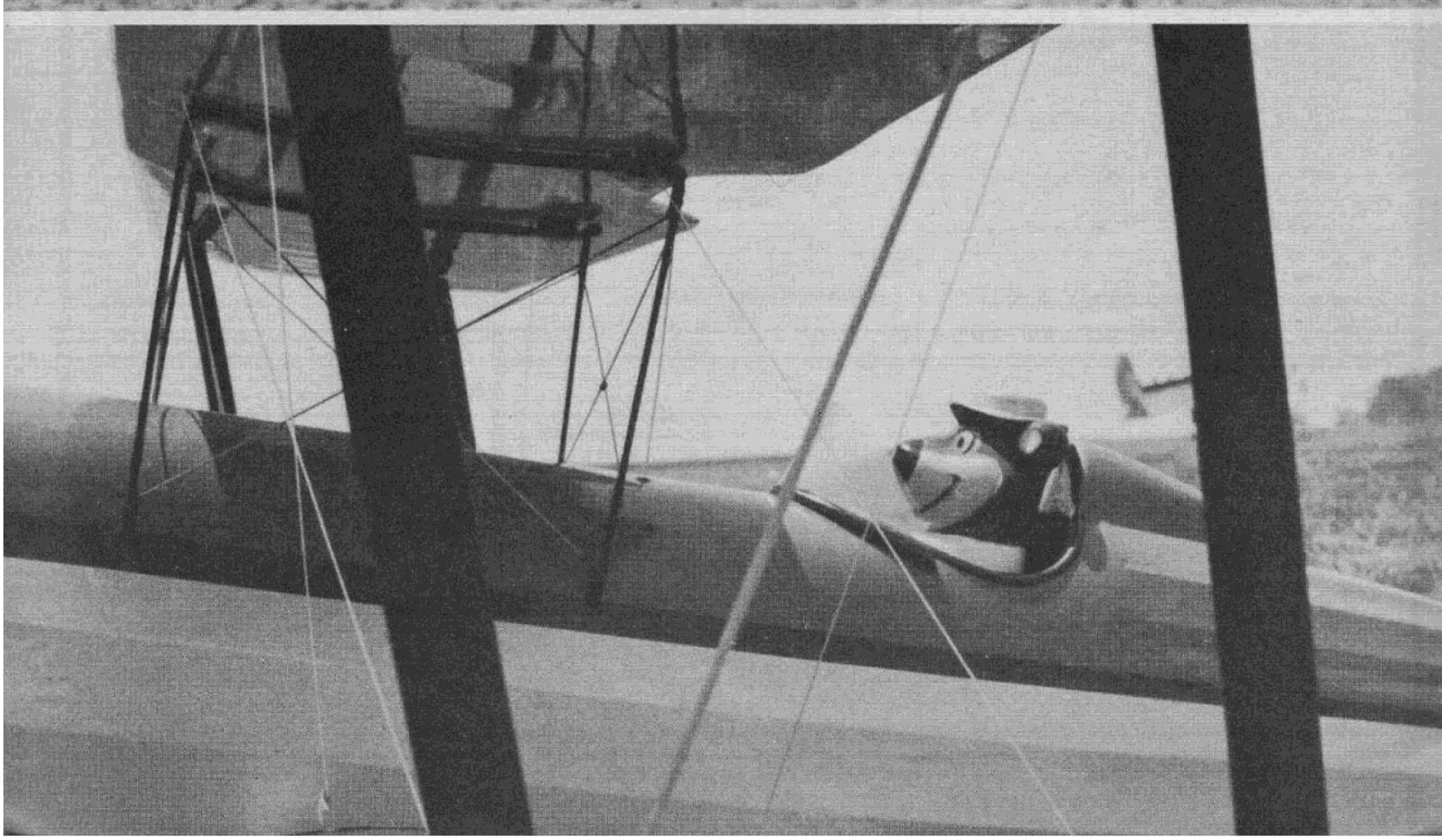
Yogi Bear readies Big John O.M.T. for an early morning flight. Build a Big John and help stamp out balsa wood by buying it all!



**THERE'S JUST NO TELLING HOW FAR SOME GUYS WILL GO TO SUPPORT THEIR LOCAL HOBBY DEALER. HOCK YOUR WIFE, SELL THE FURNITURE, AND START IN ON THIS 1500 SQ. IN. MONSTER.**


Tom Mahon of Carmichael, California, poses with his S.T. .71 powered Big John prototype.

# BIG JOHN O.M.T.

**BY BOLIVAR Q. SHAGNASTY AND BILL NORTHROP**


WHEN Don Dewey asked me to write an article on Big John O.M.T., I consented but felt that in all fairness, my old RPI aeronautical engineering classmate and Theta Chi fraternity brother, Bolivar Q. Shagnasty should do the job.

Y'see, he actually sketched out the first B.J. one night back in 1942 when we were sitting around a table in Pete Simonian's Bar in downtown Troy, N. Y., guzzling beer and discussing the kind of airplane we'd like to own if we could design it ourselves. Well, old "Ball-Q" (short for Bolivar Q. You know, "Que-Ball" turned around) didn't exactly sketch it, you might say he "scratched" it. If the place is still there, one of those tables has the original layout for Big John carved by penknife right in the middle of the top. When a true genius gets inspired, he can't always wait for pencil and paper!

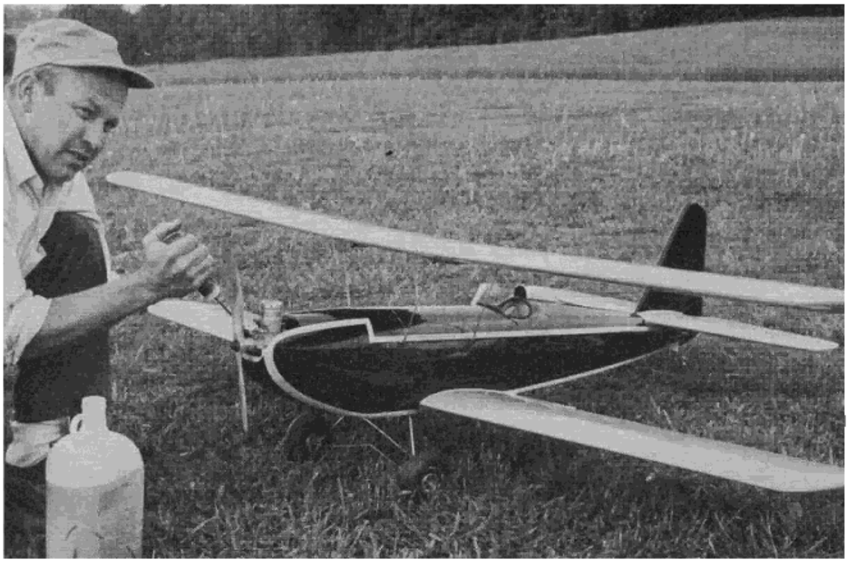
We lost touch with each other a few months later (both flunked Calculus IV and had to go to war) and it wasn't until a few years ago when, having seen my "Wild Child" article in RCM, that Shaggy got in touch with me. He's located somewhere in the hills of Tennessee now and runs a small outfit known as "Flying Stills, Inc.," whatever that is. I was sworn to secrecy as to the location of the general store where he picks up his mail.

Anyhow, it turned out Shag is still keeping a hand in the aero engineering field and he sent along drawings of the plane he's using in his business. It looked like a perfect R/C project to me, and being a biplane nut, I drew up model plans for the original Big John. Shag suggested the name because he wanted to preserve the memory of the rather unusual place where he did his best thinking, particularly on the upper level, he said.

