875

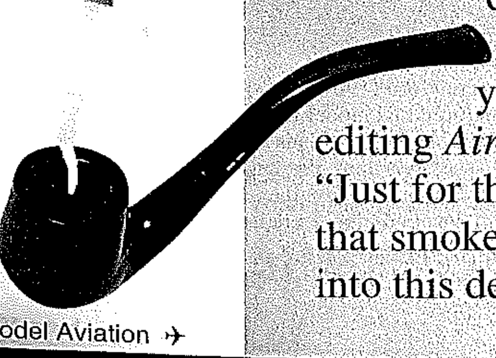
PIPE DREAM

■ **Bill Winter & John Hunton**

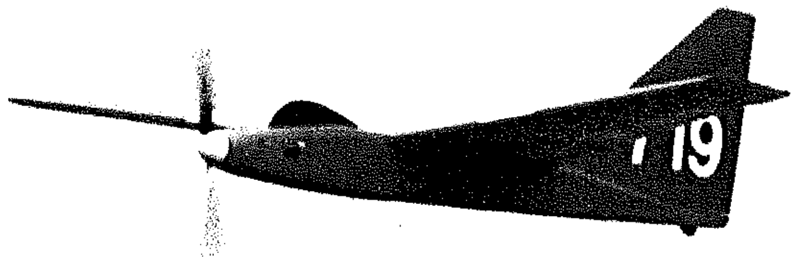
High-performance flying wing for Speed 400s

Pipe Dream is one of Bill Winter's final designs. It is a fitting final statement, being a culmination of many thought processes and resulting in an advanced and fine-performing model, designed around the popular Hobby Lobby geared Speed 400 motor.

Bill Evans, father of the Simitar series of flying-wing models, had been "after" Bill Winter for many years to design a flying-wing model. The Pipe Dream is the result. Evans remembers that the younger Winter always smoked a pipe when editing *Air Trails* or *Model Aviation*, or when writing the "Just for the Fun of it" series. Evans theorizes that all of that smoke Winter generated during that time formed into this design, so he suggested the name Pipe Dream.



Photos by Bernie Stuecker
Graphic Design by Carla Kunz



Pipe Dream is easy to fly, but takes some getting used to in the air before unusual configuration becomes second nature.

The Pipe Dream is considerably different in the air compared to a Gentle Lady or other glider-based Electric models. The Dream is a higher-performance-type airplane with a higher lift-to-drag ratio. It has better penetration for windy days and higher average speed for good transition from thermal to thermal. Even with its higher wing loading, the Dream has excellent stall characteristics and will not drop a wing when near a stall.

CONSTRUCTION

Select light balsa (less than six-pound density). Some balsa-supply houses will even hand-pick all of your wood for a specified surcharge, or they may separately list some common sizes as guaranteed lightweight. Order extra pieces to ensure matching substitutes if needed.

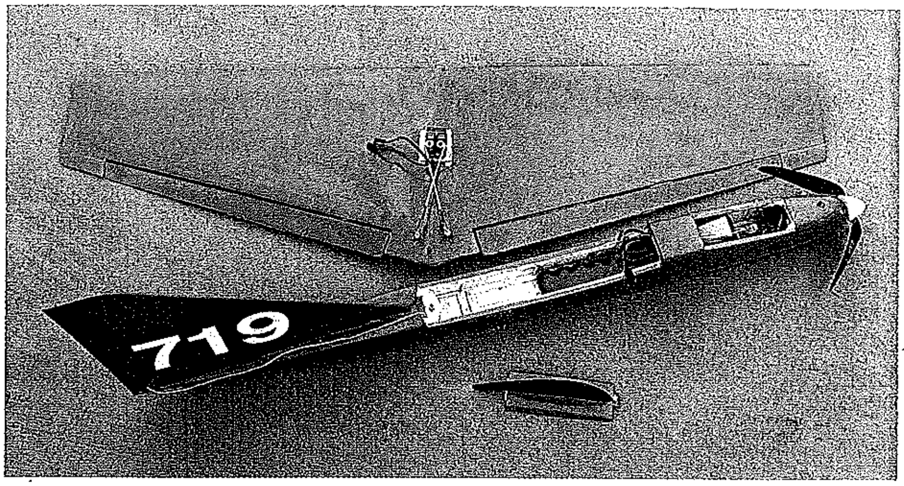
Sheet balsa for wing sheeting cannot be quarter-grain, which splits upon bending. This wood must "curl" easily along its length to facilitate matching airfoil contours and to eliminate any tendencies to pull free.

