



GIMME A "BIPE LITE"

By BOB DeMOND . . . This large, 90-inch span biplane, also known as the "Weight Watcher", was designed to fly slowly, realistically, and above all, easily. Sort of a biplane version of our very popular "Dragonfly".

• What? A 90-inch span biplane with only a .35 engine for power? "It'll never get off the ground!" So went the usual comments from various flying buddies prior to the original Weight Watcher's maiden flight back in 1982.

The author's first choice for a large sport biplane was the M.E.N. Big John, but somehow Tower Hobbies advertised the kit some six months prematurely so the order was changed to a Bud Nosen Gere Sport. This was a fun kit to build and fly, but was heavy and underpowered with a Super Tigre .60 and later a .75 in the nose. There just had to be a better way, and the end result was the craft presented here.

The Weight Watcher indeed flies with only a .35 engine and performance is slow, majestic, and scale-like. Climbs are shallow, loops require a gentle dive to gain speed, inverted performance is strictly on the level, and rolls are a downhill proposition.

Overall weight should gross out to about eight pounds, including at least half a pound of lead in the nose for ballast. The secret of keeping the weight down is probably 80% balsa selection and 20% building technique. Use common sense: hard balsa for wing spars and longerons only; medium weight for leading and trailing edges, ribs and wing sheeting; soft for the front fuselage sides, formers, top planking, and bottom sheeting. Take special pains to keep the tail feathers light, for obvious reasons. The author used Ambroid cement throughout except where

noted, but any of the CA glues would work just as well. Shy away from the white glues and epoxies as they are heavy, and difficult to sand.

Some builders, after studying the plans, will doubtless want to substitute spruce spars and longerons, heavier plywood wing gussets, and generally beef up construction. If so, a .40 engine might well be in order. Conversely, others will want to substitute a .40 to start with, so the reverse is true. . . better beef up the entire structure so it won't fail in midair. In summary, the construction shown is quite adequate for a normal .35 engine. The author's original ship has been flying for nearly three years with an old OS Max .35 R/C and no problems after hundreds of flights.

There is nothing sacred about the plane's dimensions or outline. The second version (as shown on these plans) had tail feathers enlarged about 10% over the original. There was no marked change in performance; possibly it was a little more stable. The original was also flown with two different sets of cabane struts with widely different settings. Again, little change in performance. It's even flown without the bottom wing, but needed considerable up-elevator trim to do so. In short, feel free to modify the design any way you see fit.

WING ASSEMBLY

First study the rib cross-section. Be sure to build two right and two left panels. Also note that the bottom panels are one rib bay shorter than the top ones.

Cover the plans with waxed paper and lay out the bottom sheeting, front and rear. Shim up the front edge of the front sheeting with whatever is handy. Add the bottom center sheeting and bottom cap strips, then the leading edge (bevel bottom) and trailing edge. It'll be necessary to splice the 36-inch trailing edge stock, so do this with an angle cut somewhere out near the tip. Next add the two bottom spars and then the wing ribs, omitting the three center ones (it's much simpler to add the center ribs after the dihedral gussets are installed). Now add the top spar, remove the panel from the plans, and install the bottom tip piece. Stop construction at this point until panels are joined, using the 1/8 lite ply gussets as shown on the plans. Use CA glue for this operation.

When dry, sand leading edge top to proper bevel. Add the three center ribs but remember that the second rib has a different position on the top and bottom panels. At this point, pin one panel down at a time and add trailing edge sheeting. Glue front sheeting to spar only and let dry. Position wing so leading edge sticks out over edge of workbench. Complete front sheeting installation by adhering two pieces of masking tape, at least 2-inches long, between each rib on top of the 16th sheeting (see photo). Now add glue to ribs and leading edge, then starting at the panel center pull each piece of masking tape forward and down around the leading edge, sticking it to the bottom sheeting. This precludes ugly pin holes and

does a neater, tighter job. Finally, add top sheeting to center and tip sections and install the upper cap strips. Don't omit the 1/16 sheet shear webs with grain running vertically. Reinforce center sections with 1 inch tape and also glue some tape where the rubber bands go over the trailing edges.

