BIG BINGO!

Anything you can do with an Ace R/C 4-120 monoplane, you can do with this easy-building low-wing mod—and that's plenty! With its impressive stability, amazing power profile and knockout hot dogging capability, this airplane was designed to make even mediocre pilots look good. ■ Dr. D. B. Mathews

TO BEGIN with a little straight talk, this airplane is basically a face job—an Ace 4-120 monoplane with a batch of cosmetics applied. Actually that's quite a high recommendation, since the 4-120 enjoys a well-earned reputation for excellence.

This prettified low-wing version retains all the virtues of the 4-120: superb stability, incredibly broad and well-controlled speed (i.e., power) ranges, easy takeoffs and landings, delightful nimbleness, easy construction—and an unusual ability to make mediocre pilots look good. What's more, its two-piece wing joined with a strong aluminum tube lets you carry it in a subcompact car. In fact I designed Big Bingo! to be transported (albeit just barely) in a Toyota Tercel. You won't need a minivan for *this* model, despite its size.

Modifications of the 4-120 monoplane to a low-wing configuration appeared on the scene early in 1989. Five have been built that I know of, and all proved airworthy. My original drawings for the rendition you see here were based on considerable study of those mods and incorporated what I considered the best of their design features. If an idea looked sound but simple, I borrowed it for Big Bingo!

So Big Bingo! is a sort of pastiche of concepts taken from 4-120 low-wing mods. Five versions have been built in the Kansas-Missouri area. All, including my own, have been thoroughly tested. John Riggs estimates he's put over 500 flights on his Big Bingo, many in adverse weather conditions. He juices it with a Zenoah G-23. A re-

Six-year-old Stephanie Taylor was fascinated by grandpa Doc's Big Bingo! while visiting her grandparents' home in Timber Grove Lakes, KS last summer. Stephanie's parents are Navy Lieutenant Mark and Sherrie Mathews of Port Orchard, WA.

cent thorough examination showed no evidence of structural wear, except for a set of worn-out wheels. John loves to draw gasps of astonishment at fly-ins by rolling inverted on takeoff. Obviously he's comfortable and confident with this model.

Performance appears remarkably uniform over a range of engine installations, from Enya and O.S. 1.20 four-cycles to Quadra 40s. Apparently the increased power of the big bangers is used up by their comparably increased weight.

Big Bingo! seems to appeal to the builder/flier who enjoys the camaraderie of big bird fly-ins but lacks the time, money or skill demanded by the big warbirds or the quarter-scale aerobatic designs. This model doesn't require a second mortgage and two years of effort. It's remarkably easy to build and uncommonly versatile in the air. Big Bingo! flies more gently than most big Cubs, yet is capable of wild aerobatics in the hands of more experienced pilots.

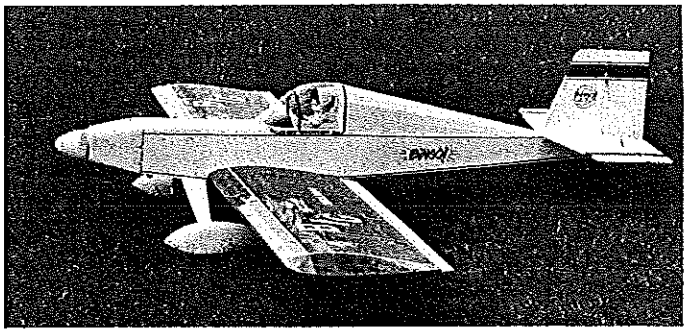
This airplane is easy to build, easy to fly and easy to buy. If that sounds like an irresistible combination, let's get building.

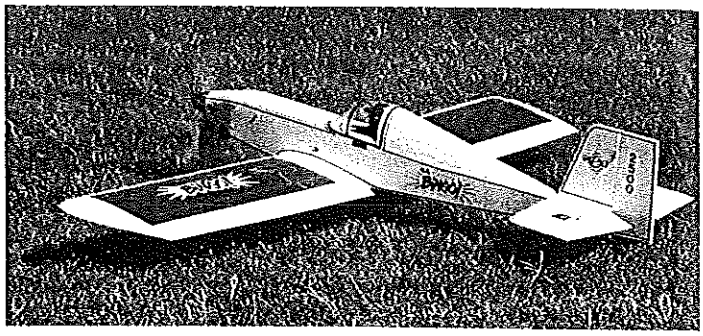
CONSTRUCTION: When compared with similarly sized designs, Big Bingo! may appear a bit flimsy at first glance. But using spruce and Lite Ply makes the difference. Spruce is 10 times stronger than balsa, while Lite Ply provides the strength of 3/8-in. balsa at close to the weight of the 3/16 variety. Lite Ply can be cut smoothly with a knife or saw and glues on nicely with any standard modeler's adhesive. Under no circumstances should you substitute balsa, regardless of its density or size, for the hardwoods used in this design.

The standard hardware used should be available at any well-stocked hobby shop. As indicated on the plan, the canopy is available from Marvin Reese. You can substitute personal preferences in hardware, as long as you're certain they're appropriate to a model of this size.

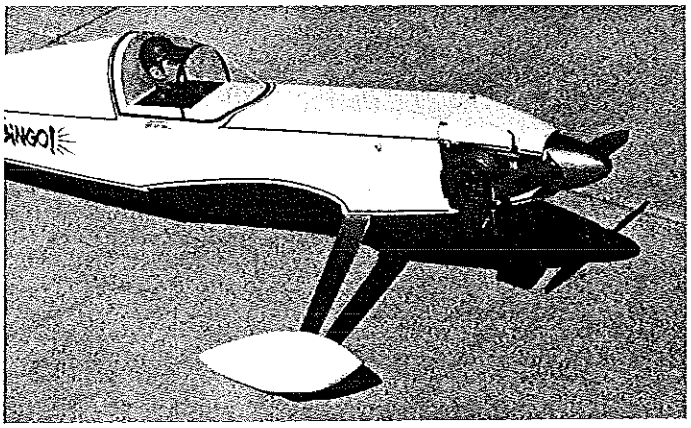
Read the directions that follow and carefully study the plan before cutting out a kit of parts. The rather innovative wing construction can be simplified by ordering a 4-120 monoplane wing kit (Part #13K227W) from Ace R/C, Box 511, Higginsville, MO 64307 (telephone 1-816/584-7121).

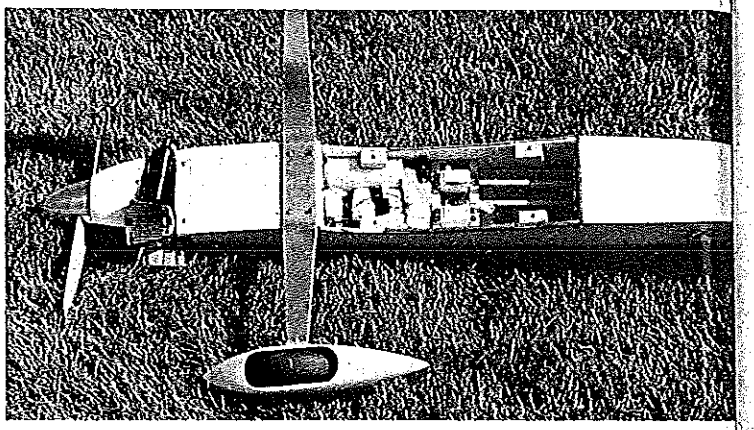
As with any scratch-building project, a simple jigsaw, such as a Dremel or the equivalent, is helpful, but a good knife will do the job.