While you want light wood, eliminate anything too "mushy." You may still have to pick out a few firmer strips for wing and fin leading edges, which are ideally soft/medium. Aileron and fin spars are firm wood. All blocks must be light wood. Wood size specs are given on the plans and are generally not mentioned in the directions.

In addition to your usual adhesives, you will need a small quantity of yellow carpenter's (aliphatic resin) glue. Covering materials are of your choice, but we use Coverite films, Balsarite™, and 21st Century paints.

Send wing root and tip airfoil profiles to a core cutter.

Fuselage: Form the motor tube of 1/32 plywood over waxed paper on a one-inch mandrel. Wet the plywood and apply 50-50 thinned carpenter's glue on the mating surfaces with an acid brush. Wrap for two plies of thickness, then wrap with masking tape and set aside in a warm place to dry. Cut out each side sheet and mark the location of all longerons, verticals, formers, and parts with a ball-point pen. Pin each side sheet over the plan and install all longerons,



Model is clean, quick to build, and "the 'flying wing' format really saves space."

Bill Winter (L) and the author compare notes on Pipe Dream during Winterfest '98.

Bill Winter with Pipe Dream at his final flying session. 719 is Bill's AMA number.

crosspieces, triangular corner parts, and the doublers. It is OK to pin through the sticks, since they will be seated in glue.

Build-up former D. Cut the plywood former C and the nose ring. Cut the common length cross-grained bottom sheeting parts between formers C and D and assemble them over waxed paper onto the plan. Pin the formers C and D in place over the bottom sheeting assembly, using a small triangle to assure verticality. Mount the side plate assemblies to the straight portions of the fuselage bottom on the board and to formers C and D.

Drive the mandrel out of the motor tube through a one-inch hole in a scrap pine block. Smooth the motor tube inside and out with fine sandpaper. Be sure that the motor slips into the tube with clearance (any slop will be taken out later).

Glue formers A and B onto the motor tube at their proper spacing, then install the motor tube subassembly into the fuselage. Remove the motor from the tube, then complete construction of the forward end of the fuselage by installing required nose blocks, bottom and top sheeting. The top hatch can be cut loose later.

Pull the sides together at the rear over the plan and glue together, being sure to maintain verticality. When dry, continue rear fuselage construction by adding the top and bottom sheeting. Install the pine wing bolt plate. Shape and sand the fuselage to final profile, then smooth with fine sandpaper. Do not drill the wing hold-down dowel hole yet.

Cut the fuselage hatch loose and install plywood hold-down plates. Be certain to install the front battery buffer; this is essential to keep the battery from sliding forward in the event of a sudden stoppage.

When applying Balsarite, be sure to give the battery compartment bottom a coat to help the Velcro™ adhere. When dry, install the fuzzy part of Velcro with spray adhesive or contact cement. Apply the other Velcro component to your flight pack batteries. The Velcro should extend across the rear half of the battery pack only, to facilitate removal.

PIPE DREAM

Type: RC Sport

Wingspan: 41¾ inches

Motor: Geared Speed 400

Functions: Motor control, elevons

Construction: Built-up

Covering/finish: Coverite and 21st Century Paint

Install the motor and all radio gear. Be sure that the wires are as short as possible, but long enough to allow motor removal from the front of the model and to allow for flight pack hookup with the wing off only (and not the hatch). You may remove the motor and RC gear for final fuselage finishing.

