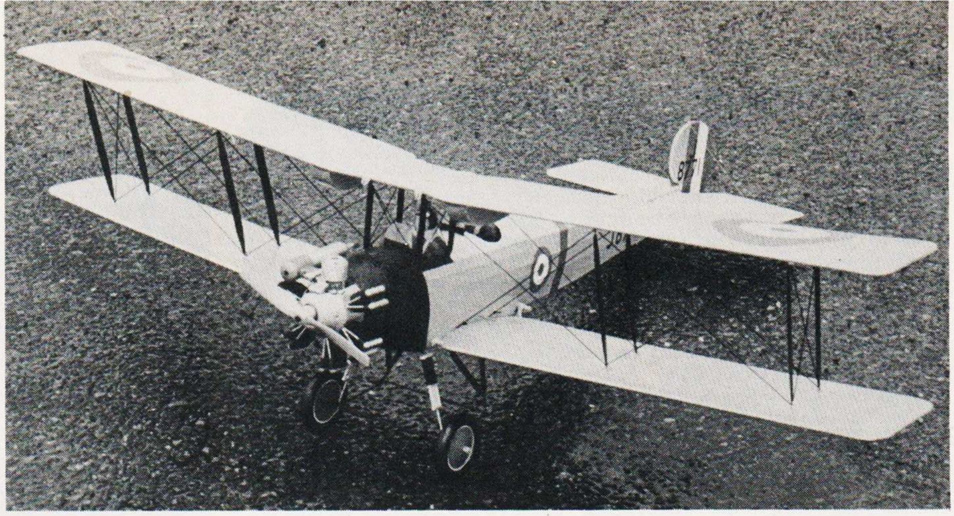
KIT REVIEW No. 116

By

Chris Pinchbeck



VERON AVRO 504N

THE Avro 504 series of aircraft originated in 1913. Designed by Alliott Verdon Roe, its qualities were immediately apparent, flying at more than 80 m.p.h. and setting a new British altitude record of 15,000 feet.

During its career (from the A to N versions), the 504 was used as a day and night fighter, trainer, bomber, reconnaissance and joy-riding plane. First production models were in service for reconnaissance with the RFC and as light bombers with the RNAS (Royal Naval Air Service) when war started in 1914. It achieved a dubious 'first' when one was shot down in action, on August 22nd, 1914.

The C and D variants had the observer's cockpit eliminated to make room for an extra fuel tank, and were used to combat the 'Zeppelin threat'. Apart from certain models within the K series, used for home defence in a night fighter role, all other marks were used for training. In fact, Prince Albert, later to become King George VI, learned to fly in a 504.

The subject of *Veron's* kit, the 504N, was the last and, perhaps, best loved mark, popularly named the Lynx-Avro after its Armstrong Siddeley Lynx power plant. 160 hp, 180 hp, and 215 hp engines were all used, giving speeds of 100 m.p.h. and service ceiling of 14,600 feet at a loaded weight of 2,240lbs.

The 504N was designed to replace the wartime K series for training purposes, a role which it fulfilled until being superseded by the Avro Tutor in 1923-33. Early models retained the wooden fuselage and tapered ailerons but later, welded tubular steel was used for the fuselage construction and rectangular Frise ailerons substituted. Production started in 1927 with J8496 and continued until 1933, the last delivered being K2423. In total, 570 were built. 504N's gave displays of 'crazy flying' at Hendon in the early 30's, but it is in its role as a trainer that it will be best remembered, especially by the majority of RAF pilots who learned to fly before 1933 with No. 1 FTS (Netheravon), No. 2 FTS (Digby), No. 3 FTS (Grantham), No. 4 FTS (Egypt) and No. 5 FTS (Sealand). At the Central Flying School, Wittering, six 504N's of E flight were fitted with blind flying hoods and pioneered instrument flying in the RAF.

When replaced by the Tutors in 1923, many N's were sold on the civil market and gave thousands of people up and down the country their first taste of flying through 'joy-riding'.

F. D. Tredrey's book *Pilot's Summer* describes with affection the docile and inherently stable flying of this aeroplane. *Veron* have faithfully retained the scale outline, and because of the above-mentioned characteristics, feel that adequate control can be maintained with just rudder and elevator control surfaces.

