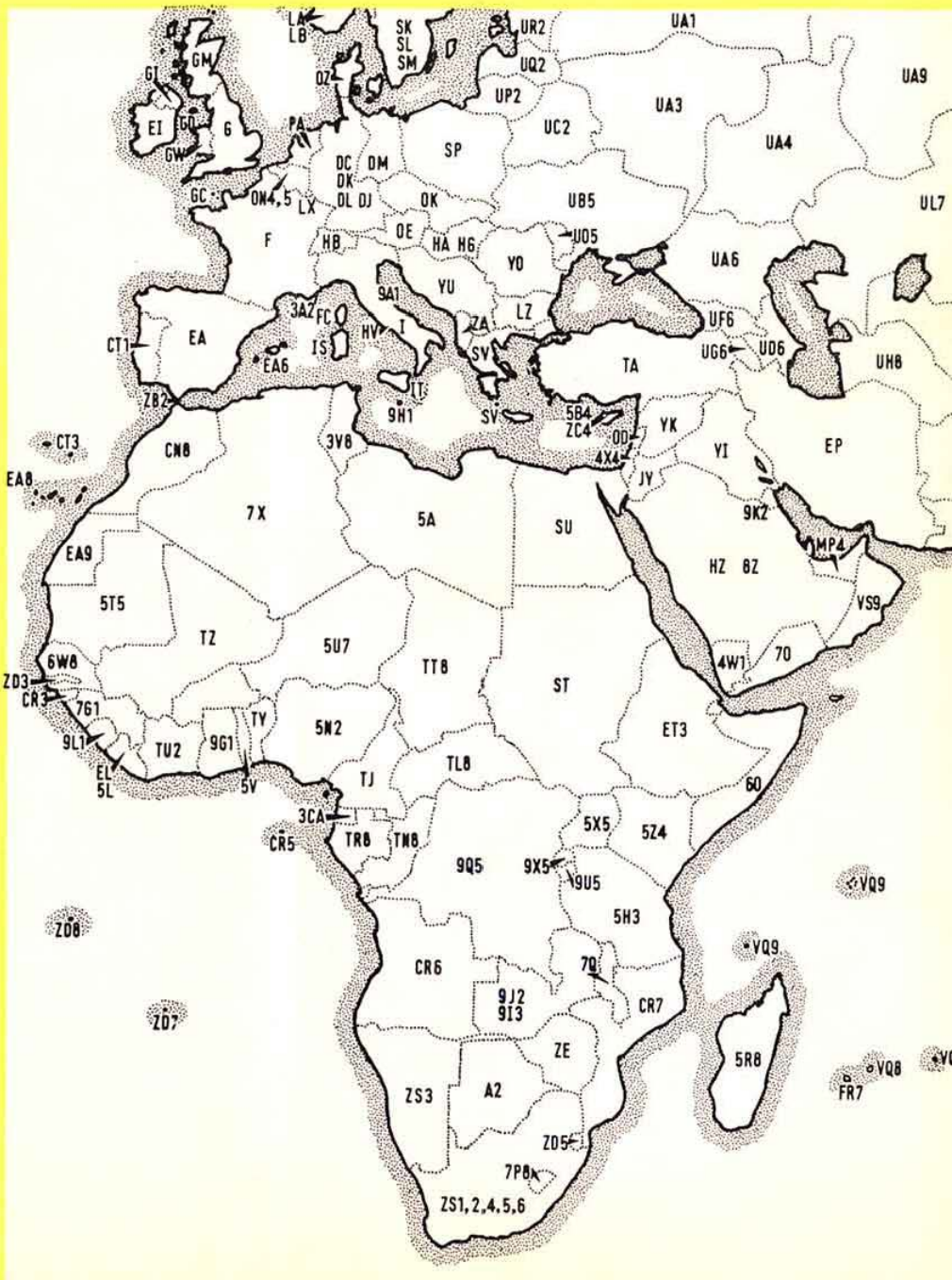
radio communication

January 1971

Journal of the Radio Society of Great Britain



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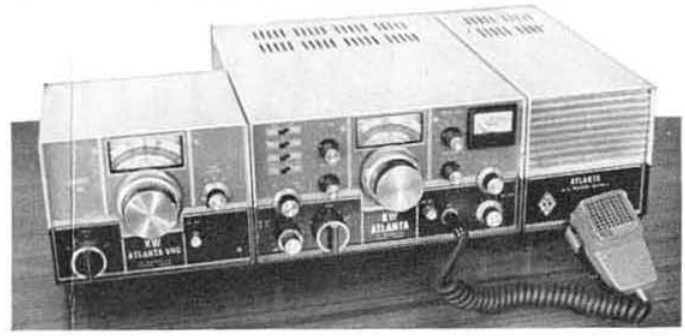

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January 1971

radio communication

Volume 47 No 1 Price 6s (30p)

CONTENTS

Radio Communication **(incorporating** *The RSGB Bulletin***) is published by The Radio Society of Great Britain as its official journal and is posted to all members of the Society on the first Tuesday of each month**

Contributions and all correspondence concerning the content of *Radio Communication* should be addressed to: The Editor, *Radio Communication*, 35 Doughty Street, London WC1N 2AE. Tel 01-837 8688.
Closing date for contributions, unless otherwise notified: 7th of month preceding month of publication.

Advertising, other than Members' Ads, should be addressed to: Mrs P. D. Harvey, Sawell & Sons Ltd, 4 Ludgate Circus, London EC4. Tel 01-353 4353

TRIO's TS-510 has opened countless SSB vistas through its creative design that enables it to operate at constant maximum power with top durability. This transceiver uses a high frequency crystal filter and covers all ham bands from 3.5-29.7 MHz. Because the TS-510's frequency coverage has been compressed to 25KHz for one complete dial rotation, tuning in on SSB signals is easy. By using TRIO's PS-510 (Power supply and speaker) and VFO-5D (Variable frequency oscillator) optimum results may be obtained. The PS-510 operates on an AC power supply through a 6-1/2" speaker. The VFO-5D has a double-gear dial covering 25KHz per rotation.

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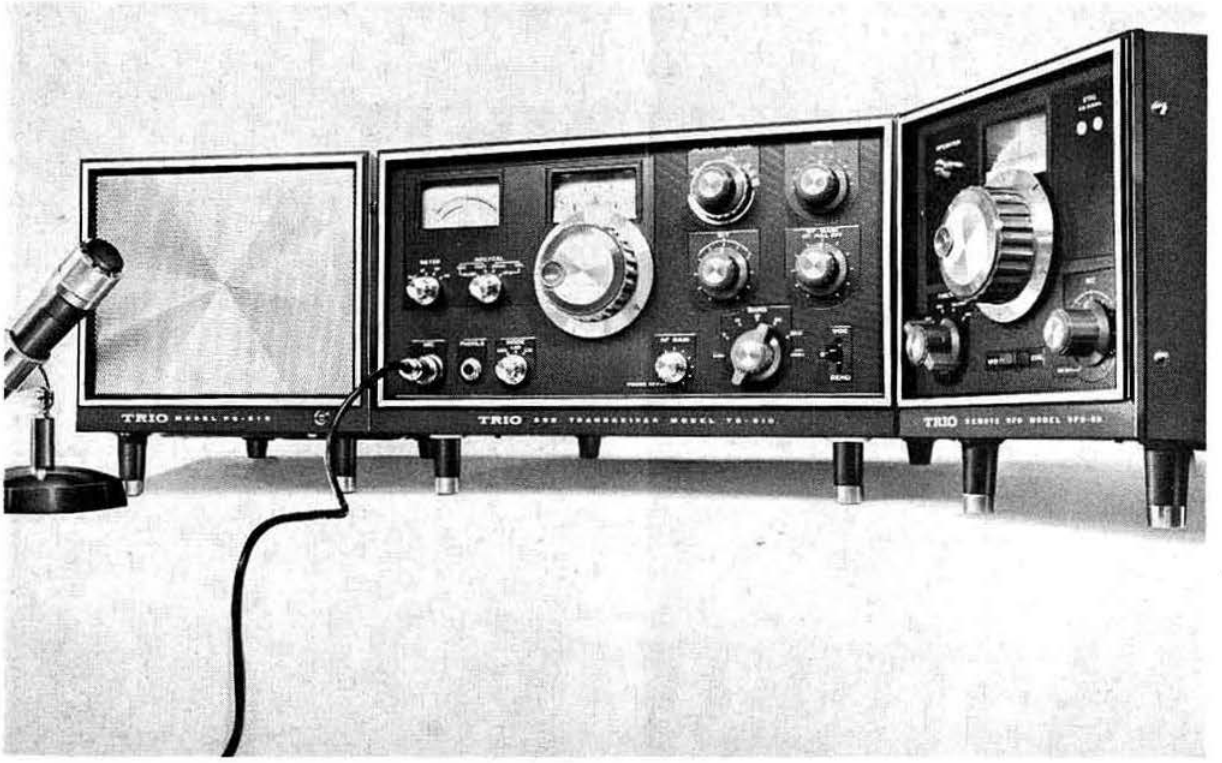
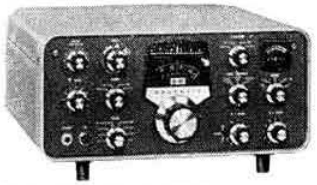


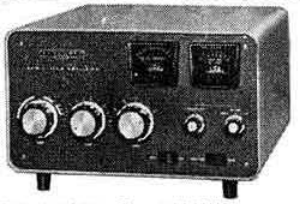
MODEL SB-102 TRANSCEIVER KIT



New transistorised L.M.O.—retains features of SB 101 input 180 watts PEP SSB—170 watts CW 80–10 metres—Requires external PSU (HP-23A or HP-13A).

Price £192. Carr. 70NP.

SB-220 LINEAR AMPLIFIER KIT



2000 watts PEP SSB input 1kw on CW & RTTY—Requires only 100 watts drive—pre-tuned pi-input—fully metered—110/240 VAC built in PSU.

Price £178. Carr. 110NP.

HW-100 5 BAND SSB-CW TRANSCEIVER KIT

High performance, minimum cost—80–10 metres—170 watts C.W., 180 watts PEP—Solid state L.M.O.—Less than 100Hz drift—Requires PSU (HP-23A-HP-13A).

Price £125. Carr. 60NP.

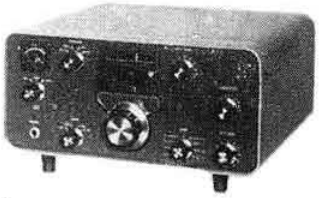
SB-200 LINEAR AMPLIFIER KIT

80–10 metres—1200 watts PEP SSB input—1000 watts CW output—pre-tuned input—internal PSU, 120/240 VAC.

Price £115. Carr. 80NP.

SB-301 AMATEUR BANDS RECEIVER KIT

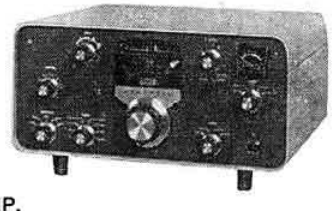
80–10 metres—Stability less than 100Hz per hour—Visual dial accuracy less than 200Hz—Sensitivity 0·3μV for 10dB S+N—N LSB, USB, CW, RTTY. 120/240 VAC.



Price £140. Carr. 70NP.

SB-401 AMATEUR BAND TRANSMITTER KIT

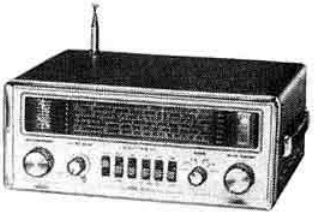
Full coverage 80–10m—Input 170 watts CW, 180 watts PEP SSB—Full transceiver or split with SB-301—With any other RX using xtal pack SB-401-1-110/240 VAC.



Price £175. Carr. 80NP.

GR-78 GEN-COV RECEIVER KIT

190kHz–30MHz in six switched bands—Double conversion on 18–30MHz band—AM-CW/SSB switch—All solid state (including 5 F.E.T.'s)—Internal rechargeable battery.



Price £65. Carr. 40NP.

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80–10 metres—internal crystal filter for optimum selectivity—Sensitivity—1μV for 10dB S + N-N—Image rejection—40dB or better—120/240 VAC.

Price £44. Carr. 60NP.

MODEL HW-17A TRANSCEIVER We regret that this model has now been discontinued. Adequate parts stock will be maintained for spares and service purposes.

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MEMBER SOCIETY INTERNATIONAL
AMATEUR RADIO UNION

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Current Comment

QUA 1971

AT the 1970 AGM there was some lively discussion concerning matters coming under the heading of administration rather than technical. It is now opportune to make some brief comment.

* * *

Appearing as always was the perennial statement that the amateur service is in danger of losing some of its existing frequency allocations. Of course this possibility is present in the same way as that any one of us may tomorrow be a road casualty. The insurance against this occurrence is the vigilance of the Society backed by the support of *all* radio amateurs. Remember . . . those who are not RSGB members benefit equally as our members from the efforts to preserve amateur frequencies.

In June 1971 the World Administrative Conference on Space Communication will open at Geneva. This is the most important conference of its type since 1959. Following liaison with the Society, the UK Ministry of Posts & Telecommunications has made proposals to the conference to enlarge the facilities available to the amateur service on frequencies above 7MHz. Further, and following an invitation from the MPT, a member of Council has been nominated as an adviser to the UK delegation for the period of the conference. Through the medium of the IARU, societies throughout the world have been made aware of the potential of the conference. Approaches to administrations have indicated that there will be a great deal of support for the UK proposals. The preparatory work will continue to the day the conference opens.

* * *

The bands at 144MHz and above attract many Class B licensees: their numbers are growing and we welcome this expansion of the amateur ranks. Since the issue of the first Class B licences the facilities available to holders have been increased. Let it be certain that there will be no reason for any change in the present position. Those who were active in the years following WW2 will recollect that we had the facility of allowing a third party to speak over the air while the licensed operator remained in control of the station, but due to thoughtless and foolish behaviour on the part of a minority this privilege was withdrawn.

There have been complaints of poor operating procedure and poor quality signals coming from stations operated by Class B licensees—some of the material collected by the monitoring service is barely credible. Let all those who operate on any amateur frequency ensure that the quality of transmission from their stations is technically beyond reproach and does not cause offence to other users of the bands. Operating procedure should be in accordance with conventional standards to which the majority of operators always adhere, so let us make sure that the behaviour of a thoughtless minority does not prejudice the position of us all.

* * *

The subject of past and future Society exhibitions attracted a great deal of comment. How to improve the presentation and interest at a time when many larger exhibitions are no longer being held is an exercise which will occupy the 1971 Exhibition Committee. If you have some constructive suggestions for the future the committee will be glad to hear from you. If you can give physical, as well as moral, assistance you will be doubly welcome.

* * *

To many members *Radio Communication* is the outward manifestation of the Society's existence. Despite a vicious spiral in print and paper costs it is hoped that the journal will continue at its present size to accommodate the many outstanding technical articles awaiting publication or which have been promised.

If you feel the urge to appear in print we will be pleased to hear from you but please first check with the editor that there are not articles on your subject already in the pipeline, and also obtain from him a copy of the style guide for authors.

It is now certain that the intention to despatch the journal by first-class mail will not be implemented. The postal increases due to come into force on Decimalisation Day have made this impossible.

* * *

A strong national society is essential for the future of the amateur radio movement. The Council and committees of the Society are anxious to play their part but for maximum effect we need your support and, what is also important, the support of those radio amateurs who are not yet members of the Society.

G2BVN

QTC AMATEUR RADIO NEWS

QSL bureau

Will holders and prospective holders of callsigns using the GB prefix please note that because of the increasing amount of work caused by marking QSL cards with the callsign of the licence holder, a special sub-manager has been appointed to whom envelopes for the collection of cards addressed to GB calls should be sent. The address of this sub-manager is Mr Cyril Turner, 56 Sunny Bower, Tottington, Bury, Lancashire BL8 3HL.

Holders of callsigns in the series G3YAA to G3ZZZ are reminded that the sub-manager for this group is no longer Mr P. R. Cheeseman, G3KDE, who has had to give up the position due to business commitments. The new manager for this group is Mr F. G. Hoare, G2DP, of 63 Mill Road, Three Bridges, Crawley, Sussex.

New clubs

An amateur radio club is being formed in Bracknell, Berkshire. Anyone interested in radio or electronics who would like to join is asked to contact Mr L. J. Parry, G8AMK, 13 Cannon Hill, Easthampstead, Bracknell, or telephone Bracknell 23704.

Mr M. Gaunt, G3WGW, group pharmacist, Killingbeck Hospital, York Road, Leeds LS14 6UQ, is trying to organize an international radio club of pharmacists, and would be pleased if any pharmacist who is a licensed radio amateur would contact him.

The inaugural meeting of the revived Yorkshire Raynet Group will be held in Bradford on Friday 15 January 1971. Further details from Colin Weston, G3VAP, 29 Ogden Crescent, Denholme, Bradford, Yorks. (Tel: Denholme 479).

The Star Short-Wave Club was formed in October 1970 and meets at the Star & Garter Hotel, Bramley, Town Street, Leeds 13. Membership exceeded 25 in less than two months.

The club is operational every Wednesday under its own callsign G3ZWA on 2m and Top Band. Lecturers have been booked and morse classes are run every week. A number of constructional projects are being undertaken.

Can you help?

Eskil Persson, SM5CJP, Frotunagrand 1, 19400 Upplands Vasby, Sweden, would like to obtain circuit diagrams of the BCC715 receiver.

The Air Electronics & Air Engineers School would like to obtain obsolete airborne radio communications equipment to be used in the teaching of basic radio theory. This equipment is no longer available from RAF stores but will be invaluable in providing students with an insight into development of airborne equipment.

Radio amateurs are likely to be the only persons who could supply this equipment, which need not be operational, and any who can are asked to contact Flt Lt E. Gregory, RAF Topcliffe, Thirsk, Yorkshire. The school is prepared to beg, borrow and collect if necessary.

Installation of President 1971

Mr F. C. Ward, G2CVV, will be installed as the thirty-seventh President of the Society during the course of a social evening on

Friday 15 January 1971

at the

Bonnington Hotel, Southampton Row London WC1

commencing at 7.30 pm

Admission will be by ticket, available on request (with sae) from Society headquarters. Tickets are restricted to two per member.

Federation Internationale des Radio Amateur Cheminots

The International Federation of Railway Radio Amateurs (FIRAC) exists to promote contact and friendship between railway radio amateurs throughout the world. There are national groups in operation in all European countries, in the USA and several other countries.

Regular contacts are made between European stations on Sunday mornings and with USA stations on Saturday evenings (gmt); also with other stations by agreement. The federation would like to hear from any group, society or railway radio operator wishing to participate in regular or occasional schedules.

Information available from: Ronald Hooper, G3SCW, Station House, Tavistock, Devon; or Owen Wade, GW3YVC, 1 Lomond Crescent, Cardiff CF2 6ES.

Proposed Amateur Radio International Travel Club

A considerable number of radio amateurs wish to visit amateurs in other countries with whom they have had contact over the air, and it is proposed to form a club with the object of trying to arrange for groups of amateurs and their families to travel by special charter at reduced prices.

Some families may want to go from place to place, others may want to interchange holiday houses by way of one family in one country going to a friend's house in another country, and in reverse etc. Other combinations of holidays and meeting amateur friends will also occur to many people, but until it is seen what the interest is, it will not be possible to form a club for this purpose.

1971 Council election results

For ordinary elected members, three vacancies:

B. D. A. Armstrong, G3EDD	1,539 votes*
E. G. Ingram, GM6IZ	1,245 votes*
Rev J. L. Marshall, G3RKH	970 votes
R. F. Stevens, G2BVN	1,615 votes*

Zone G member

A. F. Hunter, GM3LTW	43 votes
A. J. Mitchell, GM3UDL	35 votes
A. W. Smith, GM3AEL	51 votes*

* Elected.

Will those persons who are interested in this proposition please contact Mr L. W. Jones, G5JO, The Grange, Bottisham, Cambs CB5 9BD, enclosing a stamped addressed envelope.

It is proposed to operate the club as far as possible through overseas radio societies, and Mr Jones wishes it to be known that he is doing this purely as an amateur for amateurs and that there is no question of him making money out of the idea.

Stolen property

The following items of a total value of £2,257 were stolen from Mullards Works, Buuts Lane, Blowick, Southport, between 2-3 December 1970.

1. Tektronix curve tracer, t/t blue. 18in by 18in by 2in, Serial Number 10042. Value £1,100.
2. Two Telequipment oscilloscopes S.51.B Serial Nos 151046 and 15273.
   Three Telequipment oscilloscopes S.54.A Serial Nos 30237, 302268 and not known.
3. Racal frequency counter. Type 9529. Serial No 2124.
4. Autometers Mk 8. Serial Nos 93937, 93845, 106167, 1547 and 10664.
5. Unlilex power packs EP.9002. Serial Nos 11287, 11291, 11391, 11440, 11448, 11452, 11288, 11295, 11436, 11447, 11451 and 11455.
6. Philips hf generator PM. Serial No 5321.
7. Airmec galvamp. 391.
8. Philips milliammeter PM. 2454.
9. Philips oscilloscope GM.5605.
10. Philips multimeter PM.2400.
11. Ether mini temperature controller. 0-450c. Type 17-90B. Built into a blue box with a Philips transformer.

County Police Headquarters, Hutton, Preston, Lancs, would welcome any information concerning this property.

Pirates caught

As a result of Post Office enquiries into the suspected unlicensed use of wireless telegraphy transmitting equipment, the following convictions have been obtained for using wireless transmitting apparatus without the appropriate licence, contrary to the provisions of Section 1 of the Wireless Telegraphy Act, 1949:

Mr E. O. Proctor, 107 Tottenham Crescent, Kingstanding, Birmingham, at Victoria Law Courts, Birmingham, on 30 October 1970. He was fined £50 on each of two charges, plus £25 costs and forfeiture of equipment.

Mr A. Horsfall, 20 Thornholme Road, Hawke Green, Marple, at Stockport County Magistrates' Court on 29 October 1970. He was fined £10, plus £5 costs and forfeiture of equipment.

Mr J. P. Griffiths, 21 Strathyre Avenue, London SW16, at South London Magistrates' Court on 5 November 1970. He was fined £15 on each of three charges, plus £25 costs, £5 advocate's fee and forfeiture of equipment.

Mr J. Conway, 154 Stamford Park Road, Salford, at Manchester Magistrates' Court on 19 October 1970. He was fined £30 on each of two charges, plus 7gns costs.

Mr F. Sage, 1 Lulworth Avenue, Liverpool, at Liverpool County Court on 6 November 1970. He was fined £30 on each of three charges, plus £15 costs and forfeiture of equipment.

Mr G. Mancirietti, 1 Burlington Road, Bristol 6, at Bridewell Magistrates' Court on 2 November 1970. He was fined £30, plus £5 costs, £2 advocate's fee and forfeiture of equipment.

Mr M. K. Raine, 26 Arley Hill, Cotham, Bristol, at Bridewell Magistrates' Court on 2 November 1970. He was fined £20 plus £5 costs, £2 advocate's fee and forfeiture of equipment.

Mr J. P. Temple, 137 Beavens Lane, Hounslow, at Sutton Magistrates' Court on 7 October 1970. He was fined £20, plus £3 costs and forfeiture of equipment.

Mr N. Catford, 77 Burleigh Road, Sutton, Surrey, at Sutton Magistrates' Court on 9 November 1970. He was fined £20 on each of three charges, plus £15 costs, £25 advocate's fee and forfeiture of equipment.

Mr D. Wright, 87 Abbotts Road, Cheam, Surrey, at Sutton Magistrates' Court on 9 November 1970. He was fined £8 on each of two charges, plus £10 costs.

Mr H. Smith, 155 Fishponds Road, London SW17, at Sutton Magistrates' Court on 9 November 1970. He was fined £12, plus £7 costs and £10 advocate's fee.

Mr P. J. Crisp, 8 Marlborough Court, Buckhurst Hill, Essex, at Sutton Magistrates' Court on 9 November 1970. He was fined £8 and £5 costs.

Mr L. E. Horwood, 162 Chiltern Avenue, High Wycombe, Bucks, at High Wycombe Magistrates' Court on 11 November 1970. He was fined £30 on each of two charges, plus £12 10s costs, £5 advocate's fee and forfeiture of equipment.

Mr E. S. Foxall, 34 Cavendish Avenue, St Barr, Birmingham, at High Wycombe Magistrates' Court on 11 November 1970. He was fined £30, plus £12 10s costs and £5 advocate's fee.

RSGB Lecture

6.30 pm, Thursday, 21 January 1971

Institution of Electrical Engineers

Savoy Place, London WC2

Modern transmitter testing

by J. Pink, of Hewlett Packard Ltd

The lecture will commence with a talk by Mr Pink describing modern test instruments and the methods of use. This will be followed by a practical demonstration using current amateur equipment. In addition to analysis of transmitter output there will be an investigation of filter characteristics. Members are invited to bring filters, either home constructed or commercially made, for evaluation.

Buffet tea will be served at 6pm, and members who will be attending this lecture are requested to advise RSGB HQ so that catering arrangements can be made.

Internacia Ligo de Esperantistal Radio-Amatoroj

The recently formed International League of Esperantist Radio Amateurs (ILERA) held its inaugural meeting in Vienna in August during the 55th Universal Congress of Esperanto.

Honorary secretary is Ken Sly, G4MR, of 200 Nevills Road, Letchworth, Herts, who will be pleased to supply further information on ILERA.

Trapezoid modulation in amateur transmitters

by Dr A. GSCHWINDT, HA8WH*

In recent years a new type of modulation, trapezoid modulation, has been used in a.m. broadcasting, and, it is of particular application for long-range broadcasting in the mf and hf bands. In this article a short investigation of trapezoid modulation is made and some ideas are given about the realization of this type of modulation in amateur equipment.

Speech signal compression

In the age of A3 emission in the amateur bands it was a well-known thing to talk about speech clipping. The use of clipping was very useful for dx contacts where the expected signal-to-noise ratio at the receiver output was low. Modulation with clipped speech signals or trapezoid modulation means the same! The name "trapezoid" originated from the shape of a clipped sinewave.

Speech signal processing is discussed because of the poor properties of a speech signal, especially for a.m. transmission. It has a peak to average power ratio of about 14–18dB, depending on the man and microphone, and this means that the probability of the appearance of high level signals is low. If the carrier is modulated with this speech signal, the mean modulation depth will therefore also be low.

The intelligence of a transmission is located in the sidebands, and the mean power of the sidebands relative to the carrier depends on the modulation depth. Higher modulation depth results in higher sideband power or higher information power. Thus the modulation should be increased to get higher power and better readability at the receiver output.

The way to increase the average modulation depth (the maximum modulation index is limited to 1) is simple. If the peaks of the speech signal are removed, a processed signal is obtained which has lower dynamic range than before.

It is a bad thing to increase modulation by over driving the modulated stage, because of the interference to channels near the transmitted frequency, and another method of increasing the modulation index must be found.

How does the speech processer work? The amount of the limitation is determined by two factors, the ear of the man and the improvement coming from the speech clipping. Fortunately the ear is not too sensitive for clipped speech and the heavily distorted or clipped speech signal does not sound unpleasant. The limitation factor (the ratio of the speech signal peak voltage to the clipped value) which we can use in amateur transmitters may be 15–20dB, with symmetric limitation. The use of a higher limitation factor does not give a significant improvement in readability.

The block schematic diagram of the A3 transmitter used for trapezoid modulation is shown in Fig 1.

In the clipping process the original signal is heavily distorted, and this distorted, or limited, signal has a wider spectrum than before clipping. In Fig 2 can be seen the spectrum of the clipped single sinewave with 15dB limitation. Because of the symmetrical clipping in the output spectrum only the odd harmonics of the basic frequency are present.

It is clear that if more than one frequency is limited at the same time, as in the case of speech limitation, the resulting spectrum consists of new frequency components. One part of these frequencies comes from the harmonics of the input frequency and the other part from mixing the different frequencies. The first part is named as harmonic, the second part as intermodulation components.

For example, if we limit a speech signal having a maximum upper frequency limit of 3kHz, then the output of the limiter will consist of a spectrum with at least 10kHz bandwidth. This signal is inconvenient for modulation. In this case the occupied band will be ±10kHz from the carrier.

It follows from the facts given earlier that a filter must be used in the af chain to keep the original bandwidth to 3kHz. It is, unfortunately, impossible to remove all distorted components originating from the limiter because they are located in the basic band where the low-pass filter is not effective. The amplifiers after the limiter increase the signal amplitude to the desired level to modulate the carrier.

It is of interest to note the improvement coming from trapezoid modulation. The improvement is defined as the rise in the readability at the receiver when the reception is poor. Poor reception usually means a 4–6dB signal-to-noise ratio at the output of the receiver. If we are using 15–20dB limitation there is an improvement at the receiver output of 3–4dB in the signal-to-noise ratio. This improvement is true only during bad reception. When the reception is good it is not desirable to use speech clipping, but in long-range communication trapezoid modulation must often be used.

It will have been noted that the improvement is significant. A transmission of 100W carrier power and using trapezoid modulation is equivalent to a transmission of 200–250W carrier power without trapezoid modulation. This is fine, but what is the price for this success? The circuits used in trapezoid modulated transmitters are now considered.

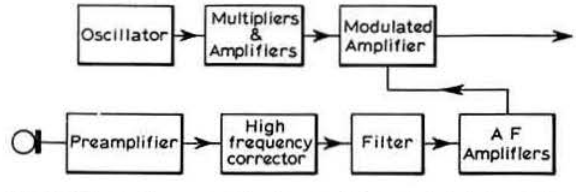


Fig 1. Block diagram of a trapezoid modulated transmitte

* Budapesti Muszaki Egyetem, Budapest 11, Hungary.

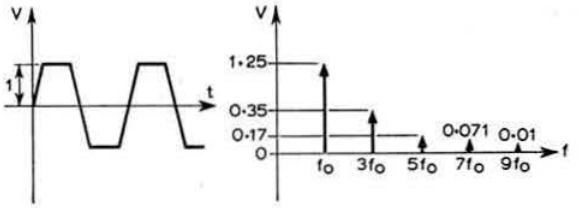


Fig 2. Spectrum of the clipped sinewave. Clipping factor 15dB

Amplification of trapezoid signal. Requirements for the transmission of clipped signals

In the transmission of non-compressed signals, it is only necessary for the modulator stage to have a constant amplitude characteristic in the desired frequency band, for example from 100Hz to 3kHz. In this band the constant value of amplification is important, that is the harmonic distortion factor must be kept at a low level.

Where the amplification of trapezoid signals is concerned there is another transmission requirement which is to retain the shape of the modulation signal. From this it follows that for good trapezoid transmission, it is necessary to ensure that the modulation amplifier has a linear phase characteristic in the desired band.

In short, two points which must be fulfilled in the modulator are:

(1) constant amplitude characteristic, and
(2) linearly varying phase characteristic in the desired af band.

If these requirements are not fulfilled the shape of the trapezoid signal will be bad.

In most amateur equipment it is more difficult to ensure the right phase characteristic than the amplitude characteristic. At the lower part of the modulation signal (from about 50–500Hz) the phase distortion is significant. The reason is simple. The amplifiers working in the modulator chain are ac coupled by resistance/capacitance or by a transformer. In the classic transmitter design the objective is to ensure the transmission of the desired af band and not to ensure good phase characteristic for minimum shape distortion.

Fig 3 shows the typical distortion of a RC coupling network. The output signal is differentiated so that it has a higher dynamic range than before. The transformers produce a similar type of distortion.

To eliminate the distortion better low frequency parameters for the modulator are necessary, that is the lower cut-off frequency must be moved downwards. In the ideal case the lower frequency cut-off would be shifted to dc because limited speech has components from dc. In practice good results are obtained if the lower frequency cut-off is as low as possible without considerable modification of the transmitter.

In a transmitter with a low-pass filter, the foregoing requirements must also be true for the filter, but unfortunately it is a little difficult to find the optimum between the good phase characteristic and sharp upper frequency cut-off.

The original speech signal when limited sounds deeper than before passing through the clipper, and to eliminate this effect a frequency distorter network is used before the clipper. This circuit gives higher attenuation for the lower sounds, and its exact parameters depend on the properties of the microphone.

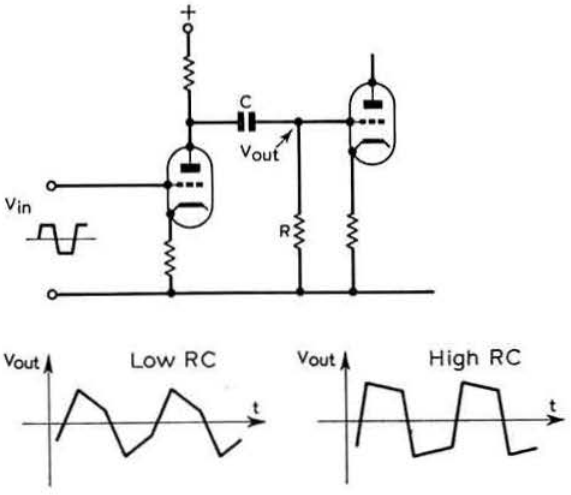


Fig 3. Effect of coupling elements on the transmission of the trapezoid signal

Elimination of modulator distortion

The character of the shape distortion is that of a differentiated signal. If a circuit is connected in series with the modulator amplifier, which distorts the trapezoid signal in such a way that it has an integrated shape, the signal at the output will not be distorted.

The name given to this circuit is "predistorter" or "corrector". The predistorter signal goes through the distortion coupling elements which distort it in opposite character, so the resulting signal will be in as good shape as before amplification. The location of the corrector is seen in Fig 4.

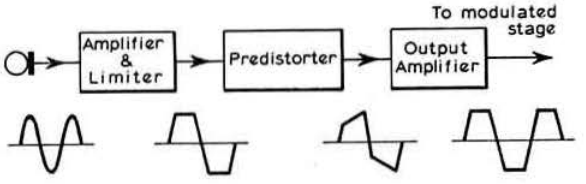


Fig 4. Elimination of the modulation distortion by predistortion of the trapezoid signal

The problem is to design a circuit for producing the integrated shape. The simple integration circuit is not good enough because it has a fall characteristic at higher frequencies. The block diagram of the corrector is shown in Fig 5. The trapezoid signal is connected partly direct to the output. With the other channel the original signal is integrated and then added to the trapezoid signal, so the result will be an integrated shape. The character of the integrated signal is determined by the R1/C1 time constant. With the

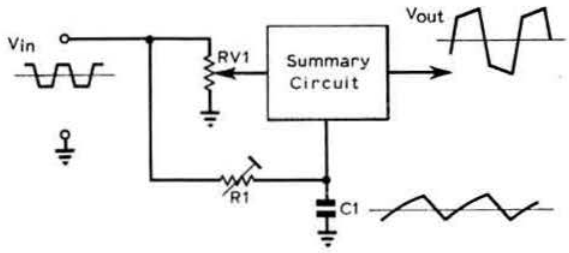


Fig 5. Principle of corrector working

RV1 potentiometer the desired amplitude relation between the two signals can be adjusted.

The undistorted envelope is produced by the elimination of the phase distortion of a network by the predistortion of the shape of the signal.

Corrector build-up

The circuit of the corrector working on the theory introduced earlier is seen in Fig 6. TR1 and TR2 are emitter followers. They allow a high input impedance, so it is possible to use a crystal microphone with the corrector. The input impedance is about 400kΩ. The low-pass filter (47kΩ and 30pF) is useful when the circuit is working in a high intensity rf field.

The amplification of TR3 may be made variable with RV2 located in the emitter circuit of the stage. At the output of TR3 there is a frequency corrector circuit (20kΩ parallel with 12nF and the input impedance of TR4). The output of TR4 is connected to the limiter. With the help of RV3 symmetrical limitation can be produced.

The limiter (D1 and D2) output feeds the integration circuit (RV4 and 2μF) through an emitter follower. TR7 and TR8 add the signals connected to their inputs.

With the help of Fig 7 it is easy to adjust the equipment.

The common collector of TR7 and TR8 feeds the filter. The response of the filter is seen in Fig 8 with the value of its components.

Finally, some parameters of the corrector:

V_{in} = 50mV (for 20dB clipping)
V_{out} = 0·8Vpp trapezoid signal
V supply = 13 to 20V
I supply = 12 to 14mA

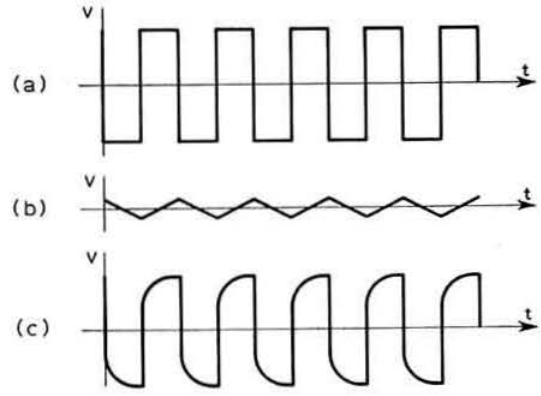


Fig 7. Shape of signals measured at different points of the corrector. Measuring frequency 300Hz, clipping factor 20dB

Modifying the transmitter for trapezoid modulation

An important warning. Do not think about the modification of the transmitter until it is running well in the conventional A3 mode!

The corrector may be connected to the input of an amplifier from where it is possible to drive the modulator fully. From this connection point it is necessary to use high value capacitors and resistors (0·1–0·2μF and 0·5–1MΩ) in the grid circuits to improve the low frequency response of the transmitter. The value of clipping is controlled by RV2.

The modulation depth control (RV6) is located at the output of the filter (Fig 8). The modulation depth may be increased with RV6 until 90–95 per cent when the modulation signal is clipped.

Carry out the modification process by the following steps:

(1) Using a frequency of 200–300Hz, take RV5 to zero so the correction signal is zero also. A trapezoid signal can be seen at the output of the corrector when the input voltage is about 200mVpp. The output level is controlled by RV6. Then take RV5 to its maximum value when the output voltage will have an integrated shape. Varying RV4 alters the character of the integrated shape.

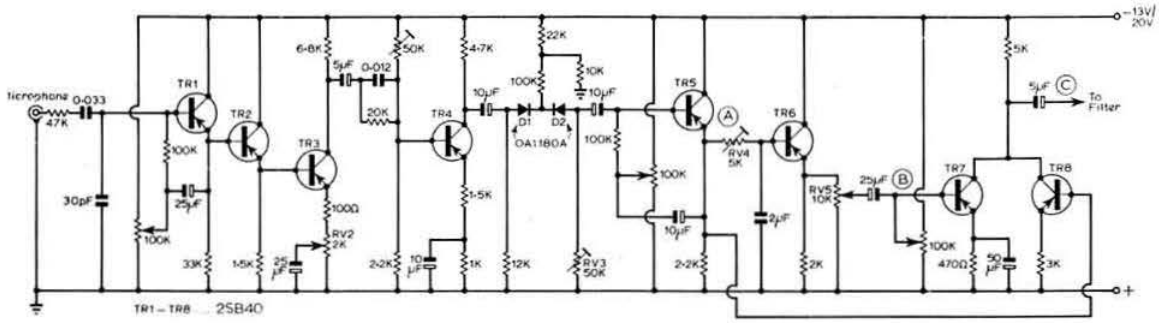


Fig 6. Circuit diagram of corrector

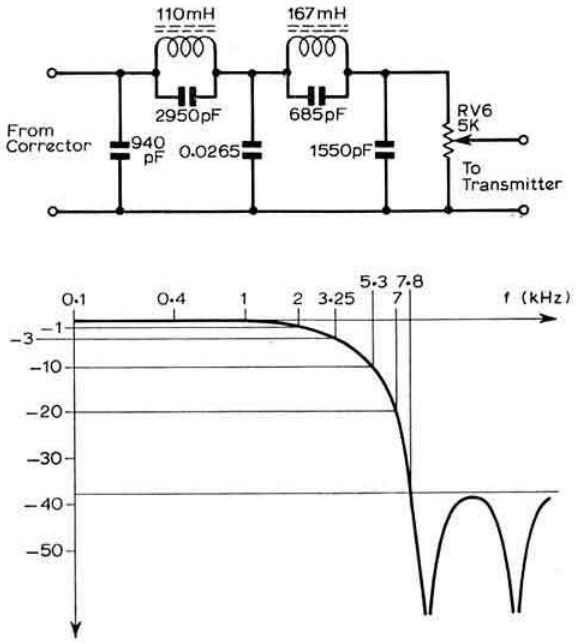


Fig 8. Low-pass filter and its character

(2) After making the previous adjustment take RV5 to the zero position and look at the shape of the signal at the modulated point. For example, at the modulated stage anode in the case of anode modulation, or at the screen for screen modulation. Naturally it is better to see the envelope of the radiated carrier.

