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June 2000 Issue

short wave magazine

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features

BROADCAST

SSB UTILITIES SPECIAL

COVER SUBJECT *You've already opened the bag!*

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COMING NEXT MONTH IN *SWM* JULY

- Scanning Special
- JW goes back to the future with the AR88
- Plus much more!

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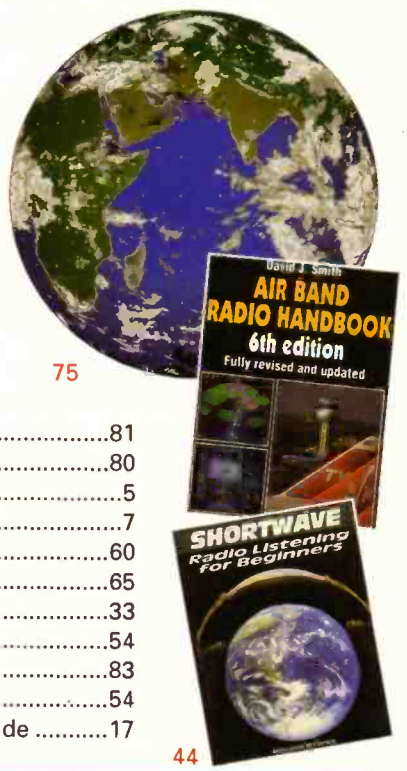

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SWM Services

Subscriptions
Subscriptions are available at £33 per annum to UK addresses, £40 in Europe and £44 (Airsaver), £50 (Airmail) overseas. Subscription copies are despatched by accelerated Surface Post outside Europe. Airmail rates for overseas subscriptions can be quoted on request. Joint subscriptions to both *Short Wave Magazine* and *Practical Wireless* are available at £55 (UK) £68 (Europe) and £74 (rest of world), £85 (airmail).

Components For *SWM* Projects
In general all components used in constructing *SWM* projects are available from a variety of component suppliers. Where special, or difficult to obtain, components are specified, a supplier will be quoted in the article. The printed circuit boards for *SWM* projects are available from the *SWM* PCB Service, **KANGA PRODUCTS, Sandford Works, Cobden Street, Long Eaton, Nottingham NG10 1BL. Tel: 0115 - 967 0918. Fax: 0870 - 056 8608.**

Photocopies & Back Issues
We have a selection of back issues, covering the past three years of *SWM*. If you are looking for an article or review that you missed first time around, we can help. If we don't have the whole issue we can always supply a photocopy of the article. Back issues for *SWM* are £2.99 each and photocopies are £2 per article.
Binders are also available (each binder takes one volume) for £6.50 plus £1 P&P for one binder, £2 P&P for two or more, UK or overseas. Prices include VAT where appropriate.
A complete review listing for *SWM/PW* is also available from the Editorial Offices for £1 inc P&P.

Placing An Order
Orders for back numbers, binders and items from our Book Store should be sent to: **PW Publishing Ltd., FREEPOST, Post Sales Department, Arrowsmith Court, Station Approach, Broadstone Dorset BH18 8PW**, with details of your credit card or a cheque or postal order payable to PW Publishing Ltd. Cheques with overseas orders must be drawn on a London Clearing Bank and in Sterling. Credit card orders (Access, Mastercard, Eurocard, AMEX or Visa) are also welcome by telephone to Broadstone **(01202) 659930**. An answering machine will accept your order out of office hours and during busy periods in the office. You can also FAX ah order, giving full details to Broadstone **(01202) 659950**. The E-mail address is **bookstore@pwpublishing.ltd.uk**

Technical Help
We regret that due to Editorial time scales, replies to technical queries cannot be given over the telephone. Any technical queries by E-mail are very unlikely to receive immediate attention either. So, if you require help with problems relating to topics covered by *SWM*, then please write to the Editorial Offices, we will do our best to help and reply by mail.

ed's comments

My Shack

Well, spring is most definitely sprung and at last the editorial shack is finally progressing. With any luck this weekend should see the floor dug out, levelled and shuttered ready to accept the concrete. Then it won't be long and I'll be moving the gear in. I hope to be able to vacate the corner of the garage that I've been slowly occupying to a greater and greater extent over the past few months very soon as I'm keen to indulge in my other hobby. Without full access to the garage/workshop, I can't get the off-road trialer rebuilt and I can't face the withdrawal symptoms any longer.

Your Shack

Recently Adrian Rees, a member of the evergrowing population of *SWM* Readers E-mail list, posted the following. "I've been reading *SWM* since 1978 and have noticed a great many changes since then ...mostly for the better. One thing I do miss though, is a single page feature called 'The Other Man's Shack'.

I would like to see this come back to the magazine, maybe with a photo or two, and a paragraph about the operator, be they s.w.l. or licenced, possibly with a word or two about listening activities, home brew gear, etc."

Well Adrian, thanks for raising the point. I'd love to see the feature return too. So don't be shy everyone, let's have those pictures and a few words of description. I'd like to extend the feature to include mobile set-ups too, so vehicle mounted gear and antennas would be of great interest.

We'll be featuring my shack and mobile antenna farm some time in the future but come on, let's see yours first.

By the way, if you're not subscribed to the [SWM_R]eaders list check it out. Join by simply sending an E-mail to **swm_readers-on@pwpublishing.ltd.uk** then you'll get a copy of all the postings to the list. Have fun.

Portishead Closed

Did you monitor the final transmission from the now defunct Portishead Radio? Family commitments ensured that I, unfortunately, missed it. Nevertheless, thanks to Day Watson, here is the text of that final broadcast made by Portishead Radio at 1200 Sunday 30 April, via RT, Telex and C.W.

"CQ de GKB2/4/5/6 This is the last broadcast from Portishead Radio. For 81 years we have served the maritime community. We say thankyou to all those who have supported and used our station. We pay tribute to Marconi who made it all possible. His first transmissions across water were made from nearby here and so started the radio era. We are proud to have been part of that era. As this historic time in the commercial messaging world comes to a close the Manager and Radio Officers wish you farewell from Portishead Radio/GKB AR VA".

May she rest in peace.

Still Life

I received a letter a short while ago complaining that I was still wearing the same shirt in the accompaning picture. Be assured that I have changed my shirt, it's just the photo that hasn't altered. So, this month a bit of variety, here's one that was taken earlier!

73

Kevin Nice

JRC CONTROL

Dear Sir
Re: letter in April *SWM* from Keith Mayhew on NRD-545 computer control.

I have my NRD-545 working from my PC's COM1 port with a 'null modem' cable connected to the RS-232 socket on the '545. A 'null modem' cable can be purchased from any good computer shop. 'Null modem' just describes the internal pin connections - i.e. it is not straight pin-pin, there is a crossover.

It does not matter whether the '545 runs from the COM1 or COM2 port on the PC, it just depends which plug (9-pin or 25-pin) is on the PC end of the cable. Some locally purchased cables may have both the 9-pin and the 25-pin plug at both ends to give greater freedom of choice.

Here I copy from the NRD-545 manual:

Use the 6ZCJDOO350 RS-232C cable (option). Use a commercially available RS-232C cable (cross connection, DSUB-25 pin connector, male-male connector); Enter the following terminal parameter settings: communication rate: 4800bps (check that the internal default rate of the 545 has not been changed); data length: 8 bits; stop bit: 1 bit; parity: none; x parameter: none.

As long as there is no conflict on the PC's internal interrupt settings, then all should work. But the correct cable is the single most important factor. Get it wrong and control will not work.

Spencer Brotherton
South Wales

Dear Sir
Re: April, Letters Page, Keith Mayhew, Notts.
The cable required is a null-modem (crossover) type, not a one-to-one. I can supply the connection data if the enquirer wants to make up his own cable.

Jim Dunnett
via E-mail

Dear Sir
I own a Sangean ATS-909 (Roberts R861, Radio Shack DX-398). So, yesterday I looked up 'Sangean ATS-909 Modifications'. I was amazed at the things one can do with the 909.

It is possible to have 76-108MHz, the chugging noise on the up and down buttons removed and also improve the s.s.b., but please help me, the only shops that can do these upgrade mods are shops in America.

Do you know anywhere in the UK that can do these modifications. I think the ATS-909 is better than my Grundig Satellit 700, Yacht Boy 400 and Sony ICF-SW7600G. The best in order are: 1) Sangean ATS-909, 2) Grundig Satellit 700, 3) Grundig Yacht Boy 400, 4) Sony ICF-SW7600G, also the silver version of the Sangean ATS-909 - don't you think the silver will wear off over time to show black parts by touching the radio a lot?

Is there any way you can put v.h.f. airband 108-137 into the ATS-909 and if you get 76-108 mods done, will RDS on 909 work in Japan? Also, do you know when Radio Shack or Yupiteru are going to have a 8.33kHz scanner?

Tandy is closing I heard, will Radio Shack be closing in the US? The Radio Shack DX-398 is the same as the ATS-909, but is only sold in Radio Shack in the USA, it is jet black. Radio Shack's stores are the same as High Street Tandy stores in the UK.

Keep up the wonderful work at *SWM*, the only thing I hate about *SWM* is its out every month - it should be published every week as I hate waiting for a great read.

John Weir
Edinburgh

Do any readers know of anyone in the UK offering the modifications to which John refers? - ***Ed.***

Dear Sir
I am a devoted reader of *SWM*, (have indeed taken out three year subscriptions in a row), particularly the broadcast sections and I contribute when I can to LM&S. I wanted to comment on your Bandscan articles.

The one from America is absolutely brilliant, unlike the Europe and (in particular) the Australia ones, it doesn't take an inward looking view, but actually lists DX audible in North America. It scores 10/10 for me and I wish you published it every month.

The Bandscan Europe one rates 4/10 - there is hardly ever any mention of DX. European radio is fairly dull newswise, but at least we live in the continent, as do most your readers, so it justifies (just about) its space.

The worst score at most is 1/10 for Bandscan Australia. The radio scene described there seems amazingly dull. However, Australia is surrounded by DX, almost as much as is the USA. I know because last month I spent a week in Canberra, took my Sony SW55 with me and picked up a number of interesting s.w. stations (e.g. the many 90m band New Guinea ones). I've sent the results to Brian Oddy of course.

Why though do we never hear anything about this from your Australian correspondent - why is he so inward looking? Why did the sad news about the demise of s.w. broadcasts from Tahiti have to come from Bandscan America, as it did some months back and not from Bandscan Australia - Tahiti is closer to Australia than the USA. Incidentally, the new and very disappointing *WRTH* still has Papeete as broadcasting on three s.w. frequencies!

How do your other readers value these Bandscan columns?

Bill Griffith
London

Interesting point you make Bill. I personally would hate it if we had enforced a unified style on our authors of Bandscan. It is my view that variation is important. I'm interested what other readers think though. - ***Ed.***

Dear Sir
I live in a property where I am unable to erect an antenna because of space limitations. However, I have a loft of the following dimensions, 7.5 x 7.2m and a height of 2m. Could you suggest an inexpensive wire antenna for use with a Sony ICF-SW55.

In your 'LM&S' reports you use the abbreviations SINPO for the ratings of the reception. Could you tell me what these abbreviations mean so that I can understand the reports more easily.

Moving to another topic, I have been looking through back issues of your sister magazine *Practical Wireless* and have come across an interesting circuit for an active antenna in the November 1998 issue, page 29. I have one query regarding this circuit, and that is the value of C3, the coupling capacitor. You quote a value of 100, 100 what? Could you clarify please.

H.C. Chapman
Shropshire

Regarding your wire antenna, you could try about 10m fixed along the underside of the ridge. You may find that you experience mains interference from your house wiring though. SINPO is explained on page 22, March SWM. *Capacitance - 100pF.* - ***Ed.***

Is there something you want to get off your chest? Do you have a problem fellow readers can solve? If so then drop a line to the Editor at QSL, *Short Wave Magazine*, Arrowsmith Court, Station Approach, Broadstone, Dorset BH18 8PW.

THE BEST LETTER WILL RECEIVE A £20 VOUCHER TO SPEND ON ANY SWM SERVICE.

You can also submit your letters by E-mail to: **qsl@pwpublishing.ltd.uk**

Dear Sir
Two items in recent editions have prompted me to write. The DXTV column, in April, may have stayed in the right frequency band, but in my view really drifted off the mark when discussing DAB. Then May's Communiqué was again off the mark - suggesting that DAB receivers are all costing at least £800.

These somewhat negative messages are a great disappointment, coming from *SWM*, because I have always looked upon the magazine as having a very forward looking, enquiring but factual approach.

Let us look at DAB receiver costs - clearly they **are** expensive at present, but prices are, as predicted, coming down. For example, the Panasonic ST-GT 1000 DAB/FM tuner is quoted at £499.99. My researches show there are now five different home tuners on sale in the UK.

A number of DAB boot mounting 'black boxes' for use with existing f.m. car head units from such as Grundig and Pioneer are in the same price range. Again my researches show there are now seven manufacturers selling in-car DAB receiver products in the UK.

Better still perhaps for readers of *SWM*, the Bosch DAB-PCI card is available for £469 and provides access not only to audio, but data services also, via a PC.

If you want to see a ground-breaking DAB receiver product go to **www.wavefinder.com** to see the Psion idea for a DAB combined antenna/receiver-to-u.s.b. for connection to a PC. This is scheduled for release in 2000-Autumn at around GBP 300.00.

So there are plenty of ideas for DAB products about to whet our appetites. Furthermore, the broadcasters are already offering new DAB only services, as well as their well established services (see tables showing channels on 2000-04-15) some of which are not available on f.m.

Ch 12B	225.648MHz
1	Radio 1
2	Radio 2
3	Radio 3
4	Radio 4
5	Radio 5 Live
6	BBC World Service
7	BBC Test
8	BBC 5 Live Sport +
Ch 11D	222.064MHz
1	talkSPORT
2	Virgin Radio
3	Classic FM
4	Planet Rock
5	Core
6	'Speech'
7	'Rolling News'
8	Life
9	One Word
10	Test channel

For me, as a broadcasting engineer, one of the most interesting aspects of DAB is the new reception experiences which DAB - using Single Frequency Networks (SFN) - will bring to us listeners. I recently had the opportunity to borrow, for a few days, a DAB engineering test receiver from the Panasonic European Laboratories, Langen, Germany.

This receiver has comparable sensitivity to their home tuner. Without a special band III antenna - in fact I used my 'scanpole' - I was able to perfectly receive both the BBC multiplex on Ch 12B and Digital One on Ch 11D. But this was in Battle, East Sussex, approximately 65km from the Croyden transmitter site and about 30km *outside* the published service area. It just may be that signals were not coming from Croyden, but Reigate Hill (about 5km nearer to me) - with SFNs it is not easy to determine the originating transmitter. Thus I am claiming the first ever UK DX-DAB award!

TOP QSL

So let's not be too stick-in-the-mud about DAB. Also let's not believe all the broadcasters say about their coverage areas. (I checked with Digital One and during my tests they were operating at a lower power than the BBC - but there was **no** discernible audio quality difference). Of course, I accept that coverage areas are about all modes of reception, including mobile, and they have to recognise this requirement, where antennas will be much lower and among the urban clutter.

I know I will still have to save my personal pennies before I buy a DAB receiver, however I'm sure the day is now rapidly approaching.

Bev Marks
East Sussex

Communiqué

Another Store

Maplin Electronics - the specialist retail and mail order company - has recently opened its latest store at **2/4 Alderman Judge Mall, Eden Street, Kingston-Upon-Thames KT1 1BS, Tel: (0208) 549 8180**. Trevor Baylis, the inventor of the clockwork radio, opened the store back on the 15th April, where he signed copies of his latest book and met customers throughout the morning.

The opening of the Kingston store brings the overall Maplin store network to 56 locations. Everything from components and cables to state-of-the-art electronics gadgetry is on show. "Maplin Electronics already have a strong mail order base in the area," comments Regional Manager Ash Limbachiya, "but now we offer an exceptional retail service".

More information from Maplin direct on **(0870) 264 6000** or write to Maplin Electronics at **PO Box 777, Rayleigh, Essex SS6 8LU, Tel: (01702) 554000, FAX: (01702) 554001** or visit their web site at: **http://www.maplin.co.uk**

Trevor Baylis opened the 56th Maplin Store back on 15th April.

GPS Drops Errors

As of the 1st of May, the United States finally stopped the intentional degradation of the Global Positioning System (GPS) signals available to the public by the use of a feature, called Selective Availability (SA). This means that civilian users of GPS will be able to pinpoint locations with up to ten times more accuracy than previously. GPS is a dual-use, satellite-based system that provides accurate location and timing data to users world-wide.

The US Presidential Decision Directive of March 1996 included in the goals for GPS a remit to encourage acceptance and integration of GPS into peaceful civil, commercial and scientific applications world-wide and to encourage private sector investment in and use of US GPS technologies and services. To meet these goals, the US government committed to discontinue the use of SA by 2006 with an annual assessment of its continued use beginning this year.

The decision to discontinue SA is the latest measure in an on-going effort to make GPS more responsive to civil and commercial users world-wide. Last year, the US Vice President announced plans to modernise GPS by adding two new civilian signals to enhance the civil and commercial service. This initiative is apparently on-track and the budget further advances modernisation by incorporating some of the new features on up to 18 additional satellites that are already awaiting launch or are currently in production. The US government state that they will continue to provide all of these capabilities to world-wide users free of charge.

Originally developed by the US Department of Defence as a military system, GPS has become a global utility. It benefits users around the world in many different applications, including air, road, marine, and rail navigation, telecommunications, emergency response, oil exploration, mining and many more. Civilian users will benefit from a dramatic improvement in GPS accuracy with the discontinuation of SA. For example, emergency teams responding to a cry for help can now determine what side of the road they must respond to, thereby saving precious minutes. This increase in accuracy will allow new GPS applications to emerge and continue to enhance the lives of people around the world.

Since it has been demonstrated that the capability to selectively deny GPS signals on a regional basis is effective when US national security is threatened, the decision to discontinue SA is supported by threat assessments which concludes that setting SA to zero would have minimal impact on US national security.

The Secretary of Defence in co-ordination with the Departments of State, Transportation, Commerce, the Director of Central Intelligence, and other Executive Branch Departments and Agencies realised that world-wide transportation safety, scientific and commercial interests could best be served by discontinuation of SA. These agencies are also committed to enhancing GPS for peaceful applications and preserving fully the military utility of GPS.

Novice/Morse Classes

The **Preston Amateur Radio Society** run Novice amateur radio courses every Thursday night at 1900 and Morse classes at 2000. Everyone is welcome. More details about the club and its activities, etc. from **Eric Eastwood** on **(01772) 686708**.

Coming Soon

Icom (UK) Ltd. have recently announced details of the forthcoming IC-718 h.f. all-mode transceiver. Aimed as an entry-level product, the IC-718 continues all the traditions of high quality engineering that you would expect from Icom. Conveniently sized and easy to operate, the IC-718 utilises all the latest r.f. and digital technology and is designed to be one of the most practical rigs ever. Indeed, the IC-718 is a worthy addition to the Icom amateur range.

The first thing that strikes you about the IC-718 is its similarity to the IC-R75 and more importantly that the speaker is mounted on the front panel of the transceiver. With the speaker facing the operator, audio can now be

Radical Redesign

The new April-August 2000 issue of the **Maplin Electronics** catalogue has been radically redesigned and is now segmented into seven discreet product worlds. The 'worlds' (Communications, Components & Cable, Computers, Electrical, Leisure & Hobbies, Sound & Vision and Tools) encapsulate all the existing product sections in previous catalogues.

The new catalogue includes many additional features and substantial price reductions. Additional benefits include vouchers worth over £50 and improved photography, illustrating Maplin Electronics is a leading provider of solutions for the home, business and leisure.

The single CD-ROM catalogue comes with a comprehensive search facility that aids product browsing. Product pictures, technical specifications, order form facility and a datasheet library collectively enhance the latest version of the Maplin Electronics' April 2000 catalogue.

More information from Maplin direct on **(0870) 264 6000** or write to Maplin Electronics at **PO Box 777, Rayleigh, Essex SS6 8LU, Tel: (01702) 554000, FAX: (01702) 554001** or visit their web site at: **http://www.maplin.co.uk**

more clearly heard during operation.

The IC-718 has a total of 101 memory channels, which stores operating frequency and mode, and is equipped with a minimum number of switches and controls for ease of use. For example, the 10-key pad on the front panel allows you to directly enter an operating frequency, or access a memory channel. All popular operating modes are offered: u.s.b., l.s.b., c.w., RTTY (f.s.k.) and a.m. In addition, there is a level adjustable noise blanker, a variety of scanning functions as well as a hand microphone and electronic keyer as standard.

More information from Icom at **Sea Street, Herne Bay, Kent CT6 8LD, Tel: (01227) 741741, FAX: (01227) 741742** or visit their web site at **www.icomuk.co.uk**

No BARTG 2000 Rally

BARTG is sorry to have to announce that there will **not** be a BARTG rally this year. As many of you will know, BARTG did not hold a rally in 1999 either. This, BARTG explains, was partly due to their venue - Sandown Park - becoming too expensive for their kind of rally and partly due to clash (or near clash) of dates with other rallies.

Ian Brothwell G4EAN, BARTG Secretary, said, "We set ourselves the goal of re-launching the BARTG rally in 2000 as a more specialised event for the datacoms and home-brew enthusiast. To do this successfully we had to find both a new, affordable venue and a clear date in the rally calendar.

"We threw open the choice of venue to our members in the hope that someone, somewhere, would know of a convenient hall of suitable size for a radio rally. We received only one suggestion for a venue and, after considerable discussion by the committee, it was decided that this venue would be too expensive for us. The committee was also uncertain as to whether to keep our rally date to a Sunday or to move it to a Saturday (in order to avoid a clash of date with other rallies).

"It was therefore sadly decided by the committee that there would not be a BARTG rally in 2000. A benefit of this decision is that, by not running a BARTG rally this year, we have freed up resources (i.e. people and money) so BARTG stands should be appearing at more rallies this year".

All membership details are handled by the Membership Secretary **Bill McGill**, at the following membership correspondence address, which is: **BARTG, Freepost NEA8763, Rotherham S66 7BR**, packet: **G0DXB @ GB7WRG**, E-mail: **members@bartg.demon.co.uk** or telephone **(01709) 814010** (1900-2100). Subscription prices are: UK - £12, EU and Eire - £16, Overseas/Air - £18 or $30. BARTG can also be found on the web - visit **www.bartg.demon.co.uk**

RAFARS Rep

Roy Walker G0TAK has recently been appointed as the Royal Air Force Amateur Radio Society (RAFARS) Area Representative for the county of Lancashire. The post has been vacant for some time and Roy says he is hoping to make sure that RAFARS is represented at rallies and other events in the county.

Roy stated in his letter that he would also like to get in touch with anyone in Lancashire who has, or has had, any RAF, WRAF, RAuxAF or VRT connections and who have an interest in any aspect of the radio hobby. Contact Roy at **3 Elderberry Close, Thornton-Cleveleys, Lancashire FY5 2ZB**.

Watson W-40SMV

Waters & Stanton PLC recently announced the introduction of the new Watson W-40SMV switch-mode 40A power supply. The first power supply of its kind to be introduced onto the UK market, the W-40SMV is able to deliver over 450W of power, and will find wide appeal with radio amateurs who want to run a 100W transceiver, plus several other devices. It will also form a good d.c. power source for solid state amplifiers.

The W-40SMV will deliver 40A and has a continuously variable output voltage control from 3 - 15V, plus a fixed 13.8V position via switch on the underside of the case. The unit weighs just 3.5kg and

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Send your news to Zoë Shortland at the Editorial Offices

rallies

Attention Please!

Would you like to have your Rally publicised? If so, all you have to do is put together as much information as possible about the Rally, i.e. date, location, times, who to contact, etc. and send it to the Editorial Offices.

May 28: The Bury Radio Rally will be taking place at the Mosses Centre, Cecil Street, Bury, starting at 1100 and features include a trade show, special interest groups, Bring & Buy and refreshments. Admission costs £1.50, £1 for concessions. Enquiries to mailbox (07946) 090773 or E-mail: **buryrally@hotmail.com**

May 28: The East Suffolk Radio Rally (the Ipswich Radio Rally) will take place at 'The Hollies', IACSSA, Straight Road, Foxhall, Ipswich. The ESWR is now principally a large car boot sale with indoor trader and special interest group support. Open from 0800 for traders and 0930 for buyers. In common with many rallies, the event will close mid afternoon. Talk-in will be provided on S22. Further details from **Sam Jewell G4DDK** on **(01394) 448495**.

June 4: The Mid Hampshire Radio Rally will take place at Medstead Hall, Medstead, Alton, Hampshire. Doors open 1030 and entry is just £1.50, which includes raffle entry in aid of the RAIBC. Telephone **(07790) 577945** or E-mail: **chris@g0wyf.freeserve.co.uk** or check out their web site at **www.g0wyf.freeserve.co.uk**

June 4: The Mansfield Amateur Radio Society's annual Radio & Electronics Car Boot Sale is to be held at Debdale Lane Sports and Social Club, Debdale Lane, Mansfield Woodhouse, Nottinghamshire, commencing at 1000. Bar, refreshments and ample parking available. Details from **Angela** on **(01623) 429218**, E-mail: **andange@netscapeonline.co.uk** or for the latest information visit **http://members.netscapeonline.co.uk/andange/rally.htm**

June 4: The 4th Red Rose QRP Festival is to be held at Formby Hall, Alder Street (off High Street), Atherton, Manchester, between 1100 and 1600. There will be trade and club stands. There is a huge car park, disabled facilities, refreshments and bar. Display of Morse keys and QRP rigs, plus a low cost Bring & Buy. Admission is £1. More details from **Les Jackson G4HZJ, 1 Belvedere Avenue, Atherton, Manchester M46 9LQ** or Tel: **(01942) 870634**.

Continued on page 9...

measures 220 x 110 x 300mm. Input voltage is 240V a.c. and cooling is via a whisper quiet rear facing fan. Full over-voltage and over-current protection is featured.

Delivery will be early June and the price will be **£149.95 inc. VAT**. More details from W&S direct at: **22 Main Road, Hockley, Essex SS5 4QS, Tel: (01702) 206835/204965, FAX: (01702) 205843**. For **orders only**, you can use freephone number **(0500) 737388**.

BBQ & QRP Evening

The **Bangor & District Amateur Radio Society** meet on the 1st Wednesday of every month in the Clandeboye Lodge Hotel, Bangor, at 2000. On Wednesday 7th June 2000 the Society are holding their annual summer BBQ and QRP evening. Visitors and new members are (as always) most welcome. More information from **Mike GI4XSF** on **0284-277 2383** or visit the club's website at **http://welcome.to/bdars**

New Web Site

Back at the end of April, leading business-to-business distributor Farnell - a part of the world-wide Premier Farnell group - launched an all new e-Commerce web site for UK industry. Available to anyone with Internet access, the site combines an intuitive user interface with sophisticated searching facilities to deliver unrivalled access to Farnell's 100,000-plus branded products and services.

