

PT-3

■ Frank Baker



The PT-3 was the standard Army primary trainer in the late 1920s and early 1930s. Its basic airframe was that of the Consolidated PT-1, designed by Ruben Fleet, and was powered by a WW I surplus Hispano-Suiza engine.

The PT-1 became the PT-3 when the engine was replaced with the more reliable Wright Whirlwind J5 and a number of small changes were made. It was allocated Approved Type Certificate #83 in November of 1928. A PT-1 is hanging in the US Air Force Museum at Dayton, Ohio and the Experimental Aircraft Association is in the process of converting a PT-1 to the PT-3 configuration.

The plans for this Scale model were enlarged from a very detailed set of drawings by Joseph Nieto in the August 1950 *Model Airplane News*.

CONSTRUCTION

Construction of the PT-3 is pretty straightforward, but a number of things have to be done in the proper order.

Fuselage: The sides are built over the plans, just like a rubber-powered model.

The area between the top and bottom longerons from the firewall to station 6 is medium hard 3/16 sheet. Before joining the fuselage sides, make the gas tank from K&S 254 easy tin sheet. The long strip is bent at the lines and the overlap is soldered. Then bend the overlaps on the front piece and solder it on.

Drill the three 1/8 diameter holes and lay the tank on the 3/16 plywood firewall and mark the holes. Solder the three 1/8 copper tubes into the gas tank. The one on the left (looking forward) goes to

the bottom of the tank; the other two are vents. Soldering the back of the tank in place and pressure-test the tank under water for leaks.

Use epoxy to glue the maple motor mounts into the firewall. Then coat the front of the gas tank with epoxy and push the three copper tubes through the holes until the tank is hard against the firewall.

Build the front wing strut assembly from the 1/8 diameter music wire front strut and formers 2a-c. The center former (2b) has a cutout for the wing strut that should be a snug fit to the music wire. Coat both sides of 2b with epoxy and place the 1/16 formers 2a and 2c on either side. Clamp the whole assembly (I used my bench vise) and make sure that the upper ends of the wire and the bottom of the former are horizontal and parallel. The end result is a three-layer plywood sandwich with the wire strut embedded in the middle layer.

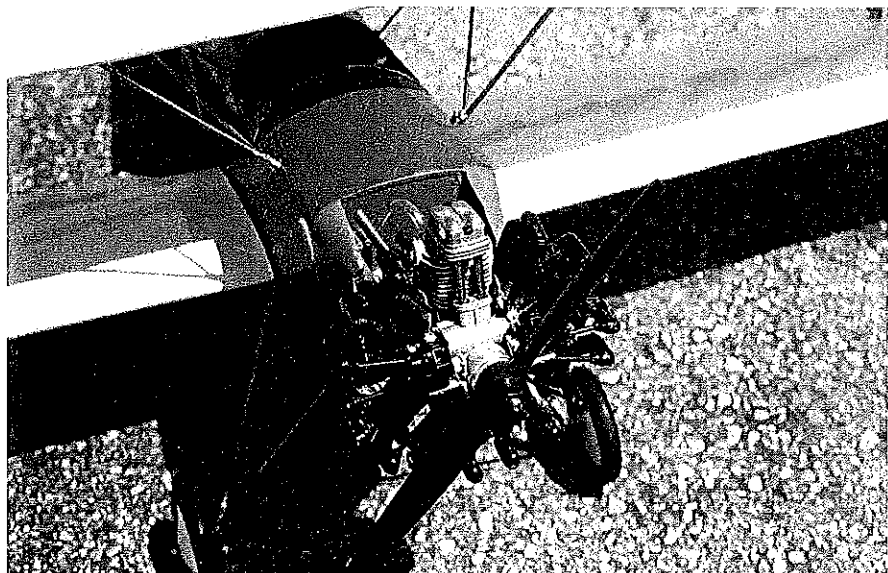
Place the fuselage sides top-down on the plans and install formers 3, 4, and 5c and the 3/16 square cross-pieces at the former 6 position. Use a carpenter's square to ensure that the sides are vertical and front of the fuselage is square.

When dry, remove from the plans and glue in the firewall assembly. Then make cuts in the sides of the top and bottom longerons at former 6, just deep enough so that the tail ends of the fuselage can be glued. Glue in the top and bottom cross pieces and then formers 5b-9 and install the stringers. Also glue in the triangle pieces in the fuselage sides and those at the ends of the top and bottom cross pieces at station 6.

Install the servo rails and the 3/32 plywood aileron plate, making sure that they fit your particular servos. Be sure that the aileron servo arm or wheel does not extend below the bottom line of the fuselage.

Slide in the engine servo and install the nylon tube for the

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O.S. 20/26 four-stroke with engine replica installed. Wood screws hold in place.