The Kit

Undoubtedly a builder's model, the box is crammed to overflowing (if you try and repack it) with a wide selection of balsawood, both in grade and dimensions. Generally, the sheet is excellent quality medium/soft, strip is medium and spindle moulded LE and TE hard. The only adverse comment about the wood in the review kit is that the die cut rib sheets were very soft. The die cut ply components were of good quality, but required the use of a strong, sharp knife to separate them from the parent sheet. Grooved hard-wood strips are supplied as under-carriage supports.

Vacuum-formed ABS mouldings are supplied for the two-part nose cowling and under-wing fuel tanks, with injection moulded polystyrene parts to make up the dummy cylinders of the Armstrong Siddeley Lynx radial engine.

4in. *Veron* scale wheels are also supplied.

The rest of the hardware comprises pre-formed wire cabane and under-carriage supports, a selection of wire for interplane struts and tail skid, control horns, push rod ends with *Kavan* links and various screws and nuts. Heavy weight *Modelspan* tissue and self adhesive PVC roundels are also supplied.

The rolled plan is unfortunately in two parts and must be joined before construction starts. With pre-slotted LE and TE stock, it is not essential to build the wings precisely over the plan, but if you wish to do this, then it is also necessary to cut out, reposition and rejoin the starboard wing-tip detail. A number of useful 'three view' sketches and section drawings are given, together with a separate sheet of construction photographs. The comprehensive instruction booklet ensures correct identification of component parts and makes for straightforward building.

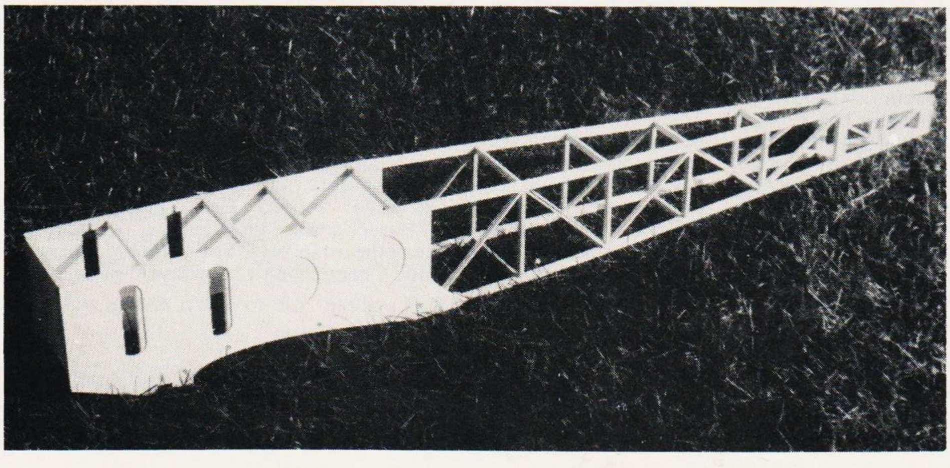
Fuselage

This is basically a simple, open framework box, apart from the forward section, which is built from sheet with plywood doublers. The fuselage contours are obtained by the use of formers and $3/32 \times 3/16$in. stringers.

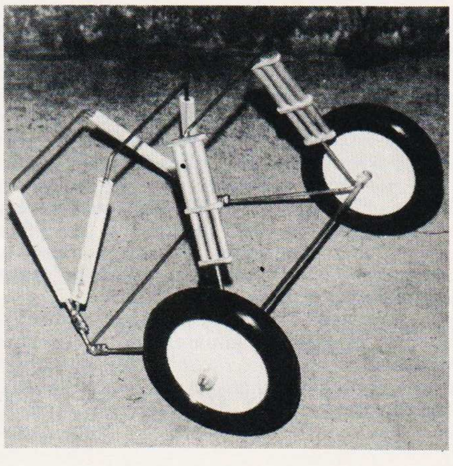
The four main cabane struts are pre-formed and have to be epoxied into grooved hardwood blocks which are then set vertically into the front fuselage section. I had to 'modify' the 12 SWG struts slightly to ensure neat and correct positioning. This was simplified by making up the four individual assemblies (pre-formed wire and hardwood block) over the plan. Since the blocks are fitted into pre-cut slots in the fuselage side, the correct height and angle for front and rear uprights is maintained.

