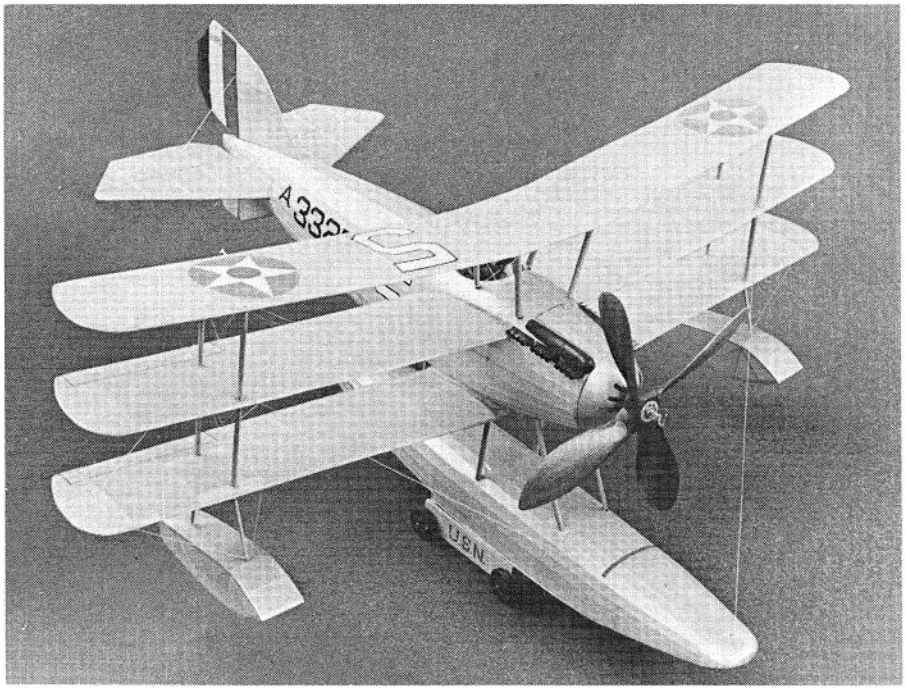
FREE FLIGHT AND CONTROL LINE

Bill Noonan's Curtiss 18-T-1 afloat on a mirror-like water surface. This rubber powered model is featured in a construction article that appears on the following pages. A rare bird indeed!



PHOTOS BY AUTHOR

CURTISS 18-T-1

"WASP"

By BILL NOONAN . . . An obscure three-winger from days gone by . . . and on floats, yet! Don't be fooled though, it's a fine flying model.

• Imagine the ghost of Glenn Curtiss standing in The Big Hangar in the Sky. He is looking out on a phantom aerial parade of famous planes bearing his distinguished name; the Jenny, all the Hawks, the Falcons, the NC-4, the P-40 series . . . the procession seems endless. Suddenly, the expression on the apparition's face becomes a faint smile with the noisy approach of an unmuffled engine, heralding the misty version of an aggressive and precocious craft elbowing its way through.

Curtiss' smile is one of a tolerant parent, making allowances for callow youth. The corpulent fuselage and extravaganza of wings and wires coupled with its brash demeanor give undeniable charm to the plane. It darts in and out of the heavenly cavalcade. Soon they are all gone from view.

This little scenario serves to establish the character of the Curtiss 18-T-1 triplane, one of many interesting and unorthodox aircraft which never achieved fame of any consequence, but which quietly took their place in aeronautical history, only occasionally revealed through probing inquiry of historians.

The Curtiss Model 18, sometimes called the Curtiss-Kirkham "Wasp" Triplane, was designed by Charles Kirkham in 1917 for his powerful K-12 engine. Its limited claim to fame is that it was considered to be the world's fastest "battle plane" in 1918, with an unofficial speed of 163 mph.

After the war, the Model 18 went through a series of modifications by Curtiss. Two of the 18-T-1 types were built for racing, numbered 3325 and 3326. Ours is good old 3325, which came to its ignominious end on a Detroit coal pile in 1922, capping a less-than-illustrious career.

While three-winged hydro-aeroplanes may not be high on your list of favorite designs, you will have to admit it's an endearing little bugger. Try it, you'll like it!