PT-3

Type: RC Sport

Wingspan: 50 inches

Engine: O.S. 20/26 four-stroke

Functions: Elevator, rudder, throttle, ailerons

Construction: Built-up

Covering/finish: Heat-shrink film

throttle-control cable; be sure that you align it so that forward on the tick is full throttle.

Glue in the front wing strut assembly (2a-c) and be sure that the ends of the struts are parallel to the top of the fuselage and perpendicular to the centerline. This alignment is critical, so check it several times.

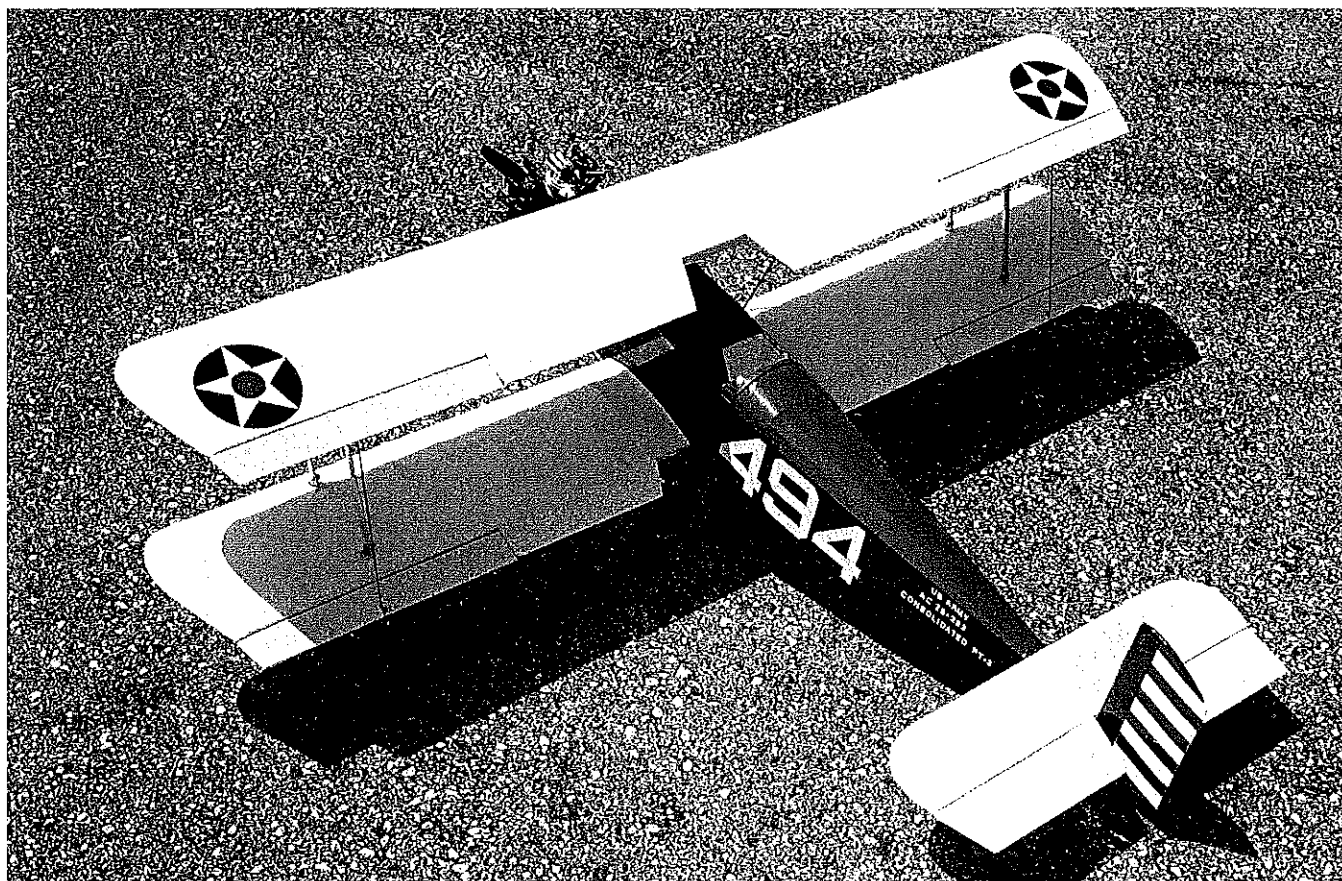
Glue former 3a in place and the $\frac{3}{16}$ square stringer. Install the $\frac{3}{16}$ balsa sheet between the firewall and former 2a as well as between 2c and 3a. Cover the top of the fuselage from the firewall to former 3a with $\frac{3}{32}$ sheet balsa.

Build the removable cockpit assembly, leaving a small gap

between formers 3a and 3b so that the assembly will lift off easily. Sheet the whole thing with $\frac{3}{32}$ balsa and cut out the cockpit holes when it is dry. This is as far as you can go with the fuselage at this point. The whole bottom of the fuselage from the firewall to former 5c should be open.

