

# R. C. M. E. Test Report WALTRON 4-5 SPORTSMAN

By Rex Boyer

**F**OR many, one might say most of today's R/C modellers setting out to buy a set of radio equipment, there are two very basic questions uppermost in their minds. How much is it? Does it work? Other considerations are secondary for the mass of sport R/C flyers for whom a matched pair of transistors are two that look alike.

And why not? After all, a set of R/C equipment is nothing more than a means to an end rather than an end in itself. To the great mass of modelling public then, an 'economy set', which does the job required for it with no frills attached, has real appeal and it is to this ever broadening end of the R/C equipment market that Waltron Electronics have always aimed, steered by Ron Donahue who has been in the R/C business long enough to get his knees more than brown!

The Waltron 4-5 Sportsman then, which is the subject of this analysis follows the general principle of simplicity and economy, totally conventional in layout, while still offering some useful 'features'. The set is supplied basically as a four function unit, while the P.C. boards of both transmitter and receiver carry the facility for modification to take a fifth function if and when required and the set is of course also available ready-made in five function form. On test we have the four function system complete with rechargeable DEAC power pack in the receiver, although the system is also available for transmitter dry battery operation at some saving in cost.

The transmitter uses the conventional two-piece folded metal case, clad in black vinyl. It is small, size  $6 \times 6 \frac{5}{16} \times 1 \frac{1}{4}$  in. comfortable to handle and, lacking a built-in charger, is quite light. The usual two dual axis sticks are employed, in this case A & M types with electro-mechanical trims, those on the test sample offering a nice action. An output meter is provided and the on/off switch moves left and right. A charging socket is built into the case bottom (charging lead provided) and rubber stops protect the bottom face.

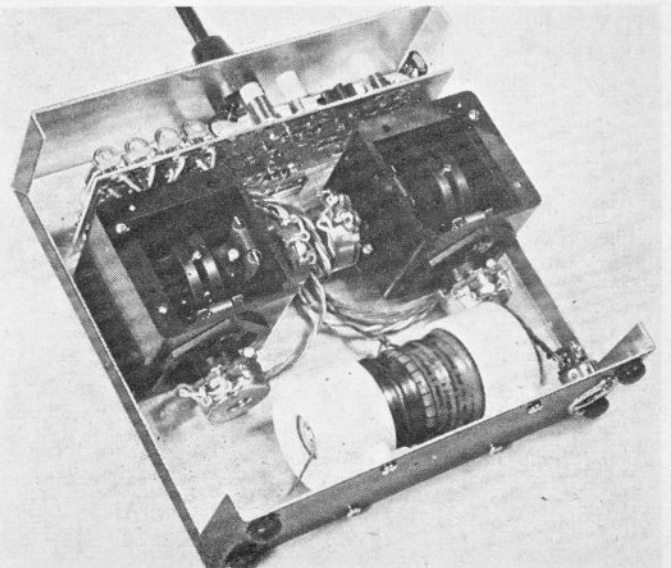
The case rear cover is retained by a combination of friction and locating dimples which key with holes in the front case side lugs. The rear cover thus quickly removes to reveal a relatively austere but nevertheless neat and tidy internal layout. The transmitter circuit board sits horizontally in the top of the case above the stick units, and a plug-in crystal is readily to hand at one end of the board. The P.C. is good quality glass epoxy and soldering is neat. Output meter and on/off switch are soldered into the P.C. board and the whole retained in the case by the two screws to the switch — an example of what Waltron call their 'fast production engineering system'. In the test set, a 9.6v DEAC power pack is retained in the bottom of the case by two SLM clamp fittings.