Fin: Build up the framework using hard balsa for the main spar, trailing edge, and leading edge. Sand both faces flat with a fine sanding block against a flat building board. Round the leading edge and taper the trailing edge somewhat. Trial-fit the fin to the fuselage and cut the required slots.

Wing: Make plywood patterns of the tip and root ribs by applying the full-size pattern with contact cement to, say, 1/16 plywood. Note that plan rib profiles include a chord reference line and for the tip rib another chord line, indicating the proper angle of washout. Bring this to the attention of your core supplier.

Attach inner leading edges and aileron spars to each wing panel. Prepare skinning materials as described, skin, provide servo cutouts and cable access, add root and tip pieces to trailing edge, add tips, only then join panels on centerline. Wing root leading edge cutout is the very last step.

Taper the inner leading edge as shown on the plan, but slightly oversize for safety. It will be sanded to match the airfoil after it has been pinned and glued in place (use carpenter's glue). Use long straight pins for alignment and wrap with short pieces of masking tape to ensure a firm joint.

Sight along the wing to check that the edges are not bowed (the outer leading edge is attached later, after skinning. It can be pretapered if desired). The aileron spar is not pretapered, since block-sanding fits it to the foam.

Attach this rear spar by the same method as the leading edge. Block-sand the leading and trailing edges to the airfoil contours shown. Work in repeated spanwise paths, sanding from root to tip.

The described skinning method is one of several popular alternatives. You may favor assembling the four wing skins before starting; if so, allow at least 1/4 inch overlap along the long edges as tolerance for minor layout errors. With the double-stick tape it is also convenient to put down one skin section at a time. Either way, all sheet butt-edges must be precisely trimmed, using a straightedge to ensure a clean fit.

Lay down two four-inch-wide sheets, one overlapping the inner leading edge and the other overlapping the trailing edge spar, with the grain being parallel to each edge. The remaining open triangle is filled with a prefitted triangular skin section (after the servo cutouts have been made).

Make a cardboard pattern for the servo cutouts, locate the outlines, and cut through the skins with a rule and #11 knife blade. Excavate the cavities for the servo mounting rails, which mount flush with the foam itself. The skin overlaps the rails beyond the cavity lines. To permit this, the triangular skin pieces are hand-fitted and removed. Install the tailored pieces after the servo rails are located. Use spade drills or sharpened tubing to cut servo wire access tunnels.

The front wing cutout is made *after* the finished and sanded panels have been joined at the root. Note that the ailerons and the inboard and outboard trailing edge chord extension pieces are all stock (if you use standard trailing edge stock, be sure that it is quite light wood). After gluing the extensions in place, block-sand the tips at the designated angle and install the tip blocks.

Trim overlapping skins true/flush with the existing structure, then attach the tapered outer leading edge piece. Sand only its top and bottom faces at this time, to match the airfoil. Mark the precise leading edge forward point with a straightedge and felt-tip pen for guidance while shaping. The final shape of the leading edge is critical for good stall characteristics, so do this shaping accurately.

Gradually shape the outer leading edge, using a balsa plane for roughing and a wide sanding board for sculpting the desired profile. Work in paths from root to tip, removing material progressively. Finish with a fine sandpaper pad.

Cut the wing roots to proper angles in the horizontal and vertical planes, using a table saw or just by shaping with a sanding board over the edge of your workbench. The sanding board is held flush to the bench face and used in a long-stroke milling action.

Check mating of the cores for flush fit, then epoxy the roots together, blocking up the panels for the required dihedral angle. Use long straight pins and/or masking tape to help hold in position. If crevices remain in the joint after the epoxy has cured, fill with a mixture of epoxy and microballoons. Outline and cut the front wing cutout and install the plywood facing.

