JET RANGER — PART 2 —

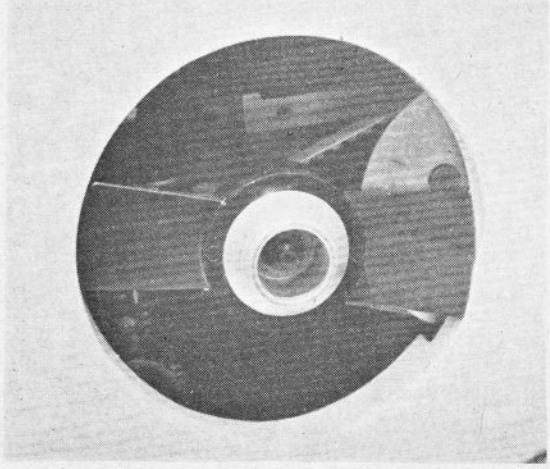
ROY YATES brings the review model to "ready to fly" stage

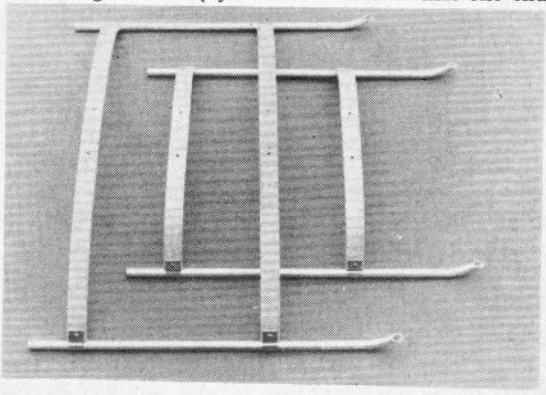
THE latter and final assembly stages of the Kavan *Jet Ranger* are the subject matter for this month, continuing from last month's resumé of the layout and early construction points. The décor applied to the fuselage was in the form of sprayed cellulose, to the colour scheme of a Kidlington based prototype. The final two coats applied were thinned Furniglass clear polyurethane. Rather a strange phenomenon occurred here, as the fuselage dried within two hours but both undercarraiges, scale and trainer, took practically 36 hours.

The Kavan dummy pilots, along with seats (my old *Proctor* seats were just right) instrument panel and fuel tank cradle—both of which I fabricated from Plasticard—were next fitted. All these I made removable, mainly because the receiver and power pack, which are installed in the nose, have to be accessible. The only access, after windows are fixed, apart from the cabin top, is a removable side front window. This, the instructions tell you, should be on the left (I made it right, because being right handed it seemed more logical), which has to be used also to change a glow plug. As you must agree, this is likely to be one of the more frequent occurrances.

The interior detail almost completed, the servo leads, with added extensions, were so arranged to obviate unsightly dangling wires, by channelling them down behind the central front window post, between two half-inch wide balsa strips which were epoxied either side of the central post.

The aluminium servo plate, suitably cut out to take my Skyleader servos, was next assembled and positioned between the angled brackets on the cabin top plyformer. Hinged at this end, with the longitudinal and lateral pitch servos, and the motor servo all mounted, the opposite end carries the 90deg. bell cranks. Three of these transfer the cyclic pitch movements through to the swash plate, whilst the remaining one (by virtue of the fact that one end





Above: the two sizes of landing gear—"standard" and (larger) "trainer." The latter is not included in the kit but available as an optional extra. Standard version shown in heading photo. Left: underneath—the cooling fan combined with metal starting cone.

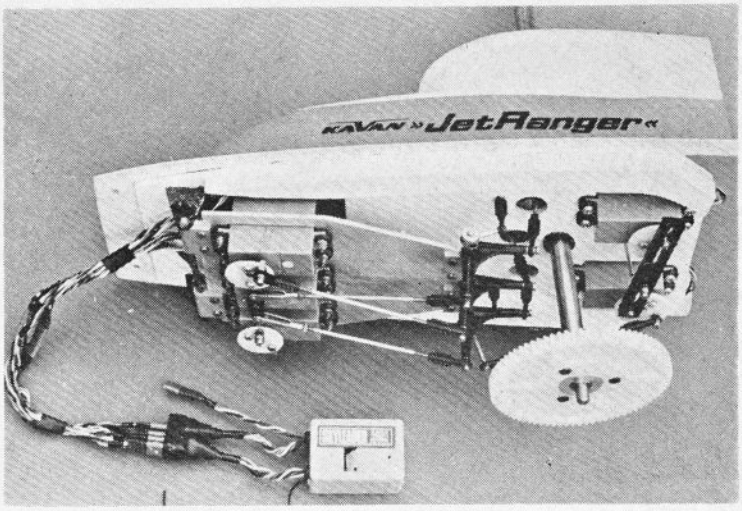
supports the completely assembled plate, and the other end connects to the collective pitch servo) moves all three aforementioned linkages en mass, thereby controlling the collective pitch.