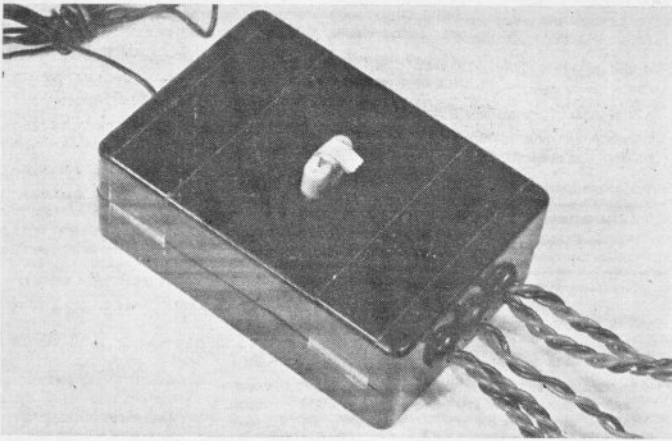
The 4-5 Sportsman receiver is a flat pack, single deck P.C. unit in a case size  $2 \frac{7}{8} \times 1 \frac{3}{4} \times 1 \frac{1}{8}$  in. The plug-in crystal sits smack in the middle and stands about  $\frac{1}{8}$  in. proud of the case, so it will require careful protection when installed in a model. Inside, the components are arranged in a relatively tight fit, and coated in polyurethane varnish for a measure of component support. Individual SLM line connectors to servos and power pack have soldered joints well supported with heat shrink tube which is a very tight fit over the solder tags and unlikely to shift. The receiver board, like the transmitter, also features a strong glass epoxy board.

Servos employ the now widely-used A & M mechanics with rotary outputs. This servo features sheering output arms and discs which shear under the strain of shock load, thus protecting the servo gear train. Two servos are arranged to operate in reverse rotation for a given input signal and are identified by colour stickers on the case tops. This is a valuable installation aid and one which, in our opinion, all radio gear should feature.

Power pack is the usual 500 mA, 4.8v unit, enclosed in a neat cuboid, moulded case size  $1 \frac{3}{4} \times 1 \frac{1}{2} \times 1 \frac{1}{2}$  in. Despite the 'economy' nature of the set, we noted attention to detail in the provision of a rear cover to the on/off switch.

Total airborne installation weight is  $12 \frac{1}{2}$  oz. — a good average





The Waltron 4-5 Sportsman receiver is a flat pack single deck type with the plug-in crystal protruding some 3/16 in from the case top. This will require careful installation protection. Components are a fairly tight fit on the P.C. board and are varnish coated for support.

figure for modern equipment. The set also offers a good average degree of compactness. Servo is fast without being ultra speedy. Generally, we liked the set, which, judged by today's standards, seems good value for money. With transmitter arranged for dry battery operation, the Sportsman 4 function is available with two servos for £75.45, rising to £98.01 with the full servo complement. With all rechargeable packs which are really to be advised (after all there's no real sense in mixing the types of power supply with attendant worries of maintaining two different types of power supply), the two servo price is £83.29, rising to £105.85 with four servos.

The five function set, with four servos costs £6.91 extra. The Waltron 4-5 Sportsman comes devoid of charger, although charging leads are provided. A Waltron charger is available, however, price £5.46. This provides dual outputs for charging power pack separately or simultaneously. Light emitting diodes monitor each output.