Shag was tickled about doing the article, but was well aware of the fact that he had neglected English grammar and spelling in his school days. Don told him to give it a try, and if it didn't come off too well, he'd have me edit for him. As it turned out, I had to write the whole damn thing. Just to give you an idea, here is part of Shag's introduction:

"Cordin to my buddy Will back in Delywar, this hear R/C plain mite have made won guy reel happy, feller by name of Glen, out in Montyzumer, Idyho. Coarse that was when he had balser wood out the gazoo and wus atrying to get rid of it. Now hez havin a fit gitting any . . . and balser wood is skarse too.

"Anyways, Dawn Dooey (J'ever tawk t'her ona fone? Hope she's as purtty as she sounds.) asted me to right somethin about Big John so's y'all mite get innerestid in bildin won. Coarse I tole him (er . . . her) y'all wood have a ruff time readin my ritin, caws my riting is rote rotten. (Li'l joke thar.)



Graham Lomax and Micro-Avionics rig with Veco .61 powered Big John. With the surfaces shown, all maneuvers are very smooth, precise and unhurried. . . . The ship is extremely easy to fly, and though not a beginner's to build, is certainly an ideal ship for a beginner to fly.

"I spose sum of yew fellars mite like to gno (betcha thot I'd spell that 'thout the 'g,' dinya?) howscum I calls this plain Big John. Y'see, we got a sorta unusual place out back here an . . ."

Well, we've been through that once, but you get the idea. Shag said he'd settle for the by-line anyhow.

Big John O.M.T. is the fourth in a series. Actually, only two have been built to this size. The Duster was a 7/8 reduction, and Galloping John was a 40-inch version for single channel.

Starting with Shag's original idea, I've tried to evolve a nice big realistic biplane that doesn't short change on flying ability. The 13½ percent airfoil is one of the main contributions to the success of B.J. The increased drag of an extra wing has been the downfall of many designs. By using a thin airfoil, this effect has been somewhat reduced. This 1500 sq. inch monster booms along about 60 mph with an Enya .60 on 12 x 5 Top Flite and will do the whole AMA pattern within the allowed time.

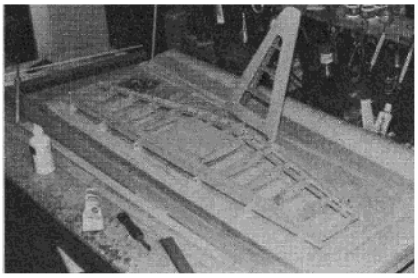
Though most R/C biplanes are built and flown for pleasure rather than for AMA pattern (Yawn, ho-hum, and wake me up when the scale event starts), those who would enter contests find that taxiing maneuvers are difficult for a bipe on windy days. The upper wing usually scoops up air and fights the rudder and tail wheel to a draw. Consequently, the biplane taxis downwind until it runs out of fuel, range, or runway. Of course, you could add a nose gear (but I've found steering with wheel brakes to be quite effective and scale-like.

I purchased 3 surplus micro-switches (Kirkland's SAC switch sold by Ace Radio Control works nice, too), and mounted them on the elevator and rudder servos to operate WAG brakes. Full up elevator activates both brakes, and, if full rudder is applied while up elevator is held, the brake opposite the desired direction of turn is released. Although the tail wheel must have a very light centering spring, takeoffs into the wind are no problem. Cross wind takeoffs, however, require some tricky rudder work, but this would be the case whether or not the tail wheel is locked.

With the control surfaces shown, all maneuvers are very smooth, precise, and unhurried. You must fly through rolls, not just slap the stick over and count, "onetwothree." There is a definite need for proper application of top rudder, down elevator, top rudder. Overall, however, the ship is extremely easy to fly, and though not a beginner's to build, is certainly an ideal ship for a beginner to fly.

There is no such thing as running out of possible improvements. In case you want to start right out with some untried revisions I'm planning for this winter, here's what will be done:

Ailerons will be cut into the upper



wing. At this time, the decision to use push rods from the lower ailerons or add another servo to operate in parallel with the existing servo, has not been made.

The chord of both rudder and elevators will be increased by about ¾ to 1 inch.

Tony Wilford and my old Travelaire are to blame for these planned changes. Equipped with Min-X two stick propo and a Fox .59, the T-aire, with its barn door elevators and rudder is doing square loops ten feet off the deck, knife edge from horizon to horizon, and stall turns better than any contest ship I've ever seen. The Fokker style, aerodynamically balanced ailerons in the top wing only, however, aren't quite enough for snappy roll-type maneuvers. Incidentally, the T-aire flys inverted hands-off — undercambered airfoil and all.

One more comment, about the fat tail surfaces, and we'll get on with construction.

The thick symmetrical airfoiled fin and stabilizer is a page from Dick Allen's and Hal deBolt's book, and is the one significant aerodynamic design change from the first Big John, which had ⅜ inch flat surfaces. Whatever the explanation, be it high speed stalling of the old flat tail section, or the increased drag effect of the new thick tail acting like the feathers on a dart, Big John O.M.T. tracks through the air as smooth as a big jet at 25,000 feet.

By the way, in case you don't know, O.M.T. means One More Time. Just got tired of Mark II, Model B, and all that junk.

**CONSTRUCTION**

Most every multi R/C construction article writer makes the assumption that his plane will only be built by modelers with a great deal of building experience. As a result, the writer usually says something like, "The Blivet Flea will be built only by modelers with a great deal of building experience (See? What did I tell you?), and therefore the construction notes will be limited to unusual features of the assembly, such as the 3/32 inch dural leading edge, the unique breakaway fuselage aft of the wing, and the laminated condenser paper covering on the inverted V-tail."

Well, the assumption ain't correct! There are plenty of modelers on their way up the scale of difficulty who appreciate a little more than a casual "Oh, you know how to do **that**," when it comes to areas that many of us take for granted.

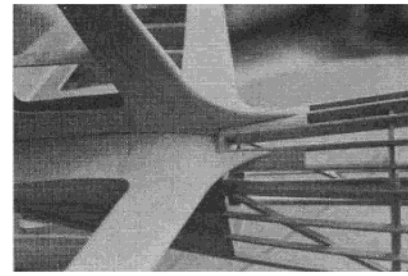
Armed with Don's permission to hog some space, and with the idea that many model builders are going over their heads to tackle this monstrosity, I will attempt to tell all without making a book out of it.

While building Big John, you must keep the same thought in mind that I did while designing the structure, "Build light and carry a contest balsa stick." (Thanx, Teddy.) For every extra ounce added to the tail, five ounces must be added to the nose to balance it out. Three extra ounces aft of the cockpit and it will take **one pound** of lead in the nose to counterbalance it! Anyhow, being a model airplane, not a girl, you don't want it to be built like a brick outhouse or it'll fly like one.

Speaking of girls, let's start construction with the . . . er . . . empennage. You can count on one hand the number of heavy sticks that go into the whole tail section; rear stabilizer spar (1) and its hardwood doubler (2), rear fin spar (3), lower rudder hardwood insert (4). The remaining material is all medium or soft (Sig contest) balsa.

Copy the fin and stabilizer ribs onto tracing paper and transfer the patterns onto medium 1/16 inch sheet balsa using a "T" pin. Be sure to mark the centerline at ends of each rib. In order to provide added strength where stab is glued to fuselage, rib S-1 is made from ⅜ inch sheet. Draw in the rib shapes by connecting the pin holes. I use a Lindy Auditor's Fine Pt. ballpoint pen; in fact,

Big John . . . in the biplane form, the upper . . . er . . . wing is directly over the lower . . . er . . . wing. Building is copied from military spec's which designate upper . . . er . . . wing as for officers only. Spec MIL-TFD.



this is a fine instrument for all accurate wood marking.

