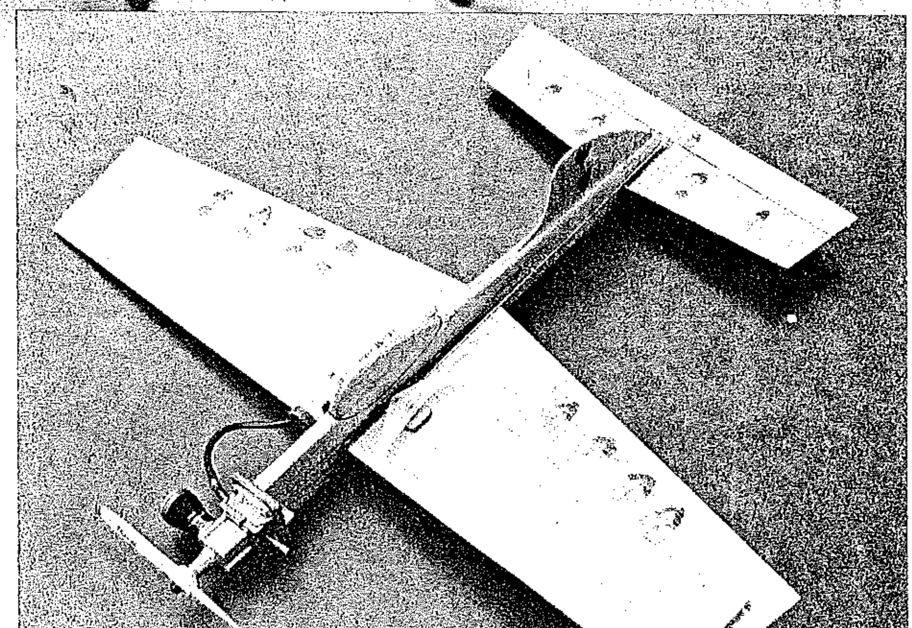
#421

Anne's Plane

Anne and Ron McNally are doing some practice flying preparatory to Anne's first solo flight. Seemingly relaxed appearance may deceive you; they were scrambling. Ron forgot to remove his ear protectors in the rush; he always wears them while starting engines. All photos by Dick Perry.



Ron's favorite daughter, left, holds her favorite airplane. It's a great one for a family building project, and it is suitable for a solo project by a youngster who has built one or two other airplanes. The picture at right displays the straight lines used for most of Anne's Plane. An inexperienced child can do quite well in cutting out the parts with a sharp knife and a straightedge guide. Anne painted the flower decorations with felt-tip pens on the bare balsa. The plane then was finished with two brushed coats of clear polyurethane varnish.

The author classifies this design as a Step 2 Control Line trainer. It uses a Cox reed-valve ½A engine, such as from a discarded RTF plane—which often can be found at yard sales. We'd say the model is ideal for young members of a modeling family. ■ **Ron McNally**

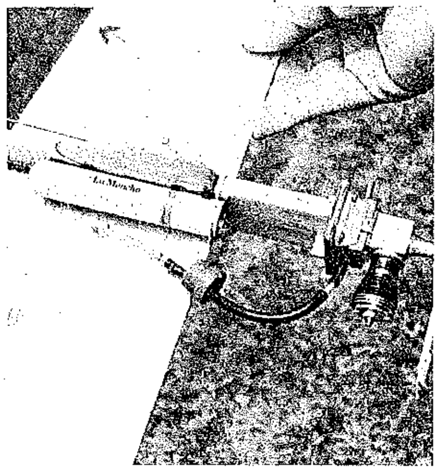
WHEN ANNE, my daughter, was eight years old, we decided to work up a small CL airplane that we could build together. The inspiration for the project ws a $2.15 bag of Sig "odds and ends" balsa which Anne was converting to sawdust and shavings. This batch contained several light, flat sheets of 3/32 balsa and some 5/16 × 3/4 medium balsa—just right for a small slab-wing airplane.

One idea led to another, and soon I was sketching the wing, stab, elevator, and fuselage shapes—seeking Anne's approval as I went along. Simplicity, an interesting appearance, and easy flying qualities were the criteria.

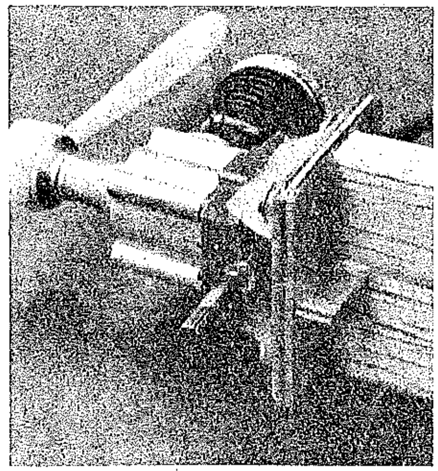
The fuselage construction, with two 5/16 × 3/4 strips and 3/32 spacers, results in almost foolproof wing/stab alignment. The 5/16-in. thickness helps, too, as the 1/4-in. wood often used is always breaking.

