Test Report

The F & M ten channel transistor transmitter and superhet receiver

EDITORIAL REVIEW TEST FIGURES

By J. H. BRUNT

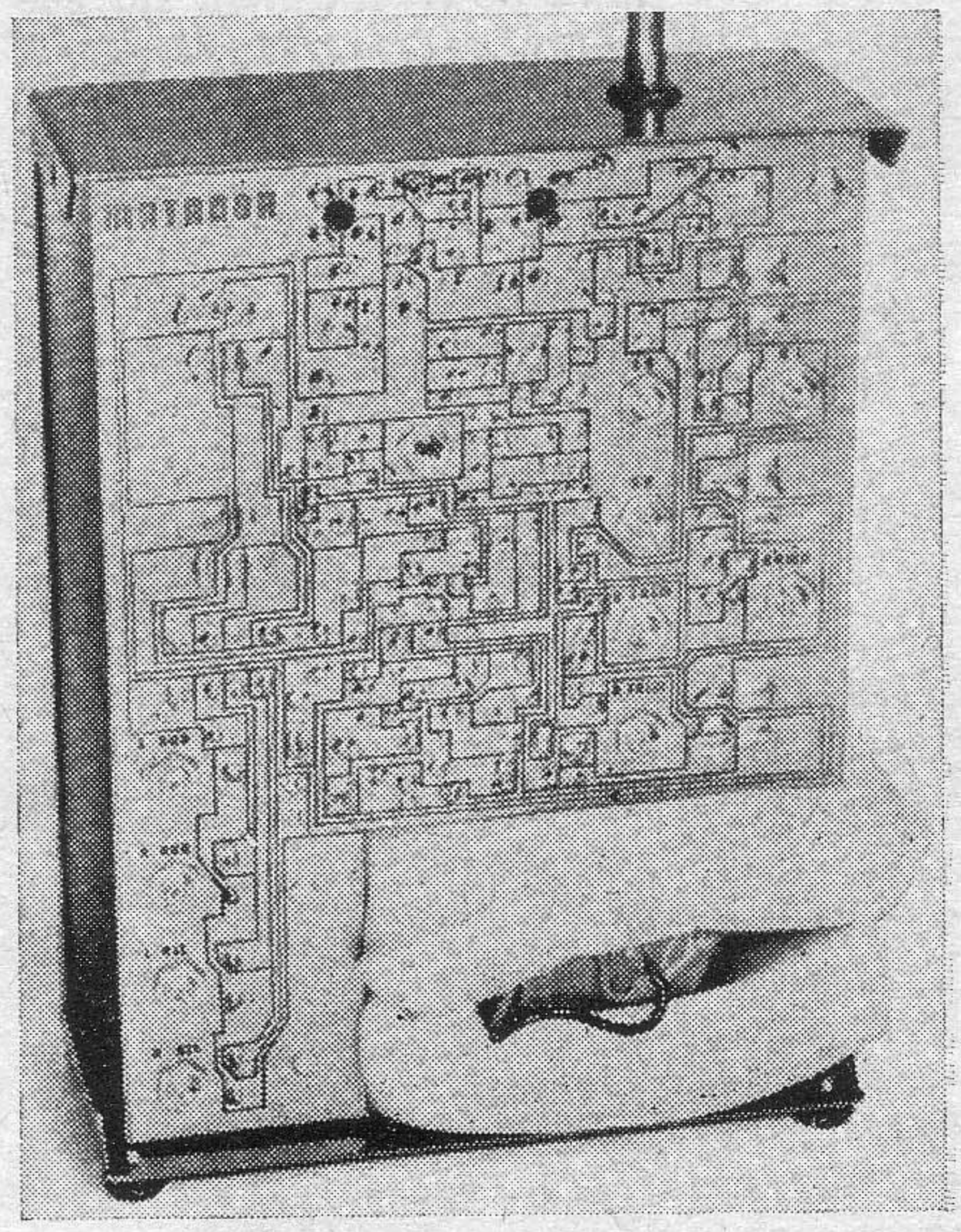
Now that F & M equipment is among those other American items readily available in this country, we thought it time to produce a test report on this equipment which now makes regular appearances in the multi contests together with the other well known manufacturers names. We will therefore deal with the "Matador" which is a ten channel, Bisimul, all transistor transmitter and matching "Midas" Vibroloc type superhet.