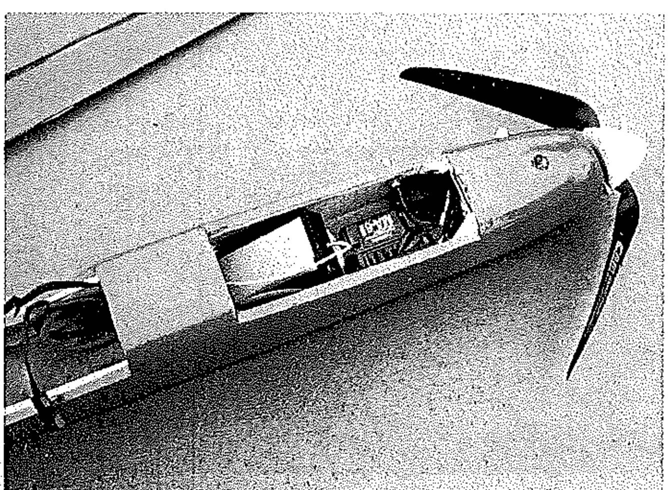
Note that the sides of the cutout are sloped to fit against the fuselage sides. The spanwise plywood dowel plate is glued in first. Trial-fit the wing to the fuselage, checking that the two side cutout pieces fit snugly and will butt against the dowel plate. Remove the wing and glue the balsa side plates in place.

Remember that the fuselage had been set aside without drilling for the wing dowel. Seat the wing to the fuselage tightly by placing masking tape on the mating area of the wing. Coat the tape with lipstick, reseat it, remove the wing, and sand away the areas with lipstick. Repeat until you get a good, tight seat.

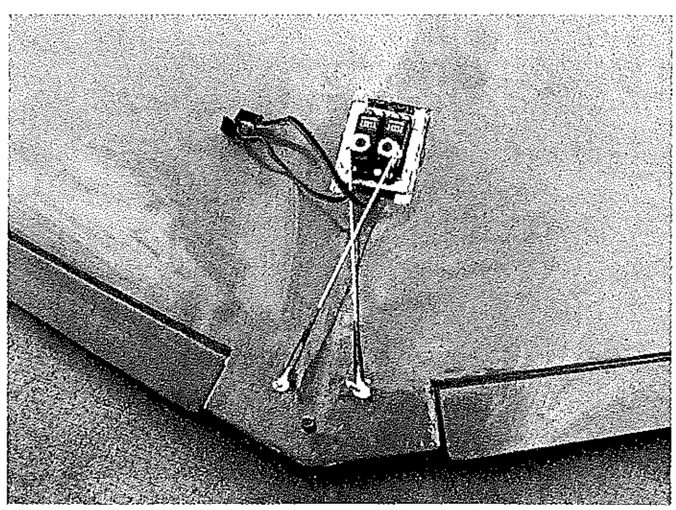
Mark former C where the midpoint of the plywood wing plate would fall and drill for the 1/4 dowel. Place a thin area of modeling clay on the front of the wing plywood plate and shove the wing into place against former C. Remove the wing, drill for the wing dowel, and install the dowel with epoxy.

To ensure accuracy, put epoxy into the hole in the plate, rub a bit on the dowel, and reposition the wing, making sure of accurate alignment. Use waxed paper to prevent gluing the plate or dowel to former C.

Cut the semicircular wing bolt plate from 1/16 plywood, place it in a vise, and force partial cracking along its centerline. Set at the



Plenty of access to the motor compartment. Most elements must be placed well forward for proper balance.



Rods are crossed for right-angle forces to the linkage. Mixing transmitter or mechanical linkage required for elevons.

required dihedral angle, then glue it to the top of the wing. Mark the center for the rear wing hold-down bolt, and with the wing still in place, drill a 3/16 hole through the wing and hold-down blocks within the fuselage.

Remove the wing and enlarge the wing hold-down bolt holes with a 1/4 drill. Now tap the hold-down blocks 1/4-20 to take a 1/4-inch nylon bolt. Apply two-inch-wide fiberglass (medium weight) over the top and bottom of the wing center-section joint.