Located at **http://www.farnell.com/uk** the site has been developed as a true e-Commerce solution. Offering each registered user a site that can be customised to their own preferences and needs, Farnell's user login system makes the site a permanent resource which customers can continue to use throughout their career.

Farnell has built extensive product search features into the site and combined this with a convenient 'shopping basket' system for order assembly. An innovative feature also allows orders to be sent to an alternative contact within an organisation for authorisation and processing.

In the planning of the site, care has also been taken to provide seamless hyperlinking to over 650 Farnell supplier web sites. In this way, the new Farnell UK web site is able to deliver a vast array of additional details on products and background information on manufacturers.

Designers and developers using the site will benefit from a dedicated designers' homepage. Providing links to some 60-plus industry sites and news groups, this area of the site also gives access to technical information, datasheets , an acronym database and A-Z listings of manufacturers with ties to Farnell.

Naturally, the site also includes an advanced product browser that supports illustrations, technical specifications and pricing information. Newly introduced to **www.farnell.com/uk** are 'Select online' and 'XS online' - two services offering special promotions on leading and discontinued or excess-stock Farnell lines. Regularly updated, these areas provide the frequent visitor with the opportunity to make major savings.

Farnell's new UK web site.

Farnell's new web site complements its paper catalogue by providing an alternate means of obtaining products and information 24 hours a day, 365 days a year. The Farnell UK web site initiative is part of Premier Farnell plc's group wide investment of some £90 million in e-Commerce and other integrated systems to enhance customer service.

Premier Farnell believes that the time, cost and information efficiency which e-Commerce brings will extend beyond its own businesses. Trading electronically with Premier Farnell will also enable supplier and customer organisations to be more efficient and effective.

Sharing its architecture and operating system with some existing and all future group companies' web sites, **www.farnell.com/uk** is an example of how all its customers can benefit from Premier Farnell's commitment to leadership in business enabling technologies.

Silver Jubilee

The **Southdown Amateur Radio Society** (SARS) and **Radio Club de Normandie** (RCN) are pleased to announce their twinning Silver Jubilee (1976-2000) in June 2000.

So, how did the two clubs get together in the first place? Well, back in February 1976, Mike Ockenden G3MHF proposed to the committees of the Rouen based Radio Club de Normandie and the Southdown Amateur Radio Society in Eastbourne, that the two societies should be twinned. By exchanging information and ideas and fostering personal relationships, Mike foresaw a deeper development of the kind of international friendship for which the Radio Amateur is renowned. Jean Haas F9NZ, Secretary of RCN, quickly confirmed their unanimous approval.

Claude Eisele F5AFB, Chairman RCN and Geoff Ellis G3LFZ, President SARS & RCN Liaison Officer, are holding the European Flag awarded to SARS by East Sussex County Council in 1988 for 12 years contribution to Anglo-French relationships.

Over the last 25 years there have been 33 official exchange visits in the name of which more than 500 return journeys have been made. Celebrations are expected to take place when SARS visits RCN in September 2000. The Society would like to think that their achievements in this field are unique, unless anyone knows different of course!

W&S Open Day

Waters & Stanton PLC are holding their 10th Annual Open Day and biggest event yet on **Sunday 28th May** at their Main Road, Hockley, Essex premises, starting at 1000, with free entry, free food and drink, free parking and a free raffle.

With the marquees in the car park, there will be more room than usual for all the bargains and special offers that make this day so special. Stands include Icom, Yaesu, Kenwood, RSGB and the Essex Repeater Group will provide the talk in on S20.

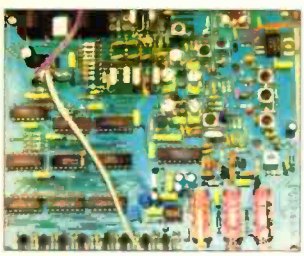
Mark will also be once again holding an auction at some point in the afternoon - your once a year chance to get all sorts of goodies for just a pound or two. So, don't miss out, go along early and really cash in with some of the best deals you will ever find.

Contact W&S at **Spa House, 22 Main Road, Hockley, Essex SS5 4QS, Tel: (01702) 206835/204965, FAX: (01702) 205843** or visit their web site at: **www.wsplc.com**

Receiver Reduced

Timestep's PROscan polar receiver now costs **just £249!** (original price was £399 - giving a price reduction of £150). With more than 2500 of this legendary weather satellite receiver in service world-wide, Timestep have decided to reduce the price. This professionally designed polar orbiting receiver has all six APT satellite frequencies fitted. In tests it has outperformed every other receiver suitable for weather satellites.

The PROscan's key features include: highly pager resistant, greater signal to noise and hence better image quality, high resolution output from linear phase i.f. filters, works fine without a preamplifier, intelligent sub carrier mute, intelligent sub carrier autoscan, channel lock-out, full function l.e.d.s, can be computer controlled for fully automatic operation and is compatible with PROsat, WXSAT, JVFAX, etc.



Don't forget though, that as with any weather satellite receiver, you need an interface and software to get images onto your computer. Timestep's "i" or LC interfaces with their "i" software will simply plug into the serial port of your PC or notebook and give you stunning full colour images. The "i" interface costs £249 and the LC £149 (carriage extra on all items).

To place your order or find out more, call Timestep on **(01440) 820040**, FAX: **(01440) 820281**, E-mail: **information@time-step.com** or visit their web site at **www.time-step.com**

Tiree Expedition

Following on from last year's successful trip, a team from **Cockenzie and Port Seton Amateur Radio Club** will once more operate from the Isle of Tiree (IOTA EU-008, ISOA NH04, WAB NM04), the most westerly of the Inner Hebridean Islands, during the RSGB IOTA (Islands on the Air) contest. During the contest, which runs from 1200UTC 29th July until 1200UTC on 30th July 2000, the club will be using the special callsign **GM2T**.

The team this year comprises of **John MM0CCC, Cambell MM1AVA, John GM7OLQ, Colin GM0CLN, Bob GM4UYZ, Ron GM0NTL, Landles GM4XZZ, Tony GM3PGY** (the islands only resident amateur), **Iain MM1CPP, Gordon MM0BYE, Robert MM0ANT, Jim GM7LUN** and **Bob GM0BWU**. Once again the QSL Manager is **Fred GM0ALS**, who is QTHR. One or two of the club members may also join the contest team.

Some operation, (no WARC) may take place outside the contest using the operators own calls or the C&PS ARC Club call MM0CPS/P, but this will be restricted to non-contest times between the afternoon of 28th July and the evening of 30th July (endeavouring to be QRV on or near the usual IOTA frequencies).

Updates can be found on the club's web page, which can be found at **http://www.btinternet.com/~john.innes/cpsarc/iota.htm**

New IC-R3

Icom (UK) Ltd. have released official details of the IC-R3. At present, details are only available of an international version of the product (which was shown at Pickett's Lock), however, the company is working very hard on developing a UK version and hope to release a model into the home market by the end of 2000.

What instantly strikes you about the IC-R3 is that it has two l.c.d. displays. The large TFT colour l.c.d. screen has a versatile dual screen format allowing you to switch from TV monitor to control functions at the press of a button - its that simple!

The colour l.c.d. screen can display up to five different layouts. The formats available to the operator include a simple screen, multifunction screen, band scope screen, direction finding screen, TV and Amateur TV screen. And if that isn't enough for you, the background colour of the l.c.d. can be adjusted with a choice of nine different colours to suit personal taste.

The smaller l.c.d. screen incorporated into the design presents operating information such as semi-duplex operation, tone squelch operation and priority watch indicator. Battery voltage is also displayed when the colour l.c.d. is not in use.

The IC-R3 is simple to operate and benefits from an uncluttered display. The receiver is controlled by a minimal number of buttons and a joystick paddle, this allows for quick and easy changing of operating bands, volume, mode, contents and the like.

Having 400 memory channels arranged into eight banks allows for storage of favourite or often used frequencies. Each memory channel or scan edge channel can also be given an alphanumeric ID such as a repeater name, club net., for easy recognition.

Memory or frequency scanning is fast - up to 30 channels per second! A 'pocket beep' function tells you when a specified station signal is received with an alerting beep. Some 50 standard CTCSS tone frequencies are programmed into the IC-R3 for the tone scan operation.

Being equipped with an automatic squelch, which automatically adjusts squelch threshold to the noise level is very convenient when receiving a weak signal. The receiver has display backlighting too, for night-time operation. The backlight automatically goes off after five seconds, but can be turned on continuously or turned off entirely if preferred.

More information from Icom at **Sea Street, Herne Bay, Kent CT6 8LD, Tel: (01227) 741741, FAX: (01227) 741742** or visit their web site at **www.icomuk.co.uk**

Send your news to Zoë Shortland at the Editorial Offices

rallies

Attention Please!

Would you like to have your Rally publicised? If so, all you have to do is put together as much information as possible about the Rally, i.e. date, location, times, who to contact, etc. and send it to the Editorial Offices.

June 4: The Leeds & District ARS are holding their twice yearly car boot sale at the Yarnbury Rugby Club, Brownberrie Lane, Horsforth, Leeds. The sale will be a general car boot sale, but with amateur radio, electronics and computer sections. There will also be refreshments and plenty of free parking. Contact **J.A. Mortimer M1CAI** on **(01943) 874650**.

June 18: The Norfolk Amateur Radio Club will be holding the Barford Rally & Electronics Car Boot Sale at Barford Village, located 14km west of Norwich, off the B1108, signposted. Open for traders from 0900, and for buyers from 1000. Local repeater and packet groups will be represented and Novice licence stand. There is ample car parking, a Bring & Buy, RAYNET supplies, refreshments and a raffle. Entry is **free. John G0VZD** on **(01953) 604769** or **Peter** on **(01603) 415992.**

June 18: The Newbury & DARS will be holding their 14th annual Amateur Radio Car Boot Sale at Cold Ash playing field near Newbury, Berkshire. Sellers/traders should arrive at 0800 and the sale will be open from 0900-1500. Sellers/traders don't need to pre-book and the charge is £9 per normal size pitch. Any telephone enquiries should be made to **George Cook** on **(01488) 682814.**

June 25: The Bangor & DARS (Northern Ireland) are holding their Summer Radio & Computer Rally at the Clandeboye Lodge Hotel, Bangor. There will be a good selection of traders attending, plus there is the always excellent Bring & Buy, with the addition of a new computer section. Doors open 12 noon and admission is just £2. Further details from the club Web site at **http://welcome.to/bdars** or from **Mark MI1DRU** on **0289-058 6515** or E-mail: **mildru@amrad.net**

June 25: The Longleat Rally will be taking place at Longleat House near Warminster, Wiltshire on Sunday 25th June 2000 - all the usual attractions. Please contact **Ron Ford G4GTD** on Tel: **0117-985 6253.**

July 8: The Cornish Radio Amateur Club are holding their 37th Cornish Mobile Rally at Penair School, Truro. **Ken Tarry G0FIC** on **(01209) 821073** or E-mail: **ken@jtarry.freeserve.co.uk**

■ Greg Baker, PO BOX 3307, MANUKA, ACT 2603, AUSTRALIA
■ E-MAIL: greg@pcug.org.au

Bandscan Australia

This time I have news on Australian Broadcasting Corporation funding and independence and on digital radio and television. In addition I have more Radio Australia reception reports and news from the Special Broadcasting Service.

ABC Telstra Deal

Controversy has been stirred up here with the proposal to sell Australian Broadcasting Corporation (ABC) news services to Telstra - Australia's main telecommunications carrier - so that they can be included in Telstra's on-line services. It seems that the ABC has been forced to do this because of years of budget cuts by the current government.

The deal is worth $67.5 million (£25 million) over five years. Some commentators are saying that this will give the ABC funds to, among other things, re-commission the Cox Peninsula transmitter once used by Radio Australia. The more cynical are arguing that this will simply give the government more reason to further cut ABC funding in future.

The controversy has come about because many see that the independence of the ABC will be compromised if it is selling into a commercial environment. Telstra is on the Internet at **http://telstra.com/** where there is a link to the proposed ABC news content. If and when that content appears, it will be at **http://telstra.com/abc.asp**

ABC Funding

The ABC has requested $194 million (£73 million) from the government in additional funding over the next three years. This would in effect be a reversal of the cuts made by the government three years ago when it came to power. With these funds, the ABC proposes to extend rural and regional services and to introduce state-based digital television channels. Radio networks JJJ (Triple J) and News Radio would be extended to serve all communities with 10,000 or more people.

In addition, the ABC is adamant that the Telstra deal mentioned above will not provide sufficient funding to cover its digital television set up costs estimated at a total of $400 million (£150 million). This figure will come in part from a separate government allocation of $180 million (£67.5 million) to cover new equipment.

However, this allocation still leaves a shortfall of $220 million (£82.5 million) to cover other digital conversion costs. The ABC itself has made no mention of re-opening the Cox Peninsula facilities for Radio Australia.

The government has also made noises suggesting that continuing ABC funding will be calculated to depend on audience ratings and on approval for programming by the government. Again, supporters of an independent ABC are horrified at this possible nexus.

Interestingly, the ABC has released figures which show that the ABC costs 7.7 cents per day per taxpayer compared with the Canadian public broadcaster CBC at eight cents and the BBC at 27.2 cents. Triple J is on-line at **http://abc.net.au/triplej/triplej.htm** and News Radio is at **http://abc.net.au/newsradio** The ABC itself is at **http://abc.net.au**

SBS Award

The Special Broadcasting Service (SBS) has joined Channel Four and the BBC's Natural History Unit in winning the Global Outstanding Achievement Award of the Banff Film and Television Festival. SBS was given the award for its vision, commitment and unique public broadcasting charter, broadcasting in more than 60 languages. The award comes at a time when the broadcaster is 20 years old. SBS can be found at **http://www.sbs.com.au** and the Banff Festival can be found via **http://www.banfftvfest.com**

Spectrum Auction

The frenzy of spectrum sales goes on with the government raking in $1,327 million (£500 million) for the sale of parts of the 1.8GHz band to aspiring mobile telephone operators Hutchinson and One.Tel. They will join the mobile 'phone sector to compete with existing operators Telstra, Cable & Wireless Optus and Vodaphone.

The new company One.Tel believes that it can pick up 2.5 million customers within five years, but in the process of these auctions, has admitted to spending over $200 million (£75 million) more than it had budgeted for. The company has been reported as saying that the budget overrun has meant its plans to enter the UK mobile telephone market may need to be put on hold. One.Tel's major shareholders include News Corporation. One.Tel can be found on the Internet at **http://www.onetel.com.au**

Digital Television

The government's plans for digital television may need to be changed following criticisms of its draft legislation by industry players and the Productivity Commission, the government body charged with reviewing and advising on microeconomic policy and regulation. The draft bill restricts datacasters to mainly text-based services and prevents them from providing Internet services other than E-mail and access to their own sites.

Potential datacasters strongly criticised these provisions and the Productivity Commission said that they "stifled competition and innovation and were at odds with major tenets of mainstream broadcasting policy". So it's back to the drawing board for the government knowing that it probably will not see legislation in place until later in the year.

Digital Radio

Melbourne radio stations appear to be trying to steamroll the government into finally approving the Eureka 147 digital radio broadcasting (DRB) system. In April they began a six-month trial of the broadcasting system including making trial DRB receivers available in shops and betting agencies and at racetracks.

Although the minister responsible, Senator Alston, has publicly backed the Digital Radio Advisory Committee recommendation for Eureka 147, the government has since been reported as considering the US developed In-Band On-Channel (IBOC) system and the Japanese Integrated Services Digital Broadcasting - Terrestrial (ISDB-T) system. Although all players seem to believe that Eureka 147 has been chosen, it has yet to be officially adopted by the government.

In this situation some doubt must remain about the final outcome. In Australia Eureka 147 would operate in the L-band spectrum from 1.452-1.492GHz using the MUSICAM MPEG-1/2 Layer II psycho-acoustic coding. Prospective digital radio broadcasters are hoping that spectrum will be provided free of charge to help offset station set up costs.

My feeling is that the government's apparent fixation on cost minimisation and revenue maximisation will mean spectrum will cost these stations whether they like it or not. More information about digital radio broadcasting in Australia is at **http://www.amt.org.au/drb.htm**

Reception Reports

Martyn Gardiner from Portsmouth has been busy again listening to Radio Australia. With his Roberts transistor portable with telescopic antenna Martyn has been able to pull in Radio Australia on 9.500MHz at around 2030-2130 for Australian news among other things. He has also heard RA at around 0815 on 9.710MHz usually readable, but occasionally with some interference.

On 15.415MHz again with good reception, but occasional fading, on 15.515MHz with good reception and on 17.750MHz. This latter frequency has suffered some interference and also fading away towards 0900UTC. In the afternoons and evenings he has heard RA on 9.500 and 11.660MHz giving good signals at around 1600UTC and 9.500MHz at 2100 which was readable, but suffering some interference.

These latter reports were using Martyn's Drake R8E with a long wire antenna, but he has also been able to pull in the same frequencies using the transistor portable during the morning. A friend of Martyn's has also heard RA in the afternoons on 11.660MHz.

Other News

Australian Broadcasting Corporation managing director since 1995, Brian Johns, has departed at the end of his five year term. He presided over the ABC at a time of great budget cuts under the Liberal - National Party coalition elected in 1996.

Telecommunications carrier Telstra has developed what it calls its Digital Video Platform (DVP) designed to be used to deliver video signals over its core trunk network. Commercial free to air television broadcasters have made a commitment to use this technology which is expected to ease the introduction of digital television in this country.

Use of the trunk network is expected to improve quality and reduce costs in comparison to existing satellite distribution methods. Telstra believes this DVP system is the most advanced such system in the world.

Legislation has passed the New South Wales parliament which will have the effect of restricting the right of television and radio stations to record or broadcast any material in the six Olympic Live sites of the 2000 Sydney Olympic Games. These sites are areas where spectators are encouraged to congregate while not watching events. The law has been opposed by civil liberty groups but the Olympics juggernaut seems to roll on regardless.

Finally

While this issue of *SWM* is on sale I will be touring in the United Kingdom. My E-mail address for that period will be **gregmbaker@hotmail.com**

I welcome any news and comments. In particular I am interested in any s.w.l. information on Australian stations heard by *SWM* readers so I can chase up more details and interesting snippets from this end. My address is **PO Box 3307, Manuka, ACT 2603, Australia.** For personal replies please send two IRCs. Those with an Internet connection can get me at **greg@pcug.org.au**

■ BRIAN ODDY G3FEX, THREE CORNERS, MERRYFIELD WAY, STORRINGTON, WEST SUSSEX RH20 4NS

LM&S

Quite a few of the entries in the short wave reception reports compiled during March were rendered no longer applicable by the broadcast schedule changes on March 26. To ensure that LM&S is as up-to-date as possible they have been excluded from the data herein.

No doubt the broadcasters' game of 'hide and seek' will have prevented many listeners from hearing their favourite programmes, but if their changes result in improved reception they will have been worthwhile. If you have picked up an official broadcast which is not included herein please send the details to me so that other listeners can share your enjoyment. Be sure to quote transmission times in UTC (=GMT) not BST.

Long Wave Reports

Note: l.w. & m.w. frequencies in kHz; s.w. in MHz; Time in UTC (=GMT). Unless otherwise stated, all logs were compiled during March.

Long Wave Chart

Freq (kHz)	Station	Country	Power (kW)	Listener
153	Bechar	Algeria	1000	H*
153	Donebach DLF	Germany	500	A*,B,D*,E,F*,H,I,J*
153	Bod	Romania	1200	H*
162	Allouis	France	2000	B,D*,E,F*,G*,H,I,J*
171	Nador Medi-1	Morocco	2000	H*
171	B'shakovo etc	Russia	1200	A*,B*,D*,E*,F*,G*,J*
171	Lvov	Ukraine	500	B*
171	Sasnovy	Belarus	1000	H
177	Oranienburg	Germany	500	D*,E,F*,H*,I,J
180	Polati	Turkey	1200	H
183	Saarlouis	Germany	2000	D*,E,F*,G*,H,I,J*
189	Gufuskalar	W.Iceland	150	B*,C,D*,H*
198	Droitwich BBC	UK	500	B,D,E,G*,H,I,J
198	WesterglenBBC	UK	50	C
198	R.Mayak via?	Russia	150	C
207	Munich DLF	Germany	500	A*,C,D*,E,F*,G*,H,I,J*
207	Eidar	E.Iceland	100	C
207	Azilal	Morocco	800	C,H
207	Kiev	Ukraine	500	H*
216	Roumoules RMC	S.France	1400	D*,E,F*,H,I,J*
216	Ganca	Azerbaijan	500	H*
225	Polskie R-1	Poland	?	A,B,D*,F*,G*,H*,J*
234	Beidweiler	Luxembourg	2000	B,D*,E,F*,G*,H,I,J*
243	Kalundborg	Denmark	300	A,B,D*,E,F*,H,I,J*
252	Tipaza	Algeria	1500	B*,E*
252	Atlantic 252	Eire	500	B*,D,E,F*,G*,H,I,J
261	Burg(R.Ropa)	Germany	85	D*,E,F*,H,I,J*
261	Taldom Moscow	Russia	2500	H*
270	Topolna	Czech Rep	1500	A,D*,E,F*,H*,I,J*
279	Sasnovy	Belarus	500	B*,D*,E*,F*,H,J*

Note: Entries marked * were logged during darkness. All other entries were logged during daylight or at dawn/dusk.

Listeners:-
(A) Simon Hockenhull, E.Bristol.
(B) Sheila Hughes, Morden.
(C) Brian Keyte, Gt.Bookham.
(D) Eddie McKeown, Newry.
(E) George Millmore, Wootton, IoW.
(F) Fred Pallant, Storrington.
(G) Tom Smyth, Co.Fermanagh.
(H) Emie Strong, Ramsey, Cambs.
(I) Phil Townsend, E.London.
(J) Fred Wilmshurst, Northampton.

Whilst listening to R.Ukraine's DX programme, which is broadcast on short wave, **Sheila Hughes** (Morden) heard an announcement that during the summer they would be broadcasting in Ukranian via Lvov on **171kHz** between 2200 and 0000UTC. At 2310 on March 22 she received the broadcast quite well and rated their transmission SINPO 43333.

The broadcasts from Rikisutvarpid (RUV) in Reykjavik via Gufuskalar, W.Iceland on **189kHz** have been attracting the attention of some listeners in the UK - see chart. The 300kW transmission was rated 35233 at 0049 by **Eddie McKeown** (Newry, Co.Down); 23222 at 0310 by **Sheila Hughes**; 22322 at 0400UTC by **Ernie Strong** (Ramsey, Cambs).

Whilst studying the transmitter information on Ceefax page 698 **Brian Keyte** (Gt.Bookham) noticed that the 500kW Droitwich transmitter on **198kHz**, which carries BBC R-4, would be off-air for an annual mast inspection on Sunday March 12, so he seized the opportunity to listen around that frequency. By using a directional loop antenna ahead of his AOR AR7030 receiver he was able to null-out the 50kW transmissions from Westerglen and Burghead, which also carry BBC R-4, to reveal the RUV transmission on **189kHz** from Gufuskalar!

Medium Wave Reports

During the night of March 28/29 **David Edwardson** (Wallsend) searched the band for m.w. broadcasts from stations in E.Canada and E.USA. He used a 2.5m x 2.5m wall mounted fixed loop ahead of his Trio R-600 receiver plus m.w. convertor. At 2307UTC he picked up 'sports talk' on **1520kHz** but was unable to obtain the station ident. To check the propagation conditions he then tuned down to **930kHz** and heard CJYQ in St.John's, Newfoundland (50kW), which rated SINPO 24532 at 2313. At 2359 he heard WNRB in Boston, MA on 1510 (50kW) with the ident 'AM 1510'. It was followed by adverts. Their transmission rated 24542.

An unusual approach was adopted by **Ernie Strong**. Instead of using CJYQ as a guide to conditions and then searching for the high power (50kW) stations he tuned to the top end of the band where a number of low power (1kW) stations operate. He says "There are only three frequencies where interference is weak enough to hear anything". Between 0415 and 0427 on March 22 he heard three stations which may have been WAZJ Atlanta, GA on 1650, WWRU Elizabeth, NJ on 1650 and WAYU Rochester, NH on 1700. He found it very difficult to confirm their identity.

The sky waves from some of the many of the m.w. stations in the Middle East, N.Africa, Europe and Scandinavia also reached the UK after dark - see chart. During daylight the ground waves from some local radio stations reached quite distant places - see chart.

Short Wave Reports

The broadcast schedule changes on March 26 were a disappointment for the listeners who had expected better use would be made of the **25MHz (11m)** band during the summer period. The cessation of the broadcasts from Deutsch Welle on **25.740** (Ger to S & SE.Asia 0800-1400) from that date came as a shock because their transmission had been reaching Australia very clearly around mid-day - see LM&S, *SWM* May 2000.

It is not known if Radio For Peace International (RFPI) is still active on **25.930** (Eng [u.s.b.] to Americas 1200-?) but it was heard just prior to the schedule changes by **Bernard Curtis** in Stalbridge.

The good news is that Radio France International is still broadcasting to listeners in E/C.Africa on **25.820** (Fr 0900-1300) and it seems likely that reception there will be good. Their transmission has been reaching the UK via back scatter and other modes and was rated 25332 at 0900 by **Fred Pallant** in Storrington; 45333 at 0900 by **Vic Prier** in Colyton; 33323 at 1000 in Stalbridge; 25422 at 1045 by **Simon Hockenhull** in E.Bristol; 43443 at 1205 by **Robert Connolly** in Kilkeel; 35333 at 1205 by **Fred Wilmshurst** in Northampton.

