TEST REPORT

O.S. COUGAR

SINCE the introduction of the Mk.I Cougar system, which was a natural progression from the original OS Minitron digital R/C system (see RCM&E June 1970 – DP4 and May 1972 – Cougar DP4) this system has undergone a steady development programme. With the ever increasing availability of suitable low cost ICs, and higher performance discrete components it appears that OS have decided that the earlier system has reached the limit of economic development.

The Mk.II system whilst retaining quite a few features from the Mk.I system has undergone quite major surgery.

Apart from technical and circuit changes the system has also been given a face lift. The transmitter now sports a modern style, wrap-round case, with moulded plastic end cheeks. The main colour remains the same – a light beige. Detail development work on the control sticks has reduced the number of metal stampings which are replaced with moulded plastic components. The sturdy metal main frame and scissor assembly is retained, the detail modifications in no way detracting from the well known positive feel of the OS stick assemblies. Another worthwhile modification is the inclusion of adjustable control stick length facility. By loosening a screw in the end of the stick the knob can be positioned as required. New design plastic bezel surrounds certainly enhance the smart appearance of the stick assemblies.

We were very pleased to see that at last OS have changed to a slide switch on the TX. The toggle switch as fitted to the Mk.I was too easy to inadvertently knock into the 'on' position. Refinements include a fully retractable aerial, a collapsible rear stand and a small hatch through which the plug-in type crystal is accessible. Care must be exercised when changing crystals as it is very easy with cold fingers to drop the crystal into the innards of tthe TX which then usually necessitates the removal of the rear cover for retrieval.

At first glance it is not immediately apparent which screws have to be removed to gain access to the inside (not a bad thing either! Ed.), the two small screws on the lower rear edge of the case proved to be the necessary ones.

It was reassuring to find that the meter on the front of the case reads RF output and not, as so many contemporary systems show, battery voltage.

Charging of the TX is accomplished via a socket in the bottom of the case (which incidentally then makes it impossible to simultaneously use the stand on the back of the case). Japanese logic perhaps?

A cursory examination of the RX revealed no change from the Mk.I excepting that the aerial exits from the other end of the case. Detailed scrutiny, however, reveals no similarity with the Mk.I RX to the extent that whilst the Mk.I featured -ve pulse outputs the Mk.II has +ve pulse outputs.

OS's continued use of a metal RX case is surprising in this day and age, as it is felt that a high-impact type of plastic case is not only lighter but offers better crash protection. No doubt the mechanical engineering background of the company has some influence on the choice of materials.

Turning to the servos offered we find that there are now two types available with optional left or right hand rotation. Normal complement supplied is 3 left hand rotation and 1 right hand, in a four channel system. Also available are high powered retract servos based on the 'Diamond' series for the switched 5th channel on the review set.

Standard series supplied are the CS 201, a derivative of the Mk.I SP 260 servo now of course modified to +ve pulse and some 1/16 in. deeper to house a new type of feedback pot. We noticed that strengthening webs have been added to the servo mounting lugs in the CS 201 servo as the SP 260 type were of a very frail nature. Also incorporated are mechanical limit stops necessitated primarily by the fitting of the new feedback pot. These stops do, of course, eliminate the possibility of the push rods being wound round and round should any malfunction occur. It was interesting to note that the output gear is in the form of a quadrant with only sufficient teeth to give approximately $\pm 50°$ of travel. A plastic spring remeshes the gear to allow travel back in the reverse direction – quite a clever feature.

The alternative more expensive servo (and we feel justifiably so) is the CS 400 series. Slightly bigger in size than its CS 200 counterpart, it features one of the best plastic gear boxes we have yet seen. Reliance is not placed on the servo body as such to fix the gear centres, but on two metal plates which give the whole assembly rigidity and precision centres. Again travel limit stops are fitted.

Accessories supplied as standard are; one all moulded charger with a single or dual output; servo mounting trays and frequency pennant, plus a spare set of output discs.

Technical description transmitter

No radical departures from normal practice are apparent in this area apart from the introduction of a 9.6V supply made up from two Rx battery packs in series, a logical progression from the Mk.I, 12V supply.

