An FM Product Review:

Sterling Models' Waco SRE

PHOTOGRAPHY: DAVE MEIER

A stand-off scale kit from one of the most well-known manufacturers around. An impressive ship/**Dave Meier**

Certainly the most prolific manufacturer of aircraft in the 1930's, in terms of numbers of different models produced, was the Waco Aircraft Company of Troy, Ohio.

From 1925 until 1942, when the government required the company to build troop gliders, Waco built a reputation for solid dependable aircraft, nearly 300 examples of which are still flying today; a marvellous testimony to engineering excellence.

The "pride of the fleet", and to our eyes, the prettiest cabin biplane ever built was the "E". Three models of this series were offered, differing in engine installation: the ARE (300 h.p. Jacobs), the HRE (300 h.p. Lycoming), and the SRE (450 h.p. Pratt & Whitney). A pilot and four passengers were carried at speeds and ranges comparing to light twins built today. With the P. & W. Wasp Jr. the SRE cruised at 195 m.p.h. at 4000 lbs. gross for 1000 miles. She had a wingspan of 34'9", a length of 27'10", and a height of 8'8". Production ended in 1942 after some 30 examples had been built. About 6 remain active today.

Sterling Models of 3620 G St., Philadelphia, PA 19134 has produced a model of the Waco SRE to a scale of 1⅝" to the foot. Spanning 56½", with a length of 45" and a fuselage width of 6½", it makes up into a rather impressive size.

The kit, as received, is most complete: lots of wood; die cut sheet and strip balsa, die cut ply, formed wire landing gear, a neat vacuum formed cowl with engine detail that, when painted and dressed up with dummy pushrods, looks much better than when you're just flying it around your shop making engine noises and dreaming of the first flight. Fact is, it's a good idea that more manufacturers ought to look into for stand-off scale ships. The engine detail considerably strengthens a plastic cowl and, from 10 feet away, looks just great. So don't be tempted to cut it all away and leave an ugly, gaping hole for the judges to ignore because they can't see the details in flight.

Large vacuum formed wheel pants, music wire lengths, nylon bellcranks, horns, links, and keepers, aluminum motor mounts, screws, blind nuts, and a very nice set of decals, along with Sterling's usual style of plan sheet with lots and lots of detailed construction sketches round out the package.

The plans also include numerous black and white photos of the full size ship and a small three-view with specifications of the real plane.

We do wish that, in the future, Sterling would put all the photos and the three-view over on one side of the plan sheet so that they can be removed for a presentation without destroying the plans. We'd also like to see the plans printed on only one side of the sheet so that the builder can move along to other construction steps while the glue is drying on the last.

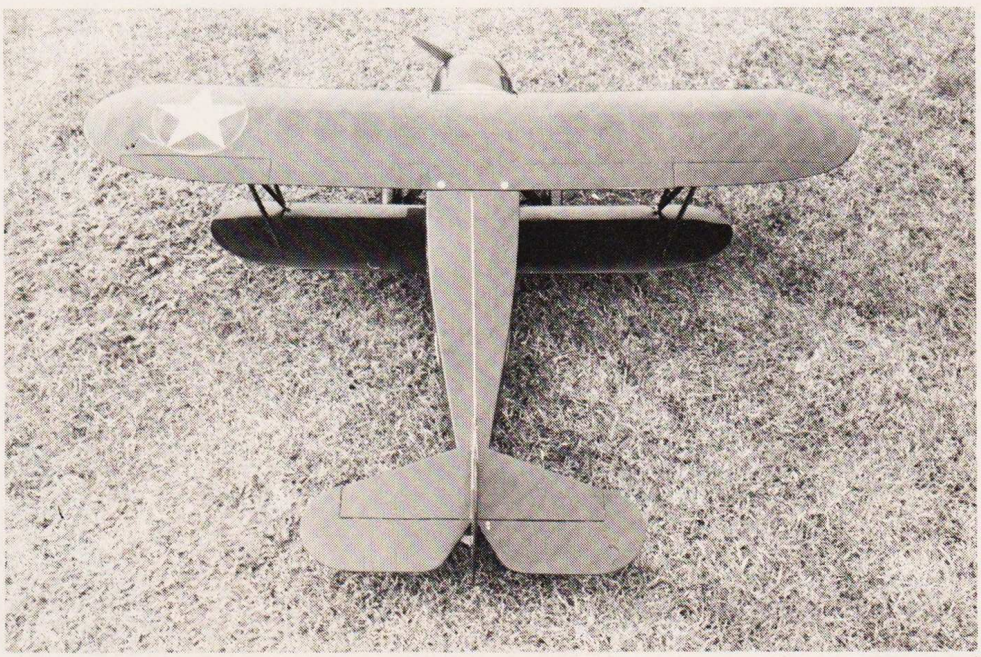
Let's get to building. We started with the wings. Both are three-piece assemblies; center section and two outer panels. Both are of straight-forward construction and one shouldn't experience much difficulty, except that the installation of the tips is a bit confusing. Work carefully here, dry fit them, both to the leading edges and the wing framework before gluing, and you'll see how best to install them.

