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R/C Boats

For the Airplane Modeler

Kodacolor by George Meyer



GEORGE MEYER'S

WACO

WACO 10 AND TAPERWING

by George Meyer

Build two related biplane classics for Rubber Scale.

Tucked away in the memory of literally thousands, are fond recollections of a happy association with the friendly and thoroughly lovable old "Waco 10" biplane, an airplane that should no doubt go down in aviation history as just about the most popular of this period. It's trim and simple beauty and pleasant character, together with its gratifying performance with the OX5 engine made it extremely popular with the small operator and private owner. They used it for just about everything, from weekend passenger hopping, charter trips to out of the way places, dual instruction, rental for solo time and what have you. Even those that used their "10" largely for sport often resorted to any of the above mentioned schemes to help defray expenses. The "Waco 10" was a good airplane, in fact its popularity became so great that "the boys at Waco" were forced to turn out over 350 of the "Model 10" with the Curtiss OX5 engine in 1927 alone. Besides these, there were a small number of the modified "10's" built with various other powerplant installations. It is quite remarkable what a transformation took place in the docile "Waco 10" by just the replacement of

wings; a set of tapered wing panels with an M-6 airfoil section turned the J-5 powered "Waco 10" into a truly fabulous airplane. Fast, eager, flashy and highly maneuverable, the "taper-wing" was the answer to a sportsman-pilot's dream and prayer. Modified from the basic "Ten-W," the "Taperwing" (Ten-T) was also a three-place open cockpit biplane powered with the Wright Whirlwind J5 engine of 220 hp. Seating for three was in two open cockpits, but the front cockpit could be closed off with a metal cover to make it into a one-place when used strictly for air-race work, stunt or sport flying.

This preamble was quoted directly from U.S. Civil Aircraft volumes I and II by Joseph P. Juptner, a wonderful source of information for the scale model builder of the older classic airplanes.

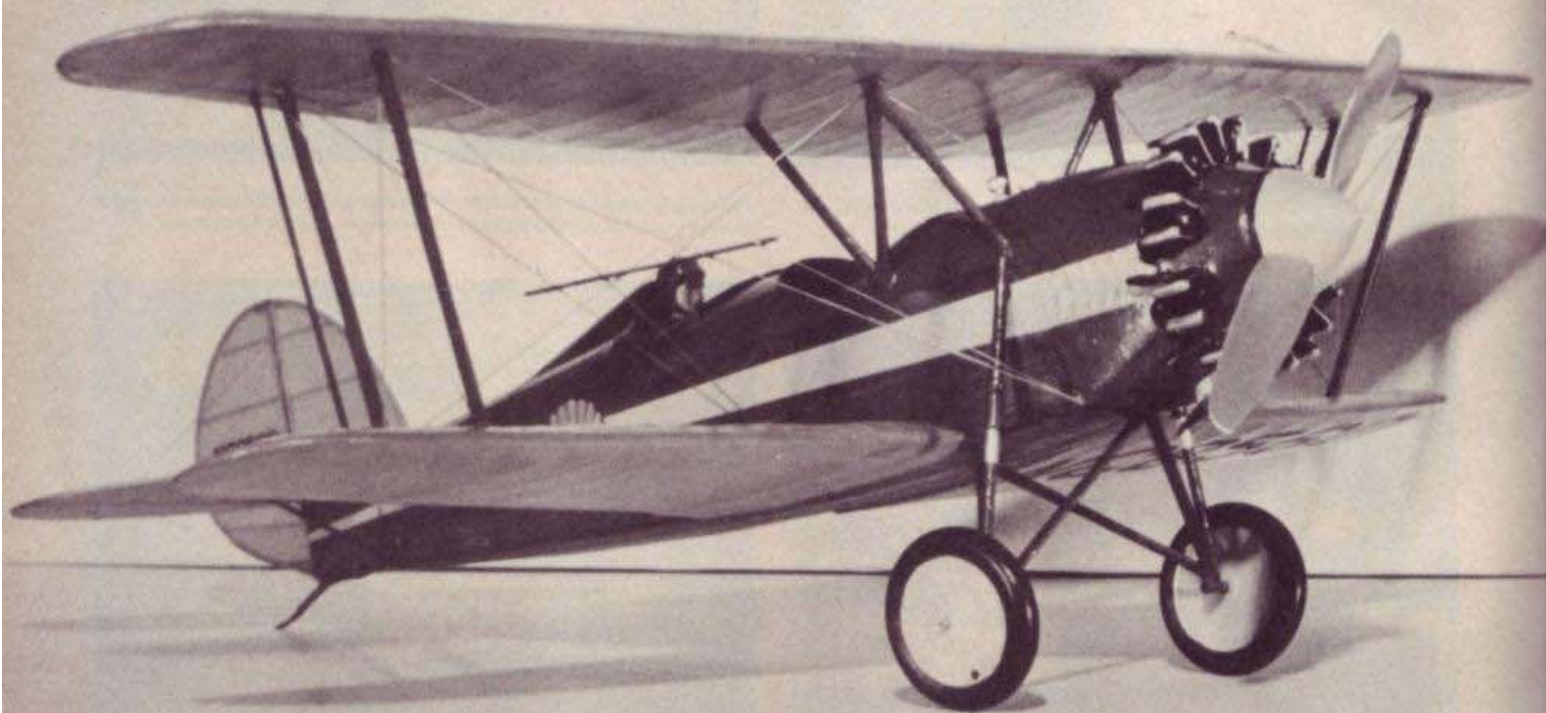
As the "Waco 10" was the basis for many different models of aircraft of that period, several models are suggested and possible from these plans. For example, some "Waco 10's" were fitted with the Wright Whirlwind J5 as well as the Curtiss OX5 and the prototype "Waco Taperwing" was fitted with the OX5 engine. Both airplanes