In contrast, quite a few broadcasters are taking advantage of the propagation conditions in the **21MHz (13m)** band. They include the BBC via Rampisham, UK **21.830** (Eng to Asia 0800-0900), rated 55555 at 0840 in Stalbridge; R.Australia via Shepparton **21.725** (Eng to Pacific areas 0200-0900), logged as 33333 at 0852 by **Tom Winzor** in Plymouth; DW via ? **21.680** (Eng to Oceania? 0900-0950) SIO 555 at 0900 by **Tom Smyth** in Co.Fermanagh; R.Australia via Shepparton **21.820** (Eng to Asia 0900-1400) 34433 at

0900 by **Gerald Guest** in Dudley & 33333 at 1330 by **Thomas Williams** in Truro; R.Austria Int, Moosbrunn **21.765** (Eng to Australia 0930-1000) 55444 at 0943 by **Tony Hall** in Freshwater Bay, IoW; UAER, Dubai **21.605** (Ar to Eur 1055-1330) 45544 at 1215 in Northampton; VOA via ? **21.555** (Eng to ? 1400-1800) 35523 at 1440 in E.Bristol; BBC via Ascension Is **21.660** (Eng to Africa 1400-1700) 33333 at 1540 by **Stan Evans** in Herstmonceux; UAER, Dubai **21.605** (Eng to Eur 1600-1640) 55444 at 1615 in Morden; BBC via Cyprus **21.470** (Eng to Africa 1300-1700) 45544 at 1632 in Wallsend; R.Nederlands via Bonaire, Ned.Antilles **21.590** (Eng to C/W.Africa 1830-2025) 22222 at 1830 in Newry; HCJB Quito, Ecuador **21.455** (Eng [u.s.b. + p.c.]) 34433 at 1935 in Colyton; VOA via ? **21.485** (Port, Fr, Hausa [Eng ident] to Africa? 1730-2100) 44333 at 2030 by **Rhoderick Illman** in Oxted; WYFR via Okeechobee, USA **21.525** (Fr, Eng to Eur, Africa 1800-2300) 34443 at 2210 in Kilkeel.

In the **18MHz (15m)** band R.Norway broadcasts to several areas during the day. Their transmission to N.America on **18.950** (Norw 1200-1230) was rated 45444 at 1205 in Northampton. Also noted in the reports was R.Sweden, Stockholm. Their transmission to N.America on **18.960** (Eng 1230-1300) was rated 45544 at 1231 by **Martin Goodey** in St.Mary's, IoS.

Until the broadcast schedule changes on March 26 R.New Zealand was making extensive use of the **17MHz (16m)** band. They still broadcast in English to Pacific areas on **17.675** between 1755-0705 but they then move to the 19m band - see that section of the data herein. Their tansmission on **17.675** was rated 24232 at 0027 in Oxted & 43334 at 0630 in Stalbridge. R.Australia may also be heard in this band during the morning. Their broadcast to Asia via Shepparton on **17.750** (Eng 0000-0500, 0600-0830, 0830-1100) was rated 44444 at 0620 by **David Hall** in Morpeth; 23333 at 0758 in Storrington; 22222 at 0945 in Truro.

Also noted during the morning were the BBC via Rampisham, UK **17.830** (Eng to Africa 0700-0730), rated 43333 at 0725 in Herstmonceux; BBC via Masirah Is, Oman **17.790** (Eng to Asia 0600-0800, 0900-1100) 55544 at 0741 in St.Mary's, IoS; BBC via Skelton & Woofferton, UK **17.640** (Eng to E.Eur, M.East, E.Africa 0700-1500) 45433 at 0955 in Northampton & 45554 at 1000 by **John Parry** in Larnaca, Cyprus; R.Pakistan, Islamabad **17.835** (Ur 0900?-1100, Eng 1100-1105 to Eur) 33333 at 1100 in Plymouth.

After mid-day R.Canada Int via Sackville? **17.765** (Eng to USA?, Mexico?, Caribbean? 1230?-1330?) was SIO 222 at 1300 in Co.Fermanagh; DW via Wertachtal, Germany **17.595** (Eng to Africa 1600-1645) 44444 at 1605 in Morden; BBC via Ascension Is **17.830** (Eng to Africa 0800-2100) 33323 at 1725 in Colyton; R.Nederlands via Bonaire, Ned.Antilles **17.605** (Eng to Africa 1830-2025) 34232 at 1830 in Newry; R.Canada Int via Sackville **17.870** (Eng to Eur, Africa 2030-2100) 55555 at 2030 by **Clare Pinder** in Appleby; VOA via Greenville, USA **17.725** (Fr, Eng to Africa 1830-2200) 11122 at 2117 by **Martin Dale** in Stockport; VOA via Philippines **17.820** (Eng to E.Asia 2100-0030) 45434 at 2216 in E.Bristol; VOA via Philippines **17.765** (Chin to E.Asia 0000-0300) 33322 at 0035 in Kilkeel.

As mentioned in the previous section, R.New Zealand may now be heard in the **15MHz (19m)** band during the morning. Their broadcast to Pacific areas on **15.115** (Eng 0705-1005) was rated 33333 at 0805 in Truro. A special broadcast to NZ Troops in E.Timor on **15.115** then follows (1005-1205 daily).

R.Australia may also be heard in the early morning on the following frequencies: **15.415** from Shepparton (Eng to Asia 0100-0400, 0600-0900), rated 34533 at 0700 in Wallsend & 15332 at 0755 in E.Bristol; **15.240** from Shepparton (Eng to Pacific areas 0000-0800), 54445 at 0750 in Stalbridge; **15.515** from Shepparton (Eng SW/SC.Pacific, N.America 0200-0900), 35553 at 0535 in Larnaca, Cyprus & SIO 444 at 0800 by **Francis Hearne** in N.Bristol.

Also noted during the morning were the BBC via Skelton, UK **15.485** (Eng to Eur, Africa 0600-1800), rated SIO 434 at 0800 in Co.Fermanagh; KTWR Guam **15.330** (Eng to Pacific 0800-1000) 34333 at 0813 by **Vera Brindley** in Woodhall Spa; BBC via Ascension Is **15.400** (Eng to Africa 0700-1130) 54433 at 0825 in Herstmonceux; V of Armenia, Yerevan **15.270** (Various to Eur, M.East [Eng 0840-0900] Sun) 53444 at 0840 in Morden; R.Bulgaria **15.700** (Eng to W.Eur 1100-1200) 34443 at 1108 in Newry.

After mid-day, R.Romania Int **15.390** (Eng to W.Eur 1300-1356) 54444 at 1306 in Plymouth; BBC via Seychelles **15.420** (Eng to E.Africa 1500-1700) 32343 at 1640 in Colyton; Africa No.1, Gabon **15.475** (Fr to W.Africa 1600-1900) 45444 at 1741 in St.Mary's, IoS.

Later, VOA via Greenville, USA **15.580** (Eng to Africa 1800-2200) was 44333 at 2036 in Oxted; RCI via Sackville **15.325** (Eng to Eur, N&W.Africa 2000-

Continued on page 15.

Local Radio Chart

Freq (kHz)	Station	ILR BBC	e.m.r.p (kW)	Listener
558	Spectrum, London	I	0.80	B,D,E,F,H,J
585	R.Solway	B	2.00	A,F
603	Capital G,Litt'brne	I	0.10	A,D,E,F,H,I,J
630	R.Bedfordshire(3CR)	B	0.20	B,D,E,F,H,I,J
630	R.Cornwall	B	2.00	A,E,G
657	R.Clwyd	B	2.00	A,D,E,F,G,H,I
657	R.Cornwall	B	0.50	A,E,K
666	Cl.Gold 666, Exeter	I	0.34	B,D,E,H,J
666	R.York	B	0.80	A,D,F,H
729	BBC Essex	B	0.20	D,E,F,H,I,J
738	Hereford/Worcester	B	0.037	A,D,E,F,H,J
756	R.Cumbria	B	1.00	A,D,F
756	The Magic 756,Powys	I	0.63	D,E,F,H,J
765	BBC Essex	B	0.50	D,E,F,G,H,J
774	R.Kent	B	0.70	D,E,H,I,J
774	R.Leeds	B	0.50	F,H
774	Cl.Gold 774, Glos	I	0.14	D,E,F,J
792	Cl.Gold 792,Bedford	I	0.27	D,E,F,H,I,J
792	R.Foyle	B	1.00	A
801	R.Devon	B	2.00	A,B,D,E,G,H*
828	Cl.Gold 828, Luton	I	0.20	D,H,I,J
828	Magic 828, Leeds	I	0.12	A,F
828	Asian Netwk Sedgley	B	0.20	D
828	Cl.G 828 Bournem'th	I	0.27	E
837	R.Cumbria/Furness	B	1.50	A,F
837	Asian Netwk Leics	B	0.45	E,F,H,J
855	R.Devon	B	1.00	E,K
855	R.Lancashire	B	1.50	F
855	R.Norfolk, Postwick	B	1.50	D,F,H,I
855	Sunshine 855,Ludlow	I	0.15	B,D,J
873	R.Norfolk, W.Lynn	B	0.30	D,E,F,H,I,J
936	Brunel CG, W.Wilts	I	0.18	C,D,E,H,J
936	Fresh AM, Hawes	I	1.00	A,D,F
945	Cl.Gold GEM, Derby	I	0.20	F,J
945	Capital G, Bexhill	I	0.75	C,D,E,H
954	Cl.Gold 954,Torquay	I	0.32	D,E,H
954	Cl.Gold 954, H'ford	I	0.16	C,D,F,H,J
963	Liberty R, Hackney	I	1.00	C,D,E,F,H,J
972	Liberty R, Southall	I	1.00	C,D,E,F,H,J
990	R.Devon, E.Devon	B	1.00	A,C,D,E
990	Magic AM,Doncaster	I	0.25	F,H
990	Cl.G, Wolverhampton	I	0.09	D,H,J
999	C.Gold GEM Nott'ham	I	0.25	D,F,H,J
999	Magic 9-99 P'stn	I	0.80	A
999	R.Solent	B	1.00	C,D,E
1017	Cl.G,WABC,Shr'shire	I	0.70	D,F,H,J
1026	R.Cambridgeshire	B	0.50	D,F,H,I,J
1026	Downtown R, Belfast	I	1.70	A,D,G
1026	R.Jersey	B	1.00	D,E
1035	RTL Country 1035	I	1.00	D,E,H,J
1035	R.Sheffield	B	1.00	F,H
1035	N.Sound 2, Aberdeen	I	0.78	A,D*
1116	R.Derby	B	1.20	A,D,F,H,J
1116	R.Guernsey	B	0.50	D,E
1116	Valley R, Ebbw Vale	I	0.50	B
1152	Cl.G Amber, Norwich	I	0.83	H
1152	LBC 1152 AM	I	23.50	D,E,H,J
1152	Pic'ly 1152,Manch'r	I	1.50	A
1152	PlymSnd AM,Plymouth	I	0.32	K
1152	Cl.G, Birmingham	I	3.00	J
1161	R.Bedfordshire(3CR)	B	0.10	D,H,I,J
1161	Brunel Cl.G,Swindon	I	0.16	D,E
1161	Magic 1161, Goxhill	I	0.35	A,F,H
1161	Southern Counties R	B	1.00	D,E
1161	Tay AM, Dundee	I	1.40	D
1170	Cl.G Amber, Ipswich	I	0.28	H
1170	Magic 1170,Stockton	I	0.32	A,F
1170	Capital G,Portsm'th	I	0.50	D,E
1170	1170AM,High Wycombe	I	0.25	D,I,J
1242	Capital G,Maidstone	I	0.32	D,E,I
1251	C.G Amber,Bury StEd	I	0.76	D,H,I,J
1260	Brunel CG, Bristol	I	1.60	E
1260	SabrasSnd,Leicester	I	0.29	H,J
1260	R.York	B	0.50	A,F
1278	Cl.Gold 1278 W.York	I	0.43	H
1296	Radio XL,Birmingham	I	5.00	A,D,E,F,G,H,J
1305	Magic AM,Barnsley	I	0.15	F,H
1305	Premier via ?	I	0.50	D,E,H,J
1305	Touch AM, Newport	I	0.20	E
1323	Capital G,Southwick	I	0.50	C,D,E,J
1332	Premier, Battersea	I	1.00	D,E
1332	Cl.Gold 1332,Pt'bo	I	0.60	D,F,H,J
1332	Wiltshire Sound	B	0.30	D,E
1359	Breeze, Chelmsford	I	0.28	D
1359	Cl.Gold 1359, C'try	I	0.27	D,F,H,J
1359	R.Solent	B	0.85	D,E,H
1368	R.Lincolnshire	B	2.00	F,H,J
1368	Southern Counties R	B	0.50	D,E,I
1368	Wiltshire Sound	B	0.10	D,E
1377	Asian Sd, Rochdale	I	0.10	A,D*,F
1413	R.Gloucester via ?	B	?	H,J
1413	R.Gloucester,Bo'ton	B	0.50	F
1413	Premier via ?	I	0.50	D,E,H
1413	Premier, Dartford	I	0.50	F*
1413	Fresh AM, Skipton	I	0.10	A,H
1431	Breeze,Southend	I	0.35	D,H*,J
1431	Cl.Gold, Reading	I	0.14	D,E,H*,J
1449	R.Peterboro/Cambs	B	0.15	D,F,H,J
1458	R.Cumbria	B	0.50	A,F
1458	R.Devon	B	2.00	A,E,G
1458	Sunrise, London	I	50.00	D,E,F,H,J
1458	Asian Netwk Langley	B	5.00	H,J
1485	Cl.Gold, Newbury	I	1.00	B,D,H,J
1485	R.Humberside (Hull)	B	1.00	F,H
1485	R.Merseyside	B	1.20	A,C*,E
1485	Southern Counties R	B	1.00	D,E
1503	R.Stoke-on-Trent	B	1.00	A,C*,D,E*,F,G,H,J
1521	Breeze, Reigate	I	0.64	D,E,H,I,J
1530	R.Essex, Southend	B	0.15	D,E,H
1530	Cl.Gold W.Yorks	I	0.74	A,F,H
1530	Cl.Gold Worcester	I	0.52	E,J
1548	Capital G, London	I	97.50	A,D,E,H
1548	MagicB8,Liverpool	I	4.40	G
1548	Forth AM, Edinburgh	I	2.20	D,F
1557	R.Lancashire	B	0.25	A,C*,F
1557	Cl.Gold 1557,N.hant	I	0.76	D,H,J
1557	Capital G, So'ton	I	0.50	D,E
1566	CountySnd,Guildford	I	0.50	D
1584	London Turkish R	I	0.20	C*,D,E,H
1584	R.Nottingham	B	1.00	C*,D,F,H
1584	R.Shropshire	B	0.50	D
1584	Tay, Perth	I	0.21	D,G
1602	R.Kent	B	0.25	D,E,H

Note: Entries marked * were logged during darkness. All other entries were logged during daylight or at dawn/dusk.

Listeners:-
(A) Robert Connolly, Kilkeel.
(B) Simon Hockenhull, E.Bristol.
(C) Sheila Hughes, Morden.
(D) Brian Keyte, Bookham.
(E) George Millmore, Wootton, IoW.
(F) Harry Richards, Barton-upon-Humber.
(G) Tom Smyth, Co.Fermanagh.
(H) Ernie Strong, Ramsey, Cambs.
(I) Phil Townsend, E.London.
(J) Fred Wilmshurst, Northampton.
(K) Tom Winzor, Plymouth

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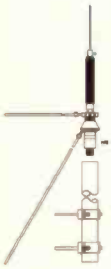

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2300) 22332 at 2037 in Stockport; R.Korea **15.575** (Eng to ? 2100-2130) 44333 at 2100 in Appleby; BBC via Ascension Is **15.400** (Eng to Africa 1500-2300) 45544 at 2135 in Northampton; VOA via Philippines **15.290** (Eng to E.Asia 0030-0100) 33333 at 0045 in Kilkeel.

The occupants of the **13MHz (22m)** band now include Christian Science SWB via WSHB Cyprus Creek, USA **13.650** (Eng to Africa 0700-0800, Tues & Thurs only), rated 44444 at 0740 in Morden; Swiss R.Int via Sottens **13.685** (Eng, It, Ger, Fr to Australia 0830-1030) 34333 at 0830 in Woodhall Spa; R.Australia via Shepparton **13.605** (Eng to Pacific 0800-1200) 43433 at 0850 in Herstmonceux; R.Austria Int via Moosbrunn **13.730** (Eng, Ger to Eur 1230-1400) 55545 at 1340 in E.Bristol; R.Sweden **13.800** (Sw to Pacific, Asia 1430-1500) 44444 at 1430 in Dudley; R.Vlaanderen Int, Belgium **13.710** (Eng to Eur, N.Africa, M.East 1730-1800) 55444 at 1730 in Appleby; R.Nederlands via Flevo **13.700** (Eng to Africa 1830-2025) 45444 at 1830 in Newry; VOA via Morocco **13.640** (Eng to ? 1900-2000) 45444 at 1925 in Northampton; VOA via Selebi-Phikwe, Botswana **13.710** (Eng to Africa 1800-2230) 44554 at 2010 in Larnaca, Cyprus; V of Vietnam, Hanoi **13.740** (Eng to Eur 2030-2100) 22222 at 2034 in Truro; RCI via Sackville, Canada **13.650** (Eng to Eur, Africa 2100-2200) 45434 at 2145 in Colyton; WWCR Nashville, USA **13.845** (Eng to Africa 1400-0100) 43433 at 2150 in Kilkeel; Christian Science SWB via WSHB Cyprus Creek, USA **13.770** (Eng to Eur 2200-0000, Sun & Wed) 43333 at 2215 in Stalbridge.

In the **11MHz (25m)** band the BBC via Woofferton, UK **12.095** (Eng to Eur, N/E.Africa 0600-1700) was rated SIO 555 at 1030 in Co.Fermanagh; R.France Int via Allouis? **11.670** (Eng to Eur 1200-1257) 54444 at 1158 in Plymouth; R.Jordan via Al Karanah **11.690** (Eng to W.Eur, E.USA 1300-1730) 54444 at 1335 in Herstmonceux; VOA via Philippines **12.040** (Eng to Asia 1500-1600) 44444 at 1505 in Morden; R.Australia via Shepparton **11.660** (Various to Asia 1430-1700)

Medium Wave Chart

Freq (kHz)	Station	Country	Power (kW)	Listener
531	Ain Beida	Algeria	600/300	H*
531	Berg	Germany	20	D*,E
531	RNE5 via ?	Spain	?	E
531	Beromunster	Switzerland	500	E,G*,H,I*
540	Wavre	Belgium	150/50	B,D*,E,H,I
540	Sidi Bennour	Morocco	600	D*,E*
549	Les Trembles	Algeria	600	D*,E*,H*
549	Thumau (DLF)	Germany	200	D*,E,H,I*
558	Espoo	Finland	50	D*,H*
558	RNE5 via ?	Spain	?	E*,H*
567	Tullamore(RTE1)	Eire	500	C,D*,E,G,H,I,J
567	RNE5 via ?	Spain	?	E*
576	Muhlacker(SDR)	Germany	500	D*,E*,H,I*
576	Riga	Latvia	500	E*,H*
576	Barcelona(RNE5)	Spain	50	E*,H*
585	Paris(FIP)	France	8	E,H
585	Madrid(RNE1)	Spain	200	A*,D*,E*,G*,H*I*
585	Dumfries(BBCScot)	UK	2	D*
594	Frankfurt(HR)	Germany	1000/400	D*,E*,H*,I*
594	Oujda-1	Morocco	100	E*,H*
594	Muge	Portugal	100	D*,E*
603	Lyon	France	300	E,H*
603	Sevilla(RNE5)	Spain	50	D*,E*
603	Newcastle(BBC)	UK	2	A*,C,D*,H*
612	Athlone(RTE2)	Eire	100	C,D*,E,G,H,I*
612	Sebaa Aioun	Morocco	300	E*
612	RNE1 via ?	Spain	10	E*
621	Wavre	Belgium	80	D*,E,H,I
621	RNE1 via ?	Spain	10	H*
621	Barcelona(OCR)	Spain	50	D*
630	Vigra	Norway	100	D*,E*
630	Tunis-Djedeida	Tunisia	600	E*
639	Praha(Liblice)	Czech	1500	D*,E*,H*
639	RNE1 via ?	Spain	?	D*,E*,H,I
648	RNE1 via ?	Spain	10	D*,E*,H*
648	Orfordness(BBC)	UK	500	C,D*,E,G*,H,I
648	Kharkiv	Ukraine	150	H*
657	Napoli	Italy	120	E*
657	Madrid(RNE5)	Spain	20	D*,E*,H*
657	Wrexham(BBCWales)	UK	2	A,C,D*,H,I*
666	Messerich(Rohrd(SWF)	Germany	150	D*,I*
666	Sitkunai(R.Vilnius)	Lithuania	500	D*,H*
666	Lisboa	Portugal	135	E*,H*
675	Marseille	France	600	D*
675	R10 FM	Holland	120	A,B*,D*,E,H,I*
684	Sevilla(RNE1)	Spain	500	D*,E*,H*,I*
693	Droitwich(BBC)	UK	150	E,H,I,J
693	Enniskillen(BBC)	UK	1	G
702	Flensburg(NDR)	Germany	5	D*,E*
702	TWR via Monte Carlo	Monaco	300	E*,H*
711	Rennes 1	France	300	A,B,E,H,I
711	Laayoune	Morocco	600	D*
711	Murcia(COPE)	Spain	5	E*
720	Lisnagarvey(BBC4)	N.Ireland	10	E*
720	Norte	Portugal	100	D*
720	Lots Rd,Ldn(BBC4)	UK	0.5	C,E,G*,H
729	Cork(RTE1)	Eire	10	C,D*,E,G
729	RNE1 via ?	Spain	?	D*,E*,H*,I*
738	Paris	France	4	D*,E
738	Barcelona(RNE1)	Spain	500	D*,E*,H*,I*
747	Flevo(Hilv2)	Holland	400	A,B,D*,E,H*,I
756	Braunschweig(DLF)	Germany	800/200	D*,E*,H*,I*
756	Bilbao(El)	Spain	5	H*
756	Redruth(BBC)	UK	2	G*
765	Sottens	Switzerland	500	D*,E*,H*
774	Enniskillen(BBC)	N.Ireland	1	D*,G
774	RNE1 via ?	Spain	?	D*,E*,H*,I*
774	Plymouth(BBC)	UK	1	C,J
783	Leipzig(MDR)	Germany	100	D*,E*,H*,I*
792	Lingen(NDR)	Germany	5	D*,E*
792	Sevilla(SER)	Spain	20	D*,E*
792	Londonderry(BBC)	UK	1	G
801	Munchen-Ismaning	Germany	300	D*,E*,I*
801	RNE1 via ?	Spain	?	D*,E*,H*
810	Madrid(SER)	Spain	20	D*,H*
810	Westerglen(BBCScot)	UK	100	C,D*,E*,G,H*,I
819	Batra	Egypt	450	E*,H*
819	Toulouse	France	50	D*
819	S.Sebastian(El)	Spain	5	E*,H*
828	Rotterdam	Holland	20	D*
837	Nancy	France	200	G*
837	COPE via ?	Spain	?	D*,E*,H*
846	Rome	Italy	1200	D*,E*,G*,H*,I*
855	Berlin	Germany	100	D*
855	RNE1 via ?	Spain	?	D*,E,H*,I*
864	Santah	Egypt	500	D*,H*,I*
864	Paris	France	300	D*,E,H
864	Socuellamos(RNE1)	Spain	2	E*
873	Frankfurt(AFN)	Germany	150	D*,E*,I*
873	Zaragoza(SER)	Spain	20	E*
873	Enniskillen(R.UI)	UK	1	G
882	COPE via ?	Spain	?	H*
882	Washford(BBCWales)	UK	100	C,D*,E,H*,I
891	Algiers	Algeria	600/300	D*,E*,H*
891	Hulsberg	Netherlands	20	E*,H
900	Brno(CRo2)	Czech Rep	25	E*
900	Milan	Italy	600	B*,D*,H*
900	COPE via ?	Spain	?	H*
909	Lisnagarvey(BBC5)	N.Ireland	10	G
909	B'mans Pk(BBC5)	UK	140	E,H,I
918	Domzale	Slovenia	600/100	B*,D*,E*,H*
918	Madrid(R.Int)	Spain	20	B*,D*,H*
927	Wolvertem	Belgium	300	D*,E,G,H*,I
936	Bremen	Germany	100	D*,E*,H*
936	Venezia	Italy	20	D*,E*
936	RNE5 via ?	Spain	?	H*
945	Toulouse	France	300	D*
954	Brno (CRo2)	Czech Rep.	200	D*,E*,H*
954	Madrid(CI)	Spain	20	D*,E*,H*
963	Pori	Finland	600	A*,D*,E*,H*
963	Tir Chonaill	Eire	10	G*
963	Tunis-Djedeida	Tunisia	200	H*
972	Hamburg(NDR)	Germany	300	D*,E*,H*
981	Alger	Algeria	600/300	B*,E*,H*
990	Berlin	Germany	300	D*,E*,H*,I*
990	R.Bilbao(SER)	Spain	10	B*,D*,E*,H*
990	Tywyn(BBC)	UK	1	C,G
999	Schwerin (RIAS)	Germany	20	D*
999	Madrid(COPE)	Spain	50	B*,D*,H*,I*
1008	SER via ?	Canaries/Spain	?	H*
1008	Flevo(Hilv-5)	Holland	400	D*,E,H,I*
1017	Rheinsender(SWF)	Germany	600	D*,E*,G,I*
1026	SER via ?	Spain	?	E*
1035	Milan	Italy	50	A*
1035	Lisbon(Prog3)	Portugal	120	D*
1044	Dresden(MDR)	Germany	20	D*
1044	S.Sebastian(SER)	Spain	10	E*,H*
1053	Zarogoza(COPE)	Spain	10	D*
1053	Talk Sport via ?	UK	?	D*,E,G,H,I,J
1062	Kalundborg	Denmark	250	D*,E*,H*,I*
1071	Riga	Latvia	50	E*
1071	Bilbao(El)	Spain	5	D*,E*,H*,I*
1071	Talk Sport via ?	UK	?	D*,H
1080	SER via ?	Spain	?	D*,E*,H*
1089	Talk Sport via ?	UK	?	D*,E,G,H,I
1098	Nitra(Jarok)	Slovakia	1500	D*,E*
1107	AFN via ?	Germany	10	D*
1107	RNE5 via ?	Spain	?	H*
1107	Talk Sport via ?	UK	?	D*,E,H
1116	Bari	Italy	150	H*
1125	La Louviere	Belgium	20	D*,E*
1125	El Beida	Libya	500	H*
1125	RNE5 via ?	Spain	?	E*,H*
1125	Llandrindod Wells	UK	1	G,H
1134	Zadar(Croatian R)	Croatia	600/1200	D*,E*,H*,I*
1134	COPE via ?	Spain	2	D*,E*
1143	AFN via ?	Germany	1	D*
1143	Stuttgart(AFN)	Germany	10	E*
1143	COPE via ?	Spain	2	D*,E*,H*
1179	SER via ?	Spain	?	H*
1179	Solvesborg	Sweden	600	A*,D*,E*,I*
1188	Kuume	Belgium	5	D*,E*
1188	Szolnok	Hungary	135	D*
1197	Munich(VOA)	Germany	300	D*
1197	Vitoria(El)	Spain	5	H*
1197	Virgin via ?	UK	?	D*,E,G,H,I
1206	Bordeaux	France	100	A
1215	Virgin via ?	UK	?	D*,E,G,H,I,J
1224	Lelystad	Holland	50	D*,E*,H
1224	COPE via ?	Spain	?	H*
1233	RFE via ?	Czech Rep.	?	D*
1233	Virgin via ?	UK	?	D*,G,H,I
1242	Marseille	France	150	D*
1242	Virgin via ?	UK	?	D*,G,H
1251	Marcali	Hungary	500	D*,H*
1251	Huisberg	Netherlands	10	D*,E*
1260	SER via ?	Spain	?	D*,E*
1269	Neumunster(DLF)	Germany	600	D*,E*,H*,I*
1269	COPE via ?	Spain	?	H*
1278	Strasbourg	France	300	D*
1278	Dublin/Cork(RTE2)	Eire	10	C,D*,E*,G*,H*,I*
1287	RFE via ?	Czech Rep.	?	D*,E*,I*
1287	Lerida(SER)	Spain	10	D*,H*
1296	Valencia(COPE)	Spain	10	E*
1296	Orfordness(BBC)	UK	500	C*,D*,G*,H*
1305	Constantine	Algeria	20	H*
1305	RNE5 via ?	Spain	?	D*,H*
1314	Kvitsoy	Norway	1200	D*,E,H*,I
1323	W'brunn (V.Russia)	Germany	1000/150	B*,D*,H,I*
1332	Rome	Italy	300	D*,E*
1341	Lisnagarvey(BBC)	N.Ireland	100	C,E*,G,H*,I
1341	Tarrasa(SER)	Spain	2	H*
1350	Cesvaine/Kuldiga	Latvia	50	D*,E*,H
1359	Madrid(RNE-FS)	Spain	600	D*,E*,H*
1368	Foxdale(Manx R)	Is of Man	20	C,D*,E*,F,G,H
1377	Lille	France	300	D*,E,H*
1386	Bolshakovo	Russia	2500	B*,D*,E*,F*,H*,I*
1395	Fllake	Albania	1000	D*,H*
1395	Lopic	Netherlands	120/40	E,G*,H,I*
1404	Brest	France	20	D*,E,G*,H*,I*
1413	RNE5 via ?	Spain	?	H*
1422	Heusweiler(DLF)	Germany	1200/600	D*,E*,H*,I*
1440	Mamach(RTL)	Luxembourg	1200	D*,E,H*,I*
1449	Squinzano (RAI)	Italy	50	E*
1449	Redmoss(BBC)	UK	2	C,E*,G
1458	Fllake	Albania	500	H*
1458	Eilat	Israel	10	H*
1467	Monte Carlo(TWR)	Monaco	1000/400	B*,D*,E*
1476	Wien-Bisamberg	Austria	600	D*
1485	SER via ?	Spain	?	H*,I*
1494	Clermont-Ferrand	France	20	A*,E*,H*
1494	St.Petersburg	Russia	1200	A*,D*,E*
1503	RNE5 via ?	Spain	?	B*
1512	Wolvertem	Belgium	300	B,D*,E,F*,H,I*,J*
1521	Kosice(Cizatice)	Slovakia	600	D*,E*,H*
1521	Duba	Saudi Arabia	2000	E*
1521	R.Manresa(SER)	Spain	2	E*,H*
1530	Vatican R	Italy	150/450	A*,C,D*,E*,H*,I*
1539	Mainflingen(ERF)	Germany	350(700)	D*,E*,G,H*,I*
1539	SER via ?	Spain	?	H*
1539	Valladolid(SER)	Spain	5	D*
1566	Bandarabbas	Iran	100	H*
1575	Genova	Italy	50	D*,E*
1575	SER via ?	Spain	5	D*,E*,H*
1584	SER via ?	Spain	2	B*,E*
1593	Holzkirchen(VOA)	Germany	150	D*,E*,I*
1593	Polonne	Ukraine	1	H*
1602	SER via ?	Spain	?	E*,I*
1602	Vitoria(El)	Spain	10	D*,E*,H*,I*
1611	Vatican R	Italy	15	A*,C