Because of the modulator distortion, the signal at the points determined above will be of differentiated shape. After this adjust RV4 and RV5 until the output shape is the same as the original trapezoid signal. If the modulator does not produce some extremely bad phase distortion, the correction process is very simple.

(3) Finally, look at the whole frequency band up to 3·5kHz. The shape of the signal above 1kHz will be sinusoidal because the filter cuts off the harmonics of the trapezoid signal. The effect of the filter can be seen in Figs 9, 10 and 11.

If all is running well connect the microphone to the input of the unit. Speak close to the microphone (5–10cm) to overcome the background noise. If the background noise is high it is not desirable to use trapezoid modulation.

Load conditions for the transmitter

The higher sideband power comes from the various stages and power supplies of the transmitter. Under normal conditions, if the transmitter is able to run continuously with single sinusoidal tone modulation and 100 per cent modulation depth, then with trapezoid speech modulation all circuits will work without overloading.

Care should be taken when adjusting the equipment, because the trapezoid signal with continuous full modulation means heavy overloading. Power increase in the last stage of the modulator is 85 per cent and 27 per cent for the modulated stage relative to the single sinewave 100 per cent

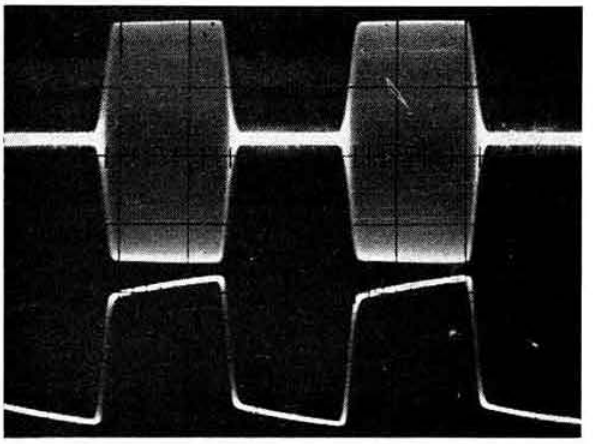


Fig 9. The predistorted modulating signal and the radiated envelope. Modulation frequency is 300Hz with 20dB clipping

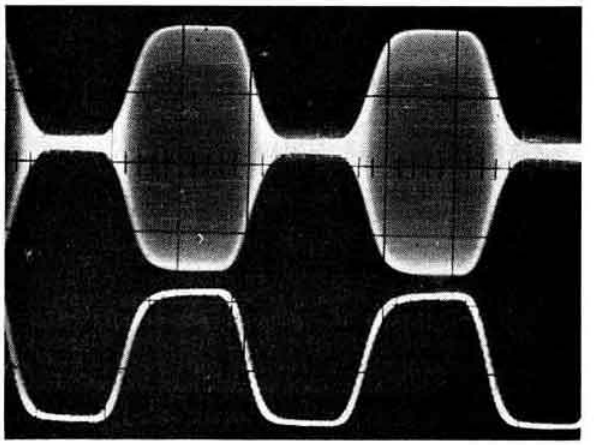


Fig 10. Modulating signal and envelope at 1kHz, 20dB clipping

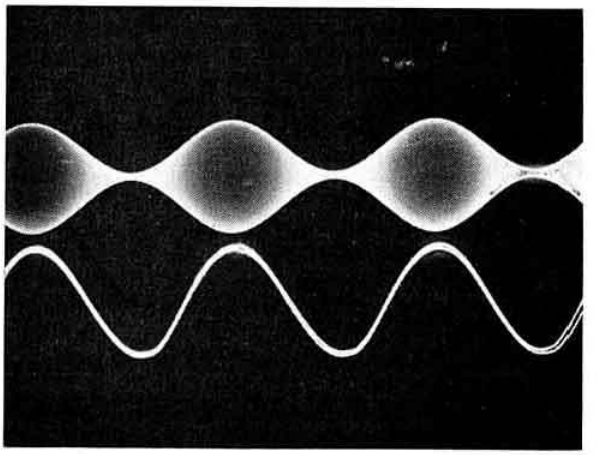


Fig 11. Modulation signal and envelope at 2kHz, 20dB clipping

modulation! During modification do not use modulation deeper than 60–65 per cent, so as to eliminate overloading.

Maximum modulation depth

Theoretically, with the use of trapezoid signals it is possible to work with 100 per cent modulation depth. This is true during testing when the modulation signal is a continuous clipped sinewave, but in practice the modulation signal is the limited speech signal. The signal at the output of the limiter has a lower frequency limit down to zero frequency (dc).

The modulator works with those amplifiers which cut off the dc components. The elimination of dc and very low frequency signals means that the output af and the envelope of the rf signal will swing (or will be modulated) by a slowly varying signal. This fact means that the trapezoid signal has not constant amplitude.

Therefore if 100 per cent modulation depth is used at any time the transmission will be overmodulated. In practice, a compromise is for the modulation index to be increased to 90–95 per cent.

Use of trapezoid signals in ssb transmitters

Processing is made on the speech signal, so the improvement is also possible with a ssb signal.

In most cases the ssb signal is generated by the filter method, so the limited speech goes through a filter which has poor amplitude and phase characteristic for minimum-shape distortion. Therefore, the signal after ssb generation will have a higher dynamic range, and the use of a moderate clipping is useful in the case of ssb transmitters, but it is better to use rf envelope clipping and filtering in ssb transmitters.

Summary

The application of speech clipping gives good results in the improvement of speech readability. The price for the improvement is the loss of the speech quality, but under poor receiving conditions this is not important. The method is not usable for the clipping of music because of the distortion introduced.

A vfo for 2m with a Pye Cambridge

by J. W. SHELLEY, G3YFZ*

THE oscillator described in this article was intended only for mobile use where stability was more important than drift; although the drift was not measured, it was very reasonable considering the frequency involved. The oscillator would therefore appear to be suitable for use on home station receivers requiring a tuning range of 133-135MHz. The Cambridge is only made tunable on receive, the transmitter oscillator remaining crystal controlled. The circuit is shown in Fig 1.

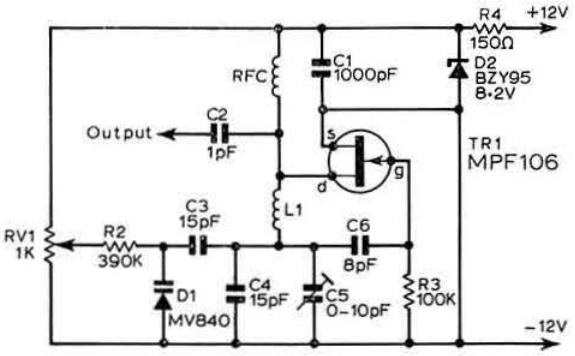


Fig 1. Circuit diagram of the oscillator

*7 Chewells Close, Haddenham, Cambridge.

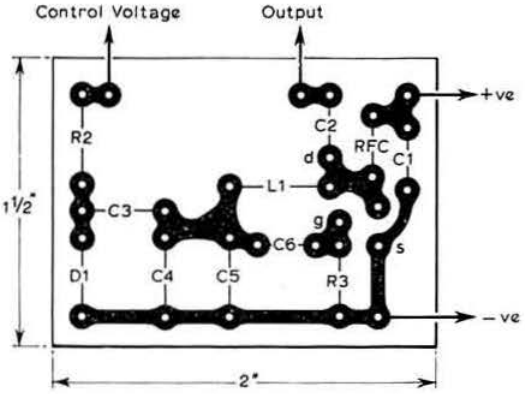


Fig 2. Layout of printed circuit board

Construction

The oscillator is constructed on a small printed circuit board shown in Fig 2, which is mounted inside a small metal box and fitted in the Cambridge in place of the multi-channel crystal positions as shown in Fig 3.

All the components are mounted on the printed circuit board inside the box except the 1kΩ linear carbon potentiometer used for tuning, R4 and the zener diode D2. Four ceramic feedthrough insulators connect the oscillator to the supply and the tuning control.

Construction is straightforward with the mechanical rigidity very much in mind, as with any vhf oscillator. The completed oscillator box is bolted to the chassis of the Cambridge by means of four 4BA nuts and bolts. The chassis will have to be drilled to accommodate the box to the individual requirements of the constructor.

The supplies to the oscillator are floating so as to allow the versatility of the Cambridge to be retained, ie use on either polarity.

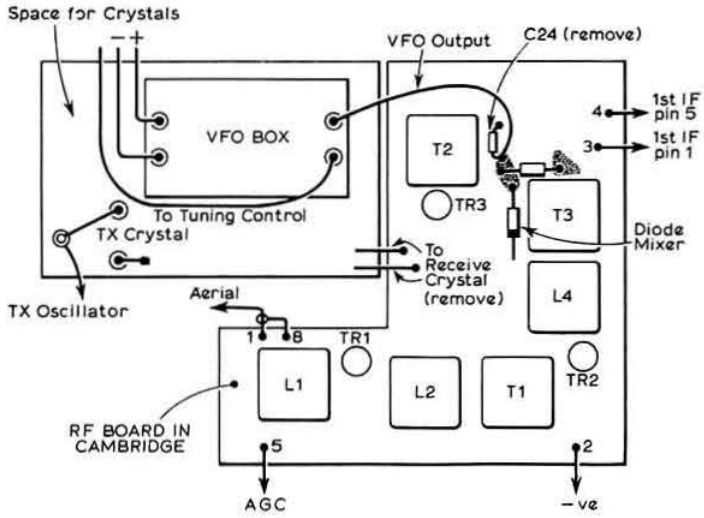


Fig 3. Positioning of the oscillator in the Cambridge

Components list

RV1	1kΩ carbon linear
R2	390kΩ carbon ¼W
R3	100kΩ carbon ¼W
R4	150Ω carbon ¼W
C1	1,000pF disc ceramic
C2	1pF silver mica
C3	15pF silver mica
C4	15pF silver mica
C5	0-10pF air-spaced
C6	8pF silver mica
TR1	MPF 106
D1	MV 840
D2	BZY 95, 8.2V
LI	2 turns of 16swg copper wire, ¼in diameter, ⅜in long
RFC	8 turns 26swg enamelled copper wire close-wound, ¼in diameter.

The 1kΩ tuning potentiometer is mounted in the channel selector switch position on the author's Cambridge but it could easily replace the panel-mounted squelch control. This would, of course, leave the receiver without any squelch control but this may be overcome by using an internal preset control.

The connection to the mixer is via C2. The original oscillator/injection capacitor C24 (see Fig 3) is removed from the printed circuit board and the output from the oscillator is connected to the mixer diode as shown in Fig 3.

The oscillator has been tried on both the dash-mounted model and the boot-mounted version and has worked well in both cases. On the boot-mounted version the tuning is achieved at the control box by using the three wires originally intended for channel changing in the multi-way control cable. Once the oscillator has been added to the boot-mounted model, it must not be used on any other control box or the zener diode will be burnt out.

The supply to the oscillator *must* be stabilized and any voltage between 5 and 18V will be satisfactory, but as most cars are 12V the zener will obviously have to be less than 12V. A voltage of 8·2V was used by the author so that the oscillator could be used with a 9V battery if the need should arise.

Conclusion

If the oscillator should fail to operate after construction, the control circuit should be disconnected by unsoldering C3 to see if the circuit is loading the oscillator. If this is the case, the value of C3 could be reduced a little. If C3 is reduced to too low a level, the tuning range will be reduced. The rfc is wound by hand and consists of eight turns of 26swg enamelled wire, ¼in diameter. The choke must not be resonant at the operating frequency, ie 133-135MHz.

The output to the mixer is via a 1pF capacitor and this value is the largest that can be used for best sensitivity.

New equipment

Heath SB-303 receiver

The latest in the range of Heathkit receivers is a solid-state design using 27 silicon transistors (including four dual-gate MOSFETS) and a pre-assembled linear master oscillator. The dial readout is 1kHz and the receiver is said to attain 100Hz stability within 10 min of switch-on. Front-end design, hitherto a problem with relatively low-cost receivers, employs transistors of dual-gate mosfet type and a new rf attenuator to provide optimum signal handling capability.

Brief details of the SB-303 are:

Frequency coverage: all bands between 3·5 and 30MHz with an additional section between 15·0 and 15·3MHz.

IF: 3·395MHz. *Modes:* cw, am, ssb and rtty.

Sensitivity: less than 0·25μV for 10dB S+N/N for ssb operation. 2·1kHz ssb filter with optional cw and a.m. filters. The ssb filter gives a bandwidth of 2·1kHz at 6dB down with a maximum of 5kHz at 60dB down. The filter is of crystal type.

Calibration: from internal unit every 25 and 100kHz.

Image rejection: 60dB or better.

IF rejection: greater than 55dB at 3·395MHz.

Cabinet dimensions: 12¼in wide by 6⅝in high by 13in deep.

Net weight: 15¼lb.

No price is yet available for this receiver, which is only now being released on to the UK market. A complete specification is available from **Heath (Gloucester) Ltd, Gloucester GL2 6EE.**

It is hoped, in due course, to publish in *Radio Communication* a complete review of this advanced-design equipment with its many interesting features.

The one-transistor wobbulator

by W. H. BOND, FRCS, G3XGP*

ONCE upon a time, before his licence arrived, G3XGP owned an AR88 which he had the wit to think required re-alining. The ensuing wrecked reception taught a lesson but also revealed that, though not essential, a wobbulator simplified rescue. The trouble was that valve variable reactance circuits were complex, and while seeking for simpler alternatives it was noted that some normally disadvantageous features of transistor oscillator circuits could be turned to benefit. The outcome was two little devices—the one-transistor wobbulators—that have earned a permanent place in the shack, for the ease and accuracy with which they permit re-alining of both rf and i.f. stages.

Every oscilloscope of any worth carries a time-base output ac or dc coupled of varying value up to 50V or more. A transistor or a diode is in one sense a voltage variable capacitor and for this reason, save in certain constant-current forms of solid-state oscillator circuits, careful stabilization of the supply voltage is essential. Marrying these observations it is obvious that the application of the saw-tooth sweep voltage from the time-base to a solid-state oscillator will result in a synchronous change in frequency because of the change in the inter-electrode capacities.

Application

Fig 1 outlines the principle of the wobbulator. Input from the wobbulator is made to the selected part of the receiver circuit; either the aerial socket, part of the rf section or the i.f. strip; and the output taken from the top of the volume control just below the rectifier diode, the agc line or the S meter, and fed to the Y amplifier of the oscilloscope.

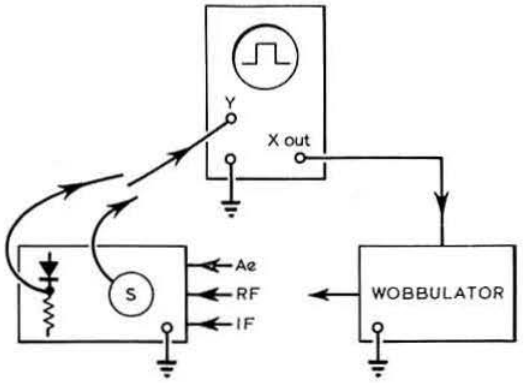


Fig 1. Wobbulator connections. Note that the trace will show low frequency to the left and high to the right, the junction capacitance diminishing with increasing voltage

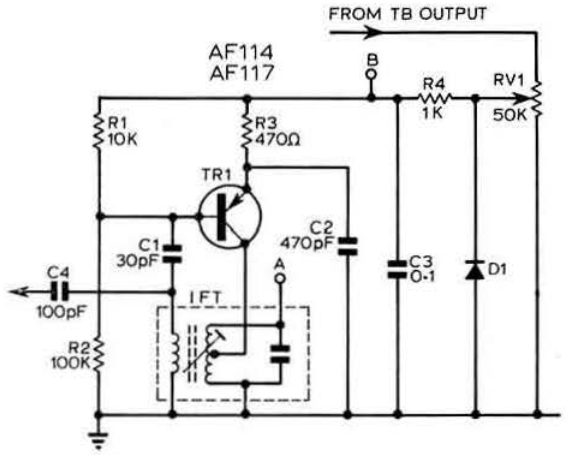


Fig 2. 455/470kHz oscillator. R1 10kΩ, R2 100kΩ, R3 470Ω, R4 1kΩ, RV1 50kΩ, C1 30pF, C2 470pF, C3 0.1μF, C4 100pF. D1 silicon junction safety diode. TR1 AF114 or 117, ift any transistor interstage i.f. transformer. Note, if oscillation does not occur connections to primary or secondary should be interchanged

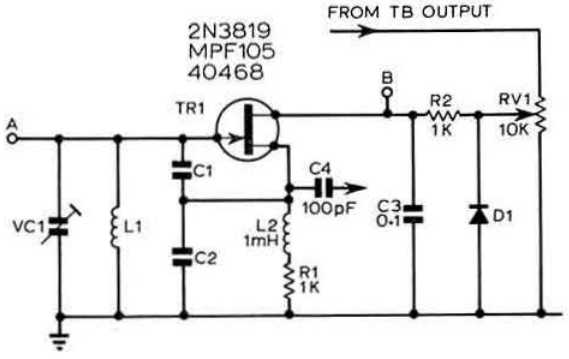


Fig 3. HF oscillator. See table 1 for values of VC1, L1, C1, C2. R1 1kΩ, R2 1kΩ, RV1 10kΩ, L2 1·0mH, C3 0·1μF, C4 100pF, D1 silicon safety diode. TR1 2N3819, MPF105, RCA 40468

* 23 Chantry Road, Moseley, Birmingham 13

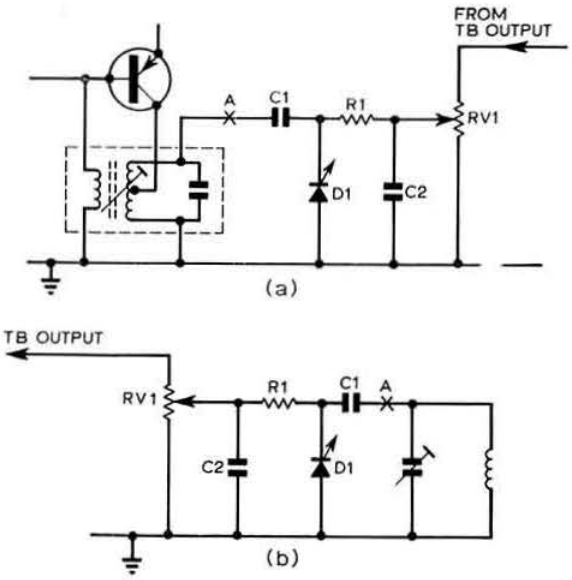


Fig 4. Varicap diode wobbulator. The additional circuit beyond point A joins A in Figs 2 and 3. R1 100kΩ, RV 50kΩ, C1, C2 0·1μF, D1 see text. Note battery supply to point B in Figs 2 and 3

The 455/470kHz oscillator shown in Fig 2 is a remarkable little circuit, for with 3V applied a 2V sine wave can be obtained for a total current consumption of 40μA. This low consumption renders it ideal for direct attachment to the time-base output. The circuit incidentally is an admirable bfo, a 250kΩ variable in the 9V supply line giving control of output, although trimmer or slug will require adjustment.

The oscillator for higher frequencies shown in Fig 3 is a simple Colpitts employing a jugfet, although a mosfet such as the RCA 40468 is possibly better. The values of capacitance and inductance are derived from RCA publication ST3520, and the values are optimized for maximum frequency shift with applied voltage, 8V moving the frequency 2000 parts per million.

Note that in neither of these two circuits is a battery supply required. This does result in a change in amplitude as well as frequency, but the resultant trace is still a very useful one. Fig 5 shows traces copied from the scope illustrating the five stages of selectivity obtained on the AR88 after re-alining. However, where the sweep voltage is too low to drive the wobbulator barefoot, the units may be given a 6V supply and frequency deviation obtained by using a reverse biassed diode, Fig 5. Pat Hawker in *Amateur*

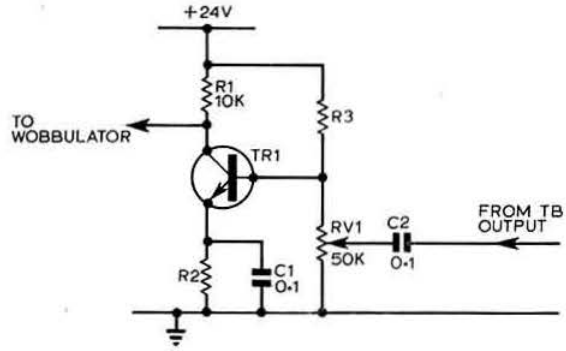


Fig 6. High output for low time-base output with separate battery. R1 1kΩ, R2 100Ω, R3 150kΩ, RV1 5kΩ, C1 100μF, Tr any silicon

Radio Techniques, 3rd edition, page 28 gives a useful list of commonplace diodes, their capacitance values and change with voltage. In practice 'XGP found that any old transistor C-B junction would do as long as it would stand the voltage. Fig 6 illustrates a technique for obtaining a voltage swing of over 20V from a low time-base output.

The construction of these devices is so simple that details are not called for, and choice of component is non-critical. The Osmor series of excellent coils has a comfortably wide range of inductances, though the plug-in Denco type may be preferred for providing easy frequency change. The transformer in the 455/470kHz oscillator was of unknown origin but suitable for the intermediate i.f. stage, and is clearly non-critical.

The frequency deviation will depend on the time-base output available, and although the circuits in Figs 2 and 3 are intriguing, being used on an old Cossor scope with a 50V sweep output, those in Fig 4 are more satisfactory. Those with interest could doubtless develop these ideas into more elegant calibrated wobbulators, and Figs 7, 8 and 9 show how a marker blip might be inserted. In Fig 7 feedback from the ift is taken through a 455kHz crystal—an AR88 crystal and a Brush Clevite transfilter have both been used successfully—via a 30pF capacitor to the base of the AF117. The crystal is shunted by a 10nF capacitor switched into circuit when a positive voltage is applied, this basic circuit being currently employed as a combined bfo and crystal oscillator. However, a bistable triggered from the time-base could be used to switch the crystal in and out of circuit, thus producing two traces on the screen, the one centred at 455kHz and the other illustrating the whole of the passband of the receiver. In Fig 8 the addition of a simple amplifier fed via a

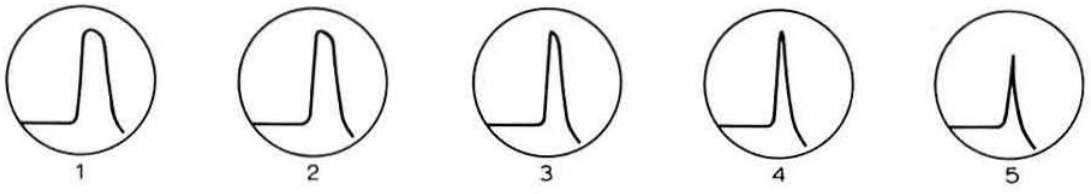


Fig 5. Illustrative traces showing five different degrees of selectivity on an AR88

crystal fed in turn from the wobbulator output directly into the Y amplifier will give a convenient marker blip at the series resonant frequency of the crystal. Possibly the suggestion in Fig 9 is the easiest to apply where the output is shunted down to deck through the crystal at resonant frequency so that a dip instead of a blip would then appear.

As is usual with 'XGP contributions, the tyro is putting into print ideas that have worked in the shack and of which the experts are fully aware, and perhaps the experts will tell where the ideas are wrong or can be improved. At the least, however, anyone with access to an oscilloscope can have a qualitative wobbulator capable of useful performance for a little thought and 10s worth of components.

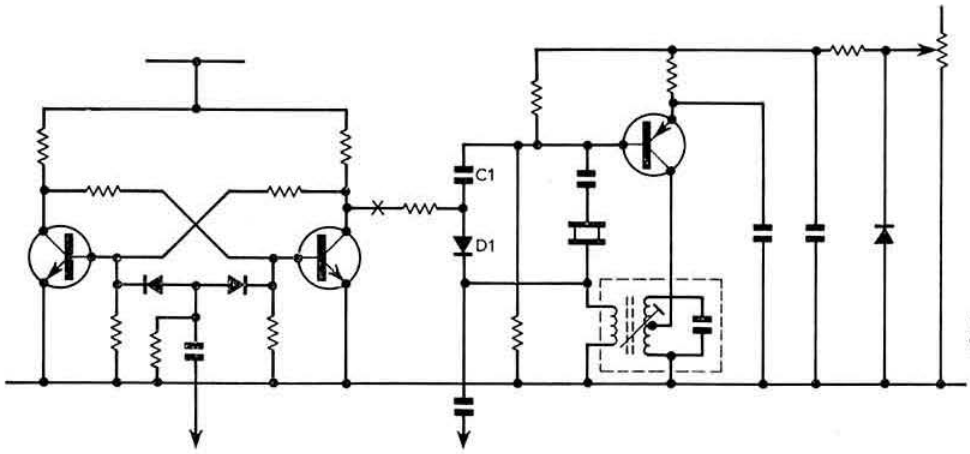


Fig 7. Alternative circuit to give calibration blips

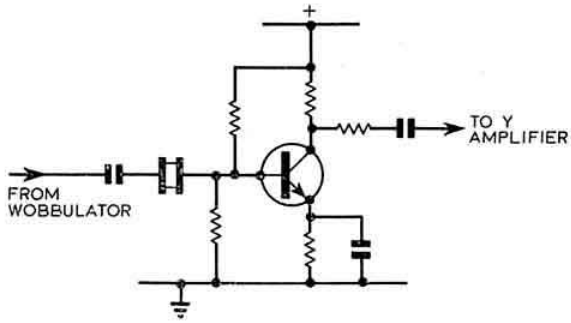


Fig 8. Alternative circuit to give calibration blips

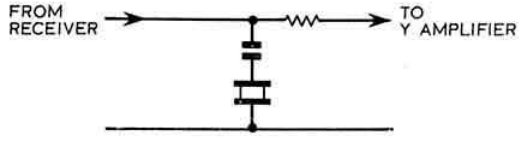


Fig 9. Alternative circuit to give calibration blips

TABLE 1

Frequency MHz	L1 (μH)	VC1	C1, C2 (pF)
1·8	10	100	1,000
3·5	5	50	680
5·0	4·2	50	470
9·0	2·0	50	330

The RSGB News Bulletin Service

Every Sunday morning the RSGB News Bulletin, GB2RS, is broadcast. This news bulletin can be received on either vhf or hf, which gives almost complete coverage of the British Isles. It keeps radio amateurs informed about the latest happenings in the world of amateur radio and gives notice of future events.

The schedule for the RSGB News Bulletin is as follows:

Time (bst)	Frequency (MHz)	Location of station
0930	3·6	SE England
1000	3·6	Severn area
	145·1	SE England (beaming N)
	145·8	Aberdeen (beaming W)
1015	145·8	Belfast
	145·8	Belfast (beaming S)
1030	3·6	N Midlands
	145·8	Aberdeen (beaming SW)
	145·3	Birmingham area (beaming NW)
1100	3·6	NW England
	145·3	Birmingham area (beaming SW)
1130	3·6	SW Scotland
	145·5	Leeds (beaming N)
1200	3·6	NE Scotland
	145·5	Leeds (beaming E)

Exhibitions—Beacons—Conventions—Contests—Local events Rallies — Scientific projects — Meetings — Licensing — Clubs Propagation reports—Lectures—Field days—Expeditions

MICROWAVES–1,000MHz and up

by Dr D. S. EVANS, G3RPE*

Polarization of signals

There is a potential polarization problem on microwaves. The current general practice on both vhf and uhf (which includes 13cm) favours horizontal polarization. On microwave bands when rectangular waveguide is used, however, vertical polarization is preferred, not apparently for any advantage or as a result of a deliberate decision, but simply because it is considered more convenient to use rectangular waveguide with its broad-face horizontal. The present situation is unsatisfactory: as both coaxial-fed and waveguide systems will eventually be used on each band, cross-polarization is likely to be a problem.

While in principle it is easy to change the polarization of signals, in practice this will become increasingly difficult as the simple equipment at present in use becomes bigger and more complicated. Furthermore, as contest working will form an increasing proportion of the operation on the bands, checking and altering the polarization of signals from contact to contact would seem an unnecessary complication.

Now, therefore, would seem to be a good time to question if polarization on the microwave bands can be standardized. The alternatives are:

(a) To use horizontal polarization on all bands whether using coaxial-fed or waveguide systems. This will have the advantage, not to be underestimated in value, of avoiding much confusion as it fits in well with general amateur practice and particularly that on the 23cm and 13cm bands. Simple multi-band feeds, such as log-periodic arrays, are practicable. A minor advantage, which may be useful if long unsupported runs are used, is that rectangular waveguide is mechanically more rigid with the broad face vertical.

(b) To use vertical polarization. It is generally considered more convenient to use waveguide broad-face horizontal, which leads to vertical polarization, and this is the orientation generally used professionally on the bench and more often than not on test equipment. If vertical polarization is to be adopted, than the question arises on which bands is this to be the preferred orientation. At present the level of activity on the 9cm to 1·5cm bands is sufficiently low to make it practical to adopt this polarization for both waveguide and coaxial-fed systems. Difficulties appear with the 23cm and 13cm bands where, in the interests of uniformity of polarization throughout the microwave bands, vertical polarization would be preferred, but horizontal polarization is well established.

(c) For the sake of completeness a third possibility may be noted: the use of different polarization on adjacent bands. This would enable multi-band feeds of another form to be constructed, but would appear to have no other advantages.

Several enthusiasts consulted agree that standardizing the polarization used needs urgent action, and they are quite happy to fall in with what other people decide, if and when they actually get around to deciding! The advantages of using horizontal polarization, mainly in eliminating confusion, seem to outweigh the slight disadvantages, in particular that of incompatability with any test equipment that is available: it seems to be a small price to pay to have to change polarization occasionally to suit the test equipment in the comfort of the shack, than to have to do the same, perhaps contact after contact, on top of a hill during a contest. A point that has not been considered is if there is a preferred polarization from a propagation point of view. Readers' views on this and the whole topic of polarization would be welcome.

Gigs, megahertz and cm

Recently a correspondent gently took the writer to task over the usage of megahertz and centimetre rather than gigahertz in describing amateur bands. International convention demands the use of megahertz up to 3,000 of them, and gigahertz at higher frequencies. One *should* remember, therefore, to change from megahertz on 13cm (sic) to gigahertz on 9cm. In less formal usage, however, "three point four" and "five point six gigs" are rather clumsy compared with "9cm" and "6cm", although it must be admitted that "ten gigs" rolls off the tongue rather well.

When it comes to precise frequencies, megahertz must surely win the day—10,006MHz is more readily grasped than 10·006GHz—and that has been learned the hard way.

The use of wavelength to describe a band is hallowed by tradition and has the advantage of brevity—when was the last time you heard anyone call "CQ 432MHz"? As is the use of frequency when being specific. On microwave frequencies, the use of wavelength has extra value in that many of the features of circuits are readily described in terms of wavelength. Thus an oscillator circuit may be described quite precisely as consisting of a $3\lambda/4$ anode cavity with $5\lambda/4$ cathode lines. This method of description has the merit of telling something of the way in which such devices are designed and work, where simple dimensions would be relatively meaningless.

It is one of the simplifying features of microwaves that a $\lambda/4$ rf choke is an rf choke at all frequencies, whereas on other bands there is no simplifying description in common use and one can only quote the appropriate number of henries for each band.

The other system used arbitrarily describes bands as, for example, S-band or Q-band. This nomenclature was designed a long time ago to confuse the enemy, and 30 years later still remains to bewilder even friends. Since it is widely used by professionals, one translation is given below.

Band designation	Frequency GHz	Band designation	Frequency GHz
L	1–2	K	18–26
S	2–4	Q	26–40
C	4–8	V	40–60
X	7–12	O	60–90
J	12–18		

* 4 Upper Sales, Chaulden, Hemel Hempstead, Herts.

FLARE-SPOT

A radio-detective story in three parts by Rev P. W. Sollom, OSB, BSc(Eng), PhD, G3BGL*

PART 2. THE GANG IS ROUNDED UP

Chapter 5. A visit to the "Rogues Gallery"

As only two suspects were "caught in the act" during the half hour in which 11 steam-train fading events occurred—as was reported in Part 1 of this story—it was necessary to cast a wide net to round up the gang. With the helpful co-operation of the Centre Superintendent of the London Air Traffic Control Centre, the official records for the period during which the Lille signal had been taped were now scrutinized. The records cover the region which extends roughly from the Irish Sea to the Dutch coast, and from Birmingham to the French coast. During the half-hour of our case there were 68 aircraft in flight somewhere in the region. Undoubtedly some of these would have a valid alibi and be just too far from the scene of the crime, but each of the 68 pictures—flight details—in the "Rogues Gallery" were examined and the alibis checked. The number of each type of aircraft investigated is given in Table 1, and in Table 2 the flight details are shown for the nine members of the gang who are now in the dock. Evidence will now be presented to show that this is the whole gang, responsible for all 11 events.

Chapter 6. The fingerprint expert

Now we call our expert witness and ask: Can you take the fingerprints of the suspects and compare them with those that were found on the tape?

Certainly! The fingerprints are completely characterized by the flight plan, and the geometry of the radio path on which they are impressed.

Table 1

AIRCRAFT IN FLIGHT 7 APRIL 1969

London Air Traffic Control Region 1345-1417gmt

Number of each type	Types of aircraft	Totals
9	707, 1-11	18
7	VISCOUNT	7
6	TRIDENT	6
5	VANGUARD	5
3	DC-8, CARAVELLE	6
2	727, 737, C-130, HERALD	8
1	720, 748, C-131, C-182, CL-44, DA-20, DC-4, DC-9, HS-125, LR-23, PA-24, T-39, TU-134, U-6, VC-10, YUK, BRITANNIA, CORONADO	18
		68

* Douai Abbey, Upper Woolhampton, Reading, RG7 5TH

Consider an aircraft at P, Fig 7. Its flight path may cross between transmitter and receiver, or beyond one or other, so we have two diagrams which are quite different at first sight, but which are really exactly similar and so are labelled with the same letters and angles—a few dotted construction lines and tilt your head a bit to the left when looking at the lower diagram to see the top diagram layout.

The velocity of the aircraft is resolved into components along the rays from the aircraft to transmitter T and receiver R. The number of wavelengths per second at which these rays are lengthened or shortened determines the shift in the observed frequency of the signal reflected by the aircraft. When the bounce-path length is changing at a certain rate, the receiver will intercept more (if path is shortening) or less (if lengthening) cycles per second than are actually transmitted. This is equivalent to a shift in frequency and is known as the Doppler effect. When the signal reflected from the aircraft beats with the ground wave of the same transmission, interference occurs and fading or beating is observed at a frequency equal to the Doppler shift.

The Doppler shift is most easily computed by a graphical method in which the route of an aircraft is plotted on a map, the points P along the route being marked (say) for every minute. At each point the angles α and β are found with a

Table 2

Flight details of selected air traffic

Event	Aircraft type	True air speed (knots)	Height FL (at†)	From	Route	To
A	1-11	440‡	150	Glasgow	Daventry, Woodley† Midhurst, Fawley	South-ampton
B	1-11	440‡	110	Glasgow	Daventry, Woodley† Midhurst, Mayfield	Gatwick
C	Viscount	260	130	Birmingham	Daventry, Woodley† Midhurst, Seaford	Paris
D	VC-10	380*	255	Brize Norton	Lyneham, Woodley† Midhurst, Worthing	Bahrain
E	Viscount	260‡	110	Jersey	Fawley, Midhurst Epsom†, Brookmans Park	Luton
F	707	380*	70	Heathrow	Epsom, Dunsfold Worthing†	Beirut
G	Coronado	380*	155	Heathrow	Epsom, Dunsfold Worthing†	Geneva
H	707	384*	70	Gatwick	Dunsfold, Woodley† Lyneham, Brecon	Shannon
J	DC-8	478	310	Rome	Lydd, Biggin Woodley†, Lyneham	New York
K	DC-8 "J" 707 "H"				approaching Woodley at Woodley	
L	VC-10 "D"				approaching Midhurst	
	Viscount "C"				at Midhurst	

* Climbing speed: aircraft was climbing at time of event
‡ Cruising speed: but aircraft was descending at time of event
FL Flight level: height in hundreds of feet (approximately)

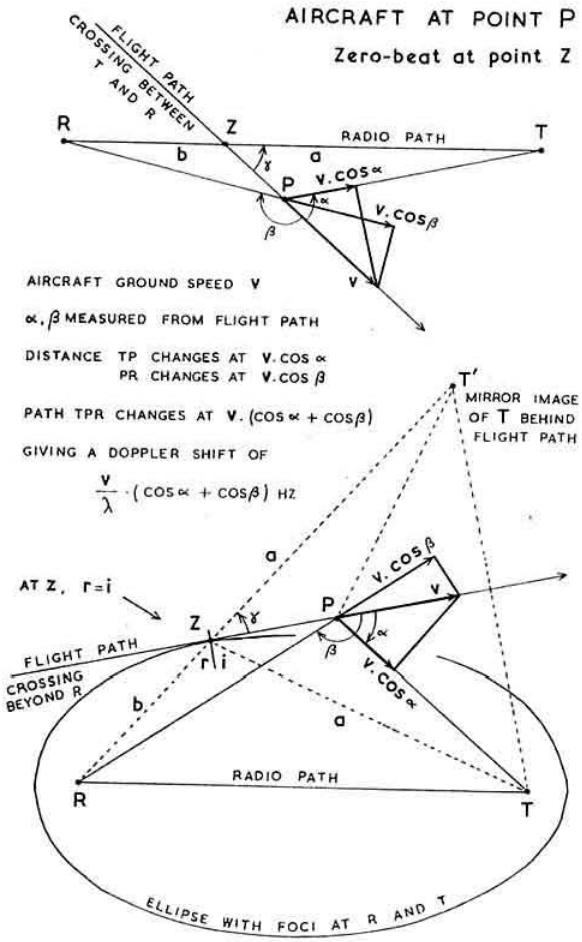


Fig 7. While the distance between a source of waves and an observer is changing, the observed frequency appears different from that transmitted. The frequency is higher if the distance is shortening, lower if lengthening. This is the Doppler effect. The difference between transmitted and received frequencies is the Doppler shift. It depends upon the rate of change of distance. The shift is zero as an aircraft crosses the path between transmitter and receiver (or "image transmitter" and receiver)

protractor, and their cosines are obtained from a slide rule or tables. The velocity V is estimated according to the flight data, allowing for the wind vector at the appropriate height. This can be obtained from the Daily Aerological Record published by the Meteorological Office. Allowance must also be made for flight manoeuvres such as climbing or descent procedures.

The rate-of-change of the Doppler shift is found theoretically by differentiating the expression for the shift. Its value in the vicinity of zero-beat is of special interest as it is a good characteristic to check first when matching fingerprints. Referring to Fig 7, at Z the angles α, $180° - \beta$ and γ are all equal. If ZT = a, and RZ = b, the slope in Hz/sec is given by $-\frac{1}{\lambda}\left(\frac{1}{a}+\frac{1}{b}\right) V^2 \sin^2 \gamma$

The negative sign means that the frequency observed at the receiver moves lower as the aircraft approaches Z, and lower still as it recedes from Z. In all this, the velocity V is assumed constant.

A particular airway crosses the radio path at a known value of the quantities a, b, and γ, so for that airway only V is characteristic of the aircraft. In practice V has only a limited range of values so the slope in Hz/sec of all traffic on that route will be similar, and the resultant steam-train events will be similar. One might hope to distinguish traffic on different airways by this characteristic, but it happens that the combined effect of a, b and γ for the Amber One (Woodley—Midhurst) and Red One (Dunsfold—Epsom) airways is very nearly the same, and so the slope does not give sufficient information in our case to match fingerprints if there is simultaneous traffic on both routes.

The situation is quite different for incoming traffic at Lydd. A maximum value for the slope can be quoted for any aircraft not exceeding Mach 1·0, and if any slope greater than this is found Lydd traffic must be acquitted. The converse is not true: small values of slope can occur with Green One traffic between Biggin and Woodley (lower diagram Fig 7) similar to those for oblique crossings near the centre of the path at Lydd. However, the complete graph of Doppler shift/time will always be unique for each flight, and will constitute a reliable fingerprint for comparison with radio interference measurements.

