



REPORT

SPRENGBROOK SPORTSMAN 4-6

By Rex Boyer



THESE days, the radio control business is very competitive. Many manufacturers offer 'contest quality' or 'professional' systems, but it is the vast army of weekend sport fliers who offer the real market for the R/C manufacturer and who, with their two basic questions "does it work, and how much is it?", present the manufacturer with his greatest challenge.

Sprengbrook's Sportsman Series was introduced nearly a year ago to cater for the price-conscious mass market and represents a considerable variation from the Sprengbrook systems previously tested.

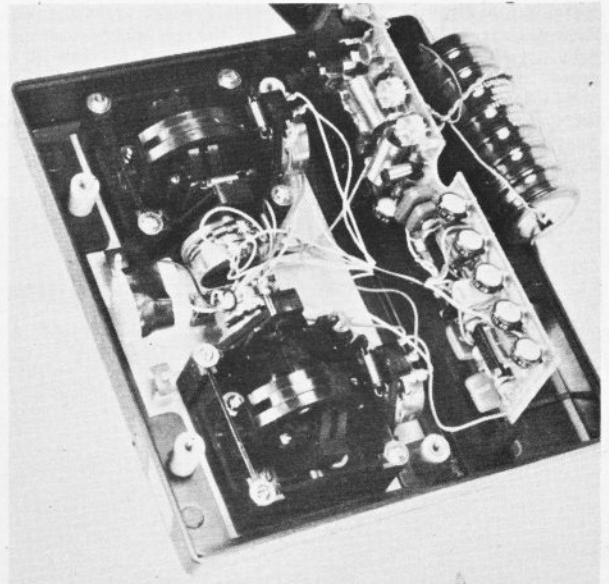
The Sportsman system offers the R/C modeller a particularly versatile and adaptable set of equipment. It is possible to start with a four function system with only two servos arranged for 'dry' battery operation using Mallory cells for £95. Servos may then be added as required, the four function system costing £139.86 including rechargeable power pack and charger. Furthermore, a four function system can be expanded to six full functions by the addition of a two function plug-in auxiliary module to the transmitter which requires no soldering and costs £5.80. Both four and six function systems are supplied with six function receivers, so no alteration whatsoever is required.

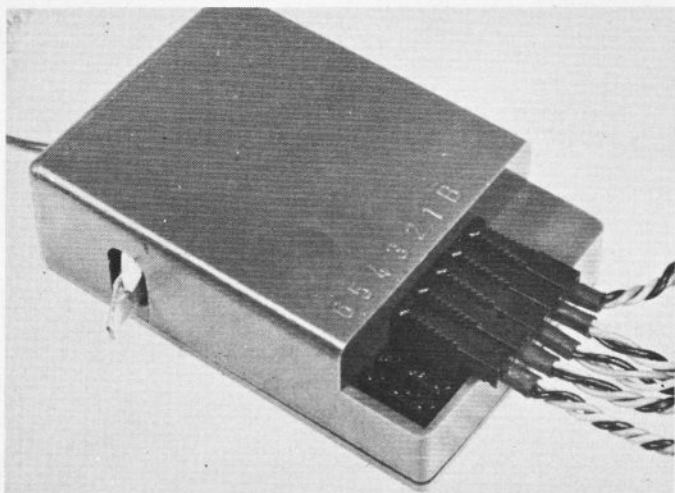
Such is the background of the Sportsman which offers the cost

conscious modeller the possibility of a relatively low cost introduction to R/C with the opportunity of long term economy in equipment cost.

The Sportsman transmitter is certainly the most striking component of the system, distinctively styled. The case is vacuum formed from tough, scratch resistant plastic material and has good eye appeal. The case is black, with a textured finish and features an orange inset panel on the front face which carries all controls, on/off switch and meter. The dual axis stick units are nice to handle with a little stronger centring springs than are usual. Positions on the on/off switch are clearly marked and the switch fascia incorporates a toggle for a neck strap. The aerial retracts almost completely into the case, leaving only a 1 in. stub protruding. The aerial is permanently installed and consequently, there's

The Sportsman Transmitter is very attractively shaped and is very light and comfortable to handle. Aerial tucks right away into the case, which is non-metal and would therefore not be quite so cold to the touch in "brass monkey" winter flying conditions. Internal layout below reveals p.c. board slotted into retainer rails.





no risk of committing that classic *faux pas* of the R/C hobby, namely leaving the aerial behind on a trip to the flying field!