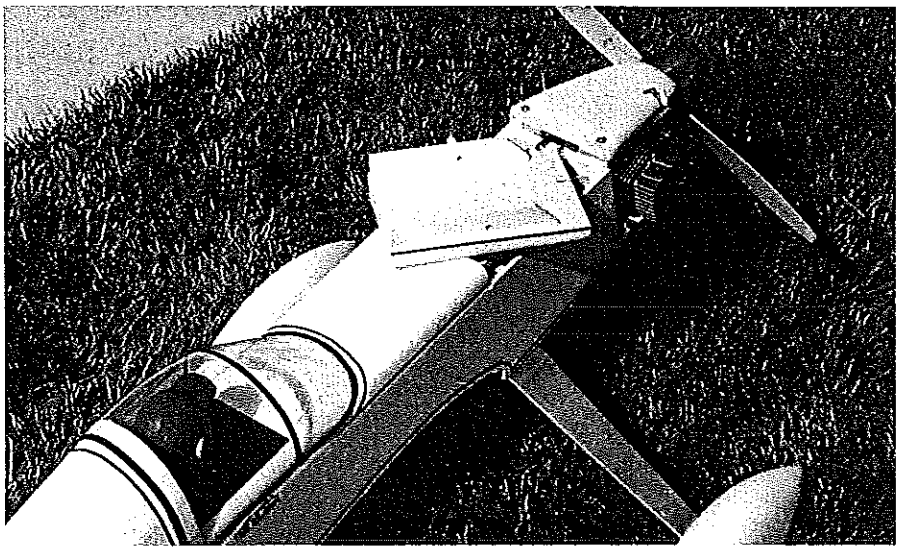


Left: A doll's head from a local toy store adds a feminine touch to this variant, which uses a Saito 1.20 and a 16 x 6 prop. The shorter Klett fiberglass landing gear from the Ace R/C 4-120 kit is preferable with such a setup. Right: Doc's all-time favorite Control Line model was Jim Saftig's Zilch. Quite by accident a bit of Zilch turns up in the Bingo!—white Oracover on the fuse and tail, an orange transparent MonoKote wing with a white Rustoleum border. Black Multistripe from the DJ company sets it all off.

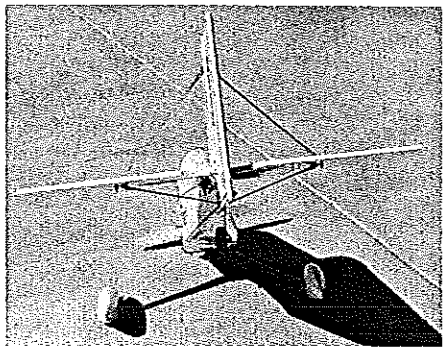




Left: Outfitted with a SuperTigre 2500, a Romco Tru-Turn 3 1/2-in. spinner, J'Tec's Giant Snuf and a Zinger 18 x 6-10 prop, Big Bingo! flies as quietly as many .40-powered models, yet has plenty of brawn. An Ace heavy-duty aluminum landing gear is used with this setup. Right: Looking at the belly with the wing removed. The sidewinder ST 2500 installation with a J'Tec Super Snuffler works well and is pretty nice to look at. The author replaced the shorter fiberglass gear he originally used with a longer aluminum unit after breaking too many 18-in. props on $10 landings. He hasn't broken one since. Note the four wing hold-down blocks, servos on rails, and carbon fiber pushrods.

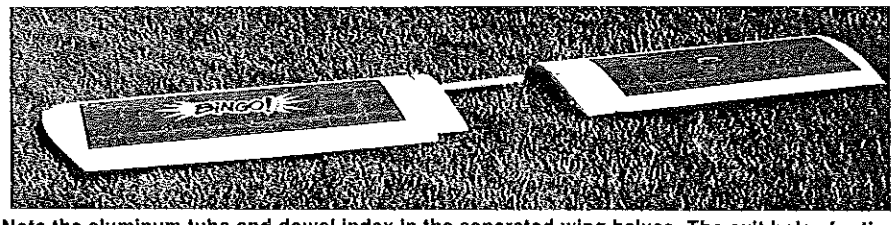


"A buried tank is a leaky tank" is a favorite maxim of Doc's. Providing access to the tank and plumbing, the hatch is held by a set of plywood rails threaded with 1/4-20 nylon bolts.

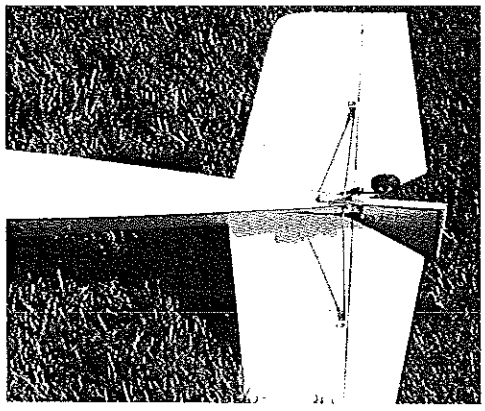


The tail brace wires on this particular version are fastened to the stabilizer with solder links and sections of nylon control horns. They pass completely through the tail wheel block and then are crimped.

An overhead view of the empennage and brace wires. Nearly any method of attaching the bracing is fine, but the 4-40 threaded rods and related hardware absolutely cannot be omitted from this design.