Note: Entries marked * were logged during darkness. All other entries were logged during daylight or at dawn/dusk

Listeners:-
(A) Simon Hockenhull, E.Bristol.
(B) Sheila Hughes, Morden.
(C) Brian Keyte, Gt.Bookham.
(D) Eddie McKeown, Newry.
(E) George Millmore, Wootton IoW.
(F) Clare Pinder, while in Appleby.
(G) Tom Smyth, Co.Fermanagh
(H) Ernie Strong, Ramsey, Cambs.
(I) Fred Wilmshurst, Northampton.
(J) Tom Winzor, Plymouth.

Tropical Bands Chart

Freq (MHz)	Station	Country	UTC	DXer
3.200	TWR Manzini	Swaziland	1825	K
3.240	TWR Shona	Swaziland	1855	D,H,K
3.255	BBC via Meyerton	S.Africa	1853	D,H,K
3.270	Namibian BC,Windhoek	Namibia	1840	K
3.290	Namibian BC,Windhoek	Namibia	2111	H,K
3.315	AIR Bhopal	India	1723	H
3.316	SLBS Goderich	Sierra Leone	2031	B,H
3.320	SABC (RSG) Meyerton	S.Africa	1856	B,H
3.335	CBS Taipei	Taiwan	1709	H
3.365	GBC R-2	Ghana	2340	B
3.365	AIR Delhi	India	1706	H
3.380	NBC Blantyre	Malawi	1744	H
3.915	BBC via Kranji	Singapore	2105	B,E,K
3.955	BBC via Skelton	England	2135	B,G,E,K,L,M
3.965	R.Taipei via Skelton	England	1800	B,J,K,L,N
3.965	RFI Paris	France	1922	B,E,G,M
3.975	R.Budapest	Hungary	2050	F,J,K,L,M
3.980	R.Korea via Skelton	England	2020	B,E,J,L,M
3.985	Nexus, Milan	Italy	2025	B,L,M
3.995	DW via Julich	Germany	2214	B,C,F,G,L,M
4.760	AIR Port Blair	India	1725	H,K
4.770	FRCN Kaduna	Nigeria	2100	B,F,H,J,K,L,M
4.775	AIR Imphal	India	1726	H
4.783	RTM Bamako	Mali	2021	A,B,F,H,K
4.790	Azad Kashmir R.	Pakistan	1727	H
4.800	AIR Hyderabad	India	1727	H
4.815	R.diff TV Burkina	Ouagadougou	2255	B
4.820	AIR Calcutta	India	1728	H
4.830	R.Tachira	Venezuela	0017	B,D,G
4.835	RTM Bamako	Mali	2104	A,B,C,D,F,H,K,L,M
4.840	AIR Bombay	India	1727	G,H,K
4.845	RTM Kuala Lumpur	Malaysia	1733	H
4.845	ORTM Nouakchott	Mauritania	2104	B,G,H,M
4.850	R.Yaounde	Cameroon	2025	B,H,L,M
4.860	AIR Delhi	India	1727	H
4.865	R.Alvorada, Londrina	Brazil	0633	D
4.885	R.Clube do Para	Brazil	0337	D
4.885	KBC East Sce Nairobi	Kenya	1755	H
4.890	R.Port Moresby	Pap.N. Guinea	2018	H
4.895	Pakistan BC	Pakistan	1728	H
4.915	R.Anhanguera	Brazil	0028	G
4.915	GBC-1, Accra	Ghana	2045	B,F,H,M
4.920	R.Quito, Quito	Ecuador	0340	D
4.920	AIR Chennai	India	1729	H
4.930	R.Internacional	Honduras	0342	D
4.935	KBC Gen Sce Nairobi	Kenya	1758	H
4.940	AIR Guwahati	India	0031	G,H
4.940	R.Contin'tal,Barinas	Venezuela	0345	D
4.950	AIR Srinagar	India	1729	H
4.950	VOA via Sao Tome	Sao Tome	2030	B,F,G,H,I,J,L
4.955	R.Nac. de Colombia	Colombia	2355	B
4.960	Hanoi 2	Vietnam	2212	C
4.965	Christian Voice	Zambia	1735	H
4.975	R.Uganda, Kampala	Uganda	2040	B,D,G,H,I,L,M
4.980	Ecos del Torbes	Venezuela	0400	B,D,M
4.985	R.Brazil Central	Brazil	0005	B
5.009	R.TV Malagasy	Madagascar	1729	H
5.010	AIR Thiru'puram	India	0039	G
5.025	R.Rebelde, Habana	Cuba	0015	B
5.025	R.Uganda, Kampala	Uganda	2052	H
5.035	R.Aparecida	Brazil	0025	B
5.035	R.Bangui	C.Africa	2123	H,M
5.047	R.Togo, Lome	Togo	2052	B,F,H,K,M
5.050	Haixia 1,V of Stralt	China	2112	H
5.050	R.Tanzania	Tanzania	1756	H,K
5.055	RFD Cayenne(Matoury)	French Guiana	2340	B
5.060	PBS Xinjiang, Urumqi	China	2330	D,F

Note: Some of the above entries were rendered no longer applicable by the broadcast schedule changes on March 26.

DXers:-
(A) Michael Casey, Manchester.
(B) Robert Connolly, Kilkeel.
(C) Martin Goodey, St.Mary's, IoS.
(D) David Hall, Morpeth.
(E) Simon Hockenhull, E.Bristol.
(F) Sheila Hughes, Morden.
(G) Rhoderick Illman, Oxted.
(H) Fred Pallant, Storrington.
(I) John Parry, Larnaca, Cyprus.
(J) Clare Pinder, while in Appleby.
(K) Vic Prier, Colyton.
(L) Phil Townsend, E.London.
(M) Fred Wilmshurst, Northampton.
(N) Tom Winzor, Plymouth.

44444 at 1545 in Morpeth; R.Kuwait via Kabd **11.990** (Eng to Eur, N.America 1800-2100) 55544 at 1620 in Northampton; V of Russia **12.000** (? to ? 1700-1800) 43333 at 1700 in Storrington; R.Nederlands via Flevo **11.655** (Eng to Africa 1730-2025) 44444 at 1825 in Newry; WWCR Nashville, USA **12.160** (Eng to N.America, Eur 1400-2200) 35433 at 1850 in Colyton; V of Mediterranean, Malta via Russia? **12.060** (Eng) 33323 at 1930 in Stalbridge; V of Russia **12.070** ([World Service] Eng 1930, Russ? 2000) 45333 at 2017 in E.Bristol; RAI Int, Rome **11.880** (Eng to Eur? ?-2030) 33343 at 2025 in Storrington; VOA via Sao Tome **11.975** (Eng to Africa 1800-2230) 23443 at 2145 in Kilkeel; BBC via Ascension Is **12.095** (Eng to S.America 2100-0300) 544443 at 0132 by **Martin Cowin** in Kirkby Stephen.

Noted in the **9MHz (31m)** band during the morning were Swiss R.Int via Montsinery, Fr.Guiana **9.885** (Eng It, Ger, Fr to Australia 0830-1030), rated 44444 at 0834 in Woodhall Spa; Christian Science BC via WSHB Cypress Creek, USA **9.860** (Eng to Eur? 0800-1000) 54445 at 0915 in Stalbridge; R.Nederlands via Wertachtal **9.865** (Eng to Eur 1030-1225) SIO 555 at 1020 in Co.Fermanagh.

Later, R.Nederlands via Flevo **9.895** (Eng to Africa 1830-2025) was 44444 at 1830 in Newry; VOA via Morocco **9.680** (Eng to M.East? 1930-2000) 44444 at 1935 in Storrington; AWR via Meyerton, S.Africa **9.745** (Eng to Africa 2030-2100) 44333 at 2030 in Morden; R.Thailand via Udon Thani **9.655** (Eng to Eur 2000?-2100?) 22222 at 2040 in Truro; R.Australia via Shepparton **9.500** (Eng to Asia 1430-2130) 33344 at 2056 in Stockport; R.Cairo, Egypt **9.990** (Eng to Eur 2115-2245) 44334 at 2115 in Dudley; BBC via Kranji, Singapore **9.740** (Eng to Australia? 1800-2200) 33443 at 2125 in Kilkeel; V of Russia **9.890** (World Service [Eng 2010] 44333 at 2150 in E.Bristol; VOA via Thailand **9.770** (Eng to Asia 2200-0000) 44433 at 2208 in Kirkby Stephen; AIR via Aligarh? **9.910** (Eng to Australia 2045-2230) 45444 at 2210 in Storrington; VOA via Kavala, Greece **9.740** (Eng to ? 0100-0300) SIO 444 at 0252 in N.Bristol.

Some of the broadcasts to Europe in the **7MHz (41m)** band originate from R.Japan via Woofferton, UK **7.230** (Jap, Eng 0500-0700), rated 43443 at 0655 in Herstmonceux; WEWN Birmingham, USA **7.425** (Eng 1000?-1100) 23222 at 1015 in Morden; V of Russia **7.380** (World Service [Various]) 44444 at 1851 in Kirkby Stephen; AIR via Bangalore **7.410** (Hi, Eng 1745-2230) 33323 at 2010 in Stalbridge; R.Canada Int via Woofferton; UK **7.235** (Eng 2100-2200) 44433 at 2154 in E.Bristol; V of Turkey **7.190** (Eng 2200-2245?) 44343 at 2200 in Newry.

Also mentioned in the reports were KTBN via Salt Lake City, USA **7.510** (Eng to N.America 0000-1600), rated 33333 at 0625 in Morpeth; VOA via Botswana **7.415** (Eng to Africa 1900-2200) 33443 at 2115 in Kilkeel.

The broadcasters using the **6MHz (49m)** band to reach listeners in Europe include R.Nederlands via Julich, Germany **6.045** (Eng 1030-1225), rated SIO 222 at 1030 in Co.Fermanagh; Swiss R.Int via Julich, Germany **6.110** (Ger, It, Fr. Eng 1730-1930) 54434 at 1910 in Colyton; R.Vlaanderen Int, Brussels **5.960** (Eng 1930-1956) 54444 at 1942 in Plymouth; R.Yugoslavia, Belgrade **6.100** (Ger 2000-2030) 43334 at 2015 in Stalbridge; R.Austria Int, via Moosbrunn **6.155** (Various) 44333 at 2044 in Stockport; R.Budapest, Hungary **6.025** (Eng 2100-2130) 43333 at 2100 in Morden; R.Canada Int via Skelton, UK **5.995** (Eng 1900-2200) 54544 at 2157 in Northampton; R.Austria Int via Moosbrunn 5.945 (Ger) 44444 at 2243 in N.Bristol.

Good reception of R.Nederlands relay to N.America from Bonaire, Ned.Antilles on **6.165** (Eng 2330-0128, 0430-0525) was reported by some listeners in the UK. In Manchester Michael Casey logged it as 35555 at 0115. Also mentioned in the reports were VOA via Biblis **5.965** (Eng to M.East? 1900-2000) 31431 at 1914 in Oxted; VOA via Sao Tome **6.035** (Eng to W.Africa 1800-2230) 32332 at 2050 in Kilkeel; BBC via Sackville, Canada **6.175** (Eng to USA 2200-0500) 45544 at 0225 in E.Bristol.

World Wide Radio Guide

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SHORT WAVE

Time (UTC)	Station	Country	Day	Frequency (MHz)
0000-0100	R.Japan	Japan	-	6.050
0000-0100	R.Japan	Japan	-	6.155
0000-0100	R.Pyongyang	Korea (DP.R.)	-	3.560
0000-0100	R.Pyongyang	Korea (DP.R.)	-	11.735
0000-0100	R.Pyongyang	Korea (DP.R.)	-	15.230
0000-0100	R.Pyongyang	Korea (DP.R.)	-	17.735
0000-0200	Merlin Network 1	UK	Fri-Sat	3.985
0000-0200	Merlin Network 1	UK	Fri-Sat	6.180
0000-0200	Merlin Network 1	UK	Fri-Sat	7.165
0000-0200	WEWN	USA	-	9.355
0000-0300	RFPI	Costa Rica	-	6.975
0000-0300	RFPI	Costa Rica	-	15.050
0000-0300	RFPI	Costa Rica	-	25.930
0000-0700	HCJB	Ecuador	-	21.455
0000-1400	WWCR-2	USA	-	5.935
0000-1600	KTBN	USA	-	7.510
0000-2400	WJCR	USA	-	7.490
0000-2400	WJCR	USA	-	13.595
0100-0130	R.Yugoslavia	Yugoslavia	Mon-Sat	7.115
0100-0200	IBC-Tamil	UK	-	9.355
0100-0200	R.Pyongyang	Korea (DP.R.)	-	3.560
0100-0200	R.Pyongyang	Korea (DP.R.)	-	11.735
0100-0200	R.Pyongyang	Korea (DP.R.)	-	15.230
0100-0200	R.Pyongyang	Korea (DP.R.)	-	17.735
0100-0200	R.Ukraine Int.	Ukraine	-	6.020
0100-0200	R.Ukraine Int.	Ukraine	-	9.560
0100-0200	R.Ukraine Int.	Ukraine	-	9.810
0115-0120	Kyrgyz Radio	Kyrgyzstan	-	4.010
0115-0145	V.of Africa	Libya	-	15.235
0115-0145	V.of Africa	Libya	-	15.415
0115-0145	V.of Africa	Libya	-	15.435
0130-0200	V.of Greece	Greece	-	7.450
0130-0200	V.of Greece	Greece	-	9.420
0130-0200	V.of Greece	Greece	-	11.645
0130-0200	V.of Greece	Greece	-	15.630
0200-0230	R.Yugoslavia	Yugoslavia	-	7.130
0200-0300	IRRS-Shortwave	Italy	Sat-Sun	7.120
0200-0300	R.Pyongyang	Korea (DP.R.)	-	11.845
0200-0300	R.Pyongyang	Korea (DP.R.)	-	13.650
0300-0330	Merlin Network 1	UK	Sat	9.735
0300-0330	R.Belarus Int.	Belarus	Fri-Mon	6.070
0300-0330	R.Belarus Int.	Belarus	Fri-Mon	7.210
0300-0400	BBC World Service	UK	-	6.195
0300-0400	BBC World Service	UK	-	9.410
0300-0400	WSHB	USA	Mon	7.535
0300-0800	RFPI	Costa Rica	-	6.975
0300-0800	RFPI	Costa Rica	-	15.050
0340-0350	V.of Greece	Greece	-	7.450
0340-0350	V.of Greece	Greece	-	9.420
0340-0350	V.of Greece	Greece	-	11.645
0340-0350	V.of Greece	Greece	-	15.630
0400-0500	BBC World Service	UK	-	3.955
0400-0500	BBC World Service	UK	-	6.195
0400-0500	BBC World Service	UK	-	9.410
0400-0500	R.Ukraine Int.	Ukraine	-	6.020
0400-0500	R.Ukraine Int.	Ukraine	-	9.600
0400-0500	R.Ukraine Int.	Ukraine	-	9.610
0400-0500	Voice of America	USA	-	7.170
0400-0500	V.of Turkey	Turkey	-	6.010
0400-0500	WYFR Family R.	USA	-	9.985
0400-0900	WMLK	USA	Sun-Fri	9.465
0400-1200	WWCR-4	USA	-	2.390
0415-0440	RAI - Int.	Italy	-	5.975
0415-0440	RAI - Int.	Italy	-	7.150
0500-0515	Israel Radio Int.	Israel	-	9.435
0500-0515	Israel Radio Int.	Israel	-	11.605
0500-0515	Voice of America	USA	-	7.170
0500-0515	Volce of America	USA	-	9.700
0500-0515	Voice of America	USA	-	11.825
0500-0515	Voice of America	USA	-	15.205
0500-0530	Swiss Radio Int.	Switzerland	-	9.655
0500-0600	R.Japan	Japan	-	7.230
0500-0600	WSHB	USA	Mon	7.535
0500-0600	WYFR Family R.	USA	-	9.985
0500-0600	WYFR Family R.	USA	-	11.550
0500-0700	BBC World Service	UK	-	3.955
0500-0700	BBC World Service	UK	-	6.195
0500-0700	BBC World Service	UK	-	9.410
0500-0700	BBC World Service	UK	-	12.095
0500-1000	WWCR-1	USA	-	3.210
0515-0530	Voice of America	USA	-	7.170
0515-0530	Voice of America	USA	-	9.700
0515-0530	Voice of America	USA	-	11.825
0515-0530	Voice of America	USA	-	15.205
0530-0600	R.Austria Int.	Austria	-	6.155
0530-0600	R.Austria Int.	Austria	-	13.730
0530-0600	R.Thailand	Thailand	-	9.655
0530-0600	R.Thailand	Thailand	-	11.905
0530-0600	R.Thailand	Thailand	-	15.115
0530-0600	Voice of America	USA	-	7.170
0530-0600	Volce of America	USA	-	9.700
0530-0600	Voice of America	USA	-	11.825
0530-0600	Voice of America	USA	-	15.205
0540-0550	V.of Greece	Greece	-	7.450
0540-0550	V.of Greece	Greece	-	9.420
0600-0620	Vatican Radio 1	Vatican City State	-	4.005
0600-0620	Vatican Radio 1	Vatican City State	-	5.883
0600-0620	Vatican Radio 1	Vatican City State	-	7.250
0600-0629	R.Canada Int.	Canada	-	6.0450
0600-0629	R.Canada Int.	Canada	-	6.150
0600-0630	Swiss Radio Int.	Switzerland	-	9.655
0600-0700	IRRS-Shortwave	Italy	-	3.985
0600-0700	R.Japan	Japan	-	5.975
0600-0700	R.Japan	Japan	-	7.230
0600-0700	Voice of America	USA	-	5.995
0600-0700	Voice of America	USA	-	7.170
0600-0700	Voice of America	USA	-	11.825
0600-0700	Voice of America	USA	-	11.930
0600-0700	Voice of America	USA	-	15.205
0600-0700	WYFR Family R.	USA	-	7.355
0600-1900	Deutsche Welle	Germany	-	6.140
0610-0615	V.of Greece	Greece	-	7.475
0610-0615	V.of Greece	Greece	-	15.630
0630-0700	R.Georgia	Georgia	-	11.805
0641-0656	R.Romania Int.	Romania	-	7.105
0641-0656	R.Romania Int.	Romania	-	9.510
0641-0656	R.Romania Int.	Romania	-	11.775
0641-0656	R.Romania Int.	Romania	-	15.105
0700-0710	Vatican Radio 1	Vatican City State	Mon-Fri	4.005
0700-0710	Vatican Radio 1	Vatican City State	Mon-Fri	5.883
0700-0710	Vatican Radio 1	Vatican City State	Mon-Fri	6.185
0700-0710	Vatican Radio 1	Vatican City State	Mon-Fri	7.250
0700-0710	Vatican Radio 1	Vatican City State	Mon-Fri	9.645
0700-0710	Vatican Radio 1	Vatican City State	Mon-Fri	11.740
0700-0710	Vatican Radio 1	Vatican City State	Mon-Fri	15.595
0700-0730	V.of Mediterranean	Malta	Mon-Sat	7.150
0700-0800	BBC World Service	UK	-	6.195
0700-0800	BBC World Service	UK	-	9.410
0700-0800	BBC World Service	UK	-	12.095
0700-0800	BBC World Service	UK	-	15.485
0700-0800	BBC World Service	UK	-	15.565
0700-0800	BBC World Service	UK	-	17.640
0700-0800	WYFR Family R.	USA	-	7.355
0700-0800	WYFR Family R.	USA	-	7.520
0700-0800	WYFR Family R.	USA	-	9.985
0700-0815	IRRS-Shortwave	Italy	-	7.120
0700-0900	HCJB	Ecuador	-	9.780
0700-0900	HCJB	Ecuador	-	21.455
0700-1100	KVOH - Voice of Hope	USA	-	5.975
0703-0708	Croatian Radio	Croatia	Mon-Fri	6.165
0703-0708	Croatian Radio	Croatia	Mon-Fri	7.365
0703-0708	Croatian Radio	Croatia	Mon-Fri	9.830
0720-0725	Kyrgyz Radio	Kyrgyzstan	-	4.010
0730-0740	V.of Greece	Greece	-	9.420
0730-0740	V.of Greece	Greece	-	11.645
0730-0800	R.Finland	Finland	-	9.840
0744-0755	Trans World Radio	Monaco	Sat-Sun	9.870
0744-0755	Trans World Radio	Monaco	Sat-Sun	12.070
0754-0920	Trans World Radio	Monaco	-	9.870
0754-0920	Trans World Radio	Monaco	-	12.070
0800-0827	R.Prague	Czech Republic	-	11.600
0800-0827	R.Prague	Czech Republic	-	15.255
0800-0830	R.Vlaanderen Int.	Belgium	-	5.985
0800-0900	BBC World Service	UK	-	9.410
0800-0900	BBC World Service	UK	-	12.095
0800-0900	BBC World Service	UK	-	15.485
0800-0900	BBC World Service	UK	-	15.565
0800-0900	BBC World Service	UK	-	17.640
0800-0900	R.Korea Int.	Korea(Rep.)	-	13.670
0800-0900	WSHB	USA	Sat-Sun	7.535
0800-1200	RFPI	Costa Rica	-	6.975
0800-1200	RFPI	Costa Rica	-	15.050
0803-0808	Croatian Radio	Croatia	Sat-Sun	6.165
0803-0808	Croatian Radio	Croatia	Sat-Sun	7.365
0803-0808	Croatian Radio	Croatia	Sat-Sun	9.830
0815-1300	IRRS-Shortwave	Italy	Sat-Sun	7.120
0830-0900	R.Georgia	Georgia	-	11.910
0900-0930	V.of Mediterranean	Malta	Sun	11.770
0900-1000	WSHB	USA	Tue-Thu	7.535
0900-1500	BBC World Service	UK	-	12.095
0900-1500	BBC World Service	UK	-	15.485
0900-1500	BBC World Service	UK	-	15.565
0900-1500	BBC World Service	UK	-	17.640
0900-1630	HCJB	Ecuador	-	21.455
0920-0950	Trans World Radio	Monaco	Sun	9.870
0920-0950	Trans World Radio	Monaco	Sun	12.070
0930-1000	Adventist World Radio	USA	-	7.730
0930-1000	R.Vilnius	Lithuania	-	9.710
0940-1000	V.of Armenia	Armenia	Sun	4.810
0940-1000	V.of Armenia	Armenia	Sun	15.270
1000-1100	WEWN	USA	-	7.465
1000-1100	WWCR-1	USA	-	7.435
1000-1600	WHRI-2	USA	-	6.040
1030-1045	U.A.E.Radio	United Arab Emirates	-	15.255
1030-1045	U.A.E.Radio	United Arab Emirates	-	15.310
1030-1045	U.A.E.Radio	United Arab Emirates	-	17.760
1030-1045	U.A.E.Radio	United Arab Emirates	-	21.735
1100-1105	R.Pakistan	Pakistan	-	17.835
1100-1105	R.Pakistan	Pakistan	-	21.460
1100-1130	Swiss Radio Int.	Switzerland	-	9.535
1100-1300	WWCR-1	USA	-	12.160
1100-1659	Overcomer Ministry	USA	-	5.850
1100-1730	R.Jordan	Jordan	-	11.690
1100-2100	WEWN	USA	-	15.745
1120-1129	Vatican Radio 1	Vatican City State	Mon-Sat	5.883
1120-1129	Vatican Radio 1	Vatican City State	Mon-Sat	9.645
1120-1129	Vatican Radio 1	Vatican City State	Mon-Sat	11.740
1120-1129	Vatican Radio 1	Vatican City State	Mon-Sat	15.595
1120-1129	Vatican Radio 1	Vatican City State	Mon-Sat	21.850
1130-1135	Israel Radio Int.	Israel	-	15.640
1130-1135	Israel Radio Int.	Israel	-	17.535
1130-1157	R.Prague	Czech Republic	-	11.640
1130-1200	Merlin Network 1	UK	Sat	17.650
1130-1325	R.Netherlands	Netherlands	-	6.045
1130-1325	R.Netherlands	Netherlands	-	9.855
1138-1140	V.of Africa	Libya	-	15.435
1200-1257	R.France Int.	France	-	11.670
1200-1257	R.France Int.	France	-	15.155
1200-1257	R.France Int.	France	-	15.195
1200-1300	R.Bulgaria	Bulgaria	-	15.700
1200-1300	R.Bulgaria	Bulgaria	-	17.500
1200-1300	R.Pyongyang	Korea (DP.R.)	-	3.560
1200-1300	R.Pyongyang	Korea (DP.R.)	-	9.640
1200-1300	R.Pyongyang	Korea (DP.R.)	-	9.850
1200-1300	R.Pyongyang	Korea (DP.R.)	-	9.975
1200-1300	R.Pyongyang	Korea (DP.R.)	-	11.335
1200-1300	R.Pyongyang	Korea (DP.R.)	-	13.650
1200-1300	R.Ukraine Int.	Ukraine	-	9.870
1200-1300	R.Ukraine Int.	Ukraine	-	15.520
1200-1400	WWCR-4	USA	-	7.435
1200-2400	RFPI	Costa Rica	-	15.050
1200-2400	RFPI	Costa Rica	-	25.930
1230-1257	R.Prague	Czech Republic	-	6.055
1230-1300	Adventist World Radio	USA	-	7.230
1230-1300	R.Vlaanderen Int.	Belgium	-	9.925
1300-1330	Swiss Radio Int.	Switzerland	-	9.535
1300-1359	R.Polonia	Poland	-	6.095
1300-1359	R.Polonia	Poland	-	7.270
1300-1359	R.Polonia	Poland	-	9.525
1300-1359	R.Polonia	Poland	-	11.820
1300-1400	R.Korea Int.	Korea(Rep.)	-	9.640
1300-1400	R.Romania Int.	Romania	-	11.940
1300-1400	R.Romania Int.	Romania	-	15.390
1300-2100	WWCR-1	USA	-	15.685
1303-1308	Croatian Radio	Croatia	-	6.165
1303-1308	Croatian Radio	Croatia	-	7.365
1303-1308	Croatian Radio	Croatia	-	9.830
1330-1400	R.Austria Int.	Austria	-	6.155
1330-1400	R.Austria Int.	Austria	-	13.730
1330-1400	U.A.E.Radio	United Arab Emirates	-	9.605
1330-1400	U.A.E.Radio	United Arab Emirates	-	15.255
1330-1400	U.A.E.Radio	United Arab Emirates	-	15.315
1330-1400	U.A.E.Radio	United Arab Emirates	-	21.735
1330-1400	V.of Vietnam	Vietnam	-	7.145
1330-1400	V.of Vietnam	Vietnam	-	9.730
1330-1430	V.of Turkey	Turkey	-	17.815
1335-1350	V.of Greece	Greece	-	9.420
1335-1350	V.of Greece	Greece	-	9.690
1335-1350	V.of Greece	Greece	-	12.105
1335-1350	V.of Greece	Greece	-	15.530
1400-1430	R.Santec	Germany	Sun	9.710
1400-1500	Voice of America	USA	-	15.205
1400-1600	Merlin Network 1	UK	Sat	9.605
1400-1600	Merlin Network 1	UK	Sat	13.640
1400-1600	Merlin Network 1	UK	Sat	15.510
1400-1600	Overcomer Ministry	USA	Mon-Fri	6.010
1400-2100	WWCR-4	USA	-	9.475
1400-2200	WWCR-3	USA	-	12.160
1400-2400	WWCR-2	USA	-	13.845
1430-1459	R.Canada Int.	Canada	-	11.980
1430-1500	R.Sweden	Sweden	-	13.800
1500-1530	Israel Radio Int.	Israel	-	15.650
1500-1530	Israel Radio Int.	Israel	-	17.535
1500-1600	BBC World Service	UK	-	9.410
1500-1600	BBC World Service	UK	-	12.095
1500-1600	BBC World Service	UK	-	15.485
1500-1600	BBC World Service	UK	-	15.565
1500-1600	R.Pyongyang	Korea (DP.R.)	-	4.405
1500-1600	R.Pyongyang	Korea (DP.R.)	-	6.575
1500-1600	R.Pyongyang	Korea (DP.R.)	-	9.335
1500-1600	R.Pyongyang	Korea (DP.R.)	-	11.710
1500-1600	R.Pyongyang	Korea (DP.R.)	-	13.750
1500-1600	Voice of America	USA	-	9.575
1500-1600	Voice of America	USA	-	15.205
1500-2000	WINB World Int BC	USA	-	13.800
1600-1615	R.Pakistan	Pakistan	-	11.570
1600-1615	R.Pakistan	Pakistan	-	15.100
1600-1615	R.Pakistan	Pakistan	-	17.510
1600-1630	Voice of America	USA	-	9.575
1600-1630	Voice of America	USA	-	15.205
1600-1645	U.A.E.Radio	United Arab Emirates	-	9.605
1600-1645	U.A.E.Radio	United Arab Emirates	-	13.755
1600-1645	U.A.E.Radio	United Arab Emirates	-	15.255
1600-1700	BBC World Service	UK	-	9.410
1600-1700	BBC World Service	UK	-	12.095
1600-1700	BBC World Service	UK	-	15.565
1600-1700	Merlin Network 1	UK	Sat	3.965
1600-1700	Merlin Network 1	UK	Sat	9.655
1600-1700	Merlin Network 1	UK	Sat	13.640
1600-1700	R.Algiers Int.	Algeria	-	11.715
1600-1700	R.Algiers Int.	Algeria	-	15.160
1600-1700	R.Korea Int.	Korea (Rep.)	-	5.975
1600-1700	R.Pyongyang	Korea (DP.R.)	-	3.560
1600-1700	R.Pyongyang	Korea (DP.R.)	-	6.520
1600-1700	R.Pyongyang	Korea (DP.R.)	-	9.600
1600-1700	R.Pyongyang	Korea (DP.R.)	-	9.975
1600-1700	WYFR Family R.	USA	-	15.695
1600-1700	WYFR Family R.	USA	-	17.510
1600-1700	WYFR Family R.	USA	-	21.525
1600-1900	Deutsche Welle	Germany	-	6.140
1600-2000	WHRI-2	USA	-	13.760
1600-2400	KTBN	USA	-	15.590
1630-1700	Voice of America	USA	-	9.575
1630-1700	Voice of America	USA	-	15.205
1630-1700	V.of Vietnam	Vietnam	-	7.145
1630-1700	V.of Vietnam	Vietnam	-	9.730
1700-1727	R.Prague	Czech Republic	-	5.930
1700-1800	BBC World Service	UK	-	6.195
1700-1800	BBC World Service	UK	-	9.410
1700-1800	BBC World Service	UK	-	12.095
1700-1800	Merlin Network 1	UK	-	6.185
1700-1800	R.Japan	Japan	-	12.000
1700-1800	R.Romania Int.	Romania	-	9.625
1700-1800	R.Romania Int.	Romania	-	11.740
1700-1800	R.Romania Int.	Romania	-	11.940
1700-1800	R.Romania Int.	Romania	-	15.365
1700-1800	Voice of America	USA	-	6.040
1700-1800	Voice of America	USA	-	9.760

