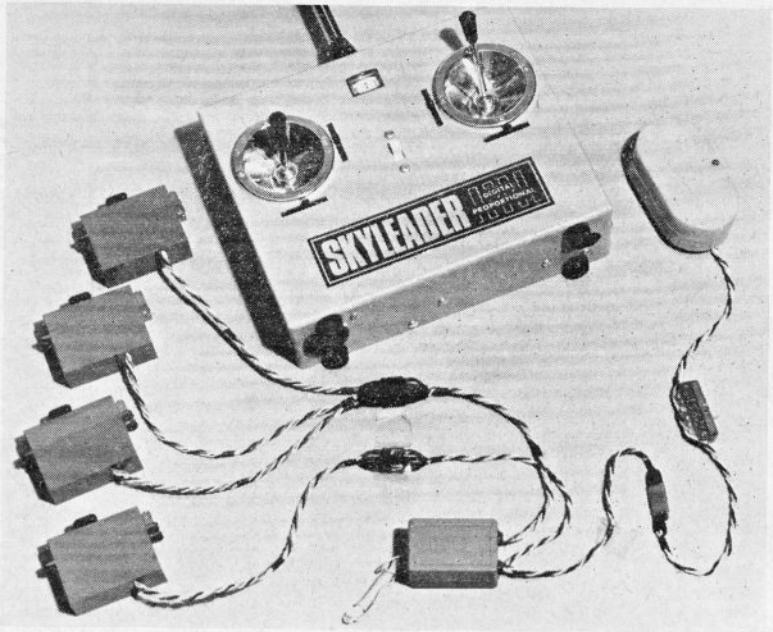


R.C.M.&E. TEST REPORT

SKYLEADER SL 4

MODELLERS for whom contest success is a criterion of equipment performance can hardly fail to be impressed by the recorder of Skyleader Radio Control's latest SL series systems during the 1969 contest season, put to good effect in the hands of competition fliers like Mike Birch, Dennis Hammant and Mick Charles.

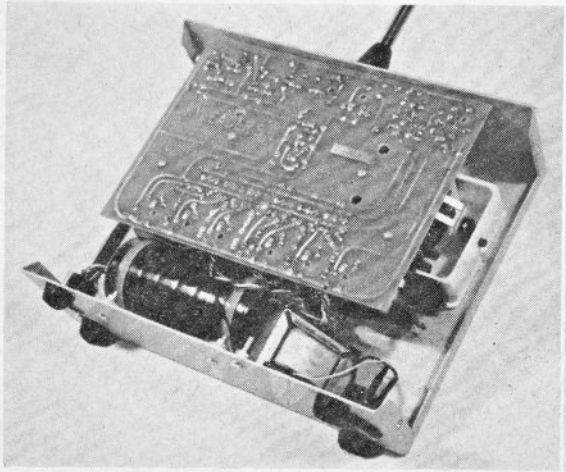
If it is 'packaging' that impresses you, the physical appearance of the system that is, then the Skyleader SL certainly scores again with its handsome yellow vinyl clad transmitter case, chrome deposited stick assembly surrounds and tiny receiver.

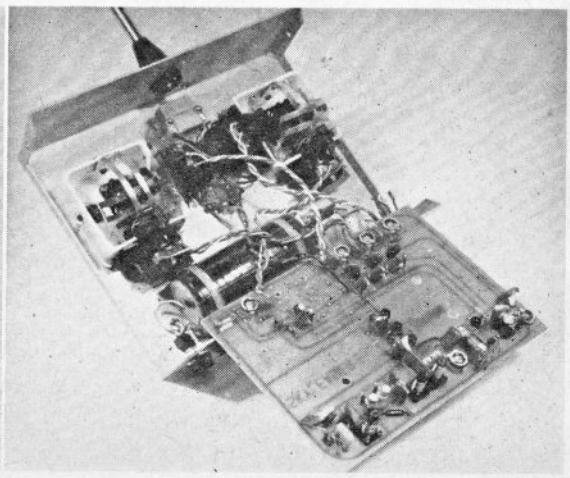
As usual, we'll take the transmitter first in our general description of the system, the unit supplied being a Skyleader SL 4. The SL 6 six function system is physically similar.