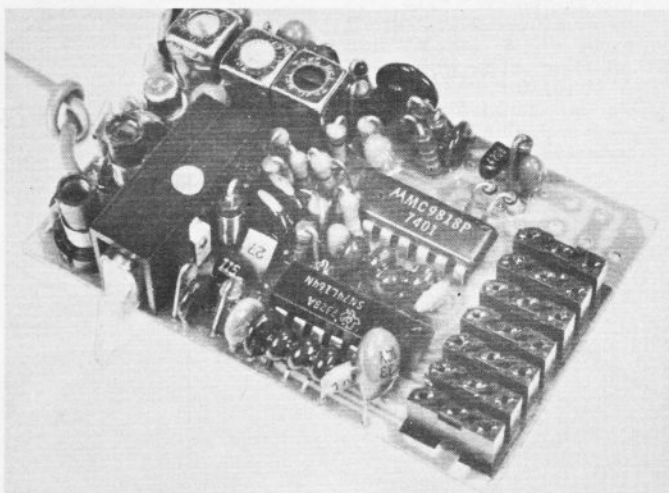
The Sportsman features plug-in crystals, in the transmitter accessible under a small and neat hatch in the rear cover. The case, size $7\frac{1}{2} \times 6\frac{1}{2} \times 2\frac{1}{2}$ in. overall, splits down the centreline and is held together by four quite large bolts – any one of them would hold down the largest of wings with safety! The rear half removes to reveal that the aerial is solidly attached to it and connected into circuit via a fly-lead and single pin tag connector on the p.c. board. The board itself, which is good quality glass epoxy, sits horizontally in the case, slotting into moulded rails. Below the p.c. board is a channel for the power pack which, in the case of the test sample is a 9.6v. DEAC secured only lightly in place by a strip of foam plastic. Though not so fitted to our sample, transmitters now feature snap-on connectors to the power pack to permit interchangeability with an eight cell Mallory 'dry' pack, which is the alternative power source. At first this might appear to be an unnecessary embellishment, but does permit interchangeability so that by carrying the interchangeable dry cell pack, the length of a flying session need not be limited to the charge of a DEAC pack.

The Sportsman receiver is a flat-pack single deck type enclosed in a moulded case size $2\frac{11}{16} \times 1\frac{13}{16} \times 1\frac{5}{16}$ in. overall. The unit features a connector block for the battery input and servo lines with each position identified, 'B' for the power pack and individual control functions numbered 1-6. The plug-in crystal is easily accessible through the side of the case. The grip tag is substantial and will not remove without the crystal on the end! In response to our direct criticism, Sprengbrock will in future colour code the transmitter and receiver crystals. Tx crystals will have an appropriate coloured band on the top of the crystal case and receiver crystals will each have a coloured dot. Wave soldering is applied to the glass epoxy p.c. board, although some hand soldering work is also evident.

Micro-Loc dual output linear action servos, similar to those previously tested with Sprengbrock systems, were supplied with the Sportsman. Though no record setters in terms of miniaturisation by current standards, the unit is compact and robust, the case measuring $2\frac{1}{16} \times 1\frac{5}{16} \times \frac{7}{8}$ in.

The Micro-Loc servo lacks conventional mounting lugs and relies instead on locators moulded into either case end which key into special metal mounting clips. The servo mechanism also lacks the usual screw arrangement to hold the case together, the top and bottom case pieces held together instead by moulded clips which friction fit over the mounting keys in the case ends.

Servo centring can be adjusted by turning a screw in the case top using a small screwdriver. Servo connector employed is very neat, a three pin type which completely encloses the soldered joints and supports the leads against fracture very well indeed.



We particularly liked the new lightweight 450 mA H rechargeable airborne power pack supplied. This is very compact, little more bulky in fact than a standard 225 mA H unit and measures $1\frac{1}{4} \times 1\frac{1}{8} \times 1\frac{1}{8}$ in. in its moulded case. Switch harness incorporates a good quality switch with moulded rear cover and front fascia – the 'on' position identified by a small pip on the fascia.

After complaining to the manufacturer about the charger originally supplied with the test sample which provided no visual indication of charge in progress, Sprengbrock have now gone over to a completely revised charger unit with light emitting diodes used as indicators to show that charging is taking place. The unit also charges a 2v. accumulator, a useful additional feature. (Good example here of a manufacturer prepared to listen to constructive criticism.)

Viewed as a whole, the Sportsman has good eye appeal. The transmitter is light, handles nicely with good control stick action and smooth trims, although the trim levers could stand just a little more proud off the case for ease of operation. Although setting no records for miniaturisation, the airborne complement is quite acceptably small and at $13\frac{1}{2}$ oz. with 450 mA H power pack is quite light.