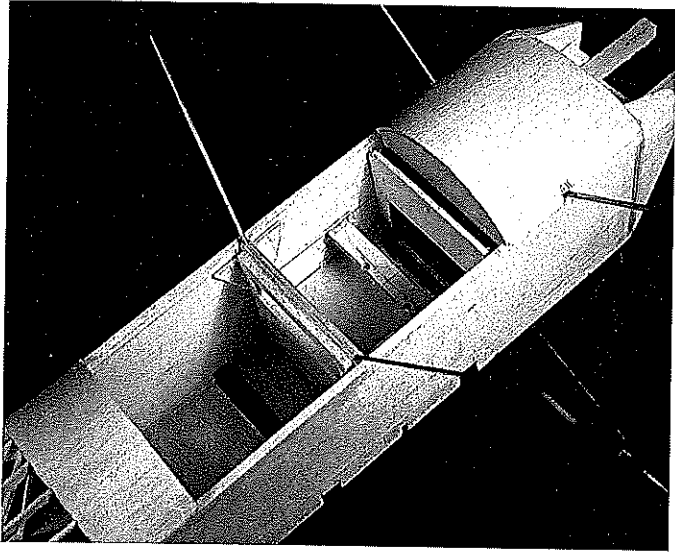
Epoxy the balsa blocks to the front of the firewall and carve to shape. Soak the inside of the blocks and engine mounts with slow-drying epoxy and use a heat gun to get it very liquid so that it soaks into the wood and really seals it against fuel.

Wings: The top and bottom wings are the same except for the

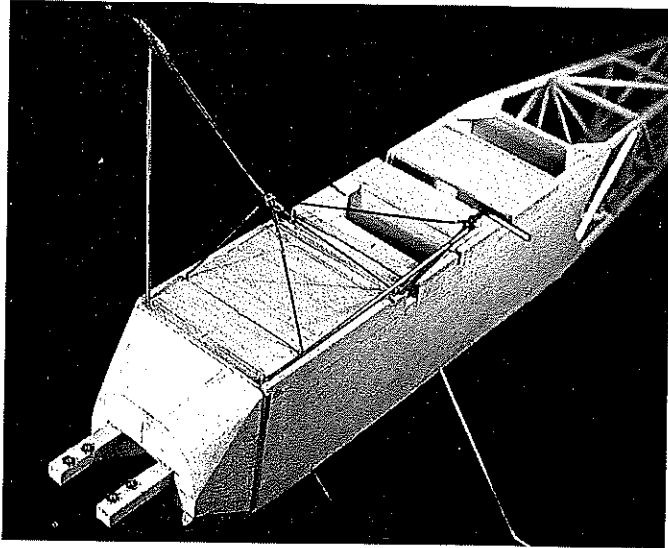


his version of the 1920s-1930s trainer was based on Joseph Nieto drawings in the August 1950 *Model Airplane News*.

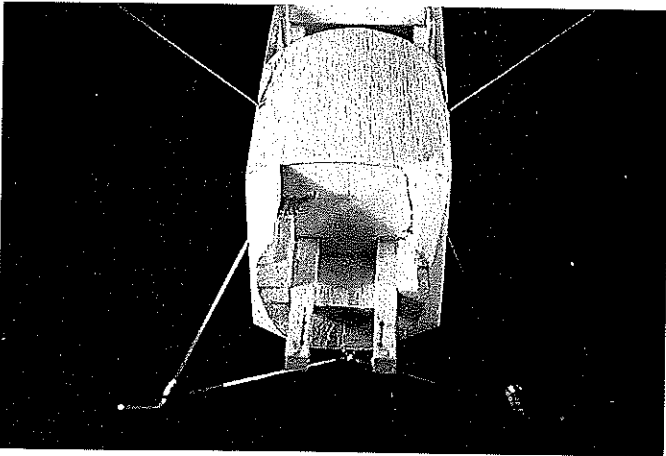
PT-3



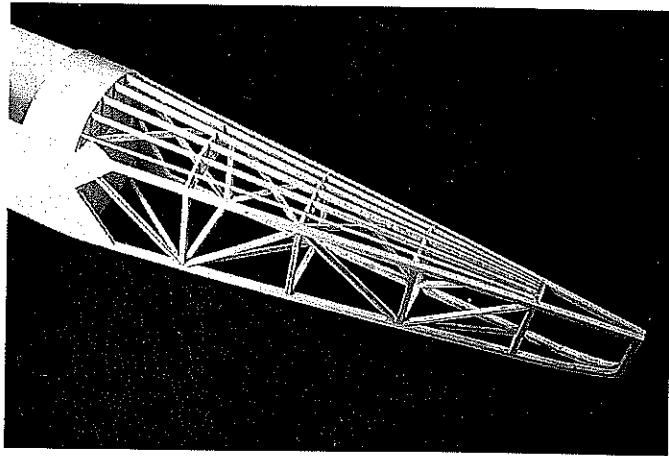
Cockpit area showing rear wing strut and servo rails.