Vinyl clad in yellow, the transmitter case measures 7 x $5\frac{3}{4}$ x 2 in. The case is very shallow, which explains the 'SL' part of the title – Slim Line. This slimness makes the transmitter very pleasant to handle and, with the aerial fully extended, is perfectly balanced. Stick assemblies, which are Skyleader's own, have a soft spring action, and stick modes are quickly interchangeable. Trim levers have electro mechanical action, are smooth with just enough friction to hold trim positions positively. Stick assemblies do, incidently, have adjustable lengths to suit the individual's grip.

The aerial is 11 ins. long retracted and extends in five sections to 48 ins. This is a good strong aerial and has a good sturdy socket. The Tx case bottom sports four rubber 'bog stops', and sockets for mains input to the integral charging unit and an output socket for charging the airborne power pack. Finally, absence of any but two PK screws in the transmitter front face make for a very pleasant, uncluttered appearance.

Removal of the case rear cover reveals the usual





Pilot's Impression

by Mike Birch

In fairness to anyone who may read this little discourse, I must open by confessing that my knowledge of *radio* may be summed up by the following.

On one occasion I was faced with the too familiar problem of a servo driving in the opposite direction to that desired for a given command. My patience was far shorter than the journey from Feltham to Croydon so I did, with a hot soldering iron in one hand, a small pair of pliers in the other, a wiring diagram and after about five 'phone calls' actually change the direction of this poor wretched servo. Then, after checking that all joints were sound, no-one, repeat no-one, was more surprised than I when it actually worked!

Installing radio into the model is yet one more subject that I know very little about. My installation was once the subject by an eminent technician in this field of a lecture on how not to do it.

I understand from this eminent technician that when my installation was described to the auspicious gathering, the entire company were seen to fall about the floor in gusts of raucous laughter.

With a lack of knowledge of radio and installation like mine, it would at first appear to be in the very least foolhardy to fly model aircraft under these conditions. Fortunately, this country now produces some of the finest radio equipment in the world. Comparative tests with the best that America and other countries have to offer have proved this. For competitive flying, indeed any sort of aircraft, boats or cars, equipment must possess certain basic qualities, good range and interference rejection, accurate servos and good life between charges.

I have yet to fly my Skyleader out of range in any direction and as for the interference rejection, I can only say that this equipment is the most solid I have flown. My set has the small Orbit PS-3 servos because I liked the rotary output, but upon installation it was found that the backlash in the racks was so insignificant that I now use these for all the major controls, and after 300 flights in two models I can find no appreciable wear or slackness in them.

I frequently fly two or three sessions of practice on only one charge, representing about 12 to 16 flights. Another bonus is the size of the receiver which seems to get lost in the smallest of corners inside the fuselage. It sometimes seems harder to lose the connecting block than the receiver! The plastic covered battery pack sits remarkably free from the egress of oil and is small enough to slip neatly under the fuel tank. A season of competitive flying with Skyleader SL series radio has instilled in me a feeling of confidence and I have the highest regard for this equipment. In my view the SL series system ranks with the best and represents some of the finest value today.

mechanical arrangement, with the P.C. board in the top part of the case attached to the stick assemblies. The dual charger, which permits simultaneous charging of Tx and airborne power packs or individual charge of either, sits in the bottom of the case alongside the Tx power pack which is held in place by neat nylon straps.

The power pack is an interesting point, for this 9.6v. pack is made up of Ever Ready sintered plate cells of 550 mAH capacity, and the Skyleader SL is the first system we have discovered using these cells which allow a very high discharge rate.