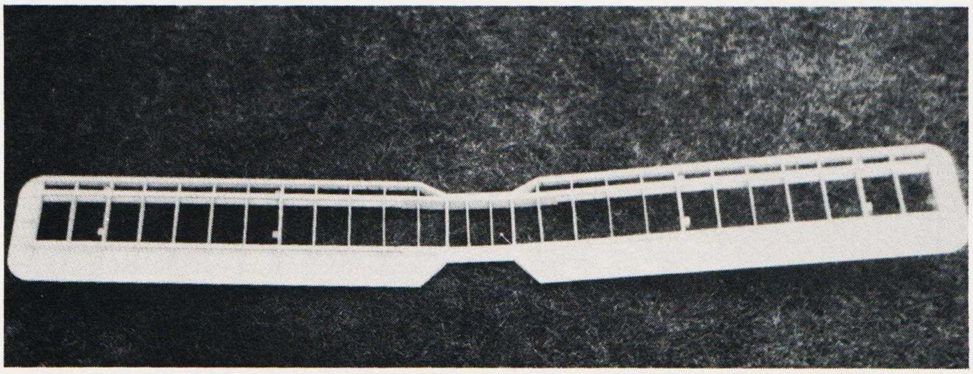
The cabane structure is completed with two wing supports and 18 SWG cross bracing. By

Below; basic fuselage, sheeted front has plywood doublers. Formers and stringers are fitted to this structure to provide the scale section.



Below; undercarriage is built from pre-formed 12 SWG wire sections. Oleo strut detail is produced by winding on gummed paper strip.





Above; upper mainplane before covering, interplane strut fixing lugs can be clearly seen here.

ensuring that the pieces to be joined are clean and carefully bound with fuse wire, before soldering, a rigid structure is produced. An acid flux is desirable – either Baker's fluid or a suitable acid flux cored solder.

The top decking around the cockpit area can be produced from two pieces of $^1/_{16}$in. sheet which should be steamed to shape, cut to fit around the cabane supports, then joined longitudinally *in situ*.

The motor mount is built into the structure at an early stage and consists of two beams with $^1/_4$in. ply plate. The ABS nose cowl has to be cut and fitted, ensuring that holes are made in the front face for throttle linkage and fuel supply pipe. Adding to the scale appearance, a vacuum-formed front cowl or crankcase is fitted to the nose cowl with small brass woodscrews. This has to be cut away to suit the engine being used. Basic cutting and trimming of the ABS can be done with scissors or tin snips, final shaping is best carried out with a sharp modelling knife and fine grade glass paper.

Dummy engine cylinders and push rods 'make' this model, giving it an air of nostalgic realism. Each cylinder comprises four moulded components and a balsawood dowel bush to assist fixing to the crankcase. Details are given for an exhaust collector ring and although fragile, from an operational flying point of view, this should be fitted to confirm the authenticity of the model.

Wings

At first sight, the wing plan can appear a little confusing. However, by joining the separate drawing of the starboard wing tip to the main plan, all is revealed. Instructions are self-explanatory but one or two points require clarification concerning construction.

The trailing edge is built directly onto the underside sheeting, and is *not* a butt joint (as I first thought).

Because of the symmetrical wing section and the fact that the TE is pinned to the building board, it is necessary to block the lower main spar with $^3/_{16}$in. scrap.

Wing tip sheets should be positioned at a slight angle and line up with the TE and centre line of the leading edge.

Wing centre section sheeting is $^3/_{16}$in. balsa wood and the design calls for this to be fitted between the ribs. Although I faithfully followed these instructions, it would have been better to modify the ribs by reducing their depth $^3/_{16}$in. top and bottom, then sheeting overall in the usual way. Much sanding and filling would then have been avoided.

Wire clips are recommended for anchoring the interplane struts. However, I find that covering is complicated by having wires protruding above the surface. So, hardwood blocks were fitted instead, then after covering, they were drilled and tapped 8BA to accept clips made up from threaded bicycle spoke ends. The result is a little more cumbersome than 20 SWG wire, but makes for easier covering and is barely noticeable when the interplane struts are held in position, with short pieces of PVC sheathing from household wire.

Tailplane & Fin

The fin consists of two pre-cut pieces of $^1/_4$in. sheet joined with a $^1/_4$in.$\times$$^3/_8$in. hard balsa rudder post and strengthened with $^1/_4$in.$\times$$^1/_4$in. let into the rear section. The edges are then simply rounded.

Tailplane construction is conventional open framework with leading edge sheeting and presents no difficulty at all.

Undercarriage

A fairly complex structure, made up from pre-formed 12 SWG wire. The oleo strut detail is shown on a separate sheet and can be realistically reproduced by winding on a suitable width and length of gummed brown strip paper.