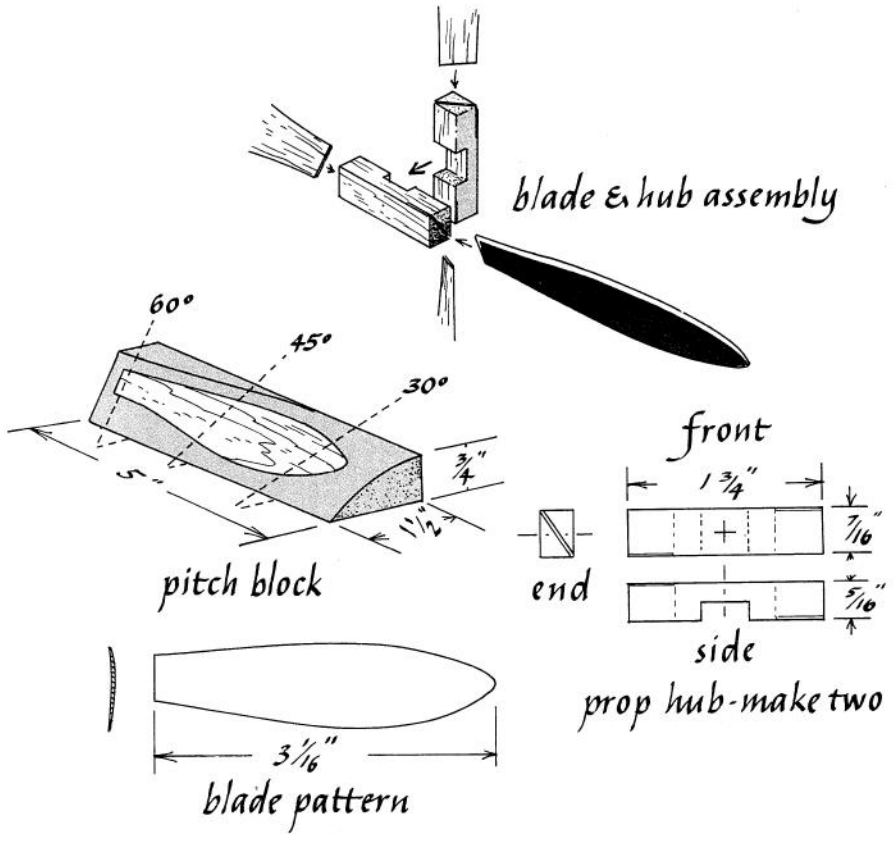
FUSELAGE CONSTRUCTION

Before anything else is done, it is necessary to cut formers for the right and left sides of the fuselage. These may be from soft 1/16 sheet, or, if you don't mind a little more work, structural benefits may be had by laminating two pieces of 1/32 sheet balsa at 90 degree angles, and cutting the formers from this more rigid stock. The advantage becomes more apparent later on when filing notches to receive the stringers.