SHORT WAVE continues on page 18...

SHORT WAVE (continued from page 17)

Time (UTC)	Station	Country	Day	Frequency (MHz)
1700-1800	Voice of America	USA	-	15.205
1700-1800	WYFR Family R.	USA	-	15.695
1700-1800	WYFR Family R.	USA	-	17.510
1700-2100	Overcomer Ministry	USA	Mon-Fri	3.965
1700-2200	WWLK	USA	Sun-Fri	9.465
1715-1730	Vatican Radio 1	Vatican City State	-	5.883
1715-1730	Vatican Radio 1	Vatican City State	-	7.250
1715-1730	Vatican Radio 1	Vatican City State	-	9.645
1715-1730	Vatican Radio 1	Vatican City State	-	15.595
1715-1800	V.of Africa	Libya	-	15.435
1730-1756	R.Slovakia Int.	Slovakia	-	5.915
1730-1756	R.Slovakia Int.	Slovakia	-	6.055
1730-1756	R.Slovakia Int.	Slovakia	-	7.345
1730-1800	R.Austria Int.	Austria	-	6.155
1730-1800	R.Austria Int.	Austria	-	13.730
1745-1800	R.Tirana	Albania	-	7.210
1745-1800	R.Tirana	Albania	-	9.755
1745-1900	R.Bangladesh	Bangladesh	-	7.185
1745-1900	R.Bangladesh	Bangladesh	-	9.550
1745-1945	All India Radio	India	-	7.410
1745-1945	All India Radio	India	-	9.950
1745-1945	All India Radio	India	-	11.620
1800-1827	R.Prague	Czech Republic	-	5.930
1800-1827	R.Prague	Czech Republic	-	7.315
1800-1830	V.of Azerbaijan	Azerbaijan	-	9.165
1800-1830	V.of Vietnam	Vietnam	-	7.145
1800-1830	V.of Vietnam	Vietnam	-	7.440
1800-1830	V.of Vietnam	Vietnam	-	9.730
1800-1859	R.Polonia	Poland	-	6.000
1800-1859	R.Polonia	Poland	-	7.285
1800-1900	BBC World Service	UK	-	3.955
1800-1900	BBC World Service	UK	-	6.195
1800-1900	BBC World Service	UK	-	9.410
1800-1900	BBC World Service	UK	-	12.095
1800-1900	R.Taipei Int	China (Rep. Of Taiwan)	-	3.965
1800-1900	RAE	Argentina	Mon-Fri	15.345
1800-1900	Voice of America	USA	-	6.040
1800-1900	Voice of America	USA	-	9.760
1800-1900	V.of Russia	Russia	-	5.940
1800-1900	V.of Russia	Russia	-	5.965
1800-1900	V.of Russia	Russia	-	9.340
1800-1900	V.of Russia	Russia	-	9.480
1800-1900	V.of Russia	Russia	-	9.890
1800-1900	WSHB	USA	Sun	15.665
1800-1900	WYFR Family R.	USA	-	15.695
1800-1920	Radiobras	Brazil	-	15.265
1800-2000	IRRS-Shortwave	Italy	-	3.985
1800-2100	R.Kuwait	Kuwait	-	11.990
1800-2100	R.Kuwait	Kuwait	-	13.620
1830-1900	R.Georgia	Georgia	-	11.910
1830-1900	R.Sweden	Sweden	-	6.065
1830-1900	R.Sweden	Sweden	-	7.345
1830-1900	R.Vlaanderen Int.	Belgium	-	5.910
1830-1900	R.Vlaanderen Int.	Belgium	-	9.925
1830-1900	R.Vlaanderen Int.	Belgium	-	13.600
1900-1910	V.of Greece	Greece	-	7.475
1900-1910	V.of Greece	Greece	-	9.375
1900-1930	V.of Vietnam	Vietnam	-	7.145
1900-1930	V.of Vietnam	Vietnam	-	9.730
1900-2000	BBC World Service	UK	-	3.955
1900-2000	BBC World Service	UK	-	6.195
1900-2000	BBC World Service	UK	-	9.410
1900-2000	Merlin Network 1	UK	Thu-Fri	6.010
1900-2000	R.Korea Int.	Korea(Rep.)	-	5.975
1900-2000	R.Korea Int.	Korea(Rep.)	-	7.275
1900-2000	R.Pyongyang	Korea (DP.R.)	-	6.575
1900-2000	R.Pyongyang	Korea (DP.R.)	-	9.335
1900-2000	R.Pyongyang	Korea (DP.R.)	-	11.710
1900-2000	R.Pyongyang	Korea (DP.R.)	-	13.760
1900-2000	R.Pyongyang	Korea (DP.R.)	-	4.405
1900-2000	R.Thailand	Thailand	-	9.655
1900-2000	R.Thailand	Thailand	-	11.855
1900-2000	R.Thailand	Thailand	-	11.905
1900-2000	SLBC	Sri Lanka	Sat	6.010
1900-2000	Voice of America	USA	-	9.760
1900-2000	V.of Russia	Russia	-	5.920
1900-2000	V.of Russia	Russia	-	5.940
1900-2000	V.of Russia	Russia	-	5.965
1900-2000	V.of Russia	Russia	-	7.205
1900-2000	V.of Russia	Russia	-	7.340
1900-2000	V.of Russia	Russia	-	9.480
1900-2000	V.of Russia	Russia	-	9.890
1900-2000	WSHB	USA	Tue-Thu	15.665
1900-2000	WYFR Family R.	USA	-	5.760
1900-2200	HCJB	Ecuador	-	17.660
1900-2200	HCJB	Ecuador	-	21.455
1930-2000	R.Georgia	Georgia	-	11.760
1930-2000	R.Slovakia Int.	Slovakia	-	5.915
1930-2000	R.Slovakia Int.	Slovakia	-	6.055
1930-2000	R.Slovakia Int.	Slovakia	-	7.345
1930-2000	R.Yugoslavia	Yugoslavia	-	6.100
1930-2000	V.of Mongolia	Mongolia	-	11.790
1930-2000	V.of Mongolia	Mongolia	-	12.085
1930-2030	R.Tehran (IRIB)	Iran	-	7.190
1930-2030	R.Tehran (IRIB)	Iran	-	9.022
1930-2030	R.Tehran (IRIB)	Iran	-	11.765
1930-2030	V.of Turkey	Turkey	-	9.630
1930-2030	V.of Turkey	Turkey	-	9.895
1935-1955	RAI - Int.	Italy	-	5.970
1935-1955	RAI - Int.	Italy	-	7.285
1935-1955	RAI - Int.	Italy	-	9.760
2000-2025	Israel Radio Int.	Israel	-	7.510
2000-2025	Israel Radio Int.	Israel	-	9.435
2000-2025	Israel Radio Int.	Israel	-	11.605
2000-2025	Israel Radio Int.	Israel	-	15.650
2000-2030	R.Budapest	Hungary	-	6.025
2000-2030	R.Budapest	Hungary	-	7.165
2000-2030	R.Finland	Finland	-	6.135
2000-2030	Swiss Radio Int.	Switzerland	-	6.165
2000-2030	Voice of America	USA	-	6.095
2000-2030	Voice of America	USA	-	9.760
2000-2030	V.of Mediterranean	Malta	-	7.440
2000-2045	Deutsche Welle	Germany	-	9.725
2000-2045	R.Iraq Int.	Iraq	-	9.685
2000-2045	R.Iraq Int.	Iraq	-	11.785
2000-2100	BBC World Service	UK	-	3.955
2000-2100	BBC World Service	UK	-	6.195
2000-2100	BBC World Service	UK	-	9.410
2000-2100	China Radio Intl.	China (People's Rep.)	-	5.965
2000-2100	China Radio Int.	China (People's Rep.)	-	9.535
2000-2100	R.Algiers Int.	Algeria	-	11.715
2000-2100	R.Algiers Int.	Algeria	-	15.160
2000-2100	R.Bulgaria	Bulgaria	-	5.845
2000-2100	R.Bulgaria	Bulgaria	-	7.535
2000-2100	R.Exterior de España	Spain	Mon-Fri	9.680
2000-2100	V.of Indonesia	Indonesia	-	9.525
2000-2100	V.of Indonesia	Indonesia	-	15.150
2000-2100	V.of Russia	Russia	-	5.940
2000-2100	V.of Russia	Russia	-	5.965
2000-2100	V.of Russia	Russia	-	7.340
2000-2100	V.of Russia	Russia	-	9.480
2000-2100	V.of Russia	Russia	-	9.890
2000-2200	WYFR Family R.	USA	-	5.760
2000-2200	WYFR Family R.	USA	-	7.355
2000-2200	WYFR Family R.	USA	-	15.565
2000-2200	WYFR Family R.	USA	-	21.525
2000-2315	IRRS-Shortwave	Italy	-	3.985
2005-2105	R.Damascus	Syrian Arab Republic	-	12.085
2005-2105	R.Damascus	Syrian Arab Republic	-	13.610
2015-2100	V.of Africa	Libya	-	15.235
2015-2100	V.of Africa	Libya	-	15.415
2015-2100	V.of Africa	Libya	-	15.435
2030-2045	R.Thailand	Thailand	-	9.535
2030-2045	R.Thailand	Thailand	-	9.655
2030-2045	R.Thailand	Thailand	-	11.905
2030-2045	Voice of America	USA	-	6.095
2030-2045	Voice of America	USA	-	9.760
2030-2100	R.Belarus Int.	Belarus	Tue-Thu	7.105
2030-2100	R.Belarus Int.	Belarus	Tue-Thu	7.210
2030-2100	R.Sweden	Sweden	-	6.065
2030-2100	R.Tashkent	Uzbekistan	-	9.540
2030-2100	R.Tashkent	Uzbekistan	-	9.545
2030-2100	V.of Vietnam	Vietnam	-	7.145
2030-2100	V.of Vietnam	Vietnam	-	9.730
2030-2129	R.Polonia	Poland	-	6.035
2030-2129	R.Polonia	Poland	-	6.095
2030-2129	R.Polonia	Poland	-	7.285
2030-2129	R.Polonia	Poland	-	9.525
2030-2130	R.Havana Cuba	Cuba	-	13.660
2030-2130	R.Havana Cuba	Cuba	-	13.750
2045-2100	Voice of America	USA	-	6.095
2045-2100	Voice of America	USA	-	9.760
2045-2230	All India Radio	India	-	7.410
2045-2230	All India Radio	India	-	9.650
2045-2230	All India Radio	India	-	9.950
2045-2230	All India Radio	India	-	11.620
2050-2110	Vatican Radio 1	Vatican City State	-	4.005
2050-2110	Vatican Radio 1	Vatican City State	-	5.880
2050-2110	Vatican Radio 1	Vatican City State	-	7.250
2100-0400	WWCR-4	USA	-	7.435
2100-1000	WHRI-2	USA	-	5.745
2100-2127	R.Prague	Czech Republic	-	5.930
2100-2130	China Radio Int.	China (People's Rep.)	-	5.965
2100-2130	China Radio Int.	China (People's Rep.)	-	7.150
2100-2130	China Radio Int.	China (People's Rep.)	-	9.535
2100-2130	R.Korea Int.	Korea(Rep.)	-	6.480
2100-2130	R.Korea Int.	Korea(Rep.)	-	15.575
2100-2159	R.Canada Int.	Canada	-	5.995
2100-2159	R.Canada Int.	Canada	-	7.235
2100-2159	R.Canada Int.	Canada	-	9.770
2100-2159	R.Canada Int.	Canada	-	9.805
2100-2159	R.Canada Int.	Canada	-	11.945
2100-2159	R.Canada Int.	Canada	-	13.650
2100-2159	R.Canada Int.	Canada	-	13.690
2100-2159	R.Canada Int.	Canada	-	15.325
2100-2159	R.Canada Int.	Canada	-	17.820
2100-2200	BBC World Service	UK	-	3.955
2100-2200	BBC World Service	UK	-	6.180
2100-2200	BBC World Service	UK	-	6.195
2100-2200	R.Japan	Japan	-	9.725
2100-2200	R.Romania Int.	Romania	-	5.955
2100-2200	R.Romania Int.	Romania	-	7.195
2100-2200	R.Romania Int.	Romania	-	7.215
2100-2200	R.Romania Int.	Romania	-	9.690
2100-2200	Voice of America	USA	-	6.040
2100-2200	Voice of America	USA	-	6.095
2100-2200	Voice of America	USA	-	9.595
2100-2200	Voice of America	USA	-	9.760
2100-2200	V.of Russia	Russia	-	5.940
2100-2200	V.of Russia	Russia	-	5.965
2100-2200	V.of Russia	Russia	-	7.300
2100-2200	V.of Russia	Russia	-	7.340
2100-2200	V.of Russia	Russia	-	9.890
2100-2200	WSHB	USA	Sat-Sun	11.550
2100-2300	WWCR-1	USA	-	9.475
2100-2400	WEWN	USA	-	9.975
2115-2145	V.of Armenia	Armenia	Mon-Sat	4.810
2115-2145	V.of Armenia	Armenia	Mon-Sat	9.965
2115-2245	R.Cairo	Egypt (Arab Rep. Of)	-	9.990
2130-2200	China Radio Int.	China (People's Rep.)	-	5.965
2130-2200	China Radio Int.	China (People's Rep.)	-	9.535
2130-2200	Merlin Network 1	UK	Fri	6.100
2130-2200	R.Belarus Int.	Belarus	Tue-Thu	7.105
2130-2200	R.Belarus Int.	Belarus	Tue-Thu	7.210
2130-2200	R.Korea Int.	Korea(Rep.)	-	15.575
2130-2200	R.Tashkent	Uzbekistan	-	7.105
2130-2200	R.Tashkent	Uzbekistan	-	9.540
2200-1400	WWCR-3	USA	-	5.070
2200-2230	R.Budapest	Hungary	-	6.025
2200-2230	R.Korea Int.	Korea(Rep.)	-	3.980
2200-2230	R.Yugoslavia	Yugoslavia	-	6.100
2200-2259	R.Canada Int.	Canada	-	5.995
2200-2259	R.Canada Int.	Canada	-	7.235
2200-2259	R.Canada Int.	Canada	-	9.805
2200-2259	R.Canada Int.	Canada	-	13.690
2200-2259	R.Canada Int.	Canada	-	15.325
2200-2300	BBC World Service	UK	-	3.955
2200-2300	BBC World Service	UK	-	6.195
2200-2300	China Radio Int.	China (People's Rep.)	-	7.170
2200-2300	Merlin Network 1	UK	Fri	6.170
2200-2300	Merlin Network 1	UK	Fri	7.165
2200-2300	Merlin Network 1	UK	Fri	9.615
2200-2300	Overcomer Ministry	USA	Mon-Fri	5.995
2200-2300	R.Bulgaria	Bulgaria	-	7.535
2200-2300	R.Bulgaria	Bulgaria	-	7.545
2200-2300	R.Exterior de España	Spain	Sat-Sun	9.680
2200-2300	R.Taipei Int.	China (Rep. Of Taiwan)	-	5.810
2200-2300	R.Taipei Int.	China (Rep. Of Taiwan)	-	9.355
2200-2300	R.Ukraine int.	Ukraine	-	6.020
2200-2300	R.Ukraine int.	Ukraine	-	9.810
2200-2300	WSHB	USA	Thu-Sun	7.510
2200-2300	WYFR Family R.	USA	-	7.355
2200-2300	WYFR Family R.	USA	-	11.580
2200-2300	WYFR Family R.	USA	-	15.565
2200-2300	WYFR Family R.	USA	-	21.525
2230-2255	R.Moldova Int.	Moldova	-	7.520
2230-2300	R.Austria Int.	Austria	-	5.945
2230-2300	R.Austria Int.	Austria	-	6.155
2230-2300	R.Budapest	Hungary	-	3.975
2230-2300	R.Sweden	Sweden	-	6.065
2230-2300	R.Sweden	Sweden	-	7.325
2230-2300	R.Tirana	Albania	-	7.130
2230-2300	R.Tirana	Albania	-	9.540
2300-0500	WWCR-1	USA	-	3.215
2300-2400	BBC World Service	UK	-	6.195
2300-2400	Merlin Network 1	UK	Fri	3.985
2300-2400	Merlin Network 1	UK	Fri	6.170
2300-2400	Merlin Network 1	UK	Fri	6.180
2300-2400	Merlin Network 1	UK	Fri	7.165
2300-2400	R.Romania Int.	Romania	-	7.195
2300-2400	R.Romania Int.	Romania	-	9.690
2300-2400	V.of Turkey	Turkey	-	6.135
2300-2400	V.of Turkey	Turkey	-	9.655
2300-2400	WSHB	USA	Wed-Sun	7.510
2315-2320	Kyrgyz Radio	Kyrgyzstan	-	4.050

MEDIUM WAVE

Time (UTC)	Station	Country	Day	Frequency (kHz)
0000-0300	BBC World Service	UK	-	648
0100-0300	Voice of America	USA	-	1548
0100-0300	Voice of America	USA	-	1548
0300-0330	R.Belarus Int.	Belarus	Fri-Mon	1170
0300-0330	R.Finland	Finland	-	558
0300-0400	BBC World Service	UK	-	648
0400-0500	BBC World Service	UK	-	648
0400-0600	V.of Russia	Russia	-	693
0500-0515	Voice of America	USA	-	792
0500-0700	BBC World Service	UK	-	648
0515-0530	Voice of America	USA	-	1197
0515-0530	Voice of America	USA	-	792
0600-0620	Vatican Radio 1	Vatican City State	-	1530
0600-0700	Voice of America	USA	-	1197
0600-0700	Voice of America	USA	-	1260
0600-0700	Voice of America	USA	-	792
0600-1000	V.of Russia	Russia	-	1323
0600-1000	V.of Russia	Russia	-	693
0700-0710	Vatican Radio 1	Vatican City State	Mon-Fri	1530
0700-0710	Vatican Radio 1	Vatican City State	Mon-Fri	527
0700-0800	BBC World Service	UK	-	648
0700-1200	Voice of America	USA	-	1197
0730-0800	R.Finland	Finland	-	558
0800-0830	R.Vlaanderen Int.	Belgium	-	1512
0800-0900	BBC World Service	UK	-	648
0900-1500	BBC World Service	UK	-	648
1100-1115	Vatican Radio 1	Vatican City State	Mon-Fri	1530
1100-1115	Vatican Radio 1	Vatican City State	Mon-Fri	527
1200-1400	Voice of America	USA	Mon-Fri	1197
1230-1300	R.Vlaanderen Int.	Belgium	-	1512
1400-1500	Voice of America	USA	-	1197
1400-1500	Voice of America	USA	-	1548
1500-1600	BBC World Service	UK	-	648
1500-1600	Voice of America	USA	-	1197
1500-1600	Voice of America	USA	-	1260
1500-1600	Voice of America	USA	-	1548
1500-1600	V.of Russia	Russia	-	1215
1500-1600	V.of Russia	Russia	-	1323
1500-1600	V.of Russia	Russia	-	1386
1500-1600	V.of Russia	Russia	-	693
1600-1630	Voice of America	USA	-	1260
1600-1630	Voice of America	USA	-	1548
1600-1700	BBC World Service	UK	-	648
1630-1700	Voice of America	USA	-	1197
1630-1700	Voice of America	USA	-	1260
1630-1700	Voice of America	USA	-	1548
1700-1730	Vatican Radio 1	Vatican City State	-	1530
1700-1730	Vatican Radio 1	Vatican City State	-	527
1700-1800	BBC World Service	UK	-	648
1800-1830	V.of Azerbaijan	Azerbaijan	-	1296
1800-1900	BBC World Service	UK	-	648
1800-1900	V.of Russia	Russia	-	1494
1830-1900	R.Sweden	Sweden	-	1179
1830-1900	R.Sweden	Sweden	-	1179
1830-1900	R.Vlaanderen Int.	Belgium	-	1512
1900-1930	R.Vilnius	Lithuania	-	666
1900-2000	BBC World Service	UK	-	648
1900-2000	Voice of America	USA	-	1197
1900-2000	V.of Russia	Russia	-	1143
1900-2000	V.of Russia	Russia	-	1494
2000-2030	R.Finland	Finland	-	558
2000-2030	R.Finland	Finland	-	963
2000-2100	BBC World Service	UK	-	1296
2000-2100	BBC World Service	UK	-	648
2000-2100	V.of Russia	Russia	-	1386
2000-2100	V.of Russia	Russia	-	1494
2030-2045	Voice of America	USA	-	1197
2030-2100	R.Belarus Int.	Belarus	Tue-Thu	1170
2030-2100	R.Vlaanderen Int.	Belgium	-	1512
2050-2110	Vatican Radio 1	Vatican City State	-	1530
2050-2110	Vatican Radio 1	Vatican City State	-	527
2100-2200	BBC World Service	UK	-	648
2100-2200	Voice of America	USA	-	1260
2100-2200	Voice of America	USA	-	1548
2100-2200	V.of Russia	Russia	-	1323
2100-2200	V.of Russia	Russia	-	1386
2100-2200	V.of Russia	Russia	-	1494
2130-2200	R.Belarus Int.	Belarus	Tue-Thu	1170
2130-2330	R.Netherlands	Netherlands	-	1512
2200-2230	R.Santec	Germany	Tue	1323
2200-2230	R.Santec	Germany	Tue	1386
2200-2230	Voice of America	USA	-	1548
2200-2300	BBC World Service	UK	-	648
2230-0030	Voice of America	USA	-	1260
2230-0030	Voice of America	USA	-	1548
2230-2300	R.Sweden	Sweden	-	1179
2230-2300	R.Tirana	Albania	-	1215
2300-2315	Trans World Radio	Monaco	-	1467
2300-2400	BBC World Service	UK	-	648
2315-2345	Trans World Radio	Monaco	Sun-Mon	1467

Commercially Speaking

Back this month with another top h.f. receiver, JW gets to grips with Rockwell Collins' latest h.f. receiver - the 95S-1A.

