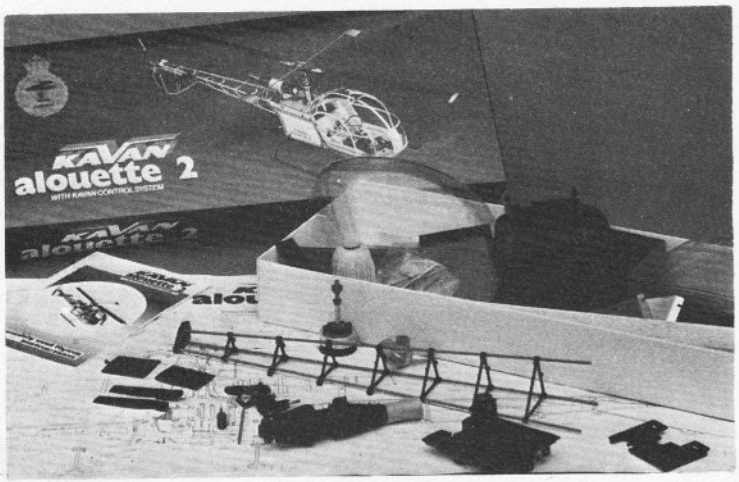
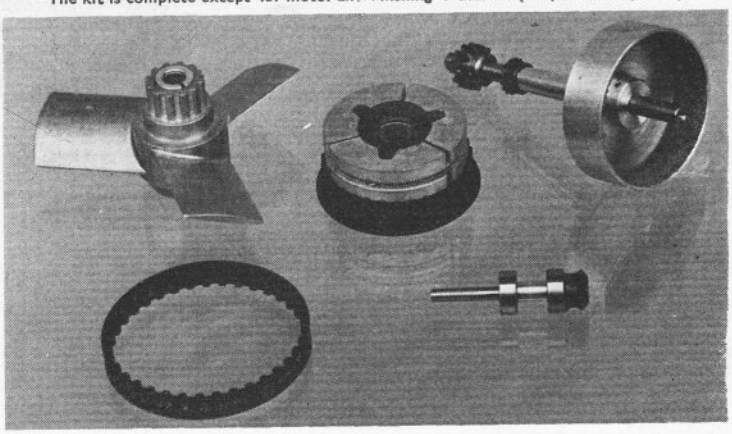
RM TEST REPORT The 'ALOUETTE' II

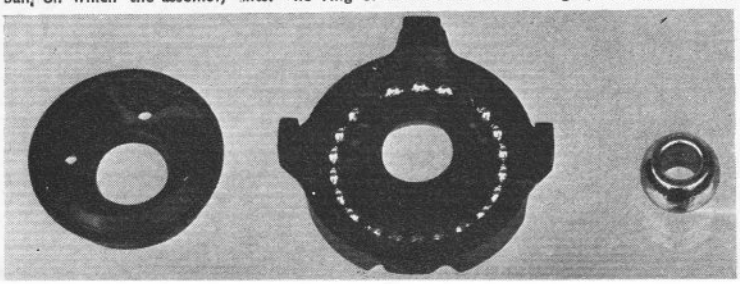
TONY BRAY reports on KAVAN's latest helicopter kit



The kit is complete except for motor and finishing materials (and, of course, radio).



Above: cooling fan, clutch and tail-rotor drive. *Below:* 3-piece swashplate shown with the large ball on which the assembly tilts. The ring of loose balls makes a light, effective bearing.



THE long awaited "small" helicopter from Kavan is now being imported by Irvine Engines. It is a near scale model of the Aerospatiale *Alouette II* designed to use a .40 cu.in. motor and four channel radio. The model, which is of the "bubble and boom" type, is constructed principally of metal and plastic. Wood is used only for the main rotor blades, cabin floor—which forms the servo tray—and the sides of the transmission box.

The transmission is obviously descended from the *Jet Ranger*, (reviewed July-Sept. '73). The motor is mounted with the cylinder centre-line horizontal and the head facing forward. The crankshaft, which points down, is fitted with a combined fan and pulley for a toothed belt. This drives a vertical intermediate shaft with a reduction of 5:2 via a substantial clutch. This has three die-cast shoes, retained by a circumferential spring, which expands into a light alloy drum with a thin cork friction lining. The main rotor shaft is driven from this intermediate shaft by a pair of 1 Module nylon-to-steel spur gears with a further reduction of 5:1. Thus the overall reduction, motor to main rotor, is 12.5:1.

The tail rotor is driven by two pairs of 1:1 steel bevel wheels and a 2mm. wire shaft. The whole power unit, motor with silencer, intermediate shaft, clutch, main rotor shaft and tail rotor primary drive are built onto a heavily ribbed plastic plate which may be easily removed, complete, from the model for inspection and service, as shown in the photograph opposite.

The cabin comprises a rigid plastic base and back which is bolted via the plywood sides to the transmission plate and tail boom. The cabin floor, which is 3mm.

plywood, is cut out to hold the four servos receiver and nicad pack. The bubble is formed from two epoxy mouldings joined by a plastic channel.