Technical Analysis

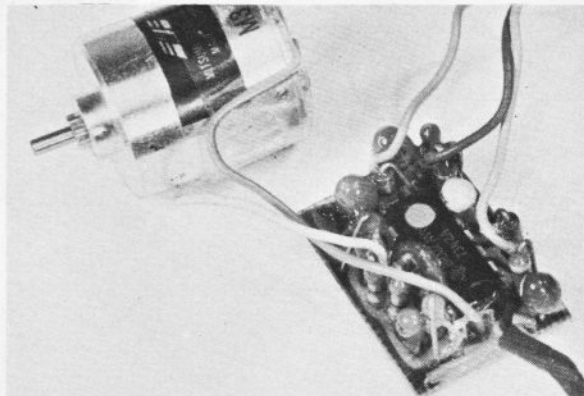
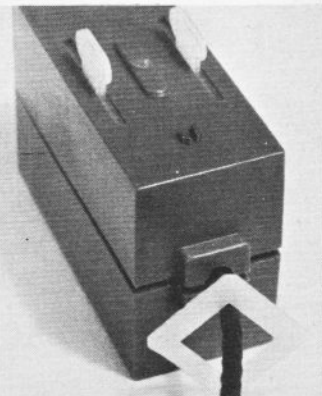
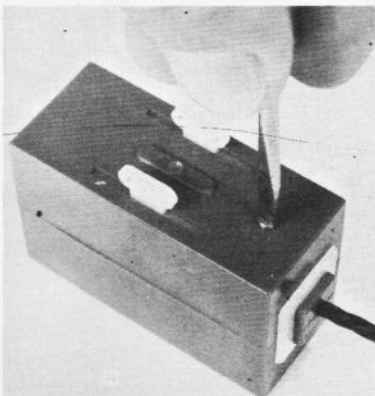
Transmitter

The basic circuitry of the Tx. remains virtually unchanged, following conventional logic encoding techniques of a multivibrator clock generator and a cascade arrangement of half shots. The main difference between the Sprengbrock Sportsman and contemporary systems is in its use of an R.C.A. CA3086 I.C. type transistor array in place of the usual discrete transistors as in our last Sprengbrock analysis. We would question the value of this chip in view of the fact of the galaxy of components associated with it for RF suppression. As is normal, trim pots are included in all the pulse half shots in order to facilitate accurate setting of the encoder pulse widths.

The test results will show that Sprengbrock have made a big step forward from their previous outfit in that all three flying controls have consistent neutrals and pulse width variations, although on the throttle function there is for some reason, 10% difference in the settings.

From the encoder we turn to the R.F. section in which we find a crystal oscillator followed by a buffer stage and then a double tuned π (Pi) output stage. One feature we did note was the use of capacitive coupling between the oscillator and the buffer and inductive coupling between the buffer and the output transistor – the only "different" feature here is that the coupling also has a capacitor in a series, therefore making it necessary to bias the output stage with a resistor.

As with the Series '73 and 'Professional' units previously tested, the Sportsman transmitter signal is particularly 'clean' and free from



Slim shaped Sportsman receiver employs German Hirschman servo and battery connectors which very effectively support the leads at soldered joints.
 Right: neat hatch in rear of transmitter case makes plug-in crystal accessible. Far right: latest Sprengbrock charger is indeed an excellent unit, capable of charging receiver and transmitter batteries simultaneously or independently with provision also to charge a 2v. cell. 5-6 auxiliary function Tx. module and retract servo also shown.



harmonics, thanks to the design of the double tuned π (Pi) output stage, although due to physical limitations it is not possible to exploit this feature to the full because the aerial loading coil would be too large to go in the case. An academic point, but it does illustrate the potential of the design.

The 'output' meter on the case front is in fact a voltmeter connected across the battery and does not indicate R.F. It works just as well with the crystal out as it does when it is plugged in and consequently is not really indicative of signal state.

Receiver

The Rx. circuit is changed considerably from the last Sprengbrock we saw - the R.F. section remains double tuned but limiting diodes across the coils are now deleted. The mixer stage, which is a radical departure from most current practice, employs a Field Effect Transistor (RCS40841). The F.E.T. is, as we have previously discussed, theoretically a much better mixer than the standard transistor. The Sportsman instructions open with a comment on this device stating: "The Rx. features an F.E.T. mixer stage which outperforms passive mixer circuits". True and we would hope so, after all, a passive mixer stage may only consist of a diode.