Trial-fit the control horns to the ailerons, then "dry run" the hinges for minimum gap between the ailerons and the aileron spar. The slotting depends on the type of hinge. Mylar™ hinges are simple, light, and as strong as anything else if properly installed. Hinge slots can be accurately cut with a #11 blade. Mark the positions exactly, and use something straight for a guide in cutting. Be sure that the cut is parallel to the surface.

Since the wing core is foam, you will need an appropriate type of cyanoacrylate (CyA) glue to avoid melting the foam. Install ailerons, servos, and linkages after covering with film.

Covering: Coat all raw balsa with Coverite's BalsaRite. This will ensure good adhesion of the film. Sand lightly, then cover with film. Since this model will be capable of reaching very high altitudes, cover the bottom with a dark color and the top with a light color for good visual orientation.

Install all radio equipment and pushrods. When assembly is complete, check that the model is balanced exactly where shown. Shift the radio gear or add ballast if necessary; the flying wing configuration necessitates very accurate Center of Gravity (CG) location.

Mark the battery location after achieving balance to be sure to get it back in the same place every time you install it. If you change battery types, balance again before flying.

Check alignment of the fin with the fuselage, and correct any warps in the wing. Normal configuration for the elevons is slightly up (see plans). Check to make sure that you have full elevon deflection for turns both ways with the elevon full up and full down.

Flying: For the first test flight, be sure that the elevons are deflected slightly upward, as shown on the plans. After gently moving the throttle stick to full power, launch the Dream into the wind with a firm shove (not strong enough to dislodge the battery!), preferably over tall grass. Pipe Dream is a faster model than you are probably used to, so the launch should be proportionate.

When it is climbing out, make any correction required in roll first, then pitch. Do not overcontrol, but let the model gain good speed, then initiate a gentle climb to get to a safe altitude, then trim it out.

With this (faster) model it is important to keep it close in and within good visual range until you get used to how it performs and its somewhat unusual visual clues in the air; then you can go thermal seeking. The model will glide best with the prop stopped and folded, and with near full up trim.

To hand-launch, use a firm push into the wind. Keep the model low and straight-out until a good amount of airspeed has been established, then enter a gentle climb to altitude.

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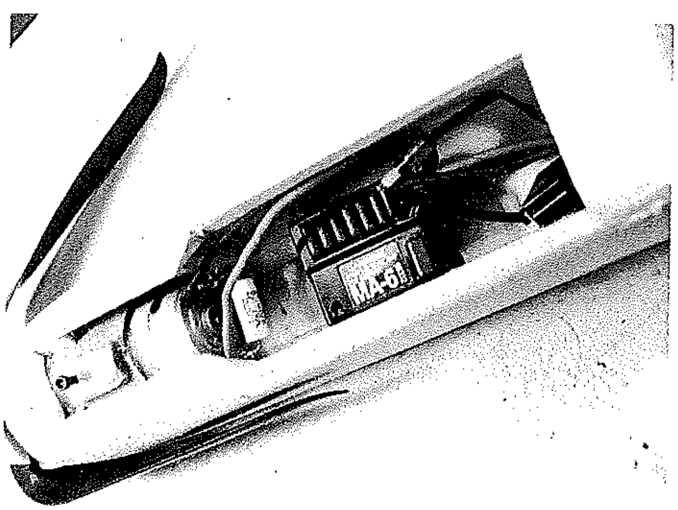
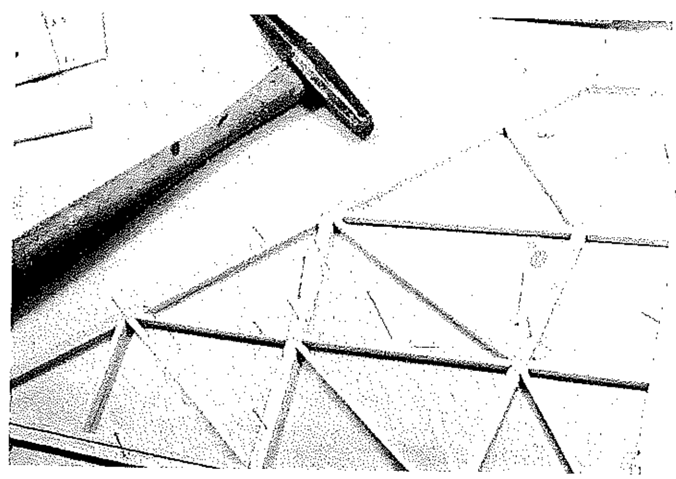
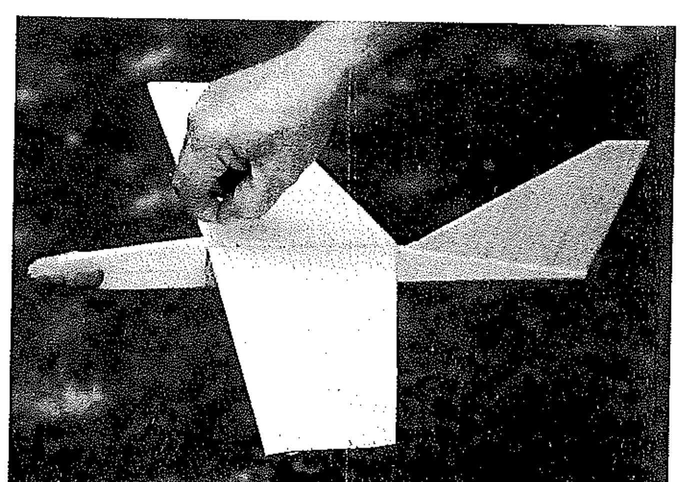