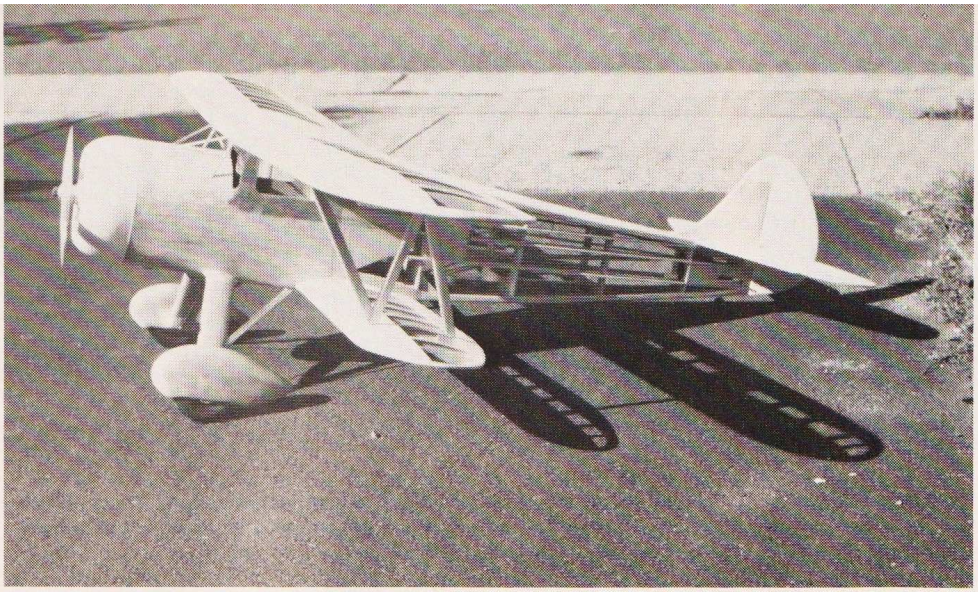
Speaking of the leading edges, they are of a formed diamond shape that Sterling has used on several designs. Make sure to enlarge the rib notches to accept them before gluing up the wing framework. It's a tough job to do later. Also, be sure the spars fit the notches, especially the laminated assemblies, so that you can thread the outer panels onto the center sections when it's time for that step.

Note that the 3/16" square spar extensions on the lower wing center section are really only to locate the proper dihedral angle and are not structural. If you plan to fly without the struts, you will probably experience the same problems that a pilot of the full-size Waco would have if he tried to fly without them. You can probably get away with it though, if you fiberglass the joints of the outer panels and center sections.

Ailerons are on the upper wing only. These are semi-shaped solid balsa and about 10 minutes work with razor plane and sandpaper will have them ready for hinging. They look small you say? They are. Important! Substitute Williams Bros. 60 degree bellcranks for the ones supplied and install them so as to get as much up aileron and as little down as possible. If you don't use differential ailerons you'll have to be especially good at making co-ordinated turns because of the opposite yaw effect caused by the drag of the down aileron.

Actually gang, the use of differential ailerons ought to be more encouraged, even in





low wing aircraft. The number of times we've heard guys say "but I was holding left" when their aircraft snap-rolled to the right into the ground on take-off or landing has reached the point of boredom with us. That aileron hanging down only lifts for so long, then the drag builds up, the wing panel stalls, and the opposite panel comes rolling over quicker than you can say "Hot Stuff". Differential is part of the cure. The other part is using the rudder more. At low speeds and high angles of attack the rudder, not the ailerons should be used to lift a wing that's hanging down.

