

**This is "it" for
ducted fan
enthusiasts. New
construction methods
and terrific performance**

JAVAHAWK by P. E. Norman

UNDOUBTEDLY THE FINEST example of ducted fan propulsion yet produced by its talented designer, *Javahawk* enjoys the admirable reputation and great distinction of being the first ducted fan model to take off unassisted from the ground (using a dolly undercarriage) and established a world "first" by successfully flying under radio control. Photo above shows the 28-oz. development which was demonstrated by P. E. Norman and his team of collaborators at Northern Heights Gala.

Ultra-lightweight 4.5 v. transistorised radio is carried in the nose, pen-cells occupy the fuselage spine and a Fred Rising actuator in the fin blister operates the rudder. Performance is outstanding. It will climb fast, spiral dive, recover immediately on correction and produced the finest spot landing of the day at Halton Meeting. All this with a standard Frog 150 diesel and fan as detailed on the drawing opposite, but with the airframe expertly modified to reduce weight and increase area.

The standard *Javahawk* is a diminutive 27½ in. span and weighs only 21-oz., yet as all who have seen it know, it is extraordinarily robust, and the life of P. E. Norman's prototypes will probably exceed several thousand flights apiece. The only difficulty likely to arise in construction concerns the method of making a "moulded" plywood fuselage, so this side of building is detailed as follows.

Cut a piece of aircraft grade resin bonded 1/32 in. 3-ply measuring 7 in. by 17 in. (this is oversize but allows for trimming at a later stage). Glue the belly strengthening piece A in place and mark a centre line accurately inside and outside. Measure the length of half the circumference of the already made fan ring carefully with a strip of paper, and mark half this length each side of the centre line on the inside of the 3-ply, in the position the fan will occupy. Measure the distance both to the rear of the engine mount, and mark two more points each side of the centre line, allowing for incidence.



Carefully cut ply away so that the mount fits correctly in position with the ring locating correctly, and then glue in place, with formers 1 and 3 pinned to shape the ply.

When the ring and mount are set, cut off surplus wood on each edge to allow an overlap on upper half and chamfer the edges. Straightening vanes will have to be trimmed to their correct length just prior to gluing the assembly.

Mould for upper half

It is practically impossible to bend thin plywood in a complex curve, *i.e.*, two directions at once, but a very good shape can be obtained fairly simply.

Cut a piece of 1/32 in. 3-ply for upper half of fuselage to 19 in. by 8 in. and mark centre line inside and out, and slit with a sharp knife from the front as far back as former 2 position. Soak ply thoroughly in hot water. Ensure that mould has grease-proof paper in position (*see* drawing).

Lay ply over the mould (made in either of two ways as sketched) and pin and bind rear portion in position ensuring that slit portion is central. Have a cloth handy to keep the ply damp with hot water. Carefully pin along one bottom edge and also pull down to fit to top curve of mould. Pin in position and lightly bind the front. Repeat performance with second half, removing pins to fasten down this half but pin through both pieces; gradually working towards front end. Do not worry about glueing the parts together yet, but only be concerned with getting the pieces into position, forming as true a surface as possible.

Have resin-glue ready, so that it may be applied immediately the pins and binding are removed. Then replace binding and pins to hold wood in position to the mould and set aside to dry thoroughly. File and sandpaper the overlap portion.

Mark the exact position of the hatch on the ply and prick each corner with a pin. When everything is set, remove ply from mould and fit and trim upper portion to lower assembly. Cut away ply at sides and in the region of mount to allow about ⅜ in. overlap between lower and upper half. When satisfactory, remove again and dope and fuel-proof the *inside* very thoroughly having first removed any surplus glue, etc.

Other points are detailed in the sketches on the plan which show the sequences of assembly.

Prepare two lengths of jig strip, square hardwood, two or three inches longer than fuselage. Cut these away at mount position, so that they lie snugly against lower fuselage shell sides. Their purpose is to serve as a board into which the assembling pins are driven and to prevent sides from becoming concave. Mark their position and proceed. When assembly is complete and dry, the sides may be cleaned up with file and sandpaper.

The nose portion must be securely dowelled all

cemented in place as it invariably makes first contact with terra firma and it is an advantage to protect the extreme nose with glass fibre, although hardwood has been satisfactory on prototypes.

Wings are, apart from the incorporated washout, perfectly standard construction, the only point needing comment is the use of spring clip fastenings to hold the wing in place on the tongues. These have been found superior to rubber band retainers and a sketch is provided on the drawing to show how the spring is fitted.

The fan

This type of fan, which is the result of several years experiment has proved extremely efficient, and is not too difficult to make, the 8-bladed type is simple and the rate of climb with Javahawk proves its superior efficiency.

The sketch in previous pages shows a simple sawing jig for the 9-ply 3/8 in. thick hub. The slots are cut at an angle of 40 degrees and the slot through which the spring-loaded screw (2 B.A.) passes, allows different diameter hubs to be cut.

Hub and jig are held in a light vice while being sawn with hacksaw blade, and released and moved round to next mark for cutting. Blades are cut overlength from 1/32 in. fibre or ply, then glued into the slots with a resin glue, and pinned through with a small shoe brad. Circular former 2 may then be held to front face of fan by the screw, the exact lengths marked and cut off to size.