used the basic "Waco 10" fuselage from the firewall aft, so if you do not want to go to the trouble of building the Wright J5 engine for the "Taperwing," build it like the prototype with the OX5 engine nose. If you enjoy building radial engines, put the Wright J5 on the "Waco 10," then known as the J-5 straight wing. Make your own choice and build what you favor the most.

The Fuselage Construction

Since I hate to build wings, but love biplanes, I build the fuselage first. The fuselage is built up in the conventional manner, using $\frac{1}{16}$ " sq. basswood (railroad stock) or hard balsa. I suggest you build both sides at the same time, one on top of the other. Use a $\frac{1}{16}$ " sliced rib, cut into sections and installed between the longerons and uprights where the lower wings will attach. When the glue is dry, carefully split the two sides apart back to the tail post with a razor blade. Install the cross-members, starting at the tail and working forward. Be sure to attach the $\frac{1}{16}$ " x $\frac{1}{4}$ " cross-members at the firewall and rear landing gear attachment points. Add the bulkheads to the top of the fuselage and install the $\frac{1}{32}$ "

Photos: George Meyer except where noted



x 1/16" stringers. The center stringer on the bottom of the fuselage is 1/16" sq. balsa.

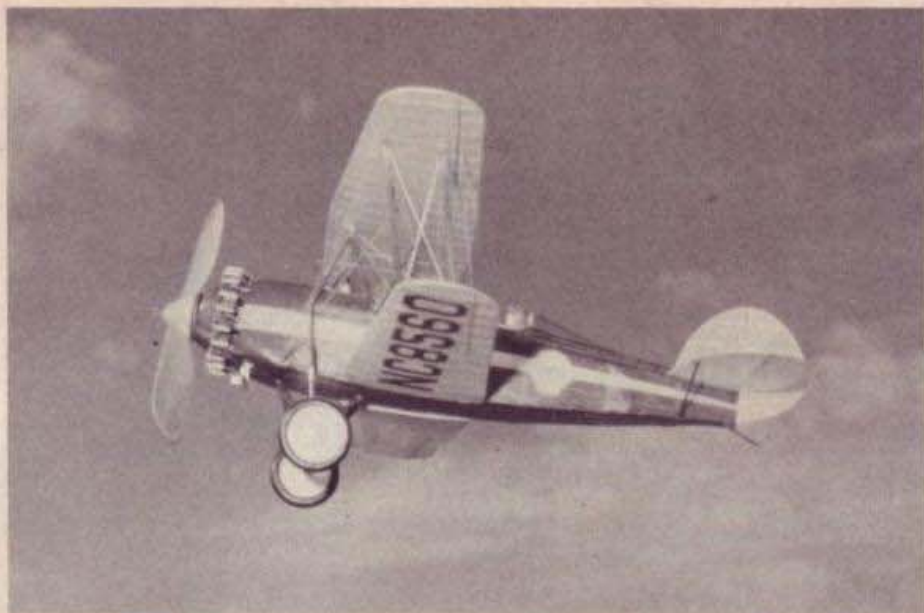
Cover the top of the fuselage with 1/32" soft balsa to the back edge of the rear cockpit. Cut the cockpits out and glue 1/16" cord around the edges for crash pads, then carve the head rest out of soft balsa and hollow to about 1/16" in thickness. Do not install this until after covering the fuselage.

Two blocks of soft balsa are glued together for the nose block as shown on the drawing. The OX5 nose stops at the removable nose block. Carve it to shape, then split it apart at the tack glue joints and hollow to approximately 1/16" thickness. Glue back together and install the 1/32" plywood bulkhead with the 1"x1 1/16" cut-out to receive the nose block box. Make up the nose block box, two if you are going to make an exhibition nose and propeller and glue it to the removable nose block. Slip the two together and trim the removable nose block to match the rear nose cowl. Carve the exhaust stacks for the "Waco 10" out of 1/8" plywood, rounded off to shape.

The "Waco Taperwing" cowl is a little different. Glue two blocks together as before, then shape the nose block per the plans. Cut the block at the point shown, two places, in front and back of the cylinders. Split the rear section as before and hollow out to about 1/16" in thickness. Install a 1/32" plywood bulkhead to the front of this section. The bulkhead has a 1 3/16" hole in the center.

Make the engine crankcase of laminated 1/8" balsa. I used 7/16" dia. dowel turned to the proper taper and a thread file to cut the cylinder fins. Heads and rocker boxes are of balsa blocks and you can simulate fins with a small needle file with a knife-edge.