The plane is easy to build, and it makes a good joint project for a father and child. It should also be a good solo project for the child who has built one or two models previously. With some guidance, an inexperienced youngster can do pretty well in cutting out the parts with a straightedge and a modeler's knife—especially if there is some wood that can be wasted.

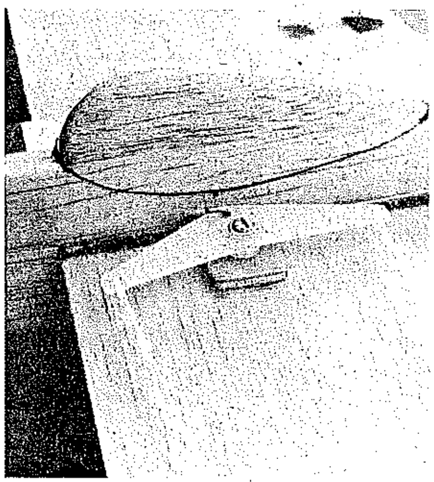
The plane is very easy to fly. It is stable without being nose-heavy, and it goes where you aim it. While not at all jumpy or skittish, it will do smooth loops, eights, wingovers, and so on (with the line spacing on the handle at 4 in.). For a beginner's first flights, handle line spacing of 2 in. seems about right.



Details of the surgical tubing bladder tank. A 5/8-in. aluminum cigar tube holds it. This kind of tank with the Cox 290 engine has given exceptionally steady runs. The plane may be easily adapted to integral-tank engines.

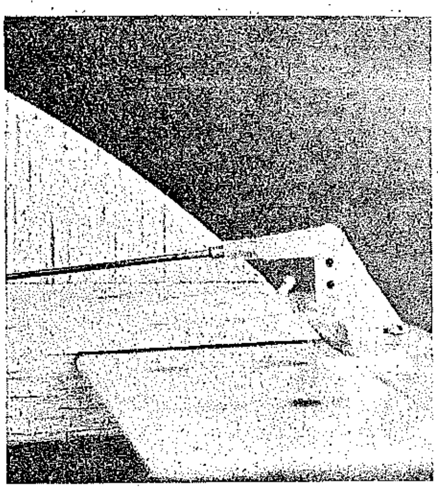


A Goldberg adapter is on this Cox 290 engine, but recent Cox 290s don't need an adapter. The engine mount is made of 1/8 plywood, and so is the engine mount brace.

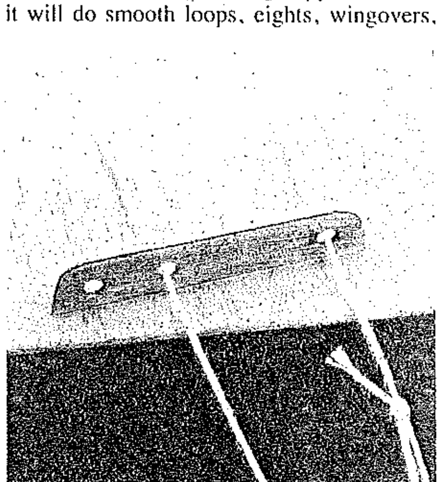


A No. 2 sheet metal screw of ½-in. length is used to mount the bellcrank, a Goldberg ½A unit. A single 1/8 ply bellcrank mount was used for this model, but author now prefers two of 1/16—one on top, one on bottom.

Pushrod of .047 wire is stiff enough to not need a guide, but once the desired flight trim is achieved, a guide helps to prevent handling damage. Author has a small cotter pin for a guide, but a paper clip bent like the end of a small safety pin would also work well.

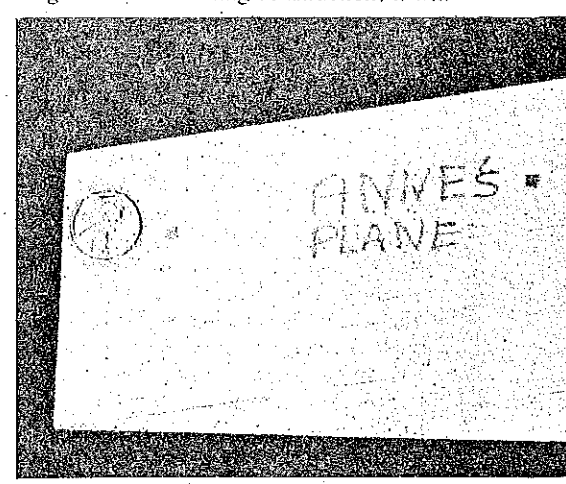


An adjustable pushrod and control horn helps in setting-up flight trim and matching control response to the flier's experience. An .047 spring thread soldered to the pushrod, Goldberg mini snaplink, and Goldberg short control horn provide the needed adjustment.