Chapter 7. Damning evidence

The routes of the suspected aircraft with their reporting points and some position times are given in Fig 8. The radio path is also shown. The theoretical values of Doppler shift that each aircraft would give at all points on its route have been determined as described in the last section. They are plotted as the solid line graphs in Fig 9. Also shown in that figure are the points plotted from the analysis of the tape recording. In nine cases out of eleven the fingerprints taken from the flight data match up conclusively with those from the signal analysis. So we may conclude that events "A" to "J" in Fig 2 were caused by aircraft A to J listed in Table 2.

On the evidence submitted above, the DC-8 is to be acquitted from causing a steam-train event when it crossed the radio path at Lydd at 1355gmt. It was, however, responsible for the event "J", a long section of cyclic fading without a zero beat point, starting at 1401gmt when it changed course at Biggin.

Events "K" and "L" are still to be explained. It is now suggested that these events were caused by two Doppler-shifted frequencies beating together, ie by one aircraft in collusion with another. It is further suggested that the aircraft concerned are already in the dock. The difference between the frequencies of H and J at K′ in Fig 9 changes in exactly the same way as the analysis points of event "K". In the absence of other information it was assumed that the ground wave was one of the frequencies involved in this zero beat event. Similarly, the Doppler shift curves for C and D intersect at L′ in a way that exactly explains the observed points in event "L".

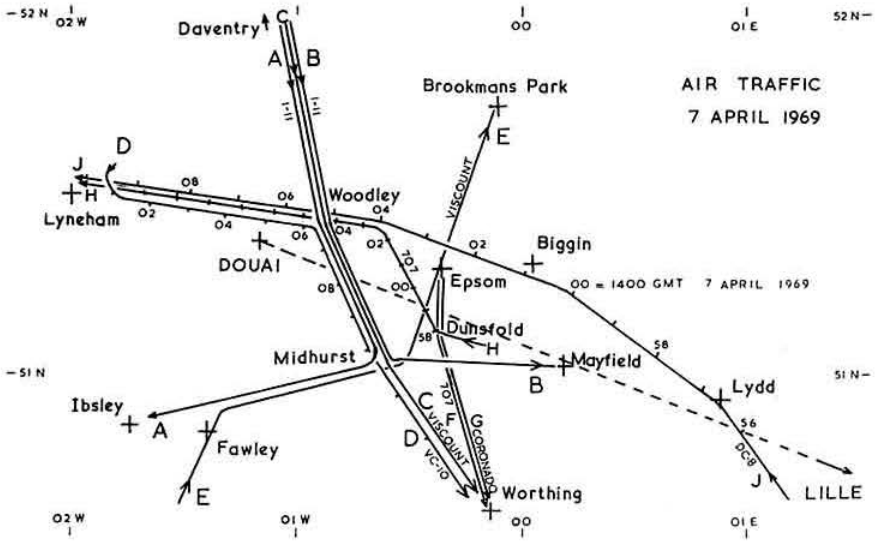


Fig 8. The fight paths of nine aircraft during the time of the signal recording as reconstructed from air traffic records. Position times are shown for three aircraft. At any position, the bearings of transmitter and receiver from the aircraft track are measured with a protractor, and the Doppler shift can then be calculated for that position. The Viscount, C, should be shown as changing direction at Midhurst to Seaford not Worthing

At the time of event "K", the DC-8 was one minute before reaching Woodley. It was rapidly overtaking a 707 which was climbing towards Lyneham having passed Woodley at 1403. Their Doppler shifts became equal at about 30Hz at this time because of their different speeds. Event "L" occurred when the VC-10, D, was catching up on the Viscount, C, near Midhurst. This was just before the Viscount changed course for Seaford which accounts for the sudden drop in its Doppler shift just afterwards.

In a beat between two aircraft reflections, the rate of change of frequency can assume a very wide range of values depending upon the flight path details. In particular, the perplexing case of zero slope can occur for an appreciable duration, ie constant frequency cyclic fading. Large values of slope can occur, as in event "K", which would have required a supersonic aircraft on any of the civil airways that cross the Lille-Douai path! It is obviously a fallacy to presume that the signal strength recorded is predominantly ground wave.

An example of spectrum analysis just after the time of zero beat in event "L" is given in Fig 10. The frequencies of C and D are so close to the ground wave that they blurred together in the time exposure in Fig 6. These two components cannot be identified separately on pen recordings or oscillograms in which only the resultant event "L" appears. The spectrum analysis completely supports the theory based on the flight data.

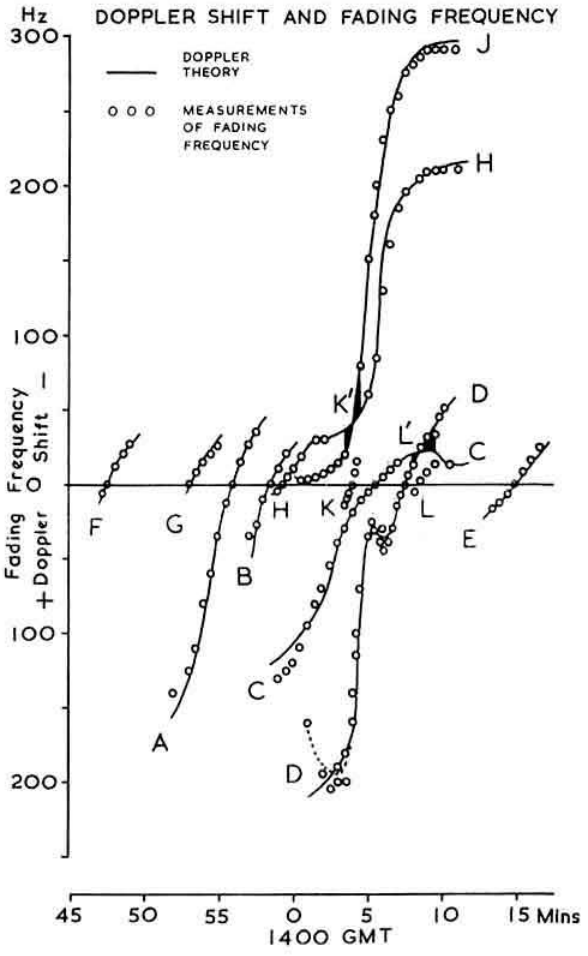


Fig 9. The Doppler shifts calculated from the air traffic data (solid lines) are plotted with reversal of sign. They correspond accurately with the points for fading-frequency derived from pen-recordings, oscillograms and spectrum analysis. No Doppler shift line corresponds with the events "K" and "L". The observed fading does, however, agree accurately with the difference (beat) between two Doppler-shifted components whose curves intersect, at K′ and L′. Aircraft D joined the airway at Lyneham and its change of course would give the dotted line

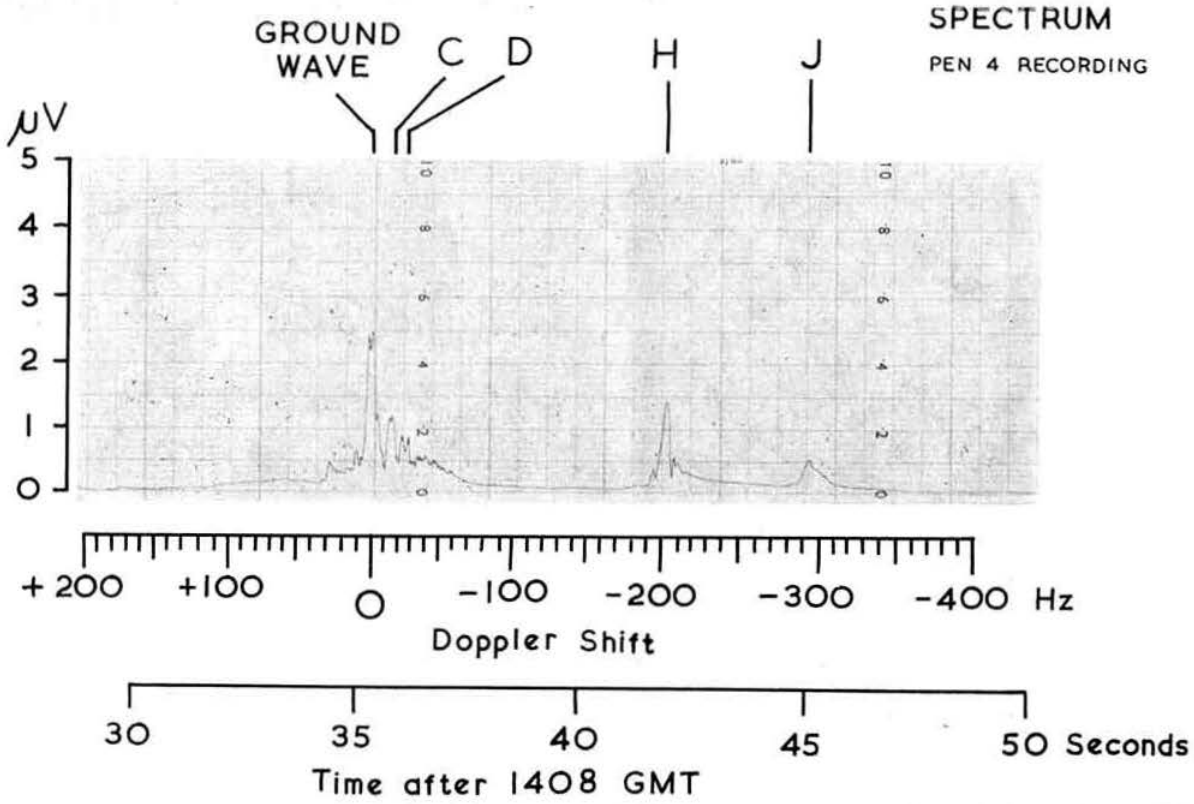


Fig 10. An example of spectrum analysis in which four Doppler-shifted frequencies are present. The equivalent bandwidth of the crystal filter is 4Hz at the slow speed replay, and is just narrow enough to distinguish the ground wave, C, and D shortly after the zero-beat of event "L". Slight ringing of the filter and some background sidebands must be ignored. The sign of the Doppler shift is reversed because of the frequency relationship of the conversion oscillators

Chapter 8. The case for the defence

The case for the prosecution abounds in loopholes, any one of which would be sufficient to introduce an element of doubt, and which together make it improbable that steam-train fading is caused by aircraft at all! I suggest that the "matching of fingerprints" has been a sheer coincidence contrived by manipulating the evidence, and that an adequate explanation of all the incidents could be found in meteorological phenomena. To be specific:

1. The aircraft are presumed to be reflecting the same transmission that is also being received by a ground wave or diffraction path. But are the aircraft being illuminated by the transmission? Is the Lille transmission not beamed elsewhere? And how about the nulls in the vertical pattern due to ground reflections? Furthermore, is it not true that Paris also radiates on 174·1MHz and could be causing the interference by random drifting across the Lille frequency?

2. Then, why pick on aircraft at the receiving end of the path? Surely ideas of reciprocity suggest that possible culprits would be found abroad?

3. Surely the "crime" of interference is not as serious in practice as has been made out. The aerial you used was only a halfwave dipole, $\frac{3}{8}\lambda$ above a ground plane, and so was deliberately "omnidirectional" and liable to receive far more interference than a typical vhf beam. Moreover, agc (or limiting in fm service) would be used to minimize the effects described.

4. It has been implied that the aircraft are responsible for the peak enhancement of the signal which sometimes occurs in the region of zero beat. Surely any enhancement is a boon, not a crime? It supposes that the normal trans-horizon propagation can be bettered by some gratuitous new mode. And should the aircraft be proved responsible, this mode could be exploited more predictably than anything meteorological.

5. It has not been emphasised enough that the assumptions made in this case presume the aircraft to be *passive* reflectors of signal—so they cannot be "responsible" in any culpable sense—unless it is a crime to be airborne at all, or to move about if they are airborne!

6. For such a precise mathematical theory as has been presented, there is far too great a latitude in the flight information for reliable results: the airlanes are 10 miles wide; the individual times of reporting can be up to a minute in error; and as for estimates of times, these might be out by several minutes. The way in which changes of direction are made are sheer guesswork, and what about the wide scope given to air traffic controllers as to the deviations they might require from the idealized airlane routing. How accurately can an aircraft six miles high tell when it is over a reporting point? Surely an aircraft does not fly down the

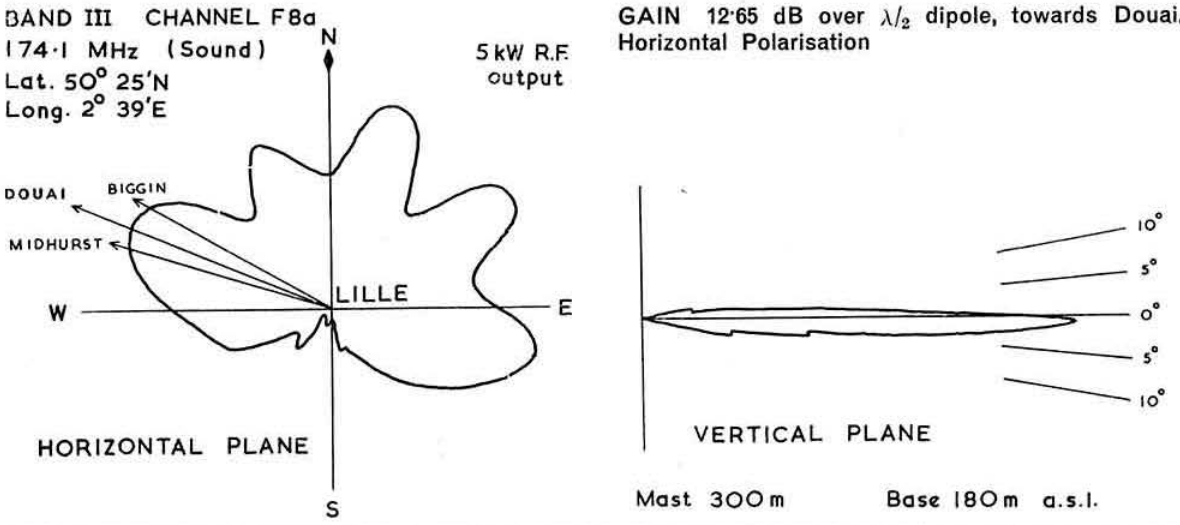


Fig 11. Polar diagrams measured by a helicopter flying around the aerial at Lille. All air traffic A to J is almost equally illuminated in the horizontal plane. A ground reflection factor must be added to the vertical plane diagram

centre of the airway when it will be quicker to cut corners or go to one side? There must be considerable conjecture as to the actual height and speed of aircraft at intermediate points between the beacons during climb or descent periods. There is possibility of error in the wind vector if the time or place of radio-sonde ascent is not near the point at which the data is applied. How have all these errors been manipulated? The agreement of measurement with theory in Fig 9 is really too good to be true.

7. If one postulates "blobs" in the lower troposphere, having reflecting properties for radio waves, would these not give Doppler-shifted signals of the kind observed when travelling at typical wind velocities near the transmitter or receiver?

8. Consider the radar equation:

$$\text{Power received} = \frac{P_t G_1 G_2 \lambda^2 \sigma}{(4\pi)^3 d_1^2 d_2^2}$$

The received signal from an aircraft should become greater as d_1 or d_2 become small—ie the nearer the aircraft is to transmitter or receiver. But the VC-10 passed within 11km of

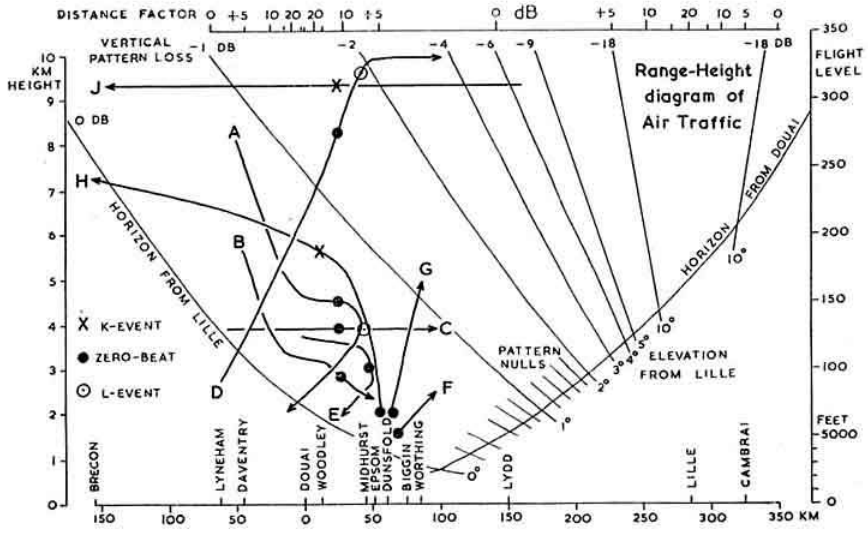


Fig 12. Some factors affecting the amplitude of the signal reflected from an aircraft due to its position in space

1. The radio horizons (for 4/3 earth radius); 2. The elevation angle from Lille (vertical pattern loss); 3. Nulls due to ground reflection (every 1/6° for smooth earth); 4. A factor depending upon the distance of the aircraft from the terminals (reference level of 0dB at mid-path)

Against this background, the profile flight paths of the nine aircraft are shown with their positions at zero-beat points

the receiver at 1404gmt without a peak in the signal, yet it is supposed to have produced the event "D" which is a major peak when at 24km range. So long as the amplitude behaviour of the signal is not explained, there is doubt as to the whole explanation so far presented.

9. And if one must pick on aircraft, why have military and test flights not been investigated?

Chapter 9. The evidence of L'Ingénieur en chef

In answer to the first point of the defence, the information given in Fig 11 was provided by the chief engineer at the Office de Radiodiffusion Télévision Française, Lille. The polar diagrams were obtained by helicopter measurements. In addition to this information he states: "Il y a un décalage de 50kHz entre les fréquences son des émetteurs de Paris et Lille", so with that separation between them there is no likelihood of beating between the Lille and Paris transmissions.

The Lille data is applied to the present case in Fig 12 in which the radio horizons for the transmitter and receiver are indicated. Nulls should occur in the vertical radiation pattern of Lille every 1/6° due to ground reflection, but cancellation of radiation in the nulls will not be complete as the transmission is beamed slightly downwards towards earth, and the direct and ground-reflected rays will not have equal amplitude. The illumination is virtually unobstructed for any aircraft above 5,000ft at Midhurst, 4,000ft at Epsom, and 13,000ft at Lyneham. The profile flight paths of all the suspects A to J are shown.

The radiation from Lille is at least 20dB down in the direction of aircraft on the Blue Three airway from Dover via St Inglevert to Cambrai. This route passes over the Lille aerial, so it is when vertically overhead that aircraft might produce a zero beat event. It is a relatively little used airway, and carried no traffic at all in either direction during the period under investigation. There is no other airway crossing the radio path between Amber Two at Lydd and Blue Three at Lille itself. The lower limit of the airspace over Lille which is visible from the receiver is 17,000ft, so the geometry is by no means reciprocal.

It will be necessary to present further evidence in answer to some of the other allegations of the defence, so the case is now adjourned for the moment.

(To be continued)

AERIALS WILD

The date: Thursday 19 November 1970 at 10am.
The place: the council chamber of the Chelmsford RDC.
Present: A Ministry inspector, two council representatives, some 30 radio amateurs and one objector.
The reason: the appeal of G3WSN and G3YDY against the refusal of the Chelmsford RDC to allow the erection of supports and aerials for vhf working.

The aerial of G3WSN comprises a 12 over 12 for 144MHz mounted on a guyed mast in the centre of the garden of a suburban house. The G3YDY aerial array consists of an 8 over 8 for 144MHz, a Parabeam for 432MHz and a 3 element for 70MHz; all mounted on a mast fixed to the rear wall of a house located in the same area as that of G3WSN.

During the course of a long morning, during which the two cases were presented and questions were asked, several points became clear. The complaints against the aerials of both amateurs stemmed from tvi, although the Inspector clearly stated at the inquiry that this factor was irrelevant and entirely outside his terms of reference. The offending aerials were basically similar to television receiving aerials, and in some cases were less conspicuous than arrays of this type in the immediate neighbourhood of the amateurs. The RDC eventually agreed that the dimensions of the amateur aerials as given in their submissions were exaggerated, and the correct, and lesser, dimensions were agreed with the Inspector.

At no time did the council give a satisfactory explanation as to why objections had been taken against the amateur radio aerials while similar aerials used for television reception had been allowed to remain undisturbed. If planning permission is required for one type then why not for all such aerials?

One objector complained of the noise of the aerial rotator, saying that the aerials were continually sweeping. The point was elaborated by the objector who stated that there was considerable activity into the small hours of the morning at the time when the Jordan fighting was taking place. Anybody claim a new 'first', the UK to Jordan on 144MHz!

As the inquiry progressed it became clear that the case for the amateurs was gaining strength and, indeed, the case for the council was at times pitifully weak. This, however, was not due to chance. The two amateurs concerned, with the assistance of a number of members of the Chelmsford ARS, had taken a great deal of time in assembling material and facts, all of which were presented clearly. A full dossier of diagrams, photographs and copies of relevant letters had been compiled and copied and it was on this factual evidence that the amateur case was presented, rather than on the unsatisfactory base of emotion. At the inquiry, Don Beattie, G3OZF, was the spokesman for both the appellants, and his performance was truly professional. Despite the traps laid for him by the council representative he conducted the cases calmly and logically. The Inspector who conducted the inquiry was strictly impartial and yet helpful to G3OZF on matters of procedure.

The writer, who attended the inquiry on behalf of the RSGB, was left with two prevailing impressions: firstly, the appalling waste of public money in inquiring into the presence of aerials similar to domestic television arrays, and secondly, the excellent documentation and presentation of the amateur case. It is to be hoped that the result of the appeal, which will be known in about two months, will be favourable.

G2BVN

TECHNICAL TOPICS

A monthly feature by PAT HAWKER, G3VA

A New Year. New resolutions; new targets; new hopes—lots of new ideas in radio communications floating around waiting for someone to get busy trying them out. Integrated circuit receivers and transceivers? Direct-conversion receivers or fully synchronous detectors for dsb operation? Miniature active aerials which could give us directional receiving arrays on mf and hf? A plethora of new techniques to think about trying—even if sometimes, as the months roll by, the experimental urge falters and we may find ourselves still plodding along with the old gear next Christmas. So, as the wall scribblers are traditionally supposed to scrawl at this time of the year, "A Happy New Year to all our regular readers". And now down to work.

Double-balanced cross-coupled mixers

The formation of double-balanced mixers and modulators by means of cross-coupled pentodes, triodes and transistors has been briefly described before in *TT*, *ART2* and *ART3*, but has perhaps never been given the emphasis which it seems to deserve. This cross-coupled approach forms the basis of the Plessey SL640 and SL641 double-balanced integrated-circuit mixers. One of the advantages of this type of circuit, over the more customary diode-quad double-balanced mixer, is that conversion gain instead of conversion loss can be achieved; another is the elimination of the need for carefully balanced transformers—with this system the input and output circuits can be those of any conventional mixer.

To re-cap on balanced mixers. Most of the balanced mixers and modulators, such as those used in ssb practice, are "single balanced"; that is to say that usually the oscillator frequency is balanced out of the output, leaving only the signal frequency and the sum-and-difference frequencies in the output circuit. In a double-balanced arrangement, both the signal frequency and the oscillator frequency are balanced out, and thus largely eliminated from the output It should also be noted that while the diode-quad ring mixer is double-balanced, several other four-diode mixer arrangements, such as the diode series and diode shunt configurations are only single-balanced. Both balanced and double-balanced arrangements can normally be expected to show better dynamic range than non-balanced mixers.

Double-balanced mixers, offering a significant rejection of both the input frequencies, have useful applications in superhet and direct-conversion receivers; in pre-mixer and heterodyne-type oscillator systems; in ssb exciters and the like. The subject of mixers both of the single-balanced diode types and cross-coupled transistors has been discussed and analysed in two recent papers by Dr J. G. Gardiner, whose work on mixers has been mentioned before in *TT*. These two papers are: "Distortion performance of single-balanced diode modulators", J. G. Gardiner and A. M. Youssif, *Proc IEE*, August 1970; and "Cross-coupled transistor mixer", D. C. Surana and J. G. Gardiner, *Proc IEE*, November 1970.

The following extract from the second of these papers is of considerable interest to amateurs: "In many applications, the single-transistor mixer fails to provide certain features of performance which are of great value in the design of communication equipment, especially receivers. Of particular importance is the property of double balance, ie high suppression of both local-oscillator and input signals at the mixer output, which is readily available in the ring-diode mixer for instance, and which prevents high-level input signals and the local oscillator from overloading subsequent stages of the receiver. The ring modulator has the disadvantage that it introduces significant conversion loss, typically 6dB (with hot-carrier diodes), but the properties of double balance and useful conversion gain can be obtained simultaneously from the two-transistor "cross-coupled" mixer of Fig 1. This circuit, while now known to many circuit designers, has received very little attention in the literature, particularly with regard to analysis of its gain, intermodulation, cross-modulation and harmonic-distortion properties when operating in the switching mode."

This paper provides a detailed theoretical analysis of the performance of the mixer shown in Fig 1, indicating how the results agree closely with experimental results at a local oscillator frequency of 8MHz and signal at 2·7MHz both at a source impedance of 50Ω with output measured at 10·7MHz. The local oscillator injection needs to be high enough to establish fully switching action in the transistors: typically from 300 to 900mV for a signal emf of the order of 20 to 80mV. Conversion gain in these conditions is about 12 to 13dB. The dc consumption is low since the transistors are cut off in the absence of local-oscillator input.

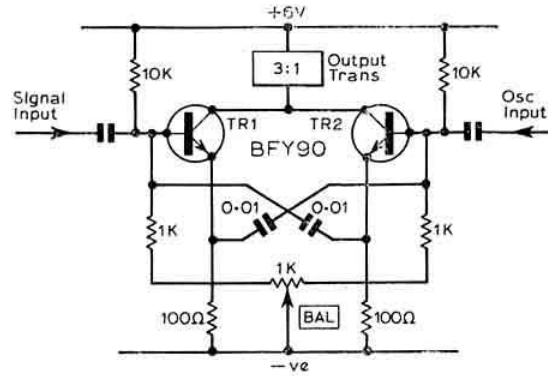


Fig 1. Cross-coupled double-balanced transistor mixer

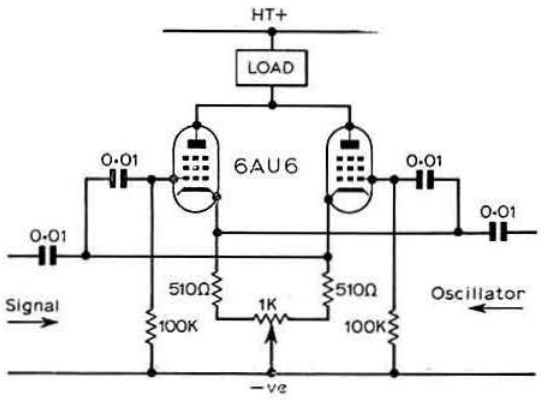


Fig 2. Cross-coupled pentode mixer—this circuit could also form a starting point for anyone experimenting with a cross-coupled fet or mosfet mixer

It looks as though considerably more use could be made of these various forms of cross-coupled mixers. One is left wondering also whether the cross-coupled technique might usefully be applied to FETs and MOSFETs, and whether these would perform more satisfactorily with low oscillator injection, or alternatively with high enough injection to put them into the switching mode: the basic pentode circuit of Fig 2 may be a useful starting point for valve or mosfet operation.

Improved bipolar vhf tuner

On the general question of MOSFETs versus bipolars for vhf front-ends, one must be careful, as we have hinted before, not to accept too readily the view that fet devices will *always* prove superior to bipolars. For example, an article in IEEE *Transactions on Broadcast Receivers* (August, 1970) by members of the semiconductor division of AEG-Telefunken shows that it is possible to design fm Band II tuners using bipolars having large signal characteristics similar to those achieved with fet devices.

The writers point out that the junction-fet has several drawbacks when used as the signal amplifier in a vhf front-end; for example, it must usually be neutralised, and its parameters are dependent to a relatively high degree on supply voltage—this can cause problems at low supply voltages.

In a discussion on how the large-signal characteristics are governed, it is noted that when a tuner is overdriven by a strong signal the noise figure is increased by the decreased amplification. Benefits are bestowed by good tuned circuit selectivity and by devices having long control characteristics. In commercial tuners the oscillator can often be influenced by a high input voltage (this is usually less important in amateur converters where an independent oscillator chain is often used instead of the combined mixer/oscillator often found in broadcast receiver practice). The other main problem is the generation of spurious responses, and it is suggested that grounded-base circuits should be used in conjunction with devices having a current amplification factor in this configuration which is as constant as possible up to 10mA collector current, with a noise figure less than 4dB at 5mA collector current. A transistor to this specification, the BF314, has been developed, and the paper outlines a vhf tuner using one of these in the rf stage.

Reciprocal mixing

A term new to me turned up recently in an IERE lecture by B. M. Sosin of The Marconi Company on the design of hf solid-state communications receivers with particular reference to the design philosophy of the advanced H2900 receivers (see *TT*, February 1970). This was *reciprocal mixing* and it soon turned out that this term was being used to cover the effect of signal and local oscillator noise sidebands. This is the important limitation to adjacent channel performance as discussed in *TT* (April/May 1968 and on several other occasions), in *ART*, and also by Barry Priestley, G3JGO, in "Oscillator noise and its effect on receiver performance" in *Radio Communication* July 1970.

B. M. Sosin, in his lecture notes, writes: "Only relatively recently has a phenomenon called reciprocal mixing been appreciated. In superhet receivers the radio frequency is converted to intermediate frequencies in various mixers. Under normal conditions incoming signals are mixed with locally generated heterodyne signals. However, no signal is noise free. When a large interfering signal appears at the mixer it will also mix with the noise of the heterodyne, and although the interfering signal may not fall in the i.f. band, the noise so produced may be in-band. This is called *reciprocal mixing* and is measured by the amount of noise introduced into the output by this phenomenon, ie when level (dB μV) of interference signal spaced 20kHz away from wanted signal produces a reduction of signal-to-noise ratio by 10dB. It is possible to consider reciprocal mixing as an equivalent path by-passing the i.f. filtering. . . . It is evident that only a receiver with a high figure of reciprocal mixing will perform well. Some 70dB reciprocal mixing will introduce severe limitations on receiver performance. It is of interest to note that only very few receivers have this parameter better than 70dB, and many considerably worse. Such a receiver will appear very noisy indeed under operating conditions, and an operator will confuse this with the receiver having a high noise factor, when in fact this may not at all be the case."

This is thus further evidence that the question of the generation of noise sidebands in oscillators (both receive and transmit) has considerable practical significance even if most of the standard textbooks have not yet caught up with this concept.

Intermodulation responses

Another term which we find still causes some confusion is *intermodulation* as it applies to receivers, although its application to ssb exciters is more often grasped. Unwanted intermodulation products in receivers refers to the in-band signals which may be generated by the interaction (mixing) of two strong out-of-band signals. Unlike *cross-modulation* (where there may be no special frequency relationship between an interfering signal and the wanted signal) intermodulation difficulties arise from specific frequency products. Sosin, for instance, points out that when a number of strong signals are present at the input to a receiver, they mix with each other if there are any non-linearities in either the amplifying or frequency-conversion devices. This again, as with reciprocal mixing, can have a profound effect on the performance of even a high-grade receiver. The first approach to reducing

the problem is to increase linearity of the mixer and rf stages—but equally important, in practice, is the provision of good rf selectivity before the mixer. This is one reason why broadband front-ends impose almost impossible demands on linearity. Sosin notes that many hf receivers do not have good linearity and to make them operate satisfactorily under present-day conditions considerably better input tuned circuits are required. It is worth mentioning again the unusual three-pole tuned band-pass filter of W0IYH (*TT*, October 1970) as providing possibly the most effective practical selectivity in a single stage. An alternative is the use of two band-pass double-tuned filters, one in the rf stage, another in the input to the mixer—a system of this type has been suggested recently by Philip Hay-Heddle, BRS31995, and has also been used in several hf converter designs. The importance of intermodulation products in product detectors was underlined (*TT*, December 1968 and *ART*3) by G3JGO.

In considering intermodulation problems the following definitions may be found helpful:

Intermodulation response is the measure of the ability to inhibit the generation of in-band signals caused by the presence of two or more signals at unwanted frequencies. Intermodulation response is expressed in terms of the ratio in decibels of the levels of two unwanted signals of equal amplitude to the level of a wanted signal which when applied simultaneously at the input of the receiver will cause the snd/nd ratio due to the wanted signal alone to fall to a specified level. Intermodulation products can be derived from an almost infinite series of frequency combinations. The most serious products are those corresponding to the receiver i.f. and the tuned frequency. In practice the most important IPs are those produced by third order non-linearity.

Batteries

The economic powering of transistor receivers and transmitters from batteries calls for some awareness—as we have indicated several times in the past—of what currents can, and cannot, be drawn from dry cells. Our excuse for bringing up this subject again is that a long survey article, "Batteries and Fuel Cells", by M. Barak, has been published recently in *IEE Reviews*, Vol. 117, August 1970. This provides a mass of information on all types of primary and secondary cells as well as a discussion on the prospects for the more exotic types of cells that at present are very expensive. Among other topics, it again underlines the advantages of using high-performance dry batteries in applications where the current drawn is substantial. Although the HP ranges usually have the same dimensions as the U2, LPU2 and SP2, at high wattage they have endurances, in watt-hours, from four to 18 times as great. Whereas standard cells can be expected to provide 500mA for only 18 minutes to a final voltage of 1·0V per cell, a battery of HP cells should give this power for some three hours continuously. Fig 3, from this paper, represents a situation more likely to be met in practice: it gives a comparison of cells discharged for two hours per day through a 3Ω load.

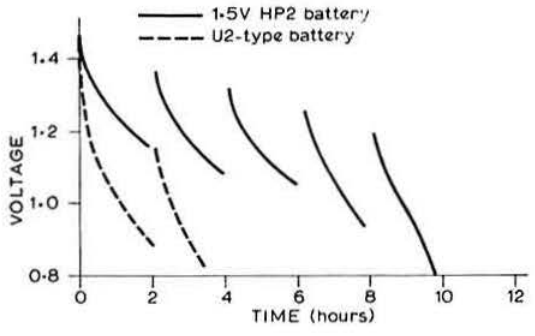


Fig 3. Performance curves of standard U2 and high-performance HP2 cells discharged through 3Ω load. Full line is the HP2 cells, dashed line is for the standard U2. The graph indicates the terminal voltage during discharge for two hours per day

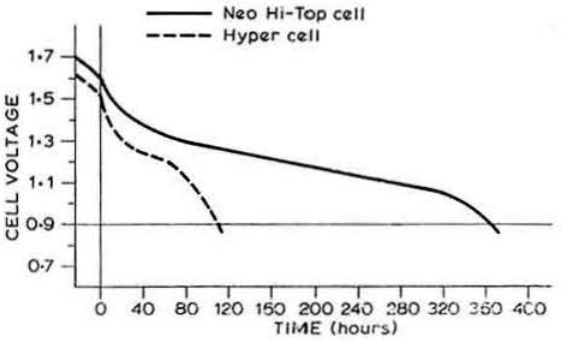


Fig 4. Comparison of the performance of two types of Japanese dry cells. Full line shows that of the Neo Hi-Top type of cell; dashed line is the standard Hyper cell of similar size. Curves are taken using the cells operating a radio receiver requiring 25-80mA for four hours each day

It is also noted that similar developments have taken place in Japan. Fig 4 shows the comparative performance of Standard Hyper and Neo Hi-Top cells when used to operate a radio receiver requiring 25–80mA over periods of four hours per day. While the Hyper falls to 0·9V per cell after 115 hours operation, the Hi-Top cell clocks up 3·2 times this figure (368 hours). The extra cost of the improved cells is thus recovered in situations where appreciable power is being drawn from the cells.

Continuous stand-by power source

In *TT* (October 1963, see also *ART*), we presented a mains/battery power supply suggested by Sven Weber, G8ACC/ex-G3SFW/T, in which a miniature 12V accumulator was permanently "floated" across the output of the 12V power pack to reduce ripple and transient voltages. A rather different application of a basically similar approach turned up recently in *Electronic Design* (1 September 1970) by G. N. Sharma and G. N. Acharya. A 12V battery in this arrangement forms a permanently available instantaneous "no-break" emergency supply for the equipment, which could be a receiver monitoring an important channel, and which is normally operated from a mains battery eliminator. This involves two diode switches: D1 and D2 in Fig 5. With the receiver operating normally from the mains supply, D2 is reverse-biased, and there is no drain from the battery. Should the mains output suddenly fall, then D2 becomes forward biased to connect the battery while D1 now prevents discharge through the power supply which should

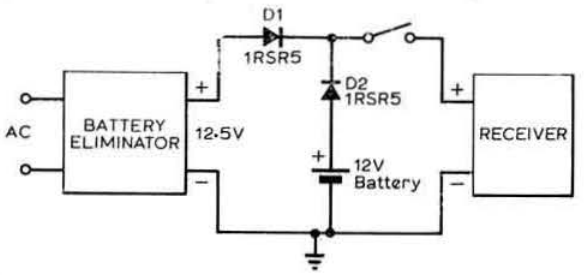


Fig 5. This arrangement provides a "no-break" emergency supply switching the battery into use automatically in the absence of output from the mains battery eliminator. The diodes(types non-critical provided they carry required current) prevent battery drain except to receiver

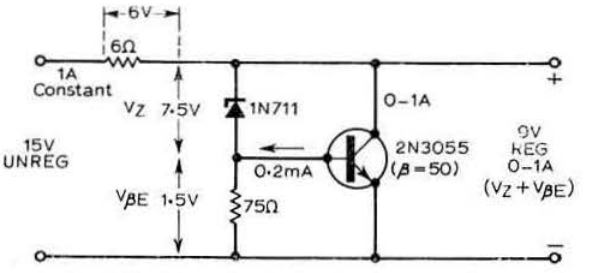


Fig 6. Simple shunt regulator as high-power zener diode simulator

have an output voltage about 0·5V or so above the battery voltage.

Amplified zener

C. J. Ulrick in *Electronics World* (September 1970) notes that while 400mW and 1W zener diodes are inexpensive, this does not apply where a 10 or 50W rating is required. He notes, however, that a useful alternative exists in the form of a small zener plus a low-cost power transistor. This simulates a high-power zener by forming a simple shunt regulator as in Fig 6. While he provides design data and several alternative arrangements, the details shown in the diagram may give an idea of how to use the system. It indicates, of course, that shunt regulation does mean that one is constantly drawing some 15W from the power source no matter how little output is being taken; on the other hand the shunt regulated supply can be safely short-circuited with an immunity to damage seldom provided in series regulated arrangements.

Parametric-mode frequency multipliers

Some years ago (*TT*, July 1965, *ART2* and *ART3*) we gave some information on a technique called "transistor-parametric-mode" (tpm) which allowed transistors to be used for power amplification at frequencies well above those for which the devices would normally be expected to operate. This system aroused interest in both professional and amateur circles at the time, and its application in conjunction with "overlay" transistors was promoted by RCA. But, to be honest, we have heard little about tpm for some time.

However, a new lease of life may be given by some new work at 800MHz reported in *Proc. IEEE* (September 1970) by two TRW Systems engineers. Their letter suggests that, with certain selected samples of 2N2857, 2N3880 and MT601 transistors it is possible to build low-power but high-gain frequency multipliers: for example a times-five multiplier with a gain of 9dB at an input of 2mW, while even a times-nine multiplier can have a 5·5dB gain. Such circuits might well have useful application in oscillator chains for uhf converters. It is suggested that the "excellent gains, frequency multiplications and stabilities achieved with transistor parametric frequency multiplication have indicated that this technique is reliable for high-performance applications and that a good future exists for vhf-uhf transistors made especially for the parametric effect". The main difference from normal frequency multipliers is the inclusion, in the base circuit, of one, two or three idler circuits. Fig 7 shows the experimental circuit described in *Proc IEEE*.