Once again joints to be soldered must be thoroughly cleansed and supported by stout fusewire bindings.

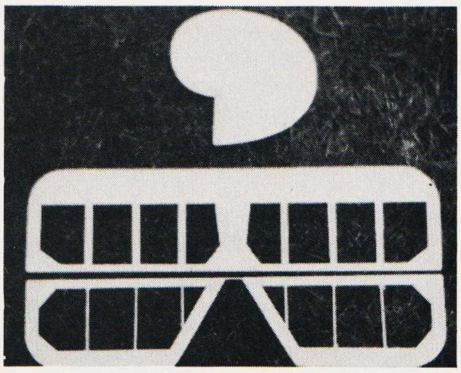
The tail skid can most easily be made by fitting the ply support plate to the fuselage, drilling the positioning holes, then bending up the 18 SWG wire to fit. Final attachment of this item was left until after covering for the reasons mentioned above in reference to the interplane strut clips.

Covering

Heavy-weight Modelspan is supplied, and warnings are given about the use of iron-on film since it is felt that this material does not impart sufficient rigidity to the wings.

In order to obtain an authentic finish, I elected to use lightweight nylon. The parts of the airframe where the nylon was due to be anchored were prepared with two coats of dope, then the dampened nylon was applied in the normal way. In order to maintain the nylon weave to represent a fabric finish, I wanted to use as little dope as possible to seal the covering. In fact, one coat sealed the weave, and after careful inspection, *Humbrol* Silver enamel was brushed on overall. At first, all appeared well. I subsequently found that the single coat of dope had sealed the nylon between the framework, but where it had rested on the stringers, ribs, etc., the dope had simply passed straight through the nylon into the woodwork. The net result was that the enamel had 'taken' on the open bays, but had soaked straight through into the framework where this was in contact with the nylon covering – disaster!

I was now left with the need to seal the nylon



Above; $^1/_4$ in. balsa sheet rudder/fin. Tailplane and elevator are of simple open frame construction.

and framework with more dope, but over an enamel finish! For those new to the hobby, although enamel will take over cellulose finishes, e.g. dope, the converse leads to the development of bubbles and blisters when the cellulose dries out over enamel. I tried sealing with polyurethane varnish and with French chalk mixed with enamel, but to no avail. Nothing for it, but to strip it all off! A can of *Nitromors* paint stripper was obtained and I set to work with steel wool. The results were effective but a trifle worrying, some of the covering sagged, the rest ballooned up! However, 24 hours later, all was back to normal as the stripper and nylon dried out.

So I started all over again, and after a further two thinned coats of dope, all was sealed and ready for the silver enamel. Normally, silver paints are best sprayed, but by judicious thinning, a good brush finish can be obtained.

Finally, the vinyl roundels were positioned and lettering made up from black *Solarfilm,* before fuel proofing.

I have deliberately gone into some detail in this section to illustrate to those who have not experienced a similar catastrophe that there is no short cut to obtaining a decent finish.

Rigging

The interplane struts are made up from 20 SWG wire sandwiched between two lengths of $^1/_4$in. trailing edge stock. Interplane rigging was made up from black 'hat elastic'.

The all moving rudder/fin needs some support and this was provided by nylon fishing line secured to the tailplane and looped around a glass-headed pin at the top of the fin, carefully positioned above the hinge centre line.

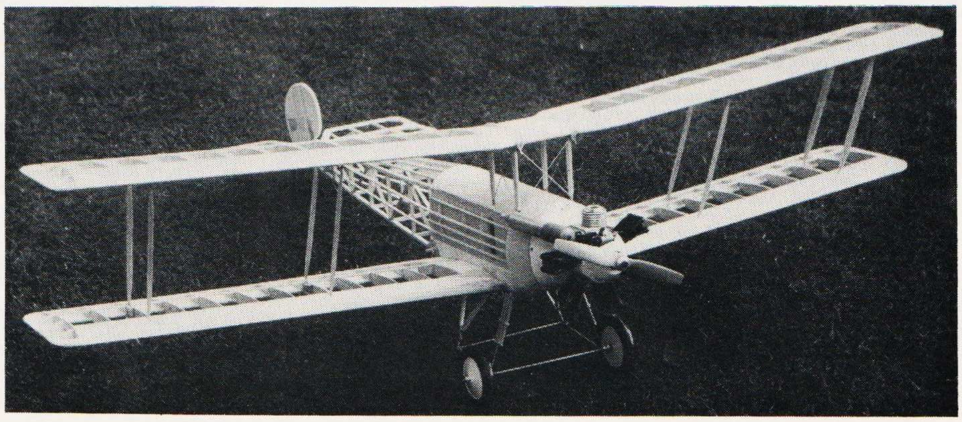
Weight of bare airframe and wheels was 3lbs 1oz.

