

*M. W. Payne's*

SCALE CONTROL  
LINE MODEL

*Wyvern*

THE Westland *Wyvern* is the first aircraft to fly with the Python propeller turbine engine, and although not yet in service with the naval squadrons, the type points the way towards even faster naval strike aircraft, of which the *Firebrand* was the first modern example. With a speed of 455 m.p.h., one of the most powerful engines in any single engined aircraft in the world, and a compact span of only 44 ft., the *Wyvern* looks right, and despite its weight it behaves like a true fighter. Later versions are reported to have dihedral tailplanes, which in view of the already enormous fin, would indicate the short tail moment.

The model deviates from true scale in detail. Obviously the tail area has been increased and the proportions of the wing altered slightly to increase root chord and reduce the moment; dihedral design has been simplified in the interests of strength. A  $1\frac{1}{2}$ -in. supersonic spinner reproduces the long spinner of the prototype, and the already long nose permits an easy tank installation on the model. Commence building by marking off on the lower  $\frac{3}{16}$  in. keel the positions of the formers, and erect all except *E* and *F6*, steadying them by slotting in the top keel pieces forward of *F2* and aft of *F3*. Note that the latter projects about  $1\frac{1}{2}$  in. behind *F5*. This extension picks up the leading edge of the fin whose outline and spar (*F6*) may now be assembled and, when dry, cemented to the top and bottom keels as shown on the plan. Now firmly cement and pin the top wing spar across the rear of *F2*, so that the lower spar pieces will meet on top of the lower keel. Fit *R1* on either side and allow them to dry.

Meanwhile the engine can be securely bolted radially to a thick ply former (*E*), using locknuts, and the former should be checked for size in its future position. Do not secure it yet, owing to its weight. The bottom spars may now be fitted, making sure of a strong joint at the centre and tapering the tips in depth until at the extreme end, the tip pieces cement only to a single piece of  $\frac{3}{16}$  in. sq., i.e., the continuous top spar. When dry, mark off the rib stations and slide in the ribs themselves; then complete the outline with leading and trailing edges, blocking up the latter to the lower keel in the centre with

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$\frac{3}{16}$  in. sheet cut to shape. Web the spars between *R1* and *R3*.

The tailplane and elevators are normal, with tape hinges and a 16-gauge wire bridle to brace both elevator halves together. Mount the completed tail on blocks set on a length of  $\frac{3}{8}$  in. sq. between *F5* and *F6*. This permits ample "down" elevator movement. The leading edge should cement against the rear face of *F5*. The control system may now be fitted on a platform in the centre section, the port *R1* being suitably stiffened for safety. Lead-out wires of 18-gauge pass through the ribs and emerge through brass tubes at the tip, and the push-pull rod is of 14-gauge wire. Trim the holes in the formers to allow absolutely free movement, and the rod should be able to rise along the port side of the tailplane mounting when the elevator is "up." Adjust the movement for more "down" than up, since the long wing chord tends to blanket the elevators when "down" is most needed.

Rudder ribs may now be fitted, and *E* complete with engine can be cemented in place, a hole for fuel feed having been drilled in the appropriate place. Greater strength can be built in at this point if pieces of  $\frac{1}{4}$  in. sheet are cemented on the rear of *E* and sanded flush with its outline in order to provide greater surface contact with the planking. This is recommended as plywood alone will readily break away from balsa cement. Now install the tank, bound to two  $\frac{1}{4}$  in. sq. strips between *E* and *F1* and pinned through the latter. Their position depends upon the type of stunt tank used. Finally cut a hard  $\frac{3}{32}$  in. sheet former, exactly circular, to fit over the extended driving washer of the Amco 3.5, and with it in place, commence planking the entire fuselage with strips of  $\frac{1}{16}$  in.  $\times$   $\frac{1}{4}$  in., beginning at 12, 6, 3 and 9 o'clock to hold this front former in place. The rest is quite straightforward; a hole should be cut where the cockpit cover seats. The windscreen is replaced by a longer, sloping, rounded shield both