Transequatorial, auroral and propagation miscellanea

In the recent review of the Japanese study of tropospheric propagation (*TT*, October 1970), we attempted to sketch in very briefly a little of the background to the amateur discovery of this mode of long-distance propagation. In doing so there was space for only a few highlights—so that a lot of valuable work was omitted altogether. Oliver P. Ferrell, now editor of *Popular Electronics*, has helped to put the historical significance of TE in its proper perspective. He writes:

"The first scientific notice of this radio amateur discovery appeared in the British publication, *Nature*, Vol 167, page 811 of 19 May, 1951, in my letter 'Enhanced trans-equatorial propagation following geomagnetic storms'. Several weeks

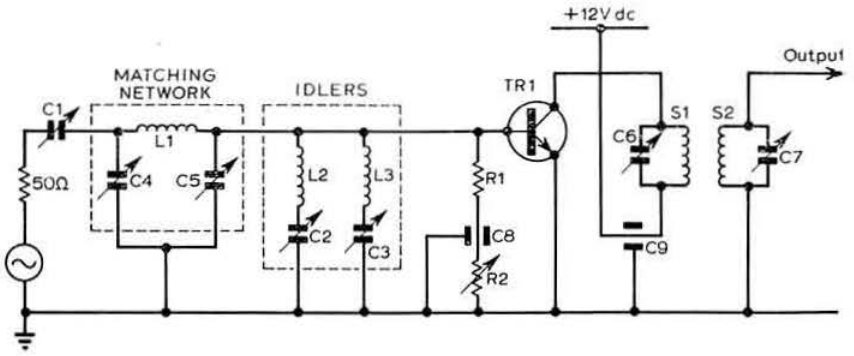


Fig 7. Parametric-mode high-gain transistor frequency multiplier circuit with output on 800MHz. C1, 2, 3, 4, 6, 7—0·8–10pF; C5—0·4–6pF; C8, C9—1,000pF; L1—10 turns No 30, ¼in id; L2—2 turns as L1; L3—3 turns as L1; S1, S2—capacitively tuned resonant strips, 1·6cm long by 0·56 cm wide; R1—2kΩ; R2—1–10kΩ; TR1—2N2857.

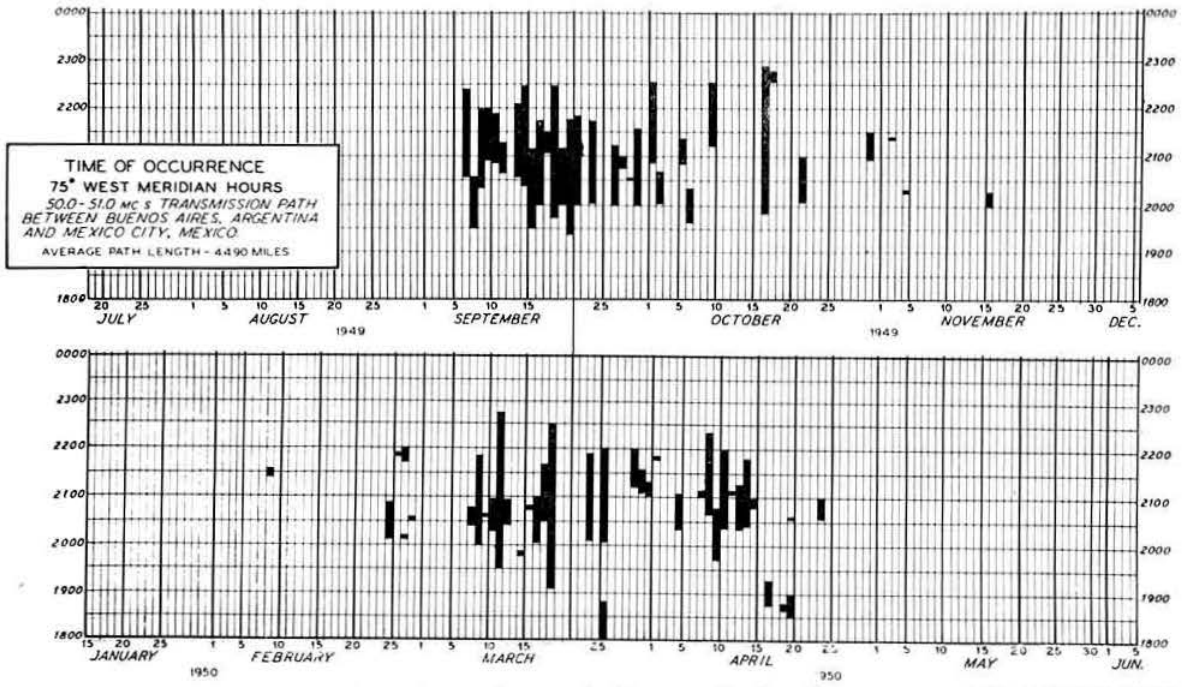


Fig 8. Some of the original amateur observations on transequatorial propagation from the paper presented by Oliver P. Ferrell in 1951 based on the path between Buenos Aires and Mexico City, and showing the concentration of openings around the equinoxes

earlier I had given a paper at the Washington, DC, meeting of URSI titled 'Very high frequency propagation in the equatorial region' (abstracted in *Proc IRE*, June 1951, p719). The Washington paper gave the scientific community a chance to comment on this radio amateur discovery and from that point you will find a gradual build-up of intense interest."

Oliver Ferrell has sent along Fig 8 which is reproduced from one of the slides used in the Washington paper and which I do not think has ever been published here before. The information shown was obtained from the participating radio amateurs in the three-year, 50MHz data gathering project subsidized by the USA Air Force, of which he was project supervisor. I am glad to draw attention to this early sustained work in this field; it is also interesting that the openings recorded in the 1950 era have much in common with the detailed charts of openings in the recent Japanese paper.

An interesting (and entertaining) survey of almost 50 years of hf propagation study was given recently in the 6th Appleton lecture of the IEE by G. Millington. He noted that in the early days these frequencies were 'thought useless' and given over to the amateurs who then soon showed they could be used to "communicate over great distances". He told a number of stories of the great T. L. Eckersley and K. W. Tremellen, who developed the still-used technique of using two control points 2,000km from the two stations to predict the possibility of communication. He also noted that while much propagation study in the post-war period has shifted away from hf, the challenge of the medium remains. Recent work has indicated that the structure of the ionosphere is much more complex than was first imagined and that transitory ducts allow hf communication "though it is not certain whether these will prove an asset or a liability" (to professional communicators). He noted that if frequencies around 40MHz had not been allocated to television they might have been used for long-distance communication. Certainly, recent work of the CCIR is underlining the opportunities for amateurs to make dx contacts well above the "classical muf", if I might add a comment to this lecture.

Yet another item on propagation having significance to amateurs turned up in *Electronics & Power*, December 1970, in an article on radar meteorology by Dr Eric Eastwood. He discusses auroral phenomena in some detail, but the following quotation may be of particular interest to uhf operators: "Metric wavelengths were used in the first auroral radars, as it appeared likely that the electron densities would only reflect waves with frequencies in the tens to hundreds of megahertz range. *We now know that very active auroras can reflect microwaves* (1,000 to 3,000MHz) . . ." Here then is the possibility of auroral contacts on bands much higher than those with which one normally associates such operation.

Suppressed zero voltmeter

A need frequently arises for a voltmeter that will indicate relatively small changes of potential around some fixed reference point, and this has led to the development of many types of meters having an expanded scale for a limited range, without attempting to cover the full scale down to zero. A two-fet unit of this type, with high input impedance, has been described in *Electronic Design* (11 October, 1970) by J. Agnew: see Fig 9. This unit consists of a differential dc voltmeter formed by connecting the two 2N3819 FETS back to back. The low end of the range is adjusted by R1,

the high end by R2. A push-to-read switch is needed since with no input or with voltages above or below the range, the needle will peg either up or down scale. The meter-zero potentiometer corrects for any minor differences in components. The original meter was developed to cover the range 1·35 to 1·6V in order to measure the voltage of mercury cells, but of course there could be many other applications, in which small variations around a fixed voltage need to be observed. The unit can be calibrated by reference to a standard voltmeter, preferably a laboratory digital voltmeter.

Proportional temperature control

Small crystal ovens have been turning up recently on the surplus market, and the idea of running oscillators (more especially VFOs) in a controlled temperature chamber has some appeal—although it should be noted that the higher the temperature the greater will be the oscillator noise (a consideration which led the Marconi designers of the H2900 to put their LC oscillator and the crystal oscillators in a substantial aluminium block having considerable thermal lag). But if you do want to use thermal control, then a very precise control can be achieved electronically by the arrangement of Fig 10. This circuit is suggested by William Ress in *Electronic Design* (13 September, 1970) as being low-cost and precise. It is claimed that it will hold a small heated chamber at 60 ± 0·1°C over an ambient temperature range of −20 to + 50°C. By selecting an appropriate thermistor and heating element, the controlled temperature can be varied from about 40° to 80°. Close temperature control is achieved through the use of high-gain dc feedback with a transistor (TR3) varying the current through the heater element. The circuit was developed for use with a low-cost Watlow silicon-rubber heater pad, 1in wide by 3in long and maximum dissipation 6W (maximum input power for the controller is 6·6W and nominal power to maintain a typical oven is given as 3·6W). While British constructors will probably not want to use identical components, it is felt that a proportional control circuit may well prove of use in other applications.

Quite a number of amateurs turned up for the recent IERE talk by J. R. Brinkley on "12·5kHz channel spacing in the 420–516MHz band" (attracted in the first place, no doubt, by the provocative title). But, in the event, the controversial

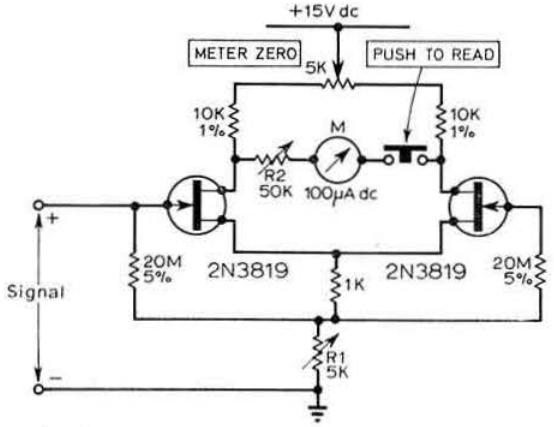


Fig 9. Suppressed-zero voltmeter using two FETs

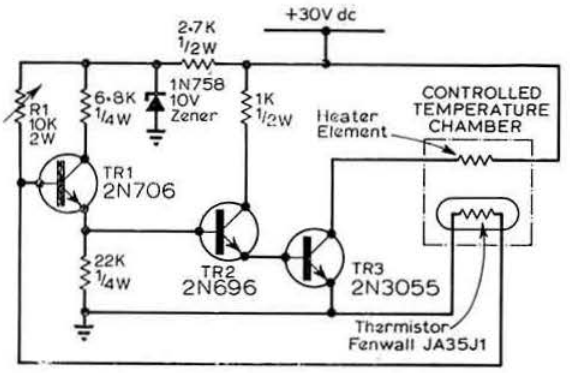


Fig 10. Circuit diagram of unit providing proportional control of oven temperature by using a thermistor sensor and high-gain amplifier

aspects of frequency allocations were kept fairly subdued. Technically, it was interesting to note John Brinkley's comments on the good performance of crystals in miniature all-glass holders. (*TT*, August 1963) particularly in respect of low ageing drift. He also commented on the good performance of miniature monolithic hf bandpass crystal filters (*TT*, July 1968) small enough to allow them to be used in hand-held personal radios as well as in commercial mobile equipment.

Slow-scan tv activity

In *TT* (February and April 1970) we drew attention to the lack of facilities for British hf slow-scan television and facsimile transmission. It was, therefore, with considerable pleasure that we were able to report recently (*Wireless World*, January 1971) that at least one amateur (Robert Skegg, G3ZGO and G6ADJ/T, 18 Eastbourne Avenue, Acton, London W3 6JN) has obtained from the MPT an sstv permit covering 14 and 144MHz. On 21 November, nine days after receiving his permit, he made what may have been the first-ever British two-way international sstv contact with SV1AB of Athens on 14·23MHz. He has the problem that his hf rig is only an HW32 with a loft dipole so that his chances of good sstv contacts with the United States and New Zealand (where there is considerable sstv activity) are not too bright. He is anxious to get in touch with anyone having sstv transmission experience and also to try a rig having more effective radiated power.

Here and there

This month we have concentrated mainly on items stemming from professional rather than amateur sources. It is clearly part of the job of *TT* to keep an eye on what is going on regardless of who is doing it—always supposing that this activity seems to have relevance to amateur radio. But it does mean that we still have several letters and ideas held over—and our apologies to the writers concerned. May I take this opportunity of thanking the many readers who send in suggestions, and also to admit that, in the reverse direction, my replies to correspondents seeking information tend to be highly erratic. On this point, I can plead only that a busy existence means that these enquiries have to be given a low priority if *TT* is to come out each month.

FOUR METRES AND DOWN

A monthly account of vhf news compiled by JACK HUM, G5UM*

Starting point

What of "Seventy" during '71? Will "Four" be filled with the tearing noise of Tone A as Aurora takes the metre-wave stage? And who on "Two" will achieve the most alliterative callsign of all, G8GGG? He will probably be with us before 1971 is out. As for 1,296MHz and up, it is safe to bet that the so-called "difficulties" of this frequency area will fall into perspective by the time the new G3RPE microwave feature in *Radio Communication* has made its full impact. Difficulties always do; there was a time when "Two" was looked upon as too tough to tackle, and from what we hear, sections of the hf band fraternity still think that way, even with the example of a couple of thousand Class B men to persuade them otherwise.

The hope for '71 will be that it turns out to be as good as 1970 in respect of anomalous propagation. There were opportunities in plenty last year for the newer comer to vhf to learn how to relate weather portents with what was likely to happen on the bands, even though the subtler variations may have escaped him.

For example, those stretches of golden days when "everything was wide open" on all bands from "Four" to 23cm could have given cause to conclude that this is the way it always is when the pressure goes high. Not at all. Mike Walters, G3JVL, offers the reminder that tropo does not necessarily react on the 2m band in the same way that it affects, say, 4m. He says: "Tropo ducting can be likened to a waveguide with a lower frequency cut-off, unlike Es or normal ionospheric propagation. Good evidence was furnished in the September openings during the later days of which 70cm was well open with 2m being left out."

The corollary is obvious: to make the most of available openings it is important to be equipped for as many metre-wave bands as possible.

* * *

Last year's many openings were reflected in the increase in applications for Four Metres and Down Certificate Awards. In 1969 a total of 73 (yes!) certificates was issued. In 1970 this figure had been overtaken by early November.

And of course 1970 was significant for the issue of the first-ever Supreme Award. Perhaps the QSLs in the pipeline between last year and this will enable somebody somewhere to put in a claim for Supreme Award No 2 before the year is out.

* * *

It does not do to emphasize too much the dx delights of vhf/uhf, remembering that for most of the time the operative word is *not* "anomalous" when talking about radio propagation in this spectrum. What we do with our bands under the much more common "normal" conditions is something that calls for constant attention if the amateur service at vhf is to be worth its salt—*and seen to be worth its salt*. For there is far more to do than most of us have man-hours for. If any one has time on his hands after tackling telegraphy, television and teletype, not to mention spot-channel net operation with a.m., sideband or nbfm (or the lot), not forgetting that a net is only a net if it *is* co-channel, then there is always the contests calendar to turn to.

So let us turn to it now, with a word or two from G3JKY, who has done so much in the last five years as a member of the VHF Contests Committee to enliven the competitive scene.

"No startling changes . . ."

"We of the VHF Contests Committee have been discussing the General Rules for 1971. There are no startling changes: just a few clarifications," says G3JKY—and how the General Rules look this year may be seen from the page devoted to them elsewhere in this issue. It will be no bad thing if every intending contestant studies them in detail to avoid the possibility of disqualification for some quite unwitting default, such as, 'JKY tells us, the odd contestant here and there (and odd seems to be the appropriate word) who persists in sending his contest entry to RSGB Headquarters oblivious of the fact that the address of the adjudicator for each event is unequivocally given in *Radio Communication*.

"We on the committee assume that, since it is quite clear in the General Rules, in the individual contest rules and on the cover sheet that entries are to be sent to the adjudicator, anyone who does otherwise hasn't read *any* of the rules!" This is G3JKY's final comment.

So far as innovations in 1971 are concerned it looks as if the two-band event embracing 144 and 432MHz within one contest and successfully tried in November, will find a place in the calendar this year. Even newer will be a 70MHz Cumulative Contest, the need for which has already been expressed by 4m correspondents to *FMD*. The gap between VHF National Field Day in September and the 70MHz contest of the following February may very well have this new cumulative slotted into it.

* * *

Writing of VHF NFD prompts us to offer an observation on the speed with which this event is now handled by the VHF Contests Committee: less and less time for more and more entries seems to be their philosophy. In 1969 with the Cambridge trio of G2XV, G3EDD and G3USB processing 144MHz logsheets, the results were out in November, only two months after the fray. In 1970 only one checker was available for 144MHz so that the results for this band could not be made known until December, which the committee felt was a source of some lamentation but to most members

* Houghton-on-the-Hill, Leicester LE7 9JJ.

still worthy of praise when it is remembered that in former years it was generally February before the final tally was out.

Wrong crystal . . .

People who put out hopeful CQ after CQ miles out of 2m zone, getting few replies because locals tune only their own zones, are probably using proprietary makes of transmitter, either ready-made or built up from a kit, which have come with crystals of arbitrary value, not necessarily in the purchaser's own zone.

Members who decide to buy manufactured rigs might care to give some thought to making quite sure that the crystal or crystals supplied are in their geographical zones, plus perhaps one more for the cw end (if the device will send cw).

This way purchasers will earn maximum returns per CQ, because they will appear in the 2m band where others will hear them, and secondly they will help preserve the noted orderliness of this part of the spectrum.

. . . and wrong sound

Apart from commercial kits, which come new and unused, there are the ex-business radio rigs, which come far from new and often very used—a lot of them, anyway. Because these can be had cheaply they have been instrumental in helping many members make a quick start on "Two".

Channelling restrictions are no doubt the reason why many business radio transmitters are constricted in audio sound. Base station operators, 'tis sometimes said, need to develop a special aural acuity to understand the traffic coming into them from mobiles.

There is no need for amateurs to have to do this: a little modification to modulator sections generally effects a big improvement in most of these devices, and tailors their audio to the generally high standard typical of "Two". The single biggest improvement seems to be to throw away dynamic microphones and input transformers and to replace them with high impedance crystal microphone input. To maintain audio gain a transistor preamp fed from the lt rail through a tiny rectifier and smoother may be required.

Point one five up

Today's revised and updated 2m bandplan has now been in operation for exactly a year. Announced to the membership in October 1969, to come into force on 1 January 1970, it rationalized earlier bandplans in minor details: the earlier ones had worked well. Things people like about the contemporary 2m bandplan are: its simple division into four geographic-frequency zones easily remembered as A, B, C and D; and secondly its elasticity in practical use.

There is still just one small nail penetrating this elasticity, not enough to puncture it but irritating all the same. It is *phone in the telegraphy segment*.

Zone A starts at 144·15MHz, and B, C and D extend up the band to 146MHz. The tiny bit from 144·15 down to 144·0 is intended for use by telegraphy operators and is not bandplanned for phone. The fact that phone is still occasionally to be heard there can only be attributed to thoughtlessness on the part of operators or ignorance of the existence of a bandplan for "Two". The second is unlikely, the first can occur if a man inadvertently plugs in a wrong crystal (beware breaking a licence regulation by the way; the actual *transmitted frequency*, not simply the band in use, must be known and written in the log).

At the last meeting of the Society's VHF Committee a list was tabled of a dozen south-country 2m operators who had been heard persistently using phone in the cw end. Some of the callsigns came as a surprise: "Should have known better at his age," said one member of the committee. "Refuse to work them!" suggested another. The reports of phone-in-telegraphy segment arrived from three separate monitoring stations, corroborated by complaints from members.

So far as contest operators are concerned, disqualification is a salutary cure. As for other offenders, the charitable view is ". . . perhaps they don't know, and need a gentle reminder to get in lane". There is always the final arbitrament of powerful local cw making their signals impossible to read!

A thought for phone operation in 1971: "Checking this frequency first, then tuning 144·15 UP".

Extra-terrestrial

While observing the meteor pings coming off Radio Gdansk on 4m during the mid-November Leonids shower, Ron Ham, BRS15744, became aware of an increase in the atmospheric noise level accompanied by what can only be described as an absorption of incoming radio signals. This was the start of one of the largest solar storms which his colleagues in the British Astronomical Association had ever recorded visually, and certainly one of the noisiest to be noted at the '15744 listening post in Sussex.

Ron Ham reports that the solar noise became apparent in his 136MHz radio telescope on 11 November and by 16, 17 and 18 November had driven the recorder pen off scale, subsiding to full scale on 19 November and petering out by the 22nd. He adds: "One got the impression after the sun had set that the atmosphere was re-emitting the solar energy it had absorbed, like some gigantic off-peak heater!"

Past experience shows that this kind of phenomenon can be conducive to auroral conditions at vhf. Observations on noise storms like those done at Storrington are invaluable in themselves and also for propagation anomalies they predict.

As for Gdansk on 4m, there was quite a good hourly rate of return from the Leonids between 13 and 30 November, peaking as high as 259 on the 17th.

QRS video

Amateur television contacts on the hf bands are obviously impracticable if only because of the megacyclically wide spectrum required. Slow down the speed of sending the visual information and narrow its bandwidth and the thing becomes a reasonable proposition. Slow scan is catching on at hf; it promises to do so at vhf. And someone who has attempted it in both spectra is G3ZGO, Robert Stagg of West London.

Having obtained from the MPT authority to conduct slow scan on the hf bands, G3ZGO established what is believed to be the first contact by this medium with Greece on the 20m band. Now he is ready to send on 2m.

Transmissions from G3ZGO on sstv are to the American standard of 120 lines, 8s/frame, with fm sub-carrier, and, as the operator himself puts it ". . . are sent as a.m., much the same way as rtty is transmitted on 2m. The resulting sound is much like two tone rtty with chirp!"

This effort will be unavailing unless people are around who can resolve the 'ZGO transmissions. It is not difficult: but to all who wish to have a go Robert Stagg is very willing to proffer what advice he can—but send him an sae if you do ask him for some. He can be reached at 18 Eastbourne Avenue, Acton, London W3 6JN. And if unfamiliar noises are heard on 144·7MHz just off the southern rtty spot, they could be his.

Repeaters

Repeaters in the 2m band are a well-established feature of vhf communication in the United States and Canada. Well over 100 are in use at present (see *73 Magazine* April 1970 for a comprehensive catalogue).

Although repeaters are not at present legal in the United Kingdom they are in Western Germany, and G3FZL sends details of two that could be used by UK operators under good conditions. Both are designed for nbfm and are opened for use by a calling tone. The repeater then transmits for a specified period of time. Details are:

DJ9CRA Cuxhaven
Input frequency 144·15MHz
Calling tone 1,750Hz
ON time 28 seconds
Output frequency 145·84MHz
ERP 6W

DL0NFA 15km E Nurnburg QRA FJ47a
Input frequency 144·15MHz
Calling tone 1,700Hz
ON time 5 seconds
Output frequency 145·85MHz
ERP 12W (receiver sensitivity 0·6μV)
Height asl 630m

At a later date a second channel is to be commissioned at DL0NFA: this will receive on 144·2MHz and will transmit on 145·9MHz. Reports on the use of these repeaters will be welcomed. PA0EZ reports that he can use DJ9CRA at any time from his QTH.

"Four", Wednesdays

The proposal to initiate an activity night for 70MHz has received widespread approval, judging from what was being said on the band after November's announcement. Even in those sensitive Channel 4 and 5 tv areas people were saying they would have a go on Wednesday nights—though we anticipate that most operators thus situated will prefer to hold a listening brief.

This does not mean that they need take only a passive part in the new 4m activity night. Crossband contacts from 2m remain perfectly feasible, and all that need be done is to announce after a 2m CQ that you are tuning 70MHz as well as 144MHz (tuning the band you are *sending* on is mandatory). Conversely, the 4m "regulars" will find it profitable to have the 2m converter going on Wednesday nights. Crossbanding in this way may very well increase the QSO rate.

* * *

At Cowes in the Isle of Wight the habit of BRS32036 is to monitor the vhf bands every night (except Thursday RAE night) between 7 and 1030pm, with special concentration on "Four" on Wednesdays. Sited at 200ft asl, his 4m four-element beam pulls in good signals from well up country to the extent that he suggests that some of the northern operators fortunately situated in Channel 2 programme areas might be surprised how well their signals cover a 200-mile-plus path down to his aerial socket. Members who would like him to keep a watch for them on "Four" should write to him, Malcolm Roper, 11 Wroxall Close, Northwood, Cowes.

Some idea of the 4m activity in the north is provided by G3HVI of Stoke on Trent. During the first Wednesday activity night he earned himself precisely one contact, on the following Wednesday three, and on the Wednesday after that seven.

BEACON STATIONS

Callsign	Location	Nominal frequency	Emission	Aerial direction
GB3ANG	Angus	145·95MHz	A1	SSE
GB3CTC	Redruth, Cornwall	144·13MHz	A1	ENE
GB3DM	Burnhope, Co Durham	145·975MHz	F1	N/S
GB3GW	Swansea	144·25MHz	A1	ENE
GB3GM	Thurso	70·305MHz	A1	N/S
GB3GM	Thurso	145·995MHz	A1	N/S
GB3GEC	W. London	433·45MHz	F1	N/W
GB3SC	Sutton Coldfield	433·50MHz	F1	N/S
GB3SU	Sheffield (temporary location)	70·695MHz	A1/F1*	Omni
GB3SX	Crowborough Sussex	28·185MHz	A1	E/Omni
GB3SX	Crowborough	70·699MHz	A1	N
GB3VHF	Wrotham, Kent	144·500MHz	F1	NW

* Callsign on F1 continuously, on A1 once a minute. When on A1, F1 is suppressed

Big scores, low volts

A quick round-up of activity in December must record the big turnout for the 144MHz Fixed Station Contest that brought serial numbers steadily towards the century mark as 4pm finishing time approached. No help from conditions —though *some* help from half a dozen portables undeterred by the weather or by the fact that they could not claim a scoring place in the table for what was a fixed station event. Much praise for the "gentlemanly operating hours" of 0700 to 1500 was to be heard afterwards.

Next day came the nationwide compulsory QRT when the electricity generating dispute denied 240 ac to many of the fraternity. But those who had built G8ARV transistor rigs (or derivatives) were laughing: G8BDO with his 100 milliwatter, the G8DKZ briefcase portable, the G3GXN lunchbox special—oh, and several more, including doubtless most RAEN members—could keep on radiating on "Two" while the rest had stopped.

Amid the encircling gloom a beam of energy emitted from the Isle of Man brought a ray of cheer to all "seventy centimentals" who still had ac on tap: the fog-inducing anticyclone of the first power-cut week lifted the 433MHz signal from GD2HDZ into many a converter well beyond the 200 mile mark. And as the second power-cut week ensued, another "high" drifted across England at just the moment when the GB2RS Sunday morning news bulletin was announcing the onset of spottiness on the solar disc. So anything could happen—*after we have gone to press*!

Tech corner

From G3JKY (A. J. Gould of Beckenham)

When analysing contest logs the VHF Contests Committee still gets occasional complaints of overmodulation. Half the trouble, it seems, is that few stations have any form of modulation indicator, and operators not familiar with gear used under field day conditions may tend to "talk the pa needle up".

The indicator used at G3JKY utilizes a movement taken from a burned out thermal meter (probably about 3mA) plus a diode and a resistor. Fig 1 shows how. The PIV of the diode must be more than twice the ht voltage. There is a 22kΩ resistor to protect the meter.

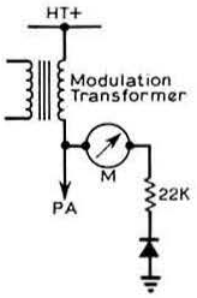


Fig 1.

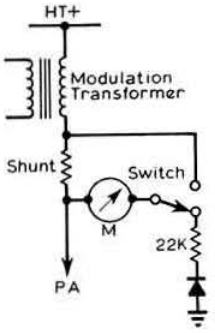


Fig 2.

Negative excursions of modulation make the meter lift off the stop when the power amplifier ht swings through zero. A slight swing beyond zero is not too serious as the rate of change of ht will not be very great.

If the pa current meter has an external shunt it may be persuaded to read either pa milliamps or mod level at will, by the use of a changeover switch as shown in Fig 2. After all, once the pa has been tuned there should be little need to monitor anode current.

No doubt this idea has been published before, but it is so simple I think it deserves more use.

From G8CEX (B. J. Turner, Westcliff on Sea)

The vfo used at G8CEX proved to be far easier to build and get going than I imagined. I used the G3PDM circuit from *Technical Topics*, December 1969, modifying the tuned circuit to 8MHz, and using TIS34 oscillator and 2N697 buffers. The output is then fed to a further 2N697 amplifier and coupling stage taken from a design in the ARRL *VHF Handbook*, and then into the grid of the original crystal oscillator valve in the transmitter. This stage operates as a multiplier to 16MHz.

The vfo is extremely stable. The G3PDM circuit is capable of good results even when the output frequency is being multiplied by 18. Certainly it seems to me that any member with a die-cast box and a few components to hand can build himself a good vhf vfo in an afternoon.

One alteration to the specified components was to use a small, very cheap negative temperature coefficient trimmer in place of the "Tempatrimmer". Subsequent purchase of this item at a cost of around £4 showed that no further improvement could be obtained.

From G3FZL (Geoff Stone of South London)

Details are given of a further nbfm detector module which makes use of a newly available Mullard integrated circuit, the TAA570, basically designed for use in uhf television receivers but equally having application in communications receivers having an i.f. up to 6MHz. For IFs in the 9MHz region a TAA710 is required. PA0EZ has used one of these successfully in a BC348 receiver, the main virtue being the simplicity of the inductor, which has no taps or complicated windings.

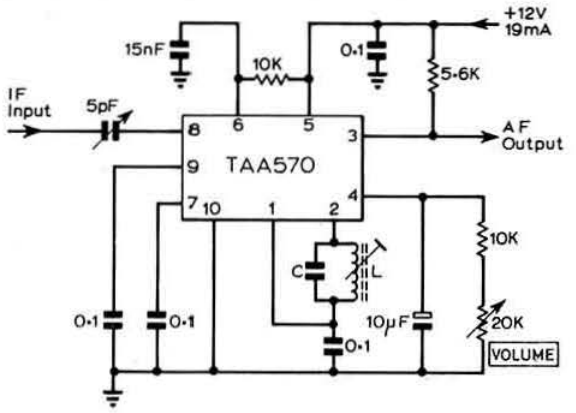


Fig 3. The nbfm detector module described by G3FZL in the accompanying note. The values of L and C should provide resonance at the i.f. of the station receiver in use. Typically, for a BC348 with an i.f. of 915kHz, C will be 39pF and the Q of L will be approximately 25–30.

The circuit diagram is shown at Fig 3. Its performance is such that full limiting is achieved with an input of about 200μV and the output is about 100mV for a deviation of 5kHz or 300mV for 15kHz. Maximum audio output occurs with the volume control at maximum resistance. For zero output pin 4 can be shunted to earth. This would be useful in a switched am/fm receiver.

The integrated circuit is contained in a JEDEC TO–74 can and this together with the associated components can be located on a small printed circuit board to make a very compact module.

From G3YKB (Brian Hodgson of Ealing, London W5)

Here is another derivative of the G3PDM circuit for achieving vfo control at vhf (see *Technical Topics*, December 1969). Versions have been constructed for 2m using both 12–12·17MH. nd 8 to 8·11MHz, while that for 4m covers 3·89–3·93MHz. At G3YKB both the 12MHz and 3·9MHz VFOs were built into a single diecast box 3¾ by 4¾ by 2in, with their separate variable capacitors ganged to the one Muirhead 50:1 dial. Each of the vfo outputs is fed into the crystal sockets of the 2m and 4m transmitters. Netting is accurate and easy.

The VFOs are left running during receive periods. The switch S is closed when it is desired to net. Component values required for each generated frequency are given in the following table:

	2m		4m
FREQ	12–12·17	8–8·11	3·89–3·93
L	1·1μH	1·57μH	3·6μH
C1	1500p	1800p	3300p
C3	27p	47p	68p
C5	20p	27p	56p
C6	180p	270p	446p*

(* 390 + 56)

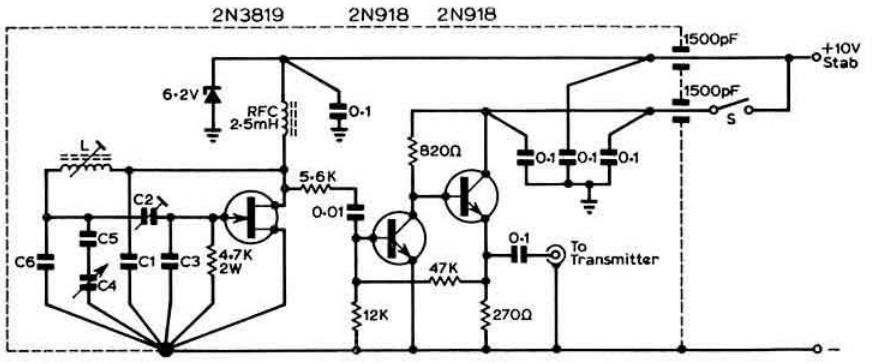


Fig 4. The vfo for vhf described by G3YKB.

The main tuning capacitor is a Wingrove and Rogers 5–25pF, and C2 is a 3–30pF Philips trimmer.

Stability seems remarkably good, and during one soak test when the 2m version was netted on to GB3VHF, the drift was less than 2kHz in four hours (which is possibly proof that the sub-zero temperature in the shack is fairly constant!).

One final point: it is most important to take all precautions to prevent rf from getting into the vfo. The diecast box was important. It may be useful also to insert rf chokes in the battery feed line.

Here and there

"With crystal control centred around 144·5 to 145 and 60W, it would take anything up to an hour of continuous shouting to raise a Continental. During a recent opening and using the vfo I was able to contact six PA0s one after the other in about 50 minutes by netting on to the calling station's frequency"—G8CEX.

* * *

"More new recruits for rtty on 2m are G8COT, G8CKF, G3AOK, G3MMJ; G3UVZ is teleprinting from a potent new site at West Kingsdown. But *please* will phone operators keep the rtty channel 144·6 clear?"—G3YKB.

* * *

Nothing new about Ar . . . the following is from the *Scientific American* for October 1870:

"There have been of late several brilliant displays of the Aurora Borealis, or Northern Lights, and the indications are that the present fall and coming winter will witness a succession of magnificent auroral demonstrations. These are accompanied by the usual magnetic disturbance and interruption of telegraphic working. The true character of the phenomena is still undetermined, but there would seem to be little room for doubt that they are electrical, and are mainly induced by the magnetic action or disturbances of the sun. The photosphere of the sun is in a state of great perturbation, and has been for some time past. At times the spots have been so extensive as to be almost visible to the un-aided eye. Cyclones and storms, of an extent and violence almost inconceivable to us, are taking place on the surface of our great luminary, and the auroras which render our nights brilliant and magnificent are in some undiscovered way the result of these terrible manifestations."

* * *

". . . a meeting for all older amateurs including non-members . . . for informal discussion" organized by the Midland Amateur Radio Society on 15 December attracted a substantial proportion of the region's two-letter call vhf men, plus a sprinkling of G2-plus-threes, all pre-war. Much good should flow from this meeting in the way of closer contact between old-timers.

* * *

From G8AFN, Peter Cleall of Maldon in Essex, comes a suggestion, based on his concern at lack of home-built equipment at the recent exhibition and of information about microwave techniques in particular, that VHF Convention 1971 should remedy these omissions by organizing a series of what he calls "chat-ins" on specific subjects, with a table set aside to show members' own equipment. Agenda item for next meeting of RSGB VHF Committee—but meanwhile, members' comments please!

* * *

"Further to your comment about British 2m tuning habits (*FMD* November) I have checked my log for the big opening of mid-June and find that of 64 continentals who were worked, 61 were co-channel with me. Many commented adversely on the UK custom of 'carefully tuning' from one end of the band to the other"—G8CMB (then), G3ZPZ (now), Sheffield.

* * *

At its last meeting of 1970 the Society's VHF Committee decided to invite G3RPE to serve in 1971. Dr Dain Evans's acceptance will usefully strengthen the committee's microwave representation this year. Other members are G3FZL (chairman), G2UJ, G3BPT, G3GMY, G3HBW, G3JHM, G8AXA and G5UM (secretary).

* * *

Recently licensed as G8DXY, Gareth Evans, 7 Cadbury Rd, Portishead, Bristol BS20 9QF, contemplates starting video operations at a later date. He would like to hear from anyone in the Bristol area who can transmit or receive television on 70cm. Letters to the above address will be forwarded to him at the University of East Anglia. Meantime listen for him (on A3) from the vicinity of Colchester.

THE MONTH ON THE AIR

A monthly feature by John Allaway, G3FKM*

ONCE again the calendar has changed and your scribe would like to wish all readers the very best of good fortune in 1971. This will be a vital year for amateur radio, with the ITU World Administrative Radio Conference on Space Communications due to take place in June. One item which will be under discussion will be the use of satellites for amateur communications and it is to be hoped that with the help of friendly administrations we may find ourselves privileges.

One is tempted to wonder whether the day may arrive when there are no countries where amateur radio is not allowed, and when worldwide standards for the issue of amateur licences are adopted thereby enabling the issue of an international licence which may be used in any country in the world. This international type of licence already applies in the case of the driving licence so that the idea is not as impractical as it may at first appear to be.

Correspondence with GM3SYO has established the fact that he is not QSL manager for a station which used the callsign ST2PO a few years ago. He does not have and never had any logs for this station whose authenticity must therefore be open to some doubt.

Top Band news

Jan Berkers, PA-1575, says that W4BRB will be in the Bahama Is during January and will be using the callsign W4BRB/VP7.

G3SED reports that the first transatlantic station worked this season was on 26 July—about the same time as in previous years. August, September and October provided a few more QSOs but on the whole were not good. The first good opening seems to have been on 1 and 8 November when W1HGT worked G3OQT, G3SED and G3MYI on phone (the W was on a.m.). The Ws have been coming in well at 2130 since early November—something which does not normally happen until mid-January and everything indicates that this will be a very good dx season. Peak times for working Ws are given as 2130 to 2230 (when conditions are good), 0000 to 0115 (most days) and 0400 to 0700.

The 160m DX Net (page 846, December 1969 *MOTA*) is at present under the control of G3XDV and has met with moderate success. ZC4IK has been worked by DL9KRA and PA0PN, and ZD9BM has heard G3LYW but no QSO resulted. ZB2A reports that the club should be on with ssb later in the season, and 5N2AAF is also said to be on at net times and on Sunday mornings between 0330 and 0530 in the section 1,815 to 1,825kHz. He does not favour split-frequency working as he has a transceiver. G3UPY is now ZD8AY and has skeds with G3LYW. Skeds have been made with VS6DO to follow the JA tests on 2 and 16 January and 6 and 20 February between 2200 and 2245; in this case VS6DO may be on 1,802–1,804kHz and Europeans 1,820-1,830kHz. Another peak time on this path occurs around 1545. All taking part are asked to adhere most strictly to the net procedure.

News from overseas

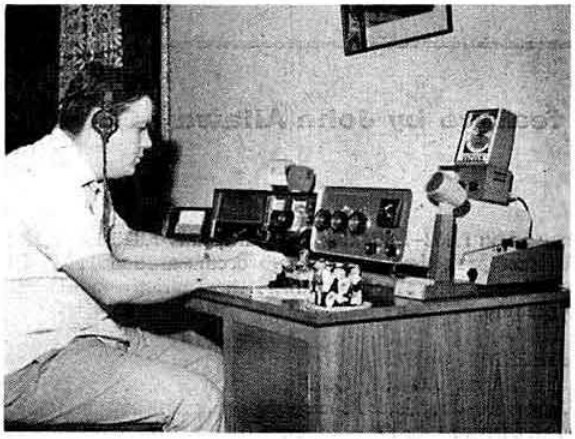
Iain Morris, ZC4IM, QSL and awards manager of the Cyprus Amateur Radio Society, has written to say that hopes of an early restoration of amateur licences do not seem to be high. This has resulted in a falling off in the number of members and in revenue and the club has therefore decided that it cannot support the Cyprus Award any longer. This will be discontinued on 31 March and apologies are extended to those who have already applied but have not received their certificates. It was hoped that the situation would be cleared up by the end of November. Iain points out that ZC4 calls are issued to members of military organizations in the Sovereign Base Area, that licensees refrain from giving full QTHs over the air for security reasons, and that they are often moved to other parts of the world at short notice. This can lead to difficulties with direct QSLs when ZC4s give the bureau address (PO Box 216, Famagusta) as all cards sent there go via the world bureaux. Cards for QSOs three or more years ago may not reach their destination and it is suggested that IRCs for return postage be sent with these and they will be returned if they cannot be forwarded.