MATADOR TRANSMITTER TEST

Following the trend of most transistor transmitters, a considerable lightening of weight and reduction in size was to be expected. It does in fact make a handy size box, the controls being conveniently placed, the lever switches themselves have a nice soft action permitting accurate hand pulsing to be accomplished. There is a miniature meter incorporated in the front panel to give an indication of R.F. power and a test button which, when operated, changes the function of the meter to read battery volts under a simulated operating load. The controls are positioned so that the aileron key is at the top right hand corner, this is largely a matter of preference from the pilot's point of view, and if one is used to flying with the lower right control for aileron, it is a simple matter to transpose the servo plugs in the model. An interesting point too, is that the tones are arranged in a slightly different order with elevator as the lowest note whereas we have been used to having trim in this frequency range. Providing aileron and elevator operate from reeds which have a quick response, general arrangement is unimportant.

Above, front face of Matador transmitter showing lever layout, meter, test button and switch. Below, case back removed to show printed circuit board with pot control identification etched into the copper.

The transmitter uses Measa transistors for the R.F. stage, and there is no centre loading coil in the aerial. Field strength readings carried out during the



test were very high and the mechanical construction and general layout on a wide land, one panel glass epoxy printed circuit board showed that much thought and skill had gone into the production. The crystal used in the MOPA oscillator circuit is third overtone 0.005 per cent tolerance and the transmitter complies with the American Citizens band requirements of 0.01 per cent maximum permitted R.F. drift.

The audio tone generators use toroids for tone stability. The manufacturers claim modulation in excess of 95 per cent and a stability of within 1 cycle of the reed frequency over a useful range of battery voltages and normally expected temperature changes. The tones may be tuned over 25 c.p.s. to compensate for reed bank differences.

We tested the transmitter tones to tune over 60 cycles in the high range and 70 cycles in the low range. Similarly, although the receiver specification indicated a tone range of from 200 c.p.s. to 650 c.p.s., this particular transmitter being set up to suit the "Midas," went from 640 down to 345.

Test Figures

A 6.25v. DEAC pack had been installed in place of the dry battery for which the transmitter was designed, this is quite a normal modification by modellers who do plenty of flying. The makers recommend the use of a 2½ ohm resistor in one of the DEAC leads in this case, to hold down the high surface voltage following a charge (such a resistor is supplied free) in this case. The DEAC reads six volts on load, the current was measured as follows:

Aerial Extended

Carrier 125 mA.
One tone operated between 180 and 250 mA., depending on frequency of tone.
Simultaneous between 230 and 240 mA. (up elevator and left or right rudder).

Aerial Retracted

Carrier 130 mA.
One tone operated between 215 and 255 mA., as above.
Simultaneous 250 mA.

Estimated R.F. Output

Slightly over 250 mW., field strength reading very high.
Audio frequencies, note staggering of tones.

		R 640
Aileron		
		L 565
		R 600
Rudder		
		L 530
		Hi 395
Throttle		
		Lo 345
		U 365
Elevator		
		D 425
		U 460
Trim		
		D 490

It should be remembered that this arrangement of frequencies requires the appropriate connections on a reed bank, and has been specially designed to suit the combination of this transmitter and Midas receiver. Needless to say, a similar reed wiring system should be used with any other reciever operated with this transmitter.

Physical Data

Size 8⅛ in. high, 6¼ in. wide, 2¾ in. deep + 1 in. for switch projections.
Weight 2¾ lb. + DEAC 3¼ lb. total.
Aerial Retracted 9 in.
Aerial Extended 58 in.
Case, folded aluminium, blue anodised with four rubber buffers on base. Back retained with four self tap screws and is removed to change battery or adjust tones.