The editor of this magazine really caught me with what I believe is known as a 'Double Whammy' by asking me to take a look at an AR88 from the 1940s to see how it performed today, but then presenting me with a Collins 95S-1A to review at the same time.

The double whammy comes about because I have been grunting on about AR88 tuning knobs being wonderful, but I never expected to be offered a receiver with no knobs at all! That's right, the Collins 95S-1A has not a single knob to be seen, apart from a power on/off switch.

The whole function of the receiver is software controlled from a standard PC using an RS-232 interface, so our Ed. put me right on the spot following my numerous, sometimes forceful condemnations of computer controlled boxes - although it has to be said that I loved the Icom PCR1000 and have recommended it to many small companies in the Southwest as an EMC pre-compliance receiver in which role it works well at very reasonable cost.

However, a Collins 95S-1A is by no means a hobby receiver, so here we go.

A Lot Packed In

The 95S-1 is built on a single printed circuit card measuring about 23 x 340 x 233mm so you can imagine that there is a lot packed into a small space. The card is normally supplied as one element of a larger system, but a desk top case is available which includes input and output connectors together with a mains power supply, and this is the version which I tested.

In this form the receiver is designated 95S-1A. The whole unit weighs about 4kg which makes a change from the AR88 and its two man lift requirements. The front panel, and remember it's less than two inches high, carries the power on/off switch, three l.e.d.s, a headphone jack and a tiny loudspeaker grille..

Round at the back there are equally few things to see, but the labelling of the BNC connectors gives the game away that this receiver is something special because we have 0 to 30MHz antenna input as one might expect, but alongside it is another BNC labelled 20 to 2000MHz antenna input.

The 95S-1A covers 5kHz to 2GHz in 1Hz steps, which is a little out of the ordinary, and before anyone says that there are other receivers on the market which go to 2GHz, there is one other surprising fact to reveal about the 95S-1A. From 20 to 2000MHz the 95S-1A operates as a direct conversion receiver, mixing the incoming signals with an on-frequency synthesiser using two carriers with a 90° phase angle between them and passing both channels to separate analogue to digital converters feeding digital signal processing before digital to analogue conversion back to audio.

Having no intermediate frequency means a total absence of image or i.f. responses, and using d.s.p. with the necessary decoding algorithms should enable the receiver to handle any type of signal in almost any bandwidth needed. What about the frequencies below 20MHz? Well, they are handled by up converting the 5kHz to 30MHz (you have spotted the 20 to 30MHz overlap?) to an i.f. of 51.2MHz using a synthesiser tuning range of 51.2 to 81.2MHz and conventional superhet principles.

Once at 51.2MHz the signal is directly converted to baseband and demodulated in the d.s.p. section using the same process as signals in the 20 to 2000MHz range. The block diagram of the receiver looks deceptively simple, but such throw-away lines as "two carriers with a 90° phase angle" hide a great deal of good r.f. engineering, and if you have ever tried to generate r.f. signals having a precise 90° phase angle over the considerable range of 20 to 2000MHz, you will appreciate what I mean.

If you have the opportunity to see a catalogue from Mini-Circuits who are leaders in the field of professional phase shift networks (among many other things) you will find that their 90° phase shifters can only operate over limited bandwidths and using them would require no less than eleven units to cover the 20 to 2000MHz range for the 95S-1A, whereas the Collins engineers manage it in two bites, 20 to 500MHz and 500 to 2000MHz. Obviously the spirit of Art Collins still stalks the corridors at Rockwell Collins headquarters in Cedar Rapids.

Ahead of the baseband processing, signals above 20MHz are routed through one of eight front-end band pass filters, four half octave sections between 500 and 700MHz and four varicap tuned covering 20 to 500MHz. The main function of these filters is to prevent signals at harmonics of the direct conversion oscillator from getting into the mixer chain and producing spurious responses.

For example, if the receiver is tuned to

The whole 95S-1A, wristwatch optional.

550MHz, a strong incoming signal at 1100MHz might mix with the local oscillator second harmonic to produce a demodulated output. The presence of a 500 to 700MHz half octave front-end filter effectively prevents the 1100MHz signal from reaching the mixers and causing this problem.

After each filter section r.f. amplifiers are used to maintain gain and noise figure across the whole frequency range. Down in the frequency range where short wave listeners operate, the 0 to 30MHz signals are fed through low pass filtering to a double balanced mixer where they are mixed with a +7dBm local oscillator to produce the 51.2MHz i.f. for final direct processing as a single 51.2MHz signal.

Again, the circuitry looks deceptively simple on paper, but takes more than a casual approach to design, and only the designer knows precisely what each component is there for. But what does the basic specification for the 95S-1A tell us about it? Here are a few crisp details from the published figures for your delectation:-

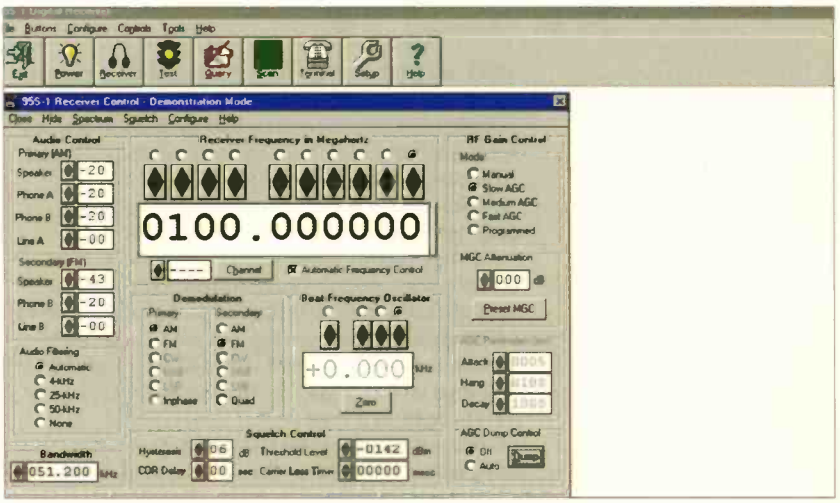


Fig. 1: The control software

Frequency range:	5kHz to 2000MHz in 1Hz steps.
Operating modes:	c.w., u.s.b., l.s.b., i.s.b., f.m., a.m., In-phase and Quadrature-phase (I/Q).
Sensitivity s.s.b.:	-111dBm for 10dB SINAD in 3.2kHz bandwidth.
Sensitivity a.m.:	-97dBm for 10dB S+N/N ratio below 30MHz in 6.4kHz bandwidth-101dBm above 30MHz.
Sensitivity c.w.:	-114dBm for 10dB SINAD in 1.6kHz bandwidth.
Sensitivity f.m.:	-110dBm for 12dB SINAD with ±5kHz deviation in 12.8kHz bandwidth.
Selectivity:	74 installed bandwidths from 100Hz to 300kHz (3dB points).

This last information may require repeating. There truly are 74 bandwidths available in the 95S-1A, with the facility for 181 user defined bandwidths to be downloaded via the control software, all this courtesy of the d.s.p. system.

AGC system:	Attack, hold and decay times are all programmable by the user, in addition to Fast, Medium and Slow pre-programmed settings already resident.
Second order intercept point:	+60dBm below 30MHz; +40dBm above 30MHz.
Third order intercept point:	+25dBm below 30MHz for signals in the 60dB filter stop band. +5dBm between 30 and 500MHz. 0dBm above 500MHz.
Third order intercept point:	+14dBm for signals within the 3dB filter pass band.
Internal spurious responses:	Less than an equivalent antenna input of -115dBm.
Synthesiser noise:	@ 1kHz separation -105dBc/Hz @ 10kHz separation -110dBc/Hz @ 100kHz separation -135dBc/Hz

These are just a few figures from the ten or so pages of detailed specifications for the 95S-1A, but it must be obvious that this is a professional receiver, so how did it measure up to my usual tests and more importantly for the readers of *Short Wave Magazine*, how did it perform as a hobby receiver?

For evaluation I used a Rockwell Collins software package which gives access to all the receiver functions, but anyone with programming knowledge could do almost anything with the commands provided, and would no doubt be able to provide a visual front-end to match anything yet on the market. Take a glance at the picture of the control screen **(Fig. 1)** to see what control is available from the computer keyboard.

The real business end.

Smack in the middle is the main frequency display, and you can guess from looking at it that each digit can be changed up or down using the arrows above it. Frequency can be keyed in directly by mouse left clicking to the left edge of any digit, or by clicking at the extreme left hand edge and entering the entire frequency, not forgetting all the leading zeros.

By clicking the round button above any digit and then giving a single right click inside the frequency display, you enter a free tuning mode based on the selected digit. For example, if you select the button above the 1kHz digit and then right clicking, moving the mouse from left to right changes the frequency continuously (until you run out of table top) in 1kHz increments, whilst moving the mouse up and down increases or decreases the frequency at ten time the selected rate, i.e. 10kHz in this example.

Sounds very odd, but you soon become accustomed to 'wiping' the mouse across the desk,

Commercially Speaking

and I found that even tuning around an amateur band was an eventually acquired skill, and selecting v.h.f. frequencies such as airband known spots was very easy from the computer keyboard. However, it also has to be said that after a few days operating like this I was longing to get to grips with the AR88 and spin a real dial.

Other tuning functions are provided by the computer keyboard function keys, F2/F3 giving up/down changes of 1kHz, F4/F5 of 5kHz and F6/F7 of 25kHz which seems useful at v.h.f./u.h.f. until you realise that you can't select 12.5 or 6.25kHz (or 8.33kHz) step changes, being limited to changing single digits at a time.

There is a redeeming feature in that choice of any steps is provided under scan control, so it's not all doom on this front.

On Frequency?

If so, then you will want to choose mode and the screen illustration speaks for itself, except that there are two sets of mode select buttons labelled Primary and Secondary, which refer to the provision of two separate and independent audio channels which can be used individually or merged together. No provision is made for synchronous a.m., but with the 95S-1A you have full i.s.b. together with automatic frequency control which makes synchronous a.m. pointless.

Leaping your gaze sideways to the upper left screen you will see the controls for the two audio channels, and these are automatically changed by mode selection in the 'Demodulation' box. Once again you have to use the mouse to increase or decrease the audio level, as you have to do if you leap to the other side of the screen and survey the r.f. gain control options.

The 'manual', 'slow', 'medium' and 'fast' a.g.c. settings are obvious enough, but there is joy unbounded when you come to the 'programmed' a.g.c. setting because you can set the a.g.c. attack, hang and decay characteristics to suit both your own personal preferences and the nature of the signal to which you are listening. You may recall my comments on the 'spitting' a.g.c. characteristics of the Harris RF-590A receiver, and I can tell you that the 95S-1A is absolutely unbeatable in the a.g.c. department.

I found the default settings at 50mS attack, 2 seconds hang and 1 second decay to be utterly perfect for Shanwick Transoceanic listening, with no trace of spits or spats at the beginning or end of words. I will take the opportunity to mention that John Thorpe designed this type of characteristic into the AR7030, so you happy owners will know one more reason for the '7030 sounding so nice.

But onwards:- The adjustable b.f.o. range of ±4kHz in 1Hz increments makes c.w. and teletype users very happy, as will the little box at bottom left showing the receiver bandwidth (can't call it i.f. bandwidth 'cos there isn't an i.f. unless you think of d.c. as the i.f.). The adjustable b.f.o. is also enabled in the s.s.b. modes for the pernickety chaps on 80m who like everything adjustable down to the last digit so that they can complain about everyone else in the net being slightly off frequency.

I won't list all of the 74 bandwidths available, but take it from me that there's one to suit you whatever your listening pleasure. Below 30MHz the widest bandwidth is limited to 20kHz or less, and additional audio filtering can also be used with fixed roll off frequencies of 4, 25 and 45kHz, selected in the 'Audio Filtering' box on the left of the screen.

Bottom of screen covers the 'COR', this not being a comment on the excellence of the receiver (as in COR Blimey) but an abbreviation for Carrier Operated Relay, this being a fully floating relay contact closed when a signal is present. The COR Hysteresis sets the level by which the signal has to fall before the relay contact opens and the squelch closes, and this is useful when listening to fading signals.

The squelch threshold sets the level in dBm at which the audio squelch opens, and the carrier loss timer sets the delay between the loss of received signal and the squelch re-closing. This can be set in 1mS increments from zero to 30 seconds. The comprehensive squelch facilities are a delight to use, and for earwigging on either h.f. or v.h.f. communications channels can't be bettered. Now flip eyeballs upwards to the little box marked 'Channel' underneath the main frequency display and be prepared for a surprise.

The 95S-1A carries an impressive 1000 memory channels, the surprise being that each channel contains no less than 23 bits of information including not only the obvious frequency, mode and bandwidth, but also all the a.g.c. settings and best of all the squelch setting for the individual channel. This allows you to enjoy h.f. (and v.h.f./u.h.f.) scanning regardless of the different background noise on each memorised frequency.

This is the first time I have seen this on a receiver of this type, although I will again stick my neck out and remind you that the feature was designed into the AR7030, and since the handbook for the 95S-1A suggests that it was produced long after the AR7030, one has to wonder who thought of it first - John Thorpe or Rockwell Collins?

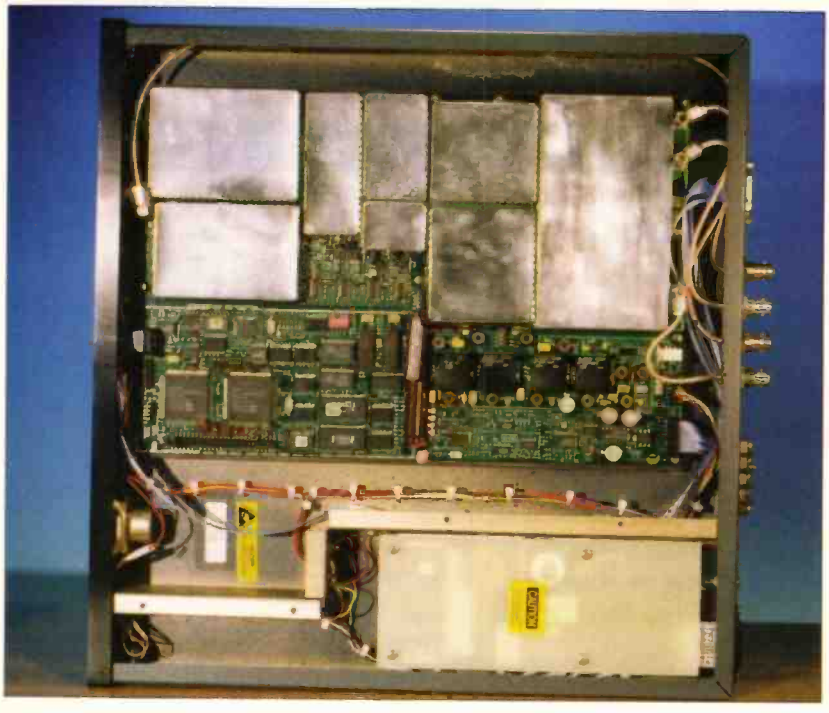
Those familiar with 'Windows' screens will have seen the word 'Spectrum' in the top bar and perhaps wondered about it. Wonder no longer - the 95S-1A incorporates a powerful scan function which enables you to use a pull down 'Configure' screen to set start and stop frequencies, scan increments in steps down to 1Hz (so you can use 6.25kHz steps), and scanning receiver bandwidth.

A further function allows you to set the dwell time on each scanned frequency in 1mS steps from 0 to 1000mS. Selecting 0mS makes the dwell time dependent on a.g.c. settings. When the scan settings have been inserted, clicking on 'start' will display a frequency spectrum between the limits chosen, and you can have this as a single sweep or continuously updated.

A cross-hair marker controlled by the mouse can be placed on any displayed signal, and a left click will display the frequency and level of the chosen signal. By right clicking on a signal displayed, the receiver will immediately tune to that frequency, and by holding the right mouse button down and dragging left and right the receiver follows the mouse frequency across the displayed spectrum. Brilliant!

As an example, I set the scan start to 540kHz, the scan step to 9kHz and the scan stop to

Continued on page 26...



Doesn't look like there's much in there! – deceptive eh?

...continued from page 24

1215kHz. A quick scan revealed all the medium wave signals spread out across the screen, and I could tune the 95S-1A to any one of them by a single click. The same technique can be used at any frequency or span throughout the tuning range of the receiver, so it's a monitor's dream receiver. The only additional feature I would have enjoyed would be a 'Max. Hold' facility so that I could leave the receiver scanning, say, the v.h.f. airband, and come back later to see what had popped up.

Almost as an afterthought I should mention that a signal level reading can be enabled at the bottom of the screen, and this displays the incoming signal level in dBm - and it's incredibly accurate, so much so that the receiver could be used as a precision measuring instrument. I checked spot frequencies all the way from 50kHz to 2GHz and it was spot on according to my HP 8648B generator which I checked with an HP-436 power meter before each measurement session. I had to put aside my love for swinging analogue pointers, which wouldn't in any case have been appropriate in a receiver like this.

Basic Measurements

To fully understand all the facilities offered by a receiver of this complexity requires detailed study of the full operating manual and there may be some things I have missed in this space limited review, but I think I have covered most of the features and given you a flavour of what the 95S-1A has to offer. I thought I had better stop driving the receiver and do some basic measurements to at least confirm what the handbook told me, and started with basic sensitivity in all modes.

Time clearly doesn't permit measurements at all frequencies but I chose samples in the middle of each front-end band pass filter responses and can confirm that the sensitivity remains virtually constant at -117dBm for s.s.b. and -104dBm for a.m. across the entire tuning range all the way to 2GHz.

Just for the hell of it I went through my normal short wave receiver checks at 14MHz and found to my surprise that I was unable to measure the third order intercept point with 20kHz carrier spacing because the 95S-1A behaved very strangely, showing real distress with the input levels required (around -20dBm).

The problem seemed to be caused by the digital a.g.c. system which began to 'pop' the receiver audio on and off according to the setting of the a.g.c. time constants. Undeterred, I increased the test signal spacing to 100kHz and found the receiver settled down perfectly with a measured dynamic range of 104dB and a third order intercept of +30dBm, which is in line with the published specification. Second order intercept with my usual 6.5/7MHz carriers, resolving the second order product at 13.5MHz came out at +80dBm, which is excellent considering the absence of a tuned front-end preselector and the published spec. of +60dBm.

Spectral purity of the synthesiser was also outstanding, and better than the earlier HF-2050 from the Collins design team. Measured noise at 10kHz spacing from 14.2MHz was -127dBc/Hz which compares with the published specification of a typical 95S-1A at 110dBc/Hz.

Lower Frequencies

My own simple test on lower frequencies trying to listen in the early evening to stations at 900 and 918kHz in the presence of wide-shouldered Radio 5 Live on 909kHz revealed that the d.s.p. of the 95S-1A was well up to the requirements of this demanding application and comfortably out-performed the NRD-545 which you will recall started this whole 'monkey chatter' debate. No problems for the Collins in this department at all.

Conclusions

What can I say? Despite my slight reservations about the 95S-1A a.g.c. performance in the presence of very strong closely spaced signals at 14MHz, the rest of the test sessions were pure pleasure. I keep going back to the computer keyboard and using the receiver to listen to more frequencies than I thought I would ever try, and always come away totally satisfied with the results.

If cost were no object, and I don't actually know how much this radio might set me back in the open market, I would have a 95S-1A permanently connected into my listening set-up for the rest of my life. For the real short wave (i.e. below 30MHz) listener, the 95S-1A would have to be backed up by a manually tuned receiver for 'tuning around', and I have to say that I was reminded of the words of 'Old MacDonald' whenever I used the 95S-1A for any length of time:

Old Art Collins had a farm,
Ee Eye Ee Eye Oh,
And on that farm he had a mouse,
Ee Eye Ee Eye Oh,
With a click click here,
And a click click there,
Here a click, there a click,
Everywhere a click click,
Old Art Collins had a farm,
Ee Eye Ee Eye Oh.

I think you get my point, but I loved it anyway. Next time it will be back to the future with the AR88.

Happy listening **SWM**

"I keep going back to the computer keyboard and using the receiver to listen to more frequencies than I thought I would ever try, and always come away totally satisfied with the results."

Fun With EAMs

What do you know about EAMs? Graham Tanner takes a look at some of the stations and aircraft that transmit Emergency Action Messages, otherwise known as EAMs.

If you spend any length of time listening to any of the numerous US Air Force or US Navy frequencies in the h.f. spectrum, you will almost certainly have encountered long strings of number and letters being transmitted. There are plenty of coded transmissions which appear in the h.f. spectrum at various times. Consider the number of different transmissions recorded and categorised by the members of ENIGMA - their bi-monthly column in *SWM* is an indication of how much interest those signals have.

However, I am talking about the signals on a fixed set of frequencies, with almost an operating schedule, and who take the trouble to identify themselves at the end of their transmissions (somehow I can't imagine the *MOSSAD* doing that!). If you are not sure which broadcasts I am talking about, tune your h.f. receiver to 11.244MHz for a few hours, and you are sure to hear at least one or more.

A USAF C-58 Galaxy just before touch down. *G. Tanner*

There are elements of the United States military forces that are responsible for the upkeep, training and (possible) launch of nuclear missiles. These generally come under the banner of USSTRATCOM - United States Strategic Command. This came into being in June 1992, replacing the Strategic Air Command that had been in existence since 1946.

Much of the factual information surrounding EAM broadcasts is classified because of what they are used for, but their existence has been all but officially acknowledged due to their use in several books and films. The 1995 film *Crimson Tide*, for example, starring Denzel Washington and Gene Hackman is the story of a US nuclear submarine which receives an incomplete missile launch order (via EAM), and the crew who battle to prevent the trigger-happy captain from launching their missiles. EAMs are also mentioned in the Tom Clancy book *Hunt for the Red October*.

Emergency Action Messages are known to be associated with the control and launch of nuclear weapons. It may seem strange to think that of the hundreds of EAMs broadcast each week, you never hear of any weapons launches. Most of the EAMs heard will be training messages, or even 'dummy' messages used to confuse anybody trying to 'crack' a message.

This article is an attempt to demonstrate just how much is known about these messages, a brief look at some of the stations and aircraft that transmit the messages, and a few ideas to get you started as an 'EAM cryptanalyst'!

The EAM

An EAM is an Emergency Action Message, and it is a category of urgent messages from US Commanders to deployed forces. An EAM is often used as a short-hand method of distributing a specially coded nuclear attack directives. This sounds very ominous, but a large percentage of the broadcasts heard will be either training messages or dummy messages.

Transmitting dummy messages or training messages in the midst of real messages is a well-known method of deceiving anybody attempting to 'break' a coding system. The operators in this system also get a lot of training, so a large percentage of EAMs are probably training messages.

An EAM contains key instructions from high-level authority (usually the Joint Chiefs of Staff), and have a predetermined format. They are transmitted to their recipient by various means, including h.f. radio, v.h.f. and u.h.f. radio, and even over satellite links. I would not be surprised to find that they are also passed over telephone links, also. They carry FLASH precedence, and they contain vital messages containing time-sensitive data.

It is not unheard of for other transmissions from aircraft to be interrupted while an EAM (or a whole series of EAMs) is passed. EAMs are not the most important messages however, as another kind of message even supersedes an EAM (see later for brief details of 'Sky King' messages).