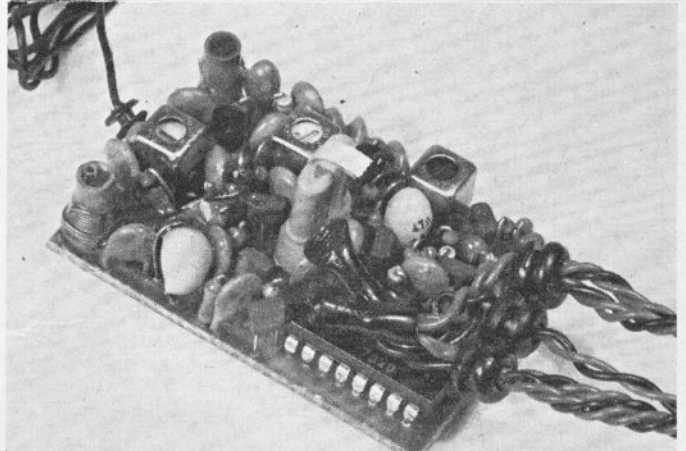
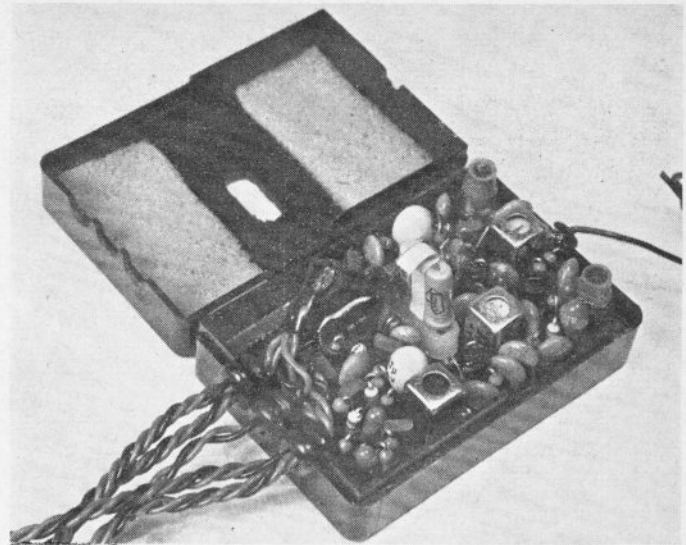
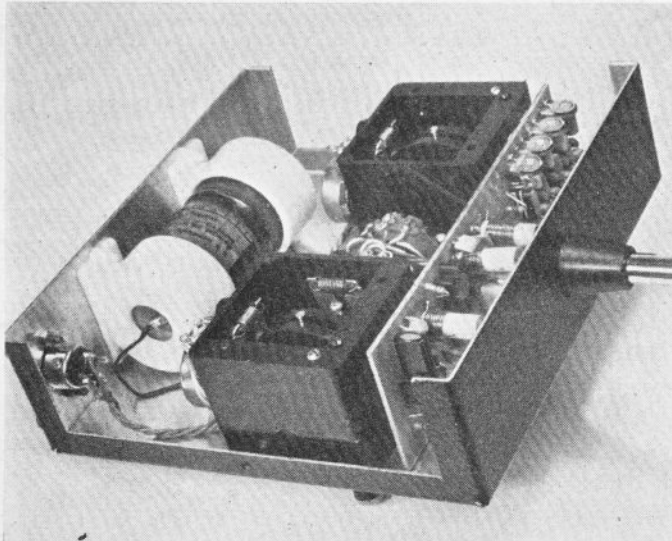
### Technical Analysis

#### Transmitter

The circuit follows very conventional circuitry in all its functions. The usual multivibrator clock generator is followed by a string of half shots, each half shot having individual skeleton pots for pulse range adjustment. We did notice particular attention had been paid to pulse shaping circuitry to reduce to a low level the amount of side band splatter produced by the transmitter. One feature which we found new to Waltron was the use of the now almost universally employed  $\pi$  (pi) output stage. In other Waltron products, the use of a parallel tuned R.F. output stage is still current.

The circuit also employs a base loaded aerial. We noted a great deal of thought has gone into the production engineering of the Tx with final cost in mind. For example the P.C. board is one of the smallest 4-5 function Tx boards we have seen yet it is not cramped, although no area of board is wasted. The board is also unusual in that it is fitted horizontally in at the top of the case.

Circuitry is arranged so that either 12 volts of dry batteries or 9.6 volts of nickel cadmium can be used. The latter obviously cost



more being factory fitted. Either arrangement has the charger socket fitted because this doubles as the buddy box facility outlet socket.

The case is of the conventional double U construction with dimples in the sides of the rear cover to locate it, in place of the more familiar self-tap screw arrangement.

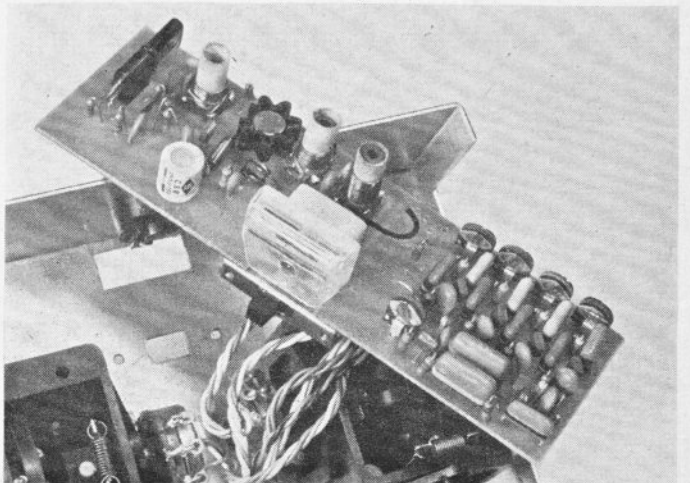
An R.F. output meter is provided below which is situated the on/off switch, which horizontally. There is no legend on the switch to indicate its position - a point we feel should be remedied.