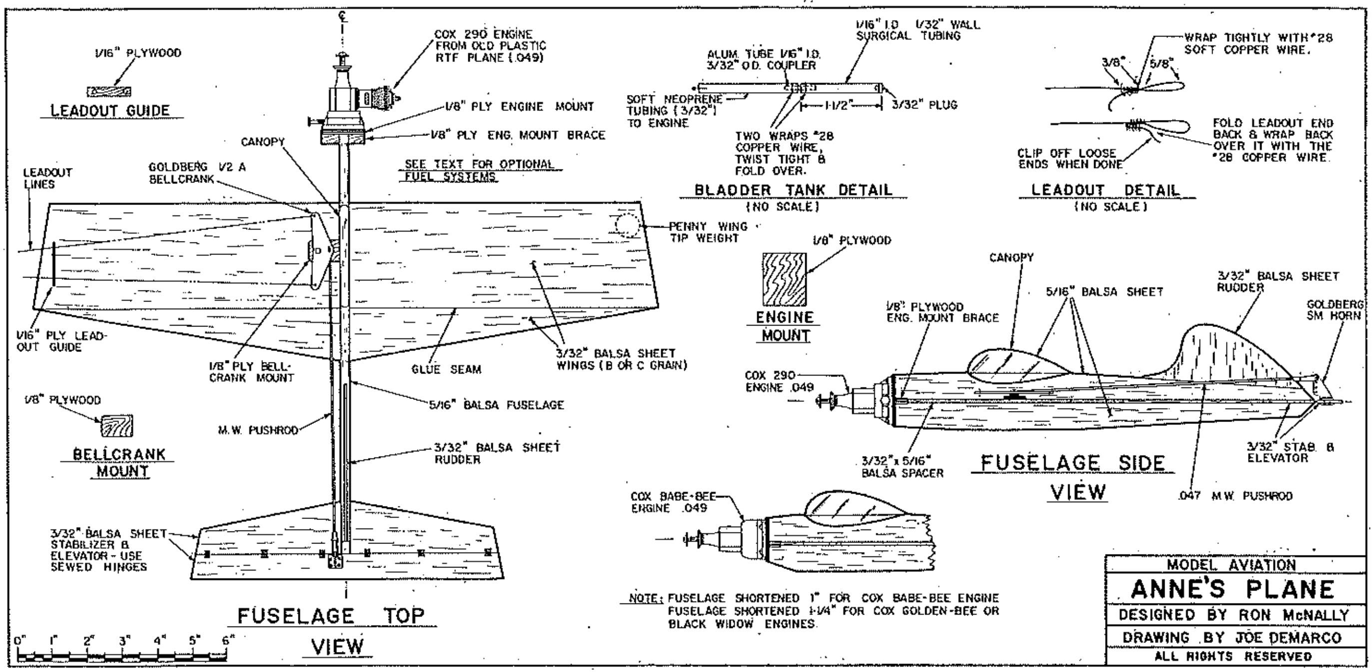
The first estimate of the proper lead-out position was too far forward. Moving the front lead-out a bit rearward corrected the problem. Plans show the correct position.

Engine. Before starting construction, it will



One penny provides the right amount of wing tip weight to balance 35-ft. by .008-in. stranded steel lines, about 1½ pennies for 42-ft. Except for really calm wind, 35 ft. is best. Any doubt about who owns this airplane?

FULL-SIZE PLANS AVAILABLE . . . SEE PAGE 172



be necessary to decide which one to use. Any of the ½A Cox reed-valve engines are suitable. A Cox Medallion would also be a good choice if the mount is modified. A Cox T.D. is not at all suitable for this airplane.

We used the Cox 290 from a plastic RTF purchased at a garage sale. A small surgical tubing pressure bladder was used for the tank. If someone with bladder tank experience is always available to start the engine and set the needle valve, this setup gives the best engine runs. It doesn't miss a beat through any set of sustained maneuvers, and it doesn't cut out on overheads.

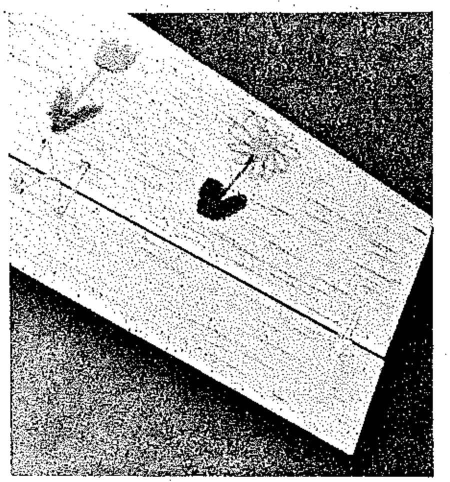
One can also use a small wedge tank with the Cox 290 engine. Based on our experience, it may be desirable to convert the tank venting to a uniflo configuration. Some variation on the Jim Walker balloon tank could probably also be made to work well with the Cox 290.

The plane's nose will need to be shortened for other engines, as shown on the plan. This presumes that you build about the same as I do. If you tend to build heavy, fudge a bit towards a longer nose (it requires less lead to balance a nose-heavy model).