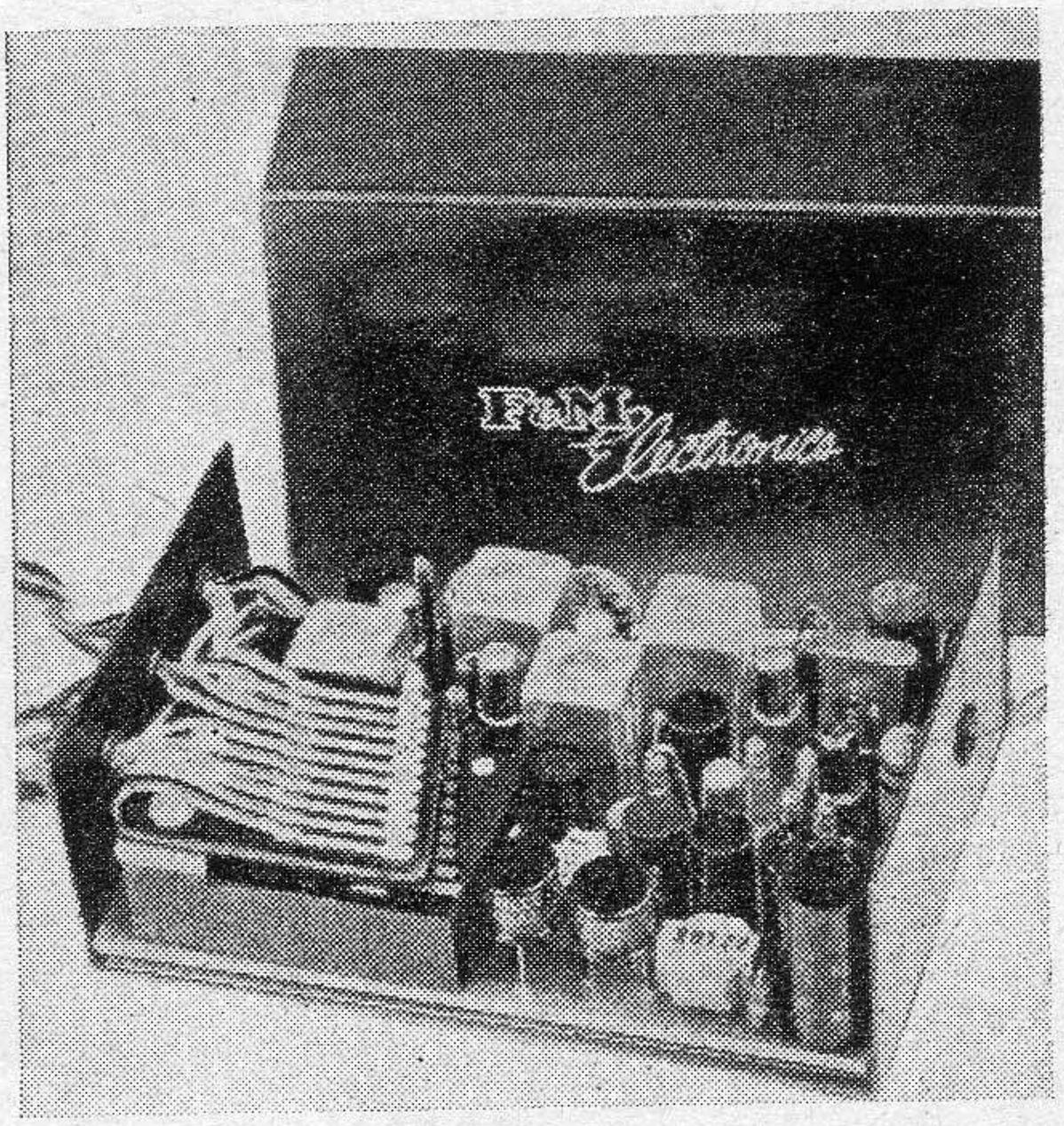
MIDAS RECEIVER TEST

This is a ten channel all transistor superhet using a "Medco" reed bank and is designed to match the Matador Transmitter, or Hercules (earlier valve transmitter). Here again a similar glass epoxy circuit board with generously wide lands is used, and the component placement carefully arranged to avoid interaction and reduce the chances of mechanical damage. It operates on 6 volts from the servo battery pack which may be either dry batteries or more usual DEAC (6.25 volts) pack. The receiver cannot be described as *sub*-miniature, and weighs 4½ oz.