The aerial is detachable and screws into a plastic cone in the top of the Tx case.

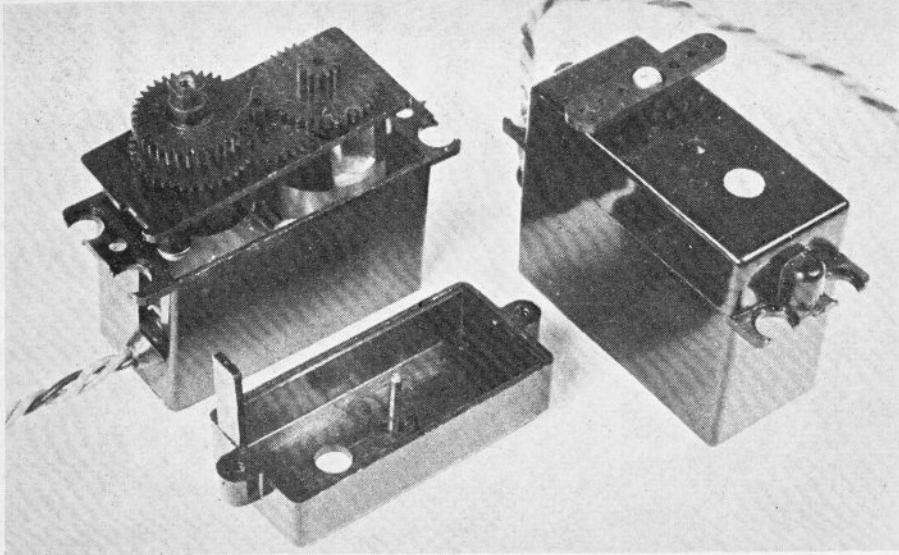
#### Receiver

The circuitry of the Receiver follows well established practice having a double tuned front end, followed by a mixer stage. A

Four views of the Waltron 4-5 transmitter, showing general external and internal layout. The P.C. board is quite small and fits into the case top retained by only two screws used to secure the on/off switch.







The Waltron 4-5 uses the now familiar A & M servo mechanics, together with Waltron 3 wire I.C. servo amplifier. Small disc marker on case top of complete servo (left) indicates reverse direction travel for a given signal input. Two of the four servos are supplied like this.

separate crystal oscillator is employed and is fed into the mixer stage. Two stages of I.F. amplification follow the A.F. or demodulated signal being conditioned by discreet components before interfacing with a low power T.T.L. I.C. decoder which in the test sample was a SN74L196 five-bit shift register in a 16 lead plastic pack. We noted that as with the Tx, circuiting, the majority of the transistors were Ferranti E. Line types, the notable exceptions being the RF/IF components which are Silec. At first sight, the p.c. board looks a little odd with the crystal socket smack in the middle of the board. Examination of the copper side of the p.c. board, however, shows that the layout is very symmetrical and even and it is a long time since we have seen hand soldering of such high quality.

The outputs of the receiver to the 3 wire servos are via S.L.M. type connectors of the latest type with a moulded end tag which allows the user to separate the plug/socket combination without pulling these apart by the wires - a very worthwhile addition.

### Servos

Servo mechanics are the now widely used A & M units moulded in black. The amplifier employs the World Engines I.C. in a To5 case with its familiar galaxy of tantalum capacitors occupying the majority of the p.c. board. The feedback pot is again the almost unusual cermet type used not as a potential divider but as a variable resistor. This mode of operation does sometimes lead to non-linearity in servo travel. However, we did not find this so in the Waltron system. One thing we did notice was that the servo travel was greater than most cermet systems being  $\pm 45^\circ$ .