The intake pipes are 3/32" dia. plastic tubing (model railroad material). This type



WACO 10

Type: 3-place open cockpit biplane
 Wingspan: 30'7"
 Wing Area: 286 square feet
 Length: 23'3"
 Height: 9'2"
 Empty Weight: 1199 pounds
 Gross Weight: 2025 pounds
 Fuel Capacity: 50 gallons
 Top Speed: 96 mph
 Cruise: 85 mph
 Landing Speed: 40 mph
 Service Ceiling: 13,500 feet
 Rate of Climb: 700 fpm

WACO TAPERWING

Type: 3-place open cockpit biplane
 Wingspan: 30'3"
 Wing Area: 227 square feet
 Length: 22'6"
 Height: 9'
 Empty Weight: 1677-1787 pounds
 Gross Weight: 2600 pounds
 Fuel Capacity: 76-100 gallons
 Top Speed: 137 mph
 Cruise: 110-115 mph
 Landing Speed: 52 mph
 Service Ceiling: 19,000 feet
 Rate of Climb: 1200 fpm



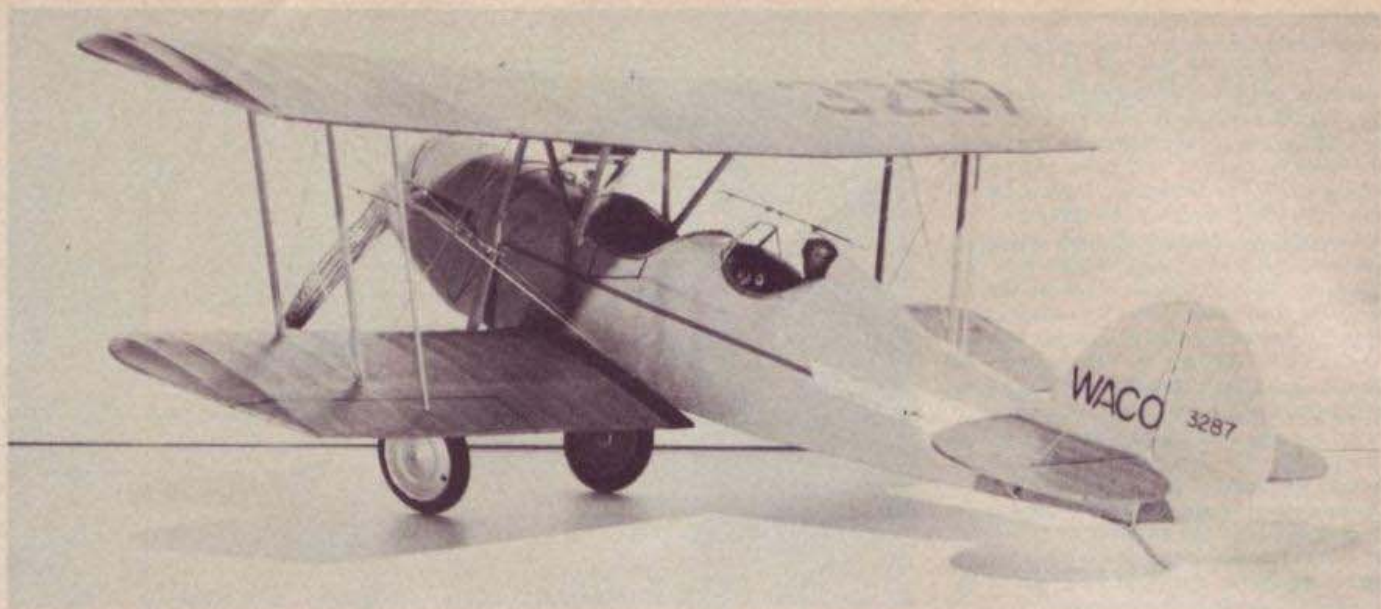
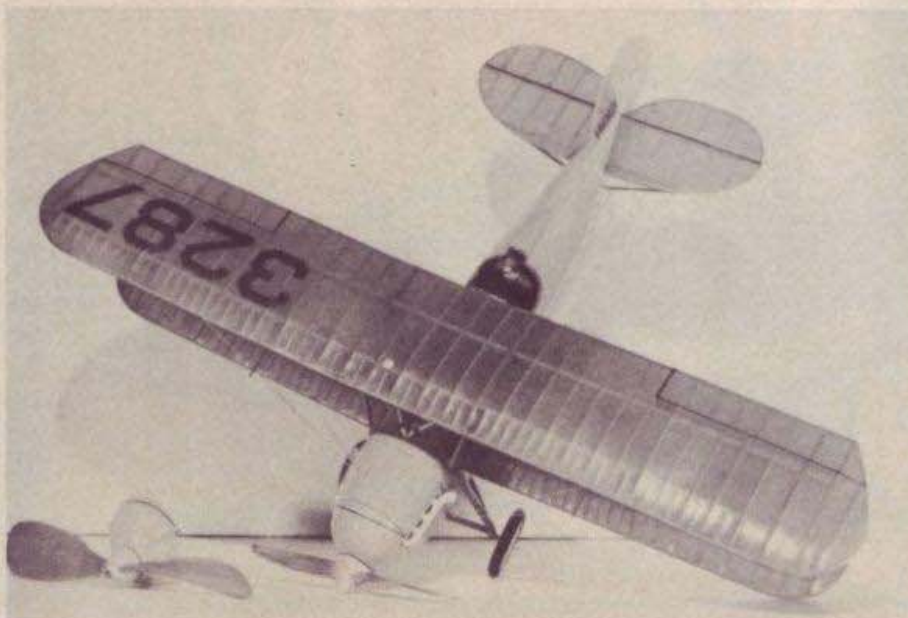