Weight after covering and finishing was 4lbs 8$^1/_2$oz.

Engine and Radio Installation

A *Cippola 25* was used for the power plant with a 9in.$\times$6in. glass reinforced nylon propeller. Power was just adequate, but there was none left in hand. The engine was bolted

Below; seems almost a shame to cover all that lovely woodwork! Cockpits have yet to be cut out.



directly to the ply mounting plate, which gives the required down-thrust. A minimal amount of side-thrust was obtained by 'swinging' the engine. In the event a further 1° or 2° would have been better.

Futaba radio was comfortably installed as far forward as possible with three servos in line abreast, operating through balsa/wire push rods. Servo mounting blocks/supports are provided, but I prefer to use 1/4in. balsa side supports glued to the fuselage with 1/4in. × 1/4in. ramin mounting beams. I find that the ramin is rigid enough to give good support, and if pre-drilled, accepts woodscrews to hold the servos in place, but splits quite easily in the case of a crash, or is it uncontrolled landing!

The finished weight, without fuel, came out at 5lbs 13oz.

No control movements were given on the plan, so rudder was set at 1in. each way and elevator movement reduced to the minimum possible by using the outside hole on the horn provided, with an extra hole drilled on the inside of the servo disc. Even so, elevator movement was 7/8in. each way. Yes, it looked a lot.

Flying

Low overcast with a hint of occasional drizzle, but no wind. The intrepid birdmen sallied forth. The engine was started and with all radio checks made, the '504' was released.

The take-off on tarmac was very realistic, with a smooth easy run and no tendency to swing. The climb out was gentle with no hint of what was to come! Gentle circles were made to slowly gain height and it was soon found that the elevator movements, coupled with the long movement arm of the model, were far too fierce. In fact, the handling characteristics were very 'twitchy' indeed! Rudder control appeared to be acceptable. So much for the first flight.

Back home, the rudder and elevator horns were replaced with ones which are 3/8in. longer. By using the outside hole, elevator movement was reduced to 3/8in. each way.

In addition, 3 1/2oz of lead was bolted underneath the engine mount, effectively moving the CG position about 1/2in. forward.

After several weeks of enforced delay because of the weather, the next outing was made on a calm but very cold day. This time to our club grass-strip field.

Engine started, radio checks completed, release, and away she trundles. Unfortunately there was insufficient power for a grass take off. Various alternative propellers were tried but to no avail. Nothing for it but a hand launch, first problem was where to hold it! At last, after a few steps the Avro lifted herself out of the launcher's hands, and picking up speed started to slowly gain height. Elevator control was fine but at the slightest touch on the rudder she started a wallowing axial oscillation. Was this the dreaded Dutch rolling? Whatever it was it looked and felt most uncomfortable not to mention dangerous. Eventually it was found that by only just moving the stick, proper control could be maintained. It has subsequently been found that only 1/2in. each way of rudder movement is adequate.

Once this problem was sorted out, flight characteristics were established as being smooth and free from vices, the stall was flat and control easily regained. The Avro showed a strong tendency to screw out of loops. The glide is gentle but coupled to a high rate of descent, and full control can be maintained all the way down.

Summary

A nice scale model which is a pleasure to build, and *given the control movements above,* simple to fly. However, an engine *towards the top of the recommended range* should be used coupled to some *additional side thrust,* and dependent upon engine used, *additional down thrust may be required.*

Manufacturer
Model Aircraft (Bournemouth) Ltd.,
Norwood Place,
Bournemouth.
Price
£37.50

Footnote. Subsequently an *OS40* fitted with an 11×4 propeller has been installed in the 504 which has cured all the problems described. A slight increase in weight coupled with power to spare has transformed the model into a pleasurable practical Sunday afternoon flyer.

Full power is only necessary for take-off and can immediately be reduced when the model lifts off. Between one-third and half power is adequate for general cruising around and realistic loops and stall turns can be accomplished after an initial dive. Final recommendation would be an engine of 0.35 cu. in. such as a Merco .35 fitted with an 11 × 4 propeller.