A typical EAM would broadcast as follows:

"WZSWUN, standby; WZSWUN, standby; WZSWUN, message follows;
WZSWUN3FT7VAW3SBFMRUOTQ7SD3HV2" The message is then repeated again, and at the end the transmitting station identifies themselves - "Andrews, Out"

All the letters in the message are spoken phonetically. The message may then be repeated by other stations in the network, with the

AOR® AR8200 SERIES-2

NEVER BEFORE HAS ONE HAND PORTABLE OFFERED SO MUCH

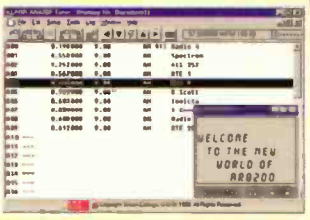
NEW

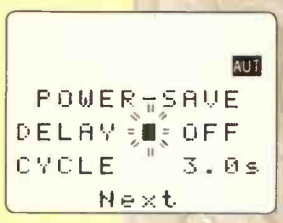
The AR8200 represented a beacon when first released, technology marches forward with the NEW *AR8200 SERIES-2* keeping the innovative concept and forward thinking alive and bright. It has not been easy improving on what many thought to be the ultimate, however the NEW *AR8200 SERIES-2* does provide even more with nothing taken away. A Temperature Compensated Crystal Oscillator (**TCXO**) now forms the heart of the NEW *AR8200 SERIES-2*, this ensures **high stability** with **minimal internal spurii**... the TCXO replaces a crystal reference as commonly employed in other receivers and is usually only seen in top of the range (more expensive) table-top models such as the AR5000 and AR7030. Performance too has seen the AOR R&D team fine tuning the design for **best sensitivity and strong signal handling** over the extremely wide coverage of 530kHz to 2040MHz (all mode receive without gaps).

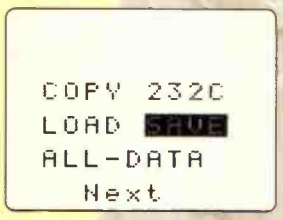
The aerial has also been replaced by a **telescopic whip** on a swivel base, this ensures the best results, a medium wave bar aerial is also provided as standard. The design team have certainly been taking account of customers wishes, the keyboard ZERO key has been swapped in position with the DECIMAL to match the telephone layout, LCD illumination has been increased (for improved visibility) and following requests for longer operation between charges, the **4 x AA size NiCads have been increased in capacity**, again reflecting improvements in modern technology. The obvious change has been left for last... the **cabinet colour** has been changed from green to **black**!

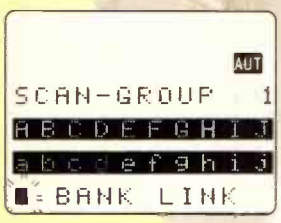
The list of features is vast, large multi-section backlit LCD, side mounted navigation keys and rotary tuning control, alpha-numeric text comments for memory channels, banks and search. The all mode receive features Wide, Standard and Narrow AM with Wide FM, Narrow FM and Super Narrow FM bandwidths provided, tuning step sizes are programmable in all modes down to 50Hz with comprehensive step adjust and correctly implemented 8.33kHz for the new VHF airband spacing.

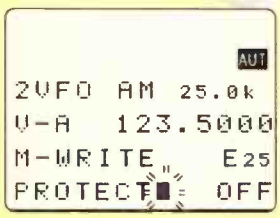
Connection to a computer is possible with the optional CC8200 lead/interface with free PC software available from the AOR web site. Unique optional slot cards further enhance features offering CTCSS, Tone Eliminator, Record / Playback, Voice Inverter, External Memories (backup for 4000). Other options include the RT8200 for 'reaction tune' with the Opto Scout and other compatible devices, clone lead, soft case, option lead, record interface. Even the operating manual reflects the careful design being 140 pages of ENGLISH language with plenty of illustrations.

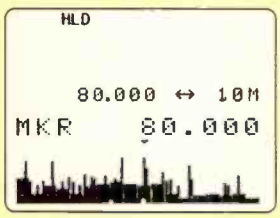


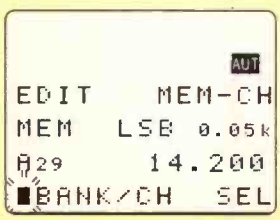


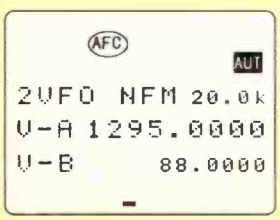












★★★★☆ AR5000+3 awarded four starts by both the authoritative Passport To World Band Radio and World Radio & TV Handbook

AR5000
True base receivers are few and far between, some have simply evolved from the hand held equivalents with little tangible improvement in performance or facilities over their smaller counterparts - *the AR5000 is not like this!*
High performance, top quality build and true wide coverage all mode receive. The "+3" version offers even more with synchronous AM, AFC and Noise Blanker. Popular with government agencies throughout the world.

AR5000c
When making critical measurements, the frequency coherence is very important whether a single or multiple unit is employed. This involves the use of a single reference for all oscillators employed throughout the receiver. The AR5000C now provides this commercially required capability. The "C" version may be provided to order in either the standard AR5000 format or with two of the +3 additions of AFC and NB. If you are a commercial operator with this application in mind, please request the separate specification leaflet for the AR5000C.

AR5000+3 - Sync AM, AFC, NB

The "+3" version offers even more with synchronous AM (upper side band, lower side band and double side band with excellent lock range), AFC (Automatic Frequency Control for accurately tracking moving transmissions or unusual band plans) and Noise Blanker.

Passport to World Band Radio'99.
"Front-end selectivity, image rejection, IF rejection, weak-signal sensitivity, AGC threshold and frequency stability all superior".
"Unlike virtually every other receiver we have tested over the past 21 years, the frequency readout is unfailingly accurate to the nearest Hertz. This should make the AR5000+3 of exceptional interest to broadcast engineers".

World Radio TV Handbook'99.
Speaking of the AR5000+3 in conclusion... "Compared with the ICOM ICR-8500 it offers considerably more features, better strong-signal handling, wider coverage and decidedly superior filters".

AR5000+3

- ✓ Wide frequency coverage 10 kHz - 2600 MHz
- ✓ All mode reception: USB, LSB, CW, AM, Synchronous AM, NFM, WFM with automode tuning (any mode and bandwidth on any frequency is possible)
- ✓ Automatic Frequency Control
- ✓ Noise blanker
- ✓ High stability TCXO reference, 1 Hz NCO tuning
- ✓ 1,000 memories, 10 memory banks, 20 search banks, 5 VFOs (all twice!), alpha tag, EEPROM chip storage
- ✓ Multiple IF bandwidth 3 kHz, 6 kHz, 15 kHz, 30 kHz, 110 kHz, 220 kHz with an option position for 500 Hz CW. (30 kHz is ideal for WEFAX).
- ✓ High sensitivity and excellent strong signal handling assisted by a preselected front end from 500 kHz - 1 GHz
- ✓ Extensive RS232 control list
- ✓ SDU ready with IF output for spectrum display unit

FOR FURTHER DETAILS, PLEASE VISIT YOUR DEALER, CALL FOR A LEAFLET OR VISIT THE AOR UK WEB SITE AT
www.aoruk.com

SDU5500

The **SDU5500** is a Spectrum Display Unit, when coupled to the AR5000 receiver, it provides a spectrum display of 10MHz bandwidth anywhere between 10kHz and 2600MHz. Already pressed into commercial usage by the government, the professionalism of the unit has truly been grasped.
The SDU5500 has a high resolution monochrome (white/blue) LCD with improved status read-out on the top-half of the display with a spin wheel tuner controlling the marker position, similar to a dedicated high-priced spectrum analyser. The SDU5500 supports a number of AOR and ICOM receivers. Free supporting software is available from the AOR internet web site.

ARD2

ARD2 portable ACARS & NAVTEX decoder & display unit, can be operated from internal batteries or external d.c. supply. An RS232 port expands capabilities, free supporting software is available from the AOR internet web site.

★ ★ NEW PRODUCT NEWS ★ ★

The AR8200 SERIES-2 is expected to arrive in the UK early in June'2000.
Following in its heals is the new AR8600 base/mobile receiver which was first displayed last year at the Donington exhibition, generating great interest. The AR8600 features a similar microprocessor operating system to that of the AR8200 SERIES-2 but has a completely different RF and mixer stage reflecting the primary base design goal for good strong signal handling. The all-new metal cabinet accepts all five slot card options (used by the AR8200) simultaneously, a 10.7MHz i.f. output is also provided to drive the SDU5500 spectrum display unit. Further information will be released soon.
UK based R&D work has been in progress for some time with the aim to produce a new UK designed & built receiver. This new unit will be displayed for the first time in 'proto-concept' format (part way between concept, prototype and pre-production) at the Dayton, USA exhibition on 19th May'2000, it will also be displayed at Friedrichshafen, Germany on 22 June'2000. The new model is the result of another successful joint development between AOR and internationally acclaimed UK designer John Thorpe (design engineer of the award winning AR7030). However, the new receiver will not be a replacement to the AR7030 short wave receiver, it is designed with the modern digital world in mind and offers many new features and concepts, it is principally targeted at the commercial and government operator. Production is expected to roll-out toward the end of 2000. Details will be released later in the year.

same message often repeated by numerous stations around the world. The station which first broadcasts the EAM is known as the 'Lead station'.

The Format

An EAM always starts with a six-character pre-amble that is read three times, and then followed by the entire message (including the pre-amble again). The whole message is usually repeated twice, and at the end of the broadcast, the station transmitting the message identifies itself. Sometimes there is just a single EAM, and sometimes the same station will broadcast a number of EAMs in a single broadcast.

Once the EAM has finished, listen carefully, it is most likely that the same EAM will be broadcast by another station. The signal will almost certainly have a different strength, and the 'voice' reading the EAM will be different. Or maybe the first station will have another EAM to pass.

Analysis of the messages over a period of time shows that the entire message usually falls into a limited number of lengths. Common message lengths are 30 characters and 20 characters (with both formats including the six-character preamble), although much longer messages have been heard. This format commenced during October 1998 and continues to this day. Prior to that date, the commonest formats were 26 and 20 characters in length.

In many cases the EAM is transmitted by a ground station, usually one of the USAF GHFS stations. During 1999, monitors noticed that these GHFS stations appeared to have a transmission schedule, as broadcasts usually occurred during certain time periods each hour.

Other broadcasts come from stations with a 'callsign', and these are thought to be either USN E-6B Mercury 'TACAMO' aircraft, or from USAF E-4B aircraft - see later for details of these aircraft. The callsigns used by these aircraft come from the 'back-end' communications staff, and they change callsign each day.

A USAF KC-135 tanker aircraft with special markings.
G. Tanner

Since late 1995 there has been a pattern to the way in which an EAM is first broadcast. The 'Lead Station' gets to announce the EAM with 'Mainsail ... Mainsail', while all the other following stations just launch straight into the EAM.

During each month, for the first week McClellan is the Lead Station, during the second week it is the turn of Andrews, and for the rest of the month it is Offutt. See also the GHFS frequency listing for details of the approximate times that each GHFS station will broadcast EAMs.

The Players

EAMs have always been known to have been transmitted by ground stations and from aircraft. Prior to 1998 the majority of EAMs coming from aircraft came from a special mission known as 'Looking Glass'. This was a special USAF EC-135 aircraft which was orbiting somewhere over the USA.

Between February 1961 and July 1990 there was always a 'Looking Glass' aircraft airborne 24-hours a day, seven days a week, 365 days a year. In 1990 this was reduced to a lower level, with aircraft sitting on the end of the runway waiting to take-off at a moments notice.

The final 'Looking Glass' EC-135 flight was in October 1998, when the mission was taken-over by the US Navy with their E-6B Mercury aircraft. Ironically, both the EC-135 and E-6B are derivatives of the same line of aircraft - the Boeing 707.

The USAF EC-135s were aircraft built in the late 50s and early 60s, while the Navy E-6Bs were built in the early 1990s. The E-6A Mercury was originally intended as a replacement for the US Navy fleet of EC-130 Hercules 'TACAMO' (TAke Charge And Move Out!) that were used for communicating with submerged nuclear submarines of the US Navy. This was accomplished via v.l.f. transmissions using a trailing wire antenna that was hundreds of metres long. In the 1990s the fleet of E-6As were upgraded to E-6Bs to allow them to also take on the 'Looking Glass' role.

The E-6Bs usually operate from three locations in the continental USA - one on each coast, and one in the central area. These are known as 'TACAMO LANT' for the Atlantic coast, 'TACAMO PAC' for the Pacific coast, and 'TACAMO CENT'. Sometimes it is possible to hear EAMs being broadcast for specific areas, and the EAM will be prefixed with a message such as 'For TACAMO LANT PRIMARY'.

Several times a year an E-6B is sent to Europe, and it usually flies from RAF Mildenhall for a few days. Many of the missions flown are over the North Sea or out over the eastern Atlantic, and there are usually NOTAMs which indicate where and when they will be flying as they mention 'orbit areas' and 'trailing wires', and even the times when the areas will be active.

The other 'airborne player' in the EAM circuit is the E-4B, which is a variant of the Boeing 747 'Jumbo Jet'. These were originally acquired in the 1970s to serve as command post aircraft in the event of national emergencies, however the role was changed during the 1990s to that of National Airborne Operations Centre (NAOC).

There are only four E-4B aircraft, and until the end of 1998, they were usually heard using the callsign 'Night Watch'. The primary aircraft was 'Night Watch 01' and the secondary aircraft was always 'Night Watch 02', but these have now changed and standard daily tactical callsigns are used.

The Nets

There are two sets of frequencies where most EAM broadcasts take place. The most commonly known Net is the USAF GHFS network which has a broad spread of h.f. frequencies and stations around the globe (see later in this article for a list of stations and frequencies). Not all the GHFS stations participate with the broadcast of EAMs.

The second most important network is known as the 'Zulu Net' by monitors. Once again, there is a broad spread of frequencies, but they are not assigned to any specific ground stations.

Each frequency in this network is assigned a 'Zulu' number (see the frequency list later for details), and stations in this network always refer to other channels by their 'Zulu' number rather than their frequency. Almost all the callsigns heard on this network are codewords, or tactical callsigns, which change on a daily basis.

It is quite common to hear an aircraft with a tactical callsign working one of the GHFS stations on their published frequencies. They usually request the 'working frequencies' for another station with a tactical callsign. Sometimes they request the frequencies for 'Night Watch', but this happens less often now as even these aircraft are using tactical callsigns.

The GHFS station will somehow find out which of the Zulu channels is in use at that time, and pass them to the aircraft requesting them. In most instances, the GHFS station will pass two Zulu channels (the Primary and Secondary channels), but sometimes a third is also passed (the Tertiary channel). By checking the Zulu channel number in the list provided, you can find the frequency that they are then using.

Sky King Messages

In the middle of all these EAMs and other more mundane GHFS traffic you will hear other coded messages being passed. They are 'Sky King' messages, but they are also known as 'Foxtrot' broadcasts. These broadcasts are immediately recognisable because of their distinctive call-up message - 'Sky King, Sky King, do not answer'. This is followed by a tri-graph message, a two-digit minute-stamp, and then a two character 'authentication code'. It is thought that the authentication code is related to the time.

'Sky King' messages are more important than EAMs, because EAMs have been interrupted to allow the transmission of one or more 'Sky King' messages. One important distinction with 'Sky King' messages is that the station making the transmission does not identify itself. I am not aware of anyone making detailed notes and analysis on these broadcasts, probably because they are over so quickly and there is little apparent information passed to allow a thorough analysis.

Callsigns

The callsigns used by stations seem to be completely random, but nonetheless very distinctive and easy to recognise. The GHFS stations use their station name (e.g., Croughton or Andrews), but all the other stations use a callsign that is either a single long word or two shorter words.

There is no pattern to the callsigns used, typical examples could be 'Envelope', 'Dusty Gold', 'Undulate' or 'Big Tree'. The callsigns change every day, and there are so many different words used that it would be very difficult to try to compile a callsign list (in fact, you may have one already - its called a dictionary!).

A typical weeks-worth of 'tactical callsigns' (from early April 2000) included the following: Envelope, Auxiliary, Quick Lime, Two Timer, Hit Song, Legislate, Back Pack, Head Dress, Round Hat, Ambition and Reliable. If anyone can make sense of the sequence of callsigns used, please get in touch!

There are very few fixed callsigns nowadays. The commonest fixed callsigns were the 'Night Watch' series (with a numerical suffix) used on the 'Zulu' network, but these are now quite rare. The 'Night Watch' aircraft are now using 'word' callsigns like the other aircraft.

Patience To Monitor

If you have the time and patience to monitor the GHFS frequencies and 'Zulu' frequencies listed, I would recommend that you make notes about the EAMs that you hear. For each one received, you should try to record the following details:

1) callsign of the sending station (note: may be a GHFS station, which is announced at the end of the transmission).
2) date and time of transmission.
3) six character pre-amble
4) the full message text string.
5) the length of message string - how many characters in total.

Over the course of a day (or even longer), if you record these details of the EAMs that you hear, you will begin to notice some patterns. Although you will not be able to decode the actual message, there are a number of interesting factors that will reveal themselves.

The first two characters of the pre-amble stay static for many days (up to 20 days maximum as a general rule). You may get lucky and happen to be listening on the day in which it changes. This is a bit like the peak in sun-spot cycles - you only know after the event has happened.

When you hear an EAM which appears to have a new or different pre-amble, you will not know for sure until you have heard quite a few with the new prefix, and have **not** heard any with the old prefix. This entire transition process from old prefix to new prefix could take as much as a day. You might be hearing one of the 'one-off' series of EAMs.

Repeating patterns in the message - sometimes characters repeat several times, and sometimes a pattern of two, three or even four characters will be repeated later in the message/similar repeats in other messages.

Some letters or numbers may not appear at all, or very infrequently. The frequency of the messages will be significant, as highs and lows will tend to indicate other activities. Significant increases in EAM activity have been noticed of the 'third Thursday' of every month, and this is probably to coincide with some kind of monthly training schedule.

Web Watch

US Strategic Command:
www.stratcom.af.mil
www.55srwa.org

E-6B Mercury:
www.fas.org/
www.fas.org/nuke/guide/usa/c3i/e-6.htm
www.tacamo.navy.mil/E6-B.html

E-4B:
www.fas.org/
www.fas.org/nuke/guide/usa/c3i/e-4b.htm
www.af.mil/news/factsheets/E_4B.html

EC-135:
www.stratcom.af.mil/factssheets/ec135.html
tuvok.au.af.mil/au/database/projects/ay19
96/acsc/96-004/hardware/docs/ec135.htm
azzato.virtualave.net/history/airforce/lookingglass.htm
131.84.1.31/news/Sep1998/n19980922_981443.html
www.fas.org/nuke/guide/usa/c3i/ec-135.htm

USAF GHFS:
http://ute-monitor.org/~jrc/ghfs.html
http://grove-ent.com/mtghfs.html

GHFS Stations & Frequencies

The USAF Global High Frequency System provides a 24-hour global network of stations available for 'Command & Control' (C2). The commonest kind of

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transmission heard of GHFS frequencies is the 'phone-patch' and the next commonest is the EAM.

Location	EAM Time	Frequencies
Andersen, Guam		6.739, 8.968, 11.175, 13.200
Andrews, USA	H+30	4.724, 6.712, 8.968, 11.175, 15.016, 17.976
Croughton, UK	H+06, H+35	4.724, 6.712, 8.992, 11.175, 13.200, 15.016, 17.976
Elmendorf, Alaska	H+21, H+40	4.724, 6.739, 8.968, 11.175, 13.200, 15.016, 17.976
Hickam, Hawaii		6.739, 8.968, 11.175, 13.200
Incirlik, Turkey		4.724, 6.739, 11.175, 15.016, 17.976
McClellan, USA	H+11, H+50	4.724, 6.739, 8.968, 11.175, 13.200, 15.016, 17.976
Offutt, USA	H+00	6.739, 8.968, 11.175, 17.976
Thule, Greenland	H+16, H+45	4.724, 6.739, 8.968, 11.175, 13.20
Yokota, Japan		4.724, 6.739, 8.968, 11.175, 13.200, 15.016, 17.976

Zulu Frequencies

The following list gives all the known 'Zulu' frequencies. Notice how all the designators and frequencies are in ascending order, and that all the designators are multiples of 5, except for Z124 and Z124 - the significance of this is unknown. A number of frequencies are unconfirmed, and higher ones are unknown, waiting to be found as the solar-cycle reaches its peak. All frequencies are in MHz u.s.b.

Z100	3.068	Z180	9.057	Z265	18.024
Z105	3.116	Z195	9.809	Z270	18.027
Z110	3.134?	Z190	10.204	Z275	18.046?
Z115	3.143	Z195	11.104	Z280	18.387
Z120	3.295	Z200	11.181	Z285	?
Z124	?	Z205	11.494	Z290	19.665
Z125	4.495	Z210	11.229	Z295	19.755
Z130	4.472	Z211	12.070	Z300	20.167
Z135	4.745	Z215	13.242	Z305	20.407
Z140	5.026	Z220	13.245	Z310	23.337
Z145	5.705	Z225	13.907	Z315	23.872
Z150	5.800	Z230	15.046	Z320	24.828?
Z155	5.875	Z235	15.094	Z325	24.978?
Z160	6.715	Z240	15.097	Z330	26.532?
Z165	6.757	Z245	?	Z335	26.859
Z170	7.831	Z250	15.962	Z340	
Z174	?	Z255	17.973	Z345	
Z175	9.016	Z260	18.006	Z350	

Preamble Usage

As mentioned above, the preamble part of an EAM contains six characters. The first two characters remain the same for a number of days, while the other four characters change for each message. Monitors have recorded the way that the first two characters have changed over the years, but during the last 18 months the following have been used.

Prefix	Start	End	Active Days
UH....	01/10/98	22/10/98	21 days
7C....	22/10/98	13/11/98	22 days
JL....	13/11/98	27/11/98	14 days
5X....	27/11/98	13/12/98	16 days
22....	13/12/98	28/12/98	15 days
R5....	28/12/98	11/01/99	14 days
DS....	11/01/99	26/01/99	15 days
QH....	26/01/99	08/02/99	13 days
XO....	08/02/99	23/02/99	15 days
XV....	23/02/99	10/03/99	15 days
PX....	10/03/99	30/03/99	20 days
LG....	30/03/99	15/04/99	16 days
UJ....	15/04/99	04/05/99	19 days
AP....	05/04/99	05/21/99	17 days
72....	21/05/99	06/06/99	16 days
XE....	06/06/99	22/06/99	16 days
2G....	22/06/99	05/07/99	13 days
W6....	05/07/99	20/07/99	15 days
L3....	20/07/99	05/08/99	16 days
4Y....	05/08/99	22/08/99	17 days
F7....	22/08/99	04/09/99	13 days
3H....	04/09/99	20/09/99	16 days
HV....	20/09/99	01/10/99	11 days
FY....	01/10/99	20/10/99	19 days
LC....	20/10/99	10/11/99	21 days
OV....	10/11/99	27/11/99	17 days
ZO....	27/11/99	13/12/99	16 days
WN....	13/12/99	28/12/99	15 days
XA....	28/12/99	14/01/00	17 days
YF....	14/01/00	30/01/00	16 days
RH....	30/01/00	17/02/00	18 days
6O....	17/02/00	02/03/00	14 days
3Q....	02/03/00	14/03/00	12 days
WC....	14/03/00	27/03/00	13 days
WZ....	27/03/00	Active	

The 1st October 98 was the date the EAMs changed from being 26/20 character EAMs to 30/20 EAMs - the non-preamble part of the 26-character string grew by four characters.

The final column indicates how many consecutive days that particular EAM prefix was in use. These are approximate values as the time that the prefix changes varies throughout the day, so the total is not an exact number of 'days'. As you can see, there is no pattern to the way that the prefix changes, nor a pattern to the number of days that the prefix will remain in use.

Thanks

Compiling this article has taken several weeks of work and research, and it has been made a lot easier with the assistance of **Jeff Haverlah** in the USA, and everybody on **WUN** (World Utility Network), who's almost daily loggings have helped to fill-in gaps. This article would have been considerably smaller without their help.

Conclusion

This brief article has only scratched the surface of the 'world of EAMs'. There is much more out there waiting to be discovered.

There are the 'Sky King' messages that take higher precedence over EAMs, there is the category of EAMs that are destined for specific users (identified by their 'For ...' introduction), and a whole area of research into the very long EAMs. Some of these are mentioned above, but to include notes and comments about these would increase the article beyond all reasonable proportions.

Oddly enough, there is quite a bit of information on the Internet about EAMs and the various aircraft and ground stations associated with EAMs. Simply searching for such key phrases as 'Looking Glass' or 'Night Watch' will yield a large number of web-pages. However, these tend to be official web-pages.

I have yet to see a web-page listing EAMs that have been broadcast. Such a web-page would allow monitors around the world to submit details of what they have heard, increasing the coverage so that all areas are covered.

At the moment, there are very few 'active' monitors who record details of what they have heard, and then attempt to make sense of it all. Most listeners simply log them as 'another string of random characters' and write them off as 'spy messages'.

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SSB Utilities

SAR Jamming

The subject of the jamming/interference on 5.680MHz has brought a lot of response from readers, so first up this month are some of their letters and comments.

Costas Krallis in Greece reports that since there is virtually no Greek h.f./s.s.b. activity (except for the civil aero on 5.637MHz) he often tunes to 5.680 or 4.742MHz during local evenings. His location is much closer to the Middle East, so has noticed that, at times, an a.m. broadcast signal appears at various frequencies, including 5.637, 5.680 and 5.750MHz, etc. Some 10 seconds later, the jammer shows up with a much stronger signal. The a.m. signal stays there for a couple of minutes or so, before it jumps to another frequency, and then the jammer follows it to the new frequency.

Robert Connolly in Northern Ireland comments that he has the same thoughts as myself about the origin of the warbling interference - somewhere rather closer to home! He reports hearing English, Scottish and Northern Irish trawlers using out of band h.f. frequencies for communication between trawlers in different parts of the Irish sea. He has heard trawlers working each other recently simplex on 5.678MHz (within 2kHz of Kinloss), and also working within 2kHz of Shanwick's 5 & 6MHz frequencies causing similar problems.

I have heard similar 'trawler broadcasts', but not on these frequencies. Just recently I did hear a 'G3' amateur radio callsign (details omitted to protect the party concerned!) calling Shanwick on 5.616MHz for a radio-check. I was most surprised to hear Shanwick give a good report to the amateur operator! But this is hardly interference - deliberate or otherwise - to a recognised utility station.

Mike Beaumont from Coventry, on the other hand says that he mostly hears the interference at weekends when he spends most of his time monitoring. It tends to be more noticeable from 1600 onwards. The operator at Kinloss has even mentioned on the air that the interference originates from the Eastern Block!

Trawlers

Hot on the heels of last month's write-up about Trawlers operating on the wrong frequencies, an E-mail from **David Stewart** says that he is surprised at *SWM* for giving space to this subject. I am inclined to agree with David, but the problem does exist.

