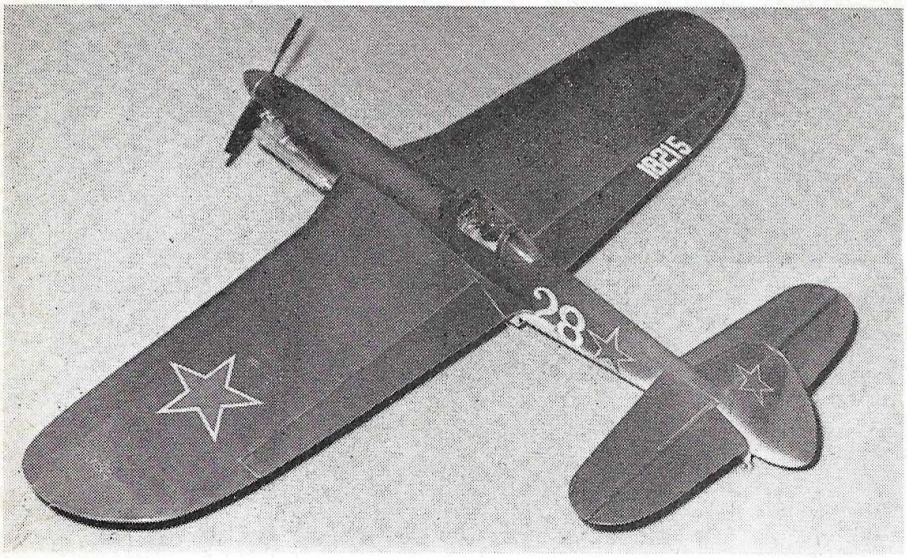


YAK-9D

Semi-scale control-line stunter for 5-6 c.c. engines designed by H. C. QUEK

WHY THE YAK 9D? Unlike the Spitfire, Mustang or the Hien, the Yak 9D has so little to offer in terms of character! However, though simple both in profile and plan form, the Yak 9D was one of the very successful *Yak* series of Soviet aircraft during the second World War.

From the modeller's point of view, the simple lines provide an ideal subject for an easy-to-build, semi-scale model. The design presented here is far from scale, but well finished and decorated should provide immense eye appeal.

Basically, it is a slab-sided model, with no gimmicks in the design. The prototype model had an overall span of 58 in. and used full span flaps. After flight tests the span was reduced by $3\frac{1}{2}$ in. and the flaps subsequently reduced to just two thirds of the span – these two vital modifications were found to contribute towards improving both level flight and square manoeuvres. Wing fairings were added to the original model to improve its appearance.

It is always worthwhile making a careful selection of the various grades of wood required. Using very carefully selected wood the weight distribution was found to be just right on the original model – no ballast being necessary to achieve the correct centre of gravity position.

Carefully cut out all the wing ribs from light quarter-grain wood. The sections used are grossly modified NACA 0018 airfoils varying in percentage thickness from R1 to R14.

The wings are built flat on the building board. Pin the bottom $\frac{3}{16}$ in. sq. main spars in position, then pin all the ribs in position. Level up the T.E. of the ribs with scrap pieces of balsa. Next mark and insert the $\frac{3}{16}$ in. sq. top spars. Pin $\frac{1}{4}$ in. sq. to trailing edges of the ribs and $\frac{3}{8}$ in. sq. to leading edges of ribs – still without using any glue. Check alignment and when satisfied that it is absolutely true – with no twists etc., spot cement all the cross points and allow to dry thoroughly. Finally, cement top $\frac{1}{2}$ in. x $\frac{3}{16}$ in. joiner in position.

With the wings still pinned to the board, add the $\frac{1}{16}$ in. L.E. and T.E. sheeting to the top surface before cap stripping the ribs with $\frac{3}{16}$ in. x $\frac{1}{16}$ in. soft balsa.

When dry, remove from board, turn over, and preferably pin wings to the board to check alignment. Add the $\frac{1}{2}$ in. x $\frac{3}{16}$ in. joiner and secure the wing tip weight as shown. Sheet the L.E. and T.E. and add the cap strips as before. Sheet cover underside of centre section. When dry, remove wings from boards and build on the wing tip.

Sand T.E. of wings to section shown. Cut and sand flaps to section, add flap horn, then hinge to wing. Install the bellcrank mount complete with the control assembly.

Connect the bellcrank to the flap horn with a 16 s.w.g. pushrod, before sheeting the top of the centre section. The complete wing may now be sanded thoroughly all over.

Leave the main undercarriage assembly until last to keep it out of the way! Do not substitute solid sheet for the tailplane – it must be kept light.

Notch the leading and trailing edges to take the $\frac{3}{8}$ in. x $\frac{1}{16}$ in. ribs. Build both the tailplane and the elevators flat on the board. Sand to section when dry.

Fix elevator horn and elevators to tailplane to complete assembly.

Laminate two sheets of $\frac{3}{16}$ in. or use $\frac{3}{8}$ in. sheet to form the rudder trailing edge. Cut and notch the L.E. and T.E. to take the $\frac{3}{8}$ in. x $\frac{1}{16}$ in. ribs. Build fin and rudder separately, but flat on the drawing. Sand to section when dry.