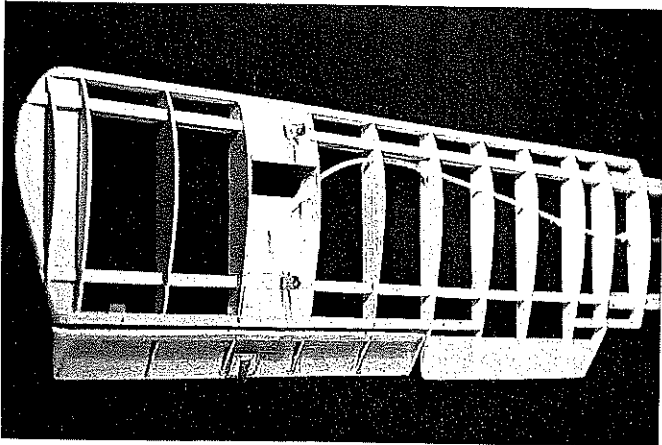
Fuselage bottom showing landing gear and aileron servo hatch rails.



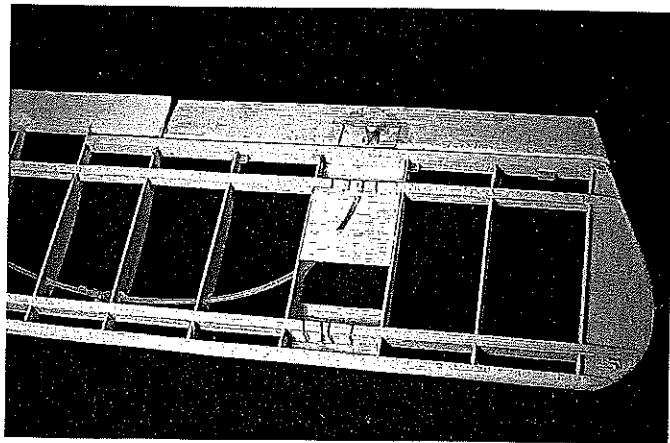
Engine compartment and engine mounting beams.



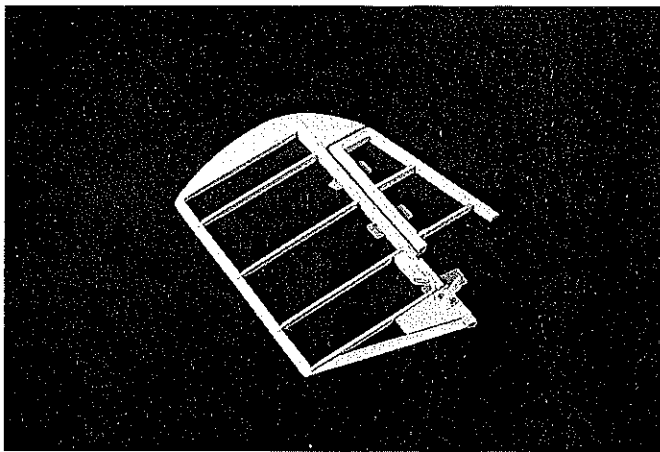
Rear fuselage construction and stringers.



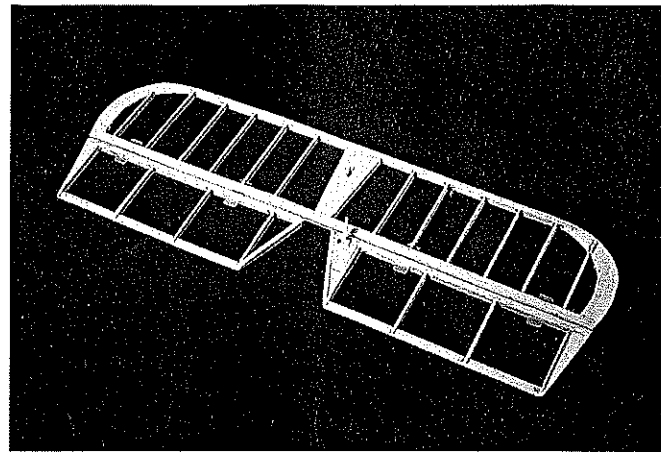
Lower wing strut fittings, aileron control cable tubing.



Example of how aileron control tubing exits lower wing.



Rudder construction. Ribs are $\frac{1}{16} \times \frac{1}{4}$ balsa.



Stabilizer-elevator construction. Joiner is $\frac{3}{32}$ music wire.

cutouts at the fuselage; only the bottom wing has nylon tubes and cables to drive the ailerons.

The wing spars are laminated from $\frac{1}{8} \times \frac{1}{4}$ spruce with a balsa core— $\frac{1}{4}$ square in the front spars and $\frac{1}{8} \times \frac{1}{4}$ in the rear.