Say the plane takes off with a left turn. Right rudder causes the aircraft to yaw, causing the left wing panel to speed up, relative to the right, causing more lift on the left panel, and bingo, it's up and level.

But you all knew that, right? Those of you who didn't understand the preceeding drivel can lock the ailerons and fly with just the rudder if you like. The SRE will do fine this way.

Comparing the upper wing structure with the plans will show you that somebody goofed and three hinges won't work on each aileron unless the hinge line is lowered.

We used two hinges on each which seems adequate. We also inletted ⅛" ply scraps into the lower aileron surface and used wood screws to attach the horns rather than the unsightly nut plates on top.

The tail surfaces won't give any trouble. Our kit had some very heavy wood supplied for these, so we substituted freely here. To tell the truth, we used ¼" sheet for the stab and added a filler on the stab saddle to raise it to its proper level on the fuselage.

Now comes the fun part, building the fuselage. First off, the plans show an upright engine position with no cooling provisions. It won't work, so don't do it that way unless you like burning up engines. Decide whether you like the engine sticking out from the cowl as far as shown on the plans. If you don't you can cut the center out of the firewall, epoxy a piece of ¼" ply behind, and thus move the engine back ⅜". We didn't like the engine sticking out, but were trying to build the kit as stock as possible, so we left it as shown. Next, you should provide for at least 2 degrees right and 3 degrees down in thrust offsets. Lay this out on the plans before building so that the prop shaft comes out in the center of the cowl. We didn't and had to add the thrust offsets after the first test flights . . . unsightly!

We still have to decide in what position the engine should be mounted. We studied the photos and couldn't find any cowl flaps for cooling until we came to the front view located over the fin/rudder portion of the plan. There we saw the Waco "patented cowl flap" hanging down between the landing gear. That settled it. We inverted the engine and cut the firewall to provide an opening the size of the cylinder and head. We sheeted this area inside the fuselage to make a duct that curves down from former #10 to #11 and left an opening out the bottom of the fuselage between those formers the width of the stringers that parallel the lower keel. This also involved sectioning a portion of the lower keel to the profile of the duct.

We later found that the engine still overheated some and added sheet aluminum pieces curved around each side of the cylinder and flared out slightly in front to catch the incoming airstream. These were flanged at the rear and screwed to the firewall, flush with the sides of the duct opening. This fix forced cooling air through the cylinder fins and cured the overheating problem.

Our next problem was tank position. Due to the cooling duct we couldn't get the tank centerline below the needle valve as we would have wished. To reduce the problem of flooding, we used a Sullivan SS-6 tank lying flat on the duct. This flat oval tank keeps the fuel head above the needle valve as low as possible. No flooding problems have been experienced with this tank system and we recommend you follow our lead here. A six ounce tank is plenty for a .40 to .45 engine in this type of model.

A .40 to .45 engine is plenty of power also. We used our old, reliable Enya .45 swinging a 12-4 prop and flight speeds at ¾ throttle are very realistic, although we'll try some smaller diameter fans to reduce torque problems not fully cured by the right thrust.

To more easily service the fuel tank we made a fuel delivery manifold of sheet brass with three short brass tubes soldered into holes drilled in the brass sheet. The tank hooks up to one side of the firewall, the engine to the other. This allows a nice large hole to be cut in the firewall to get at the tank tubes and hook up the fuel system. The manifold is then screwed to the firewall after the tank tubes are attached. A couple of photos of the front end of the Waco with the cowl removed show this as well as our engine installation. The manifold plate is ¾"x1" and the hole in the firewall is ½"x¾". Extra long fill and vent lines are secured to the firewall with a clip and routed out through the duct, along with glow plug leads. Now, the only hole that is required in the cowl is for access to the needle valve.

We turned on our lathe and milled a piece of aluminum to make an exhaust manifold, attached to the Enya with a single screw into the tapped boss in the exhaust stack that used to hold the exhaust butterfly. Two pieces of 7/16"brass tubing were mitered and silver soldered together to form a right-angle exhaust pipe which connects, through a hole in the firewall, to the manifold and exits the bottom of the fuselage alongside the duct between former #10 and the firewall at about the scale position. We were very pleased with this set-up which, wonderously, was quite quiet and left the plane fairly free of fuel residue.