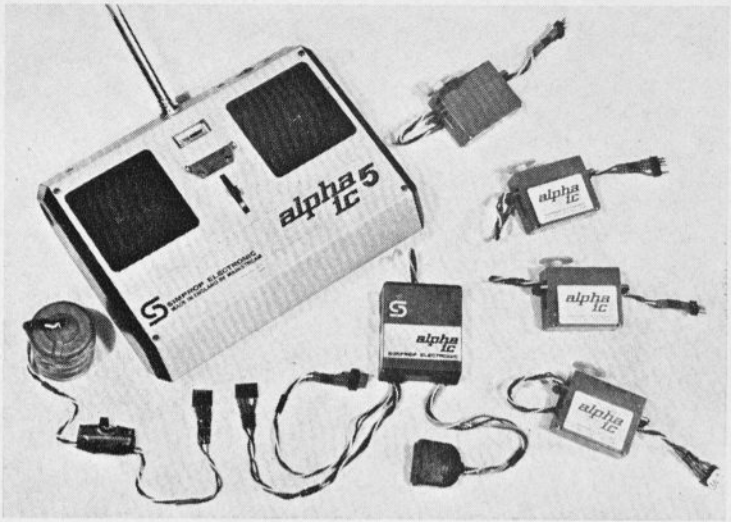
R. C. M. & E. TEST REPORT

Mainstream Simprop ALPHA 5 I.C.

By
Rex Boyer



THE Simprop Mainstream Alpha 5 is a logical development of the Simprop Digi 5 reviewed in *R.C.M.&E.* November, 1969. The main innovation has been in the servos where a custom made I.C. amplifier has been incorporated.

This I.C. which was commissioned by Simprop and developed and manufactured by Ferranti in U.K., is one of the first attempts to design an I.C. specifically for the R/C market, rather than use existing I.Cs normally designed for the computer field, in circuits which have to be tailored to suit the I.C. rather than the other way round.

It was indeed a bold move by Simprop to commission such a device because development costs on such an item run into many thousands of pounds and production can only be cheap if a large volume are manufactured.

The Alpha 5 is, apart from the servo, what could be termed as a 'conventional' R/C system. The receiver case is of metal when most manufacturers are changing over to plastic cases, which are easier to seal against the ingress of water, oil and 'fingers'.

The servo mechanics are again the very precise Simprop type, with one of the finest gear trains we have seen. The smaller 16 mm. Mitsumi motor is retained (Simprop were, as far as we can ascertain, the first to use this smaller motor), the only mechanical change that we could find being the feedback pot, now changed to a lower value dictated by the I.C. amplifier.

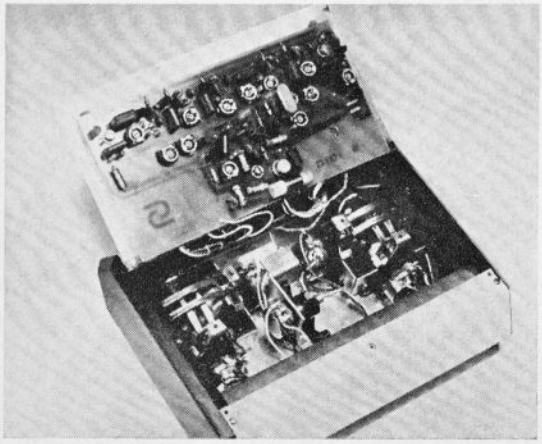
The transmitter appears quite unaltered at all (except for the nameplate). Shape, size and circuitry are unaltered from the Digi-5. Continuation of a good design for several years must make economical sense. Providing state-of-the-art developments do not make it obsolete, this can only help to reduce costs, a fact borne out by the lower price of the Alpha 5 than the original Alpha 2007 from which we assume is was developed.