When building the lower wing, install but do not glue the ribs that are adjacent to the fuselage. You may need to adjust them later. Note that the bottom of each aileron is a piece of $\frac{1}{16}$ sheet balsa. Use a small plane to trim the two balsa false spars at the ailerons to match the contour of the ribs.

Once the basic wings are complete, cut them at the appropriate dihedral breaks. Glue in the plywood dihedral braces.

Fabricate the .015 aluminum wing strut brackets and bend them according to the diagram on the plan. Place a piece of $\frac{3}{16}$ plywood in the open gap and use a drill press to drill the $\frac{3}{32}$ bolt hole.

Use a triangular file to make two small notches on each side of the horizontal legs on both sides. These brackets will be held onto the wing spars by short pieces of copper wire that wrap around the spar and bracket and are twisted together inside of the wing. Clip the ends, leaving about 2-3 turns, and fold down the ends. Be sure to place the proper bracket in the correct place. Glue in the $\frac{1}{16}$ balsa sheet around each bracket; these will be used to anchor the covering.

Install the hinges in the wing and ailerons; use those with a removable pin, such as the Klett, so the ailerons can be covered easily. Glue in the $\frac{1}{16}$ balsa plates in the bottom of the wing for the aileron push cables.

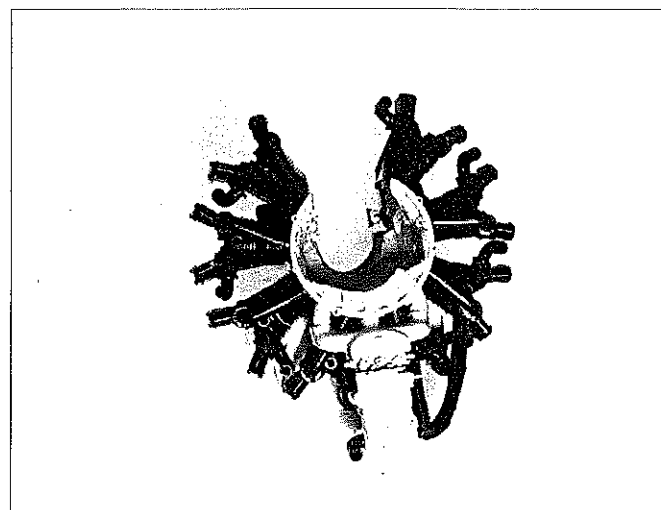
I like to use Hobby Lobby bulk pack #HLH 805 nylon tube and cable. Unfortunately, this comes rolled up. Cut the nylon tube a few inches longer than will be needed and insert a $\frac{1}{16}$ length of music wire. Use your heat gun to get the tube hot all around, and let it cool. Remove the wire and the tube should be reasonably straight. If not, repeat the heating process but be careful not to melt the tube.

Use a $9/64$ drill bit to cut the holes in the bottom wing ribs for the cable. The holes in the last two ribs before the bottom plate should be above the front spar so that the tube exits through the balsa plate at an angle. As you approach these ribs make the holes a little bit higher each rib so that there is a smooth path.

Bolt the aileron horns to the $\frac{1}{16}$ plywood plate in each aileron and install the ailerons. Run the cable through the nylon tube and tape each end to the outer end of the aileron horn. This is just to get the angle of the tube correct. Once aligned, use clear silicon RTV to glue the nylon tube in place.

Completing the Fuselage: The four components of the landing gear will be fabricated next. Be sure to bend the landing gear wires at the points indicated on the plans and in the proper direction. Use some pincher clothespins to roughly assemble the wires and plywood parts.

Place the components in the fuselage and be that the bends are correct and every thing will hook up properly. Use the laminating process described for the front wing strut to epoxy the plywood and music wire together.



Rear view of replica engine showing cutout for O.S. 20/26.

Slide the plywood sandwich into the fuselage and check the match of the wires. You can rebend them a bit by clamping the plywood sandwiches in a vise and bending the wire. Make the rear wing strut assembly using the same technique. This is an old Free Flight technique and is incredibly strong.