Photo: Tom Meyer



Above: Two cockpits for three. A ride in a "Waco" is a view of the world through singing wires. Scale buffs will find it a stable design, all your work rewarded in the blue. Below: "Waco 10."



bends easily and glues well with aircraft cement. Create the sabre exhaust stacks of $\frac{1}{8}$ " round balsa, tapered as shown. Get a Williams Bros. catalog for details of the Wright J-5 engine. Their cylinders can be used, but they are a little small for the $\frac{3}{4}$ " scale required for this mode. Paint the engine at this time.

Glue your engine to the $\frac{1}{32}$ " bulkhead, then take the front section out of the cowl and cut a $\frac{13}{16}$ " hole in the center and adhere to the crankcase of the engine. Use small pieces of $\frac{1}{16}$ " balsa to fill in between cylinders with about $\frac{1}{32}$ " space around the cylinders. The removable nose block is of $\frac{1}{32}$ " plywood and a balsa block $\frac{13}{16}$ " in diameter to fit in the nose block. Use a $\frac{1}{8}$ " aluminum rivet, drilled .045" for the prop shaft bearing.

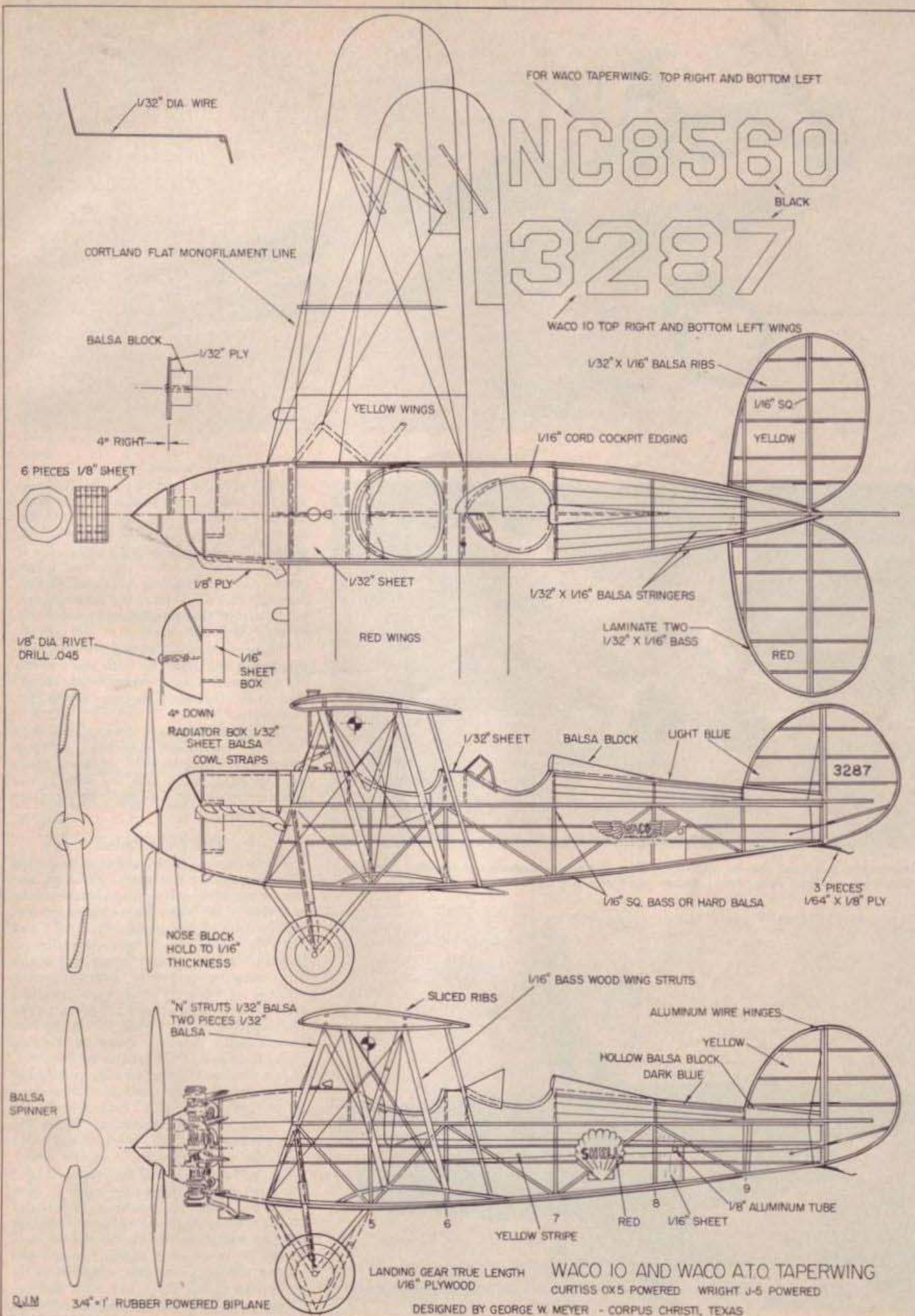
For exhibition propellers, I used a plastic prop for the metal one used on the "Taperwing" and "Model 10." I made up a block of eight laminations of birch glued together with Weldwood Resorcinol glue. It is dark in color and makes the laminations show up beautifully when carved. Simulate tips of this prop with .005 copper sheet available at art stores. The spinners are of balsa or white pine.