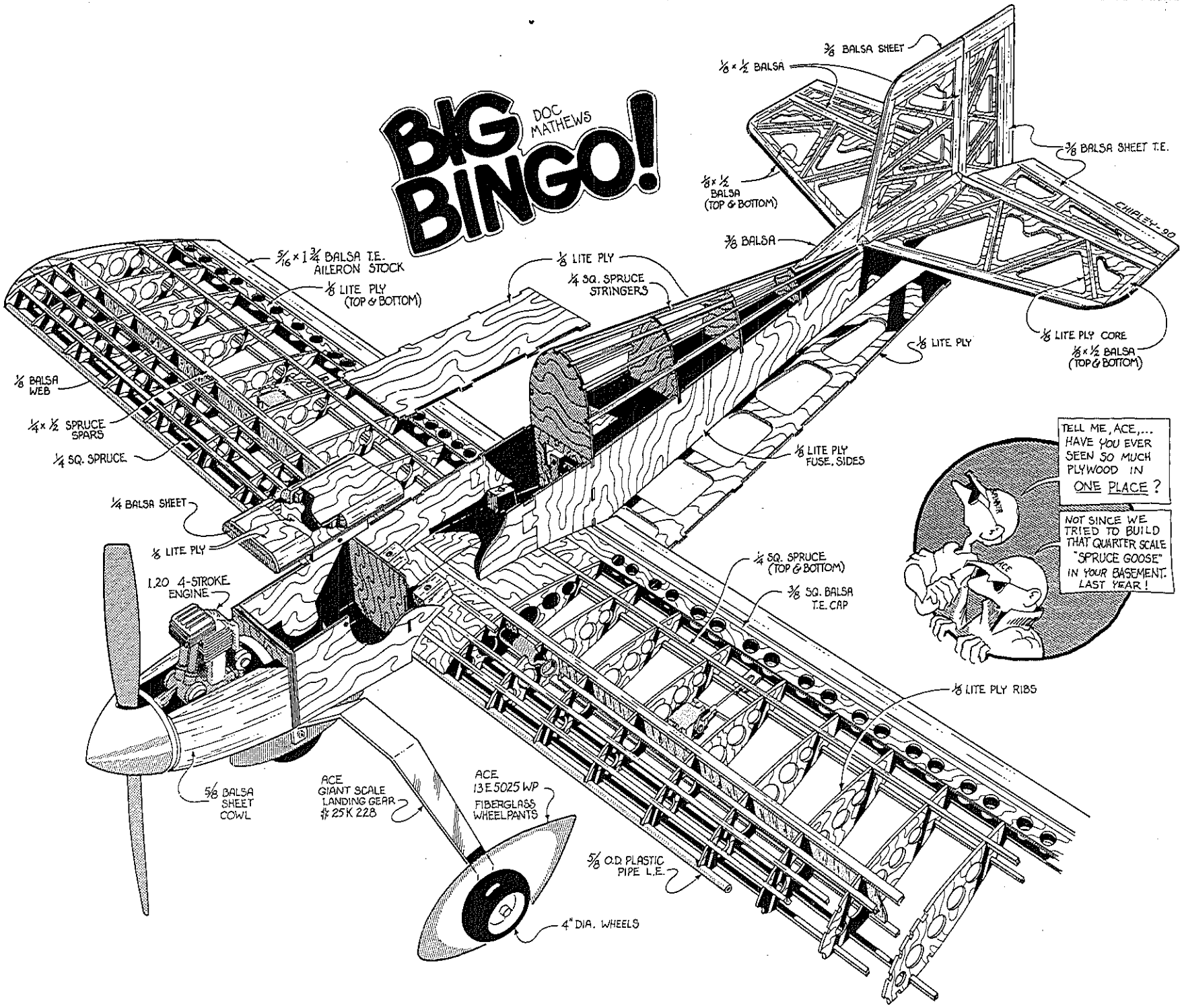


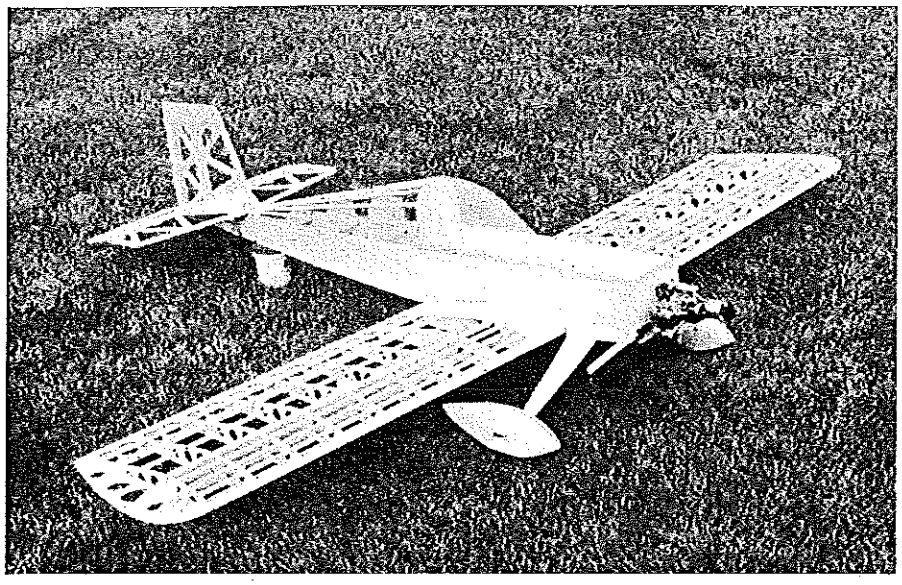
Note the aluminum tube and dowel index in the separated wing halves. The exit holes for the aileron cables, joined with an Ace R/C noise trap, can also be seen. Bingo! decals were custom generated on an Apple computer, then transferred to sticky-backed vinyl.



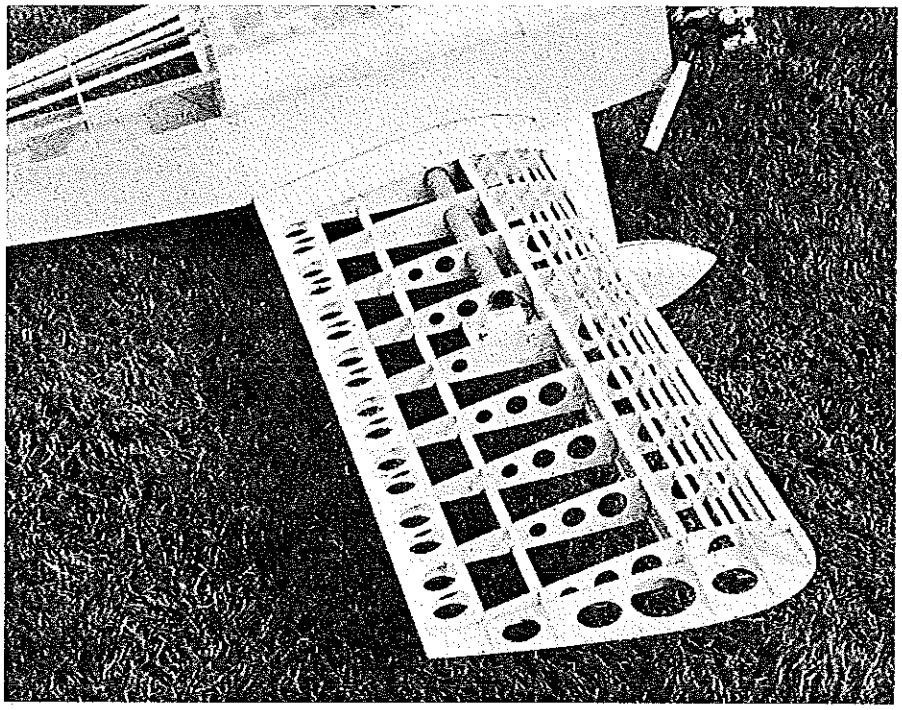
BIG BINGO!

DOC MATHEWS

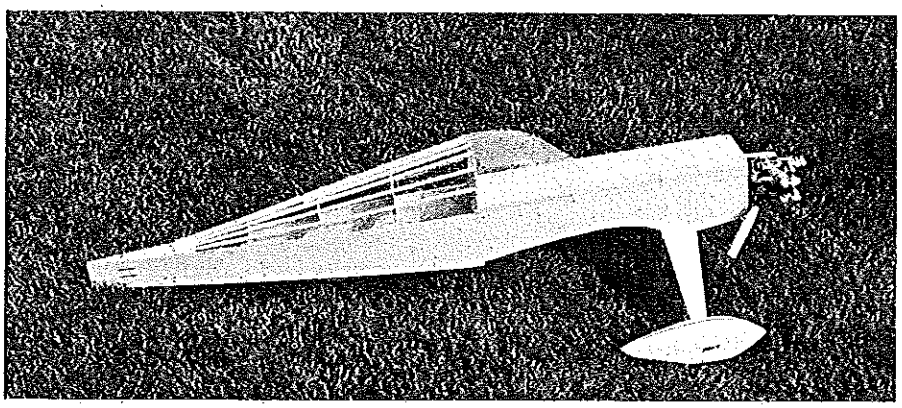




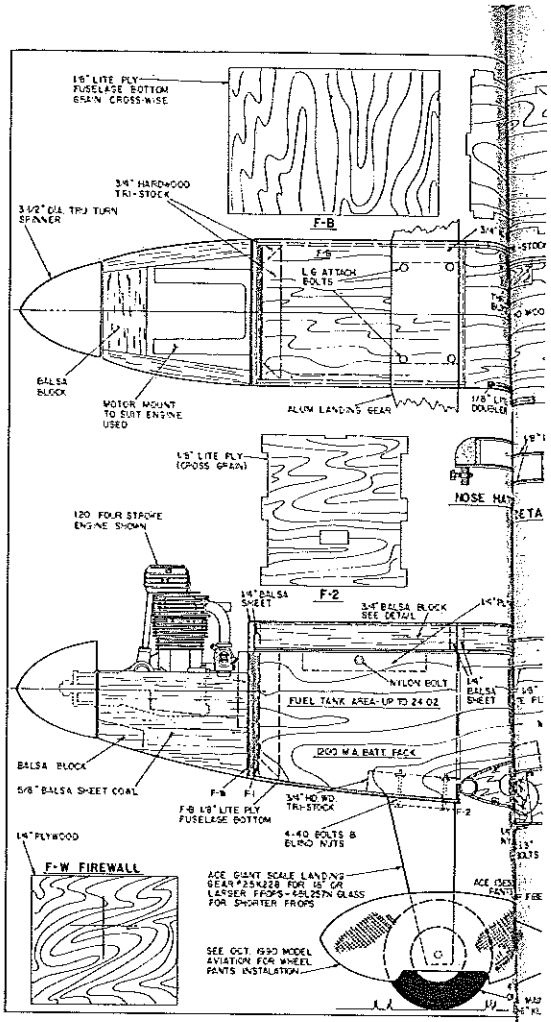
In its bare bones Big Bingo! looks deceptively puny and difficult to build. In fact the framework is made almost entirely of hardwoods and couldn't be stouter. Think of how a house looks before the scaffolding is covered—or a full-sized airplane, for that matter.