I like to mount the reed-valve engines so that the cylinder is on the outboard side of the fuselage and the needle valve is on the inboard side. This helps to provide the outboard weight, and it puts the cylinder-needle valve out of the way of most crash damage.

On the integral-tank engines, the fuel pickup will need to be moved so that it is still on the outboard side of the tank. The tank vents should be oriented up and down, as usual, except on the Babe Bee. On the Babe Bee, tip the plane to fill the tank, and plug one of the vents with some fuel tubing stopped with a cut-off finishing nail. The Babe Bee tank won't leak fuel, then, when the plane is returned to level or when it is flying—even if inverted or flying outside maneuvers.

For the absolute beginner. For the presson who has yet to successfully fly out a tankful of fuel without help, some maneuverability should be sacrificed for durability. Substitute ⅜-in. wood for the fuselage and ⅛-in. for the wing, stab, fin, and spacers.



Sewn figure-eight hinges are quick and very flexible. Use ½A Dacron flying line, and sew with a needle after the plane has been painted. Four simple hinges like the one on the right are all that you will need.

Similarly, for the absolute beginner, engine run reliability during sustained maneuvers is not as important as convenient restarting of the engine—again, and again, and again. The most convenient setup in this circumstance is the Golden Bee or the Black Widow with its integral tank.

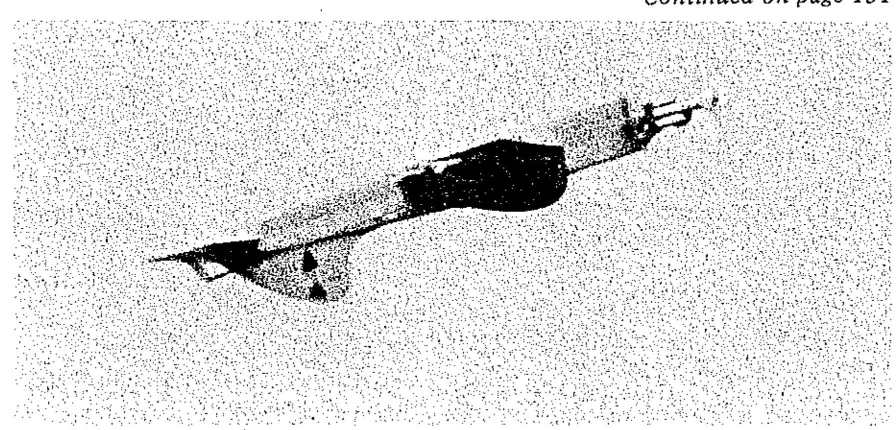
Finally, to compensate for any extra weight, make the nose length up to ½ in. longer than that recommended for your engine.

Construction is pretty straightforward. Most modelers will be able to glance at the plans, skim the rest of the article, and decide for themselves how to proceed. However, for the sake of younger modelers of limited experience, I am going to provide fairly detailed instructions.

Unless otherwise specified, glue means aliphatic resin—such as Titebond, Sig Bond, etc. One of the gap-filling cyanoacrylate (CyA) glues could be used instead to speed things up, but one would not have any chance to correct mistakes. Children should not use the CyA glues without adult supervision.

All epoxy gluing should be done by an experienced modeler or an adult. It is vir-

Continued on page 151



It really is flying upside down (you can tell by the shadow on the canopy). Anne's Plane has proven to be quite maneuverable for a small, flat-wing airplane. It's also quite durable.

produces maximum torque when the airplane is at rest or moving very slowly, as at takeoff and at the stall. In high-speed flight, the propeller is operating at its best L/D so that rpm increases and the drag (torque) is at its minimum and the propeller unloads, as they say. In the case of Helicopters, where the rpm is low and the line of flight is close to that of the rotor disc, the disparity in blade angle between the advancing and receding blades becomes a factor to contend with. But this is not the same thing as P-factor. More on torque in a future article.

4.a. Torque is additive. If two engines are turning in the same direction, the torque will be twice as great as that produced by one engine. On the other hand, if rotation is reversed on one of the engines, the torque cancels out and the airplane is free of its effects. If rotation is arranged so the propellers swing "up and out" with respect to the fuselage, the spanwise lift distribution is enhanced and any asymmetry disappears.

5.a. Climb is the result of the application of power. If sufficient excess power is not there, applying elevator can slow the airplane down and cause it to stall.

6.b. A pendulum will work fine as long as straight flight is maintained as shown in Figs. 4a and 4b, since it wants to hang down under this condition.

Sooner or later the relative wind will change and initiate a turn. When it does, centrifugal force will throw the pendulum away from the center of the turn to cause an irreversible spiral dive as shown in Fig. 4c.

7.b. An airplane wants to fly at the angle of attack (speed) for which it is trimmed by the horizontal tail. It also wants to turn into the relative wind.