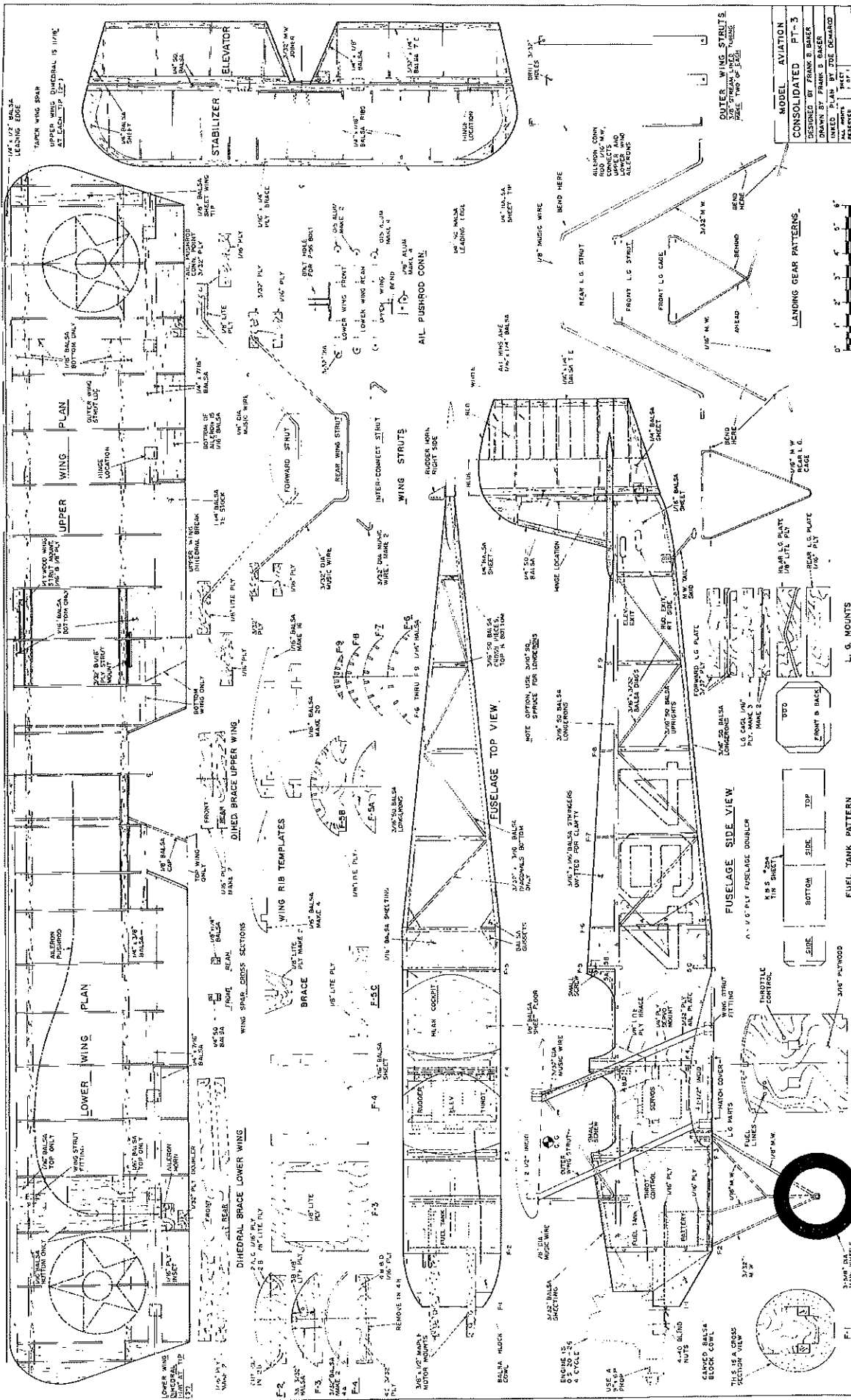
Cut the rectangular slots in the bottom of the fuselage for the lower wing spars and the aileron control nylon tube. Slip in the lower wing and check for alignment and an $1\frac{1}{2}^\circ$ incidence. Use a carpenter's square to check that the leading edges of the wing are perpendicular to the fuselage sides. If you have to trim the slots, glue shims to the fuselage to get proper alignment. Glue the lower wing butt ribs, leaving about $\frac{1}{32}$ clearance from the fuselage.

At this point you have to make a major decision: to glue or not to glue! When building the original, I covered the lower wing and the fuselage sides before I glued on the lower wing. This prevents oil from getting into the butt ribs and the fuselage sides.

Glue the wing to the fuselage using a slow-drying glue so that you have time to check the alignment and incidence again.