The radiator for the "Waco 10" is of $\frac{1}{32}$ " sheet balsa. Score the front and back with a ball point pen, then rub on Copper Rub 'n Buff, available at art stores. The water tubes are $\frac{3}{32}$ " plastic tubing.

Wheels are fabricated of $\frac{1}{32}$ " plywood and $\frac{1}{8}$ " sheet balsa, all glued together on a 4" dowel. The dowel is used as a mandrel to hold it in the lathe or drill press to turn the correct contours. (Note the offset in the wheel side plates). When finished shaping, cut the $\frac{1}{4}$ " dowel off flush with the wheels and glue the $\frac{1}{16}$ " aluminum bearings in place.

The tailskid is three laminations of $\frac{1}{64}$ " plywood. Make a simple jig of pins to hold in a curve until the glue is dry.

The landing gear legs are $\frac{1}{16}$ " plywood stacked together and sawed. Sand to a streamlined shape. Shock struts are made of balsa, streamlined on "Waco 10" and round on the "Taperwing." Score the shock struts with a piece of $\frac{1}{32}$ " wire until the wire will pop into the groove. The landing gear is of $\frac{1}{32}$ " dia. wire with a one turn coil

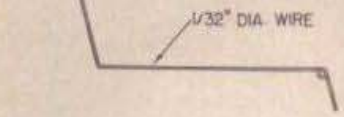


FOR WACO TAPERWING: TOP RIGHT AND BOTTOM LEFT

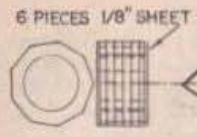
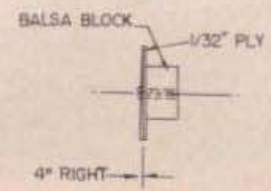
NC8560

3287

BLACK



CORTLAND FLAT MONOFILAMENT LINE



1/8" DIA. RIVET
DRILL .045

1/8" PLY

1/32" SHEET

1/32" X 1/16" BALSA STRINGERS

LAMINATE TWO
1/32" X 1/16" BASS

RED WINGS

1/16" CORD COCKPIT EDGING

1/32" X 1/16" BALSA RIBS

1/16" SQ.

YELLOW

RED

4" DOWN
RADIATOR BOX 1/32"
SHEET BALSA
COWL STRAPS

1/32" SHEET

BALSA BLOCK

LIGHT BLUE

3287

NOSE BLOCK
HOLD TO 1/16"
THICKNESS

1/16" SQ. BASS OR HARD BALSA

3 PIECES
1/64" X 1/8" PLY

1/16" BASS WOOD WING STRUTS

SLICED RIBS

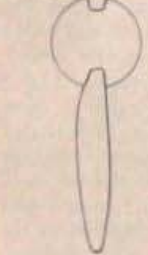
ALUMINUM WIRE HINGES

"N" STRUTS 1/32" BALSA
TWO PIECES 1/32"
BALSA

YELLOW

HOLLOW BALSA BLOCK
DARK BLUE

BALSA
SPINNER



LANDING GEAR TRUE LENGTH
1/16" PLYWOOD

WACO IO AND WACO A.T.O. TAPERWING
CURTISS OX5 POWERED WRIGHT J-5 POWERED

DESIGNED BY GEORGE W. MEYER - CORPUS CHRISTI, TEXAS

QJM 3/4" = 1" RUBBER POWERED BIPLANE



Photo: Tom Meyer



Guaranteed to make you late for dinner. Biplanes in trees don't come out so easy. Fun to fly it. At top: A tail-dragger, skid and all. Below: Kind of a still-life scene. Scale prop for display.