VP8LK is located at Base "E" on Stonington Is and is visited only once yearly (in February) by a supply ship. During the antarctic summer the scientific members of the party depart on a five-month expedition by sledge and Ron's job is to keep in touch with the party (on about 4MHz) and with HQ at Port Stanley. Amateur operation is dependent on the generators running and these are only on for a couple of hours a day during the summer. The aerial is the base's metal flagpole with radials added to make it work as a ground plane on 14MHz. A weekly sked is kept with G3NOM (his QSL manager) to whom logs are passed.

Mike Dransfield, 5N2AAF, has now returned to the UK after nearly twelve years in Nigeria and will be found at the address given in *QTH Corner*. Mike did a fine job as editor of *NARS News* (among other duties) and this task will be taken over by Eric Lomax, 5N2ABG. 5N2AAJ has been returned unopposed as president of NARS for 1971.

Bill Johnson, VE3APZ/VE3NSS/VE3OSC, says that the Ontario Science Centre is one of the leading permanent science exhibitions in the world and is similar to the Science Museum in Kensington. It has its own amateur station (VE3OSC) which is equipped with Collins S Line and three-element beams (including 7MHz), and with a dipole for 3·5MHz. Skeds will willingly be made on application to Bill at 208/3201 Lawrence Av. East, Scarborough, Ontario, and he will be available on cw on Fridays from 2200 to 2400, on Saturdays from 1700 to 2300, and on Sundays from 1800 to 2300.

* 10 Knightlow Road, Birmingham B17 8QB.



Dave, VU2OLK, will be leaving India this month and returning to Scotland and his GM3OLK call (see News from overseas)

Maurice Caplan, VS6AA/G3NWQ, is now DA2YW and his address is 415 Krefeld, Mueller, Bruederlinstr. 22, W. Germany. The holder of another well-known dx callsign—DU7SV—has moved and is now WB6EFY. He may be reached at 643 Cole St, San Francisco, Calif, 94117, USA. VU2OLK will be back in Scotland early in January and all QSLs for him should be sent to GM3OLK at 27 Hazel Place, Leslie, Fife.

JW5NM has informed BRS2098 that JW8MI and he are located at a small aeronautical and meteorological station which looks after the interests of aircraft flying over the North Atlantic and North Pole. The other two amateurs in Spitzbergen are JW7UH at Ny-Aalesund and JW9QH at Longyear. He wishes it to be known that he *does* verify listener reports but only when IRCs are enclosed (two from Europe or three from elsewhere) because he anticipates using some 10,000 QSLs by July 1971. Cards may be sent via NRAL or to Mathias Bjerrang, N-9172 Isfjord Radio/Aerodio, Svalbard, via Tromso, Norway. (DOTM is also mentioned elswhere as JW5NM's QSL manager).

SM7BZD, Lars Johansson, formerly 9K2BJ, is now in Tunisia and has the callsign 3V8AH. He may be reached at Box 780, Tunis.

New USSR callsigns

Full information about the recent changes in Russian callsigns is to hand. It seems that there are now more than 16,000 licensees and the old series was not adequate to cover requirements. It was therefore decided to issue all club stations and all individual stations licensed since the end of 1969 with new calls beginning UK— in the case of club stations and with the old prefixes but with three-letter suffixes for the latter. The suffixes now indicate the oblast in which the station is located. VHF (ten metres and above) individual stations use the RA, RB etc prefixes. UK2F stations are in Kaliningrad, UK2A, C,I,L,O,S and W are in White Russia, UK2B, P are in Lithuania, UK2G and Q in Latvia, and UK2R and T in Estonia. In the UK8 series UK8H is UH8, UK8A, C,D,F,G,I,L,O T,U and Z are UI8, UK8J and R are UJ8, and UK8M and N are UM8.

Expeditions

The Cambridge University Wireless Society, G6UW, will not visit the Isle of Man during its Easter expedition this year but will be visiting some of the rarer counties in Scotland. The timetable is as follows: 14-16 March, Ross and Cromarty; 17-19 March, Sutherland: 20-22 March, Caithness; and 24 March, Nairn. Operation will be all evening on the days specified on ssb and cw on 160m. There will be some operation on 10, 15 and 20m during daytime.

The Belgian expedition which has been in Central Africa for some time will be in Congo about 7 January and in Burundi about 19 February using the callsigns OR5AA/9Q5 and OR5AA/9U5, respectively. It has an HW32A transceiver and ground-plane aerial and will be found on 14,305 kHz.

Iraq and Albania. Plans for visiting these two countries are still being made by OH2BH. Martin has received a letter from the Finnish Ambassador in Baghdad telling him that the operation will be given serious consideration in the spring. Favourable correspondence with official quarters in Albania may result in this year's ZA effort being a multi-band affair with beam aerials.

DX news

Readers will be sorry to learn that Gene, WA6DKW, who had been on the air for a few days from Tonga as VR5DK, died from a heart attack on 11 November.

According to *West Coast DX Bulletin* the US Naval Oceanographic Office says that Maria Theresa Reef was totally submerged in 1959 and is now 2,800 fathoms beneath the surface. Another reef mentioned by the same publication is Tanderburg Reef—supposedly located some 500 miles from the Republic of South Africa which claim the reef. DXCC possibilities are being investigated. ZS2MI, Marion Is, is active again and has a good signal between 1700 and 1900 often on 14,155kHz.

KC6RS (R. Spalding, PO Box 22 Moen, Truk, E. Caroline Is, 96942) has a Swan 350 and linear amplifier with a three-element beam on 10 and 15m, a four-element beam on 20m, and an inverted vee for 40/80m. He is prepared to arrange skeds.

A new station in Cocos Keeling Is is AX9YR. He is to be found almost daily around 14,250kHz between 1000 and 1600 and asks for QSLs via VK6RU. 3B7DA has now left St Brandon and is back in Mauritius. ZD9BO should have left Tristan da Cunha and been replaced by Les, ZD9BR, who will also QSL via ZS2RM. DJ6QT and DJ1QP say that their's was the first ever licensed operation from Mali. A new station in Gabon is TR8VW who hails from Germany and asks that the words "amateur radio" should not appear in his address. ZD3D is alleged to appear on 21,410kHz every Tuesday between 1800 and 2000 to give quick QSOs to those who need a contact with Gambia.

4T4O was the special call used by the station of the Radio Club Peruano in Lima to commemorate its 40th anniversary. A special QSL will be issued. The YO0 prefix was used by stations in Timisoara, Rumania, to celebrate the 700th anniversary of the founding of their city.

Jim Stent, YJ8JF, is now on the air from New Hebrides with a Trio transceiver and is said to be averse to pile-ups! He may be reached via the Post Office, Vila, New Hebrides.

Peter Dodd, ex-G3PBD etc, is now in Western Australia

Brigadier-General L. Kolatkowski, SP5PZ, the President of the Polish national society, Polski Zwiazek Krotkofalowcow. This picture was taken on the occasion of the 40th Jubilee session of PZK at Warsaw. In the background are Ryszard Girulski, SP5QQ, PZK Bulletin editor, and G2BVN

and has the call VK6CIF. ZK2AG, Trevor, has been reported on 14MHz and is said to be ZL3TV; QSLs are requested via ZL4NH and activity is expected to last until February.

ST2SA is now very active on ssb and is keeping skeds for "list" type QSOs. He prefers the low end of the USA phone band on 14MHz from 1400 onwards.

UA9VH/JT1 is now using W3HNK as QSL manager and those who are waiting for cards for contacts during 1970 should apply to W3HNK (see UM8FM in *QTH Corner*) with sae and IRCs.

ARRL will publish DXCC *Honor Roll* in March and September issues of "*QST*" in future. QSLs should be submitted in December and June. It is understood that contacts with Gus, W4BPD, when operating from Bardeuse Cay, Etoile Cay, and Bertaut Reef, count as those with Seychelles (VQ9).

1970 Countries Table

	1·8 MHz	3·5 MHz	7 MHz	14 MHz	21 MHz	28 MHz	Total
G3VBL	—	—	30	100	126	49	305
G8VG	4	21	30	37	76	55	233
G3SWX	—	17	18	48	29	59	171
G3ZOQ	—	8	41	42	27	42	160
G3JVJ	4	75	45	48	37	29	238
G3VPS	11	13	15	54	29	36	158
A6265	5	102	103	234	185	167	796
A7006	18	32	28	183	183	138	582
BRS25429	3	111	93	154	162	125	648
A6248	9	63	71	166	149	118	576
ORS31427	—	14	18	193	125	123	473
A6904	10	36	47	149	145	95	483
A7054	11	121	43	139	163	67	544
BRS27880	6	59	52	142	122	85	466
A5489	—	76	21	95	83	123	398
A6553	6	27	36	65	109	75	318
A6148	5	84	19	49	46	68	271
A6278	4	53	47	112	90	43	349
BRS30694	6	24	29	70	61	44	234
A6098	4	21	12	26	37	25	125
A7065	1	10	7	52	35	23	128
A6023	5	38	39	78	37	19	216
A6242	2	19	7	38	26	29	121
A6992	—	—	2	201	—	48	251

(This month's table is in order of 21 plus 28MHz totals. The final scores will appear next month. The 1971 table will appear in February issue.)

Polish call areas

5Z4LW intends to be very active on 40 and 80m during January and February. He has 18AVQ, 275ft wire and G5RV aerials and will operate between 3,790 and 3,800kHz on ssb. The owner of another well-known African callsign, 9G1HM, has left Ghana after a five-year stay and is now OK3HM, J. Horsky, Krajinska 3029, Plestany, Czechoslovakia. QSLs for both TR8VW and TR8JM may be sent to DK2NU (Josef Mueller, Bei der Muehle 2, D-3011 Laatzen. W. Germany) instead of to the direct QTHs given in *QTH Corner*.

Slow-scan tv

G3ZGO received permission to use sstv on 14 and 144MHz and what is believed to be the first international QSO from the UK on the mode was effected with SV1AB on 14 November. News of sstv activity by other G stations would be welcomed by G3ZGO (R. Skegg, 18 Eastbourne Avenue, Acton, London W3 6JN).

DXCC

December *QST* listing of DXCC Honor Roll includes the following UK calls: GW3AHN, G8KS and G3FKM (322), G3HCT (320), G4MJ (319), G2BOZ and GI3IVJ (318), G2BVN (317), G3HDA and G5VT (316), G3DO and G6TA (315), and GI3JIM (314). In the phone listing G8KS and G3FKM have 319, GI3IVJ 317, G6TA 315, and G3DO and G5VT 314. The current maximum possible score is 322 countries.

Contests

The REF Contest

1400 30 January to 2200 31 January (CW section)
1400 27 February to 2200 28 February (Phone)

Contestants work France and DUF countries and QSOs count three points. Exchanges consist of RS/T plus serial

number of contact (starting from 001). The multiplier is the number of DUF countries and French departments (indicated by the two figures after F calls) worked on each band added together. Stations in HB, 4U1, LX, ON, 9Q, 9U and 9X will also be taking part and will count as multipliers (each Swiss canton and Belgian province counts). Logs should be sent to: REF, Bvd de Bercy 60-75, Paris 12, France. Certificates will be awarded to top scorers in each country and contest QSOs may be used when claiming a number of French awards if claimed within two years. In the 1970 contest UK scores were as follows: (CW) **G3ESF,** 55,263; G3TXF, 37,788; G3AAQ, 22,440; G3NSY, 18,894; G3OCA, 12 points and **GM2HCZ,** 2,475 points. (Phone) **GD5APJ,** 139,968; **G3RAA,** 77,748; G3SWX, 12,495 and G3XZF, 10,800 points.

The ARRL International DX Competition.

0001 6 February to 2400 7 February } Phone
0001 6 March to 2400 7 March }
0001 20 February to 2400 21 February } CW
0001 20 March to 2400 21 March }

Object is to work as many stations in the 48 contiguous USA and Canadian call areas as possible. Repeat contacts on additional bands are permitted. Each complete QSO counts three points, incomplete ones count two. Send RS/T and dc input power. W/VE stations will send RS/T and state or province. Multipliers on each band are the 48 states plus VO and VE1 through to VE8—a total of 57. Log sheets and entry forms are available from G3FKM (large sae please—100 QSOs per sheet).

The First World SSTV Contest

This is sponsored by *CQ Electronica Magazine* and will run from 0700 to 1400 7 February and 1600 to 2300 13 February. SSTV frequencies suggested are 3,750, 7,050, 14,230, 21,100 and 28,100kHz ± 5kHz. Exchange QSO number and picture—each QSO counts one point and a station may only be worked once. A multiplier of five points is given for each continent worked. Logs to: Prof Franco Fanti, Via A. Dallolio 19, 40139 Bologna, Italy, before 28 February.

Winners of the **1969 IOTA Contest** were **G8JM** (79 islands in seven continents = 553 points) and SWL Bill Smith, W1-7897. G8JM was also European and UK winner. The 1971 contest will run from 1 January to 31 December 1971. The IOTA *Directory* and details of this competition and the various awards are available from Geoff Watts, 62 Belmore Rd, Norwich, NOR 72T, price four IRCs.

Results of the **11th Annual CQ 160 Metre Contest** held last January have arrived and are as follows:

Single-operator

GW3UPK	**34,536 points**	**GI3WSS**	**2,241 points**
GD3SVK	**33,212** "	G3NT	1,944 "
G3VIP	**7,744** "	G3YPM	1,881 "
G2DC	7,376 "	G3XTT	1,860 "
G3WPO	5,160 "	GW3HGL	1,789 "
GW3GWX	2,849 "	G3YGS	370 "
G3YPK	2,295 "	**GM3YOR**	**120** "

Multi-operator

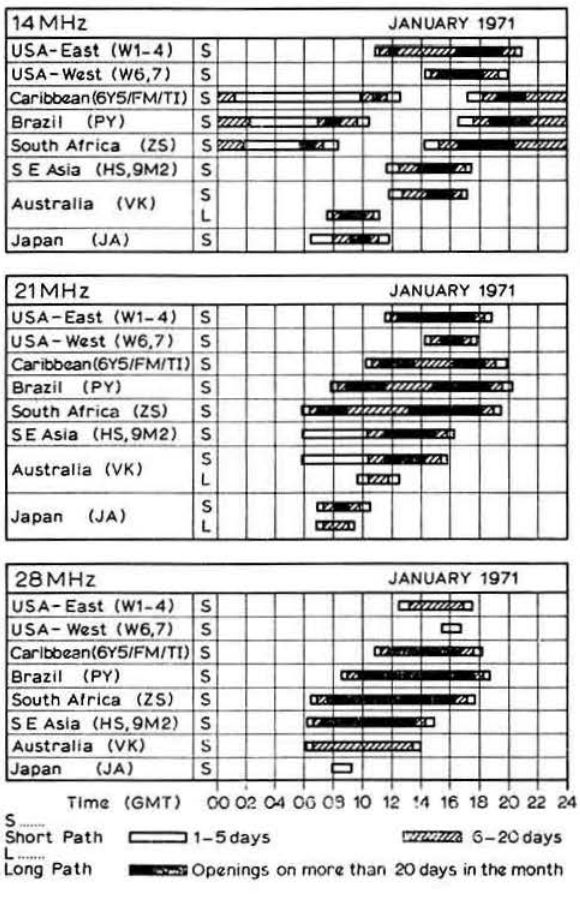
GM3IGW/A	**46,530 points**	GM3YCB	17,744 points
GM3OXX/A	23,331 "	**G3KAC**	**10,575** "

Awards

The CQ DX Award

CQ Magazine

This new award bears close resemblance to DXCC and is issued to those submitting proof of contact with at least 100 countries (as per ARRL list) since 15 November 1945. Separate awards are issued for two-way ssb and two-way cw. Endorsements will be issued at 150, 200, 250, 275, 300, 310 and 320 countries, and to promote multi-band operation a Low Band Endorsement will be issued to those contacting 100 or more stations on any combination of 3·5 and 7MHz. A 28MHz endorsement will likewise be given to anyone with 100 or more on 28MHz. Any altered or forged QSLs will



Propagation Predictions

In January conditions will differ little from those of the previous month. Towards the end of the month the hf bands should remain open a little longer in the evenings. Otherwise the forecast given in the December issue will still hold good for all bands mentioned. Because of the relatively high sunspot activity during the last 12 months, compared to 1968 and 1969, conditions will vary little from those of January 1970. It is pointed out that the time in the tables is given in gmt. This is done to facilitate conversion into local time of various dx countries such as western USA, Asia and Australia.

The provisional sunspot number for November 1970 from the Swiss Federal Observatory was 91 with a period of high solar activity between the 14th and the 22nd of the month. The predicted smoothed sunspot numbers for March, April and May 1971 are 82, 80 and 78 respectively.

result in permanent disqualification and "Fair play and good sportsmanship in operating are required for all amateurs working towards CQ DX Awards. Continued use of poor ethics will result in disqualification . . ."

Applications should be made on the official application form and this should be sent with the relevant QSLs to an authorized checker (G3FKM for the UK) for endorsement, and then sent with eight IRCs to Jerry Hagen, WA6GLD, PO Box 1271, Covina, Calif, 91722, USA. Applications for endorsements *after* the issue of the basic award need only consist of a list of QSLs but specific cards may be asked for; please enclose an IRC with these applications. An Honour Roll in *CQ* will list all those with totals over 275 who have updated their totals anually.

The Thunder Bay Award

Lakehead ARC Awards Committee, PO Box 571, Stn "P", Thunder Bay, Ont, Canada

This award commemorates the amalgamation of the twin cities of Fort William and Port Arthur into the new unit of Thunder Bay on 1 January 1970, and is awarded for working (or hearing) five stations in the new city after 1 January 1970. Send log details and 10 IRCs to the address above.

The SWL Chapter 3 Award

Last month's *MOTA* omitted to mention the fee for this award which is 5s, 10 IRCs or $1. This should accompany the GCR list of QSLs held.

QTH Corner

DJ1QP/CT3, **DJ6QT/CT3** (see TZ2AB)
JD1ABO via JA1BA, PO Box 1, Funabashi-Higashi, Chiba, Japan.
KG6JAC via DJ9ZB, Carl Kistnerstrasse 19, 78 Freiburg, W. Germany.
KG6SI viaWA6AHF, Rubin Hughes, 17494 Via Alamitos, San Lorenzo, Cal, 94580, USA.
KG6SV John Leekley, POB 212, Capitol Hill, Saipan, Mariana Is, 96950.
OH0AA OH0NI, Skillnadsgatan 37, Mariehavn, Aaland Is, Finland.
OR5AA ON5TO, BP 33, B-8000 Brugge, Belgium.
PJ0FC via W1FJJ, 180 Den Quarry Rd, Lynn, Mass, USA.
TR8VW BP 5050 Libreville, Gabon. (Do not mention radio).
TY9ABC, **TY0ABD** (see TZ2AB)
TZ2AB (cw QSOs) via DJ1QP, Falkstr. 1, 59 Siegen, W. Germany. (phone QSOs) via DJ6QT, An der Klostermauer 3, 6471 Hirzenhain, W. Germany.
UM8FM (after 1/11/70) via W3HNK, Box 14, Norwood, Pa, 19074, USA.
VK9YR via VK6RU, J. E. Rumble, 43 Pandora Drive, City Beach, 6015, W. Australia.
VP8KD via G3LDA (new QTH) 109 Naunton Crescent, Cheltenham, Glos, GL53 7BE.
VQ9SM via JA0CUV/1 (new QTH) Tack Kumagi, PO Box 22, Mitaka, Tokyo, Japan.
VR2FO (after 18/6/70) via W2FXA, 72 S. Pierce St, Buffalo, NY 14206, USA.
XT2AC (see TZ2AB).
YN1ZZ via DL3OH, Peter Rivinius, Goethestr. 4, 7136 Detisheim,W. Germany
ZD3N, **ZD3P** (see TZ2AB)
ZD9BR via ZS2RM, PO Box 5181, Port Elizabeth, CP, Rep. of South Africa.
ZF1AN via W2HAQ, 28 Maple Lane, New Hyde Park, NY, USA.
ZK1CD via ZL2FA, G. B. Butler, 46 Winter St, Gisborne, New Zealand.
4T4O R.C.P., PO Box 538, Lima, Peru.
LA8YB/4W via LA3BI, Benedikts Vei 17, Bekkestua, Norway.
ex-5N2AAF Dr M. Dransfield, The Spinney, Kings Lane, Southwater, Horsham, Sussex.
5W1AG, **5W1AR** (Op'n by VE7HE and VE8RA) VE7BWG, 488 E. 4th St, N. Vancouver, BC, Canada.
7P8AZ via VE2JH, 8844 E. Rue Notre Dame, Montreal 430, Que, Canada.

RSGB QSL Bureau, G2MI, Bromley, Kent, BR27 NH.

Band reports

Conditions seem to have been fairly good on all bands during the past month with 28MHz carrying quite a large amount of dx signals from all parts of the world. The 21 and 14MHz bands are now opening late and closing early and 7MHz is producing signals from Japan and the USA (via the long path) during mid-afternoon. 3·5MHz has produced ZLs in the early evening and west coast Ws in the mornings, and will be at its best about now.

Very many thanks to the following for supplying information and logs: G2HKU, GW3AX, G3HB, G5JL, G8VG, G3AAE, G3GVV, G3JKY, G3LPS, G3UKH, G3UML, G3UYM, G3YHB, G3YTS, G3YWX, G3ZOQ, BRS2098, BRS19682, BRS30231, BRS31301, G-10654, A6265, A6553, A7054 and A7065. Stations listed in italics were on cw, the rest on ssb unless otherwise indicated.

1·8MHz. 0600 *W1HGT, K1PBW.*

3·5MHz. 0500 *PJ0DX.* **0600** HK0BKX, JW8IL (Bear Is), PJ1AA, VE7ZM, W7JMQ (Ariz). **0700** TI2CMF, ZLs. **1700** ZM4s BT, KE. **2000** TR8s DG, JM. **2100** FB8XX, MP4BFO, VE8YL, ZC4IK, 6W8DY. **2200** CR6JC, FP8CT, PJ7JC, VS9MB, ZD3K, 4S7AB, LA8YB/4W, 5H3AC, 9G1DY. **2300** EA6BK, EL2AK, KL7DTH/KG6, TZ2AB, ZB2A, 9E3USA.

7MHz. 0100 *CX8CZ.* **0300** *YV3GN.* **0500** HH9DL, *9G1HM, 9Q5QR.* **0600** *JW5NM.* **0700** *HC2GG/1, OA3Y,* TI0RC,VP1WMU. **0800** *HI3PC, OA4MS, W7JLU/7,* ZL3RK. **1000** *JA0GUZ.* **1500** *JA1JYI, JA7AKQ/1.* **1800** *OA3X* (QSL via SM6CSB). **2000** *AX2BKM, UA0OI.* **2100** *JAs.* **2200** *CT3/DJ1QP,* EP2s BQ, TW, *JX2HK, KV4CI,* ZB2A. **2300** ET3USA, ZC4JW. **2400** *FB8XX, PJ0FC, VU2IRA,* 9G1DY.

14MHz. 0600 KC4USP, UA0YT. **0700** FO8BO, TR8VW, VR2CC, ZK1MA, ZM4OL/A **0800** FK8BG, FO8EH, VR4CG. **0900** DU9VL. **1500** JY1/B. **1600** VQ9SM. **1700** FB8WW, FB8XX, FB8YY, ST2SA, VS9MB/JY1. **1800** FR7AG (BP 819, St Denis), KL7GRP, UA1KAE/1, ZS2MI, 9Q5MG (QSL via DJ4PS). **1900** CR3KD, KH6s, ZD7SD. **2200** CR5SP, VP8s KD, LR.

21MHz. 0700 *XT2AB.* **0800** *5U7AR,* 7X2OM. **1000** FY0ZO (QSL to DK4MD), TR8DG, 3V8AL. **1200** *KC6CT.* **1500** AX9XI, *TG4SR,* YB0AAO (QSL to DL0AK). **1600** FR7AC. **1700** AX9JR, 3B8CZ. **1900** *A2CAK, KH6IJ.*

28MHz. 0700 KG6AAY, RA0LEH (Zone 19), 9M2EK. **0800** AX9XI, VR2CC, VU2JM. **0900** CR4BB, HS1ABU, UA1KAE, YS3HF. **1000** VKs, 7Q7AA. **1100** CT2BB, *DJ1QP/CT3,* ZD3K. **1200** CR8AG, FR7ZM, FY0NA, VS9MB, XT2AC, *G3LZQ/ZS4,* 5R8AP, *8RIJ.* **1300** FH8CG, JY1, TR8VW, VP2VI. **1400** AX6HD, AX9XX (Christmas Is), G6ZY/CN/M, YS2ACB (on a.m.). **1500** *EA9AQ,* PJ9JR, TZ2AB, ZD5X, 3B8CW. **1700** CT3AF, EA9EJ, VP2LX, W6s and W7s. **1800** W6s and W7s, YV5AK (QSL via W7HK1).

Gratitude is expressed to all correspondents, and especially to the following for information obtained from their publications: the **West Coast DX Bulletin** (*WA6AUD*), the **Ex-G Radio Club Bulletin,** (*W3HQO*), **DX'press** (*PA0TO*), **DX News Sheet** (*Geoff Watts*), **Intercom** (*Euradio*), **QUAX** (*G3DME*), the **DX'ers Magazine** (*W4BPD*), **Florida DX Report** (*W4FRO*), the **DX'er** (*K6YGS*), **NARS Newsletter** (*5N2AAF*), **Long Skip** (*VE3DID*), and **On the air** (*ON4AD*

Please send all items for February issue to reach G3FKM no later than 11 January, for March issue by 8 February, and for April issue by 15 March.

SOCIETY AFFAIRS

A brief report of the Council meeting held at Society HQ on 6 November 1970.

Present: *Dr J. A. Saxton (President, in the Chair), Dr E. J. Allaway, Messrs B. Armstrong, R. J. Hughes, A. F. Hunter, E. G. Ingram, G. R. Jessop, A. C. Morris, L. E. Newnham, J. R. Petty, W. A. Scarr, R. F. Stevens, G. M. C. Stone, J. W. Swinnerton, F. C. Ward, E. W. Yeomanson (members of Council), R. G. B. Vaughan, general manager, and A. W. Hutchinson, editor.*

Apologies for absence were received from Messrs J. O. Brown and C. H. Parsons.

Prior to the commencement of the meeting, Council stood in tribute to the memory of Mr Norman Caws, G3BVG, and Mr Fred Lambeth, G2AIW.

Presidential Installation
The general manager reported that preliminary arrangements had been made with the Bonnington Hotel for the Installation, and confirmed that the arrangements would be similar to those of previous years.

Exhibition at Geneva during Space Conference
Mr Stevens reported that this matter had been considered at the recent IARU Region 1 Meeting, and a sum of 5,000 Swiss francs had been voted to support the enterprise. Approaches were being made to an amateur in Dusseldorf, who it was hoped would be able to organize the exhibit on behalf of IARU.

Membership and affiliation
It was resolved:

(i) to elect 167 corporate members and 49 associates;
(ii) to grant corporate membership to 27 associates;
(iii) to waive the subscriptions of 23 members due to blindness or other disability;
(iv) to grant affiliation to the Adur Contest Group, Worthing; Dartford Heath DF Club; Eastbourne College SW Radio Society; English School Radio Club, Nicosia, Cyprus.

Proposed first transatlantic amateur contact celebration
Mr Hunter reported that at the Regional Conference, Blantyre, the question of a celebration of the 50th anniversary of the first transatlantic signal was discussed. Scottish members felt it appropriate that some formal celebration of this event should be organized, and Mr Hunter had accordingly investigated the historical aspect. Some difficulty existed, as several dates were recognized in various ways. Council agreed to consider the form of a possible celebration and discuss the matter again at the next meeting.

Telecommunications collection at Science Museum
The President explained that he had received a letter from the president of the IEE inviting financial support for the provision of certain equipment in connection with the Telecommunications Collection at the Science Museum, South Kensington.

After discussion, it was agreed that Dr Saxton should write to the president of the IEE regretting that the Society's present financial state did not permit a donation although the Society was sympathetic to the cause.

Region 12 ORM
Council agreed to a request by Mr A. W. Smith, GM3AEL to hold an ORM in Region 12 on 9–10 October 1971.

City & County of Bristol Group
Council noted that the City & County of Bristol RSGB Group had requested a lecturer from HQ to attend its meeting on Monday 25 January. Following discussion Mr B. Armstrong, G3EDD agreed to attend this meeting.

Other business
Mr Armstrong conveyed good wishes to the Society and Council from the New Zealand Association of Radio Transmitters.

Dr Saxton regretted he would be unable to attend the next Council meeting and the Annual General Meeting, because of other engagements. Mr Armstrong would take the chair on both occasions.

Mr Yeomanson proposed a vote of thanks to Dr Saxton for his conduct of Council affairs during the past year. This was approved with acclamation.

OBITUARIES

Mr W. R. Burne, ex-G2KW
Bill Burne died on 26 November 1970. A pioneer amateur of the 1920 era, he had been off the air for many years, although at the time of his death he was attending RAE classes in St Helens with a view to obtaining a new callsign.

Mr S. Burnett, VE3GK
Sid Burnett died on 18 October 1970. He had a regular weekly rtty sked with G8LT and G6JF for almost two years. He will be remembered for his work for CARTG, and his passing leaves a gap in the rtty world.

Mr G. H. Hill, G8MZ
George Hill of Stratford upon Avon died recently in his 67th year. A keen vhf man, he was active on all bands for many years, particularly on 2m on which he did much mobile work.

Mr F. W. McAllister, G3WNH
Francis William McAllister died on 24 November 1970. Becoming virtually house-bound 10 years ago, he took up amateur radio and after obtaining his licence his main pleasure had been on the air with RAIBC nets and other local nets.

Mr N. Sanders, G3FHC
Norman Sanders, who died on 29 October 1970 was a founder member of the old St Ives (Cornwall) RC and a member of the Cornish RAC since its formation. A keen dx worker, he had recently been active on 4m. He was a former mayor of St Ives.

Mr D. B. Shiers, G3JUG
Denis Shiers died on 20 November 1970 at the age of 49. He was a chief superintendant in the Hampshire Constabulary, had held a licence since 1954 and was a member of Basingstoke ARC.

Mr S. J. Taylor, G3OFN
John Taylor, another member of long standing of the Cornish RAC, died on 22 November. His interests embraced all facets of the hobby, and he will be remembered for his work on the "Cornishman" ssb transmitter and publication of *Quad Handbook*.

Mr A. Turner, G3UOT
Arthur Turner of Slough died in August. Although he received a callsign late in life, he had always been a keen supporter of amateur radio. He was a founder member and former treasurer of Maidenhead & DARC. Mainly active on 40m and Top Band nets, he also used the 2m band.

We have also been advised of the deaths of:

Mr A. C. Appleby, G3BKK, on 4 May 1970;
Mr E. Greaves, G3LCU, in November 1970;
Mr E. J. Simonard, G2CQY, on 9 November 1970.

1970 AGM Presentations

At the RSGB AGM held in London on 4 December 1970, the Society's Executive Vice-President, Mr B. Armstrong, G3EDD, in the absence of the President abroad, made the annual presentation of trophies.

Photographs were taken and a random selection is shown here—lack of space preventing us from showing all of them. (Copies of these and those not reproduced can be obtained for 7s each from the editor).

Top: A group of trophy winners after the presentation.

Centre (l to r): Calcutta Key to L. Ward, BRS27952; Founders Trophy to A. O. Milne, G2MI; Hanson Trophy to C. J. Baker, A5032.

Bottom (above, l to r): L. H. Thomas Trophy to A. J. Slater, G3FXB; Louis Varney Trophy to Mrs K. Priestley, G3XIW (and B. Priestley, G3JGO); Ostermeyer Trophy to D. H. Guest, GM3TFY.

A surprise presentation after the official ceremony is shown on the left when a tankard was presented to E. W. Yeomanson by P. Balestrini, G3BPT, to mark his 20 years' service on the Exhibition Committee.

RADIO AMATEURS' EMERGENCY NETWORK

by S. W. LAW, G3PAZ*

Another year and those new resolutions are no doubt glowing as traditionally bright as in other years. It is, however, also traditional that the glow fades rapidly as the normal daily tasks are resumed once more. May we then quote a valued colleague whose motto for all times is "Write yourself a copious note!" Not only is this an excellent precept for the working day but it will stand you in good stead for all those ideas for the good of Raynet and your own group in particular which somehow seem to get lost in the stress of the common round.

Do not forget to pass around any good ideas either; we shall be only too pleased to hear from you. In particular, remember to pass on the data of any call-out to the RAEN Committee for entry in the Call-out Book. This record can be of inestimable value when dealing with the authorities on Raynet matters.

RAEN Committee

The committee held its last meeting of 1970 on 12 December, but due to the exigencies of publication schedules it is not practicable to provide a report in this issue. This will be rectified next month.

Practice set-ups

It is only on rare occasions that we are fortunate enough to have the opportunity of taking part in a really full-scale exercise such as the Essex simulated rail crash of last November or the similar one in Norfolk some time ago. However, imagination goes a long way and a "think-tank" among the members of your group coupled with an intimate knowledge of the possible hazards in your area should produce some excellent schemes for practice alerts. We have been privileged to read some quite hair-raising text for imaginary disasters and have realized that most have been well within the bounds of possibility in the areas to which they have referred. A conference with one of the local user services will soon give you plenty of ideas of what might one day be expected of Raynet in your district. Better be well informed than run the risk of being caught out when it does happen!

National calling frequencies

At the south-east area controllers meeting held at RSGB HQ on 10 May 1970 it was proposed that national calling channels might well be agreed upon and 70·375 and 145·8 were recommended. Comments from other areas are invited on this subject and should be forwarded to the RAEN Committee with any recommendations in order that an overall picture may be obtained.

The power problem

As this is written there is a possibility of severe cuts in the mains power supplies in the winter months. In a typical call-out the first requirement is usually a /M or /P station working back (possibly via relay stations) to a fixed base, the latter on the public mains. Therefore it is as well to bear in mind the problem of (*a*) alternative ac supplies from transportable generators and (*b*) the use over long periods of static "mobile" stations.

On the other side of the globe our Australian friends think nothing of mounting a saddle and pedalling a generator, but so far we have not heard of this being done over here. As for hand-cranked jobs, it is many years since we saw one (although we have tales of past years to tell!). So for most of us it must be the small power-driven "genny". But what of the static mobile? True, he may have one of those admirable little jobs which are so quiet, reliable *and* expensive. On the other hand the car batteries today are so small that the engine must be run. Good for the heaters but bad for the engine, unless an auxiliary electric fan is fitted. Have a chat with the sports-car types; they will be only too glad to tell you what is available.

Best wishes to all for 1971.

* 130 Alexandra Road, Croydon, Surrey CRO 6EW.

Exercise Pullman

Following our mention in last month's issue we have received this report from John A. Rollason, G3WCO.

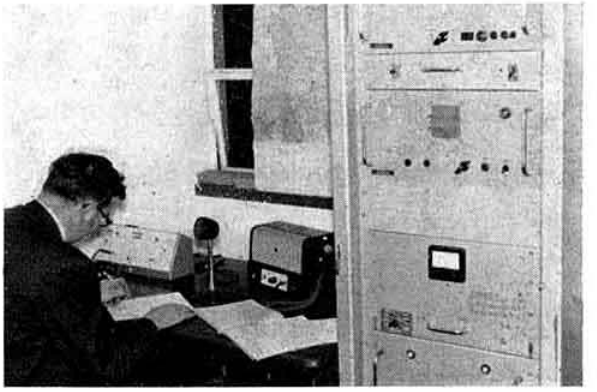
In November Essex Emergency Radio Network (Raynet to readers of *Radio Communication*) took part in "Exercise Pullman". This simulated a rail crash, at Braintree, involving some 120 casualties. These had to be transported to four receiving hospitals, three in Chelmsford and one at Black Notley near to the incident. The exercise embraced the police, fire and ambulance services, together with volunteer organizations including St John Ambulance and British Red Cross.

Exercise Pullman casualty collecting centre

Photo: *Braintree and Witham Times*

At the beginning of the exercise our task was to provide communication between Red Cross teams at the incident, their headquarters and their ambulances. This involved mobiles at each hospital, two on site and two operators at British Red Cross Headquarters (G3NYP) and Central Control at police headquarters (G3PHQ). On site we established a local 10m link using walkie-talkies to pass and gather information directly from the mobiles to the incident officer, normally some 200 yards away.

After the exercise had been under way for about 30min all our equipment was in position, including a 4m ground plane and 2m Yagi, since the spot allocated us by the police was heavily screened from Chelmsford some 10 miles away. Wherever possible 2m and 4m mobiles had been placed at each hospital so that we could rapidly reorganize the net according to the prevailing situation. It was soon realized by the county ambulance controller and senior people at the hospitals that, excluding the police channels, ours was probably the only way that a message could be got to the site since there were no telephones established as part of the exercise.



G3WCO at the controls of Essex Raynet Control, G3PHQ, at Essex Police HQ

Photo: G3GNQ

Additionally, the telephone at British Red Cross Headquarters mysteriously went out of action for the duration of the exercise. For the remaining hour or so of the three-hour exercise, we were fully occupied on both channels with user traffic.

We feel that the following contributed to what must have been a very successful exercise from the communication point of view:

(a) All equipment is crystal controlled on transmit and receive. Very few receiver modifications have been done to the equipment which is mostly of Pye manufacture, since immunity of cross modulation at the incident is more important than range or sensitivity.

(b) A permanent high-power station with omni-directional aerials is installed at police headquarters. A lower power equipment with similar aerials is installed at British Red Cross Headquarters.

(c) Regular activities take place on 2m and 4m using the Raynet equipment, both mobile and fixed. Discussions take place before an exercise to work out the best way of dealing with the forthcoming emergency and contingency plans are made.

Those taking part in the exercise included: G3FD, G3GNQ, G3AJS, G3OZF, G3JSV, G3MVV, G3PEN, G8CVI, G8CUT, G3VPK, G3PGN and G3WCO.

YOUR OPINION

The Editor
Radio Communication

Sir—So "Seedy" says more tvi is caused by breakthrough than harmonics? G3HVA believes it is 90 per cent harmonics, and a another gentleman tells me it is negligible anyway!

SSB as a system cannot be blamed for tvi caused by a cheap, badly designed transmitter, with misleading instructions, bawled into overload on every syllable by a clot who neither knows nor cares what goes on inside the box. A **clean** ssb rig will produce less harmonic output than A3 and at worst no more than an fm or morse transmitter, depending on the class of operation used for these modes. Cross-modulation is related to the peak output power, with A3 and ssb equal (depending on how much splatter is considered desirable), followed by morse with key clicks; next, morse without; and lastly fm provided push to talk is not used. Cross-modulation has come into prominence due to the use of bi-polar transistors in tv sets, and the arrival of commercial ssb transmitters at about the same time is just a coincidence.

The plug-in-appliance operator buys a commercial rig to supplement his lack of experience or knowledge (bearing in mind that pre-war licensees did not even have RAE). Such rigs, although good value for money, are of similar standard to a domestic tv set with all the short-comings this implies. This may be obvious to amateurs of 20 years' standing, but you are in a minority, gentlemen. The plug-in-appliance operator needs your guidance not condemnation.

Yours sincerely,
B. Priestley, G3JGO

The Editor
Radio Communication

Sir—I have been a member of RSGB for about a year, and having passed the RAE I am struggling to learn morse. I do feel that it is time someone paid a public compliment to those chaps who send slow morse. I am based in an area where we are well served and I would like to compliment those men listed in the magazine who so faithfully attend to their keys and help beginners.

Recently I took the trouble to write one of these chaps a brief note and thank him. As a result I received from him a magnificent letter, in fact one might call it a document. He is G3SAZ, one of the party from Echelford Club who are on the air for several nights a week between them.