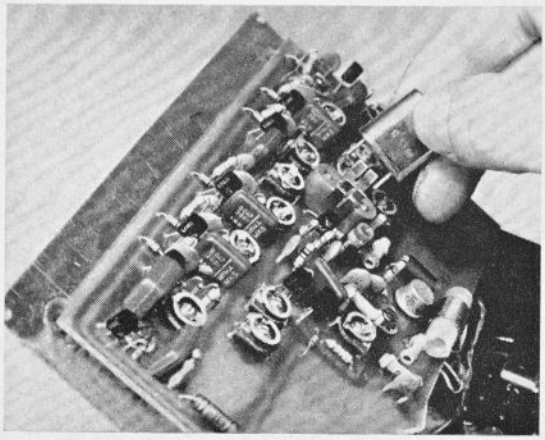
Technical Description

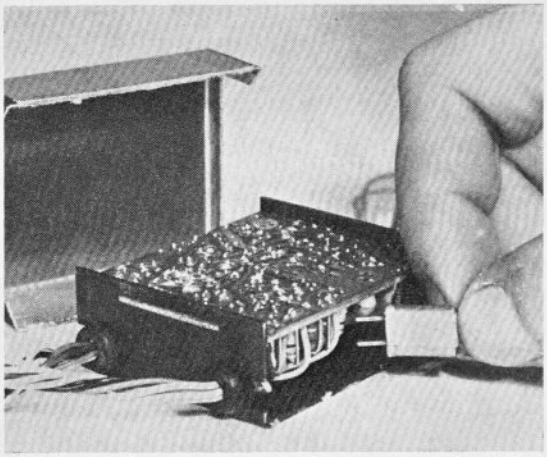
As stated previously there appears to be no significant change in the Tx. circuitry or layout compared to the previous Simprop system but a brief recap will not be amiss.

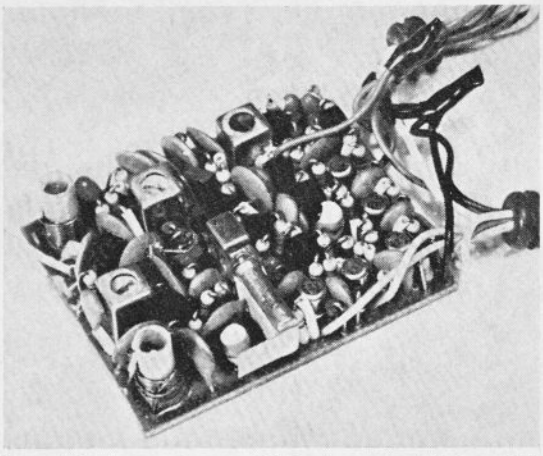
Nothing very unusual is evident in the encoder. The clock generator is a fairly simple multi-

Below left: the internal layout of the Simprop Alpha 5 transmitter showing the p.c. component board on the hinged rear cover. Below: removeable crystal plugs into socket as shown and is retained by a clip.









Above left: the receiver crystal is also removable for quick change of operating frequency. Small receiver crystal unit is easily handled, thanks to plastic tag. Note how p.c. board is retained in case by lips which slot into case ends. Above, receiver component layout. Note position of crystal in socket.

vibrator with a preset potentiometer in each of the timing circuits. In fact, we still have a total of 13 preset pots in the Tx. as before, very good for quick setting up but perhaps not very 'finger-proof'.

The back of the case again is hinged with the p.c. board attached copper side to the case, revealing the components. All wires are neatly loomed. The stick units are easily accessible for setting up and it is but a few seconds' job to change the mode of operation of the sticks.

Frequency changing is also simplicity itself with the large type crystal prominent near the centre of the p.c. board. No chance of a mishap between the Rx. and Tx. Crystal here due to the tremendous difference in physical size.

Silec plastic transistors are used throughout the Tx. except in the R.F. P.A. stage where a TO 5 metal can 2N2218 is used.

The R.F. circuitry is the 'different' part of an otherwise very conventional system. The modulation is applied to the crystal oscillator and to prevent excessive frequency modulation when the oscillator is switched, quite complex circuitry is employed.