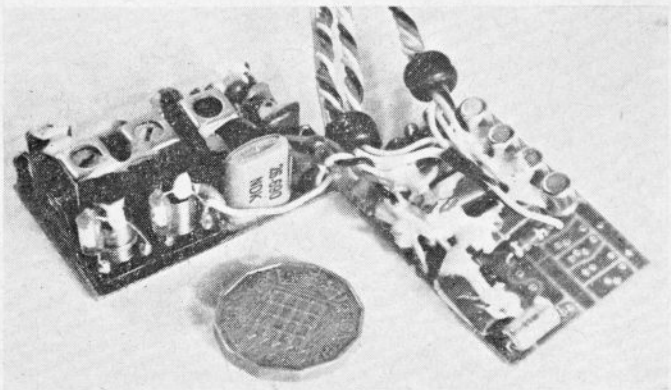
Soldering work on the glass epoxy p.c. board is a real pleasure to behold – a series of bright, beautifully uniform solder blobs with spaces left for the fifth and sixth function circuitry if and when required. The P.C. board removes to reveal neatly braided fly leads, and the usual low component count of digital proportional transmitters.

Receiver

What receiver? Oh yes, there it is, that tiny red nylon box lurking among the servos! The SL receiver is the smallest 4/6 function propo type we have yet come across in our current test series, measuring an almost beefstock cube sized $1\frac{3}{4}$ x $1\frac{1}{8}$ x $1\frac{1}{8}$ ins. Gad, what would Katie say! The SL receiver is a fully sealed unit – you can't get at the innards without butchering the case and even if you did, you'd then be faced with a little dollop of silicon rubber because the receiver is completely potted in this compound for added protection.

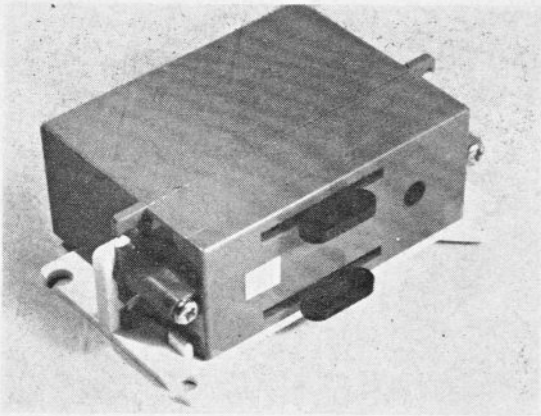
This silicon rubber is, incidently, the most ideal form of potting compound for R/C purposes, supporting the individual electronic components, yet easily, cleanly removes to allow servicing work if required. Inside the case, electronic components for the R.F. and decoder circuits are accommodated on two separate 1 mm. glass epoxy p.c. boards. Soldering work on these two boards is again first class.

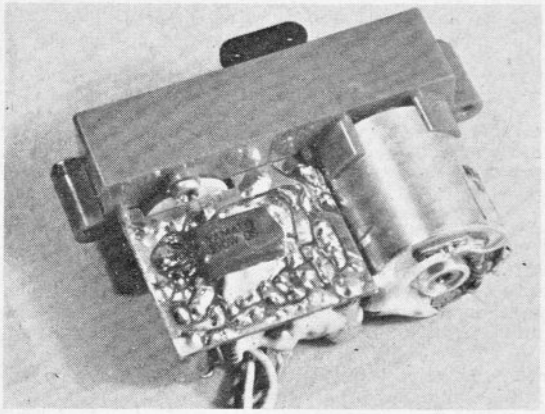
The receiver works off 4.8v 55 mAH power pack, like the transmitter using *Ever Ready* nickel cadmium cells

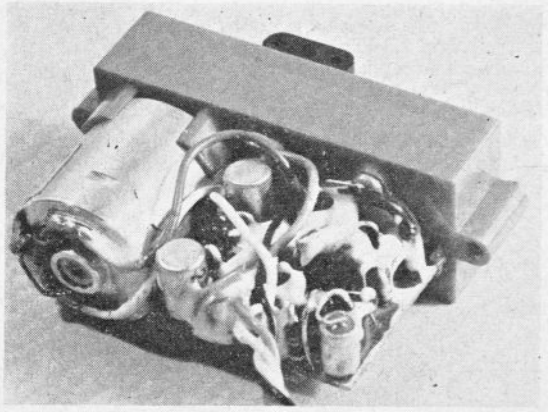


Far left: transmitter rear cover removed to reveal typical internal layout. Note transformer charger in bottom of case.
Near left: p.c. board removed from mounting to reveal mechanical layout internally and component placings on p.c. board.