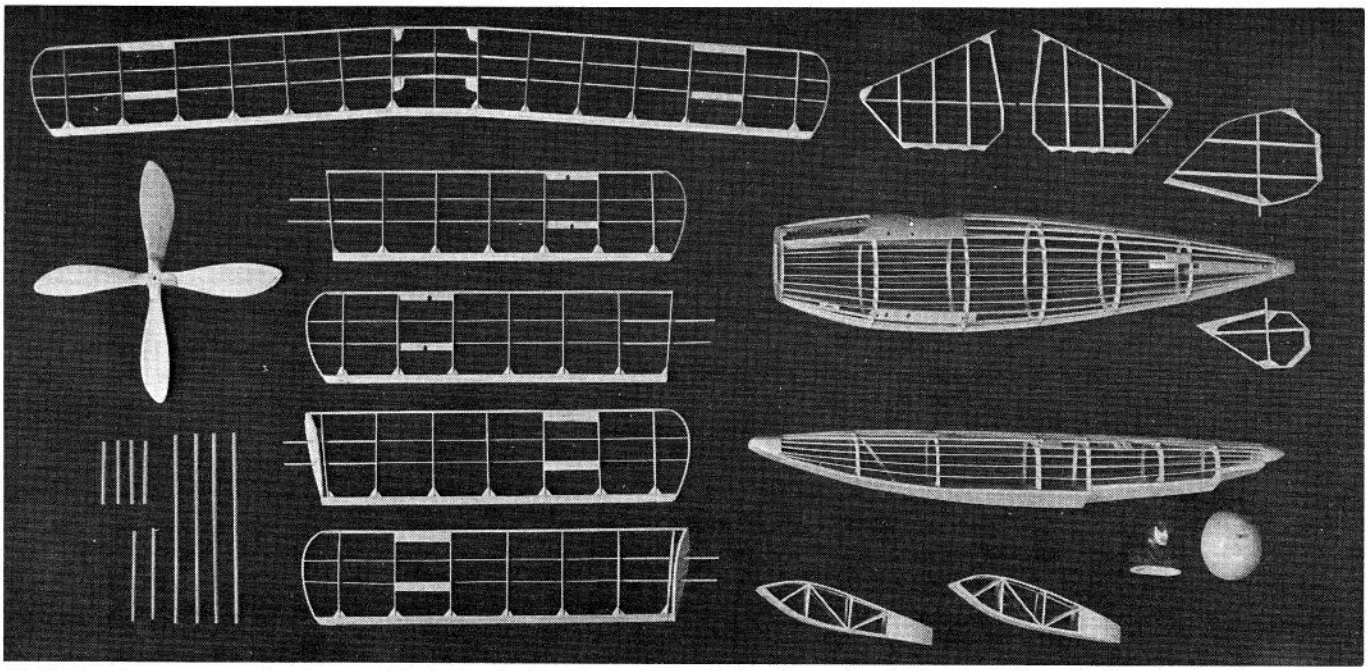
Pile the accurately cut right and left formers in a safe place on your workbench. No stringer notches at this time, they come later.

Protect the plans from surplus cement with Saran Wrap or wax paper. Apply cement along the edge of a piece of hard 1/16 square balsa slightly longer than the fuselage length. Mate this to a similar piece to make up a laminated "backbone." Secure to side view and form both top and bottom components. Do not pierce wood with pins.

Take formers for the left side and check them for fit at their respective stations. Notches at top and bottom of each former should index snugly with backbones. After making any necessary alterations, cement left side formers in place, checking for perpendicularity with a small 90 degree square as you proceed.



PROP DETAILS



Finished surfaces, uncovered and unassembled, showing the structural details. Fuselage and main float look like a fair bit of work, the rest is relatively simple. Only the top and middle wings do any lifting; the bottom wing has a symmetrical airfoil and just goes along for the ride.

When this assembly is thoroughly dry, remove it from plans and repeat the procedure with the right-hand former halves, carefully mating them to form the full former shapes. Check for any distortion by sighting down fuselage centerline.

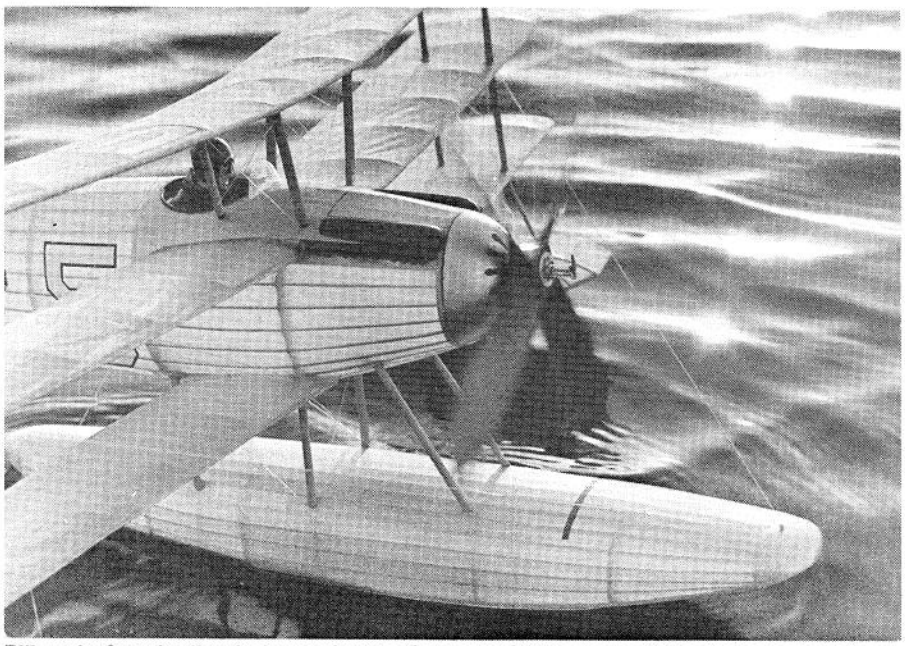
The plans show stringer locations on former 3. These reference marks should be transposed to the balsa former (both right and left halves) prior to cementing to backbone.