Using lots of lightening holes pays off. The author once weighed all the cutouts and holes in a 4-120 monoplane, came up with slightly over 16 ounces! Ace R/C's 4-120 monoplane kit can be easily adapted to Doc's Bingo, making it all the simpler to build.



Big Bingo's sleek and sexy-looking fuselage is in reality nothing more than a simple box fitted out with some extra formers. The cockpit and tank cover are hollow and require only a small amount of balsa block. Nothing complicated about building this model.



Cutouts can be easily made by drilling a ¼-in. hole in the part, threading the blade into the hole, and reattaching it to the saw. A sharp modeling knife works well for tabs and slots.

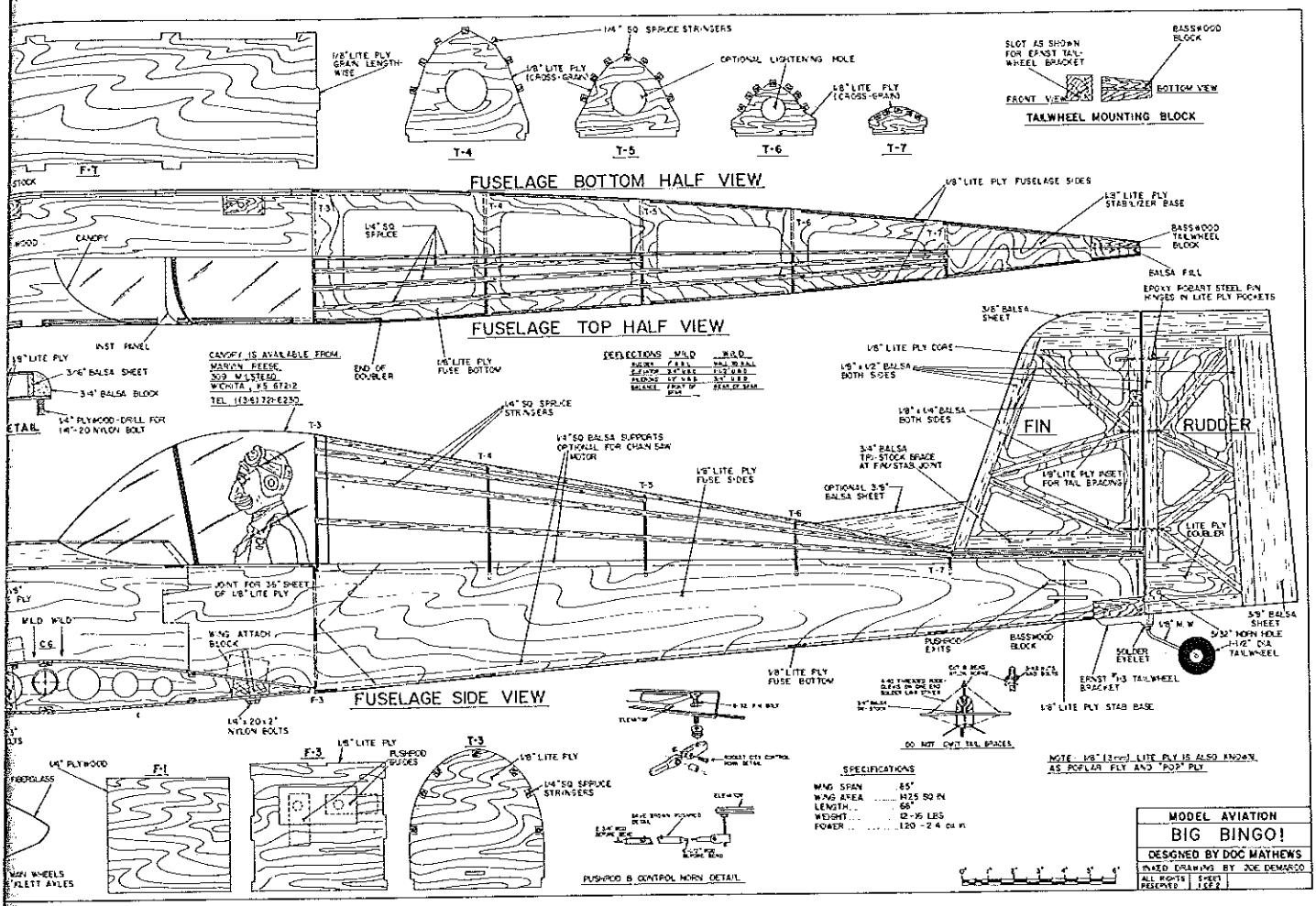
** Medium-viscosity CyA (cyanoacrylate glue) and epoxy adhesives were used in all the prototypes.

Big Bingo! is simple to build and easy to keep in good alignment, provided you use a smooth, flat work surface and follow sound principles of construction. Remember, a straight model will fly straight.

Wing. Since the wing panels will be needed early in the fuselage construction, it's preferable to build them first. These instructions assume that you're using the Ace R/C wing kit; if not, be prepared to make rib templates by transferring a pattern of each rib onto Lite Ply using carbon paper, then cutting them out and drilling them.

What follows is intended to cover just the key points of wing construction. The Ace kit, if you use it, will include instructions, while modelers who are experienced in cutting the ribs out from scratch would find my instructions superfluous.

Begin by punching out the ribs from the die-cut sheets. The ribs are identical except for the eight that are fitted with a ⅛-in. hole between the cutouts for the ¼ x ½-in. spars. The sequence of these center section ribs permits the wing joiner tube to create



the dihedral angle.

The first rib has a ¼-in. hole in the rear area for the joiner key. The fourth is ⅛ in. larger around the perimeter. Though the number 2 and 3 ribs look alike, the tube hole in #2 is closer to the top of the rib than is that in #3. Label them carefully to avoid error in assembly.

Experience has shown that the Hot Stuff/ Sprayment technique works best with these wings. I can construct a panel in less than an hour using the method described below.

Lightly spray a flat piece of plate glass with 3M Sprayment 77. Place the plans on the glass, spray them lightly, and cover them with waxed paper (*not* plastic wrap). Coat the waxed paper fairly heavily with Sprayment and allow it to become tacky.

Position and align the parts, holding them in place with Sprayment. Begin with the bottom trailing edge sheet, then add the bottom spars, using a rib or two for perfect alignment. The airfoil is flat from the bottom spar rearward, which simplifies your task considerably.

Use the scrap ply dihedral gauge to position rib #1. Shear webs, precut and carefully sized, are used to position the other ribs. Once the center section bottom sheeting is in place, glue the ribs by flowing CyA on both sides of the joints.

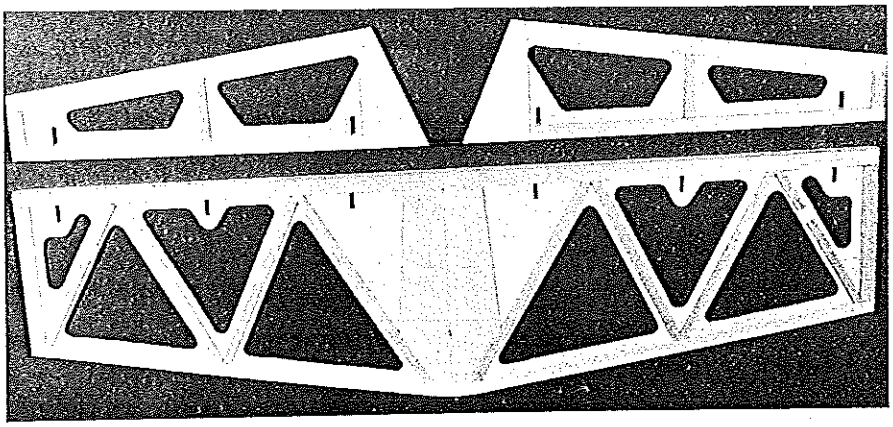
The PVC pipe leading edge should be prepped with 120-grit sandpaper for better adhesion. A certain amount of bowing is normal; the pipe will straighten as it's glued to the ribs.

Add the hardwood bolt blocks, and sheet the top center section. Add the top spars, wing tips, etc.