Right: the receiver R.F. and decoder boards prior to sealing in receiver case. Note space on decoder board for fifth and sixth function circuitry and size comparison with threepenny bit. Picture here depicts receiver boards not much less than full size.







Top: EK servo in aileron installation tray, which is supplied with the set.

Second down: servo bottom cover removed to reveal the usual five ohm Japanese motor, and p.c. circuit board neatly mounted in vertical position.

Above: another view of the servo internals showing p.c. board from the component side. Note liberal application of silicon rubber for component support.

Skyleader was the subject of the first test analysis in our present series, a report on the Skyleader 3+1 appearing in our December 1966 edition. S.R.C. have considerably increased their range of digital proportional R/C sytems, so an analysis of a current Skyleader offering is timely.

Theoretical circuits, helpfully supplied by the manufacturer, have saved us considerable time and effort in producing an accurate technical description of this system, so we will start with a general technical description of the circuit and its operation.

Transmitter

Two points immediately became apparent on examination of the Tx, as being different from present day trends and we will look at both these during the description of the circuit.

The encoder (or logic) consists of a conventional multivibrator clock with diode protection, coupled to the conventional string of half shots. All transistors are NPN silicon ME 4103 and the clock is adjusted for frame rate with a 50K preset in one half of the multivibrator.

The first of the 'unusual' features appears in the encoder in that when the last half shot has fired, it resets the clock generator. The nett result of this is that the sync. pause always remains constant regardless of stick positions while the frame rate varies with stick positions. Usually, digital TX encoders employ a fixed frame rate.

The output from the encoder is fed into a bistable circuit to give the 300 μ sec. gap between the pulses.

Signals from this bistable then operate the modulation switching transistor, which in turn controls the local oscillator via the emitter. Both the rise time and the fall time of the pulses are controlled with capacitor slugging and this feature is important if the bandwidth of the transmitter is to be kept at a tolerable level.

The second of the 'different' features of the Skyleader lies in the P.A. stages where two transistors are used in parallel. Small value emitter resistors are used in circuit with both transistors which are not decoupled. The tuned circuit follows the familiar Pi circuit and is fixed tuned. The aerial is bottom loaded and the loading coil is inductively tuned. The R.F. meter/indicator is connected via a small capacitor to the bottom of the aerial.

Power source for the Tx is 9·6v supplied by a Nickel Cadmium battery. Charging facilities are built into the Tx case. One useful feature worthy of note is variation of charging arrangements permitted. The Rx and Tx batteries can be charged simultaneously or the Rx battery can be charged separately merely by reversing the plug to the Rx battery on the Tx outlet socket. The meter indicates charge showing different levels for the differing charge modes.

Receiver

In the Rx, we find the now familiar double tuned R.F. circuit inductively coupled to the mixer stage. The local oscillator which runs at 455 Kc/s below the Tx is capacity coupled into the base circuit of the mixer stage. Two stages of I.F. amplification are employed, the output from this section feeding into an audio amplifier via a detector diode. The output of this A.F. amplifier is used for

arranged in 2+2 layout in a moulded flat shaped case. Output leads from the receiver to the rudder, elevator and throttle functions go to a Brunner connector block and thence to the servos. Personally we much prefer the connector block arrangement to others and it is gratifying to see a manufacturer sharing this preference. The aileron servo connects via an individual Brunner connector and the battery line carries ultra small S.L.M. connector and an on/off slide switch.

Servos

Skyleader SL servos on our test sample employ E.K. Logictrol servo mechanics though Orbit PS–3 servo mechanics are available as an alternative.

The bright red E.K. type servo has two linear output arms which drive in opposite directions. Each system is supplied with two servos each carrying a little blue identification patch. These two servos drive in the opposite direction for a given command to those without this identification. That is to say, if you installed one of the two servos without the ident. patch in your model, tagged it up to the servo and keyed left rudder, you'd

technically speaking . . .

A TECHNICAL ANALYSIS OF THE SKYLEADER SL4

By Rex Boyer

A.G.C. as well as feeding the signal to the decoder. A.G.C. is applied to both I.F. amplifiers.

Before feeding into the decoder, the signal is passed through a diode level detector to help obviate the passage of unwanted noise in the signal.