8.b. A biplane is inherently less efficient than a monoplane because of mutual interference, where the pressures between the wings are unfavorable. The upper wing loses positive pressure on its underside, and the lower wing gains pressure over its upper surface.

9.b. Longitudinal stability is a function of CG location. The CG must always lie forward of the neutral point. (See April 1980 *MA*, "Let's Talk About the CG.")

10.a. Lateral stability is largely provided by dihedral on low-wing monoplanes with straight, unswept wings. High-wing monoplanes have an effective dihedral due to the high placement of the wing, so little or no geometric dihedral is required. Swept wings and Delta wings also have effective dihederal due to the sweep of the leading edge. In fact, some highly-swept wings require negative dihedral (anhedral) when placed high on the fuselage as on the British Harrier.

11.a.&c. A fuselage must have a tail. Otherwise, it does, indeed, want to set itself perpendicular to the airstream and fly sideways.

12.b.&c. Spiral dives are caused by excessive fin area coupled with insufficient dihedral. We will go into this at length in a future article.

13.a.&b. Dutch roll is caused by insufficient fin area, together with excessive dihedral. The small fin allows the fuselage to yaw, and the dihedral overcompensates to cause lateral oscillations.

14.a.&b. A mass of air accelerated downward reacts to produce the upward force called lift. The curved path of the airstream over the wing manifests this lift produced in the form of increased velocity and lower pressure over the upper surface and a decrease in velocity and increased pressure over the lower surface, thus distributing the lift over the wing.

15.a. True. There are precise relationships between large and small things having the same configuration and means of operation, as pointed out at the beginning of the article.

16.b. The use of the Lift Equation will be the subject of the next article. It is not nearly so formidable as it looks, and it is useful in understanding how wing area, weight, speed, etc., are interrelated.

17.a. Washout, together with an increase in camber at the wing tips, is desirable to prevent tip stall.

18.(all). Reynolds' Number has to do with *all* these things. (See "Let's Talk About Reynolds' Number", February 1979 *MA*.)

19.b. A stable airplane has its CG forward of the neutral point, which is the center of total lift of the whole airplane. Therefore, there must be a down load on the horizontal tail to keep the nose up. This has the effect of moving the net lift forward to the CG.

20.b. For maximum range on a real airplane, the wing incidence is normally set at the angle for Max. L/D. For most airfoils, this is about three degrees. The downwash from the wing is usually adequate to trim the airplane for level flight at cruising speed by producing a down-load on the tail when the tail is set at zero incidence.

On Pattern models having symmetrical airfoils, where it is desired to have no surprises while flying upside down, there is something to be said for setting both the wing and tail at zero degrees. When this is done, the airplane will not fly, however, unless some up-elevator is applied to trim the wing to a positive angle of attack. Thus, the airplane can only maintain level flight when the fuselage is in the attitude of a slight climb. This would suggest that maybe Pattern jobs should be designed with flaps that can be deflected either up or down to provide positive incidence in the form of camber in either normal or inverted flight. Maybe they do it already. I haven't progressed to Pattern flying yet.

How well did you score? Don't hesitate to write if you have questions or polite comments: Bradford W. Powers, 5470 Castle Hills Dr., San Diego, CA 92109.

Anne's Plane/McNally

Continued from page 58

tually impossible for most younger modelers to avoid gluing themselves. (Industrial experience with epoxy seems to indicate that everyone will become allergic to epoxy with enough exposure. Avoiding inhaling the fumes and skin contact allows the safe use of this very useful adhesive.)

With a reasonable amount of care, the plane can be built so that it weighs 4 to 4½ oz. The original weighs 4 oz. with a bladder tank and 4½ oz. with a 3/8-oz.-capacity wedge tank. It flies fine at either weight, but the effects of the extra ½ oz. are easily noticed. Avoid excess glue and excess pigmented paint. The original was decorated with felt-tip pens and finished with two brushed coats of polyurethane. Anne did the decorations and helped brush on the polyurethane.

Wing. It is better to join two sheets of wood than to use one wide piece. It's less expensive and easier to find flat, warp-free 2- and 3-in. sheets than it is to find the same in 5-in. sheets. You'll need one each of 2-in. and 3-in. sheets of 3/32 × 36-in. balsa. This should be lightweight but firm, C or B grain (speckled).

Cut an 18-in. length of both the 2-in. and the 3-in. sheets. True up one edge of each by trimming off a very small sliver using a sharp modeler's knife and a straightedge. Be sure the knife cut is vertical so that the edge is square. Test-fit the two edges together. If necessary, square things up with a large sanding block and 320 paper.

When you are satisfied with the fit, hold the two edges together tightly on a flat board, and run a strip of cellophane tape down the seam. Turn the taped-together sheets over, bend open at the seam, lay a bead of glue in the joint, and then pin the sheets tape-side-down on a flat board. Clean up all excess glue with a damp paper towel, and leave the sheets to dry overnight. When dry, remove from the board, remove the cellophane tape, and sand the seam with 320 paper and a large block, if necessary.