The R.F. P.A. stage is of the new common π network with the capacitive components fixed and the coil tuned with a slug. Again departing from common correct practice, the Alpha 5 continues to employ a centre-loaded aerial.

Power supply for the Tx. is from a 12v. (nominal) Ni-Cad battery situated in a tube at the bottom of the case.

The Rx. circuitry is fairly conventional, utilising a double turned front end and all-silicon transistor line-up. The vast majority of the 11 transistors used are of the plastic silec type but two Ferranti E Line types were apparent.

As in the Tx., the receiver crystal was of the plug-in type, easily extracted from its holder, thanks to the plastic tag on the crystal case.

We were a bit surprised to find S.C.Ss in the decoder (Mullard BRY 39s) when dual transistors are now all the vogue.

Our only real criticism of the system comes in the Rx. and this is the large 4-way Servo socket. It's a quarter the size of the Rx., we can't help feeling that a smaller version of this socket would be an improvement.

Servos.

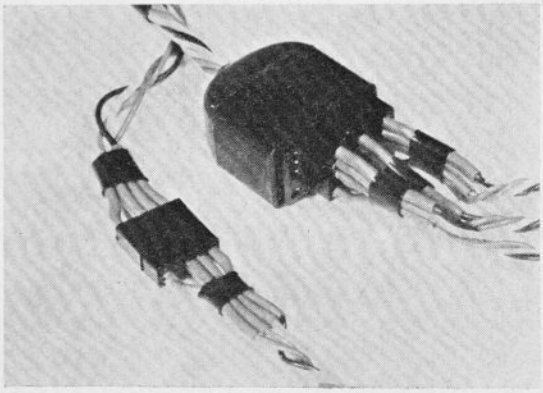
Once again we find the fine Simprop mechanics with the small motor but by far the biggest innovation is the use of the Simprop/Ferranti I.C. servo amplifier. As mentioned previously, it does indicate an advance in thinking when a R/C manufacturer can go out and have a custom-built I.C. specially made for R/C work.

What goes on inside the chip is very similar to the working of a conventional discreet compact amplifier. It does not, however, suffer from the assembly and compact packing problems of a discreet built unit and reliability should therefore be superior.

Performance of the system.

As in all previous test reports, the system was mounted on the servo tester to check the performance, details are evident in the following tables. One thing which did come to light was the very linear speed/load characteristics of the servos, right up to the stalled condition. Servo transit times increase with load, as is to be expected but in most cases, transit times tend to increase disproportionately to load, usually due to tooth indentation of the plastic gears.

Below: receiver socket for servo connections and power (aileron function served by separate connector in foreground). Size of multi-way connector is a bit large but IT IS POSITIVE and there is no better recommendation for any connector.



In the case of the Simprop servos tested, this fall-off in efficiency was nowhere near so evident, the load/speed graph being much nearer to a straight line than is usual.

We were very impressed by the servo performance as an overall system. How much of this is due to the I.C. and how much to the excellent mechanics is not easy to ascertain.

From the second of the following tables, it is possible to see that tight linkages produce high standing currents, so if you want long battery life between charging, make sure your controls are free.

Test Figures

Tx. timings (left-hand throttle)

	Channel No.	Min.	Neutral	Max.
Rudder	1	1.2	1.7	2.02
Throttle	2	1.2	–	2.00
Elevator	3	0.9	1.25	1.55
Ailerons	4	1.12	1.6	2.00
	Aux.	1.18	–	2.1

All timings in milliseconds
Frame rate 20 m/s i.e. 50 fps. Positive going pulses.

Servo response

Load at ⅛in.	Against	With
0 oz.	.625 sec.	.625 sec.
5.5 oz.	.68 sec.	.6 sec.
10.5 oz.	.75 sec.	.58 sec.
21.5 oz.	.89 sec.	.53 sec.

Servo just stalled at 3.2 lb. at ⅜ in. radius.
Total servo movement 80 deg.

It was noted at all speeds and in both directions that there was 2-3 per cent overshoot.