Just one other point; I had occasion to give details of the slow morse time-table to some friends of mine who want to learn morse for quite another reason, so that they can understand navigation signals while sailing in the English Channel—so once again the radio amateur is contributing to safety at sea.

Yours faithfully,
H. E. Grafton Watts, CEng, FIMechE, BRS38161

Supplementary Report of RSGB Council

The Council is pleased to submit the following brief report on Society activities since 1 July 1970. The period 1 July 1969 to 30 June 1970 was covered by the report published in the November 1970 issue of *Radio Communication*.

RSGB International Radio Engineering & Communications Exhibition

Held this year from 19–22 August at the Royal Horticultural Society's New Hall, the exhibition was formally opened by Major General J. E. Anderson, CBE, Assistant Chief of Defence Staff (Signals), Ministry of Defence.

The exhibition was once again organized by Mr P. Thorogood, G4KD, and Council wishes to express its appreciation of Mr Thorogood's efforts, particularly in view of the increasing economic difficulties connected with the organization of technical exhibitions.

The Society's participation in the exhibition was again under the control of the Exhibition Committee under its chairman, Mr E. W. Yeomanson, G3IIR, and the thanks of Council are also due to the Committee and the many voluntary helpers for their excellent work.

Radio Amateurs' Examination

The Society again organized a centre for the December Radio Amateurs' Examination at the University of London, where over 150 candidates took the examination.

Publications

New publications introduced for the exhibition included a new edition of *Amateur Radio Techniques* and a de-luxe Log Book. The 1971 edition of the *RSGB Call Book* was published on 1 October, and many thousands of copies have already been sold. Work on the preparation of new publications and the revision of those already in existence continues, and the Society owes a debt of gratitude to the members who find it possible to carry out this work.

RSGB Mobile Rallies

The Society's Mobile Committee again organized the Woburn National Mobile Rally, held on Sunday 9 August, at Woburn Abbey in Bedfordshire. A record attendance helped to ensure the financial success of the event, and the Mobile Committee under its chairman, Mr N. Miller, G3MVV, is to be congratulated.

The Scottish Mobile Rally was organized on behalf of the Mobile Committee by the Mid-Lanark RSGB Group, under its chairman, Mr T. Sorbie.

Meetings

The Scottish VHF/UHF Convention was held at the Queen's Hotel, Dundee, on Sunday 11 October, when Council was represented by the vhf manager, Mr G. M. C. Stone. The organizers, led by Mr G. C. Somerville, GM3KYI, are to be complimented on a most successful event which attracted a record attendance.

Official Regional Meetings were held at Cardiff in Region 10 on 26 September, and at Southport in Region 1 on 27 September.

Over 70 members were present at the Cardiff meeting when Council was represented by Messrs C. H. Parsons, GW8NP; W. A. Scarr, G2WS; and R. F. Stevens, G2BVN. The chair was taken by Mr D. M. Thomas, GW3RWX, and Mr Parsons was responsible for the arrangements.

Nearly 100 members attended the Region 1 Meeting at Southport, when Council was represented by Messrs J. Petty, G4JW, and F. C. Ward, G2CVV. The arrangements for this event were in the hands of the Society's Region 1 representative, Mr B. O'Brien, G2AMV.

Staff

The general manager, Mr R. G. B. Vaughan, G3FRV, had to resign his position for personal reasons, and his resignation took effect from 30 November.

Council wishes to take this opportunity of thanking Mr Vaughan and the headquarters staff for their hard work during the period under review.

Council is pleased to announce the appointment of Mr D. A. Findlay, G3BZG, to the post of general manager.

CONTEST NEWS

HF NFD 1970

Through a series of unfortunate incidents in the postal service, and a misunderstanding arising out of this, the Chester and District Radio Society's entry for HF NFD was not received by the HF Contests Committee. Needless to say, the Chester & DRS did take part, as they always do, and made a lot of contacts. The committee regrets any misunderstanding on its part and looks forward to the continued participation of the Chester & DRS in future NFDs.

NOVEMBER 1970 144/432MHz CW Contest

The introduction of this two-band contest seems to have been favourably received; however, of the 19 entrants only nine were equipped for operation on 70cm. Those who did use uhf seemed to find the points gained to be worth the effort. The logs show that 121 stations were exchanging serial numbers on 2m and 14 stations on 70cm.

Comments on conditions varied from "slightly above average at times" to "flat". The lack of QSB was mentioned by several stations. Pressure was dropping slowly throughout the contest and there was no evidence of a "dawn lift". Few comments were received on the rules, but G3NNG would like to see a higher multiplier for uhf.

Most Section A entrants agreed that the timing of the contest was not to their liking. Some preferred no night operating, the contest being held in two parts. Others preferred a daytime-only event. Some change of the timing will be considered for next year. In this section G3NNG has a commanding lead; almost one third of his points were gained on uhf. Runner-up was G2XV who concentrated his effort solely on vhf, and third place was taken by G5UM.

In Section B the Albright and Wilson ARS took the honours. All three stations in this section operated on both bands.

The leading entry in Section C, and highest overall score, was from the University College of North Wales whose representatives braved the weather on a Welsh mountain top.

Subject to approval, certificates go to G3NNG, G2XV, G3OXD/A and GW3UCB/P.

The best dx was worked on 2m : G3OXD/A with F8TC at 490km. One station lost points because of faulty time-keeping. Check logs were gratefully received from G3HCW, G3LCH and G3JYP.

Posn	Callsign	County	Score Total	2m	QSOs	Best dx	km
Section A							
1	G3NNG	BE	314	227	52	EI6AS	350
2	G2XV	CE	200	200	39	G3XAC/P	260
3	G5UM	LR	183	126	32	EI6AS	300
4	G3JVL	HE	162	162	26	G3JYP	450
5	G3AKF	OX	126	126	42	G3XAC/P	290
5	G3IAR	KT	126	126	33	G3XAC/P	340
7	G3THY	EX	119	119	34	G3XAC/P	305
8	G2WS	ST	116	113	19	G3JYP	346
9	G3OHH	SD	113	95	25	G3DAH	295
10	G3NYY	LD	93	93	30	G3XAC/P	320
11	G2HH	WE	76	76	15	F3ZD	320
12	G3RSD	LN	58	58	9	G2JF	280
13	G3YED	YS	20	20	10	G3BLG	200
Section B							
1	G3OXD/A	WR	356	287	54	F8TC	490
2	G3KAC	GR	235	169	38	G3XAC/P	290
3	G3KMI	HE	205	190	36	EI6AS	410
Section C							
1	GW3UCB/P	DB	425	320	52	G2JF	365
2	G3XAC/P	YS	319	319	40	G2JF	395
3	G3ZHH/P	EX	105	105	26	G3XAC/P	330

IARU Region 1 UHF/SHF Contest, October 1970—UK entries

This contest on 3-4 October was reasonably supported although only 16 stations decided to submit logs. There appear to be two basic reasons; some confusion over the interpretation of the rules, and a feeling that whereas the RSGB is "us", the IARU is "them". In fact we in Europe are all IARU Region 1.

It is the policy of the RSGB to support IARU contests, and the large increased entry passed on from our VHF NFD was very gratifying. Now, we must hope that this increase can be transferred in time to this newly organized event. In each case the RSGB entry will be published, in an attempt to overcome the problem of the long delays which are common in the publication of full IARU results caused by the problems associated with judging a very large international contest.

The UK entry in this contest was dominated by G3BNL/P. Operating from 5km east of Cheltenham, Les Sharrock, G3BNL, assisted by G3RPQ won the portable sections on 432, 1,296 and 2,300MHz, and they were the only entrants reporting contacts on the 9cm and 3cm bands (in both cases with G3EEZ/P). Other section winners were G8AUE in the 432MHz fixed, with a magnificent effort from Derbyshire, and G3THQ/A, operating from Oxfordshire, in the 1,296 and 2,300MHz fixed sections.

Comments mainly were directed at the wording of the rules, the disappointing lack of activity, and in two cases where entrants only sent in check logs for 432MHz. Some entrants felt that 432MHz should not have been included in this contest. The GEC Hirst Research Centre Club (G5FK) considered that Rule 5 is much too restrictive; A2 and F2 are acceptable on shf and the exclusion of pulse modes is quite unreasonable.

However, it should be explained again that this is an IARU Region 1 contest for which this year Finland is acting as the adjudicator. The rules are drawn up by international agreement and the purpose of this particular contest is to stimulate uhf/shf activity. This is, as mentioned previously, the first year and a start has been made. It will be interesting to see what general support was received in the rest of Europe and also to see what changes in rules are suggested. The subject of this contest will be debated again by vhf managers at the next IARU Region 1 meeting which is to be held in Holland in 1972—the year in which RSGB will be the adjudicating Society.

G3LAS, G3FZL

432MHz Fixed Stations

Posn	Callsign	Points	QSOs	Best dx (km)
1	G8AUE	2798	28	300
2	G2RD	1185	27	150
3	G3LAS	1001	18	135
4	G2WS	354	8	86
5	G3JKY	238	10	60
6	G8DIV	205	11	43
7	G8BKR	184	6	65

432MHz Portable Stations

Posn	Callsign	Points	QSOs	Best dx (km)
1	G3BNL/P	3437	30	415
2	G8ARM/P	2397	43	218
3	G3RPE/P	1215	21	124
4	G3TTV/P	1080	20	135
5	G8AFA/P	937	14	130
6	G6XM/P	829	12	121
7	G3RZG/P	429	7	116

1,296MHz Fixed Stations

Posn	Callsign	Points	QSOs	Best dx (km)
1	G3THQ/A	601	10	96
2	G2RD	454	10	94
3	G5FK	185	6	54
4	G2WS	171	3	86
5	G3JKY	105	5	66

1,296MHz Portable Stations

Posn	Callsign	Points	QSOs	Best dx (km)
1	G3BNL/P	1658	19	168
2	G8ARM/P	738	14	152
3	G3TTV/P	415	7	90
4	G6XM/P	412	7	103
5	G3RPE/P	386	7	92
6	G8AFA/P	240	5	60
7	G3RZG/P	211	5	56

2,300MHz Fixed Stations

Posn	Callsign	Points	QSOs	Best dx (km)
1	G3THQ/A	220	4	77
2	G5FK	75	2	54

2,300MHz Portable Stations

Posn	Callsign	Points	QSOs	Best dx (km)
1	G3BNL/P	380	4	152
2	G3RPE/P	137	3	65

3GHz Portable Stations

Posn	Callsign	Points	QSOs	Best dx (km)
1	G3BNL/P	72	1	72

10GHz

Posn	Callsign	Points	QSOs	Best dx (km)
1	G3BNL/P	72	1	72
	G3RPE/P	nil		
	G5FK	nil		

80m Field Day 1970, Results

Eleven entries were received for this year's 80m Field Day—a slight drop on the 1969 total no doubt caused by the wet weather.

This year's winner was Peter Ellis, G3WTJ, who operated from a site near Whitby in Yorkshire. He worked 17 other portable stations using a solid-state direct-conversion transceiver (which was wrongly assigned to G3WTP in last year's write-up. Sorry!) and a dipole. In second place, a mere one point behind the leader, came W. A. Higgins, G8GF, who was assisted by I. T. Cashmore, G3BMY, of top band renown. They used a vfo/ba/pa(807) outfit, a CR100, and a dipole. Third place is taken by last year's winner, G3VOC, operated by G3ANK and G3VLT.

Unfortunately the scoring system was once again omitted from the rules sent for publication in the August issue of *Radio Communi-*

cation, but an announcement giving the necessary details was made over GB2RS.

A number of comments were made regarding the delay in the publication of these results. Unfortunately it is necessary to withhold publication until after the Society's AGM in December as it is the previous year's winner who receives the Houston Fergus Trophy at this meeting. Unless someone wins the contest for two consecutive years and offers to forgo one of the two trophy presentations to which he is entitled, then this delay will probably continue.

Other comments were: "Looking forward to next year's 80m Field Day,"—G3VOC. "It was a pity that the times of the 80m Field Day and the Region 1 contest did not coincide,"—G3OGY. "This year father helped son!"—G3LHJ. "If you made the contest 0900–1230 160m and 1230–1600 80m, would it get more interest?"—GW3HGL. "Would like to see this contest run to the same rules as the Low Power Contest,"—G3JKY.

The Houston Fergus Trophy will be presented to G3WTJ and Certificates of Merit will go to G8GF and G3VOC.

Posn	Callsign	Points	QSOs	Posn	Callsign	Points	QSOs
1	G3WTJ/P	375	61	7	G3IGU/P	303	44
2	G8GF/P	374	66	8	GW3HGL/P	266	35
3	G3VOC/P	361	67	9	G3JKY/P	243	29
4	G3OGY/P	348	53	10	G3YRC/P	214	35
5	G3VW/P	332	56	11	G3SIA/P	183	24
6	G3LHJ/P	320	46				

Check logs from the following are acknowledged with thanks: G5OJ, G8GG/P GM3ITN/P, GM4QK and BRS30033.

First 1·8MHz Contest 1971 Rules

1. The General Rules for RSGB HF Contests, published in this issue of *Radio Communication*, will apply.

2. When. 2100gmt on Saturday 13 February 1971 to 0200gmt on Sunday 14 February 1971.

3. Contacts. CW (A1) only in the 1·8–2·0MHz band. County code letters, as published on this page of *Radio Communication*, must be sent after the report—serial number group, eg for a contact from Rutland, 569001 RD.

4 Scoring. Six points for each of the first six contacts with stations in any one county; three points for the seventh and subsequent contacts with stations in that county. Six points for each contact with a station outside the British Isles.

5 Logs. Column (5) must be headed "County Code Letters Received." Entries must be addressed to D. J. Andrews, G3MXJ, 54 Roman Way, Thatcham, Newbury, Berks.

6 Trophies. The Somerset Trophy will be awarded to the winning station. The Maitland Trophy will be awarded to the Scottish member with the highest aggregate number of points in this contest combined with the Second 1·8MHz Contest 1970.

January 1971 144MHz SSB Contest

1900 to 2200gmt on 11 January.

All entries and checklogs must be sent to the adjudicator addressed to: VHF Contests Committee, c/o G8AYN, 108 Gascoigne Road, New Addington, Croydon, Surrey CR0 0NE.

The following General Rules, as published in the January issue of *Radio Communication*, will apply: 1, 2, 3, 4b, 5a, 6a, 7a, 8d, 9c, 10a, 11–24.

January 1971 144MHz CW Contest

0900 to 1700gmt on 24 January.

All entries and checklogs must be sent to the adjudicator addressed to: VHF Contests Committee, c/o G3SEK, 89 Arthur Road, Wimbledon Park, London SW19.

The following General Rules, as published in the January issue of *Radio Communication*, will apply: 1, 2, 3, 4b, 5a, 6a, 7a, 8d, 9b, 10a, 12–24.

1971 432MHz Cumulative Contest

1900 to 2100gmt on the following dates: 15 and 28 January, 10 and 23 February, 1 March.

All entries and checklogs must be sent to the adjudicator addressed to: VHF Contests Committee, c/o G2HIF, 20 Harcourt Road, Wantage, Berkshire.

The following General Rules, as published in the January issue, of *Radio Communication*, will apply: 1, 2, 3, 4b, 5a, 6a, 7a, 8d, 9a, 10b 11–24.

February 1971 70MHz Fixed Station Contest

0900 to 1500gmt on 7 February.

All entries and checklogs must be sent to the adjudicator addressed to: VHF Contests Committee, c/o G3LAS, 7 Barclay Close, Hertford Heath, Hertford.

The following General Rules, as published in the January issue of *Radio Communication*, will apply: 1, 2, 3, 4b, 5a, 6a, 7a, 8b, 9a, 10a, 11–24.

County Code Letters for RSGB Contests

County Code Letters	County
AD	Alderney
AG	Anglesey
AL	Argyllshire
AM	Antrim
AN	Aberdeenshire
AR	Armagh
AS	Angus
AY	Ayrshire
BD	Bedfordshire
BE	Berkshire
BF	Banffshire
BR	Brecknockshire
BS	Buckinghamshire
BU	Bute
BW	Berwick
CA	Cardiganshire
CD	Cumberland
CE	Cambridgeshire
CH	Cheshire
CL	Cornwall
CN	Clackmannanshire
CR	Carmarthenshire
CT	Caithness
CV	Caernarvonshire
DB	Denbighshire
DF	Dumfriesshire
DH	Durham
DN	Devonshire
DT	Dorset
DU	Dunbartonshire
DW	Down
DY	Derbyshire
EL	East Lothian
EX	Essex
FE	Fifeshire
FH	Fermanagh
FT	Flintshire
GN	Glamorgan
GR	Gloucestershire
GY	Guernsey
HD	Herefordshire
HE	Hampshire
HF	Hertfordshire
HN	Huntingdonshire
IM	Isle of Man
IS	Inverness
JY	Jersey
KB	Kirkcudbrightshire
KE	Kincardine
KS	Kinross
KT	Kent
LD	London (Postal District)
LE	Lancashire
LK	Lanarkshire
LN	Lincolnshire
LR	Leicestershire
LY	Londonderry
MG	Montgomeryshire
MH	Monmouthshire
MN	Midlothian
MR	Merioneth
MX	Middlesex
MY	Moray
ND	Northumberland
NK	Norfolk
NM	Nottinghamshire
NN	Nairn
NR	Northamptonshire
OX	Oxfordshire
OY	Orkney
PB	Peebles
PH	Perth
PK	Pembrokeshire
RD	Rutland
RH	Roxburghshire
RN	Radnorshire
RW	Renfrewshire
RY	Ross & Cromarty
SD	Staffordshire
SE	Shropshire
SF	Suffolk
SG	Stirlingshire
SK	Selkirk
SL	Shetland
SR	Sark
ST	Somerset
SU	Sutherland
SX	Sussex
SY	Surrey
TE	Tyrone
WD	Westmorland
WE	Wiltshire
WG	Wigtownshire
WK	Warwickshire
WN	West Lothian
WR	Worcestershire
YS	Yorkshire

General Rules for RSGB HF Contests

The **General Rules** for all RSGB HF Contests are given below. For each contest throughout the year a short supplementary set of rules will be published which must be read in conjunction with the General Rules.

Reprints of these General Rules will be available from HQ upon request.

1 Entrants must operate in accordance with the terms of their licence.

2 Contacts with unlicensed stations will not count for points.

3 Only one contact on each band may be claimed with a specific station, whether fixed, portable, mobile or alternative address. Duplicate contacts must be logged and clearly marked as duplicates without claim for points. Cross-band contacts may not be claimed. Proof of contact may be required. Simultaneous operation on more than one band is not permitted.

4 (a) A fixed station must operate from the address shown on the licence.

(b) A portable station must operate from the same site for the duration of the contest and may not be located in a permanent building or use public mains. Power for all equipment may be derived only from a portable generator on the site, accumulators or batteries. No equipment or aerials may be installed or erected on the site prior to 24 hours before the start of the contest. This does not apply to the storage of equipment.

(c) A mobile station is a station installed in a motor vehicle, or vessel on an inland waterway, so equipped that the station may be operated in motion without alteration.

(d) An alternative address station is a station at a location not named on the licence, other than a portable or mobile station.

5 Unless otherwise stated, single-operator entries only will be accepted.

(a) A single-operator station is one manned by an individual operator who receives no assistance whatsoever in operating, log keeping or checking etc from other persons during the contest period.

(b) A multi-operator station is one which does not conform to the definition of a single-operator station given above. In those contests where multi-operator entries are allowed, such entries will only be accepted provided that:

(i) The declaration is signed by only one operator, who will be regarded as the entrant,

(ii) The callsign of the operator concerned is indicated for each contact,

(iii) The names and callsigns of all operators are listed on the cover sheet, and

(iv) For stations located in the British Isles, all operators must be fully paid-up members of the RSGB.

6 Eligible entrants. Unless otherwise stated, only fully paid-up members of the RSGB resident in G, GC, GD, GI, GM and GW may enter. In those contests which are open to radio amateurs elsewhere, British Isles entrants (as defined above) must be members of the RSGB. Entries from GB stations, aeronautical mobile and maritime mobile stations will not be accepted.

7 A contact consists of an exchange and acknowledgement of contest information. This consists of an RS report on telephony, or an RST report on telegraphy, and a three-figure serial number starting with 001 for the first contact and increasing by one for each successive contact throughout the contest, irrespective of the band or mode in use. The supplementary rules for specific contests may call for additional information to be exchanged.

8 Form of entry.

(a) Entries must be clearly written or typed on one side only of RSGB Contest Log Sheets or international A4 size paper. Columns must be headed as shown in the example below.

(b) *Separate log sheets must be used for each band.*

(c) Logs must be kept, and entries submitted, in gmt.

(d) Each entry must include a cover sheet in the form shown below incorporating a signed declaration.

HF Contest Entry Cover Sheet

Contest ..... Date ..... Score .....
Section (if any) ..... Callsign .....
Name .....
Home address .....
.....
Name of club or group (if applicable) .....
.....
Address of station, or portable location (if other than home address above) .....
National Grid six-figure reference, county code letters, or other co-ordinates (see contest details) .....
Transmitter ..... Input power .....
Receiver .....
Aerial(s) .....

Declaration I declare that this station was operated strictly in accordance with the rules and the spirit of the contest, and I agree that the decision of the Council of the RSGB shall be final in all cases of dispute. I certify that the maximum input to the final stage of the transmitter was ..... watts.

Date ..... Signed .....

Failure to sign the declaration will involve disqualification of the entry.

RSGB Contest Log Sheets and Cover Sheets may be obtained from HQ upon request. The request must be accompanied by a large sae.

(e) All entries become the property of the Radio Society of Great Britain. In the event of any dispute the ruling of the Council of the RSGB shall be final.

(f) All entries must be postmarked not later than 15 days following the contest. If acknowledgement of receipt is required, British Isles entrants should include a stamped addressed postcard which will be returned to the sender. Overseas entries will not normally be acknowledged.

(g) Unless otherwise stated, entries must be addressed to the HF Contests Committee, Radio Society of Great Britain, 35 Doughty Street, London WC1N 2AE, England.

9 For scoring purposes, aeronautical mobile and maritime mobile stations will count as mobile stations in the country of origin.

10 Awards

(a) Awards are made at the discretion of the Council of the RSGB and may consist of trophies, plaques or certificates. Awards are, where possible, presented at the Annual General Meeting following the contest.

(b) The standard award format for contests is as follows: Some winners and section leaders will be the holders of particular trophies, and these will also receive a special framed certificate. Certificates of Merit will be awarded to the entrants placed first, second and third in each section of the contest, from (i) the British Isles and (ii) overseas.

11 Disqualification. Entrants may be disqualified on any one of the following counts:

(a) Failure to complete and sign the declaration.

(b) Frequent tone reports of T8 or less.

(c) Failure to record operators' callsigns against log entries (multi-operator entries only).

(d) Failure to use separate log sheets for each band.

(e) If more than five per cent of the log entries are unmarked duplicate contacts for which points have been claimed.

(f) Failure to observe the terms of the entrant's licence.

Failure to observe and comply with other rules may also entail disqualification.

RSGB CONTEST LOG SHEET Band .....

Contest ..... Sheet No. ..... Callsign .....

Date and time (gmt)	Callsign of station worked	My report on his signals and serial No. SENT	His report on my signals and serial No. RECEIVED	(5)	(6)	(7)	Points claimed
					Total from	previous sheet	.....

General Rules for VHF/UHF/SHF Contests 1971

The following are the General Rules for all RSGB vhf/uhf/shf contests for 1971, with the exception of VHF NFD (The rules for VHF NFD will be published separately). The rules for any vhf/uhf/shf contest will be made up from these General Rules, which will be referred to by number. The results of all vhf/uhf/shf contests will normally be announced on GB2RS, three to four weeks after the contest.

Entrants should always use RSGB Log Sheets and VHF/UHF Contest Cover Sheets. These are available from RSGB HQ upon receipt of a large stamped addressed envelope. The VHF/UHF Contest Cover Sheet goes under the name of " Form 427"; ask for this when writing to HQ.

1 Date and time. See individual contest details.

2 All entries must be sent to the adjudicator at the address given with the rules of the contest. Entries that are sent elsewhere will be disqualified.

3 All operators must be fully paid-up members of the RSGB.

4 Awards

(a) In each section of the contest there will be an award to the highest scoring station. An award will be made to the runner-up in each section in which there are 10 or more entries.

(b) Awards will be made to the highest scoring station and the runner-up.

N.B. All awards are certificates. In addition, trophies will be awarded to the highest scoring stations in the following contests.

Trophy	Contest
VHF Manager's Trophy	April 1971 70MHz Open
Mitchell Milling Trophy	July 1971 144MHz Open
The Council Cup	May 1971 432MHz Open

5 Scoring system

(a) Contacts made between the distances shown in the table will score as indicated. Contacts on borders between scoring rings score low.

km	Points	km	Points
0–50	1	500–600	22
50–100	3	600–700	26
100–150	5	700–800	30
150–200	7	800–900	34
200–300	10	900–1,000	38
300–400	14	over 1,000	50
400–500	18		

(b) Contacts will be scored at one point per kilometre.

6 Location

(a) Entrants may not change the location of their stations during the contest.

(b) Entrants may change the location of their stations during the contest on one occasion provided that only the highest scoring contact with a given station is claimed in the event of a repeat contact. Repeat contacts must be clearly marked as such in the contest log.

7 Cross-band contacts

(a) Cross-band contacts do not count for points.

(b) On each band to be used for scoring in the contest, half points may be claimed for a cross-band contact by transmitting to, or receiving from, a station where two-way communication cannot be established. (Points may not be claimed on the same band for a further cross-band contact with the same station with the transmitting and receiving roles reversed, see Rule 10a)

8 Sections

(a) There are three sections:
Section A—Single-operator fixed station.
Section B—Club stations, other multi-operator fixed stations and temporary stations.
Section C—Portable stations.

(b) Single-operator fixed stations only.

(c) Portable stations only.

(d) All classes of station with no separate sections.

9 Modes

(a) Contacts may be made on all permitted modes.

(b) Entrants may transmit only A1 (cw) or F1 (fsk) and contact only other stations transmitting these modes.

(c) Entrants must make 2-way A3J (ssb) contacts only.

10 Repeat contacts

(a) Only one scoring contact may be made with a given station on each band covered by the contest. (ie callsigns that are fixed, /A, /P or /M or the same set of equipment used under a different callsign all count as one station.) If a station that has moved location is contacted a second time, only the higher scoring contact may be claimed.

(b) One contact may be made with a given station (as defined in 10a) during each activity period. Only three out of five activity periods will count towards the final score. However, logs for all periods should be sent to the adjudicator for the purposes of checking. To be eligible for an award, an entrant must take part in a minimum of three activity periods.

11 Stations using telephony in the recognized cw sub-bands 70·025–70·1MHz, 144·0–144·15MHz, 432·0–432·10MHz and 1,296·0–1,296·15 MHz are liable to disqualification.

12 Contest exchange

The contest exchange shall consist of:
(i) RS or RST report followed by serial number
(ii) Both QRA Locator and QTH.
No points will be lost where an entrant is unable to obtain a serial number or complete location information from a station not taking part in the contest.

13 Entries

Logs must be made out on RSGB Contest Log Sheets and tabulated as follows:
(i) Date and time (gmt).
(ii) Callsign of station worked.
(iii) My report on his signals and serial number sent.
(iv) His report on my signals and serial number received.
(v) QRA Locator received.
(vi and **vii)** QTH received.
(viii) Points claimed.

14 (i) Entries must be postmarked not later than 15 days following the termination of the contest.
(ii) The RSGB VHF/UHF Contest Cover Sheet (Form 427) enclosed with the log must be correctly made out and the declaration signed.

15 An entrant must operate within the terms of his or her licence.

16 Special event callsigns (eg GB) may not be used.

17 Stations that persistently overmodulate, or radiate key clicks or poor quality signals, render themselves liable to disqualification.

18 Contacts with unlicensed stations will not count for points.

19 All entries become the property of the RSGB and will not be returned. Entrants must keep their own log records in accordance with licence requirements.

20 Contacts made by EME reflection, man-made satellites (active or passive) or any relaying device will not count for points.

21 Proof of contact may be required.

22 Gross errors in claimed score render the entrant liable to disqualification.

23 Failure to comply with any of the rules given for a particular contest will result in disqualification.

24 The ruling of the Council of the RSGB shall be final in all cases of dispute.

Definitions

Portable stations may not be located in a permanent fixed building or use public supply mains. Power for all equipment may only be derived from an on-site portable generator or battery. All equipment, including aerials, must be installed on the "portable site" within the 24 hours preceding the contest or during the contest. This does not apply to the storage of equipment.

A fixed station is any station not using a suffix such as /A, /P or /M.

Temporary stations are those using the /A suffix.

Club stations may not enter Section A of these contests (see Rule 8(a). When a club station is operated from a portable site the entry must be in Section C.

Multi-operator stations are those stations where the transmitter and/or receiver are operated by more than one person.

Site (ie "portable site") is defined as a circle drawn with a radius of 1km from the operating position during the contest.

QRA Locator is the standard five symbol location system.

QTH must be given as a point identifiable on the Ordnance Survey ten-mile map or as a bearing and distance in kilometres (not exceeding 25) from such a point, to the nearest kilometre.

Serial numbers start at 001 for each band and advance by one for each contact. In the Cumulative Activity Contests the serial commences at 001 in each activity period.

CLUB NEWS

Items for inclusion in this section should be sent to regional representatives on the first of each month for inclusion in the following month's issue. They should not be sent direct to the editor.

The date of publication of the following month's issue, first Tuesday in the month, should be borne in mind so that events are not, in fact, history when the details are published. While regional representatives are pleased to receive clubs' events calendars for several months ahead, they still require monthly events lists so that entries can be confirmed or amended.

RSGB Groups

The Membership and Representation Committee is most perturbed at the poor response to the notice under QTC in the October issue of *Radio Communication* requesting the registration of existing RSGB Groups. The accuracy of Society records is most important and it would be greatly appreciated if members responsible for RSGB Groups would supply the following information immediately: (a) name of group; (b) address for correspondence; and (c) information concerning place and dates of meetings.

REGION 1 — RR B. O'Brien, G2AMV

Special regional events: 9 May, 1971 Belle Vue Convention.

Merseyside Luncheon Club—First Monday each month, 12.30 for 12.45pm, HMS *Landfall*. Please advise G3VQT or G2AMV beforehand if you wish to attend.

Ainsdale (ARC)—6, 20 January, 3 February, 8pm, "The Morris Dancers", Scarisbrick.

Allerton (Liverpool Scout Amateur Radio Society, North West Region)—Thursdays, 8pm, 1st Allerton Group headquarters, Aigburth Vale, Liverpool 17. All Scouts interested in amateur radio are welcome.

Blackburn (East Lancs ARC)—First Thursday each month, 7.30pm, Edinburgh House, Shearbank Road, Blackburn. Further details from G4JS.

Blackpool (B & FARS)—Mondays, 8pm, Pontins Holiday Camp, Squires Gate. Morse tuition at 7.30pm.

Bury (B & RRS)—Second Tuesday each month with an informal meeting on the fourth Tuesday. 8pm, "The George Hotel" (private room), Market Street, Bury. Secretary: G3VVQ, 411 Holcombe Road, Greenmount, Bury.

Carlisle (C & DARS)—Mondays, 7.30pm, Currock House, Lediard Avenue, Currock. Secretary: A. Harper, 23 Roman Way, Carlisle.

Cheshire (Mid-Cheshire ARC)—Wednesdays, 7pm, Technical Activities Centre, Winsford Verdin Grammar School, Grange Lane, Winsford. All meetings begin with a morse class, main feature is at 8pm.

Chester (C & DARS)—Tuesdays, except the first Tuesday in the month which is net night, 8pm, YMCA Chester.

Crewe—Local members continue to meet at the QTH of R. Owen, 10 Circle Avenue, Willaston, Nantwich, from whom further details may be obtained.

Douglas (D & DARS)—Second and fourth Wednesdays in each month, 7pm, Douglas Holiday Camp, Victoria Road, Douglas, Isle of Man. Please note new secretary: J. Parnell, Upper Cronkbane Farm, Quines Hill, Port Soderick, Braddan, Isle of Man.

Eccles (E & DRC)—Tuesdays, 8pm, Bridgewater School, Worlsey Lancs. Thursdays: Club top band net, 2030gmt.

Leyland Hundred Amateur Radio Club—Net nights: Thursdays at 2000gmt, 1915kHz; Saturdays at 1900gmt, 145·8MHz.

Liverpool (L & DARS)—Tuesdays, 8pm, Conservative Association Rooms, Church Road, Wavertree. Secretary: G3WCS, Ken Wood, 90 Childwall Valley Road, Liverpool 16.

Liverpool (NLRC)—15, 29 January, 12 February, 8pm, Labour Party Headquarters, 13 Crosby Road South, Liverpool 22. Secretary: M. Graham, G3XMG, 14 Albert Road, Waterloo, Liverpool 22.

Manchester (M & DARS)—Wednesdays, 7.30pm, 203 Droylesden Road, Newton Heath, Manchester 10.

Manchester (SMRC)—8 January (Colour films with sound: "Ring around the earth", "The new Caribbean"), 15 January ("A simple transistor transmitter for 160m", by G3WFT), 22 January ("An automatic CQ sender with ics", by G3MXV), 29 January (Surplus equipment sale), 5 February (to be announced). The vhf section, G3UHF, meets every Monday at 8pm, at club shack, "Greeba", Shady Lane, Manchester 23. Secretary: G3WFT, 7 Alcester Road, Sale, Cheshire. Main club meets at Conservative Association Divisional Office, 449 Palatine Road, Northenden, Manchester 22 at 8pm.

Preston (PARS)—7, 21 January, 4 February 7.30pm, "Windsor Castle", (private room), St Paul's Square. Secretary: G. Windsor, 26 St Gregory's Road, Preston.

Salford (Dial House Radio Society)—A society of GPO engineers. Wednesdays, 6pm, 8th floor (river end), Dial House, Chapel Street, Salford, Salford 3. Further details from the secretary at this address.

Stockport (SRS)—Second and fourth Wednesdays, 8pm, The Blossoms Hotel, Buxton Road, Stockport. The committee wishes all members well for 1971. Further details from the secretary, G8BCG.

Thornton Cleveleys (TCARS)—First and third Wednesdays in each month, 8pm, St John Ambulance Brigade Hall, Fleetwood Road North, Thornton, Blackpool. Secretary: G3YWH. ASR G3ZBO.

Warrington (Culcheth ARC)—Fridays, 7.30pm, Chat Moss Hotel, Glazebury. All visitors are most welcome. Secretary: K. Bulgess, 32 Hendon Street, Leigh.

Westmorland—Fridays, 7.30pm, 24 Park Road, Milnthorpe. All visitors are welcome. Secretary: J. Forrester, 44 New Street, Carnforth.

Windscale-Cumberland (WAR & ES)—Fridays, 7pm, c/o Falcon Club, Falcon Field, Egremont. Further details from N. Ramsden, G3RHE.

Wirral (WARS)—First and third Wednesdays in each month, 7.45pm, Scouts' Headquarters, Harding House, Park Road West, Claughton, Birkenhead. Secretary: A. Fisher, G3WSD, 34 Glenmore Road, Oxton, Birkenhead.

Wirral (Wirral DX Association)—Last Thursday in each month at members' homes. January at G3XJZ for the AGM. Secretary: J. Share, G3OKA.

REGION 2 — RR K. Sketheway, BRS20185

Barnsley (D & DARC)—8 January (Sale of surplus gear), 16 January (Annual dinner), 22 January (Nfd discussion), 7.30pm, King George Hotel, Peel Street, Barnsley. *G3LRP*.

Bradford (BRS)—5 January ("Second around", by N. A. Broadbent, G8CDG, Richard Allen Radio Ltd), 19 January (My favourite disc, members' records), 2 February ("Oscilloscopes and how to train them", by W. G. Scarlett, G3RXS), 7.30pm, 10 Southbrook Theatre, Great Horton Road, Bradford 7. Morse practice prior to meeting by arrangement.

Durham (DCARS)—14 January ("Varactor applications", by P. Saul), 29 January ("SSB", by J. Melvin, G3LIV), 7pm, Room 146,

Durham University's Elvet Riverside Arts Block, New Elvet, Durham City.

Fulford (York) (FARS)—Tuesdays, 7.30pm, Scout HQ, 31 George Street, York. *G5KC.*

Halifax (NHARS)—13 January ("Metrication system and decimal coinage", by Mr Mounsey), 20 January (Committee meeting), 27 January (Discussion on rtty), 7.45pm, Peat Pitts Inns, Ogden, near Halifax.

Hull (H & DARS)—1 January (Construction night), 8 January (annual dinner), 15 January (Unidentified flying object", given by guest speaker, Mr C Watson), 22 January (Short-wave listeners night), 29 January (AGM) 7.45pm, 592 Hessle Road, Hull.

Tickets for the annual dinner to be held at the Beverley Arms Hotel, Beverley, will be available from Mrs M. Longston 4 Chester Road, off Wold Road, Hull, or from the chairman, Mr I. D. Colley, G3AGX, "Micasa", Ferry Road, Wawne, price 34s each.

Members had a most interesting night on 18 November when they visited the Humber Tidal Model, this was arranged by Mr E. Space. *M. Longson.*

North Riding (NRARG)—Group meets alternate Tuesdays and Thursdays, fortnightly, in the back room of the Ship Inn, Flasgrave, Scarborough. Further details from the secretary, Jeff Jones, G3VLM, Bingley Private Hotel, Albermarle Cresent, Scarborough. *G3VLM.*

Scarborough (SARS)—Thursdays, 7.30pm, c/o RAF Association, Fulbeck House, 3 Westover Road, Scarborough.

Sheffield (SARC)—Members kindly note change of address and date for the January meeting: Monday 18 January, 8pm, The Sheaf House Hotel, Bramall Lane, Sheffield. *G8NN.*

South Shields (SS & DARC)—8 January (Visit of Mr W. Moore, formerly of Radio Dept of South Shields Marine Technical College), 8pm, Trinity House Social Centre, Laygate, South Shields.

Annual dinner to be held on Saturday 23 January at Careme House, South Shields.

Spen Valley (SVARS)—7 January ("Light beam modulation", by S. Marsden, West Riding Electronics), 14 January ("Measurement of analogue quantities", by A. Lamming, G3NXL), 21 January ("The Esro 11 project", by Prof Marsden, Leeds University), 28 January (Junk sale), 7.30pm, The Grammar School, High Street, Heckmondwike.

Sunderland (SARS)—Meetings on the first and third Tuesdays of each month, 7pm, Sunderland Polytechnic. *G3XID.*

York (YARS)—Thursdays, 7.30pm, British Legion, 61 Micklegate, York. *J. A. Rainbow.*

REGION 3 — RR R. W. Fisher, G3PWJ

Birmingham (MARS)—12 January ("Dxpeditioning", by T. Douglas, G3BA and B. Meadow, G3BHT), 29 January (Open meeting ragchew), 8pm, Midland Institute, Margaret Street, Birmingham 3. *G8BHE.*

(South)—6 January ("Use of computer boards", by J. Clements, G3YKQ), 8pm, Hampstead House, Fairfax Road, Birmingham.

Bromsgrove (B & DARC)—12 January (Films "Midland Red Tours"), xyls and yls welcome at this meeting, 7.30pm. Secretary: J. Dufrane, 44 Hazelton Road, Bromsgrove.

Cannock (CCARS)—Meetings monthly on first Thursday in each month, but a natter nite every Thursday, 8pm, Bridgtown Social Club, Walsall Road, Bridgtown, Cannock.

Coventry (CARS)—1 January (Club stag social evening), 8 January (Night on the air), 15 January (Remembering the good old days with G2WK), 22 January (Night on the air), 29 January (Lecture by G8APB on his recent trip to VE4), 8pm, City of Coventry Scout HQ, 121 St Nicholas Street, Radford.

Dudley (DARC)—5, 19 January, 8pm, Central Library, St James' Road, Club Station, The Windmill, Vale Street, Ruiton, Dudley. *G3PWJ.*

Hereford (HARS)—Every Friday. 15 January (Social evening) Civil Defence HQ, Goal Street, Hereford.