Start actual assembly by pinning the ¼ x ½ hard balsa rear spars and ⅛ x ½ medium balsa sub-leading edges over the plans. These must be blocked up with ½ inch scrap material to clear the big fat ribs. Don't forget the ⅛ x ⅜ inch hardwood doubler on the inside of the stab rear spar.

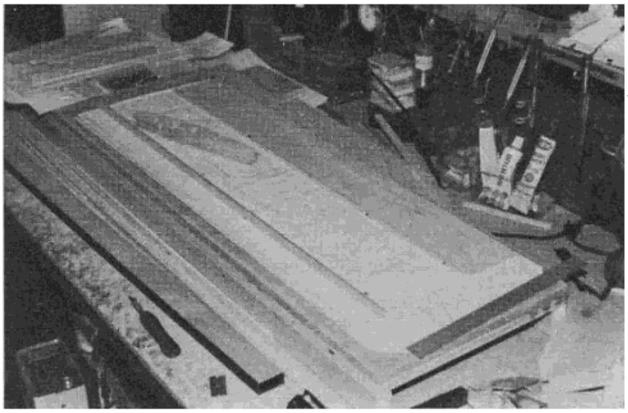
The secret of airplanes that fly "right off the board" is true alignment. To assure this, mark a centerline on the inside surface of all rear and sub-leading edge spars before pinning them in place. As you bevel and glue in the ribs, the spar and rib centerline marks can be matched for perfect alignment.

Install the ⅛ x ¼ (elevator) and ⅛ square (rudder) spars on the "up" side, followed by the rear 1/16 inch sheeting. Bevel the sub-leading edge and install the 1/16 inch leading edge sheeting and center section sheeting.

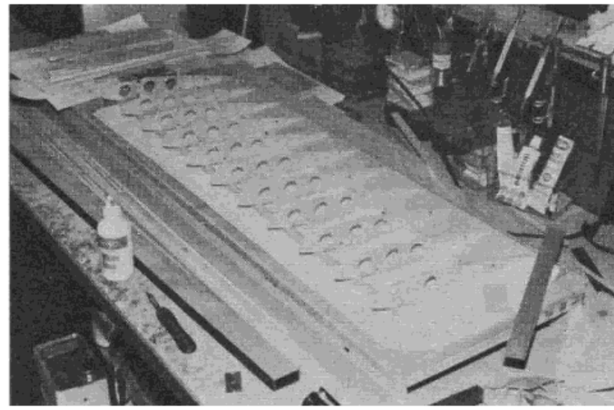
As soon as it is dry enough to remove all pins, turn the surface over, pin down again securely to the ½ inch blocks, and complete the assembly. Before "closing up" the fin, install the two stubs that key the pin to the stabilizer. Allow the completed structures to cure thoroughly before removing from the jig blocks. The 1/16 inch webbing is extra stiffening that may be unnecessary in such short spans, but the weight is negligible, so why not. Add the leading edges and soft tip blocks, plane and sand to a smooth contour and prepare for your favorite covering.

Rudder and elevators are shaped from ⅜ inch sheet soft contest balsa. The hardwood lower rudder insert accommodates the rudder horn and tail wheel coupling, taking all unusual loads (like crosswind landings and ground loops) off of the soft rudder material. The 1/16 inch ply inserts in the right elevator are essential for proper and strong mounting of the nylon elevator horn.

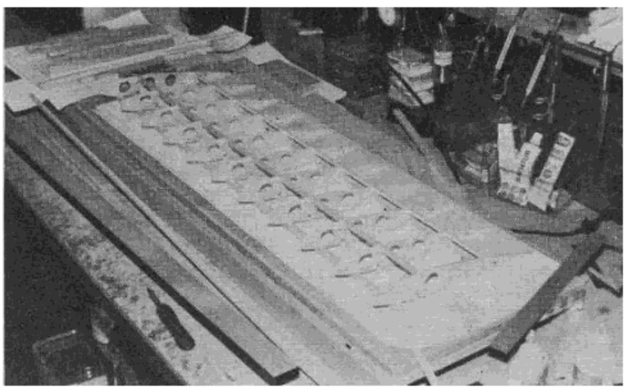
Tatone hinges were used on all tail surfaces, six on the elevator and three on the rudder. The bottom hudder hinge is installed just above the hardwood insert, the other half going into the fuselage tailpost. One obvious advantage to this hinge is that the control surfaces can be assembled after covering. Following Tony Bonetti's suggestion, stainless steel sewing pins are substituted for the brass wire included with



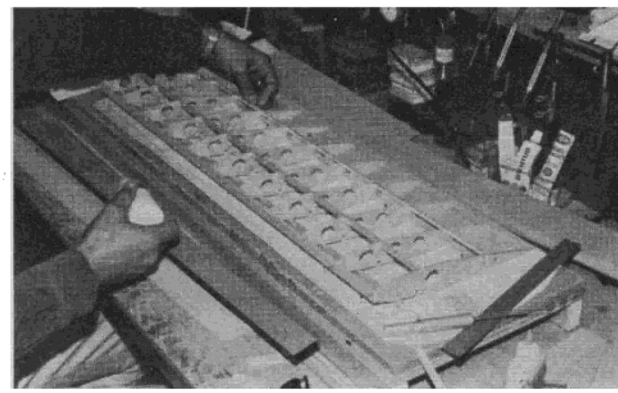
Jig strip, T.E. sheet, and bottom 3/16" spar.



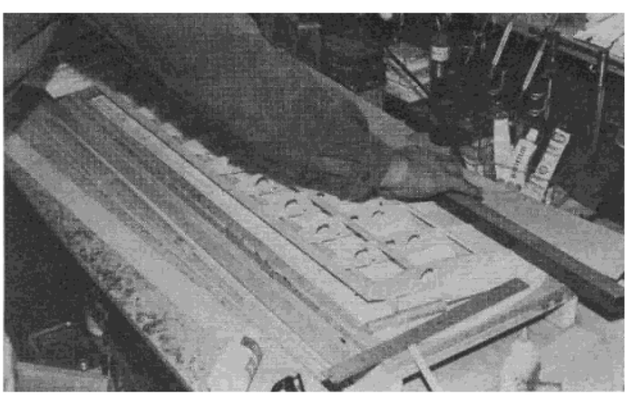
Ribs in place.



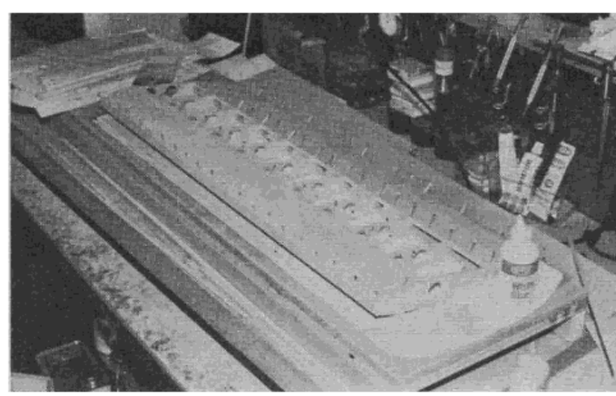
Top spars added.



Rear webbing and sub L.E. added.