Here's the procedure we followed to establish correct stringer notch locations: Take any size flexible strip material (3/32 square is OK) and lay it along the fuselage side at stringer No. 7 (counting from the top). Tape the strip lightly at the tail and nose. Mark reference points on all formers. Loosen tape and repeat the process at each stringer location, using former No. 3 marks as primary reference. Follow this by filing 1/32-inch stringer slots, 1/16 inch deep. All stringers are medium hard balsa, 1/32x3/32. Confirm accuracy of notches by occasionally inserting test stringers. Whenever you insert a left-side stringer, counter its tension with a corresponding right-side stringer. When you finally have all the little beggars in place and have checked the fuselage for symmetry, apply cyanoacrylate glue to all stringer notches.

Trim excess length of stringers flush with front and back (1 and 7) formers. Fill between formers 1, 2, and 3 and down to the fourth stringer, with soft 1/16 sheet balsa. Sand to fuselage contour. Cut paper pattern of cockpit opening and lightly scribe outline in appropriate place, immediately in front of former 3. Cut and remove stringers, backbone and filler pieces. Sand cockpit edge to achieve neat and symmetrical oval.

Cut and rough-shape nose block from medium balsa. Tack glue temporarily to former 1. Carefully contour to conform to fuselage shape, using progressively finer sandpaper. Follow same procedure for fairing cone at tail. Cut nose block away from the former, and drill to accept prop shaft thrust button.

Fill in between stringers at tail where the two stabilizer halves cement to fuselage. Also fill in between stringers with hard 1/16 sheet to provide for 1/8-inch diameter aluminum rubber anchor tube.



Bill used a freewheeling device on the prop for longer flights. Some of the struts are made from cocktail straws. Monofilament "wires" add greatly to the model's strength.

FLOATS

The center (main) float is constructed in the same manner as the fuselage. All stringers are 1/32x3/32 medium balsa with the exception of the chine (where side and bottom intersect) stringers, which are 1/16 square. The bottoms of all floats are covered with light 1/32 sheet balsa. Keep the chine edges as sharp as possible, as this is hydrodynamically important. Float struts are made of bamboo. The front struts are cemented to the back side of float former D. All four struts are made long enough to reach inside fuselage about 1/2 inch. These will be cemented to fuselage formers 2 and 3. Wherever struts pass through fuselage or floats they are surrounded with a 1/16 sheet balsa "collar" to allow securing of tissue covering. Add .010 aluminum water rudder.

The tip floats are simple boxes with pinched trailing sections. Lay down frames for four identical sides. Main components are 1/16 square balsa, diagonal braces 1/32x1/16. When as-

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Curtiss . . . . . *Continued from page 54*

sembling model, tip floats may be held in place under wing with 1/16 O.D. aluminum tube struts, fastened with 1/32 wire, or you may prefer to use bamboo. We used the aluminum tube held in friction fit with the wire fasteners. In case of rough landing, the float will separate from wing rather than transmitting stress to spars, etc. At least, that is our theory.

WINGS

Being a Seat-of-the-Pants engineer, I decided to try a theory that had been used with good success on another multi-wing model, and this is to make the two upper wings do the work, while the bottom one is streamlined and goes along for the ride. Think of the model as a parasol. The combined lift area of the two upper wings is more than enough. How flying characteristics would have differed if we had followed conventional practice is a moot point.

Cut 29 lifting airfoil ribs from 1/32 medium sheet balsa for upper wing panels, and 14 streamlined ribs for the bottom two panels. Pin both batches together for convenience of sanding and notching. Unpin and set ribs aside for a moment.