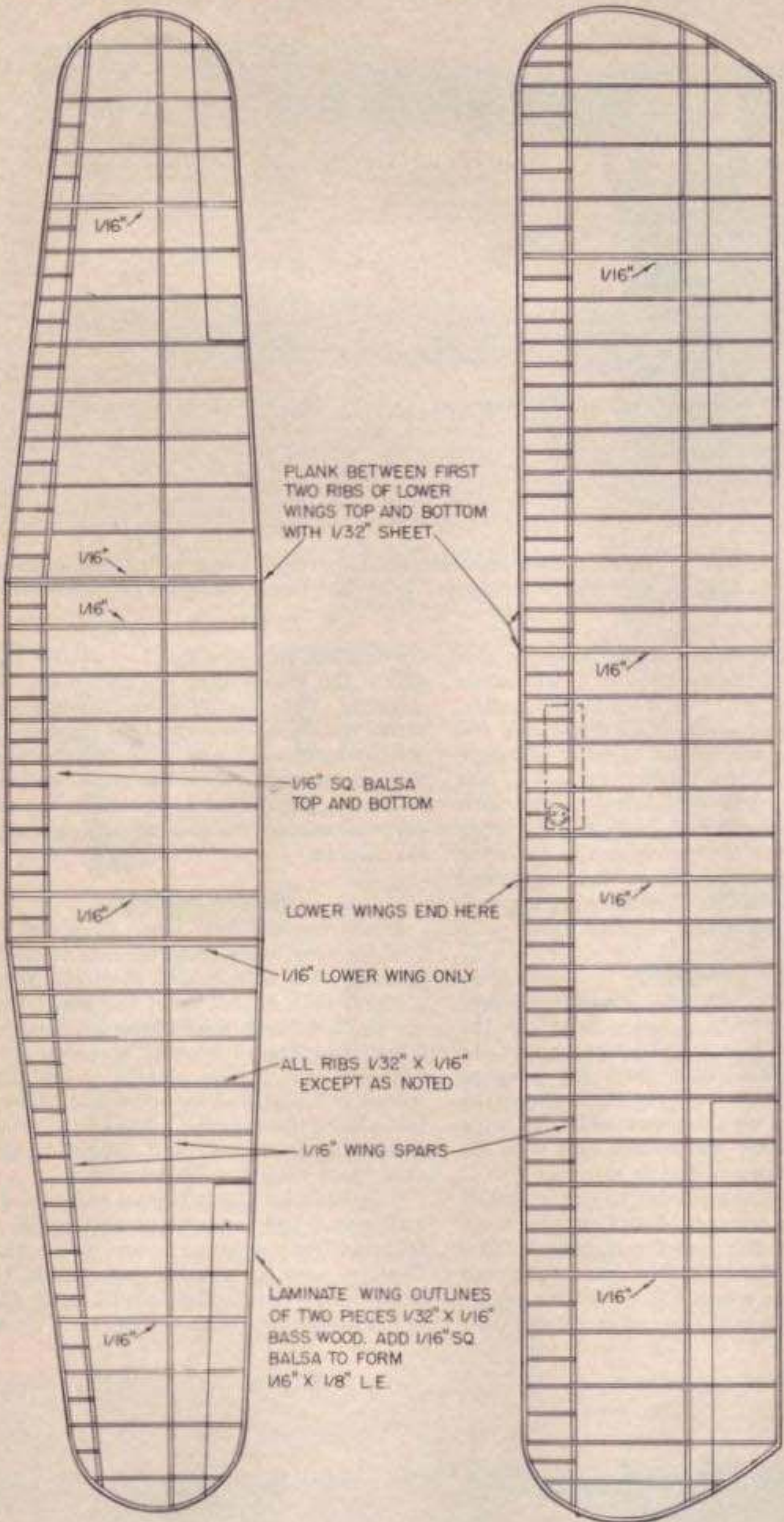
at lower ends for landing shocks. Securely glue the landing gear wire to the top cross member of the fuselage and install the balsa shock struts on the wire with glue. Assemble the landing gear with two pieces of $\frac{1}{8}$ " dia. dowel on lower ends with a saw cut to clear the landing gear coil shocks. Securely glue all joints of the landing gear, but be careful that no glue gets on the coils so they can work freely.

The center-section struts are $\frac{1}{32}$ " plywood with $\frac{1}{32}$ " balsa on both sides of the ply and sanded to a streamlined shape. Glue to the fuselage longerons at the correct angle.

The tail surfaces are conventional with $\frac{1}{32}$ " x $\frac{1}{16}$ " basswood laminated outlines, glued with Titebond. $\frac{1}{16}$ " sq. balsa spars and $\frac{1}{32}$ " x $\frac{1}{16}$ " balsa ribs are added. Use soft aluminum wire for hinges on elevators and rudders.

The Wing Panels

The wings of both airplanes are built alike, except for the spars. Make an aluminum template of the ribs as shown on the side view of the plans. Slice enough top and bottom ribs of $\frac{1}{32}$ " sheet ($\frac{1}{32}$ " x $\frac{1}{16}$ ") and $\frac{1}{16}$ " x $\frac{1}{16}$ " sliced ribs to be used on the in-board ends of the lower wings and at the strut attachment points. Laminate wing outlines of $\frac{1}{32}$ " x $\frac{1}{16}$ " basswood (railroad stock) around a cardboard template. Curve the template on the "Waco 10" so the tips have a gentle curve as shown on the side view. Your wood will probably be too short, so join them on the leading edge with about $\frac{1}{2}$ " overlap of the laminations. This is done by cutting one $\frac{1}{32}$ " x $\frac{1}{16}$ " lamination about $\frac{1}{2}$ " short and the joining one about $\frac{1}{2}$ " long so they stay flush. There should be no problem with short wood on the lower wing. Add a piece of $\frac{1}{16}$ " sq. balsa on top of the lamination at the leading edge to form $\frac{1}{16}$ " x $\frac{1}{8}$ ". Sand the outlines and round off the trailing edge and shape the leading edge to match the airfoil. Pin the outlines to the plans on your building board and glue in the top sliced ribs. When dry, remove and install the lower ribs. On the "Taperwing," clip off the trailing edges of