FUSELAGE CONSTRUCTION

Use light contest grade balsa (most major suppliers offer 4 to 6 lb stock) for the 1/4-inch sheet sides, 1/4 and 1/8-inch formers, 3/16 top planking and 1/4-inch bottom sheeting. Also select light 1/4 square for the shorter uprights and spacers toward the aft end. This is where weight savings really pay off...the fuse will be plenty strong when completed.

Build the two halves, add the 1/8 lite ply doublers, then join at stations 4, 5 and 6. Note that former 5B is 1/16-inch wider than both 4B and 6B. This facilitates a more even bend to the sides when finished. Next, add formers 3B, 2B, and the plywood firewall (with CA glue), then the tail post. Next install the top formers, F2A through F15. Note that F2A through F7, and F15, are all 1/4 sheet; F8 through F14 are 1/8 sheet. Don't try to notch any formers except F-15 until the turtledeck stringers are ready to be added later on.

Glue in the doublers fore and aft of the firewall and make provisions for tank and throttle control installation. Next, put in the 1/8 i.d. brass tubes for the cabane struts at Stations 3 and 5. Use a squirt of CA glue where the tubing goes through the soft balsa sides, but do it from the inside. Add the 3/16 balsa pieces above and below the tubes (keeping the grain vertical). Finally, smear the tubes with epoxy and add the 1/16 ply outer plates, completing the sandwich.

Now comes the fun part, planking the top from front to F-7. (It must have been Don McGovern who said that planking is a good character builder.) Use soft 3/16 sheet, cut into strips 1/4 to 3/8 wide. Using CA, install a strip at a time alternating from one side to the other. After the first few strips, begin to gradually taper them toward the front. It'll look like the devil when finished (see photo) but beautiful after sanding. Last, add the five turtledeck stringers. Use a straight-edge to mark where they go, then notch the formers 1/8-inch for each stringer. This way they'll end up straight instead of curvy. The bottom fuselage sheeting is self-explanatory as shown on the plans.

TAIL GROUP

The stabilizer is pretty straightforward after studying the cross-section and plans. Watch the balsa weight and don't forget to add the spruce doubler to the trailing edge center where the hold-down rubbers go. Try to find some fairly light tapered stock for the elevator.

The vertical fin is somewhat different than most, and cannot be built flat over the plans. Here's how to proceed: First glue the 1/8 square pieces to the rear of the leading edge and front of the trailing edge. Pin down both and add R-2, then remove from the plan and install both spars and both R-1 pieces "in midair." This will

allow the R-1 pieces to bend evenly, thus creating a symmetrical airfoil. Proceed by adding the remaining 1/16th sheet ribs, one at a time, keeping things evenly stressed.

FITTINGS

Perhaps the toughest part of the whole plane is fabricating the 1/8 music wire cabane struts. The wire is hard to bend and it's difficult to make both front and both rear struts exactly the same height. (Possibly welding rod could be substituted for all but the top pieces where the wing rests. It's certainly easier to bend.) When the struts are done, get some 1/8-inch i.d. vacuum hose from an auto parts store (or some 1/8-inch i.d. neoprene tubing from a building supply store), slit it, and slip it over the top piece. Wrap with black electrical tape and the wing will have a much softer cushion to sit atop than bare wire. The 1/8" i.d. vacuum hose also works great for cockpit combing.

The landing gear uses 5/32 wire for the main portion and 1/8 wire for the rear strut. Bind and solder like the cabane struts. After the fuselage is covered, fasten the gear into the slots with straps and screws, using CA to harden the holes. The steerable tail wheel is self-explanatory. Don't omit the 3/32 i.d. brass tube in the tail post.