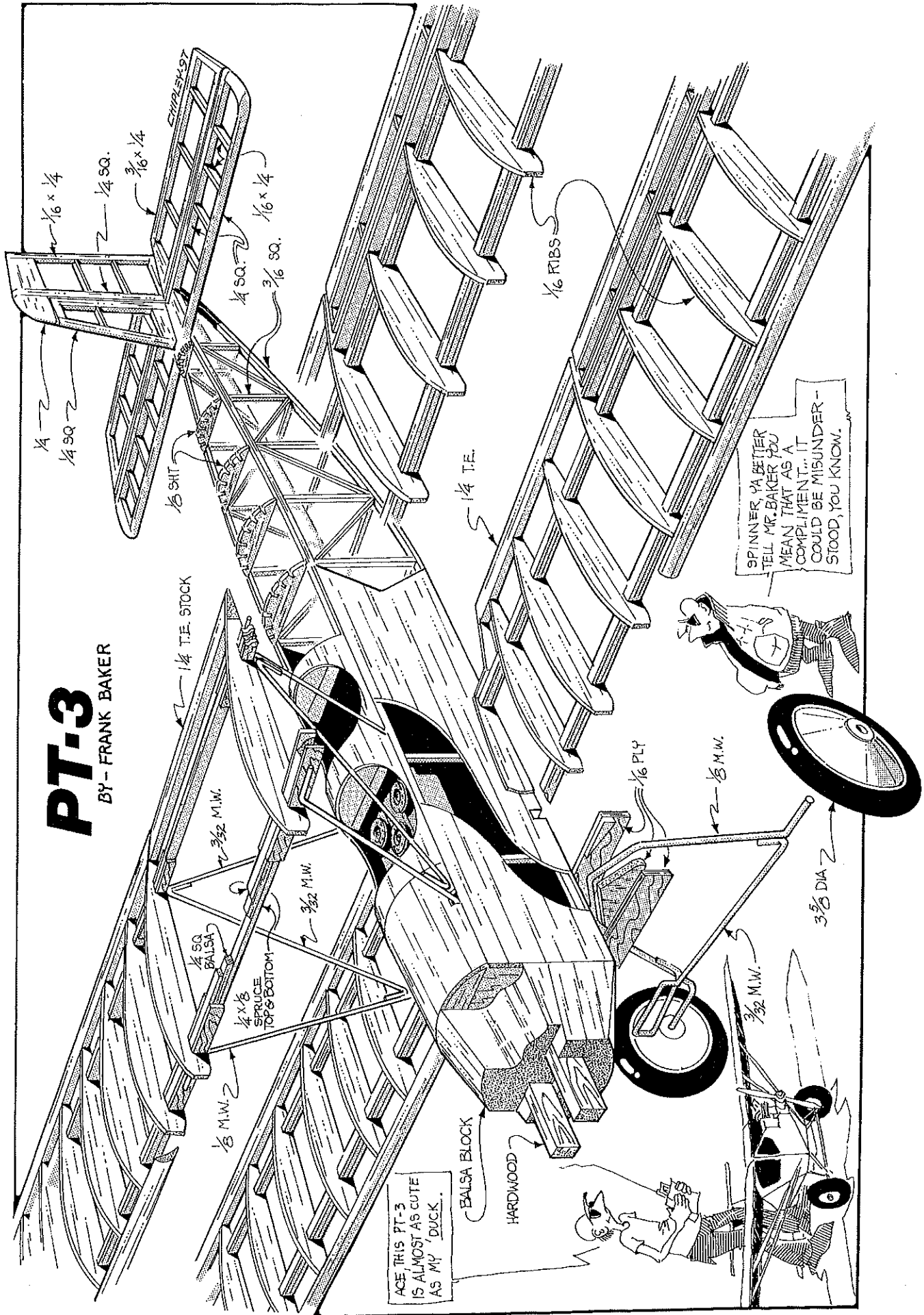
Now the landing gear can be installed. Glue the rear landing gear strut sandwich to the front wing spar and the fuselage and clamp in place. Check to see that the airplane sits level and that the axles are perpendicular to the fuselage centerline. Glue the front landing gear strut assembly to the firewall, which forms the third member of the sandwich.

When the glue is dry, bend the ends of the front strut so that it matches the rear strut. Epoxy the rear landing gear cage assembly to the front of the rear landing gear sandwich. Glue in the front landing gear cage sandwich. If all goes well, the cage wires should meet at



PT-3

BY - FRANK BAKER



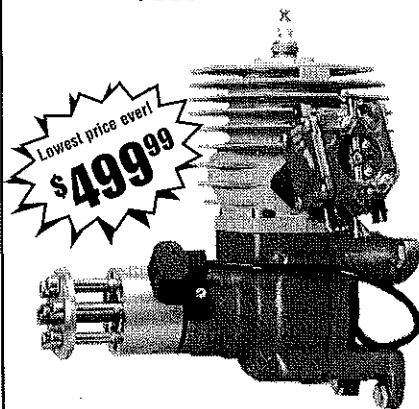
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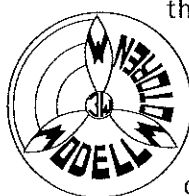
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the V. Bind with copper wire and solder. Bend the ends of the front cage wires to match the rear landing gear leg.

Use copper wire to bind the front landing gear wire, the front landing gear cage wire, and the rear landing gear strut; solder the whole works. Glue in a piece of 1/16 plywood under the fuel tank and another on top of the front two landing gear sandwiches. Your battery pack should fit in between.

Close the bottom of the fuselage between the firewall and the rear landing gear cage sandwich with 3/16 sheet. Glue in the 1/8 x 1/4 spruce frame for the aileron hatch and close the bottom of the fuselage from the hatch frame to former 5c with 1/8 balsa. Make the aileron hatch cover from 1/16 plywood and hold it in place with four small wood screws.

Installing the upper wing: Cut the plywood parts for the upper ends of the wing struts, making sure that the wire fits snugly in the slots. Note that the upper wing dihedral braces form the third member of the plywood sandwich. Cut away enough of the ribs so that the sandwiches can slide in and clamp the upper wing to the front wing strut using the plywood parts, but do not use glue. Insert the rear wing strut assembly into the fuselage.