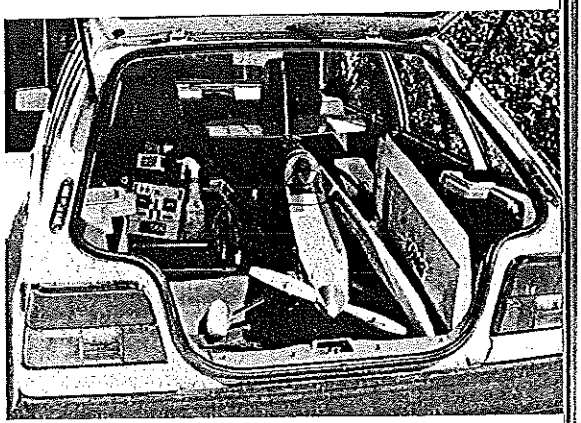
Over the years I've developed a few special wing construction techniques that are used in this model.

Adding ¼ x ¼-in. balsa strip, block sanded to contour, to the center section ribs where they join the Lite Ply sheeting considerably increases the gluing interface for the latter. These balsa strips are shown on the plans.

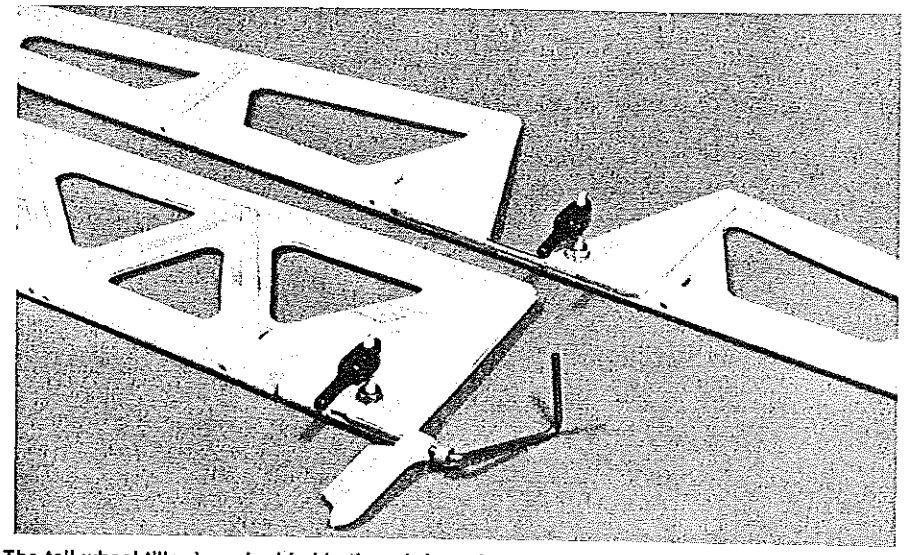
I prefer mounting the aileron servo plate to the wing with 3-48 bolts and blind nuts rather than screws. Two strips of scrap



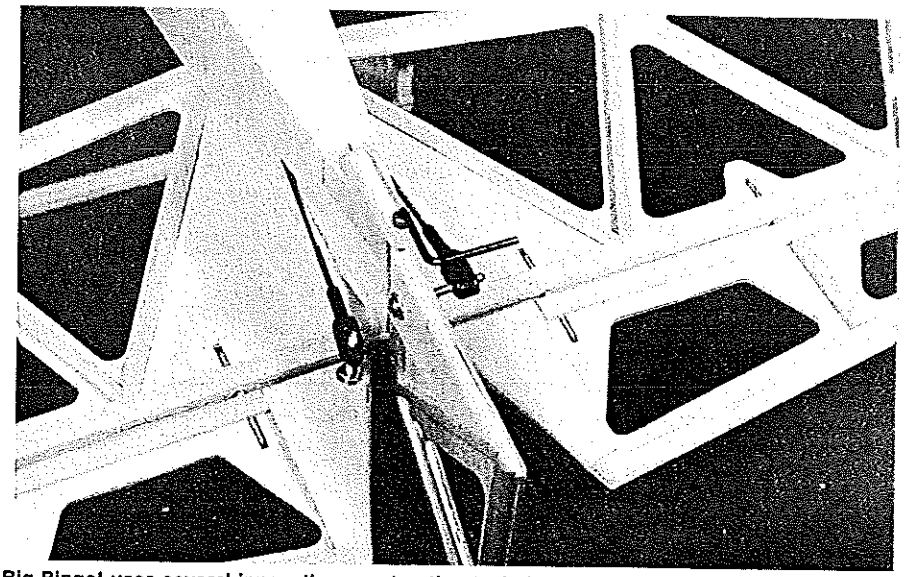
Here you see the Lite Ply cores with the balsa top and bottom, an incredibly strong yet fairly light configuration. Note the ply doubler in the top and bottom center section.



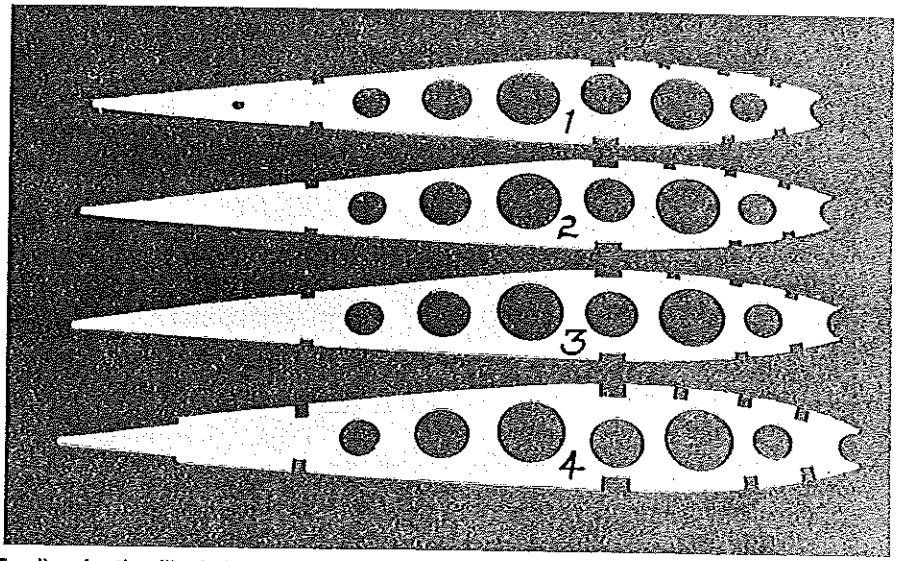
Who says you have to drive a van to fly big models? Doc designed the Bingo! to fit into his Tercel. Plenty of room for the model and support gear, but no passengers allowed.



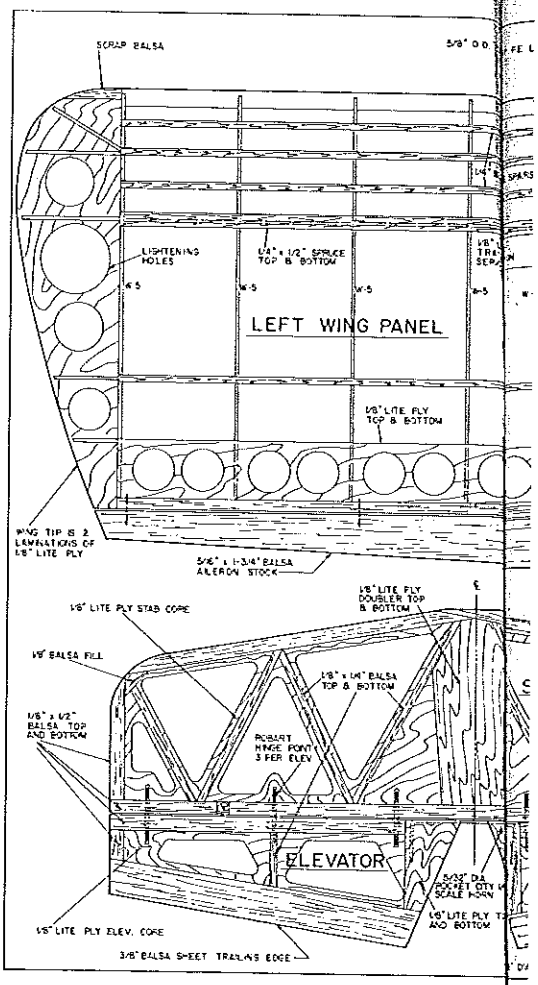
The tail wheel tiller is embedded in the reinforced area of the rudder, as are the Rocket City control horns. The wire joiner for the elevator halves is also slightly set into the face, allowing a tight seal at the hinge line.