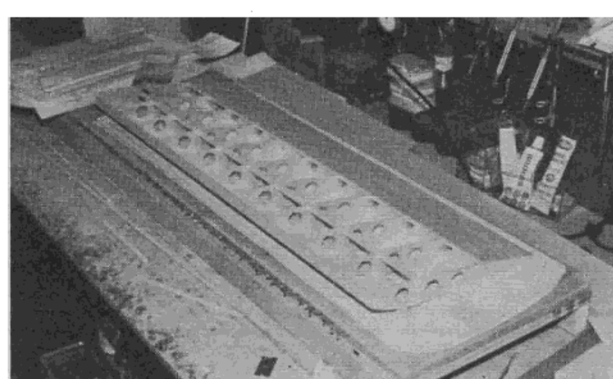


Tapering T.E. sheet.

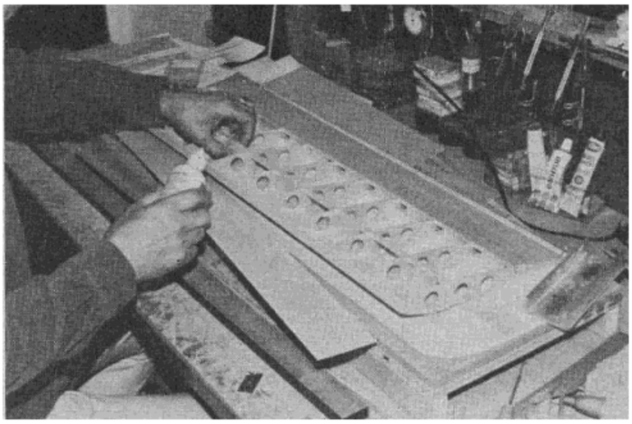


Top L.E. and T.E. sheets added.

Cap strips.



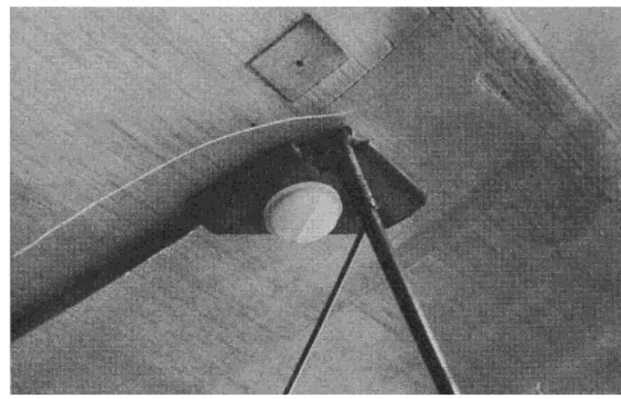
Wing turned over and bottom 1/4" sq. spar added.



Front webbing, bottom L.E. sheet next.

Cutting away ailerons.

Mating up wing panels to center section.



Close-up of upper wing attachment.

the hinges. Leave heads on and bend other end after inserting.

If you want to follow my usual building pattern, let's tackle the wings next and get them out of the way. Actually they are easy to build, just tedious and there's too damn many of them. To make the job easier, all four panels are exactly alike and can be built over one plan. (No, Clyde, one at a time . . . one at a time.)

Simplest rib cutting method is delicatessen style, like slicing bologna. Transfer the rib pattern to a 4-inch thick block and cut it out on a band saw. Using spar stock as a guide, cut nice snug notches and sand the block smooth. Now set the saw guide fence for a 3/32 inch cut (This is where you depart from delicatessen style. Nobody can cut it **that** thin), and begin slicing. To keep the slices even, turn the block end for end occasionally, starting from L.E. and then T.E. Simple? If you don't own a band saw, it's worth the trip to a friend's house to do the job. The whole batch can be done in about an hour, give or take one beer.

If you like to torture yourself, make an aluminum template, and cut all 55 ribs one at a time. In fact, why not watch Batman at the same time and **really** suffer?

Just for the heck of it, I made a cookie cutter by grinding a sharp edge on one end of a short length of 3/4 inch diameter electric conduit tubing and removed some excess wood from the ribs, as can be seen in some of the construction photos.

Although manufactured wing jigs may be used, the flat centersection could present a problem, so study the following method through first and then make your choice.

As mentioned before, all four outboard wing panels can be made over the same plan. They're all alike except that certain variations are required in order to come up with two left panels and two right panels.

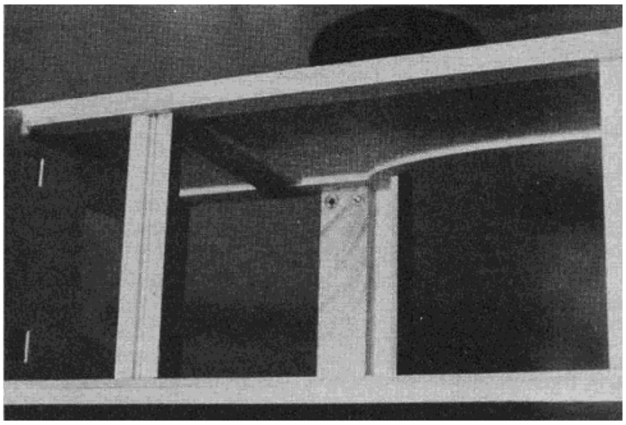
After they come off the board, the panels you select for the bottom wing will have ailerons chopped out of them.

Place the wing plan on that absolutely flat surface of yours so the trailing edge line is right on the edge of the board. Slap on a piece of Cut-Rite plastic and we're ready for the first panel.

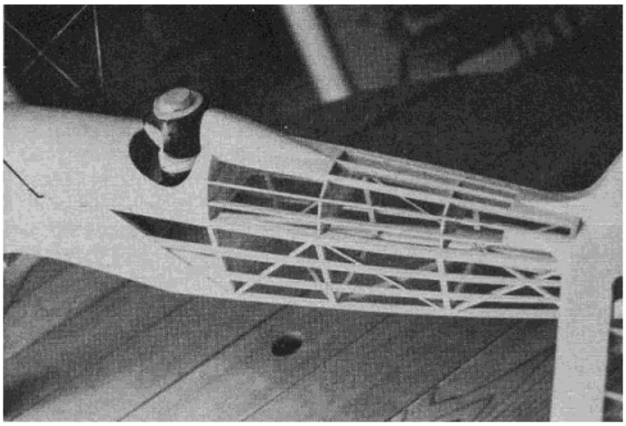
The trailing edge sheeting is roughly 3 3/4 inches wide so that the usually curved 4 inch sheet stock can be trimmed with a metal straight edge. (If you build this one crooked, it ain't going to be **my** fault.) Lay the lower T.E. sheet on the plan and position it with a couple of pins. Now glue and pin the 3/16 square bottom rear spar in place along the front edge of the sheet. Angle the pins forward to clear the upper rear spar which comes along soon. Put several ribs in place along the panel and position the 1/4 x 1/2 jig piece that supports the ribs at the proper angle. Ribs should sit flat on the bottom T.E. sheet and just rest on the jig. Pin the jig in place and leave it there throughout the construction of all four panels. Glue all eleven ribs in place, using an 1/8 inch rib at whichever end will be the inboard tip of the panel. Using the dihedral braces as a guide, a jig may be made out of some scrap wood to tilt the inboard rib at the proper angle to mate with the center section. Dihedral is the same in top and bottom wing — one degree per panel (one inch at tip rib).

Next glue in the two top square spars and the sub-leading edge. It's easier to bevel the latter **before** you glue it in place. Install the 1/16 webbing pieces **behind** the rear spars. Grain direction is unimportant, but do **not** leave them out. The triangular boxes, formed by the sheeting and webbing at both leading **and** trailing edges provide the strong but light construction required for the relatively thin 13 1/2 percent airfoil.