Measure carefully, and cut the wing outline to shape with a sharp modeler's knife and a straightedge. Don't round off the leading and trailing edges yet.

Stabilizer and elevator. Measure carefully, and cut out the stab and elevator from the remaining 2-in. sheet. It is helpful to tape the elevator and stab together (don't glue them) prior to cutting the outlines. Use a straightedge and a sharp knife.

Vertical fin. Using the same technique as was used for the wing, glue together three pieces of 3/32 sheet for the vertical fin. Use some of the remaining 2-in. wood and some of the wood trimmed from the trailing edge of the wing. Be certain that the grain is vertical. Use a straightedge for the bottom cut, and follow a template from the plans for the rest. Cut oversize—especially toward the front of the fin. Sand to the final outline later, when the fin is glued to the fuselage.

Fuselage. Select a straight strip of 5/16 × 1/4 × 36-in. medium-hard balsa. Cut two pieces 12 in. long (shorter for some engines). Use a razor saw, and make these cuts as square as possible. (If you prefer, you

may leave these strips longer and cut to correct length when the fuselage is assembled.)

Cut two 3/32 × 3/8 spacers from the scrap balsa trimmed from the wing. The rear spacer should be 4 in. long. The front spacer should be 1 1/16 in. long (shorter for some engines).

Cut a 3-in. block for the canopy from the remaining 5/16 × 1/4 stock. Don't cut to shape until glued to the fuselage.

Cut a 1½ × 1¼-in. engine mount from 1/8 plywood; block-sand the edges square and smooth. This will be installed with the long sides vertical for the Cox 290 engine (the one that requires a Goldberg adapter). The engine mount will be installed long-side-horizontal for the Babe Bee, Golden Bee, Black Widow, and the Cox 290 engine that does not require the adapter.

Cut a 5/16-in. engine mount brace from 1/8 plywood. This is to be 1¼ or 1½ in. long, depending on the engine used and the way the engine mount is oriented. Block-sand the edges square and smooth.

Cut two 5/8 × 7/8-in. bellcrank mounts from 1/16 plywood. These are to be glued on the top and bottom of the wing. (To avoid having to purchase both 1/16 and 1/8 plywood, a single 1/8-in. bellcrank mount may be used on top of the wing.) Block-sand the edges smooth. Round off the inboard corners as shown on the plans with the sanding block.

Control system. Cut a 1/4 × 1 1/4-in. piece of 1/16 or 1/8 plywood for the line guide. Drill two 1/8-in. holes separated by 7/8-in. and centered. Harden the holes with a drop of thin CyA glue. Block-sand both sides and the edges until smooth. Round the top two corners. Smooth the inside of the holes with 320 sandpaper, and again apply some CyA glue to harden. You will need the following items: 1) Carl Goldberg 1/2A bellcrank; 2) Carl Goldberg small control horn (the one packaged with the bellcrank will be too short, hence too sensitive); 3) Carl Goldberg mini snaplink; 4) .047 wire for the pushrod; 5) Du-Bro .047 spring thread coupler. Equivalent items may be used, of course, but the suggested control settings might then have to be adjusted.

Fuselage assembly. Check to be certain that one 5/16-in. edge of each fuselage strip is absolutely flat. Flatten, if necessary, by sanding against 240 sandpaper placed on a flat surface.

Glue the spacers between the 5/16-in. flattened edges of the fuselage strips so that the wing and stab slots are properly positioned and of the correct length. Only spot-glue the top fuselage stick so that it can be easily cut away later.

Glue the canopy block in position.

Place hardwood blocks on both sides of the fuselage at the wing and stab locations and rubberband together at the top and bottom. This will align the top and bottom fuselage strips.

Rubberband the top and bottom fuselage strips together with balsa pads as necessary to prevent marring. Similarly, rubberband the canopy in position. Set aside to dry overnight.

It is helpful to do a dry run first on the fuselage assembly. It is not difficult, but a dry run will make everything clear and obvious.

When dry, remove all the rubberbands, etc., and block-sand both sides of the fuselage until they are flat and smooth. The spacers were deliberately cut oversize to make fitting easier. Now, the excess must be carefully sanded away. Using templates traced from the plans and a straightedge where necessary, mark the fuselage and canopy outline and cut to shape.

Don't shape the fuselage forward of the wing until after the engine mount is attached. Cut slightly oversize and block-sand to the final outline. Either a coping saw or a large knife may be used. It is best to remove small amounts at a time, working toward the final outline.

Glue the vertical fin to the fuselage. This should be centered, aimed straight ahead, and be straight up and down. (If a mistake is made, it should be so that the vertical fin will turn the airplane outward to help maintain line tension. If, after this is complete, you find that the vertical fin will turn the plane inward, remove and correct it.) When the glue has set, sand the fin outline to final shape.

Round off the rear part of the fuselage along the vertical fin. This is much easier to do now than later after the stab is glued in. Use a small modeler's knife, and finish with a small sanding block. First use 240 paper to remove the cut marks, and then use 320 paper.