Each wing panel follows the same assembly technique; just don't build six right-hand panels!

Secure hard 1/32x1/8 balsa spars over plans with plastic "pin-downs" (available from Peck Polymers, P.O. Box 2498, La Mesa, CA 92041). These hold the wood in place without the hazard of splitting. Allow the spars to overhang end ribs by about 1 inch. Cement ribs in place on spars, with the exception of the root ribs on the middle and lower wing, which are angled to mate properly with fuselage contours. These ribs may be cemented after confirming correct angle by slipping finished panels in place with appropriate dihedral setting. Cement leading and trailing edges in place, followed by tips, which have been laminated from two pieces of 1/32x1/16 soaked basswood, bent around a cardboard or scrap balsa form. This is the only place on the model (except prop) where white glue was used, all other joints being secured with Ambroid or Hot Stuff. (This is an R.O.W., you know!) Leave laminations around form overnight. Waxing the edge of the form with a crayon or candle facilitates basswood removal.

Add hard 1/16x1/4 balsa strut base pieces as shown on plan. The pieces in the center wing panels are drilled to allow clear passage of cocktail straw interplane struts. The struts are slightly flattened to an oval cross-section. (Substitute balsa if you don't drink cocktails!) Cementing 1/4-inch long balsa stubs (which fit inside straws) in place after the wings have been covered makes it easier to accurately index the struts to the wings. These stubs are on the underside of the top wing and on the top side of the bottom wing. Add 1/32 sheet gussets where ribs cement to trailing edge.

Cut and carefully sand leading and trailing edges to proper airfoil shape. Tips should be sanded to semi-circular cross-section, tapering to fair in smoothly with trailing edge.

Construct top wing center-section. Secure this unit to workbench and slip right and left panels in place, allowing spar stubs to contact at center section center rib. The spar stubs will require tapering along the bottom to accommodate the dihedral. Prop up tips 1/2 inch before cementing. Fill in between spar stubs with tapered "bridge spar" that makes allowance for the 5 degree sweepback. Add the four laminated cabane strut mounts. Laminations should be of two pieces of hard 1/32 sheet balsa, to make 1/16 inch thick parts. These will be drilled later to insert strut ends.

TAIL

Construct vertical fin(s) and horizontal stab from 1/16 square balsa. Trailing edges are 1/16x3/16. Stab tips are 1/16 sheet. Be sure to incorporate gussets as shown. Construction incorporates 3/32x1/32 cap strips on ribs to enhance rigidity. Sand surfaces to streamline shape. Note that each part allows the spar stub to protrude about 1/4 inch. This makes assembly easier when cementing surfaces to fuselage and provides a stronger installation. Scallop trailing edges as shown.

PROP

The four-bladed prop looks formidable, but isn't difficult to make. See sketch for details. The blades are made by laying up two pieces of 1/32 sheet balsa over a pitch block made from pine. Soak the sheet balsa blades in hot water for about an hour before applying white glue between laminations and binding them to the pitch block with a length of an old rubber motor. Protect the balsa blade with a piece of thin cardboard before binding. Make four blades, letting each dry overnight on the block before removing and shaping with sandpaper to an airfoil section.

The center hub parts are cut from hard balsa and slotted as shown to receive the blades, which should have about a 40 to 45 degree angle at their centers. Wedge-fit all four blades and check for alignment and symmetry before cementing. Cut and sand hub so blades fair in smoothly, giving the prop a finished appearance. Drill hole in center to receive aluminum tubing which will accommodate the .045 prop shaft wire. This provides for free-wheeling. Prop hook is bent in a conventional manner and installed later, after prop and nose block have received final coat of dope. A lightweight compression spring at the hub front assists in disengaging free-wheeling mechanism.

COVERING, ASSEMBLY, AND FINISH

The Curtiss 18-T-1 followed the contemporary Naval aircraft color scheme. The top wing and stabilizer surfaces were chrome yellow and the balance of the plane was either light gray or silver. Silver seems to make a more attractive model, so that is what we chose. All struts were painted with Floquil railroad color, called "concrete."

Model is covered with Japanese tissue. You can use silver tissue, however, we elected to spray the pigment on white tissue.