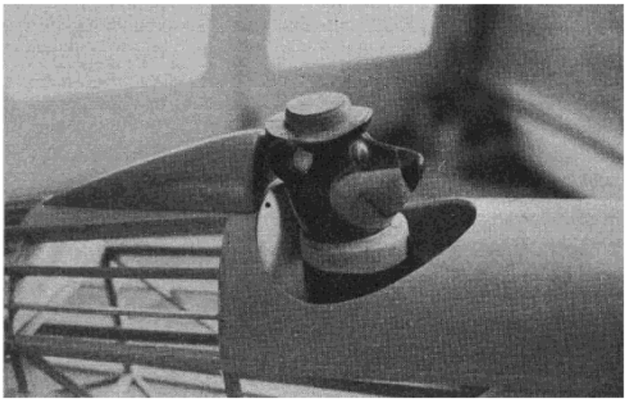
Now comes the reason for placing the trailing edge along the edge of the construction board. The bottom T.E. sheet must be tapered to accept the top T.E. sheet in a smooth, straight line. Delta Enterprises' 42-inch aluminum sanding stick sure comes in handy for this oper-



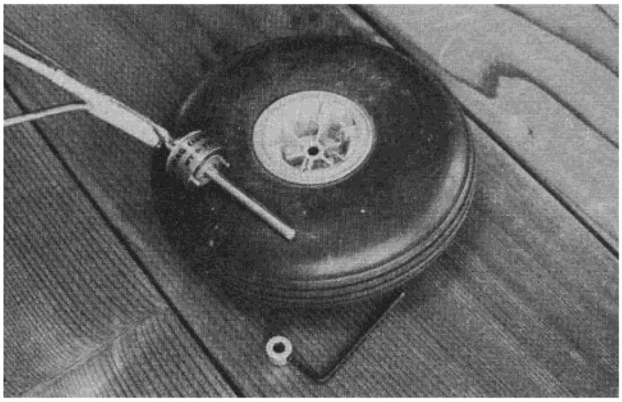
Top view of fuselage — cabane mount detail.



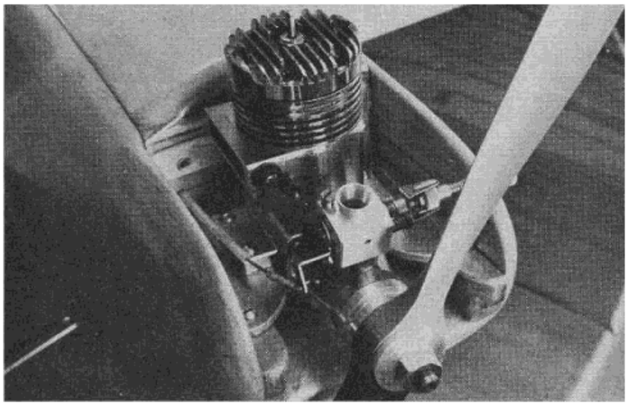
Completed fuselage — empennage assembly.



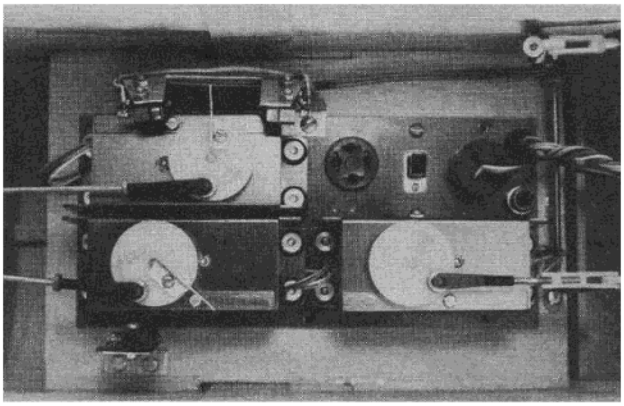
Cockpit detail and Yogi Bear.



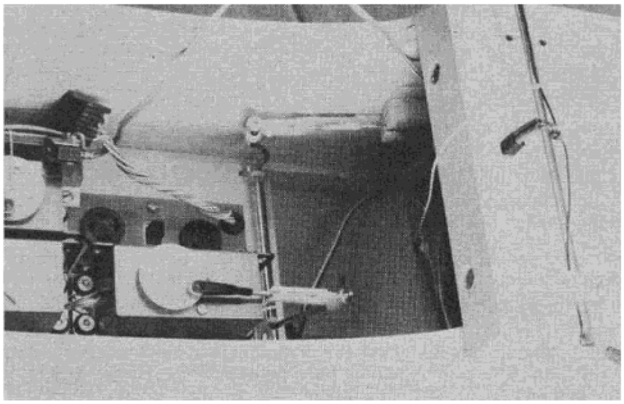
Veco 4½" wheel lub. Grind out to accept wag brake.



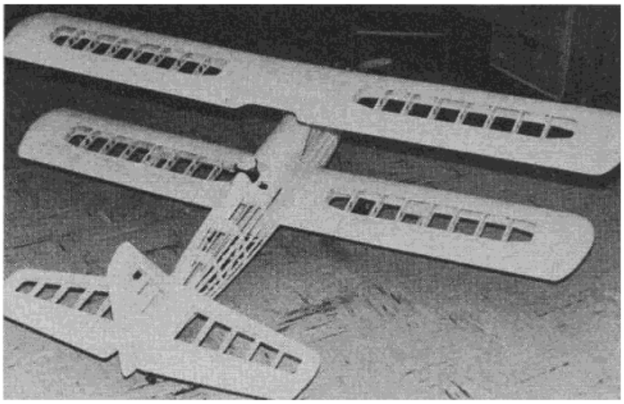
Enya .60 installed. Hatch hold-down plate minus screws.



Dee-Bee servo installation.



Another view of servo installation.



Don't tell the wife how much this one cost!

ation. By sliding slightly down the ribs and bearing down as the sander hits that bottom sheet, a nice blending taper will result.

The top T.E. sheet should be straight trimmed to size before applying, but the L.E. sheet only needs one edge dressed up. This edge is lined up with the front spar and the remainder can be trimmed off flush with the sub-leading edge later.

Keeping in mind which panel you're building, install cap strips on all but the three inboard ribs and the two outboard ribs. At this point you've done all you can on this panel until the glue is dry enough to lift it off. I say dry enough, because if you plan to turn it over and pin it down to continue work on the other side, O.K. Otherwise, leave it there until the glue is **completely** dry.

When you turn the panel over, lay it flat on the top T.E. sheet and slide it toward the jig piece until the forward top portion of the wing rests on it. Align it with the drawing underneath to make sure the wing won't be held in a warped attitude while it is being completed, and pin it down.

Final steps on this panel include the bottom front 1/4 square spar, the 1/16 inch webbing (ahead of the front spars), the bottom L.E. sheet, and the cap strips (except on three inboard and two outboard ribs, remember?). O.K., one down, three to go . . . Humph!

Let's assume you have survived through all four panels. Next job is to select the two bottom panels and whack out the ailerons. Using a straight edge, mark a line on the wing from the third rib out and 3/32 of an inch **ahead** of the aileron hinge line, top and bottom. Cut the sheeting on these lines. Now, using a pin and eyeball measuring, find and mark a line just outboard of the third rib. If you're lucky, when you make this cut, you'll just miss the rib. Rottsa ruck! You now have an aileron all cut out, but it's still attached to the wing by the ribs. I just happened to have an X-acto saw blade that had been removed from the backing and was cut down with tin snips to about 3/16 inches wide. Handy little tool! Sliding this through the cuts in the sheeting, it was a simple job to saw the ribs apart.