One feature we noticed which did in our opinion degrade the quality of the system was the fact that the servo amplifier is wrapped up in red p.v.c. adhesive tape which is not very professional.

Possibly the most apparent feature of the World Engines servo I.C. is its low quiescent state circuit drain. We have in some systems recorded quiescent currents as low as 7-8 mA while the Waltron servos averaged 11 to 12mA. We would expect this amount of spread with I.C.s. Two of the four servos are arranged for reverse travel (identified with a green spot).

### Test Results

As we have come to expect with the vast majority of I.C. servo amplifiers the linearity of response deteriorates as load increases. The Waltron is no exception in that the servo achieves up to 95 per cent of the demanded travel in a linear time but then may take almost as long again to achieve the final few degrees. This condition occurs only at high servo loads but it does happen.

### Test figures

#### Transmitter timings

Channel function	short	centre	long	
1 aileron	.92	1.51	1.7	} left hand throttle
2 elevator	.95	1.37	1.75	
3 throttle	1.05	-	1.85	
4 rudder	.9	1.35	1.71	

Pulses + Ve going

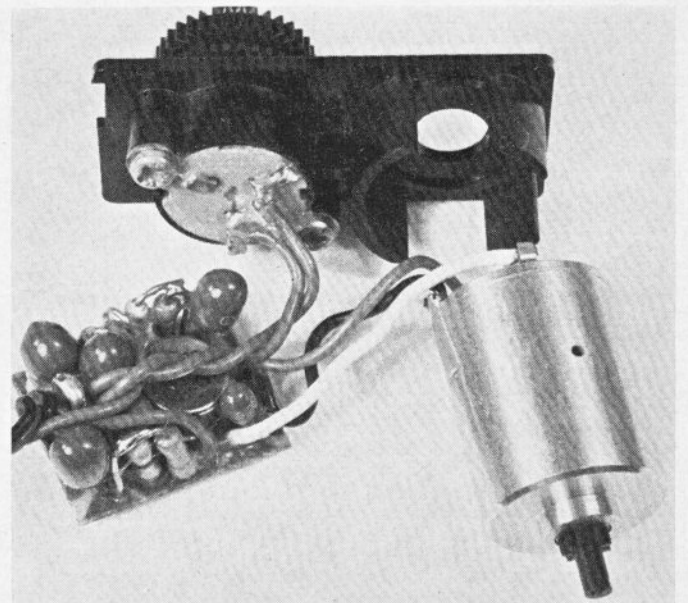
Frame rate 19.75 m/s

From the above figures it can be seen that interchangeability of servos with any hope to retaining the same centres is not possible.

#### Currents

Tx battery 9.6 volts normal 9.95 v measured (500 mA/H).

Tx current: 62 mA.



### Receiver Currents

Supply: 4.8 v Nicad 500 mA/H (5.1 volts measured).

Rx only 31.5 mA. Tx ON. No stick moment.

Rx plus 1 servo: 42 mA.

" " 2 servos: 53.5 mA.

" " 3 servos: 65 mA\*.

" " 4 servos: 77 mA\*.

Average running current: 200-250A.

\*Difficult to give exact figures due to slight servo buzz. It is worthwhile noting that the servos are set up with a very small dynamic dead band and careful attention to free control runs will pay off in terms of available flight time per charge.

### Servo response times

Servo travel  $\pm 45^\circ$ .

All servo travel times corrected for 70° total travel.

Loads are quoted in inch/oz. and the outer hole at 9/32 in. radius.

Load Against Load With Load

In outer hole	Inch/oz.	Against Load	With Load
No load	0	.51	.49
	7.1	.56	.49
	14.3	.62	.48
	21.4	.72	.47*
	35.5	.94	.45*

All times in seconds.

Just stalled load 13.5 in./oz. or 48.4 in. outer hole (3.02 lb.).

\*The time against load on these two results is for 95-97 per cent of demanded position: 100 per cent response is achieved 0.5 to 0.7 sec. later.

### Conclusion

From the results obtained we were a little disappointed in the setting up of the pulses especially as provision is for accurate setting. We must, however, compliment Waltron on a well turned out set of gear at what must be considered a very attractive price.