Cut away the ribs and clamp the upper wing to the rear strut. Use an incidence meter to check the incidence of the upper wing, then glue the rear wing strut sandwich and the two Lite Ply doublers to the fuselage.

Before the glue dries, check that the leading edge of the top wing is parallel to that of the bottom wing. Adjust the rear wing strut sandwich until the wings are parallel and wait for the glue to dry.

Remove the clamps on the upper wing and use slow-drying epoxy to fabricate all four wing strut sandwiches. Slide the top wing back onto the sandwiches and try to get the bottoms of the sandwiches even with the bottoms of the spars. Clamp the sandwiches to the spars. Check to make sure that the leading edge of the top wing is parallel to that of the lower wing, and check to see that there is the same distance between the upper and lower wingtips on

the left and right sides. Some judicious loosening of clamps can be used to get the proper settings.

When everything is dry, install the 3/32 music wire diagonals between the struts, bind with copper wire, and solder.

Empennage: The rudder and elevator are built flat over the plans. All the ribs are 1/16 x 1/4 and you need to cut a 1/16 x 1/4 slot in the center at the end of each rib to take the trailing edge. The airfoil shape is sanded afterwards.

The elevator halves are joined by a 3/32 piece of music wire.

Note that the leading edge of the vertical fin fits into a hole in the 1/4 balsa sheet at the center of the stabilizer. Once the stabilizer is glued to the fuselage, use a round file or router to scallop the formers between the upper fuselage stringers. When the upper fuselage is covered, only the stringers should touch the covering.

Replica Engine: A plastic kit of the Wright J5 Whirlwind engine was assembled as the basis of the engine replica. However, one could be built up using the Williams Bros., 1 1/2-inch-scale J5 cylinders.

After assembly (in which the top cylinder was omitted), the back of the crankcase was cut away to match the engine mounts. Cut a hole in the front of the crankcase to allow the prop shaft and driver to come through. Install the O.S. 20/26 engine and make sure that the plastic engine will slip over the model engine. There should be plenty of prop clearance and the back of the plastic engine should be against the front of the balsa blocks.

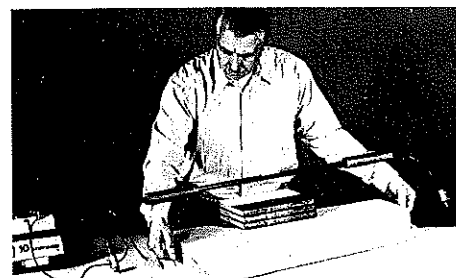
Cover the O.S.'s crankcase with clear kitchen wrap. Mix up about three ounces of auto body filler and fill the sides and bottom of the plastic engine. Then slip the plastic engine over the model engine, make sure that it is straight, and hold it until the body filler hardens. Remove the plastic engine and cut away any excess filler. A couple of small wood screws can be used to hold the replica engine in place.

Covering: Use your choice of iron-on heat-shrink film. The wings and empennage are a bright yellow and the fuselage is olive drab. I

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painted the balsa blocks forward of the firewall with olive drab dope. The national insignia appearing on the top of the upper wing and on the bottom of the lower wing were cut from trim film. The large white numbers and the red, white, and blue strips on the rudder also were trim film. The small white words and numbers on the fuselage sides were 3/8 press-on vinyl letters from a bookstore. The pilots are Williams Bros. 1 1/2-inch scale sportsman pilots painted with plastic model paints. Make the helmets and jackets dark brown.

I originally used 3 5/8 Williams Bros Golden Age wheels, but replaced them with three-inch wire-spoke wheels—I could not resist their looks.

Flying: Scale models of old biplanes of this size are a perfect match to the O.S. 20/26 four-stroke engines, and the sound reminds one of a radial engine. As with most four-stroke engines, set the needle valve so the engine is running smoothly but not screaming.

The best propeller that I have found for this engine-airplane combination is a Master Airscrew 9 x 6. Reset the exhaust pipe so that it points up at about a 45° angle. This will aim the oil away from the fuselage and keep the airplane very clean after a day of flying.

The control surface throws were ailerons, 1/2 inch up, 3/8 down; elevator, 1/2 inch up, 3/8 down; rudder, one inch right and one inch left.

Takeoff is straightforward, with little or no rudder input. Once airborne, reduce throttle until the model looks like it is just loafing along. The PT-3 will do large, lazy loops, open slow-rolls, wingovers, and spins.

The four-stroke engine will throttle down to the point where the propeller is just ticking over. As a result, it is great fun to just fly around the pattern, throttle as far back as you can, and make touch-and-gos. Without much effort you can just roll the wheels on the grass, feed in a little throttle, and go back up. I have found that rigid landing gear on models of this type actually make landings easier and smoother. →

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