The fourth rod connection to the swashplate was called, last month, the " fulcrum " for the swashplate and this unfortunately was not a very good choice of word. This rod, which passes through a slot in the bearing bracket, and then through a guide hole in the cabin top plyformer, acts as the " steady " to prevent the lower swashplate from revolving. In the true sense of the word the fulcrum for lateral cyclic pitch movement of the swashplate is the longitudinal link, along with the steady and, conversely, the longitudinal fulcrum is the lateral link.

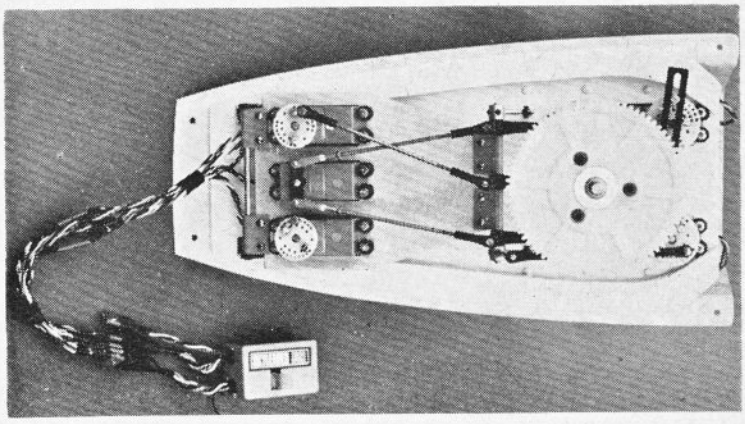
A conflict of dimensions is present with regard to the swashplate to bellcrank linkages. In the instruction book, it says to make these three linkages 95 mm. between centres, and on the plan they measure off at 85 mm. With the aluminium servo plate parallel to the cabin top plyformer, and the collective pitch servo output in low pitch position, and linked accordingly, the 95 mm. length is too long. It butts up against the inside of the cabin top on extreme lateral cyclic and collective pitch. At 85 mm. they are about right, allowing the swashplate to clear the bearing housing screws on the main shaft bearing bracket when at low collective and full longitudinal and lateral pitch position.

One could say that, at low throttle and collective pitch setting, the other pitch positions are of no consequence. However, fouling servo linkage movements are to be avoided under any conditions, to my way of thinking, to prevent overloading the servos. With this configuration, when the two links from the upper swashplate to the main rotor head are assembled, the guide boss, which ensures that the upper swashplate rotates with the mainshaft, cannot be set low enough to bring it level with the cabin top. The plan shows the boss in this position as indeed do the photographic illustrations in the instruction booklet.

The reason that the position cannot be attained is twofold. Firstly the marked circle, which I religiously cut out to on the cabin top in the early stages, turned out to be slightly misaligned and, secondly, the linkage guide rods in the boss foul the plastic snap links on extreme pitch movements. How-



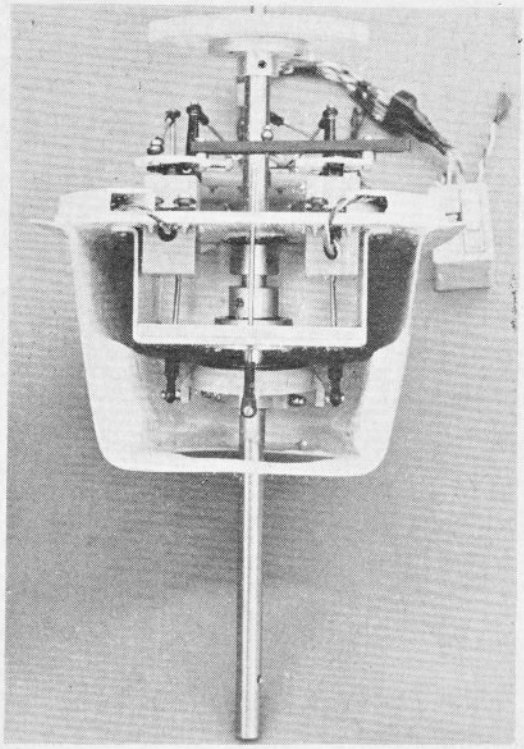
The top part of the model carries not only the main drive shaft, with its large nylon gearwheel, but also the five servos and their array of bellcranks and push-rods. Note " trim bar " joining the " yaw " servo (tail-rotor) with the collective pitch servo (main rotor).