Using the straightedge again, cut the aileron back another 1/4 inch on the top surface and 5/16 inch on the bottom. Next, cut about 3/16 inch off the inboard end, and using the rib template as a guide, make and install an aileron rib. Shortening the aileron by 3/16 inch will provide 3/32 clearance at each end. Notch bottom sheet and install 1/16 ply rib with micarta horn attached.

The wing and aileron can now be capped off with 3/32 inch sheet. However, if you use insert-type hinges, it will be necessary to install balsa blocks to receive same before you close up the works. The 3/32 inch O.D. tube and weld rod hinges used on the original do not require these blocks.

The two center sections should be built next. Use the same jig arrangement as for the main panels. Cut all rib noses back 3/32 inch before gluing ribs in place. Cut out and glue the leading edge dihedral braces to the sub-leading edge pieces, before gluing the latter in place.

Be sure to use hardwood blocks and plywood where specified. Hardwood that will be drilled and tapped to receive nylon bolts should be close grained wood such as maple, walnut, or oak. Use lots of epoxy when assembling these areas. When the "G's" start building up, these are locations where "think light" will kill you. Don't sheet the area between the front and rear spars yet.

Joining of the center section and outer panels is performed in the air, so to speak. Using a pointed blade, cut the root rib of each panel back 3/32 of an

inch from the sub-leading edge to clear the dihedral braces. Now stick each wing panel on and check the mating surfaces for a decent fit with the panels held at the approximate dihedral angle.

Glue the assembly together, using epoxy on the dihedral brace and white or cellulose glue on the butt joint. Use a generous number of pins to keep the panels lined up with each other, but avoid having any pins stick out on the underside so that you may pin the whole contraption down and jig the tip ribs up one inch.

When the wing assembly has set up thoroughly, the remaining dihedral braces may be added. Cut ribs away to clear the braces, apply epoxy or white glue, and slide into place. To avoid having rib pieces falling all over the place, install front braces first, wait until they're dry, then cut the ribs away for the rear braces.

Tip sheeting can be added now, and particularly after aileron linkage is installed in lower wing, all center section sheeting may be completed. Only thing remaining is to install outer leading edges and tips. The tips are best carved and sanded to shape before attaching to wings. After shaping, I hollowed them out with a Dremel tool to about 1 1/2 oz. (That balsa dust is great for your sinuses.) Vary the amount you remove in order to balance out any uneven weight distribution you may have acquired during construction.

Plans show locations of small rectangles of 3/32 inch ply which may be added to provide attachments for struts and nylon flying and landing wires, if you're inclined to schmaltz it up a bit. We'll get to that during assembly.

Well, if you're with me so far, the worst part is over. In spite of my partiality to biplanes, I hate to build wings. Although a fuselage does have symmetry as viewed from top or bottom, there is very little that is repetitious in the construction, and it provides lots of interesting challenges to a real model builder. (Smile, Len, baby. There are lots of model buyers and assemblers in this hobby, but we designers and **builders** did start the whole thing, didn't we?)

The basic fuselage side is simply a 1/4 inch sheet forward section blending into a built up as . . . aft end. No doublers are used up front, just stiffeners and the 1/8 ply top rails with holes cut out to receive the wing strut saddles. (Saddles were cut from maple and grooved on a table saw, but regular hardwood landing gear supports, grooved for 5/32 music wire will work fine. Cut holes in the rails to match whichever type you use.)

Build two sides over the plans before adding any stiffeners. The 1/4 inch sheet outline starts right at the nose, comes straight back just aft of the rear cabane struts, drops a 1/4 inch to receive the top longeron, drops again from C-1 down to D, runs along the top of the lower 1/4 inch square longeron, follows the curve of the bottom wing to the centerline of the L.E., comes an 1/8 inch in from the bottom and goes around the landing gear supports, and then picks up the solid straight line that slants up to the short curved outline of the nose. Whew, what a trip!

Protect the plan with Cut-Rite again and pin down the 1/4 inch sides. If you can get spruce (Sig has it. Besides, it should be easier to get than balsa these days), at least use it on the bottom longeron. It will resist a tendency to curve in under tension of a doped covering. The rearmost section, from G to the tail post has an inlay of 1/8 inch balsa set flush to the inside (watch your lefts and rights!).

When sides come off the board, add the 1/8 inch ply rails, the 1/8 x 3/4 inch vertical stiffeners, the 3/32 inch wing opening stiffeners, and F-1. Check

which side is which against those ⅛ inch balsa inlays at the rear end.

Sides are now assembled, starting with bulkhead B, the wing saddle pieces, ¼ square pieces at section D, and the ¼ x ¾ hardwood bottom wing retainer. To keep fuselage straight, assemble it upside down over the skeleton top view. Plans must be placed on the board so bulkhead B hangs over the edge. You'll have to wait for that basic assembly to dry pretty well before you pull the tail together and glue, using pieces F-8, since the body is sprung out in a sort of fat curve at sections E, F, and G. In fact, you will probably have to insert these cross pieces all at one time in order to make the sides meet at the proper angle at the tail post. Install ⅛ x ¼ diagonals in the bottom, from D to G, taking care that none are long enough to cause a force fit that could push the fuselage out of line. (Did you say I'm nuts on alignment? You bet!)

The hardwood landing gear blocks may seem too large, but a few hard landings of a 10 pound airplane will prove their worth. Both blocks are 5 inches long, making the ends flush with the outside of the ¼ inch sides. Use'm plenty 'poxy when you put 'em in. Insert 5 inch lengths of 5/32 O.D. brass tubing in the wing strut saddles and epoxy in place.

Well, it had to happen sooner or later; we must now go on a bender — not booze — wire! Unless the cabane struts are formed, the front deck can't be completed, and the nose blocks can't be glued up and carved unless the front deck is finished, and the front deck — like I said, we must now go on a bender — not wire — booze.

Just in case you're in a hurry — or on the wagon — we bend wire. The secret of accurate wire forming is "start from the middle." F'rinstance, let's do the front cabane strut. Measure in about 9½ inches from one end of a length of ⅛ inch music wire and make a tiny mark with a triangular file. Measure another 5¼ inches and make another mark. This last length will be the part through the fuselage.

The handiest gadget I've ever seen for wire forming is called—you guessed it — "Handi Bender." Available in most hardware stores, it's an aluminum alloy casting with grooves across each end, and a series of holes in the middle. Several hard steel pins that fit these holes are also furnished. The grooves are 1/16, 3/32, ⅛, and 5/32 inches wide and obviously hold the wire for bending. By placing pins in the proper combination of holes, a variety of sharper bends can be made.

Clamp the bender in a strong vise. Lay the ⅛ inch wire in the appropriate groove so the 5¼ inch part is in the groove. Line up the tiny mark with the edge of the groove and, applying pressure as close as possible to the mark, bend the wire as far as it will go. The idea is to bend **more** of an angle than is required. Try for 90 degrees here. Now grasp the wire about 4 or 5 inches out from the bend (the 5¼ part still in place) and open up the angle slightly. This trick provides a nice clean, small radius bend with straight legs. Lift wire out of bender and lay over plan to check angle. Make minor adjustments until angle is correct.

Next comes something that's almost impossible to do right the first time. What you want to do is make the other bend 5¼ inches away from the first and naturally match the angle. No problem. But, when you're finished, the whole thing should lie flat. Right? I bet it won't. No matter how hard you try, it will be a few degrees off. But don't blame yourself.