Split apart the fuselage where it was spot-glued. Glue both sides of the wing slot, place the wing in position, and glue the fuselage back together. Be sure that the two fuselage parts are lined up (the split points make this almost automatic). Also, be certain the wing is square and centered with the fuselage. Align as necessary before the glue sets up too much. If the glue grabs before you get everything lined up, disassemble the parts before the glue dries completely, and try again. When satisfied, clean up any excess glue with a damp paper towel, and set aside to dry overnight.

Afterwards, glue the stab in place. Be certain that it is centered and square with the fuselage. Clean up any excess glue, and set aside for three or four hours to dry over night.

Check the front of the fuselage to be sure that there is no upthrust or downthrust. A slight amount of outward thrust is alright. Expand the slot for the engine mount brace to 1/8 in. so that the brace fits snugly. Glue in place with 5-min. epoxy. Be sure the brace is centered and square with the fuselage so that the engine will point straight ahead. When the epoxy has set, check to see that the mount fits flat against the fuselage and the brace. Orient the engine mount correctly for the engine that you are using, and glue it in place with 5-min. epoxy. Be certain the mount is centered properly.

When the epoxy has set, taper the front of the fuselage to match the engine mount. Round off the fuselage starting at the front, just knocking off its square edge, gradually increasing the curvature until the edges are completely rounded at the midpoint of the wing and on toward the tail. Completely round the canopy (use a small, sharp knife to start, block-sand with 240 paper, and finish with 320 paper).

Glue the 1/16-in. plywood bellcrank mounts in position on the top and bottom of the wing. Also glue the line guide in position. Use 5-min. epoxy or gap-filling CyA.

Mark and bore 1/16-in. holes to mount the engine. The thrust line should be centered with the wing and stab—also sideways with the fuselage. Mark and bore a 1/16-in. hole for the bellcrank. Harden these holes with CyA glue, and deburr them; the wood won't strip, then, with repeated loosening and tightening of #2 sheet metal screws.

Sanding: Use a sanding block and 320 paper to taper the wing, fin, and elevator trailing edges to a 3/64-in. blunt edge. Round all of the remaining tips and edges of the wing, stab, elevator, and fin. Don't forget to round the stab-elevator joint edges.

Harden all leading edges, tips, and trailing edges with an application of CyA glue. Don't harden the edges along the stab-elevator joint. Go over the entire plane and smooth any rough places with 320 sandpaper. At this point, the plane is complete except for finishing, installing the control hardware, and installing the engine—in that order.

Finishing. The weight breakdown for the original plane, using a postage scale, was as follows: 1) complete plane, less hardware, paint, and engine—1 oz.; 2) Felt-tip-pen decorations and two brushed coats of polyurethane—1 oz.; 3) Control hardware and bladder container—1/2 oz.; 4) Engine, prop, mounting screws, and bladder—1 1/2 oz.

Clearly, the only place to save any weight is on the finish. Since completing the plane, I have found that one can lay on extremely thin coats of polyurethane using a Poly Puf brush (an inexpensive foam brush used for decoupage). It takes three coats to finish it with the Poly Puf as compared with two normally-brushed-on coats, but the total weight added with the Poly Puf is only about half as much. Brush marks are minor with the Poly Puf, and it is possible for a child to do a good job using one of these brushes.

Painting should be done outdoors for good ventialtion and in the shade so that the varnish won't blister. Hang the model in a shed or garage to dry, so you won't have to put up with the odor. The smell can make you sick, and the fumes aren't good for you, anyway (good ventilation, or working outdoors eliminates this problem).

Wipe the plane dust-free with a soft cloth prior to the first coat of polyurethane. Dampsand between coats with #400 wet-or-dry sandpaper. Wipe the plane dust-free with a damp paper towel prior to the second and last coats.

Prior to painting, decorate the wood with felt-tip pens. Some bleed into the balsa more than others, so test first on some scraps. We were able to brush the polyurethane right over the decorations, but test this, also. (Alternately, you may spray-seal the decorations; do a complete spray coat, and brush out everywhere, except over the decorations, with a Poly Puf to keep the coat thin and uniform.)

If you get some varnish on your hands while painting, wipe it off immediately with a paper towel, etc. Clean yourself up afterwards by scrubbing vigorously with soap and water. (Don't use solvents such as alcohol, dope thinner, acetone, or polyurethane thinner, as these only carry the varnish deeper into your skin—even though the surface seems clean.)

Flecto Varathane, Valspar Polyurethane, Pactra Formula U, and Glaskote are all okay. If you intend to change brands between coats, test first on a trial piece of scrap balsa.

Continued on page 156

Last details. Attach the bellcrank with a ½-in. #2 sheet metal screw. Sew on the elevator using ½A Dacron flying line and a figure-eight stitch. Dab a small amount of gap-filling CyA on the knots and on the needle holes using a toothpick to apply the glue. (Don't use thin CyA, as it will wick throughout the hinges and lock them.)