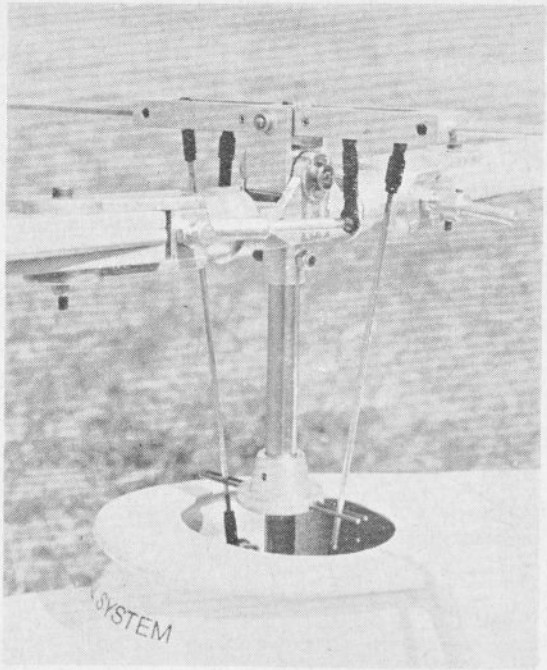


ever, there is no problem; it only means that the guide boss must be fixed slightly higher than the cabin top—just enough to clear the links on these extremities. The 90 mm. length which is advised for the swashplate steady rod also has to be shortened by 5 mm. to prevent its butting against the mixing lever connecting the tail rotor and collective pitch servos.

Whilst manipulating these linkages and, in the process, the swashplate, I wasn't too happy about the way the large ball-race was located in the lower swashplate. It appears to be purely a push fit, and could quite easily be eased out with the fingers. I may be totally unjustified by so doing but, as this part is a main transmission component for movements from servos to main rotor, I felt a need for a more secure fit. I therefore applied just the tiniest spot of slow curing two-pack Araldite to four positions inside the lower swashplate, adjacent to the linkage balls, and replaced the bearing, being absolutely certain that no surplus epoxy got into the bearing.

With regard to the throttle and collective pitch transmitter movement, I pondered for what seemed an eternity; so much so that my wife several times asked: " What on earth are you thinking about ? " Finally I decided that the fixed-wing transmitter set-up would be advisable, with the " low motor " in the rearward stick position. This is contrary to the illustrated instructions but I felt it was more important that, in adverse conditions on future flying sessions, it would be sensible to be able to operate the throttle without having to think about which way is closed. In all





Left: shown here inverted is a view from the rear of the servo and shaft housing assembly. The bar connecting the two rear servos can be clearly seen, while the swash plate is in the "lower" part of the housing. Right: the rotor head assembly on the completed model.

fairness the instructions do suggest that if one is a proficient fixed wing pilot, it would be advisable to retain the mode that one was used to.

The main rotor blades are of two-piece construction, spindle-moulded hardwood leading edge and balsa trailing edge, which are tongued together to form a symmetrical section. The root ends have reinforcing hardwood plates, which are cut from a moulded strip supplied, and glued into position. The 7 mm. fixing hole has an aluminium bush insert, which prevents distorting the blade head mount castings should the fixing screw and nut be over-tightened. A plated steel tongue is also epoxied into a 3 mm. wide slot that has to be cut in the blade root, and this facilitates blade positioning on final assembly. The blades are then balanced so that their c.g.'s are in identical positions, and then adjusted so that their weights are equal.

With the aid of Tony Bray (who built RM's *Bell-Huey*) and his accurate scales, the blades were matched to within 50 milligrams. The "Contact" type self-adhesive covering was then applied, ensuring that no wrinkles appeared. To be absolutely fussy about the situation, the blades were again weighed to ensure that by applying the covering no imbalance had crept in.

The aerodynamic damping blades are now assembled onto the rods and positioned parallel to the fulcrum pin and each at the same distance out from the fulcrum pin. Incorrect alignment of these damping blades will have adverse effects when attempting to fly, so care must be taken.

With the main blades assembled to the head, a setting-up process is detailed in the instructions. According to illustrating photographs the counterbalance main blade adjusting screws are facing forward, relative to direction of rotation. I found it necessary to fit these on the *trailing* side of the rotor head, to achieve a correct balance effect, once the setting up linkages were disconnected. This rotor head setting procedure, once completed, is a second check on how precise one has been in achieving equal blade weight. This is because, when the previously mentioned setting linkages are disconnected, the head is quite free to find its own level on the fulcrum pin and needle roller bearings. A special rubber bush is inserted between the main rotor hub and seesaw, which restricts the teetering movement between the blade hub and mainshaft.

Finally the throttle link has to be adjusted, along with the tail rotor and the main blade pitch setting. The throttle link, because I had opted to retain a fixed-wing transmitter mode, was too long as supplied, so rather than produce a double bend in the rod to effectively shorten it, I acquired a 2 mm. threading die and lengthened the threaded portion to suit the length of link I needed.

The tail and main rotor pitches are preliminarily set, but further adjustment may be necessary once airborne attempts begin. I will be in a better position to write about these settings next month, after several hours' flying time has been logged.

For any readers interested, the total time taken to build up this kit has been somewhere in the region of 200 hrs. Of course, this has tended to be on the excessive side, purely due to the fact that the exercise has included a review, which has certain time-consuming facets, such as taking photographs, for just one example. However, with the model now completed I am straining at the leash to get the thing into the air, and produce the final and most important part of this review. . . .

To be concluded