The tail boom is formed by three thick-walled aluminium tubes and triangular plastic trusses. This is supplied ready assembled and glued, and only requires the addition of the wire cross-bracing.

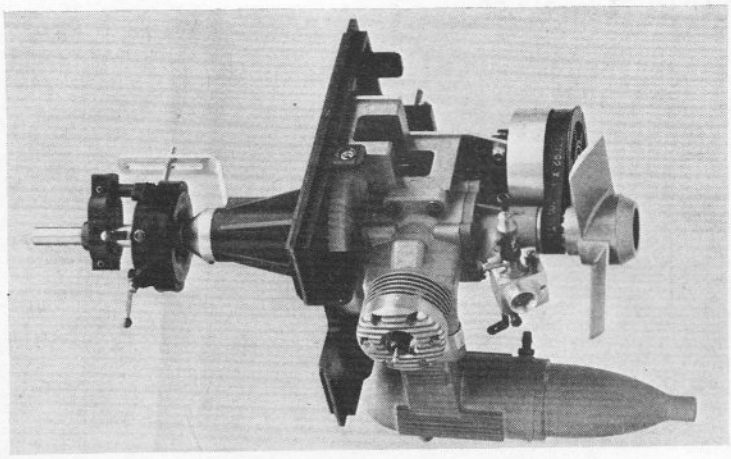
A very simple, but novel and efficient, system is used to control the pitch of the tail rotor blades. It consists of a single lever connected to the boom at one end and to a collar sliding on the tail rotor shaft at the other. In the neutral position this lever trails back at about 60deg. to the models' centreline. As this angle is increased or decreased by the control rod, it moves the collar along the tail rotor shaft and changes the pitch of the blades. This tail rotor pitch control and the bevel gear box are supplied as assembled units.

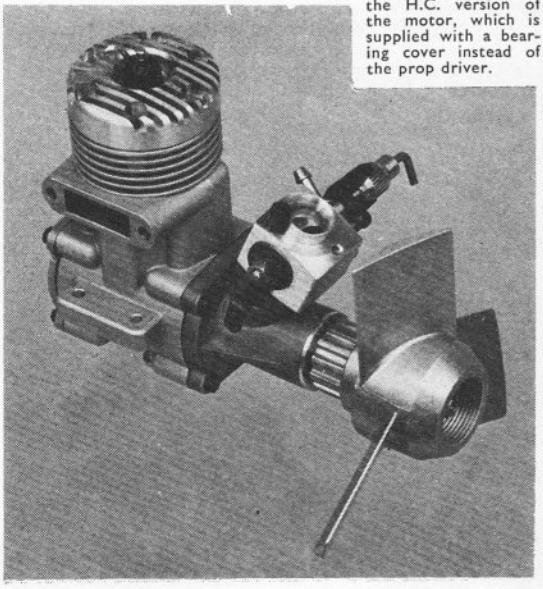
The model is not designed with collective pitch control to the main rotor but uses the Kavan system of cyclic pitch control—a combination of the Bell and Hiller systems which was developed for the Kavan *Jet Ranger*.

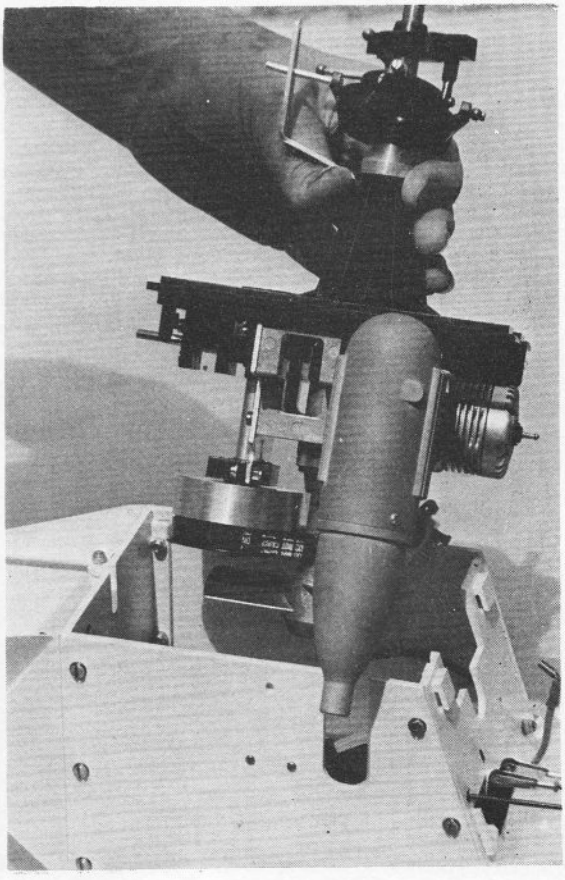
The design of the head is novel, if not elegant, and uses a plastic blade hub. This has a cross-section of 30mm x 5mm. and is very stiff in the horizontal plane, to resist the blade drag and inertial forces when the head is accelerated. It is also relatively stiff in torsion, but is flexible in the vertical plane and this allows the blades to "flap." The ends of this hub are chamfered at 4deg. to give the basic pitch to the blades, and adjustment is provided with jacking screws acting against the metal plates on which the blades sit. There are two connections to the swashplate, one to vary the pitch of the paddles and the other to the mixing lever which is coupled directly to the blade hub.