Big Bingo! uses several innovative construction techniques. Robart's steel pin hinge points are fitted into precut slots in the Lite Ply empennage cores—a simple but incredibly strong arrangement. The Ernst quarter-scale tail wheel bracket is epoxied into a slot in the large hardwood block, making it, too, nearly indestructible.



To allow for the dihedral, the four center ribs are cut with the holes for the phenolic joiner in sequence. It's essential to identify and number these ribs so that the tube socket will fit properly. The 1/4-in. hole in the rear of rib #1 is for a short dowel section, which is glued into one wing half and slides into the hole as an index in the other.



spruce are run parallel to the servo to prevent any flexing of the ply plate.

If the aileron pushrods are attached to the lower portion of the servo arm, no bends in the pushrods are needed.

Two servos of at least 25-oz. torque each are needed and should be connected with a noise trap wired in a *Y* configuration. Ace R/C's #26K17 servo works well.

Care should be exercised before installing the aileron setup. Breadboard the servos and connectors to determine the servo orientation that gives you *up* travel on one side and *down* on the other. A little preplanning will prevent a problem later.

Tail surfaces. Make plywood center cores by inserting carbon paper between the plan and the wood. Cut out the cores, and pin them flat to the work surface. Build the overstructure over the platform of cores, one side at a time. Any stress relief warps in the ply will flatten out automatically.

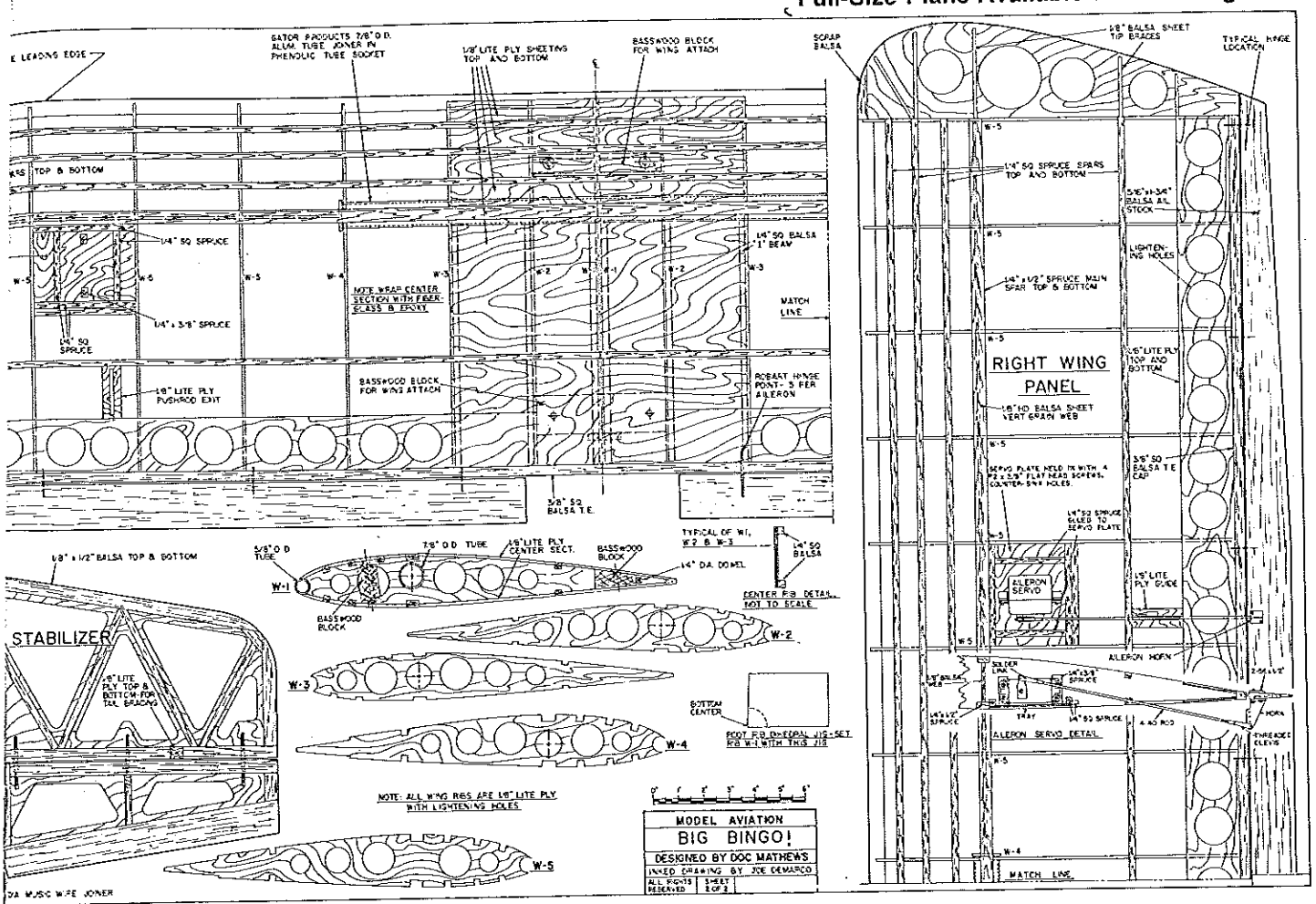
Note the precut slots for the Robart metal center hinges. You'll never hinge a large surface more easily than this!

You can either round off the ⅜-in. balsa outlines at the edges or shape them in an airfoil. Both approaches seem to work equally well.

Don't install the hinges at this point. Sand the tail surface structures, and set them aside until later.

Fuselage. The joint line shown on the plan is based on the use of 36-in. Lite Ply sheets.

Full-Size Plans Available . . . See Page 188



If 48-in. sheeting is used the joint line won't be necessary. Since it's reinforced by the doubler, the joint has ample strength.

Make the fuselage pieces using the carbon paper transfer method described above. By all means use a straightedge when drawing and cutting the straight lines.

The lightening holes shown in the turtledeck formers are used only for the lighter weight power plants, which tend to make the plane tail-heavy. In contrast, the ST 2500 and larger engines produce a nose-heavy condition.

If a large gas burner engine is used, be sure to add the ¼ x ¼-in. strips inside the fuselage top from F3 rearward and along the bottom/side joint. With this type of engine you'll also need a ¾-in. triangular balsa reinforcement at the fin-stab junction.

Since most Lite Ply sheeting has a good side and a not-so-good side, you'll want to arrange the right and left pieces with the better side facing outward. Though the ply bows after it's cut, the Big Bingo! design locks together and overcomes any potential problems from warpage. It takes a real effort to build this fuselage crooked.

Install the doublers with epoxy, taking care to align the structure to the side using small scraps of Lite Ply in the matching slots. Weight down the assembly on a flat surface while the epoxy cures. *Be sure you're assembling both a right side and a left.*

Fit F-1, F-2, F-3 and the cockpit floor together without gluing. Slight trimming of the tabs and slots may be required; just make absolutely sure the assembly is square in all planes. Tape the unit together, and flow medium CyA along the joints to double-glue all parts. The tank hatch floor is held in place with masking tape rather than glued to the sides.

Glue in the hardwood landing gear block securely, then reinforce it with a piece of hardwood triangular stock.

Install the rear bottom piece, drawing the sides into it with masking tape. With the ⅛ x ¼-in. tail post in place, clamp the fuselage together at the rear, being sure to keep the edges lined up. Adjust the rear bottom for squareness. Apply CyA along the joints, including the side joints at the tail post.