Motor retention plate is plywood. Author reports good results using Airtronics Battery Eliminator Circuit.



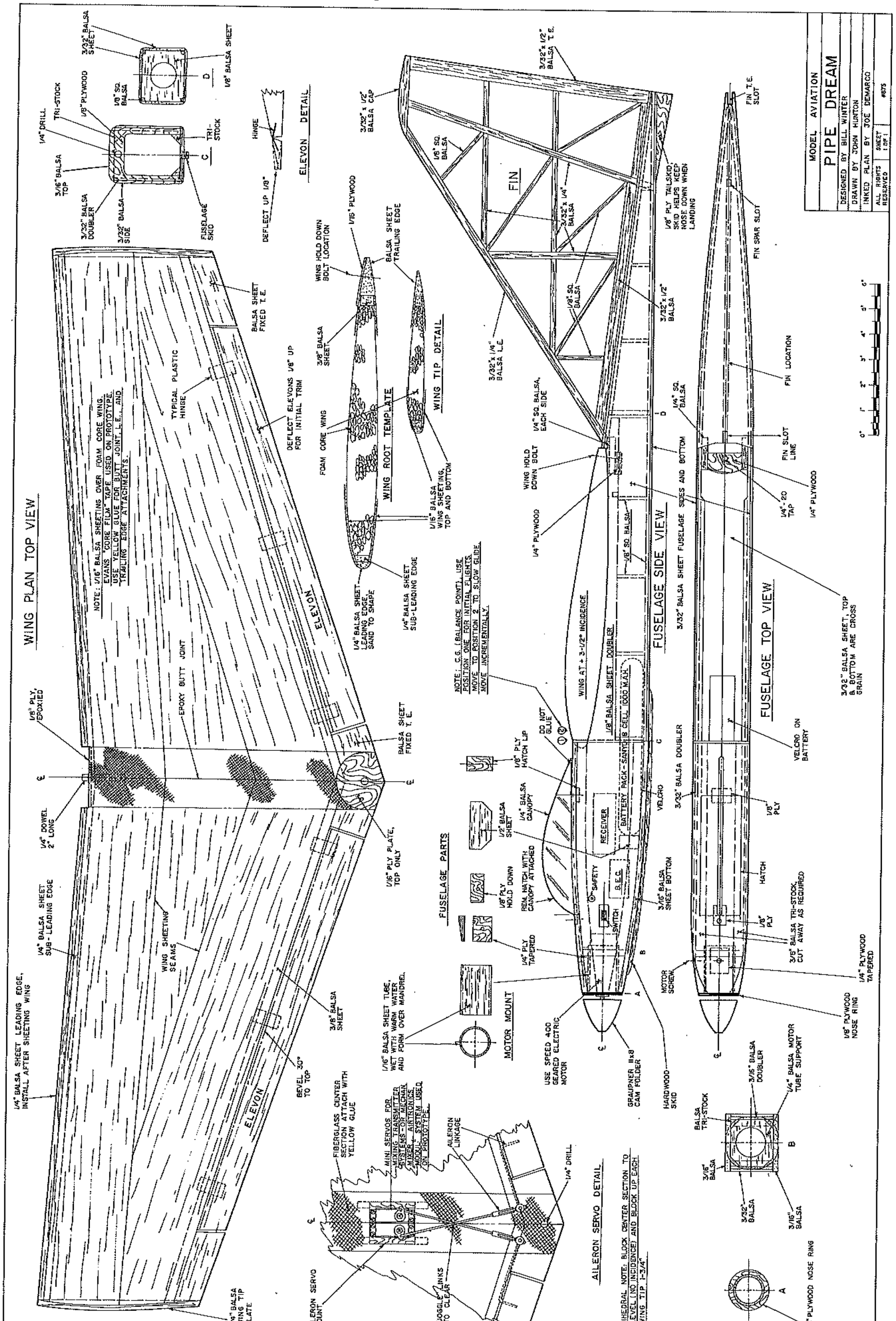
Tack hammer used to pin vertical stabilizer parts in place. Note main spar extension projects into fuselage.