Wing and tail covering does not need any special mention. The only suggestion we might make is to spray the entire model framework with diluted clear dope before covering. When flying off water, the model is sure to get soaked once in a while. The doping slows down the water absorption, thereby preventing excessive weight gain.

We never did have much luck with covering with wet tissue, but the fuselage might lend itself to this practice if you have had success with it. We chose to cover dry, cutting tissue widths corresponding to the distance between former bays and wrapping about one-quarter around the fuselage circumference. Start at the tail, and be sure tissue grain runs parallel with fuselage centerline. The main float is covered in the same manner. Cover float bottom (which is 1/32 sheet) with tissue also. Shrink tissue with alcohol spray.

The covered model is sprayed with two coats of diluted 1-to-1 clear nitrate dope, with plasticizer added to prevent excessive warping. Pin down wings and tail surfaces during drying. The third, and last, coat of dope has silver powder added. We added about a toothpaste tube capful to an ounce of dope. You don't need more. This allows the translucent quality of the tissue to be main-

tained. All solid balsa parts such as the nose block, tail fairing, float nose, and tail cone should be prepared with two coats of sanding sealer, before spraying with silver.

Engine valve covers and exhaust stacks are painted black. We rubbed them with powdered graphite to simulate the worn metallic look.

The prop is stained mahogany brown and given two coats of clear dope. Numerals and insignia are cut from colored tissue and doped on. The large numeral five which appears on the fuselage and on top of upper wing and bottom of lower wing is white with black outline. The A 3325 serial number is cut from black tissue. A red band which denotes danger area immediately below prop arc on the main float is 1/8x1 inch red tissue applied across float top.

Assembling a triplane calls for a little more care than putting the wings on a Taylor Cub. The procedure we used seems about as good as any:

Cut and position bamboo cabane struts. These penetrate the balsa filler pieces surrounding the cockpit, and cement to support pieces inside the fuselage. Cut holes in the cabane strut mounts on the underside of the top wing center-section. The bamboo cabanes should slip into these snugly. Eyeball the top wing for alignment and incorporate about 2 degrees incidence before Hot Stuffing the wing in place. Slip center and lower wings in place, with the spar stubs (hopefully) touching where they meet inside the fuselage. The center wing should have about 1 degree incidence, the bottom 0. Position the model upside-down on workbench, cushioning the top wing center-section with soft rags to prevent distortion of dihedral. Now clear everybody out of the room and lock the door. This is the time you will wish you had an auxiliary hand as there are a lot of wings flopping around.

Force interplane (straw) struts through the holes provided in center wing. Index the struts over the short stubs in top and bottom wings. These were described earlier. Check wing gap with dividers to make sure everything is OK. Check wings from top, front, and rear, before applying cement to struts and wing roots. Spar braces should be cemented to spars inside the fuselage. If everything looks good, pick up the model and admire it. Unlock the door.

The fin(s) and stab are installed in a similar manner. Set stab at zero degrees incidence. No provision is made for incidence changes. If this is necessary, install a small trim tab.

Flying wires are of 2-pound nylon fishing leader, sprayed silver. These wires, which are not difficult to install, not only add to the character of the plane but also contribute a great deal to the structural integrity of the wings. Simply stitch the wires in place with a fine sewing needle drawn through the hollow straws and wing tissue. Apply Hot Stuff sparingly at intersections.

FLYING

Balance model as shown on plans, approximately at front wing spar. Power model with 8 strands of rubber, 24 inches long. Always lube before flying.

R.O.W. takeoffs need quite a bit of poop to break the water's surface. Eight strands seems to be adequate if flying conditions are ideal, this being a slight breeze and some slight wave action. The idea with a single float model is to get it in the air fast, before a tip float has time to cause excessive water drag and slew the plane around. Some modelers have success in tying a length of thread to the stern of the float, allowing it to trail in the water and somewhat counter the drag forces exerted on the tip float.

Wind about 250 turns for initial test. If a deep grass area is convenient, make hand-launched tests, checking for flight trim. On rise-off-water flights, try letting the wind come about 10 degrees off the starboard (right) side when launching. Slight adjustment of the aluminum water rudder may be needed for water control.

The Curtiss 18-T-1 is an unusual subject, and provides a challenge to the more experienced builder. •