Position the control horn so that the pushrod holes are above the hinge line and so the pushrod will be parallel to the fuselage. Mark and bore holes in the elevator for the control horn. Harden these holes with thin CyA glue, and deburr the holes, The CyA glue, used this way, prevents crushing of the elevator when the control horn is attached. Attach the control horn.

You will need about a 9-in. piece of .047 piano wire for the pushrod. Bend a Z-shape in one end to attach to the bellcrank, and cut it 8½ in. from this bend. Solder a spring thread on the end to provide neutral adjustment. (An adult or experienced modeler should help with the soldering.) Install along with a mini snaplink for attaching to the control horn. (If you prefer, you may use Z-bends on both ends along with an adjustment kink.) Don't install the pushrod guide until after a few test flights. The .047 wire is stiff enough for the flight loads, but you will want a support once the plane is trimmed out to protect the pushrod from getting bent in handling.

Make up the lead-outs using the good parts from some ruined .015 or .018 stranded steel flying lines. (A Combat contest should yield some). Form loops and wrap with #28 soft copper wire as shown on the plans. See also, AMA rule book page No. 17. (Alternately you may use a hard-finished 20-lb.-test kite string to tie into lead-outs. Watch closely for fraying, and replace them often. Steel lead-outs are preferred.) Glue a penny in position on the outboard wing with a gap-filling CyA.

Attach the engine using ⅜-in. No. 2 sheet metal screws. Cut a small cigar tube about 4 in. long for the bladder holder, and attach it above the outboard wing and against the fuselage with thin servo-mounting tape.

Seal the penny wing weight, the hinge needle holes, and the exit holes for the engine and bellcrank screws with polyurethane. Hang up to dry.

Flying. Check the CG first. If it is between ½ and ¾ in. behind the leading edge, that is fine. If it is slightly nose-heavy, that is OK for the first few flights. If it is tail-heavy, the balance point must be corrected before flying.

The pushrod should be adjusted for equal elevator travel both ways. Use the top hole in the control horn for the first few flights.

Use a 5¾ × 3 nylon prop, and fly the plane on .008 × 35-ft. steel stranded lines. Feel the airplane out slowly—first do level flight, then big loops, then big eights, then inverted flight.

For more maneuverability, move the pushrod down one hole on the control horn. If you are brave enough, move the CG back as far as ⅞ in.—no farther than that. (Even so, move the CG in small steps, testing each change before going on.) It may become a bit soft on the lines at some of the rearward CG positions. If so, shim the inside screws of the engine mount with small No. 2 washers to give out-thrust.

The original has been flown on 30-ft. Dacron lines, as well as 30, 35, 38, and 42-ft. .008 stranded steel lines. When it is absolutely calm, it is fun to fly on 42-ft. lines (otherwise, 35 or 38-ft. seems to be about right).

Right now, the original model is rigged to use the top hole on the control horn with the CG at ⅝ in. This is a nice trim for a trainer. It zips right through a big loop, but it is very smooth and steady. Tighter turns are possible with the CG shifted back ⅛ in., and that will be nice later.

Using a pressure bladder. While it is not a big mystery, it can be difficult if you start out with an impossible combination. One combination that worked just fine is the following: 1) Very well-worn twin-port Cox 290 (new engines, until they have been run a lot, are much more trouble); 2) Bladder made from ¹⁄₁₆-in. I.D., ¹⁄₃₂-in.-wall surgical tubing (can be obtained from Kustom Kraftmanship or Sig); 3) 5¼ × 3 Top Flite nylon prop (too much prop, and no needle setting will work); 4) Cox Super Power Fuel (other fuels will no doubt work fine, but this one does for sure); 5) Add a spring to the needle valve (unless you change the nylon seal daily, needle drift may be a problem).

You will need a small 10cc syringe to fill the bladder and a clamp to pinch off the fuel line. If you are not experienced at running engines with bladder pressure, get experienced help.

Have fun with your version of Anne's Plane.

CL Combat/Johnson

Continued from page 60

and he told me of his findings with the new Fox Mark IV. Gene is a machinist, so decided to take a couple of these engines to work and see what was right . . . or wrong. The major problem is that the flanges on the sleeves were not square. Drop the sleeve in a crankcase, and it would not seat all the way around. No amount of lapping would do anything about it, either. I suppose the problem varies from engine to engine, but it is the reason a lot of engines bind once the screws are tightened. The headclamp is also a problem on some engines, as it encourages a leak rather than a seal.

Gene reported that the crank timing was also off, but that is user-fixable if you have a Dremel tool and a degree wheel. The above maladies probably wouldn't keep any Mark IV from running fairly well, but it would never be a screamer. I've seen dead-stock (but very-well-fitted) engines go as fast as most hop-ups—and often times faster, because the hop-up was really a de-tune. There are people that hop-up engines and also have them precision-fitted, and they're the ones that go fast.