A two stage squaring amplifier follows with capacitive feedback to give a form of further noise rejection.

The decoder, which employs a fairly conventional sync. detector in the form of an R.C. network uses the Mullard BRY 39 SCS's for the actual decoding. Our test sample uses 4 SCS's only on a P.C. board drilled for up to 6 channels.

Servos

Turning now to the servos we find *EK logictrol* mechanics with a fairly conventional 9 transistor amplifier, the output transistors being of the Germanium, type. NKT 211A and NKT 781 respectively with the remainder silicon 2N4288 and 2N4286 Piher types.

Performance under test

Since the E.K. servos have push pull linear outputs, the loads quoted here are the dead weights, hung on the actual output arm.

Load	Time against Load	Time With Load
0	0·540 sec	0·540 sec
8 ozs	0·625 sec	0·560 sec
1 lb	0·685 sec	0·525 sec
1·5 lb	0·750 sec	0·5 sec
2 lb	0·815 sec	0·5 sec

Load to stall servo 3·35 lb.

Current and voltage figures

Voltage: 4·8 nominal – 5·05 actual.

With no load on any servo, the current consumption figures were as follows:

Rx only	*1 servo*	*2 servos*	*3 servos*	*4 servos*
9 mA	14 mA	20 mA	25 mA	28 mA

8 ozs. on one servo 75–100 mA (pulsing).

With all four servos moving, average current was 220 mA, and with 1 servo stalled, 675 mA.

Weight of all airborne equipment with 4 servos 14·8 ozs.

Tx.

Tx Power source: 9·6 nominal – 9·8 measured.

Current aerial retracted: 60 mA.

Current aerial extended: 80 mA.

Bare weight: 2 lb 5 oz.

Servo Performance

Interpolating the servo response curves we find a good linear response for 95 – 97 per cent of total servo travel, but a slight tail off as the position error approaches zero. This is more noticeable under the higher load condition.

However, the resolution of the system is good, the servos being extremely sensitive, such that tight linkages could lead to high servo standing currents.

It must be emphasised that this point is made not to degrade the performance of the system but as a warning against misuse through employment of tight linkages in a model. Tight linkages cause unnecessarily high current consumption and thus cost flying time!

Interference rejection

One would expect that with the attention given to interference rejection in the Skyleader circuits, there would be no problems in this sphere.

We did not expect any unwanted problems and the amount of interference necessary to upset the system was a little above average for a digital system. It was, of course, possible to break through as it always is with *any* gear.

Conclusion

In conclusion we would say the Skyleader is abreast of current technical know-how without employing any gimmick circuits and on the basis of technical performance and constructonal quality is a system to be recommended.

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get left rudder. But if you substituted one of the blue patched servos, connected it up to the rudder identically, plugged it into the same output line and keyed left rudder, right rudder movement would result. Get the idea?

Our personal experience has shown this seemingly small point to be of enormous *practical* value in installations and we would like to compliment Skyleader on the valuable little piece of attention to detail.

One further practical feature is the provision as part of the system, of a useful aileron servo installation bracket. This is an E.K. product, specifically designed for the E.K. servo unit.

Removal of the case bottom cover reveals the usual Japanese servo 5 Ω motor, and a neatly soldered P.C. board which sits vertically in the case. Components on the glass epoxy p.c. board, are as in the Rx. silicon rubber supported.

Conclusions

Overall impression of the Skyleader SL 4 is one of an excellent product, combining eye appeal with a genuinely high standard of mechanical construction. Set these points aside, and it is the technical performance which is the make or break of any system, and our technical analysis proves the SL to have a performance to equal its mechanical construction.

We were particularly impressed with the low, virtually non-existent mechanical backlash in the servos in their live state, and have only one detailed criticism, concerning the switch. Soldered joints to this are supported by contact cement which is perfectly adequate, though a nice switch cover would, as with the Guinea Pig's Tail, finish off a decent job.

Manufacturer and distributor

Skyleader Radio Control,
43 Brighton Road,
Croydon, Surrey.

Prices:

Skyleader SL4:	£155
Skyleader SL6:	£169.10.0
Power packs:	£10