PLANK BETWEEN FIRST TWO RIBS OF LOWER WINGS TOP AND BOTTOM WITH 1/32" SHEET

1/16" SQ Balsa TOP AND BOTTOM

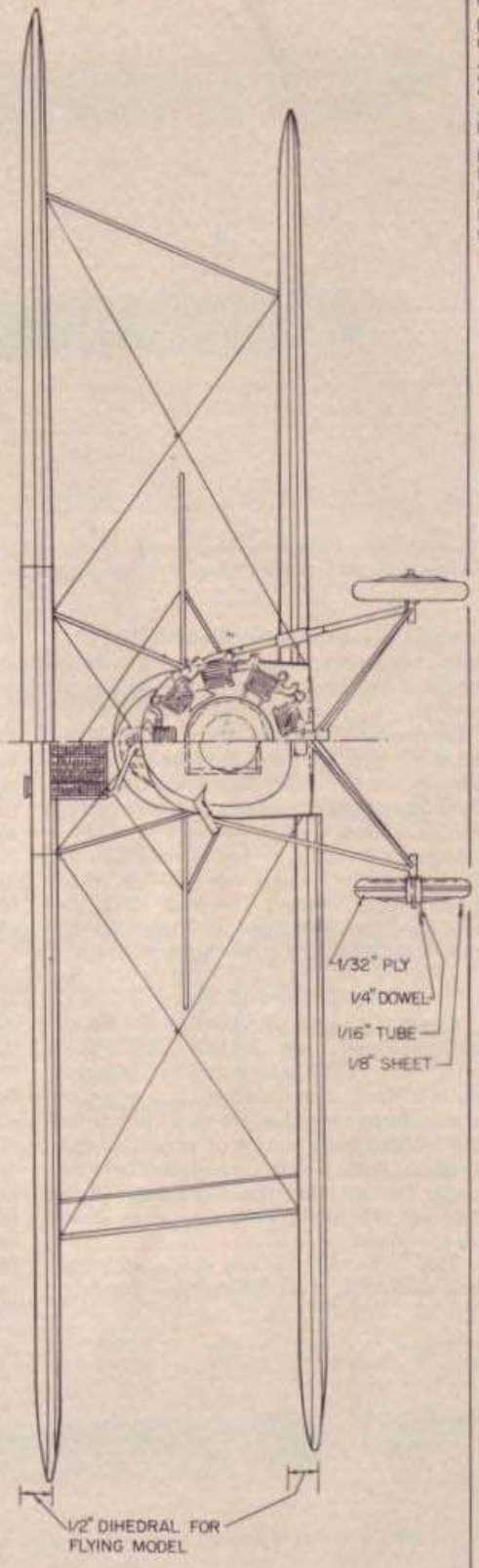
LOWER WINGS END HERE

1/16" LOWER WING ONLY

ALL RIBS 1/32" X 1/16" EXCEPT AS NOTED

1/16" WING SPARS

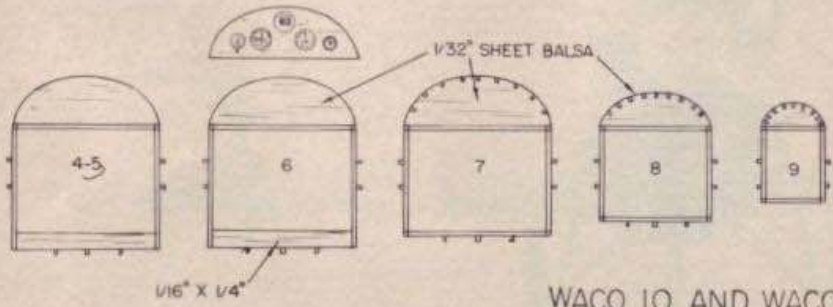
LAMINATE WING OUTLINES OF TWO PIECES 1/32" X 1/16" BASS WOOD. ADD 1/16" SQ Balsa TO FORM 1/16" X 1/8" L.E.



1/32" PLY
1/4" DOWEL
1/16" TUBE
1/8" SHEET

1/2" DIHEDRAL FOR FLYING MODEL

FLYING PROP 9-1/2" GUILLOW WOOD CUT TO 7-1/2" DIA.
POWER - 4 STRANDS 3/16" RUBBER



1/16" X 1/4"

WACO 10 AND WACO A.T.O. TAPERWING





Some changes made at the Waco works. The "Waco 10," straight of panel, in-line mill, OX5 power. It was an able aircraft in its time and age.

Below: The big radial sparked up performance and the new tapered panels gave zest to aerobatics. Turned the sport pilot of the day enthusiastic.

the ribs to get the correct length. Mark the ribs at the correct spar locations and fit the spars of $\frac{1}{16}$ " sheet balsa on the "Waco 10" and $\frac{1}{16}$ " sq. balsa top and bottom on the "Taperwing." Measure spars for a proper fit at the tips. Remove, trim, re-install and glue in place. Be sure to cut the spars and leading and trailing edges at center-section for $\frac{1}{2}$ " dihedral at the wing tips. This is necessary for good performance. Plank the first bay of the lower wings with $\frac{1}{32}$ " sheet balsa top and bottom. The wing struts are made of $\frac{1}{16}$ " basswood as shown on the drawing. Sand to a streamlined shape.