The logic part of the circuit, or encoder if you prefer, is the usual multivibrator followed by a string of half slots to produce the individual pulses. Control pots are in the collector circuit of the half shots as is now the vogue and a nice touch is the continued use of high quality moulded carbon pots on the stick assemblies when most contemporary systems have changed to the lower cost composite or paper types.

Outputs from the individual pulses are fed via diodes to a common output rail and thence to the modulating transistor.

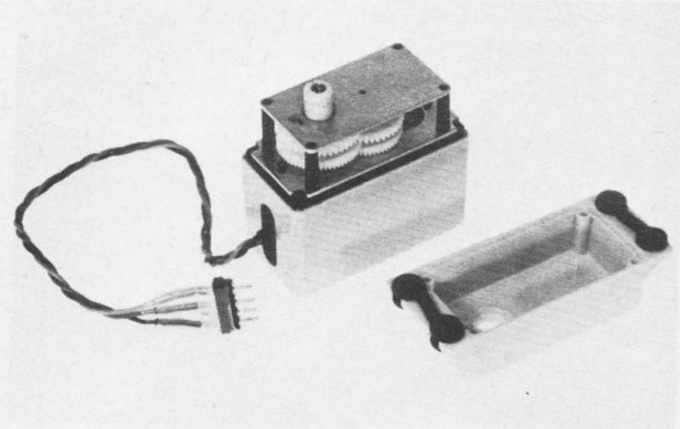
Individual pots are fitted in all the timing circuits of the half shots for setting up and also in one side of the multivibrator to enable adjustment of the frame rate.

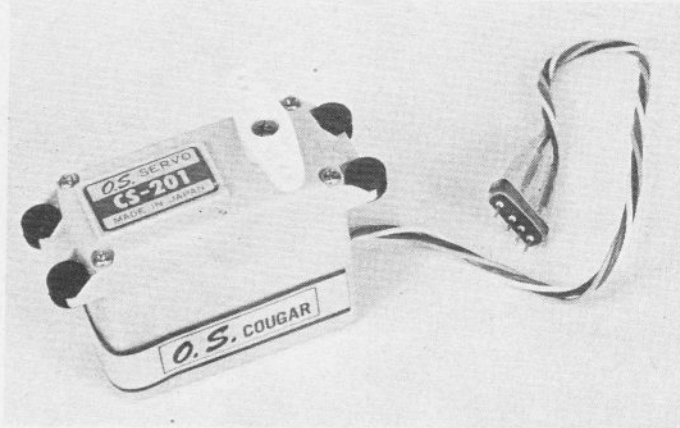
An unusual feature is the use of a further pot to set the modulation level which in effect alters the 'off' times of the carrier between pulses.

The modulation is applied to the oscillator transistor which works as usual on the 3rd overtone. RF output is via a single choke driven PA stage into a single π output filter and a loading coil to the aerial. All coils are slug tuned and would appear to be not very critical.

RF output indication is connected to the output circuit via a few 'puffs' and is adjustable for level via a pre-set pot.

RF and IF circuitry is similar to the Mk.I system with a separate oscillator feeding the emitter of the mixer stage. Aerial circuitry consists of a double tuned front end into the mixer transistor. Output of the mixer stage is fed to the inevitable 2 stages of IF amplification with AGC being applied to both stages. Once rectified, the now AF signal is fed via a RC and diode filter not much removed from the Mk.I circuit to a further 5 transistors for shaping and regeneration into the necessary pulses to drive the IC decoder chip, this being a low power TTL SNL 164 shift register and additional device which turned out to be an SCR and not a transistor is connected to the AGC line. This from observation and tests resets the output of the shift register decoder should the input signal level





Above: CS 400 Servo showing metal gear frame referred to in text. Above right CS 201 discrete component amplifier servo.

fall to an unusable level. It would appear the idea is to stop unwanted pulses from getting to the wrong channels.

The RX is wired for 4 wire operation but of course will operate the 3 wire servos.