The mixer stage is followed by two stages of I.F. amplification using PIHER 115 transistors. First A.F. amplifier would appear to be a TEXAS plastic transistor whilst the sync. stage appears to be a further discrete PIHER transistor. Pulse shaping and conducting is via a Motorola MC9818 I.C. whilst the decoding is now the universal SN74L164 shift register. As in the previously tested Sprengbrock system, we noted capacitors connected from all the outputs to -Ve, a practice specifically discouraged in the I.C. manufacturer's specification sheet. Outputs from the shift register are limited to a fixed socket row of German HERSCHMAN connectors on the p.c. board - rather nice.

The Rx. will in fact decode an eight function transmitter signal with the addition of a further two servo output sockets. This may in fact, explain the rather slow frame rate of the system. (The term 'slow' not used here as one of denigration you understand.)

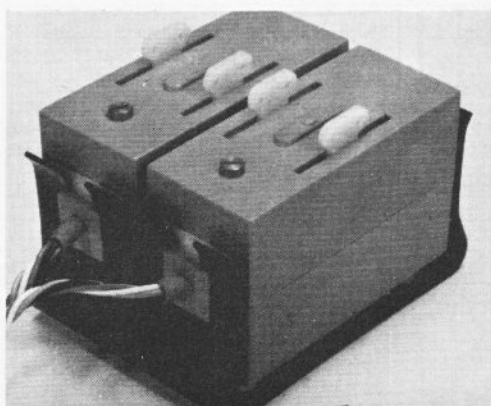
Servos

The servo amplifier in this latest system has been changed from the Signetics I.C. to the TEXAS SN28604. Not to be confused with the Kraft TEXAS I.C., this all TEXAS chip houses all the transistors in one pack on a 12 pin D.I.L. format. Nine external resistors are fitted, a single diode, six Tantulem capacitors and one disc ceramic capacitor making, in all, 17 external components.

The amplifier is, as would be expected, a three wire system and utilises +Ve input pulses. The feedback pot is the fairly stock Cermet C.T.C. pattern and the servo motor is a Mitsumi.

External centring is achieved via a protruding boss screw head. Care should be taken when adjusting to ensure that it is not turned too far

Left: Sprengbrock Micro-loc servo features dual linear output drive with centring adjustable via a small screw at one end of the case top. Case parts are held together by small moulded clips over end stops which double as keys for mounting clip. Amplifier now employs Texas I.C.
 Right: one of the Sprengbrock Micro-Loc mounting clips. Far right: Sprengbrock rotary action Micro Servos, showing neat installation trays.



so as to cause the output arms to reach a mechanical limit, thus stalling the system with subsequent high current drain.

Battery Pack

This is a custom made lightweight unit by SAFT weighing some 3ozs. for 450 mA.H. It is 1 oz. or so lighter than standard units as well as being some 30% smaller - a notable advance.

Test Results

Transmitter

Frame rate: 29 ms - fixed, 34.5 frames/sec, R.H. throttle.

Channel	Function	Short	Neutral	Long
1	Throttle	1.2	-	2.2
2	Elevator	1.0	1.5	2.04
3	Aileron	1.07	1.5	2.1
4	Rudder	1.0	1.5	2.0

All times in milliseconds.

Tx. Current: 160 mA. Aerial up; 210 mA aerial down.

Battery: VARTA Button cells. 9.6 volt nominal, 10.3 volts measured.

Receiver

Battery: SAFT 450 mA.H lightweight. 4.8 volts nominal, 5.2 volts measured.

Currents (Tx. On)

- Rx. only 33 mA
- Rx. plus 1 servo 41 mA
- *Rx. plus 2 servos 50 mA
- Rx. plus 3 servos 59 mA
- Rx. plus 4 servos 68 mA
- Average running current 250-300 mA

*These figures were difficult to obtain due to tight servo centres. Normal standing current of 100 mA is more realistic.

Servo response

Servo travel: 0.32 in. Trim range \pm .060 in., linear action.

Servo times	Against load	With load
No load	.512 sec.	.475 sec.
2 ozs.	.530 in.	.485 in.
4 ozs.	.525 sec.	.500 sec.
8 ozs.	.545 sec.	.480 sec.
16 ozs.	.575 sec.	.465 sec.
30 ozs.	.625 sec.	.475 sec.

Just stalled at 3 lb. 14 ozs.

From the above results it is obvious that the output power is above average and the servo response even at 2 lb. load remains linear and fast. Certainly a great improvement over the last Sprengbrock system tested - a truly good servo response.