Cut the $\frac{3}{16}$ in. fuselage side and the 1mm ply doublers to shape, then glue the doublers in position. Lay flat, weight and allow to dry. Shape hardwood engine bearers and epoxy to the fuselage sides. Cement the two $\frac{3}{16}$ in. sq. longerons to the top edges of the fuselage sides.

Cut away the undersides of the fuselage as indicated to accept the wing. Add all formers except F3A and F4A – check for squareness, and allow to dry. Mark and drill the engine bearers to suit your engine – note offset. Cement wings and tail assembly to fuselage, checking for accuracy, and allow to set overnight. Link up controls to elevators, then cement F3A and F4A in position.

Refit the cut-away portion of the fuselage sides – splice the joints with scrap $\frac{1}{8}$ in. hard balsa. Add the two $\frac{3}{16}$ in. sq. longerons to the lower edges of the fuselage, then add the tailwheel leg assembly. Sheet underside of fuselage

from the tail end towards, and up to, approximate position of F4A. Allow to dry. Sand forward edge of sheeting to blend in with forward fuselage sheeting.

Install the engine and spinner, and spot cement fuselage dorsal block. When dry, carve and sand to shape, then remove block and hollow out before finally repositioning and cementing block permanently in place. Remove engine and spinner, square-up nose end and add on the ply nose ring.

Cement fin and rudder in place, noting rudder offset. Build on belly scoop as shown.

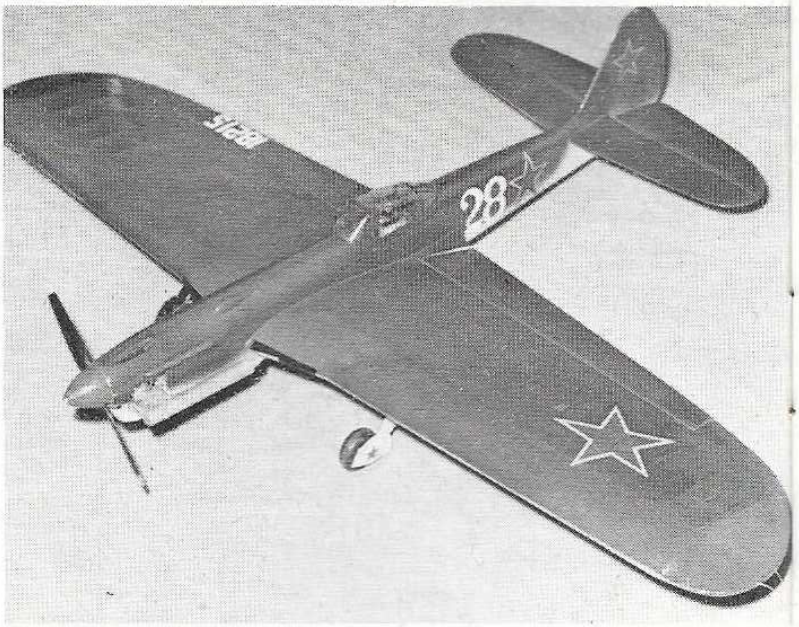
The wing fairings are optional, but may be added to improve appearance. Begin by cementing the crescent-shaped riblets 'R' to the external faces of the fuselage sides at the root of the wing L.E. Allow to dry. Add on scrap $\frac{3}{16}$ in. sq. false L.E. from notch at 'R' to wing L.E. at R4 – when dry sheet over top and bottom with $\frac{1}{16}$ in. sheet.

The cowl and tank hatch may now be tackled. Begin by laminating a piece of $\frac{1}{4}$ in. and $\frac{1}{2}$ in. sheet to form the cowl block (or use $\frac{3}{4}$ in. soft block). Cut out the aperture for the engine's cylinder head, and spot cement to fuselage. When dry carve and sand to shape. The cowl is attached at the rear by a 6 B.A. screw, screwing into a blind nut epoxied to a piece of engine bearer. At the front, a bicycle spoke is used as shown.

The main scoop can be constructed from $\frac{1}{16}$ in. ply, but an alternative method is to bend it from tinplate which is then epoxied to the cowl block. The outlet is from the same material, and is soldered to the main scoop. A hole is provided in the main scoop for the glow plug access.

The three external faces of the main scoop are now 'cladded' over with scrap $\frac{1}{8}$ in. balsa – use an 'impact' adhesive for this. Sand to shape when dry and finally tissue over.

Sand the complete model thoroughly before cementing the main u/c assembly in place.



Cover wings, tailplane, fin and rudder with heavy-weight Modelspan tissue, the remainder with light-weight Modelspan.

The method for finishing follows standard practice described in so many other designs – and this is really up to the builder's choice. *Profile Publication No.* 185 offers excellent colour schemes for the Yak 9D, and is well worth studying before applying colour.

Finally, add the wheels and install a fuel tank to complete the model – not forgetting to check the C.G. with an empty tank.