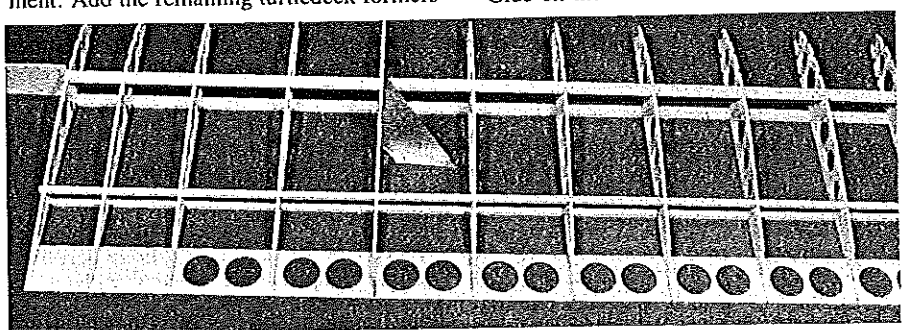
Glue the slotted tail wheel block in place with the slot centered on the fuselage bottom.

Glue T-3 atop F-3 using two pieces of scrap Lite Ply at the rear of the joint for reinforcement. Add the remaining turtledeck formers (note the reinforcement scrap pieces), making sure they are at right angles to the fuselage top. Epoxy the triangular stabilizer floor in place flush with the tops of the sides.

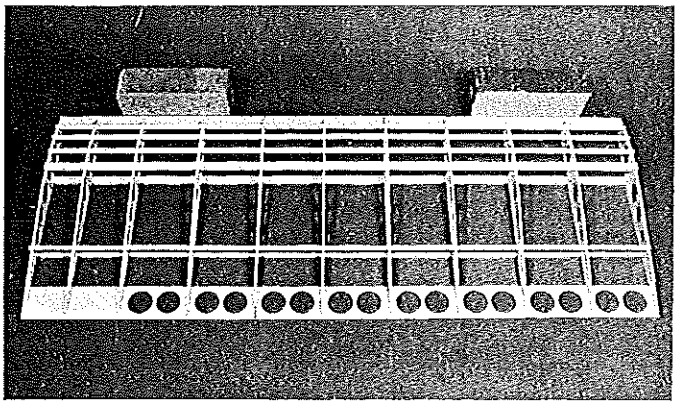
Install the ¼ x ¼-in. spruce stringers. Note that T-3 and T-7 are notched, while the other formers have flats for the stringers. This permits some adjustment of the stringer assembly for a smooth contour. One set of stringers is tucked below the surface line as it meets T-6 (rather than extending beyond it).

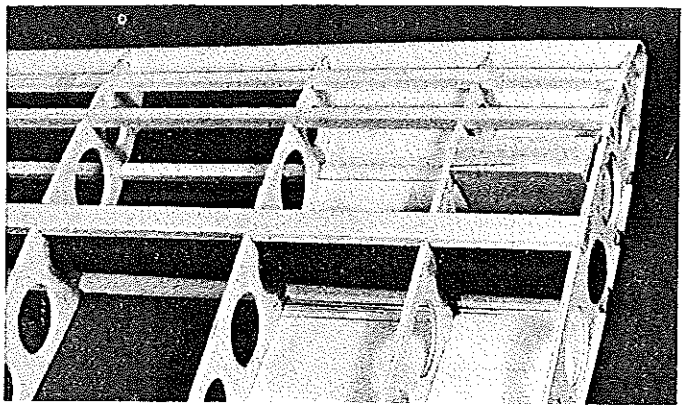
Trim the stringers to length, and smooth them to a round contour with a strip of sandpaper. Drill the firewall to suit the particular engine and mount you've chosen. My current Big Bingo! uses an ST 2500 engine, J'Tec Snuf-Vibe mounts and a Super Snuffler muffler. It's a neat setup, and far quieter than most muffled .40 two-cycles.

Glue on the bottom front of the fuselage.

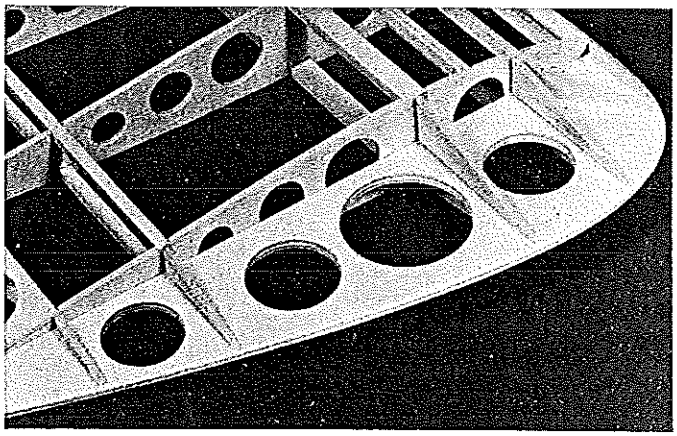


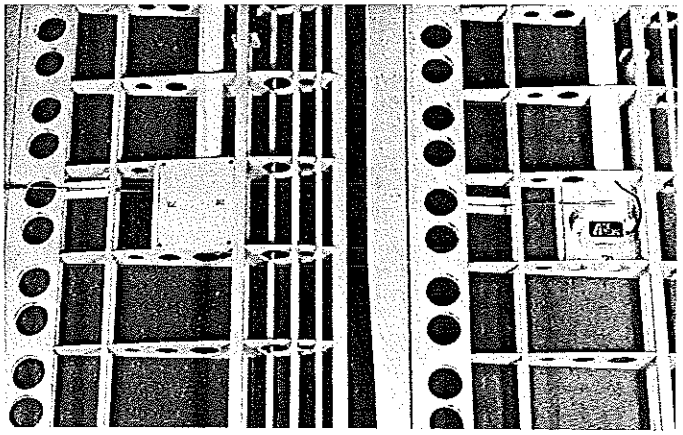
Wing construction under way. The center ribs are set to the dihedral angle using a jig; the others should be perpendicular to the work surface. Except for the balsa aileron and rear rib cap, the wing is constructed entirely of spruce and Lite Ply.





Left: The wings are built from the bottom up and are flat from the main bottom spar rearward. Here, weights are being used (bricks work fine) to hold the ABS pipe leading edge against the rib fronts as the pipe is CyA'd to the ply. Right: A phenolic tube, used as a socket for the aluminum pipe wing joiner, is glued to eight of the center section ribs to compensate for the dihedral. Note the large basswood pass-through block for the hold-on bolts, and the use of Lite Ply for the center section sheeting.





Left: Lite Ply wing tips with small scrap balsa gussets are simple, lightweight and strong. The outline is designed for easy covering with the same piece of material used on the wing surface—a one-piece-top and one-piece-bottom approach. Pulling the plastic sheet out and over the tips while applying heat eliminates wrinkles: heat, pull, stretch and tack. Right: The wing bottom is on the left, the top at right. One aileron servo is used in each wing panel. The servos are mounted on removable plywood plates with a single small slot in the covering. They're completely enclosed and protected from spray—very handy when flying off water. Note the paper tubes for the servo leads and noise trap.

If its grain has been cut properly, the wood should bend easily.

Make the cockpit and hatch. Build balsa rails on the fuselage, cut a Lite Ply top, and glue it to the rails. Balsa block is used to form a quarter-round tapering into the fuselage sides, as shown on the plan.

After final sanding, cut the hatch area free with a razor saw. To hold the hatch in place, attach two strips of ¼-in. plywood to its bottom and thread ¼-40 bolts into the hatch through the fuselage side.

Position the hardwood wing hold-down blocks as shown on the plan. The blocks should be centered 3 in. from the rear of F-2, with the rearmost one 3 in. from the front of F-3. They must be flush with the wing saddle and can be rasped to final shape if necessary.

Place the completed wing assembly in the saddle. Mark it for equidistance from the tail post. Measure and mark the locations of the holes, then drill through the wing into the fuselage blocks. Remove the wing, and tap the blocks for ¼-20 bolts. Enlarge the wing holes to ¼ in.