Rx. standing current figures

Rx. with no servos	No signal	21 mA
Rx. with no servos	with Tx. ON	25 mA
Rx. with 1 servo	with Tx. ON	31 mA
Rx. with 2 servos	with Tx. ON	51 mA
Rx. with 3 servos	with Tx. ON	72 mA
Rx. with 4 servos	with Tx. ON	90 mA

Tx. current figures

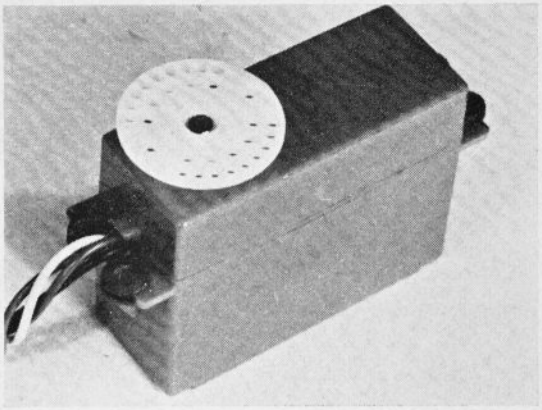
12 volts normal (12.4 measured).
Aerial retracted: 50 mA. Extended 55 mA.

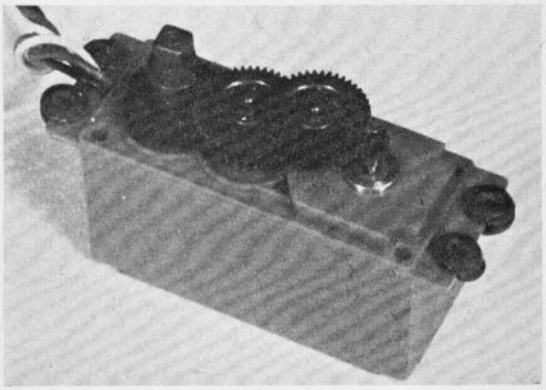
Manufacturer and distributor

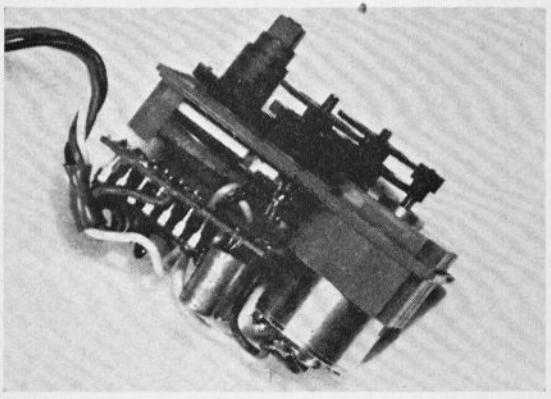
Mainstream Productions Ltd.,
Hallam Street,
Stockport SK2 600,
Cheshire.

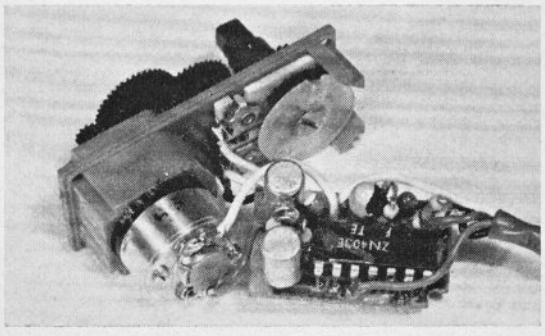
Prices

Receiver and transmitter:	£73.33
Servos (mini S500 I.C. type):	£15.40 each
Power pack (receiver):	£4.00 (500 mAH)
Neck strap:	£1.52









THE SERVO. Top right: general layout. Multiplicity of holes on output disc allow possibility of differential throw. Second right: the servo gear train which earns high praise from our columnist. Third right: general internal layout showing gear train, motor, amplifiers, etc. on internal assembly carrier moulding. Bottom right: close-up showing the servo pot and amplifier with I.C. unit.