Use six hinges for the elevator and four for the rudder, which takes additional stress due to the steerable tail wheel. Note also that due to the extra wide tail post, it may be necessary to mount the rudder horn in reverse position. After the rudder is covered, install the hooks (made from pins) for the steerable tail wheel rubber. This setup really works well and precludes ripping out the hinges if the plane ground loops or cartwheels.

A Kraft KM-40 glass-filled nylon engine mount, installed with the top of the ring just 3/4-inch below the top of the firewall, will permit plenty of muffler clearance.

RADIO INSTALLATION

Keep everything as far forward as possible. The author has used both a Tower Hobbies Kraft and a Circus IV radio installation as follows: Batteries behind the firewall, receiver between stations F-2 and F-3, and servos between F-4 and F-5. This requires access hatches in the fuselage bottom between the firewall and F-2 and again between F-2 and F-3 (see photo). The large holes in these formers will allow the radio's wires and plugs to snake through. This all sounds complicated but is quite simple during actual construction.

The author used regular blue and yellow nyrods for control linkages and they work just fine as long as you brace them every foot or so.

COVERING AND FINISHING

Both of the author's Weight Watchers were covered with Japanese silk and finished with dope. Any of the plastic iron-on coverings would work equally well. If you choose the former, the following hints may be helpful: Order your silk from Model Covering Company, 2320 Ocean Parkway, Brooklyn, NY 11223. It's only \$5.00 per yard and most common colors are available, facilitating a clear

dope finish. Also, it's much cheaper to use regular aircraft dope than the usual hobby brands. Buy it at your nearest airport. The author used Randolph dope products throughout; four coats of tautening, followed by four coats of non-tautening, all thinned at least 50%.

First prepare the airframe with a coat of clear followed by a coat of sanding sealer (make your own with dope and generic talc). Sand smooth, then add another coat of dope and sand again. Maybe once more if you wish. Jack up the structure six inches above your work bench and cut the silk at least one inch larger all around. Lay on the silk and use clothespins to hold in place. Spray lightly with water, then stretch the silk both lengthways and sideways until taut. At this point the author always folds a paper towel lengthways into four layers and drags it along the silk to soak up excess water. This helps prevent the color from running. Those pesky dangling clothespins can now be removed. Again tighten the silk to remove all wrinkles, then dope all of the outside edges only, through the silk, i.e., center, tips, leading and trailing edges (but not the ribs). Let dry, trim with a SHARP razor blade, and dope down the ragged edges.

It's tough to keep the first coat or two of dope from seeping through the silk and puddling up beneath, but here's a way that works: Use a one-inch sponge rubber brush (get 'em at K-Mart by the half-dozen) and let the weight of the brush do most of the work. When the dope starts to seep through, go back LIGHTLY over the puddle and the capillary action of the sponge brush will pull the dope back up through. Practice on the bottom of the fuse or stab and soon you'll be an expert. Sand lightly with 600 grit paper after the first three coats, then every coat or two thereafter. Steel wool also works well. Don't install the hold-down dowel until all covering is completed. If planking is a good character builder, then covering with silk must be good for the soul. The final results are worth it though, especially when your model's cruising directly overhead on a breathless, sunny day.

FLYING

First add split dowel keys to the bottom of the stab if not already installed. Be sure the model balances at a point directly above the lower wing's leading edge.

The original Weight Watcher first flew on a dead calm morning at Barton Field, the main parade ground at Fort Gordon, Georgia. It taxied along a hard surfaced dirt road and required only a tad of up-elevator to break ground. What a sight!

In the event your plane is too far out of trim with the balance point as shown, use wing shims for adjustment. As stated earlier, there is nothing critical about trimming and most corrections can be made with the rudder and/or elevator trims only. This aircraft is so stable that many pre-teen youngsters have flown it without difficulty. On one occasion, a young Air Force pilot with absolutely no RC experience visited our field and flew the ship SOLO after only ten minutes of instruction. Honest! Give it a try.