Lichfield (LARS)—First Monday and third Tuesday of each month, The Swan Hotel, Lichfield. *G8CNB.*

Rugby (R & DAR & EC)—First Tuesday in the month, 10 Drury Lane, Rugby. *G3YQC.*

Shrewsbury (SARS)—Every Thursday, 7.30pm, Harold Clowes Community Association Centre, Bentilee.

(S-o-TARS)—Every Thursday, 7.30pm, 2a Race Course Road, Oakhill, Stoke.

Solihull (SARS)—19 January ("Vhf mobile radio communication", by Mr Roper of Pye Telecommunications), 7.30pm, The Manor House. 2 February (Informal), 9pm, The Malt Shovel, Solihull. *G8BYM.*

Stourbridge (STARS)—5 January (Natternite), Scout HQ, South Road. 2 February (Annual constructors' competition), venue to be announced. *G3ZUL.*

Telford (WARS)—Every Wednesday evening, 8pm, Ketley Bank Youth Club, Main Road, Ketley Bank, Telford, Salop. *G3YEW.*

Worcester (W & DARC)—For details of meetings please contact G8ASO.

REGION 4 — RR T. Darn, G3FGY

Derby (DADARS)—6 January (Surplus sale), 13 January (Limited party to computer at Nottingham), 20 January ("Digital logic, part 1" by E. Avery, G3WBB), 27 January ("Digital logic, part 2"), 29 January Vhf/uhf night), 7.30pm, Room No. 4, 119 Green Lane, Derby. Monday evenings are now devoted to renovating equipment for the Diamond Jubilee Exhibition to be held in March. Members are requested to bring along small tools to these meetings. Visitors are always welcome. *G2CVV.*

REGION 5 — RR S. J. Granfield, G5BQ

The regional representative would like to take this opportunity of wishing all members a happy and prosperous New Year.

Bedford (B & DARC)—7 January (Film night, bring XYLS), The Dolphin, Broadway, Bedford. Secretary John Bennett, G3FWA, 47 Ibbett Close, Kempston, Bedford.

During the last year there was 46 meetings at the clubroom, and one at the Civil Theatre when 167 people saw Dud Charman's Aerial Circus. There was also a visit to the BBC at Droitwich, participation in field days, and a special event station for the Scout rally at Ampthill Park. Membership is on the increase and prospects for 1971 are very good.

Cambridge (C & DARC)—Club meets on Fridays, 7.30pm, Corporation Yard, Victoria Road, Cambridge. Secretary: Dick Luff, G3XAK, 17 Campkin Road, Cambridge.

Luton (George Kent Group ARS)—This new group held its first get-together on Monday 23 November when 12 members were present from Luton and Hitchin factories. The club station was on the air on 80m. It is hoped to hold meetings twice monthly on Monday evenings. Further information from John Allen, G3DOT, or Roy Crowley, G3TLE, both QTHR.

March (M & DRAS)—Club meets on Tuesday evening at the Old Police Station, High Street, March, Isle of Ely, Cambs.

Shefford (S & DARS)—7 January (More about moonbounce, G3OLY), 14 January ("Keeping on the rails", by Dick Bland), 21 January (AGM including financial report), 28 January (NFD planning and equipment check—the club), 4 February (NFD logging and operating procedure, G3DPQ). 7.45pm, Church Hall, Ampthill Road, Shefford, Bedfordshire.

REGION 6 — RR L. W. Lewis, G8ML

Cheltenham (RSGB Group)—First Thursday, 8pm, Great Western Hotel, Clarence Street, Cheltenham.

Gloucester (GRS)—Second and fourth Thursdays in each month, RAFA Club, 6 Spa Road, Gloucester.

South Bucks VHF Club—2 February (Surplus equipment sale) 8pm, Bassetsbury Manor, High Wycombe.

REGION 7 — RR P. A. Thorogood, G4KD

A special gold callsign badge will be presented to a club or group entry in the CBE (Constructors Best Exhibit) to be judged at the September/October RSGB Exhibition, and cash or a voucher. Closing date for entry form is 1 September.

Acton, Brentford & Chiswick (ABCRC) —19 January (AGM), 7.30pm, Chiswick Trades & Social Club, 66 High Road, Chiswick.

Addiscombe (AARC)—Second and fourth Tuesdays in the month 7.30pm, Toc H Hall, 158 Lower Addiscombe Road.
Ashford, Echelford (ARS)—Second Monday and last Thursday of month, 7.30pm, St Martin's Court, Kingston Crescent, Ashford, Middx.
Barking (B & DREC)—Tuesdays and Thursdays, 7.30pm, Gascoigne Recreation Centre, Gascoigne School, Morley Road, Barking.
Bexleyheath (NKRS)—Second and fourth Thursdays in each month. 14 January (Junk sale, G3DFM will be in charge), 24 January (Stereo broadcasting and tape recording, a joint meeting with Dartford Tape Recording Society), 7.30pm, Congregational Church Hall, Chapel Road, Bexleyheath.
Cheshunt (CDRC)—First Friday of month, 7.30pm, Methodist Church Hall, opp Theobalds Station, Cheshunt.
Chingford (RSGB Group)—Fridays. Telephone 01-524 0308.
Chingford (SRC)—Fridays, 7.30pm, Friday Hill House, Simmons Lane, Chingford E4.
Civil Service (CSRS)—First and third Tuesdays in each month, 6.30pm. CivilS ervice Recreation Centre, Monck Street, Westminster.
Croydon (SRCC)—Third Tuesday in each month. 7.30pm, Swan & Sugarloaf, South Croydon. At the last meeting 20 members discussed obtaining a local authority hut or clubroom. The proposal supported by the committee now needs funds and already an anonymous donor has promised the club £25. Members interested please contact Tony Naylor, who wants your financial help or raffle gift.
Crystal Palace (CP & DRC)—16 January ("Vhf ssb transverters", by Clive Jenner, G8APV), 8pm, Emmanuel Church Hall, Barry Road, SE22. Next month's meeting in February is the AGM. All members of the club are asked to attend to discuss the rising club costs and subscription.
Dorking (DR & DRS)—Second and fourth Tuesdays in each month. 12 January (Informal meeting and discussion on antennas, and planning of hf NFD), 26 January (AGM), 8pm, "Wheatshaft".
Ealing (E & DARS)—Tuesday, 7.30pm, Northfields Community Centre, Northcroft Road, W13.
East London—17 January ("Marine communications", by R. Broadbent, G3AAJ).
Edgeware & Hendon (E & DRS)—Second and fourth Mondays, 8pm, St George's Hall, 51 Flower Lane, Mill Hill, NW7.
Farnham, Bucks (Burnham Beeches RC)—Fortnightly on Mondays, Farnham Common, Village Hall, Victoria Road.
Gravesend (GRS)—Every Thursday in the month, 8pm, Northfleet Recreation Centre, Springfield Road, Northfleet, Gravesend.
Guildford (G & DRS)—Second and fourth Fridays, Guildford Engineering Society, Stoke Park.
Hampton Court (TVARTS)—First Wednesday in each month, 7.30pm, The Three Pigeons, Portsmouth Road, Surbiton.
Harlow (DRS)—Tuesday (General and CW practice); Fridays (Junior). 7.30pm, Mark Hall Barn, First Avenue.
Harrow (RSH)—Every Friday in each month. 22 January (AGM), 8pm, Harrow County School for Boys, Sheepcote Road, Harrow.
Havering (H & DARC)—Fortnightly, 8pm, British Legion House, Western Road, Romford.
Hemel Hempstead (HH & DARS)—First and third Fridays in each month, 7.30pm, "Addmult" Sports Club, Hemel Hempstead.
Holloway (GRS)—Mondays (RAE), 7pm; Wednesdays (Morse), 7.30pm; Fridays (Club), 7.30pm, Whittington School, Archway School Annex, Highgate Hill, N19.
Ilford—Every Thursday, 8pm, 50 Mortlake Road, (off Ilford Lane), Ilford.
Kingston (K & DARS)—Second Wednesday in each month. 13 January ("Soldering by numbers", by A. Humphreys, G8CLF), 10 February ("Grid dip oscillators", by A. Cockle, G3IEE), 8pm, Penguin Lounge, 37 Brighton Road, Surbiton. 2m net now in operation around 144·7MHz on Saturdays at 2015bst.
Leyton & Walthamstow—Tuesdays. 7.30pm, Leyton Senior Institute, Essex Road, E10.
London (UHF Group)—First Thursday, 7.30pm, Whitehall Hotel, Bloomsbury Square, Holborn, WC1.
Loughton—Fortnightly on Fridays. Loughton Hall, Rectory Lane (near Debden Station).
New Cross (Clifton ARS)—Second and fourth Fridays in each month, 8pm, 225 New Cross Road, SE14.
Paddington (P & DARS)—Thursdays, 7.30pm, Beauchamp Lodge, 2 Warwick Crescent, W2.
Purley (P & DRS)—First and third Fridays in each month, 8pm, Railwaymans Hall, Side Entrance, 58 Whytecliffe Road, Purley.
Reigate (RATS)—First Wednesday in each month, 7.45pm, George and Dragon, Cromwell Road, Redhill.
Romford (R & DRS)—Tuesdays, 8.15pm, RAFTA House, 18 Carlton Road.
Scouts (ARS)—Third Thursday in each month. 7.30pm, Baden Powell House, Queensgate, South Kensington, SW7.
Sidcup (CVRS)—7, 21 January, 8pm, Congregational Church Hall, Court Road, Eltham, SE9.
Southgate (SRC)—Second Thursday of month, 7.30pm, Civil Defence Hut, Bowes Road, N11.
St Albans (Verulam ARC)—20 January ("1,296MHz", by Dr Dain Evans, G3RPE), 7.30 for 8pm, Town Hall, St Peters Street, St Albans. At the last meeting Richard Kressman, G3SIT/VP8JJ, gave a superb talk and slide show on his experiences during a tour in Antarctica with British Ocean Antarctic Survey.
Sutton & Cheam (SCRS)—Third Tuesday in each month. 19 January (Visit to ITA transmitting station at Croydon and Crystal Palace), 8pm, The Harrow Inn, High Street, Cheam. At the last meeting 18 members heard Tim Hughes, G3GVV, talk on "Equipment for the beginners".
Welwyn (Mid-Herts ARS)—Second Thursday in each month. 14 January (Film show). 15 January (Annual dinner, tickets obtained from G3XEB. Visitors are most welcome), 8pm, Welwyn Civic Centre, Welwyn.
Wimbledon (W & DRS)—Second and last Fridays in each month, 8pm, St John Hall, 124 Kingston Road, South Wimbledon, SW19.
Wembley (GECARS)—Thursdays, 7pm, Sports Club, St Augustin Avenue, North Wembley. (This club is open to non-GEC employees by invitation. Telephone Dr Dain Evans, G3RPE, 904 1262 for details).

REGION 8 — RR D. N. T. Williams, G3MDO

Canterbury (EKRS)—21 January ("Entertaining maths for the radio amateur", by K. Smith, G3JIX), 18 February ("Preferred 2m oscillator circuits", by I. Cline, G3EMU).
Crawley (ARC)—Third Wednesday in each month. January (Members' evening), 8pm, Trinity Congregational Church Hall, Ifield, Crawley. Secretary: G. Bowden, G3YVR, QTHR.
Dover (SEK YMCA ARC)—Meetings held every Thursday 7.30pm, YMCA Leyborne Road, Dover.
Eastbourne (SARS)—Meetings held first Monday in the month at the Victoria Hotel, Latimer Road, Eastbourne.
Maidstone (M YMCA ARS)—Meetings held every Friday at 8pm, 'Y' Sports Centre, Melrose Close, Loose, Maidstone.
Mid-Sussex (MSARS)—All meetings and club station at Marle Place, Leylands Road, Burgess Hill.
Thanet (TRS)—8 January (Bring and buy sale), 15 January (Committee versus members) 22 January (Vhf meeting at Wye), 19 January (Proposed visit to North Foreland).
Worthing (W & DARC)—Meetings held every Tuesday at "Rose Wilmot" Youth Centre, Littlehampton Road, Worthing. Details of future events from G6KFH/T.

REGION 9 — RR J. Thorn, G3PQE

Happy New Year to all clubs, societies and "lone" members. Why not make it a resolution to visit your nearest club or society early in the new year, all of these depend on everyone's support to survive these days, and you will get a lot of fun and a good personal QSO as well.
Bristol City & County (BARC)—Every Tuesday and Thursday. 21 January (Lecture on PAL colour tv system by J. Collins), 30 January (Visit to Purdown Radio Station strictly by invitation so please contact the secretary). Club meets at its headquarters, 41 Ducie Road, Barton Hill, Bristol 5. Club callsign G3TAD.

At the AGM the following officers were elected: Chairman, G3TKF; treasurer, G8CJZ; secretary, G3RKH. A full programme is being planned for the year and cards will be issued. *G3RKH.*

(RSGB Group)—15 January, 7.30pm, Beckett Hall, St Thomas Street, Bristol 1. *G3ULJ.*
(Shirehampton)—Every Friday, Twyford House. *G3YIQ.*
(University)—Every Saturday afternoon, Dept of Physics, Royal Fort, Tyndall Park Road, Bristol 8. *G8ADP.*
Cornwall (CRAC)—Meetings at SWEB Social Club, Pool, Camborne. *G3UCQ.*
(Falmouth—*G3OJN.*
(Newquay)—*G3THT.*

Exeter (EARS)—5 January (AGM), at the new venue, the Community Centre, 17 St Davids Hill, Exeter. In future the first Tuesday will be a talk, lecture, etc, and the second Tuesday will be operating night from the club QTH. *G3TXG.*

North Devon (NDARC)—73 January (AGM), 27 January (Rag chew), 10 February (Aerials talk). Also on the 13 and 17 January there will be a discussion on the RAE at 7pm. *G4CG.*

Plymouth (PRC)—5 January ("4 and 6m in Gibraltar", by J. Patrick, G3TWG), 19 January ("Talk on equipment", by Phil Williams, G3YPQ), 2 February (Slide show by J. Peters, G3YOU). In November, an excellent dinner and dance with 70 attending and with guest Joe Pengelly of BBC Plymouth. *G3SPI.*

Saltash (S & DARC)—1 January (Natter nite for the line shooters), 15 January (Technical talk), 7.30pm, Burraton Toc H, Warraton Road. At the AGM all officers were re-elected for a further year. *G3XWA.*

South Dorset (SDRS)—Meetings at Technical College. *G3EAT.*

Taunton (T & DARC)—Every Friday. 1 January (Film: "The manufacture of junction transistors"), 5 February (Film: "The junction transistor in radio receivers"), at Club HQ (The old SEVO Conference Room) The Barracks, The Mount, Taunton.

At the AGM the following officers were elected: Chairman, Rex Sawyer; treasurer, D. Field, G3WNV; secretary, D. Livsey, G8CWD.

Torbay (TARS)—Every Tuesday and Friday. 30 January (AGM and reports). Club HQ G3NJA, Bath Lane, rear of 94 Belgrave Road, Torquay. Visitors are most welcome. *G3NQD.*

Weston-super-Mare (WSMARS)—Friday 8 January (this month is the second Friday although it is usually the first), Parts 2 and 3 of "Aerials", followed by reports from officers and election of the Year Men), 7.30pm, Small Lecture Theatre, Ground Floor, Technical College. *G3GNS.*

Yeovil (YARS)—Wednesdays, The Park Lodge. *G3NOF.*

REGION 10 — RR D. M. Thomas, GW3RWX

Blackwood (ARC)—Fridays, 7pm, Blanche Cottage, off High Street, Blackwood, Monmouth. *G6BK.*

Barry College of Further Education (ARS)—Thursdays, 7pm, Barry College of Further Education, Colcot Road, Barry, Glam.

Cardiff (RSGB Group)—11 January (Lecture), TA Centre, Park Street, Cardiff. *GW3ZFG.* Tel Cardiff 62411.

Haverfordwest (ARS)—Tuesdays, 7.30pm, New HQ, Rosemary Lane, Haverfordwest, Pembs. Club callsign GW3XCT. Secretary: GW3YBB.

Hoover (ARC)—Mondays, 7.30pm, Hoover Social Club, Hoover Works, Pentrebach, Nr Merthyr, Glam. Secretary: Mr F. E. Tribe.

Port Talbot (ARC)—Second Tuesday of each month, 7.30pm, Trefelin Club & Institute, Port Talbot, Glam. *GW5VX.*

Pontypool (ARC)—Tuesdays, 7pm, Educational Settlement, Rockhill Road, Pontypool, Mon. *GW3JBH.*

Pembroke (ARC)—Last Friday of each month, 7.30pm, Defensible Barracks, Pembroke Dock. *GW3LXI.*

Sully & District Short-wave Club—Tuesdays, 7pm, The Annexe, Sully Bowls & Social Club, 59 South Road, Sully, Glam. Secretary: Mr Glyn Maggs, 3 Thorley Close, Cyncoed, Cardiff.

Rhondda (ARS)—Meets at Rhondda Transport Employees Club & Institute, Porth, Rhondda, Glam. *GW3PHH.*

Swansea Telephone Area (ARS)—Tuesdays, 7.30pm, Telephone Engineering Centre, Gors Road, Swansea. Callsign: GW3ZTK. Secretary: Mr D. E. Connor, 7 Glanmon Park Road, Sketty, Swansea, Glam.

University College, Cardiff (ARS)—Details of meetings from the secretary, c/o Students Union, Dumfries Place, Cardiff. Callsign: GW3UWC.

University College, Swansea (ARS)—Details of activities from the secretary, c/o Students Union, University College, Singleton Park, Swansea, Glam.

REGION 11 — RR P. H. Hudson, GW3IEQ

Conway Valley (CVARC)—21 January ("Radio and medical electronics", by Mr Meek of the Fieldon Research Laboratory, Anglesey), Parade Hotel, Llandudno.

Rhyl (R & DARC)—Meetings held on the second Tuesday in each month. 7.45pm, Mona Hotel, Market Street, Rhyl.

Bangor (UCNWARS)—Meetings alternate Thursdays, 5.15pm, Small Lecture Theatre of the Engineering Department, Dean Street, Bangor.

REGION 12 — RR *Post vacant*

Aberdeen (AARS)—Fridays, 7.45pm, 6 Blenheim Lane, Aberdeen. GM3HGA, telephone Aberdeen 33838.

Dundee (DARS)—Thursdays, 8pm, 3 Magdalen Place (off Roseangle), Dundee. GM3KYI, QTHR.

Inverness (IRS)—Thursdays, 7.30pm, 4 Falcon Square (nr railway station), Inverness. Mr G. Norris, 148 Oldtown Road, Hilton Inverness. Tel Inverness 31907.

Lerwick (LRC)—Tuesdays and Thursdays, 8pm, Annsbrae House, Lerwick. GM3XPQ, telephone Bixter 249.

Lhanbryde (MFARS)—Wednesdays, 7.30pm, St Andrew's School, Lhanbryde, by Elgin, Morayshire. GM3UKG, telephone Clochan 225.

Thurso (CARS)—Second Tuesday in each month. 7.30pm, Thurso Technical College. GM3JUD, QTHR.

REGION 13 — RR V. W. Stewart, GM3OWU

Lothians Radio Society (LRS)—14 January (Film night), 28 January ("RAEN", by GM3UDL), 7.30pm, 66 Hanover Street, Edinburgh 2.

REGION 14 — RR N. G. Cox, GM3MUY

Ayrshire (AARG)—3, 17, 31 January, 14, 28 February, 7.30pm, YMCA Howard Street, Kilmarnock.

Ayrshire (Ardeer Recreation ARC)—5, 7, 12, 14, 19, 21, 26, 28 January, 7.30pm, Ardeer Recreation Club, Amateur Radio Section, Stevenston. Details from J. F. McCreight, GM3DJS, 10 Auchenharvie Road, Stevenston, Ayrshire.

Falkirk & District RSGB Group—29 January, 7.30pm, Temperance Cafe, Lint Riggs, Falkirk.

Glasgow University (GURC)—8, 22 January, 7.30pm, George Service House, University Gardens, Glasgow W2.

Greenock & District (G & DARC)—8, 15, 22, 29 January, 7.30pm, James Watt Library, Union Street, Greenock.

Mid-Lanark RSGB Group—15 January, 7.30pm, YMCA Brandon Street, Motherwell.

West Scotland (ARS)—8, 15, 22, 29 January, 7.30pm, Royal Signals Lowland HQ, 21 Jardine Street, Glasgow W2.

REGION 16 — RR W. J. Green, G3FBA

Please note that Mr W. J. Green, G3FBA, has now moved from Meadway, Brundall, prior to moving to Suffolk in the new year. From 9 December 1970 his address will temporarily be Wilby Cottage, West End, Avenue, Brundall. Tel Brundall 3388.

Basildon (VARS)—Thursdays, 7.30pm, The Scout Hall, Fairview Road, Vange, Basildon, *G3VOP.*

Chelmsford (CARS)—First Tuesday in each month, 7.30pm, Marconi College, Arbour Lane, Chelmsford. *G3VCF.*

Clacton (CDRC)—Second and fourth Tuesdays of each month, The Martello Tower, Marine Parade West, Clacton on Sea, Essex. Further information from G3YAI, 122A Chilburn Road, Burrsville Park, Clacton on Sea, Essex.

Colchester (CARS)—Wednesdays, 7pm, Essex Technical College, Colchester. *G3VAG.*

Gt Yarmouth (GYRES)—Fortnightly, 7.30pm, 98 South Market Road, Gt Yarmouth. *G3HPR.*

Ipswich (IRC)—Meets on the last Wednesday in each month, 7.45pm, the Gippeswyk Hall. January meeting (morse practice). *G3YWM.*

Lowestoft (LDARC)—15 January ("Modulation methods", by G3XSK). Full details from either G3JMU, tel Lowestoft 3119 (day) Lowestoft 3067 (night), or G3GNK, tel Lowestoft 64387.

Norwich (NARC)—Mondays, 7.30pm, The Brickmakers Arms Sprowston Road, Norwich. Secretary: G. Purcell, tel Drayton 459

REGION 17 **RR C. Charpe, G2HIF**

Basingstoke (BARC)—Meetings on the first and third Saturdays in each month. 16 January. (A demonstration on the art of construction by P. Sterry, G3CBU), 7.30pm, Chineham House, Shakespeare Road, Popley, Basingstoke, Hants. *G3CBU.*

Chippenham (CDARC)—Meetings each Tuesday. 5, 12, 19 January. 26 January ("Power supplies", by John Stevens, G3UFW), 7.30pm, Boys' High School, Hardenhuish Lane, Chippenham, Wilts. *G3UTO.*

Petersfield (RNARS)—The society operates a weekly net amongst members, to which amateurs working for the Mercury Award are invited to join. The RNARS Nets operate on 3·720MHz ssb each Wednesday at 1900bst and on 3·520MHz cw each Sunday at 0900bst. The headquarters station, G3BZU, also operates on the hf bands Monday to Friday at 1100 to 1300bst. Monthly morse code transmissions at 20 to 40wpm take place on the first Tuesday in each month on 3·520MHz at 1900bst. A certificate is awarded to all successful applicants. A new committee has now been formed and comprises chairman, G3LIK, secretary, G3JFF; assistant secretary and shack manager, BRS32378; news letter editor, G3TZQ; Awards managers, G2GM and G3HZL; QSL cards and discounts, G8FG and Ron Knowles; publicity, G3DOT. G3LIK operates the QRQ runs. *G3DOT.*

N Berks (AERE, Harwell, ARC)—Meetings on the third Tuesday in each month. Also informal meetings and junk sales every Friday lunchtime. Social Club, AERE, Harewell, Didcot, Berks. *G3NNG.*

Reading (RDARC)—5 January (Hospital Radio Reading—programmes and technical problems of local broadcasting), 19 January ("Electrical safety", by Southern Electricity). 2, 16 February are yet to be announced. 7.30pm, Victory Public House, Meadway, Tilehurst, Reading, Berks. *G3NBU.*

Southampton (RSGB Group)—9 January (monthly meeting), Lanchester Building, Southampton University.

(Southampton Radio Club)—Meetings each Wednesday and Friday evening at the new clubroom, Kent Road, Southampton. Tel 73378. *G3ZKR.*

Contests calendar

1971
9-10 January—AFS (Rules in December 1970 issue)
11 January—144MHz SSB Contest (Rules in this issue)
15 January—432MHz Cumulative Contest (Rules in this issue)
24 January—144MHz CW Contest (Rules in this issue)
28 January—432MHz Cumulative Contest (Rules in this issue)
30-31 January—REF Contest (cw)
30-31 January—CQ WW 160m DX Contest
6-7 February—ARRL DX Contest (phone)
7 February—70MHz Fixed Station Contest (Rules in this issue)
10 February—432MHz Cumulative Contest (Rules in this issue)
13-14 February—1st 1·8MHz (Rules in this issue)
20-21 February—ARRL DX Contest (cw)
23 February—432MHz Cumulative Contest (Rules in this issue)
27-28 February—REF Contest (phone)
6-7 March—ARRL DX Contest (phone)
13-14 March—BERU
20-21 March—ARRL DX Contest (cw)
27-28 March—WPX SSB Contest
4 April—LP 80m
21-23 May—YL ISSB QSO Party
5-6 June—NFD
3-4 July—Summer 1·8MHz
10-11 July—HP FD
12 September—80m FD
9-10 October—21/28MHz
23-24 October—7MHz cw
6-7 November—7MHz (phone)
13-14 November—2nd 1·8MHz

Looking ahead

15 January 1971—Presidential Installation, Bonnington Hotel, Southampton Way, London WC1.
21 January—RSGB Lecture at IEE.

MEMBERS' ADS

These advertisements are accepted free of charge as a service to members of RSGB. They must be submitted on the Members' Ads order form printed on the penultimate page of each issue of *Radio Communication*, or on a postcard similarly laid out. Each must be accompanied by a **recent** *Radio Communication* wrapper addressed to the advertiser, as proof of membership.

Trade or business advertisements, even from members, will not be accepted for Members' Ads but should be submitted as classified or display advertisements in the usual way. The RSGB reserves the right to refuse advertisements, and accepts no responsibility for errors or omissions or for the quality of equipment offered for sale.

Members are advised to enclose a stamped addressed envelope when replying to advertisements.

The closing date for each issue is the 7th of the preceding month, but no guarantee of inclusion in a specific issue can be given. No correspondence concerning this free service can be entered into.

See the current order form for further details.

FOR SALE

G2DAF rx, £30 plus carr. 25W self-contained modulator, pair KT66s, £5 plus carr. GW3WWN, QTHR.

Trio JR310 as new, used 12 hours, £65 ono. Fuller, 31 Bryce Way, Pitsea, Basildon, Essex.

Transistor all band G3MVZ ssb tx as *RSGB Handbook*, pair 6146 in p.a., 180W pep, Eddystone dial, built in psu, operative 15m and 20m, requires xtals and alignment for other bands. G3NXD, QTHR. Tel 0562-85 570.

Three CR150/4s, master oscillator, combining unit, psu, fsk unit, all cabling and hndbk, reasonable offers. The Secretary, Flint & DRS, 15 Alyndale, Hope, Wrexham, Denbs. Tel Caergwrle 363.

Lafayette HA600, £33. J beam 70cm 8/8 used condition, £3, post extra. G3TTV, 12 Hazel Close, Mildenhall, Suffolk.

CDR rotator TR11A, control unit and 30-35ft 4 core cable. Will exchange for /M top band tx/rx, 62 set or home-brew or £12. G3TJQ 51 Heathfield Square, London SW18. Tel 01-874 1227.

Filter, ceramic ladder, 470kHz with 8kHz bandwidth, offers or will swop for hf filter. G8AKA, QTHR. Tel Broadstone 5297.

Trio TS500, psu, ext vfo, perf cond, original cartons, £140. G3CXX, QTHR.

BC348N, original with dyno, £10. R107 incompleted project, £3. Mullard 80 8'scope, needs trnsfmr, £3. AD94 rx, original with dyno, £9. Taylor cap bridge, £4. G3IUL, QTHR. Tel 890 7091.

Wayne Kerr R & C component bridge B121, gd cond, £12. Central valve voltmeter, £6. Heathkit SB101 /M mount, £3 10s. G3UDR, Horseshoes, Stretton on Fosse, Moreton in Marsh, Gloucestershire. Tel Shipston on Stour 8439

Eagle mini lab testmeter, new, £4 ono. 2m mods for Pye 2007 Ranger, rx stage. Circuit or data on USA rx ACR3. Elms, 110 Arundel Road, Walton, Peterborough.

Hartley 13A oscilloscope, £15 inc carr. Creed model 85 printing reperf in perf cond, offers. Wanted: Auto tx and reperf similar to Teletype 28KSR, why. GM8BJJ, QTHR. Tel 047-533 478.

Yaesu Musen FTdx400 trnscvr, £145. G3JZI, 31 Goldhurst Drive, Lower Tean, Stoke on Trent, Staffs. Tel Tean 527.

Layfayette KT320 rx, 500kHz-30MHz, exc cond, £15 ono. Canadian Marconi 52 Set xtal calibrator, 1·75MHz-16MHz, with psu unit, £10 ono. Pref buyer coll. Garnsworth, 65 High Street, Carrville, Durham. Tel Durham 4625.

Sommerkamp FTdx500 trnscvr, only ten months old and in mint cond, £190 inc carr. GD3RFK, Kionlough Cottage, Bridg, Isle of Man.

Radatec doppler radar detector, 3cm, £5. Rotary convtr 12V dc to 230V 50Hz, unused, suit field day, £10. Various *Bulletins* free. G3NVB, QTHR. Tel Stubbington 3220.

Heathkit GR54 rx, factory built and aligned, mint, £35. Also RA1 little used, exc cond, £28. GI3WEM, QTHR. Tel Lurgan 3015.

Hammarlund HQ215, won at this year's exhibition, still in transit case. Offers or would consider a cheaper rx in part exch. Stevens, 2 Ullswater Way, Elmpark, Essex. Tel Hornchurch 41921.

Comp Codar 160/80m /M rig: AT5, T28, 12V psu, control box, home-brew helical whips for 160/80m, all in good order, £30. G3OOQ QTHR. Tel Stratford upon Avon 5973.

G2DAF rx mech filt, £50. CR300 with psu, £10. Uhf impulse gen, £10. Advance sig gen, £5. 4RF tuner, £3 10s. Wanted: Cannonball 160m ssb tx. Buyers coll. G3DCS, QTHR.

Base station, 4m, 75W. £22 10s. Marconi dash mounting tx/rx, hi-band, £17. Vanguard tx, 160-10m, £30. Several low band Pye Rangers, dash mounting. RCA rx, 19-125MHz, built-in cal osc, fm/am, £25 or why. Donohue, 41 Garway, Woolton, Liverpool, L25 5LP. Tel 051-428 6851.

Tiger 2m convtr with cascoded nuvistors, has slight fault, £8. 813, 25s. 4CX250B, 30s. Heater trnsfmr for pair 813s, £2. Astatic type D104 mic, £3. G3KH, 133 Station Road, Cropston, Leicester.

25 core cable, 4s per yard from 1 yard to 6 yard lengths, comp with male or female brass plug, ideal for electric organ or audio equipment. G8AFT, Warren Cottage, Westergate, Nr Chichester, Sussex. Tel Eastergate 2318.

Panadaptor RBW-2, mint cond, hndbk, £10. Solartron CD568 scope dc-6MHz, £12. Heathkit OS2 scope, as new, £18. 2N2148 transistors, 8s pair. BD131, BD132 transistors, 9s pair. Heathkit GR78 rx, mint, £35. Wanted: cc tv gear. Hill, Parkfields Pontshill, Ross on Wye, Herefordshire.

GEC miniscope for audio or rf monitor, gd order, with hndbk, case and accessories, £8. Spy tx/rx type A Mk2, small, suitcase, 80/40 18W, cw, mains or dc, £12. Carr extra. G3GAH, QTHR. Tel Macclesfield 6457.

B40 rx, miniature valves, ex cond, £22 10s ono. Latest Hamgear preselector, new cond, £6 ono. Tel Chesham 5557.

Many transformers, chokes, meters, new comps. Send sae for lists. Suflex 0·1uF and 0·05uF, 400V, 10%, 1s each. Kilner-Smith 101 Oxford Road, Marlow, Bucks.

High and low power microscopes, plus stamp collection. Sell or exch for radio equipment. Othen, 5 Millan Close, New Haw, Addlestone, Weybridge, Surrey. Tel Byfleet 48307 evenings.

Electroniques transistor Qoilpax HB166T Mk2, unused, £12 ono. G3XVE, 63 Bathurst Road, Winnersh, Wokingham, Berks. RG11 5JB. Tel West Forest 5899.

CR100 plus full set of spare valves and hndbk, £13 10s. Buyer coll. G3TAZ, QTHR. Tel Rownhams 3731.

Heathkit 60W DX40 with vy stable Heathkit VF1U, also Z match, KW low pass filt and Hansen swr meter, £21 or with 2 ele 10m beam, £24 5s. Delivery tx poss. G3WRT, 4 Bovingdon Heights, Spinfield Lane, Marlow, Bucks. Tel 5310.

Variable regulated psu, 100-500V, 150mA, adjustable automatic overload cut-out, better than 1% regulation zero to full load, 6·3V ct at 10A, 6·3V ct at 5A, metered ht current and voltage, £9. Barnes, 105 Godstow Road, Wolvercote, Oxford. Tel Oxford 57697.

Solartron scope, needs tube, £5. Marconi valve voltmeter, £5. 4CX250B valve base, £2 10s. G3XNH, QTHR Tel East Horsley, Surrey, 3982.

BC221 freq meter with charts, int mains psu, £10 ono. G3TWJ QTHR. Tel 01-648 3471 ext 114 (office hours).

Codar AT5, T28, 12MS, 12RC, comp /M station, £35. Would consider splitting. G3NPY, QTHR. Tel Skegness 4185.

Bendix RA1B rx with psu and hndbk, £13. Collins TCS12 tx, £9. 1154 tx, £2. G3MLN, QTHR. Tel Gerrards Cross 84230.

Eddystone EC10 Mk1 (new), £45. Marconi CR300/1, built-in psu, £8 ono. Absorption watt meter, 52 Ω 1W, 70 Ω 25W, £10 ono. Decade potentiometer, 10,000 Ω, £5 ono. Stabilised psu, 500V at 150mA, 6·3V etc, £10 ono. East, 40 Orchard Road, Maldon, Essex.

GEC BRT 400D rx, fb cond, realigned, £45. Woden UM3, £2. 1,000V ½A mains trnsfmr, £5. 5 5B/254Ms, £1. FL8A audio filt, 10s. G3MGW, QTHR. Tel Brightlingsea 2382.

Swan 350 comp with psu, mic and remote vfo, £170. HW32 with psu and mic, £60. R109A, £5. QQZ04-15, brand new, £1. G3OQT, QTHR. Tel Medway 361567.

19 Set 2-8MHz vhf control unit, mic and headset, 12V power vibrator power pack, variometer, comp, £7 10s. G3ZMT, QTHR.

Tavasu /M ant, 10, 15, 20, 80m, mint cond, £7. GW3TMP, QTHR.

EC10 Mk2, new April 1970, offers around £60. Brand new (see Smiths advert) AR88D, cost £90, offers around £65. Morris, 34 Birch Avenue, Romiley, Cheshire.

Class D wavemeter, mains psu, £2. B2 tx/rx psu, coils, key, original boxes, circ diag etc, £7. Pye Reporter, 4m xtals etc, £2. G3VHD, QTHR. Tel Ingrebourne 48320.

Goodmans Sherwood enclosure Audiom 60, offers. G3UXA, QTHR.

HRO with 9 coils, psu and spkr, exc cond, £19. R210, mains psu and spkr, exc cond, £35. Newnes *Radio and TV*, 10 vols to 1964, £5. Room wanted, buyer coll. G3ZCO, QTHR.

120W am/fm cw tx, ventilated screened cab with lp filters, 80-10m, £25. Buyer must coll. G3MWV, QTHR. Tel Cromer 2872 evenings.

Aiwa recorder and psu, £15. Base station, £15. 160m Command rx, £6. Garex 2m convtr, £6 10s. 2m Ranger, breaking, £1 10s. Electronic key paddle, £2 10s. Variac, £2. National hf linear grid circ, £2. G8APB, 164 Higham Lane, Nuneaton, Warks. Tel Nuneaton 4853.

Swan 350 and psu, £150. AR88D with S meter and hndbk, £25. G3HBN, QTHR. Tel Winslow (Bucks) 2228.

DX100U and SB10U, both as new in perf wkg cond as ssb unit, £70. Pref buyer coll. G3RUN, QTHR. Tel Deal 4276.

Pye base tx, PTC723V, lowband, unmod, 40W. Pye transistor Ranger PTC2002 /M tx/rx, lowband, unmod, offers. Q5'er BC453, £2. G3OJE, 84 Mount Park Avenue, Croydon, Surrey.

Pye Ranger, 5 chan 70MHz tx/rx cct, less vibrator, £7. 70cm sig gen, precision, with a.m. mod, superb tuning, heart stab, psu, £5. Hi-fi W.B. reflex spkr cab, two spkrs, £7. G8APS, QTHR. Tel 021-308 3044.

New unused Practica Nova 1B, 2·8 domiplan case, one year guarantee, £35. Why for 2m. Phone Culling, Tel 01-857 2593 evenings.

Rtty Creed 7B for 230V and perfs. Also Geloso 207DR. Best offers. Various very old items of scientific instruments: bridge, mv pot, decade resistance, etc. All lacquered brass, too good to destroy. G3PBU, 58 Jodrel Road, Whaley Bridge, via Stockport, Cheshire.

CSE 2A10 160m transmitter. G2BMI, QTHR. Tel Uxbridge 35284. Joymatch type 4 tuner, vgc, 30s plus post. G2BCO, QTHR. Tel 061-428 8576.

HA600, as new, £35. 10in 15 Ω spkr in case, £5. Polaroid land camera model 95, £10. Magnavox 363 tape deck with 4 track heads, £10. Linear LP1 tape pre-amp. £5. G8CKH, Linden, The Drive, Sidcup, Kent. Tel 01-300 4825.

R/C gear, 4 channel Orbit tone tx, £8. Graupner transistor Ultraton rx, £4. Two Bonnar Duramite multi-servos, £3 10s each. Graupner Kinematic cascade switcher, 35s. The lot £19 post paid. G3ABH, QTHR. Tel Broadstone 2452.

2 6146s, £2. 4 5763s, £2. 2 QQV02-6s, £1. QQV06-40, £2. 3-10, £1. Sundry 6V rx valves, 18 altogether, £2. GM8APX, QTHR. Tel Kinloch Rannoch 379.

HRO MX rx, gd cond with 9 gen cover coils, spares and rack mounting psu £25. Daley, 10 Arundel Road, Cockfosters, Barnet, Herts. Tel 01-449 8222.

Star SR550 rx, gd cond, hndbk etc, £35 ono. Wanted: 12AVQ or similar. GM3WXR, QTHR. Tel 041-959 2966.

Two cowl gill motors suit beam rotation, £3 each. G8CBM, 16 Holt Drive, Wickham Bishops, Witham, Essex.

Psu for WS22 fitted with B7G plugs and sockets, off/on switch and warning lights, exc cond, £1 10s, plus post and packing. Connell, 5 Findhorn Avenue, Foxbar, Paisley, Renfrew.

JXK 70cm fet convtr, 12-14MHz i.f., as new. £12 10s. G8BCA, QTHR.

Property of late G2TX: Tiger 300 tx, all bands 3·5-28MHz, £30. Eddystone EA12 rx, mint cond, £125. G3FEP, QTHR. Tel Emsworth 2243.

Trio JR-60 rx, 550kHz-30MHz, 142-148MHz, built-in Q mult, fm detector, bfo and product detector, 500kHz xtal calib, S meter, avc/mvc mute, separate recorder and hdphne sockets, slide rule scale, 80-10m bandspread, as new, £35 ono. Streve. Tel 01-590 0324.

Radionic set 4, builds 6 transistor superhet and other circs. Also printed circ and case for /P rx, 18 'E series' circ sheets, 4 additional transistors, relay, photocell and other comps. All Radionic mounted £15 cash. James, 26 Weybridge Park, Weybridge, Surrey. Tel Weybridge 43076.

Xtals, ¼in, HRO, Hallicrafter 455, 2065, 6030, 8194·29. Wanted: similar 3500-3525, 7000-7050. Also small pe generator. GM4QK, QTHR. Tel Strathaven 3332.