To Cover and Finish

Cover the model with the lightest weight Japanese tissue you can find. The "Taperwing" has yellow wings and tail surfaces, with a dark blue fuselage and a yellow stripe down the sides. Go to a Shell filling station and get a couple of empty oil cans (paper). With a sharp knife carefully cut under the Shell insignia and glue it to the fuselage sides with Titbond glue as shown on the plans.

The "Waco 10" has red wings, stabilizer and elevators, with a light blue fuselage,

fin and rudder. Water dope the tissue covered parts of the model with a light spray or water or rubbing alcohol. When dry, dope with two coats of 50-50 thinner and nitrate dope and one final coat of 20% dope (one coat only on the tail surfaces), 20% clear lacquer and 60% thinner. This seals out the moisture and gives a little shine and adds very little weight. Cut the wing registration numbers from black tissue and apply to the top of the right wing and bottom of the left wing with thin dope.

Rigging

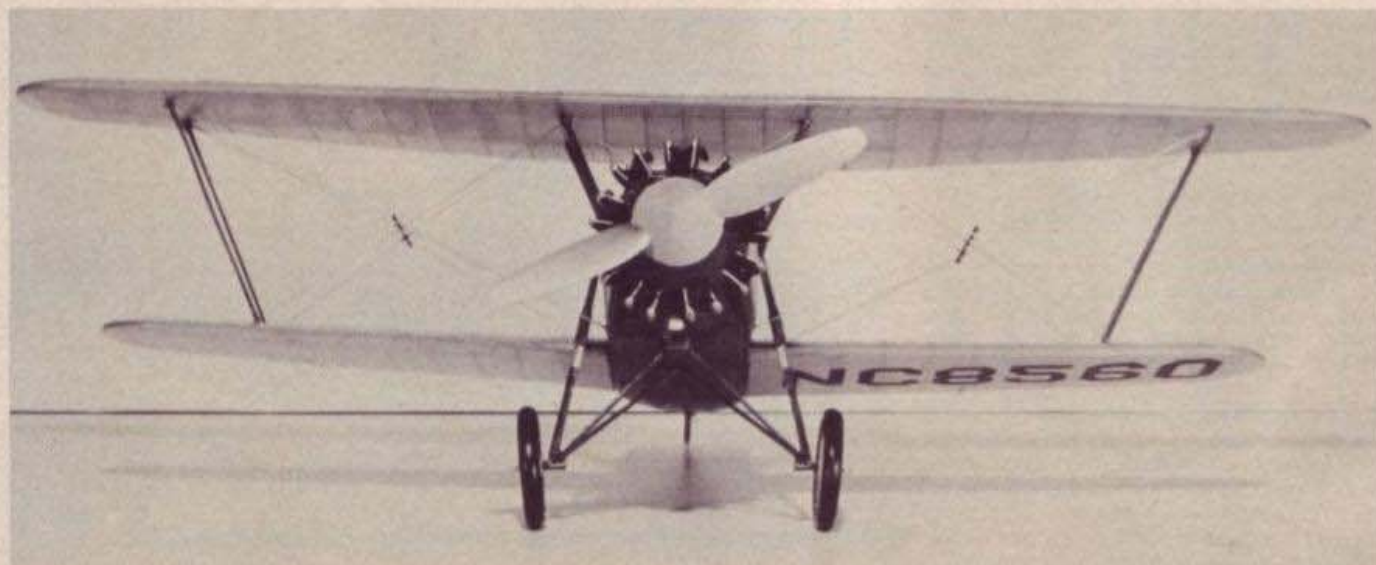
At this point, assemble wings to fuselage and cabane struts. Be sure to attach the struts at the points on the spar where the $\frac{1}{16}$ " ribs are located. Drill the fuselage uprights with a $\frac{1}{32}$ " dia. drill where the flying wires connect and drill the wing struts at the top and bottom ends with the $\frac{1}{32}$ " drill. Make a needle threader out of .010 dia. wire long enough to go completely through the fuselage. Use Cortland monofilament flat fish line for rigging, rubbed with Silver Rub'n Buff to make them look like stainless wires. Use your long needle threader and pull two wires through the

front of the fuselage and two at the rear above the lower wing as shown on the drawing. Then string them through the struts until you have all wires rigged. Tie off the strut ends and glue the knots so they do not come loose. Caution, be sure as you string the wires that they do not become twisted, but stay streamlined with the aircraft.

Before You Fly

Use a Guillow $9\frac{1}{2}$ " wood prop, cut to $7\frac{1}{2}$ " for your flying prop. Be sure to check it to be sure both blades have the same pitch. If they do not, heat the blade that has the less pitch near the hub and twist it and hold it until it cools. Make up your rubber motor of four strands of $\frac{3}{16}$ " flat rubber 20" long. The model should balance just above the forward edge of the front cockpit. If necessary, add weight to the nose block until it does balance.

Now head for the tall grass and test fly with about 200 turns until the model is adjusted. Then wind her up and have a ball. There is nothing prettier than an old biplane model circling overhead with the sun shining through the wings.



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