Although enough room has been provided for a Du-Bro 20-oz. tank, a 16-oz. size is sufficient for even the large SuperTigres. Coat the inside of the compartment and the bottom of the hatch with epoxy before installing the tank. Position the tank as high as possible with both lines exiting the firewall, and cradle it in foam rubber. A 1,200-mAh flat battery pack will fit under a 16-oz. tank.

Install the throttle linkage with the engine temporarily in place. Use whatever method you prefer to hook up the throttle.

A carved wooden cowl is shown; it can be as simple or as fancy as you wish. Remember to fuelproof the cowl interior. Tru-Turn makes a spinner backplate that's especially drilled for the ST 2500 and ST 3000 engines; the 3½-in. unit has worked flawlessly for me.

You have a range of options for installing your engine, all of them aesthetically appealing. Some of the prototypes use sidewinder engine mounts, others have the engine installed upright, and still others employ one or another of the fiberglass units on the market.

Rudder, elevator, stabilizer, fin and pushrods. Tack glue the stabilizer to the fin, keeping it perpendicular and aligned with the rear of the stab. Using the Robart hinge point, bring the units together without gluing; it's much easier to hinge permanently after the stab and fin are covered. File a notch into the stab trailing edge for clearance of the elevator joiner wire.

Slip the tail wheel tiller arm into the hole in the rudder, and place the assembly on the fuselage stabilizer mount. Slide the tongue of the tail wheel bracket into the slot in the tail wheel block, then attach the bracket with epoxy. Tack glue the stabilizer to the fuselage.

Hook up the elevator and rudder using fiberglass pushrods and appropriate hardware. Cut 4-40 threaded rods to 2¾-in. lengths for the front and 6½-in. lengths for the rear. Slip the Dave Brown plastic plug over each of the rods with a pointed right angle on the rod end. Leaving the fiberglass rods at full length, drill a 7/64 hole one inch from each end of the side.

Assemble the pushrods by poking the bent end of the wire through the hole in the shaft, then smearing the plastic part with epoxy or thick CyA and pushing it into the shaft. Secure the wire with thin CyA. Repeat the process for the other end. I prefer a 4-40 solder link on the servo end and an adjustable clevis on the surface end.

Slip the pushrod guides over each pushrod, and install them in the fuselage. The rudder and elevator pushrods cross over, with the rudder pushrod exiting in the lower fuselage slot and the elevator pushrod in the top one. Install the Rocket City ¼-scale horns on the rudder and elevator in the predrilled holes. *Continued on page 148*

Larry's Emmy/Jolly

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and won the Most Realistic Flight award. With most of the team on hand, the Emmy certificate on display, and hundreds of modelers watching (most had read the *Model Aviation* article), the day turned out to be a super homecoming for ol' 723.

I can't tell you how much it means to me that our LJMP team was able to achieve such a performance. Winning an Emmy with a model aircraft is bound to reverberate in a better public image of our hobby. I hope everyone who's interested in model aviation can share in—and ultimately benefit from—this award.

After all, "Miracle Landing" couldn't have been made except with a model. That makes me glad and proud. □

Big Bingo!/Mathews

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Adjust the wire length on the servo end for neutral position in both the servo horn and the surface being moved. Disconnect the pushrod at the horn end, pull the rods forward, and solder the front links with silver solder.

Temporarily remove the fin and stabilizer, then give the model a final sanding before covering.

A choice of landing gear units is given on the plan. If you're using a 1.20-stroker or a smaller two-cycle engine, the Klett fiberglass gear included in the Ace 4-120 kit is preferable, since it's nearly a pound lighter than the longer aluminum unit. The Klett unit, however, will safely clear only 16-in. props. The landing gear can be secured to the fuselage block with a #6 x 1-in. sheet metal screw, or with 6-32 bolts and blind nuts if you prefer.

Covering and finishing. Since the Big Bingo! wing uses the stressed-skin engineering principle seen in full-scale aviation, it depends on the covering material for some of its torsional strength. Hence the softer, lower-heat covering plastics are inappropriate. That still leaves you with a wide choice: MonoKote, Ultracote, Oracover, Koverall and dress sheathing have all been tried successfully.

Here's my quick-and-dirty approach to finishing: I use plastic film on everything except the inside of the cowl and under the tank area. The latter are sealed with two coats of K&B Superpoxy clear, then painted with white Superpoxy. I usually spray the landing gear and wheel pants with Rustoleum. Of course, you can use your own custom finishing method, as long as you don't cover the wings with any of the lower-heat materials.

One of the prototypes is covered with orange transparent MonoKote with Rustoleum white borders on the wing. It looks wonderful, but some of the paint has chipped. To prevent that, try using a primer on the MonoKote before spraying on the color. I used DJ's Multistripe material for the pinstripes, then sealed and fuelproofed it by brushing on a thin layer of Superpoxy clear.

Wheel pants are a must; Big Bingo! won't look right without them. Several choices are available. The ABS variety from Ace R/C works fine. Ace also carries fiberglass

units from the Extra 230 (part #13 E 5030 WP) that look terrific. Fiberglass units from the Sig Manufacturing Company's Bravo were used in one of the prototypes.

Preflight checking. A construction article I read recently offered a startling (to me, anyway) approach to balancing a model. According to the author, his model would tilt approximately 15° downward when balanced at the indicated points. That contradicts my long-held assumption that a downward-canted model is a nose-heavy model.

My balancing instructions are more conventional. Test for center-of-gravity by placing your fingers on the balance points shown and lifting the model; if it was built and balanced correctly, the airplane should remain level rather than tilt in either direction. Use the forward balance points for pussycat flying. Go to the rearward ones for stronger aerobatics.

I'm constantly amazed at the wide range of safe balance points on this airfoil. At an IMAA fly-in recently the bolts stripped out of my big SuperTigre and the Tatone Snuffler fell off, yet performance and landing were so nearly normal that it took a close-in flyby to tell for certain what had been lost. (The Snuffler, by the way, was found.) With almost a pound of weight shaved off its nose—the muffler unit weighs 14 oz.—the model flew just fine. Try that with an ordinary design!

I've seen 10 different versions of these 4-120 low-wingers fly, and only one turned out below expectations. A lot of things were wrong with that model. It wasn't developing full power due to being mispropped, it was balanced on the rear of the main spar, it had even more surface deflection than described for wild-side hotdogging—*and* its pilot was scared to death of it. Absent the other factors, the last-named would have cured itself. Properly set up, Big Bingo! is large but well behaved—so docile, in fact, that anyone who's comfortable with an Eagle should be able to fly it with no problems.

Before heading off for the flying field, test all systems for operation, tighten every nut and bolt once more—and go get 'em!

Flying. I've been repeatedly amazed by a delightful idiosyncrasy in this entire 4-120 and Big Bingo! series, for which I have no explanation other than pure dumb luck. These models have an inverted profile; they do outside maneuvers even better than inside ones. Even though the airfoil isn't truly symmetrical, the darned critters don't seem

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to know when they're upside down!

In the hands of a good aerobatics pilot the Big Bingo! will even do a Lomchenvak if it enters the maneuver inverted. I have no idea why.

When it comes to other maneuvers in the aerobatics repertory, Big Bingo! is limited only by the pilot's skill. Snaps, spins, figure eights, vertical eights, Cuban eights, snaps at the top of an inside loop, inverted flat spins—this model can do them all.

At the other end of the scale, Big Bingo! is an aerodynamically clean design. You can slow it way down and it won't get squirrelly. The model tracks exceptionally well on takeoff, needing only a touch of right rudder about halfway down the run. It can be trimmed to fly hands off, yet will go exactly where it's pointed once a maneuver is begun.

I've even worked out some special choreography for this aircraft. During vertical climbout I deflect the rudder alternately left and right to make the plane wiggle on the way up, then follow with a stall turn and half roll on the way down. I call it the "Bingo wiggle," and it's beautiful to watch. Because the airplane is so stable when inverted, spectacular low-level, low-power inverted passes are safe.

Landing the 4-120 monoplanes and bipes is a bit unusual, since the landing gear is farther forward than normal. It's possible to do gorgeous wheel landings by slowing the model down well out on final approach, then bringing it onto the deck with no flare.