KW77 rx and ldspkr. Also KW Vespa Mk1 with psu in matching cabinet, fitted alc, hndbks, exc cond, £125. 4m convtr, £6. Sae details. G5RS, 20 Hedgeway, Guildford. Tel Guildford 61786.

Radio control xtals, matched pairs for tx/rx for 460kHz i.f., £1 pp. G3REP, 94 Canterbury Walk, Cheltenham, Glos.

1in BC vidicon tube, £6. Reslo ribbon mic, lo-Z and hi-Z, £4. Brenell Mk5 type M recorder, perf deck, butchered electronics, almost comp, £15. B44 Mk2, most RSGB mods plus 03-10 final, £6. Hall, 109 Daws Lane, Mill Hill, London NW7 4SJ. Tel 01-959 8415.

2m txs, rf only, in chassis, 3-10 driving 3-10, 10XJ holder but most xtals OK in 8MHz osc, 6 or 12V heater, requires 225V 110mA. 3 available at £5 10s inc post. G8CHM, QTHR.

Varactors: MA4060A (5), 2-70cms, 12W, £3 ea. MA4060D (3), 70-23cms, 6W, £2 10s ea. Have been tested in tripler ccts *VHF Manual* (ARRL). 2N3375, 2N3553, a few from advert in Nov issue. G8AVA, QTHR.

Rtty Mk2 reperforator and 3X teleprinter, the lot £7. 19 Set Mk3, £4. Generator: 230V dc out, 24V dc in, £8. B2 coils, 30s. AR88 gear box, unused, £3. Trnsfmrs, chokes. Sae for list. G3CTR, QTHR.

19 Set, gd cond, £5. B40 rx, £16 ono. Two 38 Sets, 30s. Four 88 Sets 10s ea. Plus numerous army surplus spares. Cloutle, Russells, Oakfield Road, Ashtead, Surrey. Tel Ashtead 73937.

KW201 rx, comp with a.m. detector, xtal calib and Q mult, as new, £85 but carr extra. Todd, 52 Trevor Crescent, St James, Northampton NN5 5PF. Tel N'ton 51928 evenings.

Cossor double beam scope 1049 Mk2, fair wkg cond, £16 carr extra or buyer coll. Also 70·30MHz HC18 xtals, 2 only, 15s ea. Roberts, 12 Park Lane, Swindon, Wilts.

G3HTA type rx, ham bands only, well built, offers to nearest £25. G3TAQ, 29 St Mary's Road, Stowmarket, Suffolk.

Command rx, 1·5 to 3MHz, af and rf gains, bfo. Also R1155. Both in gd cond, offers to G3VPT, QTHR. Tel St Faiths 715.

Eddystone 750 rx, 500kHz to 32MHz, one owner, no mods, excellent, £30. Labgear wbc type G5026, 50s. Variac trnsfmr, 0-240V 0·5A, 30s. 0-270V 2·5A, 50s. KW Pi-tank coil, single ended, 15s. Pse add carr. GM3KXG, 15 Bourtree Road, Earnock, Hamilton, Scotland. Tel Hamilton 25388.

HQ 170 rx, £85. KW Viceroy Mk3 tx with extra ½ lattice filt, 6146Bs, £90. Both exc with manuals. Will del 50 miles. G3IUZ, 10 Crossway, Harpenden, Herts. Tel 3007.

FR100B, FI200B, comp with spkr, re-valved rx has 160m, can be seen wkg Saturdays. Buyer coll or will del 25 miles. £200. G3RGD, QTHR.

R107 with hndbk and Joystick vfa, very gd cond, £10 the lot ono. Collection to be discussed. Wanted: Trio JS310 or 9R59DE. Klinger, 4 Crooked Usage, Finchley, London N3. Tel 01-346 3286.

HRO b/s coils ac and M psus. R209 rx. Pye BCC 2m rx, mains. BCC /M tx/rx, 2 and 4m. BCC 46 pack sets. 1in C&S scope. Psu, 0-300V, 4 and 6V, PA 12V amp. Morse printer. 2m convtr. Avo vtvm. G3WMQ, 74 Bowrons Avenue, Wembley, Middlesex HA0 4QP. Tel 01-903 4363.

Heathkit balun, 75/300 Ω, £3 5s. G2YS, 29 Beacon Way, Rickmansworth, Herts WD3 2PF.

R216 with psu, spare film scale dial and manual. Exc cond, buyer coll, £50. G2BVN, tel 70 46749.

WANTED

The Amateur Radio Handbook of the RSGB, first edition, 1938. Also early headphones: Brown's, Ericsson, Fellows, General. K8IKO, Box 222, Worthington, Ohio, 43085, USA.

BC221 modulated type, must be in perf cond and with correct chart, built-in psu an advantage. Will arrange coll, pse state price. EI2W, 23 Rathgar Road, Dublin 6. Tel Dublin 977879.

EC10 rx. VCR139A. HW32. Mint comp sig generator. GI3AOB, QTHR.

AR88 cabinet. Hndbk or circ for AR77 to buy or copy. G3VMJ, 193 Baddow Hall Crescent, Chelmsford, Essex.

Mosley V3jnr or 12AVQ. Also Heathkit VF1U. Pref faulty unit if drive and external appearance OK. G3NKW, QTHR. Tel 061-962 1758.

Wireless World, Oct 1939 to Dec 1945 in one batch with covers and adverts, pre-war ARRL, Jones, *Radio Handbooks*, *How to Become a Radio Amateur* (ARRL), copies *SW Craft*. G3IDG, 96 George Street, Basingstoke, Hants.

Panda Cub. KW Z match. Trap dipole. 12AVQ. G5GK, The Tiled House, 34 Panton Street, Cambridge.

QQVO6-40A, QQVO3-20A, QQVO2-6, please state price. Fletcher, 95 Vanbrugh Hill, E Greenwich, London SE10. Tel 01-858 7913.

Buy or borrow circ diag and alignment instructions or manual for Heathkit AFM-1 allwave tuner. Stewart, 17 Levylsdene, Guildford. Tel 0483 69223.

For school society: 2m tx convtr, psus for 350V at 200mA, 250V at 250mA, 2m xtal, swr meter. Limited cash, will consider swap. Sae pse. G3ZTS, Worthing Schools Radio Society, 68 Grand Avenue, Worthing, Sussex. Tel Worthing 45010.

New to two: antenna rotator and transmitter. Why. Evans, Tel Parbold 2412 after 6pm and at weekends.

AR88 in gd wkg order. Allen, Glen Cottage, Stoke Hill, Bristol, BS9 1EY. Tel Bristol 683109.

Chess matches on 80m, pse get in touch if interested. G3YQV QTHR. Tel Brighton 735694.

G2DAF rx, wkg or part wkg. 9MHz ssb filt or ssb tx. GW3PJT, 139 Pont Adam Ruabon, Wrexham. Tel Ruabon 2577.

Eddystone 898 dial, any appearance, must work. G3XTZ, QTHR.

QP166 tuner, gd price if in gd cond. also G3HSC morse records. Will coll London area. Nicholls, Linstead Hall, Princes Gardens, London SW7.

CR tube (one inch) 1CP1 or similar. Twin gang 250pF wide spaced variable condenser. G2FMR, QTHR.

Wanted for bedridden swl. Genuine AR88D sig S meter with fitting instructions. Also 2m convtr to suit the same rx. Reasonable prices paid. Braee, 6 Wherstead Road, Ipswich, Suffolk. IP2 8JG.

Deac DKZ 225 cell. For sale: Murphy MR821, 85HMz, £4. Ultra W/ Talkie 121MHz, £7 10s. G3VVB, QTHR. Tel Slough 28014.

12Set, R107 or 19Set, must cover 4MHz to 7MHz, be in gd cond and reasonably priced. Bray, 19 The Fairway, Burnham, Bucks.

Trnscvr wanted, up to approx £120 cash. Write full particulars. G2FST, 48 Kinsale Road, Knowle, Bristol 4.

723A/B or 2K25 klystron, pse state price. Also info wanted on CV67 klystron. GM8CVN, QTHR.

Inexpensive R1475, with or without psu but must be in wkg order, otherwise cond immaterial. Harris, 6 Chestnut Avenue, Lutterworth, Rugby, Warks. Tel Lutterworth 2284.

Practical Electronics June to Dec 1969. Also any copies *Popular Wireless*, *Amateur Wireless*, *Radio Craft* 1920 to 1945. G3MIN, QTHR. Tel Shoreham (Sussex) 3552.

Borrow or rent: one triband beam or trapped vertical for dxpedition to Isle of Man in Feb 1971. Why. G5ATG, 1 The Serpentine, Liverpool 19. Tel 051-427 1272.

Wireless World Sept and Oct 1964. Beg, buy or borrow. Martin, 21 Wordsworth Drive, Balderton, Newark, Notts. Tel Newark 3172.

Buy or borrow handbk or info to copy on Marconi freq meter No 1026/1. Matthews, Woodland View, Clock Face Road, Bold Heath Widnes, Lancs.

Table model HRO for rebuild. G3NUA. QTHR. Tel Hartlepool 5643.

Heathkit Q mult QPM-1 6 for RA-1. G3ZJK, 32 Park Road, Thornbury, Bristol. Tel Thornbury 2185.

Hndbk or service manual for Philips tape recorder type EL3549. Also klystrons type 2K25 or 723A/B. G3KKP, QTHR. Tel Guiseley 2231.

Cheap rx for use with topband tx. For sale: Class D wavemeter, manual and phones, £5. G3WXT, QTHR. Tel Weybride 4555 ext 161 (business hours).

723A/B and KS9-20D klystron. Also rtty reperf and auto tx. G8AWN, QTHR.

Heathkit SB-640 external lmo, pse state cond and price. G3RUV, QTHR.

Gd gen cov rx with amateur bandspread or vernier, reliable resolution of usb and lsb, hndbk essential, reliable worthwhile mods acceptable, eg HRO60, NC1830, S750, SX100, SX28, HQ100. 63 Marlpit Lane, Coulsdon, Surrey. Tel Downland 55868.

FT241 Chan 339 and 54, two of each. Have 8·06 12016·6(2) 6009, 12029·1, 12095·833 for disposal. G8ANQ, QTHR.

Restoring suitcase tx/rx type 3 Mk2, need info on accessories, pa coils, load and tune capacitors, psu, main switch and 10X xtals. Woods, DL5ZH, RAF Wildenrath BFPO 42.

Joystick and tuner. Rtty demodulator. TA33 or TA32 and rotator. Also urgently require hand-held trnscvr for 28·5MHz (27·5 acceptable). G3OLV, QTHR. Tel Reeth 333 (Yorks).

R1294 uhf rx info, particularly uhf oscillator type. Oscillator valve also requ. G3YQC, 10 Drury Lane, Rugby, Warks. Tel Crick 626.

Xtal i.f. filt unit for Eddystone rx. B34 or 358 vintage. I.f. convtr for 160–80m to mw car radio 1·6MHz 12V dc. Why. G2DHV, QTHR. Tel 01-300 1649.

Beginners Morse records and hndbk. Also gdo. Price and details. Alexander, 52 High Street, Bottisham, Cambridge. Tel Bottisham 404.

Anyone prepared to exch Eddystone 840C for Eddystone EC10, cash adjustment if in mint cond. G6XD, QTHR. Tel Teignmouth 2611.

Double beam scope. Avo 8. 100W audio amp. Gear drive 88. Hndbks for Viceroy Mk 2, Hammarlund HQ170A. G3VXS, QTHR. Tel Endo 2158.

Joymatch 4RF tuner. G3TFS, QTHR.

Dc psu for Heathkit HA14 compact linear. GW3IVK, QTHR.

Fault finding manual for No19 Set, Mk2 or 3, pse state price. Winckworth, Alderney, Channel Islands.

TW 2m Nuvistor convtr, i.f. 4-6MHz, 14-16MHz or 24-26MHz, pse state cond and price. G3WZR, QTHR. Tel 01-660 3332 weekends.

Manuals or gen on radio sonde equip. Manual or gen on Pye Ranger 2002V. GI3VNL, QTHR. Tel B'Mena 41468.

Circ and notes on G2DAF tx and suitable lin amp required by swl trying RAE Dec 70. Also S meter for B40C rx, any cond. Davies, Cartref, Ffairbach, Llandeilo, Carms, S Wales.

Hndbk and circ plus any info on R209 Mk2 rx. Ealey, 3 Danehurst Gdns, Ilford, Redbridge, Essex.

Info on obtaining a Teletron oscillator coil type FTO4 or winding details etc. Also required 6F6 valve, U257 dual fet and cheap test-meter over 10,000 opv. G3YKY, QTHR. Tel Henley on Thames 2000.

Codar AT5 and 250/S power supply. Also HA600 rx. Price to G3RFG, QTHR.

Class D wavemeter converted for ac. Also hndbk or service info on Eddystone 358 or Navy B34 rx. G2UX, Chapel Street, Barford, Norwich. NOR 38X.

RAF tx T1154. G6QI, QTHR. Tel 01-284 3106.

Two ex-RAF ant relays required. Switch unit type 78A-24V, 10FB/366 or similar, with plugs, two pole two way. G3CRP, QTHR. Tel 304 6495.

U/s Perdio town and country transistor portable model PR32, for spares pse. Top band rx. Also plug-in coils for 1925 rxs. Williams, 204 Dysart Road, Grantham, Lincs.

Idler wheel, recording head and tapehead cover for Collano Studio tapedeck or comp deck if price reasonable. GM3PZG, QTHR. Tel Fraserburgh 2756.

GEC type lin amp (without TT21) using construction method in GEC application report No15 6/1964. Also in RSGB *Circuits Book* page 54, in one box 12 by 8 by 8, as per. Why. G2DHV QTHR. Tel 01-300 1649.

Handbk, info or otherwise on Hallicrafters SX16 rx. Vhf convtr covering aircraft band, any i.f. TT21 valves. G2HAX, QTHR.

One or two FT241 xtals, chans 57/58 or near. G3HUL, 45 Crown Road, New Costessey, Norwich. Yel Costessey 3646.

Eddystone 750, faulty one considered. GI3PSQ. QTHR. Tel OBE2 666182 after 6.30pm.

Genuine RCA S meter for AR88D rx. Richardson, 2 Edna Road, Maidstone, Kent. Tel Maidstone 51578.

Eddystone bug key, any cond, pse state price. G3WDS, QTHR.

Eddystone 77OR, Bantem, Courier am/hb. Timer counter 5MHz. Sig gens TF995, TF1064. Must be in gd cond. G3HKV, 16 Abbey Street, Crewkerne, Somerset. Tel Crewkerne 2662.

1970 World Listings Callbook or dx Listings. Reasonably cheap 2m convtr. Cheap rtty equip, would pref comp rx station. Illman, 134 Baslow Road, Totley, Sheffield S17 4DR. Tel 365345.

KW2000A/B, Atlanta or sim trnscvr. Also diag for TCS15 rx. G3YJF, QTHR.

Top band Cannonball. G3SNU, QTHR. Tel Totnes 3040.

Labgear 300 with psu, must be in gd cond, pse state price. G3WPW, QTHR.

AVO valve characteristic meter Mk1 handbk, borrow or buy. Cook, Old Lodge, Seven Hills Road, Cobham, Surrey. Tel Cobham 3117.

Halicrafters S27, must be in gd cond, pse state price. Tilly, 54 Ashton Drive, Bristol BS3 2PP.

Info on American Sig Corps dynamic mutual conductance tube tester I-177, will copy and return postage etc for trouble. Wilcox, 34 Fernbank Avenue, Elm Park, Hornchurch, Essex. RM12 5RB. Tel Hornchurch 45169.

Eagle SR65 ldspkr, original 16Ω versioh (not 8Ω) must be in gd cond. State price. G8DCA, 6 Bonnywood Road, Hassocks, Sussex.

XL101 xtal for Murphy B40 rx. Morgan, 17 Willenhall Road, Bilston, Staffs. WV14 6NW.

Ex navy Cossor freq swept oscillator CT381 NATO No 6625-99-580-2588 or sim with variable sweep up to 15% at 60kHz and 455kHz. G3ARJ, 6 Lindsay Avenue, Hitchin, Herts. Tel Hitchin 2381.

R1475 rx, will exch for Pye Ranger 2202, wkg on 2m /M. G8BKV, QTHR. Tel Ipswich 41674.

Drive for AR88. Also info on 22T trnscvr, buy or borrow. Perrott, 222 Chislehurst Road, Petts Wood, Orpington, Kent BR5 1NR. Tel Orpington 33901.

First, second and third editions of RSGB *Handbooks, Bulletins* from year dot for preservation. Spy suitcase rx/tx, must be gd, not necessary wkg. Why. For Sale: coil winder, £15. Sae for det. Howlett, 40 Leonard Road, Landport, Portsmouth. Tel Portsmouth 29618.

Wanted for museum: old wireless sets, ldspkrs, radio books, mags, catalogues, price-lists etc. Collections arranged. Gear requ for historical use, research and lectures, not for resale. Byrne, G3KPO, Jersey House, Eye, Peterborough. Tel Eye 351.

Schoolboy swl requ rtty rx, must be cheap. Also 144MHz /M rx, reasonable price. Astbury, 9 Fairmile Drive, Manchester M20 0WS.

Transistorized rx gear for listener without mains. Old mags for local swls. 2m tx or trnscvr about 60W. Xtals 5 to 5·5MHz. Walsh, Ballylynch, Carrick on Suir, Ireland.

School society needs CR100 or sim rx in gd wkg cond, can afford £12 inc carr. Would appreciate any unwanted gear. For sale: 19 Set rx with meter, suit for spares. Amateur Radio Society, Boys Grammar/Technical School, Llanelly, Carms.

GDO. 2m tx about 25W. G8ECT, 26 Stagbury Avenue, Coulsdon, Surrey CR3 3PD. Tel Downland 54130.

Beam rotator in exch for pair of gd quality 28·5MHz walkie talkies. G3FAU, QTHR. Tel Stevenage 52932.

Hndbk, circ diag. any info on ex Admiralty Marconi HR71 especially gen on xtals XL1-5. Buy or borrow. Risso, 209 Main Street, Gibraltar.

Wanted for school radio club. Buy or borrow any info on the New Zealand ZC1 Mk2 trnscvr and also any suitable mods. Landeg, c/o School House Blue, Christ College, Brecon, South Wales.

Circ or hndbk for Taylor valve tester model 45A and Cossor scope model 339B. Will photocopy and return with your expenses paid. G3YYG, 10 Rose Heath, Hemel Hempstead, Herts. Tel Hemel Hempstead 57547.

Beg, buy or borrow manual or circ diag etc for CR100/2. G3IKR, QTHR, Tel Bicester 3212 Extn 58.

Wireless World March 1967, *Radio Electronics* Jan, Feb, March, April 1970. Heinrichsons, 4 Winterhope Road, Annan, Dumfriesshire.

Shure 444, 201 or sim mic, price etc to G3YJP, QTHR. Tel Letchworth 6392.

Perdio town and country rx. Also rx or trnscvr to cover 156MHz marine vhf band. G3TSY, Little Russel, Lytchett Minster, Poole, Dorset.

46·7MHz third overtone HC6/U xtal. Can exch for 35·5555MHz 10XBE if desired. McCombe, 33A Upper Oldfield Park, Bath BA2 3JX. Tel Bath 26286.

8/8, 6/6 or 4/4 2m beam. GM3LVB, 5 Craiglockhart Park, Edinburgh EH14 1ER. Tel 031–443 3381.

Buy or borrow and return hndbk, circ diag or any info on xtal calibrator No 10 as used with the WS62 set. GW8DOV, QTHR.

Borrow or buy hndbk for Panda PR120V. Walters, 17 Greenfield Terrace, N Cornelly, Pyle, Glam.

Wanted for radio society: AR88LF in gd cond. Also illuminated S meter, perspex escutcheon and mains switch for AR88LF. Sae for reply. Jones, 14 Park Side, Park Road, Buckley Flintshire CH7 2HB.

Rack mounting psu, regulated 250-525V 800mA, 115-125V, 50Hz ac input, 6·3V, 10A heaters. New, will exch for gd communications rx with xtal filt, etc. G8LZ, QTHR. Tel Maidstone 54461.

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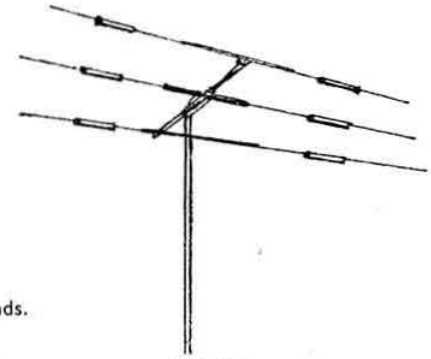

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KW1000 Linear	£125	Shure 201 Mics	£5.12.6
KW105 Matching unit	£28	Eddystone EC10 Mk2	£62.10.0
KW103 VSWR meter	£13.0.0	FL100B TX	£95.0.0
KW E-Z Match	£13.10.0	HW32 Less PSU	£40
KW Antenna switch	£3.10.0	NCX5 Transceiver with cal.	£220
KW Low pass filters	£5.12.0	Trio 9R59DE	£32
Trio TS510 Transceiver	£180	FL500 TX	£110
Trio JR310 Reciever	£77.10.0	HA350 Speaker. Cal.	£55
Trio 9R59DS Receiver	£42.10.0	Shure 444 Mics	£12.12.6
Trio SPD5 Loudspeaker	£4.7.6	2Metre 5 Element Beams	£2.10.0
Trio HS Headphones	£5.19.6	2Metre 6 Element Beams	£2.15.0
Trio 599 Rx	£185	2Metre 8 Element Beams	£3.2.6
Lafayette HA600 Rx	£42.10.0	4Metre 3 Element Beams	£2.10.0
Codar AT5 Tx	£17	70cm 9 Element Beams	£2.10.0
Codar T28 Receiver	£17.10.0	Antenna Rotators	£18, £25, £40, £70
Codar PR30x Preselector	£8.10.0	Garex 2m Convertors 28-30	£11.18.6
Codar "Q" Multiplier	£8.17.6	Mosfet 2m Convertors	£13.15.0
Hy-Gain TH3MK2 Beam	£69.10.0	2Metre Mobile Tc	£42.10.0
Hy-Gain TH2MK2 Beam	£48.0.0	2Metre Tx with AC psu	£42.10.0
Hy-Gain TH3Jnr	£48.0.0	75 ohm twin feeder per yd	8d
Hy-Gain 12AVQ Vertical	£16.10	300ohm twin feeder per yd	8d
Hy-Gain 14AVQ Vertical	£19.10.0	50 ohm co-ax per yd	2.3
Hy-Gain 18AVQ Vertical	£35.10.0	Dipole "T" Pieces	2/6
Eddystone EC10MK2	£74.10.0	Highpass filters	27/6
Eddystone 898 Dial	£7.5.0	AS100D Test meters	£12.10.0
Transistor Intercom	£2.15.0	Hansen SWR Bridges	£4.0.0
KW Balun	£1.15.0	2Band Aircraft Rx	£14
H2P Balun	£4.0.0		

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Full range of Eddystone, Datum diecast boxes, chassis, panels, meters, plugs, cable, valves. RSGB Publications now in stock. Large sae will bring you latest lists. Postage/Carriage is extra on all items.

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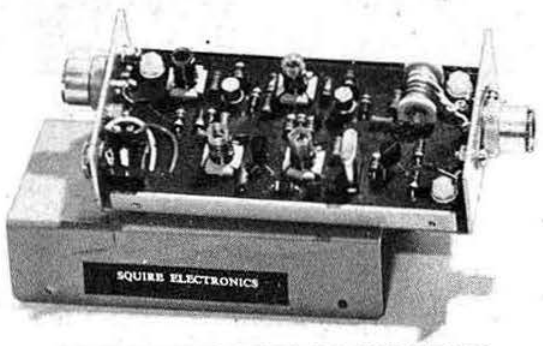
A HAPPY NEW YEAR FROM
SQUIRE ELECTRONICS



2 METRE MOSFET CONVERTER

Housed in a miniature two tone blue/grey case 3 11/16" × 2" × 15/16".
Noise figure better than 2.8db
Gain 30db
Input 144-146MHz
I.F. outputs in stock:
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18-20MHz Others to order
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PARAFIL ROPE for "fit-and-forget" jobs. 3·5mm dia. 250 lbs strength; **1/6d** metre. 4·6mm dia. 500 lbs strength; **2/-** metre. FREE SAMPLES with new list of masts and other aerial/earth goodies on receipt of SAE.

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Michael Gale and his staff wish all their customers both old and new, a very happy and prosperous New Year.

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Tel: Roman Way (070-135) 4330.

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Typical overall gain 30dB
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Supplies: 9-15 volts at 20mA positive or negative earth PRICE: £15 10 0

144MHz MOSFET Converter
Typical Noise Figure: 2·8 dB
Overall gain: 30dB
I.F.'s 4-6, 14-16, 18-20, 28-30MHz other I.F.'s also available
Supplies: 9-15 volts at 20mA positive or negative earth PRICE: £15 10 0

432MHz MOSFET MIXER Converter
All RF circuits in Microstrip
Typical Noise Figure: 3·8 dB
Overall gain: 30 dB
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144MHz TRANSISTOR TRANSMITTER (5 watts output)
This 6 channel transistorised transmitter operates on 12 volt supplies positive or negative earth. Supplied with Microphone and 1 crystal for 145·000 MHz (Mobile calling channel.) PRICE: £27 10 0

144MHz 10 Watt TRANSMITTER (ATK-1).
10 watts RF output using 6, 8 or 12MHz crystals (Not supplied)
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Printed Circuit Board & Handbook £2 0 0

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Full range of TRIO Equipment in stock:
TS510, JR599, JR310, JR500, 9R59DS.

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Eddystone 940, **£95**; Eddystone 750, **£47**; Eddystone 680X, **£65**; Eddystone 670, **£20**; Eddystone 358X, **£12**; KW201, **£75**; FR200B, **£75**; SX111, **£65**; S208, **£35**; JR500, **£50**; Mohican, **£27.**

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Xtals 8007.67, 8090.77, 10x Type **15/-** ea.

SAE for lists, Gen, etc.

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FOUR-SIDED 16 S.W.G. ALUMINIUM

Size	Price	Base	Size	Price	Base
6 × 4 × 2"	6/3	2/11	10 × 8 × 2½"	12/-	5/6
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7 × 5 × 2"	7/6	3/5	12 × 9 × 2½"	13/9	7/-
8 × 4 × 2"	7/-	3/4	13 × 8 × 2½"	13/9	6/11
8½ × 5½ × 2"	8/-	3/9	14 × 7 × 3"	14/6	6/6
9 × 7 × 2"	9/3	4/10	14 × 10 × 2½"	16/-	8/7
10 × 4 × 2½"	9/-	3/9	15 × 10 × 2½"	16/6	9/1
12 × 4 × 2½"	10/-	4/3	17 × 10 × 3"	19/6	10/1
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Plus post and packing.

PANELS, Any size up to 3ft. at 6/- sq. ft. 16 s.w.g. (18 s.w.g. 5/3).
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CAPACITORS - 2/6 DOZ

500 volt tubular ceramics : - 50, 150, 700, 2000, 3000pF; also -
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Nylon trimming tools, suit hex or slotted cores .. .. .. **1/- each**

Send SAE for lists (or supplement only if you have our March 70 lists)
Handling charge 1/6 up to 15/- order value. 2/6 for all other orders.

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Ashford (MX) 55265 (up to 9.30 p.m. any evening)

By the time this advertisement appears we should have in stock

Trio 9R 59D receivers ..	**£42. 10s. 0d.**	**15/- P. & P.**
Trio SP 5D speakers ..	**£4. 7s. 6d.**	**7/6 P. & P.**
Trio HS4 headphones ..	**£5. 19s. 6d.**	**5/- P. & P.**

S.A.E. for lists of new and second hand items.

CLOSED WEDNESDAY ALL DAY.

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R.T. & I. offer the finest selection of first-class new and fully overhauled second-hand communications and electronics equipment in the U.K.

- *Constantly changing stocks of a vast range of equipment.*
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- *Part exchanges welcomed.*
- *We are 'spot cash' buyers for almost all electronic equipment.*

Send S.A.E. for our latest list of over 50 receivers and many other interesting items.

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0803 55488 *G8ABP*

Valves: QQVO3/20A 45/- P.P. 1/- } Gold pins, First Class
QQVO6/40A 45/- P.P. 1/- } Guaranteed 3 Months'
E180F 5/- P.P. 6d.

M.E. 70 8 watt 70 cms Tripler Amplifier 2 × QQVO2/6. **£14.**

Transistors: 2N5245 (Formerly TIS88), **10/-**, 40600 **15/-**, 2N3819 **9/-**, 2N2369 **6/-**, 2N3826 5/-, 2N706 **2/6**, AF279 **14/-**, OC45 **2/-**, ZT202 **2/-**, IN914 **2/3**, BC1096/-, 2N708 **6/-**.

Post 5d. Send S.A.E. for list and enquries.

35 Lidford Tor Avenue, Roseland Park, Paignton, Devon.

EMSAC CRYSTAL SERVICE

We have produced new lists of crystals in stock here as well as lists of the large stocks held by a well known American manufacturer. We aim to deliver by return for our own crystals and within 3 weeks on the overseas lists. However, please bear in mind that these are subject to the vagaries of importation in general! As a new service we offer FT243 crystals at **21/-** including postage ground to within 1 kHz at any frequency between 8 and 8·111 MHz. Delivery will in all cases be less than three working days from receipt of order. We also have the popular 38·666 in HC18/U per return delivery at **25/-**.

Send an s.a.e. for our lists, including grinding prices, or telephone your requirements to West Kingsdown 2344: our telephone is manned between 9 a.m. to 6 p.m. 6 days a week.

ELECTRONIC & MECHANICAL SUB-ASSEMBLY Co. Ltd.
Highfield House, West Kingsdown, Nr. Sevenoaks, Kent

SPECIAL OFFER (THIS MONTH ONLY)

To Readers of "Radio Communication" only

HONDA E300E . . .

PORTABLE PETROL ELECTRIC GENERATORS

LIST PRICE £79
OUR PRICE £65

C.W.O. for IMMEDIATE DESPATCH. All equipment is new and GUARANTEED and CARRIAGE PAID U.K.

Write, call or phone, Weybridge 48291

ADVANCED DEVELOPMENTS
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Listen to the world with Eddystone

When you own an Eddystone communications receiver, you have the broadcasting world at your finger tips – wherever you happen to be – on land or at sea. The reputation these sets have attained is proof of their excellence and reliability and at Imhofs, there is a special Eddystone department, where you can see, hear and compare all models listed here.

Same day despatch to any part of the world; free delivery in the U.K.; plus after sales service for which Imhofs and Eddystone are world famous.

EDDYSTONE EB35 Mark II broadcast receiver AM/FM transistorised. A high performance all-band receiver, can also be used as a 'Hi-Fi' tuner. Powered by 6 SP2 torch cells, or, with Type 924 power supply unit, from AC mains. £88.12.3d. Also stereo model. £97.10.9d.

EDDYSTONE EC10 Mark II transistorised communications receiver. A de-luxe version of this famous design now incorporating 'S' meter and limited fine tuner. £74.10.0d.

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There is an Eddystone Communications receiver for any frequency between 10kHz and 870 mHz full details from Imhofs or your local Eddystone agent.

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R36F

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EDDYSTONE PANADAPTORS model EP17R or EP20R. Made for 77OR or 77OU Receivers. Complete with handbook in original boxes, £60 carriage £2.

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AVO Signal Generators CT378. 2-225 mc/s metered and attenuated output. For 110-260v A.C. Quality instrument, fully overhauled, £35 Carriage £1. MARCONI Distortion Factor Meter TF142E. 230v A.C. 0 - 5%, 100 - 8000 cycles. Clean condition £10, carriage paid.

REED RELAYS. 4 make contacts, 7/6 each, post 1/-. Also available reeds for above. 1·85" overall. Body length 1·1" dia. 0·14" to switch 500ma up to 250v. D.C. Gold clad contacts, 12/6 dozen, 75/- per 100. Manufacturers are invited to send for list of semiconductors and reed relays available in large quantities. 500 pf single gange variables, new and boxed, 6/- post paid.

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All receivers and Test Equipment are in working order at time of despatch. Carriage charges are for England and Wales only.

Telephone 34897

Terms: Cash with order. Early closing Wednesday

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WELLINGTON STREET, MATLOCK, DERBYSHIRE

Matlock 2817, 2430 evenings. Alan G3MME. Bill G3UBO

AGENTS (evenings and weekends only): **John (G3JYG) 16 Harvard Road, Ringmer, Lewes, Sussex. Ringmer 8071**
Sim (GM3SAN) 19 Ellismuir Road, Baillieston, Nr. Glasgow. 041-771 0364

Happy New Year

YAESU MUSEN CO. LTD.

I think it is pretty well known that Sommerkamp equipment is made by Yaesu Musen and that, for example, the Sommerkamp FT-500 is identical with the Yaesu Musen FT-400, except in name.

It gives us great pleasure to announce that we are now importing this equipment directly from the factory and new prices are as follows. Sommerkamp type number and price are shown in brackets where applicable.

Yaesu Musen FT-200 (Sommerkamp FT-250 £160) **£132**

Yaesu Musen FT-400 (Sommerkamp FT-500 £250) **£195**

Yaesu Musen FT-560 (U.S. version of FT-400) **£195**

Yaesu Musen FT-101 (New model replacing FT-150) **£218**

Yaesu Musen FL-400 (Sommerkamp FL-500 £145) **£140**

Yaesu Musen FL-2000B (Sommerkamp FL-2000B £160) **£130**

Yaesu Musen FR-400 (Sommerkamp FR-500 £160) **£120-£160** depending on options

We can also supply some items previously not available, such as external VFO's for the FT-200, FT-400/560 and FT-101, FT-200 d.c. p.s.u. and matching speakers for all models.

We have never gone in for extravagant claims or the "fabulous bargain" type of advertising—we merely present you with the facts and leave you to decide for yourself, but I would like to emphasize that even at the old higher prices this equipment was best value for money, and at reduced prices there can be no shadow of doubt about it.

In addition to the range of Yaesu equipment, we would mention the Inoue range, the FE equipment and our range of POST FREE accessories, etc. including SWR meters (£6.80), Yaesu YD844 table mike (£10), Teisco DM-501 (£3,) low impedance padded headset (£2.40), 12 hour digital clocks (£5.70), EK-9X electronic keyers (£8), plain keys (£1), etc., etc. to say nothing of a slew of small bits and pieces.

In the second-hand line, too, we don't do too badly and have a pretty good selection of excellent, fully tested and serviced equipment at very reasonable prices. It is well worth your while getting our lists—all it costs you is a large s.a.e. Schools, Colleges, etc. Can't afford to lash out capital on gear? What about leasing? Have a chat about it to us—our rates are very economic.

Inoue IC-2F. Deliveries are improving and I wouldn't mind betting by the time you read this we might even have a few in stock for immédiate delivery.

Servicing: We do it, we do it well, we do it speedily and we do it at reasonable cost.

Hours: Tuesday to Saturday, 9-5.30 (closed for lunch 1-2.0 and all day Monday).

M1 Delivery: January 17th- write for timetable.

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Advertisements should be prepaid. Private rate 1/- (5p) per word, minimum £1. Box no. 3/- (15p) extra, which includes forwarding replies.

Words comprising name and address or callsign should be counted for advertisements not requiring a box number.

Trade advertisements should be submitted by letter.

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Classification (for sale etc)

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Box No. Yes/No

Please insert this advertisement in Radio Communication. **(BLOCK CAPITALS PLEASE)**

				£1(min)
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				£1.8.0.
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NAME .....

ADDRESS .....

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DATE ..... *SIGNED*.....

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MEMBERS' ADS ORDER FORM

Please type or print clearly in block letters

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For Sale ☐

Wanted ☐

Callsign or Name and Address

	QTHR

Telephone number

DATE ..... *SIGNED*..... *CALLSIGN, BRS or A No.*.....

The number of words in each advertisement must not exceed 32, not including name and address or callsign and QTHR or telephone number Four pages of each issue are allocated to Members' Ads at present, and in order to include as many advertisements as possible licensed members are requested to give their callsign and QTHR instead of their name and address. (QTHR means: "My address in the current call book is correct").

Also to conserve space, please keep advertisements as brief as possible consistent with a clear basic description of the equipment. Advertisements will be edited to conform to a set style of abbreviations, so it is unnecessary to submit them in abbreviated form.

Conditions under which Members' Ads are accepted are published on the first Members' Ads page of each issue.

POST TO MEMBERS' ADS, RADIO COMMUNICATION, 35 DOUGHTY STREET, LONDON WC1N 2AE

INDEX TO ADVERTISERS

Radio Society of Great Britain

FOUNDED 1913
INCORPORATED 1926

PATRON H.R.H. THE PRINCE PHILIP
DUKE OF EDINBURGH, KG

APPLICATION FOR CORPORATE* OR ASSOCIATE* MEMBERSHIP

RADIO SOCIETY OF GREAT BRITAIN,
35 DOUGHTY STREET,
LONDON WC1N 2AE
Tel 01-837 8688
Giro A/C No 533 5256

* I hereby apply for election as a Corporate Member of the Society and enclose a remittance for £4 being the amount of my first annual subscription.

* Being under 21 years of age and not holding a current Amateur Radio Transmitting Licence I hereby apply for election as a Non-Corporate (Associate) Member of the Society and enclose herewith a remittance of £2 being the amount of my first annual subscription.

I, the undersigned, agree that in the event of my election to Membership of the Radio Society of Great Britain, I will be governed by the Memorandum and Articles of Association of the Society and the rules and regulations thereof as they now are or as they may hereafter be altered; and that I will advance the objects of the Society as far as may be in my power; providing that whenever I shall signify in writing to the Society addressed to the Secretary that I am desirous of withdrawing from the Society I shall at the end of one year thereafter after the payment of any arrears which may be due by me at that period to be free from my undertaking to contribute to the assets of the Society in accordance with Clause 8 of the Memorandum of Association of the Society.

Date _____

Signed _____

PERSONAL DETAILS TO BE COMPLETED BY APPLICANT

SURNAME (BLOCK LETTERS) _____

CHRISTIAN NAMES (IN FULL, BLOCK LETTERS) _____

ADDRESS FOR ALL CORRESPONDENCE (BLOCK LETTERS) _____

_____

NATIONALITY _____ *AGE (IF UNDER 21)* _____

CURRENT CALL-SIGN (IF ANY) _____

DETAILS OF PREVIOUS MEMBERSHIP (IF ANY) _____

DETAILS TO BE COMPLETED BY THE PROPOSER †

I WISH TO PROPOSE _____ *FOR * CORPORATE/* ASSOCIATE MEMBERSHIP*

PROPOSER'S NAME (BLOCK LETTERS) _____

ADDRESS (BLOCK LETTERS) _____

CALL-SIGN (OR BRS NO.) _____

SIGNED _____

* Please delete where inapplicable.

† If the applicant is not acquainted with a Corporate Member willing to propose him for election he may submit a suitable reference in writing as to his interest in Amateur Radio.

The first subscription should be enclosed with this application to avoid delay.

FOR OFFICE USE ONLY

APPROVED BY COUNCIL _____ *BRS OR A No. ISSUED* _____ *FIRST SUB. PAID* _____

Journal of the Radio Society of Great Britain

radio communication

Index to Volume 46

January to December 1970

Abbreviations

MOTA—Month on the Air
FMD—Four Metres and Down
TT—Technical Topics

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Contests, DF (Page numbers in italics signify rules)

Contests, HF (Overseas) (Page numbers in italics signify rules)

Contests, HF (UK) (Page numbers in italics signify rules)

Contests, VHF (Page numbers in italics signify rules)

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Exhibitions, conventions, lectures and meetings

HF receiving

HF transmitting

Licensing

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Reviews, publications

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TVI

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VHF/UHF miscellany

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RSGB

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	postage 5/– extra
Radio Data Reference Book	14/6
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World at their Fingertips (Paperback)	14/6
(De-Luxe)	50/–

MORSE

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RSGB Morse Practice Tape (450 ft)	13/–
G3HSC Rhythm Method of Morse Tuition—	
Complete Course (two 3-speed LP records and one EP record plus books)	88/–
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LOG BOOKS

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35 DOUGHTY ST., LONDON, WC1N 2AE

Printed in Great Britain for the RADIO SOCIETY OF GREAT BRITAIN, 35 Doughty Street, London WC1N 2AE
by The Garden City Press Limited, Letchworth, Hertfordshire.