. Install the top spar and the spar diagonals. It's best to run the diagonals for the top and bottom wings in opposite directions.

Install the $^1/_8$-in.-sq. uprights at each rib. Glue on the rolled leading edge, and install the other trailing edge sheet parts.

Remove the panel from the work surface, and build the second half the same way. Add the tip parts (the tips are just clipped ribs) and cap strips. Wrap the landing gear wire to the plywood gear parts, and install.

Wing struts. The hardwood from strut members extend from the bottom spar of the bottom wing to the top spar of the top wing. The hardwood rear strut member extends only from the top spar of the bottom wing to the bottom spar of the top wing. The balsa filler spans between the wing surfaces only. No diagonal bracing is required because the strut bracing handles torsional loads.

Wrap the assembled struts securely with thread, top and bottom, and coat them with CyA. Be sure to check for accurate wing alignment when assembling the struts; it'll be too late to change the alignment after they're attached.

Empennage and ailerons. Roll the leading edge sheeting around a pair of $^3/_8$-in. dowels. Wrap this assembly with an elastic bandage, and allow it to dry.

Pin the leading and trailing edges to the plan. Install the lower rib parts, then add the upper rib parts and the spacers. Install the hinge reinforcement and the sheet tips.

Install the rear spar doublers. These penetrate the stabilizer to provide good support for the fin. The stabilizer has a part-span spar.

The fin and rudder have rolled balsa leading edges. This stock is not difficult to make; just wet the balsa, wrap it around a dowel, secure with an elastic bandage, and allow to dry overnight.

Install the hardwood mounts for the rudder and elevator horns. Drill for and install the nuts, but don't install the horns at this point. Join the elevators with a piece of dowel.

The ailerons are built topside down over the plan. One result of this will be that the trailing edge will have a built-in warp at the tip. This is intentional and provides washout in the wing. Each aileron incorporates a special support and a pin for attachment of the aileron control linkage.

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Bipe/Hunton Winter

Continued from page 79

Covering. Transparent MonoKote is recommended; the transparent type just seems to weigh less than the opaque and metallic varieties. Attach the covering in the center of a panel, pull it toward the edges, and fasten it. Smooth out the wrinkles. Clear-coat any exposed balsa with polyurethane.

Final assembly. Assemble the wings and tail to the fuselage. Bare the abutting surfaces, align them accurately, and glue.

Attach the wing struts, being careful to affix them firmly at the spars. Fill the voids with CyA and baking soda. Add the empennage rigging to help prevent damage in that inevitable nose-over. Use light wire for the rigging, perhaps a piece of old braided control line. Run the wire around the hinges, then gather and pull it at the bottom of the fuselage. Glue all joints with CyA. On the prototype I ran a piece of 1/8-in. dowel rod through the wing center section to provide for attaching a bomb-drop mount with rubberbands.

Lightweight muffler. You can save a few ounces by building your own muffler. I made mine from a metal Band-Aid can. Other containers would probably serve equally well.

Cut a spacer from aluminum stock, making sure it's sized to support the can the proper distance from the engine's exhaust stack. I drilled four 1/4-in. holes for the outlet and clearance holes for the attachment screws.

Since the can must be supported from both sides for adequate strength, cut two spacers to span its width. Push an awl into the side of the can for a pressure tap. The tinplate will curl inward and provide a good anchorage for the pressure tap threading. Tap the can and install the nipple.

Drill an exhaust hole in the bottom of the can, and silver-solder in a brass tube of a size at least equal to the engine's regular exhaust outlet.

Assemble the can to the engine with a threaded rod and locknuts. Coat the inside of the can top with silicone. Close the top, and punch for and install a sheet metal screw to hold it shut. Add a silicone exhaust extension to carry the residue to a level below the bottom wing. This exhaust system seems to work well—and it's light.

Engine. The prototype uses an O.S. .40 SF ABC. A K&B .45 would be equivalent. I believe you could go as small as a .28 size and still get good results—along with an even lighter airplane. And remember, **Keep the model light**, and keep it flying.✈

RC Electrics/Kopski

Continued from page 67

care to share that information with me, I'll include it in a future issue.

On a related matter, many readers also continue to inquire about the VRCS, so here's that address one more time: Vintage Radio Control Society, 4326 Andes Drive, Fairfax, VA 22030.

Believe it or not: Some folks still feel that "Electric's no good." Readers may recall the June 1992 column and the discussion wherein one reader accused Electric columnists (in general) of misleading readers, in part by *not* writing about the "bad" aspects of Electric. At that time, I promised I'd do this in the future—and the future is now.

So far as I know, one can describe about a half-dozen perceived disadvantages or "bad things" about Electric flight. I know all this because I've received mail over the years that says so. Here are some things I've been told:

1. Electric is too heavy and doesn't fly.
2. Electric doesn't have enough power to fly well.
3. Electric has too short a flight time. (Notice here that we've advanced from "it don't fly" to "it don't fly long." That's progress!)
4. Electric is too complicated.
5. Electric is too expensive.
6. Nobody flies Electric around here.

I can understand if regular readers who know better are now laughing uncontrollably. But please—take care, and don't injure yourselves as you roll on the floor clutching your aching sides. Appreciate that I have no choice but to pursue this matter, 'cause one purpose of this column is to offer help, and—goodness knows—anyone who believes any of the above truly needs help!

So much for the levity. The reality here is that plenty of modelers are still convinced that Electric's no good—for one reason or another. Some of these are folks who might otherwise be quite happy with Electric but either have had a bad start or have received the wrong information.

Of course, I'm not so foolish as to believe that Electric's for everyone—that's just not so. I simply would like to help make sure that if Electric's really for you but

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FF Sport & Scale/Warner

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are worse than nothing, as they stand out like zits in a yearbook photo.

Ron Moulton, of British *Aeromodeller* fame, used a clock gear on a handle (like a pizza cutter) and pushed a little row of dents through from the back side of a cardstock, thin aluminum, or paper panel.

I believe it was Dave Platt who originated the idea that I have found most successful—that of using a hypodermic needle ground off square to deposit tiny dots of white glue. If too much water is trapped in the dot, it will collapse, so use glue that is a bit thicker than normal. Practice before working on your model—you can count on ruining the first dozen dots. When doped over, these dots give a remarkably striking effect in areas around windshield frames and other points of interest.

Continued on page 142