When wire is drawn in production, it is also twisted in the process. Now as you bend it, part of this twist tries to release itself. There's a chance you might be off just enough in the opposite direction to counteract this effect, but not likely.

Sooo — after you get your nice, carefully adjusted bends accomplished, you'll probably have to put one bend back in the ⅛ inch groove, with the 5¼ inch leg sticking up, and twist.

Now you discover something else. The "bends" and "twists" are interacting. You get the wire nice and flat, in one plane (never mind, don't try to be funny), and one of the bends has opened up slightly. A little more juggling and this can be "tuned" out.

Next measure up each strut to the point where the two legs bend over toward each other. Since each bend gobbles up some wire, measure to a point a little beyond the bend. **Accuracy is not** as important as **consistency** here. Measure one leg, mark with the file **and mark the drawing** at the same point. Now flip the strut over and mark the other leg in the exact same spot as the first. When these bends are made, they will occur at the same length, even if they don't exactly agree with the drawing. When you are making the rear strut you will make the legs a ¼ inch longer in relation to the front strut. The important thing is that the wing will sit straight and at the proper incidence even if the gap between upper and lower wings may vary slightly from the drawing. This variation is totally unimportant.

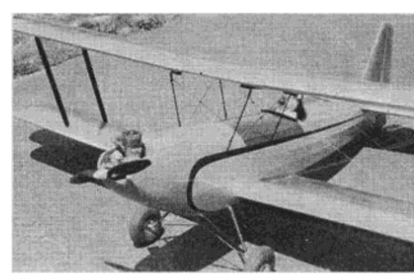
Before making the top bends, cut off all legs 1¼ inches from the bend marks. For these bends of under 90° you may want to use the pins on the Handi Bender.

Make the curved ⅛ inch wire saddles next. They do not have to follow the exact curve of the bottom surface of the wing, but the closer the better.

Now comes the most disagreeable part. You must cut your beautiful strut handywork in half! The idea here is that the fuselage may be completed, covered, and doped without interference from the cabane struts. Sure simplifies things.

Temporarily insert the strut legs into the brass tubing in the body and, using soft copper wire, bind the saddle pieces in position. Rest the top wing on the cabane in its approximate location to check the fit, and perform any slight adjustments necessary to make wing rest evenly on all four corners. When satisfied with the fit, solder all four connections. If possible, use silver solder for this work.

While you're on the wire bending kick, you might as well do the landing gear too. Follow the same precedure of working from the middle. Install the legs in the appropriate slots, fasten down with retainer plates, pull everything together and bind with copper



wire, check for alignment and again, if possible, silver solder all connections.

Now we can get back to fuselage construction. Install the front deck bulkheads C (four of 'em) and C-1 and insert the ¼ square balsa stringer. Next glue bulkheads D and D-1 together, then install, along with rear deck bulkheads E, F, & G. Add the top center 3/32 by ½ inch stringer to assist in keeping them all perpendicular. Rear stringers are extra deep to prevent excessive sagging under tension of doped fabric covering. Also note that bulkheads E and F do not come out to the fuselage cross section. This is to avoid bumps in the covering. Install remaining stringers.

The front deck should be covered with

two pieces of 1/8 inch medium soft balsa sheet. Trim to approximate size as shown on the drawing and start application by edge gluing each piece to the top longeron only. Pin in place and allow to dry thoroughly.

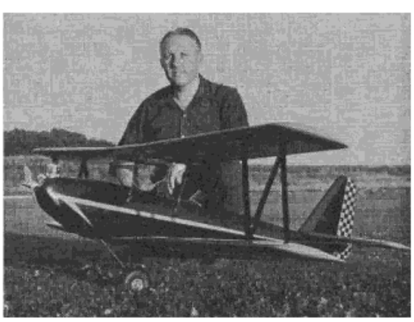
When ready to apply, spray the outside surface of one side with water and while it's soaking spread contact cement on the underside where ever it will hit bulkheads and the top center 1/4 square stringer. Also apply contact cement to these members. By the time the contact cement is ready, the sheet will probably offer no resistance to bending and following the bulkhead curves.

Water spray the other side, curve it over and trim for a tight butt joint fit against the first side. Just before pressing this sheet into place with contact cement, run a bead of cellulose glue along the butt joint.

Now glue on the 3/32 by 3/8 inch side stringers and all covering fillers. These are pretty well explained in sections B and C. Taper stringers to blend into the tail post. Glue in and trim the 1/2 inch and 1/4 inch stabilizer saddle pieces. Install the 3/16 inch ply seat for the tail wheel bracket.

To build up the nose, you must revert to a childhood pastime known as playing with blocks — a whole mess of 'em! Since many of the joints will show up on the outside surface, it's best to stick to (sorry) cellulose glue. White and contact adhesives are rather troublesome to sand and dope over.

Here's the sequence of build-up: (1) Glue F-2 (1/2 inch sheet) to **inside** of 1/4 inch sides. Rout to clear F-1 (2) **Epoxy** the 1/2 inch square maple (or equivalent) engine bearers in place. It's best to have marked their location on F-2 before F-2 is installed. (3) Glue in hatch



R. W. Knutson, Lodi, Wisconsin, with Big John. F&M 5, Enya .60.

stop F-6 on top of mounts. (4) Epoxy the 1/4 inch ply firewall bulkhead A in place. This is perpendicular to the engine bearers and butts up against F-6. (5) Glue F-5 filler pieces under engine bearers and then add fuel tank floor of 1/8 inch balsa — grain should run across fuselage.

(6) Fabricate an 1/8 inch aluminum engine plate, and locate and drill 6 holes for 4-40 plate-mounting screws. Most big engines should use 6-32 screws for mounting of engine flange to the plate. If you don't think that 4° right thrust makes any sense, leave it out. You can always make another plate later on.

Using the mounting plate as a guide, locate and drill holes in the engine bearers for the six 4-40 screws, and install steel 4-40 blind nuts. Now we can continue with the building blocks.

(7) Install 3/8 by 1/2 inch fillers under engine bearers ahead of bulkhead A. "Squunch" the fillers down over the blind nuts, but avoid clogging up the works with glue.

(8) Install 1/4 inch sheet floor, followed by 1/2 inch sheet F-4, and finally the 1/2 inch sheet piece across the front.

(9) Sand the underside flush and glue on the 3/4 inch sheet chin block.

(10) Glue 3/8 inch sheet pieces F-3 and F-7 in place.

Before making the hatch, get out your trusty little axe and rough cut the whole big blobby chunk of blocks down to something that looks vaguely like the nose of an airplane.

The hatch can be made from a piece of one inch balsa to be hollowed out later, or it can be built up of a half inch slab with spacers. Hold in place while completing the sculpturing and sanding of the nose. When finished, sand 1/16 inch off the back end of the hatch and glue on a plywood plate. Epoxy 1/16 inch plywood to the front end to serve as a fuel shield and hold-down.

Before applying any dope, mix some epoxy, thin to brushing consistency, and coat the entire nose area, in and out, for fuel proofing. Thin Hobbypoxy Formula I or II with their thinner for this purpose. Works great.

At this point you're just about ready to cover, having consumed all the balsa wood within a 50 mile radius of your shop. Construction has taken so much magazine space that I'd just as soon skip on to final assembly, but just one comment. Don't go for the shiny, super-duper, 15 coat, auto-primer plus type finish. Big John should not weigh over 10 pounds, ready to go, unless you want to spoil the scale-like flying speed and be forced to hang on an industrial engine.