The swashplate is also novel but considerably more elegant. The bearing between the plastic, static and rotating plates consists of a row of loose steel balls with the inner and outer tracks moulded in the plastic plates. The inner plate, which rotates with the shaft, is split to retain a metal ball on which the complete assembly tilts.

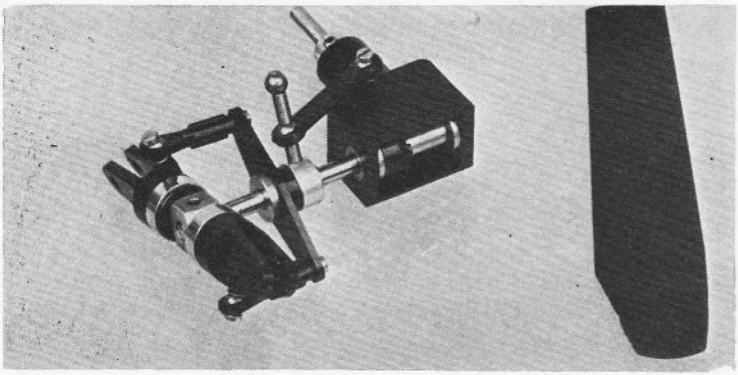
The review model was fitted with the new Irvine .40 cu.in. Schuerle







Above: the assembled power unit, into which Tony fitted the new Irvine .40 Schnuerle ported motor. *Right:* the whole unit, complete with silencer, can be easily removed from the model for inspection and maintenance, as seen in this "action shot." *Below:* the Irvine 40 with the Kavan cooling fan fitted. (Note fan's coned boss, for electric starters). This is the H.C. version of the motor, which is supplied with a bearing cover instead of the prop driver.



The tail-rotor gearbox and pitch change linkage are supplied ready assembled; the tail-rotor blades are black plastic mouldings, one being shown at right.

ported motor. This is available in a helicopter version and fits this model without modification or alteration. The radio gear chosen was the four function Sanwa with three SM311 and one SM312 servos. There is, however, plenty of room for the flight pack and any modern radio equipment could easily be accommodated.

The kit contains very complete step-by-step building instructions, together with 18 illustrations and a full-size plan. A parts list, with every part illustrated is also provided.

The building instructions are so comprehensive that any how-to-do-it information in this review would be superfluous. There are, however, several small modifications and observations that I think are worth while passing on to prospective builders.

The receiver switch is shown mounted on the plywood cabin floor, which necessitates the removal and replacement of the bubble at the beginning and end of each flight. Provision is already made for external fuelling and if this switch is fitted under the plywood, with two spacers, an operating wire may be taken out through the side of the plastic pan. An external socket for the glowplug supply is also virtually a must. Probably the best place for this is at the starboard end of the fuel tank—there is plenty of room here and it will stay relatively clean.

If a Kavan silencer is used and fitted as recommended, over 80 per cent. of the depth of the ply side-plate is cut away. As this plate is an important structural member of the fuselage this is clearly undesirable. By using a port extension the silencer may be brought clear of the fuselage side, resulting in a much smaller cut-out—and better cooling, too.

Below: the two mods. mentioned in text—*left*, the 1 : 1 lever to reverse the direction of tail-rotor pitch control relative to servo. *Right:* simple light metal cover for tail-rotor gearbox.

Minor mods

On the review model a modification was made to the suggested layout of the throttle and tail rotor push-rods. As drawn the throttle push rod goes through the bulkhead high up, and is then cranked down 35mm. to connect to the arm on the carburettor. If this arm is rotated 180 deg. the rod can be almost straight. However, it is then necessary to alter the direction of the pitch change of the tail rotor relative to the servo. It is not possible just to alter the direction of the servo as this would spoil the operation of the compensating arrangement which is provided between the throttle and tail rotor pitch. An easy way to overcome the problem is to mount a 1 : 1 lever in the transmission box. This has an added advantage that the thin wire provided may be used from the lever to the tail rotor pitch control as it is supported by the lugs and a 2 mm. rod may be used from the lever to the compensating arm on the servos where there is approximately 200 mm. unsupported.

The tail rotor gear-box is enclosed on five sides but open to the rear. A thin sheet aluminium cover may easily be made to seal the sixth side and protect the gears from dirt and grit. A small " dent " has to be formed to clear one of the gears and this can easily be made with a $\frac{1}{2}$ in. diameter steel ball.

NEXT MONTH—Part Two describes trimming and flying the model. (Tony came up against quite severe inherent vibration problems, and full gen on ironing these out will be included, together with a general appraisal of the design and the kit).