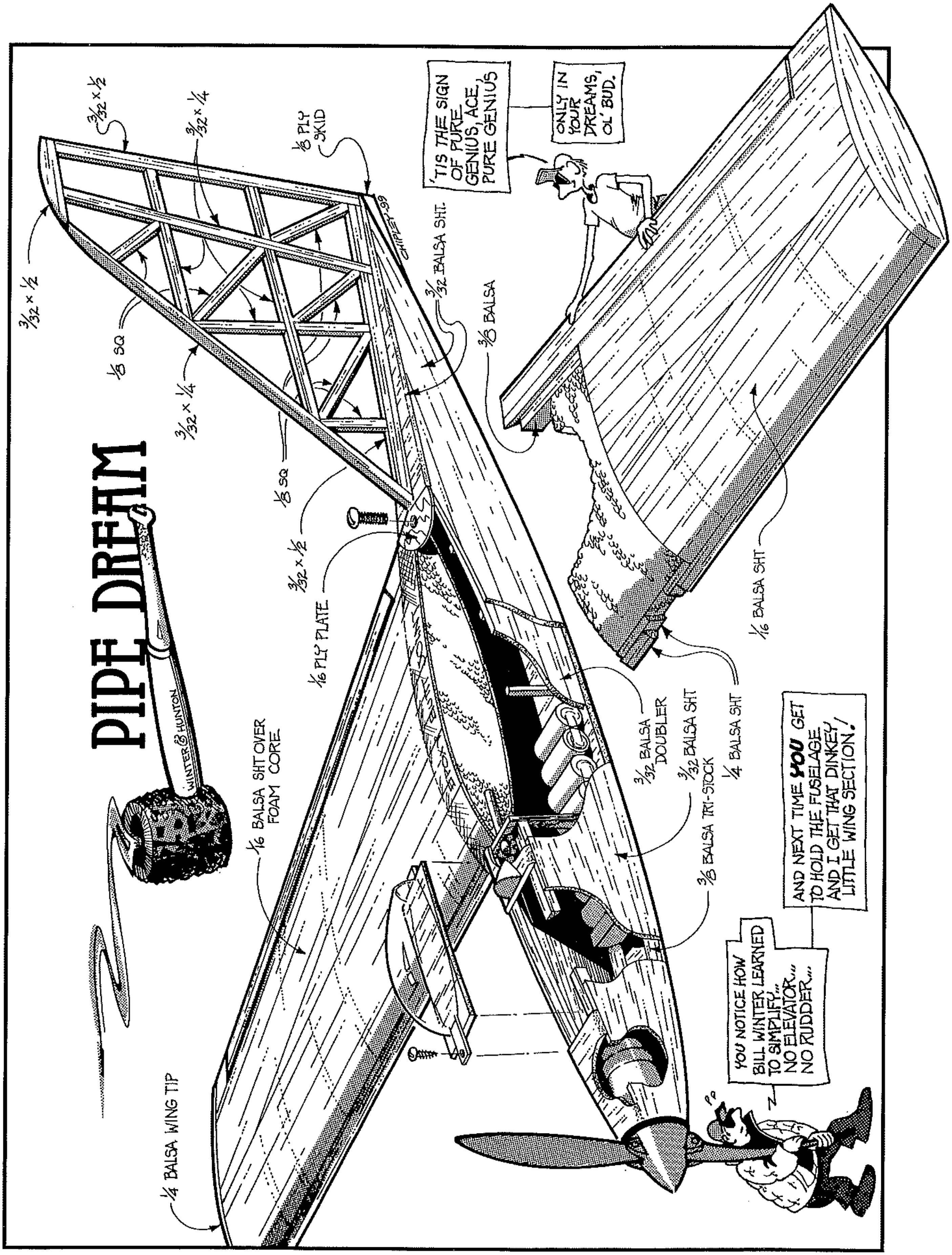
Epoxy wing halves together after careful shaping and sanding for proper dihedral angle. Lightening holes added later.