Radio installation should be no problem except that there's almost too much space in the fuselage. It's like standing in the middle of Grand Central Station and trying to lean on something. The simplest solution is judicious use of beaded foam packing material around the batteries and receiver (allow room for foam rubber around the receiver case). I expoxied side rails in place to which the servo board is bolted. Because of the fabric sides, the switch is mounted in the cockpit, right by Yogi's left . . . . er . . . . paw.

Final assembly will vary slightly depending on your attitude about your flying. I am of the go-for-broke school and prefer everything put on tight. Tail assembly is epoxied in place. (No covering or dope on the contact areas.) If you prefer rubber bands, add dowels to the fuselage, glue a hollowed hardwood block around the 3/32 wire connecting the elevators, and cut away a larger notch in the rudder to clear the latter.

The bottom wing has dowels epoxied into the fuselage fairing. Slide the wing into position and mark the spots on the ply plate in fuselage where the dowels will go. Drill the holes **above** this about an 1/8 inch. Now, using a wood rasp, gradually elongate the holes downward, testing as you go, until the trailing edge of the wing can just barely meet the fuselage. Fill the area below the rear hardwood cross piece with balsa, so that it is flush with the bottom of the fuselage.

With the wing in position, mark the location of the trailing edge on the fuselage. Now measure from there to the center line of the hardwood crosspiece. Mark this distance on the **top** of the wing. The wing bolt holes should be 3 inches apart, or 1 1/2 inches from the centerline. Drill pilot holes through the wing from the top, keeping the drill perpendicular to the **bottom** surface. (When these holes are enlarged to clear the 1/4 by 20 nylon bolts, the bolt heads will lie flat on the bottom surface. Hold it! Don't enlarge 'em yet!) Again place the wing in position and from the bottom, continue the pilot holes through the balsa filler and into the hardwood crosspiece. Now drill and tap the hardwood for the 1/4 x 20 bolts. Finally, enlarge the pilot holes in the wing, and slip it in place once more. The holes don't line up? Whatsamatta you, anyhow? Well, use that round wood rasp and fudge things a little, O.K.?

You guys with a barrel full of 64 bands to use up can simply shove dowels through the body, but you'll have to add balsa filler blocks before covering the body.

Slide the cabane struts in place and fit, bind, and solder all of the .045 cross wires in place, re-section C and side view. Protect that pretty fuselage from solder and flux while you're doing the job. Although the finished birdcage will wiggle slightly now, it firms up once the top wing is in place.

Cut out and solder in place the four 1/32 inch brass or steel corner plates. Since these go **under** the bent over strut legs and the 1/8 inch wire saddle pieces, the solder job is not critical on strength. Drill a hole in each to clear 1/4 by 20 nylon bolts.

Now with the bottom wing fastened in position, place the top wing on the birdcage with the leading edge 1 1/2 inches ahead of the front strut, line up carefully with the bottom wing and (My, ain't that purtty?) — and mark the bolt hole locations on the wing. Drill and tap the wing for the nylon bolts, being careful not to come through the top surface.

The rubber band boys are in trouble with the top wing unless they read through all this mish-mash first. The strut ends in this case are bent fore and aft rather than inward. The top curved saddle piece is made with about ¾ inch sticking out beyond the leading and trailing edge. Actually the cut-out in the center section T. E. should extend to the dihedral joint. Cut off the rear inner corner of the top wing panels and cap off as is shown for the center section. In this way, the top saddle wire will be 11 inches long.

The wings are independently rigid enough not to need any struts or rigging, but B. J. looks a helluva lot better in the air with them in place, and the method worked out requires only about two minutes for assembly at the flying field. If you could hear the wind whistling through there just once, you wouldn't leave them off.

If you decided to go the route, you already have the plywood fittings in place. They go in the bottom surface of the top wing and the top surface of the bottom wing. The struts are merely ¼ by ¾ inch balsa with ¼ square plugs on each end. Make up a gimmick as shown on plans to obtain the proper length and angles for each strut.

Next, install small roundhead wood screws in each of the plywood fixtures. Slant the screws so that nylon will not tend to slip off. Tighten them down just enough so the nylon sort of pops under the head.

Four cables are needed and in case the rigging scheme is not clear to you, the cables go as follows: start at rear strut bottom, go around screw at top wing rear center, forward to screw at top wing front center, and back down to front strut bottom. The other cable in the same bay starts at bottom rear center, goes around screw at rear strut top, forward to screw at front strut top, and back down to bottom wing front center.

When first making each cable, tie a loop in the fixed end, hook it up and cut cable off about 3 inches past the last screw. Slip the adjuster on, tie a knot, and take up slack. Adjustor must be installed as shown or it will slip loose.

First flights indicated one more piece of rigging was required. On certain maneuvers, the wings tended to spread slightly, allowing a strut to occasionally pop out. Finally getting tired of making new struts which, even with longer plugs, would still get lost once in a while, I installed small screw hooks in the bottom rear and top front ply fixtures and stretched one number 32 (⅛ x 3 inch) band between them. O.K. since then, and it whistles real great in the breeze.

### Basic Materials

**Wings**

- 9 — 1/16″ x 3″ x 36″ med., front sheet
- 9 — 1/16″ x 4″ x 36″ med., rear sheet
- 9 — ¼″ x ¼″ x 36″ hard, front spars
- 9 — 3/16″ x 3/16″ x 36″ hard, rear spars
- 2 — 2″ x 4″ x 12″ blocks (ribs), med.
- 4 — 2″ x 3″ x 12″ blocks (tips), soft
- 5 — ½″ x ⅜″ x 36″ med. L. E.
- 5 — ⅛″ x ½″ x 36″ med. sub L. E.
- 1 — 3/32″ x 6″ x 12″ ply
- 1 — ⅛″ x 6″ x 12″ ply
- 10 — 1/16″ x ¼″ x 36″ cap strips

**Tail**

- 2 — ¼″ x ½″ x 36″ hard balsa (trailing spars)
- 2 — ¼″ x ½″ x 36″ med. (leading edges)
- 2 — ⅜″ x 3″ x 36″ contest balsa (control surfaces)
- 4 — 1/16″ x 3″ x 36″ med. sheeting & ribs
- 2 — ⅛″ x ¼″ x 36″ med. balsa (spars)
- 1 — ⅛″ sq. x 36″ med. rudder spar

**Fuselage**

- 1 — ¼″ x 6″ x 36″ med. balsa side
- 4 — ¼″ x ¼″ x 36″ spruce longerons
- 2 — ¼″ x ¼″ x 36″ balsa cross pieces
- 2 — ⅛″ x ¼″ x 36″ diagonals
- 3 — ⅛″ x 4″ x 36″ bulkheads & decking
- 2 — ⅛″ x 6″ x 12″ ply bulkheads and stiffeners
- 1 — ¼″ x 6″ x 12″ ply firewall bulkhead
- 1 — ½″ x 8″ x 36″ med. balsa F-2
  or
- 2 — ½″ x 4″ x 36″ butt glued
- 1 — ¾″ x 6″ x 12″ chin block
- 1 — ⅜″ x 6″ x 18″ nose block sides
- 1 — 1″ x 4″ x 12″ hatch
- 2 — 3/32″ x 4″ x 36″ deck and side stringers

**Misc.**

- 3 — ⅛″ x 36″ music wire
- 1 — 5/32″ x 36″ ″ ″
- 1 — 3/32″ x 36″ ″ ″
- 2 — .045 x 36″ ″ ″
- 4 — gallons — elbow grease

From RCModeler Mar. 1967