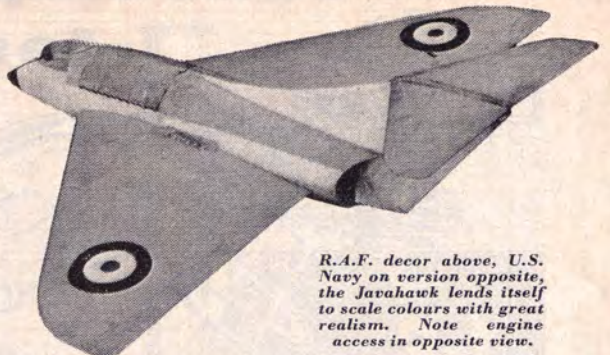
The blades are then curved by finger coaxing, and when completed, thoroughly doped and fuel-proofed against fuel and oil soakage.

Flying

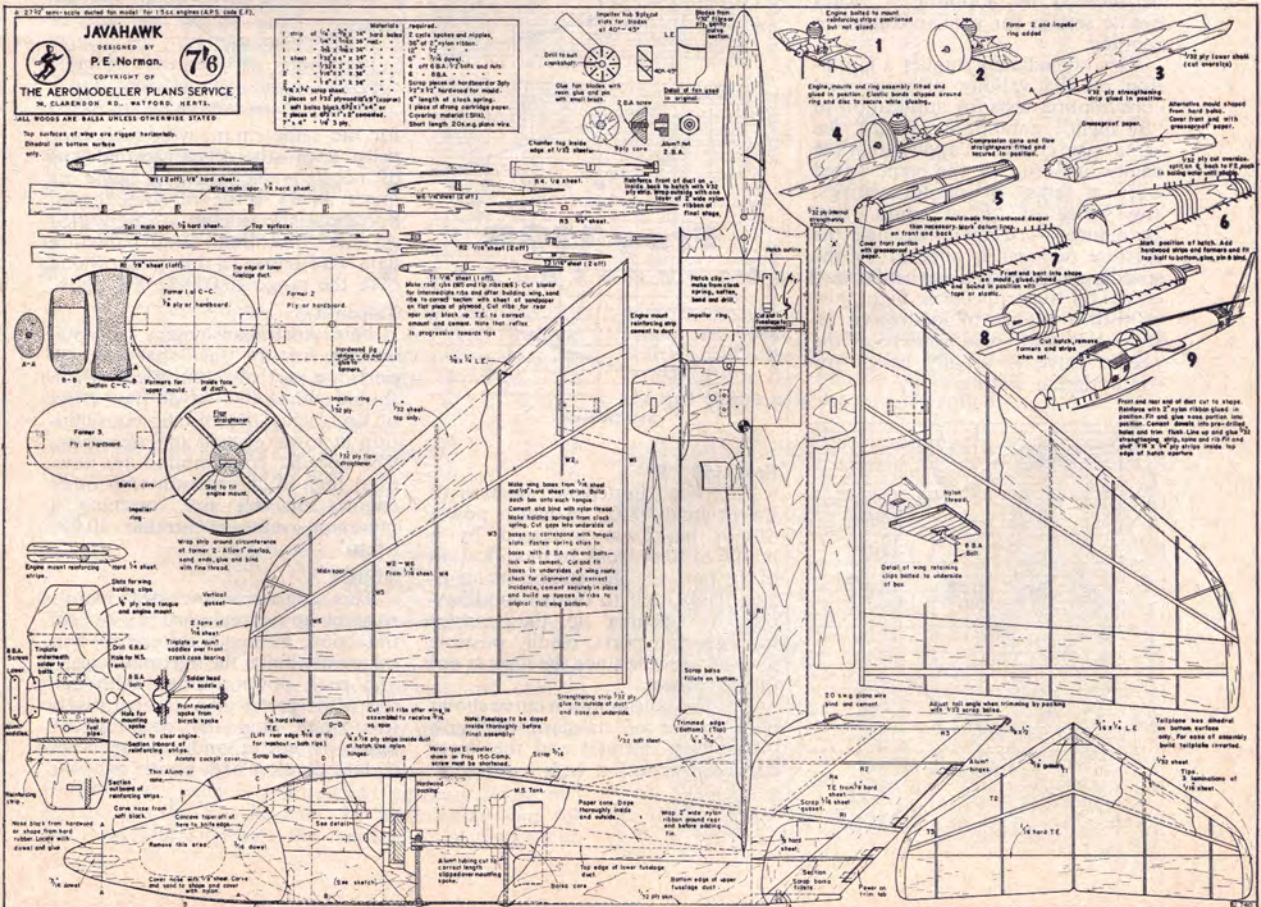
Although balance is not critical on Deltas, it is advisable to make sure that the Centre of Gravity is in the advised position. The first hand glide should be fast and straight. Remember that the model is expected to fly at scale appearance speed, so it is no use trying to obtain results from a half-hearted launch. The same launching effort must also be given when power is applied and correction for directional trim can be made by adjusting the thrust trim tab, which will be found most effective. Stalls can be cured by adding weight to the nose, but it is advised that the tail incidence be left alone. A down-thrust vane is another means of providing power control and this can be made of 1/32nd ply and fitted into the top half of the efflux.

Once the model is correctly prepared, it is virtually set for life and the owner will be rewarded with literally hundreds of thrilling and very realistic flights from a robust design of unique construction and appearance.

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R.A.F. decor above, U.S. Navy on version opposite, the Javahawk lends itself to scale colours with great realism. Note engine access in opposite view.



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