A 1/2-scale test glider was built to determine optimum balance point. Sheet model has "very good" glide ratio.

Full-Size Plans Available—see page 173




PIPE DREAM
WINTER HUNTON
1/4 BALSA WING TIP
1/16 BALSA SHT OVER FOAM CORE
1/16 PLY PLATE
3/32 x 1/2
1/8 SQ
3/32 x 1/4
1/8 SQ
3/32 x 1/2
3/32 x 1/2
3/32 x 1/4
1/8 PLY SKID
3/32 BALSA SHT.
3/8 BALSA
1/16 BALSA SHT
1/4 BALSA SHT
3/32 BALSA DOUBLER
3/32 BALSA SHT
3/32 BALSA TRI-STOCK
3/8 BALSA TRI-STOCK
'TIS THE SIGN OF PURE GENIUS, ACE, PURE GENIUS
ONLY IN YOUR DREAMS, OL' BUD.
YOU NOTICE HOW BILL WINTER LEARNED TO SIMPLIFY... NO ELEVATOR... NO RUDDER...
AND NEXT TIME YOU GET TO HOLD THE FUSELAGE AND I GET THAT DINKEY LITTLE WING SECTION!

Pipe Dream/Winter/Hunton

Continued from page 16

To land the Pipe Dream, go to full power *off* to stop the prop. If it has been gliding with full up trim, remove it to gain some speed for stall safety near the ground (similar to the procedure used in full-scale gliding). If it touches down fast the nose may pop up, so stay with the controls. Let speed bleed off to a few inches altitude, then let it settle in. With practice, Pipe Dream will skid smoothly to a stop at your feet.

For rudimentary thermal-seeking, trim the model at altitude to fly straight ahead into the wind (I mean by putting in a click of trim at a time). Let it go on its own and it will circle into lift. If you tend to fly the model with a ham fist and put control inputs into it at all times, you will never succeed in finding lift; every control input means additional drag and less efficiency. After the initial setup, you can control the model fully once it is at altitude, and even while climbing, by using trim only.

For aerobatics, try going to altitude, shutting down the motor, then diving to gain speed (it will go faster than with the motor running) and zipping across the field to loop or roll.

Pipe Dream is a very efficient model, with a wide range of capabilities. This is an excellent transition model from glow to Electric. ✈

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