Servos

CS 201. This is a derivative of the SP 260 −ve pulse servo. It incorporates a discrete component amplifier with Silicon output transistors. Motor is a 3 ohm 16mm (one would guess Mitsumi) unit. The feedback pot is now a made up unit and not as in the SP 260 a CTC type. 8 transistors are used in the circuit and standard size resistors are now employed instead of the sub-miniature ones used in the SP 260.

Plug sockets are of the standard OS 4 pin type with silver plated pins. We noted the lead terminations to the plugs are now much more steadily supported in clear double shrunk fit sleeving.

CS 400. This is a new servo from OS and features one of the best plastic gear boxes we have seen. The gears, which are supported on metal spindles by metal side plates, are robust and graduated in thickness as appropriate to the load on them.

The feedback pot is a ceramic based unit with what would appear to be a moulded carbon track. The wiper assembly features a carbon contact and all wiping surfaces are finished to a high degree.

Most significant feature of the servo is an (as until now) unheard of IC servo amplifier made by the XR company of Japan, who are world famous in the electronic industry for their precision digital timer ICs and complex logic chips. We do not know if the chip is custom made for OS (as this is a speciality of XR's), or is generally available. The motor is an 8 ohm unit, again it would appear of Mitsumi origin. The output arm is splined to the output gear as distinct from the normal square drive and the centre position is adjustable via a screwdriver slot in the centre of the output gear.

Performance tests

From the TX test figures it can be seen that some effort has been made to set up each channel for accurate timing. 'Standard' servo timings are used but in this case the timings are −1 −2 milliseconds inclusive of trim.

TX Pulse timings

	Channel	Min	Centre	Max	With Trim
Throttle	1	1.19	—	1.93	1.08-2.03
Rudder	2	1.19	1.56	1.90	1.05-1.99
Elevator	3	1.18	1.57	1.99	1.06-2.09
Aileron	4	1.19	1.57	1.96	1.09-2.05
Aux	—	1.16	—	1.91	—

Frame time 17.54 m/s   Rate. 57 Hz approx

The servos were put onto our standard test rig and loads applied as per results. The servo was timed from MIN to MAX and MAX to MIN with a starting point between. So as to be able to compare servo transit times with other test reports, all times are corrected to ±35° of rotation. Actual rotational figures are quoted. It should be noted that the linearity of the servos was good for both types. A fixed 1-1.5-2 m/s input was used for these tests. Rotational accuracy for a given input pulse was far above average.

It was nice to compare a now comparatively old discrete amplifier against all the recent IC amplifiers. As expected, it gave real linear response with power all the way to the desired position. We were more than pleased with the results of the IC 400 servo as this gave the nearest performance we have seen so far to a discrete amplifier. Usually the IC amplifiers give excellent performance except when they are under load and within 10 per cent of the desired position, then they start to fall out of a linear response. However the new XR chip certainly appears to overcome this as yet inherent IC problem.

Test results

Load at 0.5 in. Rad.	Load In 02. in.	Against Load* CS200	Against Load* IC400	With Load* CS200	With Load* IC400
0	0	.39	.28	.37	.26
2	1	.41	.3	.35	.25
4	2	.43	.31	.33	.25
8	4	.45	.33	.33	.23
16	8	.55	.43	.33	.22
24	12	.825	.54	.32	.22
32	16	1.02	.95	.29	.21

*All this in secs corrected for ±35° of rotation.

Just stalled load

CS 200 19 oz/in. (38 oz at 0.5 in. RAD)
IC 400 20 oz/in. (40 oz at 0.5 in. RAD)

Actual rotation measured

	1ms	1.5ms	2.0ms
CS 200	−44°	0°	+41°
IC 400	−54°	0°	+51°

At no time did either servo exhibit jerky movement or non linear movement.

The CS 200 servos gave approximately 2° overshoot when travelling with the load even at zero load condition.

Conclusions

The OS 5 channel or 4 channel Mk.II Cougar system is a logical step forward from the Mk.I. The new IC 400 servo is, we feel, an extremely good unit, the modification to the CS 200 series servo has made this unit much more acceptable. We would like to see a three wire version of the CS 200 using the new XR chip. We feel the plugs and sockets would be improved if they were gold plated.

Below left; Cougar Rx-servos connected with polarised plugs on fly-leads. Below: the complete Cougar package.