There is a really hearty drive to the reeds, which leaves no doubt whatsoever that they are making contact! Indeed this is the highest reed amplitude we have seen on test so far, yet the

selectivity of the bank was such that we could detect no tendency for the adjacent reeds to vibrate in sympathy. The fact that the reeds are wired so that ajacent reeds go to different servos is an additional safety factor. Should two adjacent reeds strike whilst tuning the tone pots it is unlikely that damage will occur to the servo amplifier under these conditions.

The receiver we tested is fitted with an additional piece of circuitry known as the "Vibro Loc." This is sensitive to *any* tone and closes the circuit to the reed comb on receipt of a tone. Should mechanical vibration transmitted from the model cause any reed to vibrate when no signal has been sent, the servos will not operate. This does not, of course, prevent mechanical vibration affectiing the reeds while a signal *is* present. We understand that the "Vibro Loc" system has largely been found unnecessary when a normal amount of care is exercised whilst installing the receiver, so on later models this facility has been omitted, resulting in what must be the smallest superhet, ½ oz. lighter and the same circuit less "Vibro Loc".



Midas superhet receiver has closely packed components and Medco reed block. Tuning slugs to four I.F. cans and R.F. coil are sealed with wax, to prevent movement and tampering. Manufacturers recommend that case be taped around edges to prevent entry of dust and dirt. The new "Midas" is much smaller, makers claim ; smallest R/C superhet

Test Figures

Rx. supply volts 6.25 from common servo and bias pack of DEAC 500 cells (makers indicate that four 1.5 volt dry cells may be used for receiver and servos, plus one or two 1.5 cells for bias).

Receiver Currents

No Signal 12 mA.
Carrier 11 mA.
One tone 38 mA.
Two tones (simul) 37 mA.
Current measured in supply lead with servos in circuit 300 mA. total while un-loaded servo operates.
Peak current with servo overloaded approximately 500 mA.

Sensitivity

Better than 2 microvolts.
Bandwidth not greater than 10 Kc (measured at I.F. frequency).

Reed Frequencies

640, 600, 565, 530, 495, 460, 425, 395, 365 and 345 (spacing extremely accurate).

Physical Data

Size 1⅛ in. high, 2⅛ in. wide, 3¼ in. deep.
Aerial length 18-36 in.
Weight 4½ oz.
Aproximate installation weight (Rx. battery, 5 oz.), plugs, sockets etc. 1¾ oz., 5 servos at 2¾ oz. each = total 25½ oz.

Case folded aluminium, blue anodised with white silk screen legend. There are six grommets in one end ; for power supplies and five sets of servo connections, aerial passed through additional grommet at opposite end of case.

Compatability

All Matador transmitters and Midas receivers are individually matched and the makers can only guarantee results when the receiver is operated by its own transmitter. This is due to the extreme sensitivity of the Midas which requires good stability at the transmitter end. It can, however, be aligned carefully to suit a number of other Txs.

Manufacturers Claims

F & M guarantee an operating temperature range from 0° F. to 130° F., sensitivity greater than most supergen receivers, subminiature precision crystal used in the local oscillator. Extremely sharp sensitivity thanks to the four I.F. transformers producing selectivity equal to commercial (broadcast) receivers. Stable circuitry free from oscillation producing regeneration ; noise shield of mixer and I.F. stages accomplished by

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large "power filters"; everything possible has been done to reduce actuator noise interference. High gain transistor detector (collector mode) transformer coupled to audio stages. Exclusive A.G.C. circuit does not use diodes or complicated feedback networks, yet effectively eliminates close range blocking.

Complete Equipment Test

After a preliminary range check, the equipment has been flown in a "Tauri" with six channels used.

The gear was then given ground range check to ascertain the extreme ground to ground limit of operation with servos switched in. This proved to be 750 yds. before a servo ceased to operate.

Manufacturers: F & M Electronics Inc., 153 Vermont N.E., Albuquerque, New Mexico, U.S.A.

British prices: 10 channel £89.17.0d.; 12 channel £105.0.0d.

Obtainable from, and serviced by: "Soraco" (Harry Brooks), 32 Redhill Drive, Brighton 5.