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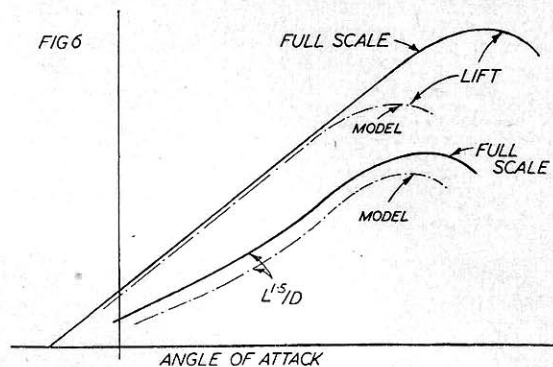
sections is still of doubtful value, unless specifically related to the Reynolds Number of the projected design (or, more simply, of the same aerodynamic scale in that the product of the chord and velocity of the airstream is the same in each case). A particular case in point is that it is known that the conventional sections such as R.A.F. 32, Joukowski and so on all stall at quite a moderate angle of attack under model conditions (around Wakefield size)—some 8 deg. as compared with higher Reynolds Number test figures of 15 deg. or so. But the  $L_{1.5}/D$  curve does not appear to be so much modified in shape, at least and would appear to occur very near the stalling point. Fig. 6.

A warning must be given here with regard to many early wind tunnel test figures which were carried out with chord widths and airspeeds corresponding roughly to those of the present C/L speed models. The fact that here the Reynolds Number is roughly the same is, unfortunately, no indication that these figures are of direct value, as in many cases they are very inaccurate due to errors in measurement and uncorrected tunnel effects. Also since all such test data should, in any case, be corrected either to a standard aspect ratio or infinite aspect ratio before comparative study, the whole thing threatens to be far more mathematical than the average modeller is prepared to undertake.

Even so, there is fun in knowing the practical "whys and wherefores" and knowing what to look for in aerofoil characteristics can lead to interesting, and often profitable, lines of thought.

Summarising, briefly, the more important requirements for different types of models, we can say:

**Gliders:** High  $L_{1.5}/D$  ratio; sufficient thickness of section for adequate spar depth as size of model increases; reasonable value of  $L/D$  at  $L_{1.5}/D$  max.;



maximum  $L/D$  if the glider is to be used and rigged for distance flying; reasonable lift value for slow flight with flat stall point.

**Rubber duration:** High  $L_{1.5}/D$  ratio; sufficient depth of section in larger models; reasonably low value of Drag at  $L_{1.5}/D$  max. in order to get good climb.

**Free flight power duration:** High  $L_{1.5}/D$  ratio for best glide; high  $L/D$  ratio for best climb; sufficient depth of section; low drag at  $L/D$  max.

**Free flight power-sport:** Good  $L_{1.5}/D$  ratio for good glide; high lift values for slow flight; sufficient thickness for adequate spar depth; reasonably low drag figures to avoid overloading the motor.

**C/L stunt:** Good lift values at low speeds (high angles of attack), with "flat" stall feature; low drag; good  $L/D$  ratio throughout; good lift at low angles of attack; symmetrical characteristics.

**C/L speed:** Minimum drag at small angles of attack; reasonably good lift at low angles of attack; high  $L/D$ ; high max. lift/min. drag ratio.

## Wyvern

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for better scale appearance and better streamlining. The double planking immediately aft of the spinner is diagrammatically explained by the plan.

Cover the fuselage and fin with Modelspan doped on (two coats), and the wing and tail with double strength, using plenty of strong glider dope. The original model has been twice dived vertically into hard earth at full speed and only the nose planking has ever suffered; so be generous with the dope. The finish is in standard naval camouflage—dark grey on top of wings, tail and fuselage, and cream beneath, over all the fin and up the sides of the fuselage to within  $\frac{1}{2}$  in. of the cockpit. Apply standard roundels with broad white rings; no fin flash.

No difficulties should be encountered in flying. The model is fast and light—only 13 oz. with 215 sq. in., and in spite of a short moment arm it is smooth and steady with plenty in reserve. It leaps away from hand-launches and it has been standard practice from its third flight to climb away at 60 deg. and fly it straight into a high tight loop. At least 50 ft. lines should be used, and there is still full control at the very

end of a long glide. The slightly raised position of the low wing and the slight dihedral obtained through tapering the lower spar holds the wing off all but the worst obstructions, and no damage has ever been caused by normal landings at low speed, and propellers last almost indefinitely with careful positioning on the shaft.

No offset either on fin or engine has ever been found necessary. Speed takes care of everything, and in fact the last three-quarters of a wing-over has been completed with absolute safety after a sudden cut in the climb. In flight, the model looks stylish and sleek, and very smart in its contrasting colours. It has proved its ruggedness and manoeuvrability, the former in spite of, and the latter because of its light weight. It is easy to build, and it lasts a long time.

Scale fans will enjoy building and flying the *Wyvern* and those who have not yet tried this fascinating branch of the hobby might well start with this model. They will not be disappointed with either its appearance or performance.

Build it and see.