It was my decision to use the information, particularly as it related to marine matters, and that is an area which gets very little coverage in this column. It was certainly not my intention to publicise the illegal operations, just to demonstrate how widespread they are. The list of frequencies is just a starting point, so that readers may look for others if they are so inclined.

It is not just trawlers and other fishing vessels which are the culprits. There are countless illegal signals in the 6MHz band which affect aeronautical communications, however David does provide a suitable example. He listens to North Atlantic air traffic, and reports that the number of fishing vessels transmitting on aviation frequencies is on the increase.

The most recent took place on the 20th April 2000 at 0940. The fishing vessel was transmitting on frequency 6.622MHz and interfering with North Atlantic air traffic - at one stage making it impossible for Shanwick OACC to communicate with several aircraft.

Eventually, Shanwick enlisted the help of the Coast Guard who sent a message "To Scottish fishing vessel transmitting on 6.622MHz, this is the Aberdeen coastguard, you are transmitting illegally on an Air Traffic Control frequency and you are endangering air traffic over the North Atlantic. Clear this frequency at once". Moments later the fishing vessel moved to another frequency and the ATC communications continued.

Antenna Farm

Paul Burnett from Cleveland writes with a story about an 'antenna farm' he decided to investigate while on holiday on the north-east coast.

Driving along the A170 and with a couple of miles before getting to Scarborough, just to the left there is a rather large antenna farm, easily spotted. He decided to take a closer look, and driving along a narrow public road towards the tall h.f. masts he came across a very large communications building, heavily fortified with steel fences, barbed wire, electric fences and guards.

The building itself has a massive array of antennas inside the perimeter fence, including a mast with a rather large log-periodic on it. There were also many 'wires' crossing over the road, from the local fields where the large masts are, and into the building. All the feeder wires were on insulated poles.

On this particular day, there were a couple of men working on either end of a long wire antenna which they had lowered to the ground. Paul managed to attract their attention, and one said that the site was part of the GCHQ chain of stations up and down the country.

Well Paul, I do know of this site, but I have never been there. The site is known as 'Irton Moor', and when it was first brought to my attention a few years ago the site was known as 'CSOS Irton Moor'. The 'CSOS' part of the title was listed as 'Composite Signals Out Station', however one wag from the local area did say that it stood for 'completely secret outside Scarborough'! It is (allegedly) a remote receiving site for GCHQ at Cheltenham, although I strongly suspect that Irton Moor is one of the 'world-wide sites' rather than 'UK-wide' sites.

As it is a receiving site, it is most unlikely that there would be any transmissions coming from the site. Perched high-up on the edge of the North York Moors above Scarborough, the site must have some spectacular views across the coast, and the radio receiving conditions must be quite impressive also. I have attempted to find some more information about this antenna site on the Internet, but I could not find anything that I would consider as 'informative'. I was able to find a reference to Irton Moor in another web-page, but I will leave the reader to investigate that and come to their own conclusions.

As an aside to the earlier comments about 'Irton Moor' being part of a chain of stations, would anybody care to enlighten me (and other readers) whereabouts the other sites might be. I suspect that there may be one down in the west country and another in the north, possibly Scotland. I look forward to your letters and E-mails.

GHFS Changes

Most listeners consider that the USAF GHFS network is static, and that frequency changes never take place. Well, a recent snippet of information from the Internet proves otherwise. A NOTAM (Notice to Airmen) mentioned an update to the USAF Flight Information handbook and detailed some changes for the Lajes GHFS station in the Azores. Details from the NOTAM are repeated below:

REFERENCE: FLIGHT INFORMATION HANDBOOK, PG. B-47; GLOBAL HIGH FREQUENCY LISTING - WINTER CHANGE AS FOLLOWS: STATION: LAJES FREQUENCIES 4724, 6712, 9025 MONITORED FROM 1800Z - 0800Z; FREQUENCIES 11181, 13212, 15016 MONITORED FROM 0800Z - 1800Z. 06 MAR 10:31 UNTIL 04 JUN 23:59.

REFERENCE: FLIGHT INFORMATION HANDBOOK, PG. B-46; GLOBAL HIGH FREQUENCY LISTING - SUMMER CHANGE AS FOLLOWS: STATION: LAJES FREQUENCIES 4724, 6712, 9025 MONITORED FROM 2230Z - 0400Z; FREQUENCIES 11181, 13212, 15016 MONITORED FROM 0800Z - 1800Z. 06 MAR 10:31 UNTIL 04 JUN 23:59.

This gives details of changes to the times that the GHFS Operators will be monitoring certain h.f. frequencies at different times of the day. The most important item in this is that Lajes GHFS is monitoring 11.181 and 13.212MHz, and as far as I know they are the only stations to do so. Has anybody heard any REACH flights working Lajes GHFS on these frequencies? They are very close to existing GHFS frequencies

Web Watch

Irton Moor - **http://www.villagevoice.com/features/9908/vest_madsen.shtml**
Lajes - **http://www.lajes.af.mil/**

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Computer Compatible FREE Software Disk

£199 Plus £6.00 Carr.

This new receiver covers 30kHz to 30MHz and is designed for SSB, CW and AM reception. A much improved version of the Target HF-3, it is fitted with 2.6kHz SSB filter, advanced mixer design, backlighted display, active active antenna facility, and computer output. Included in the package is a software disk and 12V AC mains adapter Optional self-powered active antenna £59.95

IC-R75 Receiver 30kHz - 60MHz

FREE AC PSU & DSP Unit

ICOM

£629 Plus £7.50 Carr.

The IC-R75 has received rave reviews in the Amateur Radio Press. It's a very serious short wave receiver with coverage right up to the exciting 6m Ham Band. Features include USB, LSB, CW, AM, FM * 101 Memories * Super High Dynamic Range * Synchronous AM detection * Twin Pass band Tuning * Digital Signal Processing * Automatic Notch Filter * 101 Alphanumeric Memories * RF Gain/Squelch * Clock * Numeric keypad * Attenuator * 2-level Pre-Amp * Scanning.

YAESU FRG-100 Receiver

50kHz - 30MHz

£389 Plus £7.50 Carr.

The FRG-100 has stood the test of time. It offers full coverage of the short wave bands plus long wave and medium wave. It features, * USB, LSB, AM, CW, * 50 memories * 2 stage attenuator * Noise Blanker * Band Scanning * Memory Scanning * Dual Speed AGC * High and low impedance antenna Inputs * Programmable steps from 10Hz - 1kHz * Optional Narrow Filters, PSU and FM board * BFO reverse for CW * Twin Clocks. Ask for leaflet.

0kHz - 32MHz AOR-7030 Receiver

Phone Plus £7.50 Carr.

Needing little Introduction, this receiver has become a classic of design. Features USB, LSB, CW, AM, FM, * 100 Memories * Dual VFOs * Resolution to 10Hz * Clock and Timer * Variable Bandwidth * Wide Dynamic Range * Seamless Tuning using Single Loop DDS * Clear LCD Readout * Infrared Remote Controller * AC Power Supply. Send for leaflet.

Fairhaven RD-500VX 20kHz - 1.75GHz

Phone Plus £7.50 Carr.

This very wide range receiver offers a complete listener station in one package. Features include USB, LSB, CW, AM, FM, Video out * 5Hz step accuracy * Over 13,000 memories with 20 Alphanumeric Characters * Noise Blanker * Text Search * Pass Band Tuning * Stereo CW Reception * Notch & Peak Filter etc.

We Will Match or BEAT Competitor's Prices

On genuine UK Stock

wsplc.com Go

Yupiteru MVT-9000EU Mk2

100kHz - 1.99GHz

Latest Mk2 Version

Phone Plus £7.50 Carr.

Here's your chance to purchase the latest scanning receiver from Yupiteru at an unbelievable price. Covering the complete radio spectrum from long wave to UHF, you have a complete station in your pocket. Features include NFM, WFM, NAM, WAM, LSB, USB, CW, * 7 Frequency steps * 1,000 Memories in 20 banks * 500 Pass memories * 10 Priority channels, * Band Scope display * Duplex receive function lets you hear both sides of the conversation * Fast tune function, * Built-in AM antenna * Dual frequency display * Fast keypad entry. * Rechargeable batteries, AC charger and helical antenna.

Phone Plus £6.00 Carr.

Yupiteru MVT-7100EU

100kHz - 1.65GHz

Probably the best value for money, it has stood the test of time and is very sensitive. Offers USB, LSB, CW, AM, FM, WFM, * 1,000 memories * 500 Pass channels * 12 Tuning steps * Fast scan speed * Rechargeable batteries, AC charger and telescopic antenna.

Yupiteru MVT-7000EX

£179 Plus £6.00 Carr.

100kHz - 1.3GHz

The ideal scanner for those who are mainly interested in VHF and UHF listening. Features include, FM, WFM, AM reception * 200 memories in 10 banks * 20 steps per sec scanning * 6 Tuning steps * Good sensitivity * Supplied with rechargeable ni-cads and AC charger.Telescopic antenna included.

AOR-8200

500kHz - 2040MHz

This wide range scanner is fitted with a data port for computer control. Features include USB. LSB, CW, FM, WFM * Programmable steps * 1000 memories in 20 banks * Alphanumeric display * Built-in AM antenna * 8.33kHz steps for air band * Rechargeable ni-cads, AC charger and helical antenna.

Phone Plus £6.00 Carr.

£249 Plus £7.50 Carr.

IC-R10E

500kHz - 1300MHz

USB, LSB, CW, AM, FM, WFM * 1,000 Memories * Bandscope * Noise Blanker * Wide range of tuning steps * alphanumeric Display * Real Time Band Scope * Voice scan feature * Data output port * Programmable scanning * Ni-cad pack, AC charger and helical antenna.

IC-R2

£129 Plus £7.50 Carr.

500kHz - 1309MHz

This palm size handy offers great performance. Offers FM, WFM and AM * Auto squelch * 400 Memories * 11 Tuning steps * CTCSS decode * Duplex monitoring feature * PC Programmable * Built-in attenuator * Priority watch * Needs 2 x AA cells (extra). Antenna included.

ICOM New ICR-3E Scanner WITH TV RECEPTION!

Phone

* NSTC/PAL TV Receive.
* Wideband AM & FM Receive (No SSB)
* 496 KHz - 2450 MHz frequency coverage.
* Memory: Extensive Storage.
* Display: Detailed data control display.
* Dual Receive.
* AC charger and batteries included.

Icom have launched a new scanner with a built-in TV receiver. So when there is nothing to listen to, you can watch the pictures. You will need to be in a good signal area to get best results.

UBC - 220XLT Handheld Scanner

£119.95 Plus £8.00 Carr.

Ideal for general listening, this scanner covers all the major bands from 66MHz - 956MHz AM and FM. 200 memories and a very fast scanning speed make this a very attractive buy. You also get the flexible short antenna, AC charger and batteries.Very popular with Airband listeners.

Double Your Life!! NiMH Cells

These Nexcell Ni-MH cells have around twice the capacity of ni-cads and no memory effect. The AA size are 1350mAh. Ideal for handhelds and digital cameras. As supplied to the police.

4 x AA cells	£9.95
4 x AAA cells	£9.95
Charger for above	£9.95

Carriage £2 maximum. Quantity discounts - phone.

ICOM PCR-1000

Computer controlled Receiver 10kHz - 1300MHz

Mode:USB. LSB. CW. AM, FM, WFM.

£279.95 Plus £6.00 Carr.

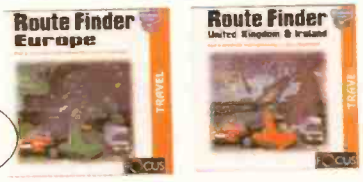
Connect this up to your PC and enjoy high quality reception with an amazing station data base and memory log. Can be used remotely from PC. Requires PC not included.

Hoka Gold-3 Decoding Software

THE SECRET'S OUT!

We are now the UK distributors. As used by governments, it can decode just about any form of data transmission on HF and VHF. Simply connect between PC and Rx audio. Can be loaded on any number of PCs. This is very advanced programme. £349.95 Plus £2.00 Carr.

NEW Route Finder (Europe) Software



£9.95 Plus £2.00 Carr.

* Optimum route between start location and destination in seconds
* Details the distance and time for a planned route
* Covers 26,798 locations and 328,982 miles of road
* Provides two levels of route information
* Provides five levels of map detail
* Includes a ZOOM facility on the map section

FB1 - 9 Skin Coloured Earpiece

£9.95 Plus £2.00 Carr.

The FBI-9 is a brand new design that is skin coloured to make it far less obvious when worn. The cable and cable exits will take a strain of 12kg so it won't break in commercial applications.

W-LWB MkII Long Wire Balun

Just attach any length of wire and feed back to radio with coax cable. Reduces interference and improves matching to receiver. £22.95 Plus £2.00 Carr.

AT-100 Active Antenna

Intended for indoor use, the unit has a telescopic antenna. Dramatically improves reception. Adjust controls for maximum signal. Powered by internal 9V cell or external supply. £79.95 Plus £6.00 Carr.

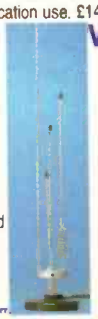
Ant-60 Wire antenna

This 7m long shortwave antenna coils up like a tape measure. Pull it out and attach the input end to your receiver socket or whip antenna. Idea for portable or vacation use. £14.95 Plus £2.00 Carr.

WS-Desktop

The answer to those who want to improve the scanner performance using an indoor antenna. Covers 25 - 1300MHz and includes coax cable terminated with BNC plug. £49.95 Plus £7.50 Carr.

WS-Mobile Antenna



Just 0.9m high with magnetic base and 4m cable terminated with BNC plug. Covers 25 - 1300MHz and is the ideal choice for scanner users. £24.95 Plus £7.50 Carr.

SWL DX-1 HF Ant.

Covers 1.5 - 30Mhz and is 50m long. With 10m feeder wire back to receiver. An ideal general purpose antenna. £25.95 Plus £6.00 Carr.

Global AT-2000

The classic wire antenna tuner for short wave listening. Covering 1.8 - 30MHz, it includes our exclusive Q-switch, which improves front-end selectivity. Just connect a random length of wire and connect a coax cable from ATU back to receiver. £89.95 Plus £6.00 Carr.

Angler HF/UHF Antenna

Plus £7.50 Carr.

Ideal for scanners, this antenna is 14m long and covers the range 100kHz - 1300MHz. It includes coax cable terminated with BNC plug. £19.95

QS-300 Desk Stand

Designed for all handheld scanners. Your scanner sits on the adjustbale holder and a short BNC cable runs to an SO-239 socket, ready for you to plug your extenal antenna into. A really smart device. £13.95 Plus £2.00 Carr.

WS-Base Discone

The classic antenna covering 25Mhz to 1300MHz. Ideal for all scanners. Height is 1.2m. Just connect coax cable to the SO-239 socket. Suitable for indoor or outdoor use. £49.95 Plus £2.00 Carr.

Leather-Look Holder

This leather-look holder is machine stitched and will take your medium sized scanner or handy and offers you wallet storage space with a separate zipped compartment and dividers. Includes belt loop and carry strap. £9.95 Plus £2.00 Carr.

QS-400

This new mount clips on to the dash grill. The sprung fingers, and bottom support, secures any size of handheld firmly in place. Features quick release grip for easy removal of handheld and also includes angle adjustment. £9.95 Plus £2.00 Carr.

USAF ALE

ALE is a relatively new system that uses computers to control and monitor the performance of radio links. Here, Graham Tanner explains more about 'Automatic Link Establishment'.

In the June 1998 issue of *SWM* I wrote an article called 'Reaching Out' which gave the low-down on the tail-numbers of various USAF aircraft that listeners were likely to hear on h.f. The idea behind that article was to allow listeners to attempt to identify the type of aircraft they were listening to when a USAF 'Reach' flight used a numeric callsign.

I also explained that this was not an exact science as aircraft swaps could occur because the originally planned aircraft was no longer available, and that in a few instances the aircraft heard could actually be one of three different aircraft. 'Reaching Out' contained a whole page of tail-numbers of the various aircraft concerned, and also some photographs of each type so that readers could see what kind of aircraft they were hearing.

At the time that the article was written, listeners were just starting to hear about a new transmission mode known as 'ALE' (Automatic Link Establishment). A few frequencies were known, but nobody knew how to decode the warbling tones to discover just who was using this new system.

During 1999 a decoder for the ALE mode became available to listeners (those with PCs anyway!), and the mode has taken-off quite literally in the past six months. **Charles Brain** wrote a decoding program that uses a sound-card in a PC to decode and display the contents of the warbling signal, and then made it available to anybody who was able to download it from his web page.

Mike Richards covered the ALE software in his 'Decode' column in the April 2000 issue of *SWM* (back-issues of June '98 and April '00 are available from the *SWM* offices), he also included some screen shots and a partial list of ALE frequencies. This feature is a bit of a cross-over article between 'Decode' and 'SSB Utilities', and is designed to give you some background information to what you see on your ALE screen when listening to the USAF ALE network.

In the May 2000 issue Mike Richards also wrote about the USAF-specific use of ALE, and my discovery of the way that the ALE address is constructed (see 'Just A Bit More ALE!', page 51). This article expands greatly upon that discovery.

During the last few months of 1999 members of WUN who had installed the ALE software started to post their logs of what they had 'heard', and to give other listeners an idea of what was possible. Seeing these logs was quite a revelation, as it proved just how good the decoding software was.

Questions were asked as to what some of the codes meant, and I soon realised that on the USAF ALE frequencies the aircraft were using their tail-numbers as their ALE addresses. As more and more listeners installed the program and sent their logs in to WUN, I was able to cross-check more and more addresses, and to produce a list which would allow listeners to work out the aircraft tail-number (and hence the aircraft type) from their ALE address. This has now progressed to the point that I able to present my findings, and to give a listing of ALE Addresses for aircraft.

For those of you who already use either of the ALE decoding programs (or maybe you are a professional user?) the information in the article relates to the information that appears on your screen with the title of 'TIS' or 'TWS'. This is generally known as either the ALE id or ALE address, and I am going to stick with the latter term.

USAF ALE Addresses

The ALE system allows users to set-up their own addressing system, and the USAF have chosen to use the ICAO Designator for its ALE ground stations, and a variation on the aircraft tail-number for aircraft using the USAF ALE network. This is very convenient (in most cases), as this allows listeners to work out what kind of aircraft they have heard on ALE from what is displayed in the ALE screen.

The ALE address used by USAF ground stations is a cut-down ICAO Designator - the first character of the designator is dropped-off. For example, the ICAO Designator code for Andrews AFB is 'KADW', but on the ALE network it uses just 'ADW'. There are a few non-standard addresses, but **Fig. 2** (on page 38) lists all those known.

The ALE address used by aircraft is a bit more complicated, and this is where you may like to refer to the aforementioned 'Reaching Out' for a better understanding of the USAF tail-number system. ALE addresses for USAF aircraft are mostly six-digit numbers, and the ultimate goal of this article is to

demonstrate how to decode that number, and then to work out what type of aircraft you are listening to.

The **first digit** of the aircraft address indicates which type of aircraft it is, as the following list will show:

1 = C-5 Galaxy
2 = C-17 Globemaster III
3 = C-141 Starlifter
4 = KC-10 Extender
5 = KC-135 Stratotanker
6 = C-9 Nightingale
7,8,9 are reserved for later use
0 = all other types

The **second digit** is the last digit of the year of manufacture, i.e. aircraft manufactured in 1978 or 1988 would use the number '8'. In practise there are very few instances where a single aircraft type has remained in production for more than 10 years, and in the few cases where it does happen, the rest of the tail-number differentiates the two aircraft. Strictly speaking, this is not really the 'year of manufacture' of the aircraft, it is the Fiscal Year in which it was ordered, but the principle is still true - use the last digit of the year.

The **last four digits** of the ALE address are the last four digits of the aircraft tail-number. In most cases there are only ever four-digits anyway, but consider the final block of C-135 aircraft which all have five-digit aircraft-numbers - in this case you would select just the final four digits.

Exceptions

It probably comes as no surprise that there are exceptions to this 'rule'. As the allocation and format of the ALE address is the responsibility of the individual users, they are free to pick and choose whichever addresses they wish.

Most of the USAF transport fleet fall into the patterns described above, but there are a number that do not. All the following ALE addresses have been heard in the UK, and with some patient and thorough investigation, they have all been identified.

Voice	ALE	Unit/Aircraft	Remarks
Trout 99	512669	C-135 'Speckled Trout'	see next entry!
Trout 99	S99	C-135 'Speckled Trout'	
Air Force 2	AF2	Air Force Two	Presidential a/c
SAM 049	AF5	AF Tail No 50049	Secret Service a/c
SAM 050	AF6	AF Tail No 50050	Secret Service a/c
SAM 403	AF7	AF Tail No 60403	Secret Service a/c
Air Force 1	AF8	AF Tail No 28000	
SAM 29000	AF9	AF Tail No 29000	see 'Air Force 2' above
Casey 01	C01	Casey 01	(KC-135E 57-2589)
Marine 1	HMX263	VH-60N 163263	Presidential helicopter
Nightwatch 01	NW1	NAOC Aircraft	E-4B
Nightwatch 02	NW2	NAOC Aircraft	E-4B
Nightwatch 03	NW3	NAOC Aircraft	E-4B
Nightwatch 04	NW4	NAOC Aircraft	E-4B
	352	352ndSOG Mildenhall, UK	
	353	353rdSOG Kadena AB, Japan	
	459	459thAS, Andrews AFB, MD, USA	
	16F	16thSOW Hurlburt AFB, FL, USA	
	16T	16thOSS Hurlburt AFB, FL, USA	
	23A	23rdCCS Charleston AFB, SC, USA	
	51T	51stCCS Robins AFB, GA, USA	
	52T	52ndCCS Robins AFB, GA, USA	
	53T	53rdCCS Robins AFB, GA, USA	
	66A	66thCCS McChord AFB, WA, USA	

Web Watch

ALE Decoder - **http://www.chbrain.dircon.co.uk**
ALE Decoder for MAC -
http://www.blackcatsystems.com/software/multimode.html
USAF Tail-numbers - **http://home.att.net/~jbaugher/usafserials.html**
WUN - World Utility Network - **http://www.wunclub.org**
WUN ALE info - **http://www.wunclub.com/files/aleinfo.html**
ALE write-up by Richard Lacroix -
http://webhome.globalserve.net/rlacroix/modems/ale.html

A USAF KC-10 Extender refuelling aircraft climbing steeply after take-off.
G. Tanner

It was hardly a surprise to find that the USAF VIP transport fleet were using a different format of ALE address. During March 2000 President Clinton visited the Indian sub-continent, and his flights and many of those supporting his trip passed through UK airspace. This allowed monitors to cross-check signals on v.h.f. and h.f. with signals on the USAF ALE frequencies, and this made it quite easy to tie-up the ALE addresses with their voice callsigns.

There are also one or two examples of where the ALE address is 'not quite right'. Sometimes the last five digits of the ALE address are a bit muddled, maybe with two digits transposed. I have also been told about a C-17A Globemaster III aircraft which is using the wrong 'year' digit in its ALE address.

USAF ALE Frequencies & Callsigns

Fig. 1: USAF ALE Network (frequencies in MHz, all u.s.b.).

3.059
3.137
4.721
5.708
6.715
6.721
7.632
8.965
9.025
9.057
11.226
11.250
13.215
15.043
18.003
20.631
23.337
27.870.

Those of you who wish to try scanning these ALE frequencies to try to follow the communications should bear in mind that aircraft scan 'from the bottom up' through the range of frequencies, while the ground-stations scan 'from the top down'.

Fig. 2: Callsigns on USAF ALE Net.

Callsign	ICAO Designator	Location
ADW	KADW	Andrews AFB, Maryland, USA
AED	PAED	Elmendorf AFB, Alaska, USA
CRO		Croughton, UK
GTL	BGTL	Thule AB, Greenland
GUA		Anderson AB, Guam
HAW	FHAW	Ascension Island, Ascension
HIK	PHIK	Hickam AFB, Hawaii, USA
JDG	FJDG	NAS Diego Garcia, Diego Garcia, BIOT
JNR	TJNR	Salinas PTR (Roosevelt Roads NAS Puerto Rico)
JTY	RJTY	Yokota AB, Japan
LOU	KLOU	Kentucky ANG, Bowman Field, Louisville, USA
MCC	KMCC	McClellan AFB, California, USA
OKC		StratComm Wing One, Tinker AFB, Oklahoma, USA
OKV		Civil Air Patrol, Winchester, Virginia, USA
OFF	KOFF	Offutt AFB, Nebraska, USA
PLA	LPLA	Lajes Field, Azores
RIC		Civil Air Patrol HQ, Richmond, Virginia, USA
RSC		Rockwell Service Centre, Cedar Rapids, Iowa, USA
TAG	LTAG	Incirlik AB, Turkey
WRI	KWRI	McGuire AFB, New Jersey, USA
WRL		Warner Robins Laboratory, Warner-Robins AFB, USA

The 'RSC' address is also reported to be used by the Rockwell Scope Command Facility at Dallas in Texas, USA. Incirlik in Turkey is officially listed as being an ALE station, but there have been no loggings of that station - there are plenty of loggings of aircraft and other ground-stations calling Incirlik, but nobody has ever reported Incirlik replying to calls or making calls itself.

USAF Transport Aircraft Tail Numbers

The following listings show the tail-numbers assigned to each different aircraft type. In most instances these aircraft tail-numbers are allocated in blocks, and I have listed the first and last in each block - the ranges are inclusive. For each tail-number (or block of tail-numbers) I have given the Fiscal Year (FY) and the four-digit aircraft number; for example, 66-8303 is a C-5A Galaxy with Fiscal Year '66' (representing 1966) and aircraft number '8303'. That is a single aircraft in a block of five consecutive aircraft.

A USAF KC-17A Globemaster III making a slow flypast.
G. Tanner

After each block of tail-numbers I have listed the ALE Address that the aircraft in that block 'should' use, but there is no guarantee that this will happen. I have left-out the details of the C-9 Nightingale aircraft, as I have not yet seen any ALE logs for these aircraft. There are relatively few aircraft anyway, so I will leave the analysis of the ALE addresses for that aircraft type to the listener.

Lockheed C-5A/B/C Galaxy

66-8303 - 66-8307	(168303-168307)
67-0167 - 67-0174	(170167-171074)
68-0211 - 68-0228	(180211-180228)
69-0001 - 69-0027	(190001-190027)
70-0445 - 70-0467	(100445-100467)
83-1285	(131285)
84-0059 - 84-0062	(140059-140062)
85-0001 - 85-0010	(150001-150010)
86-0011 - 86-0026	(160011-160026)
87-0027 - 87-0045	(170027-170045)

McDonnell-Douglass C-17A Globemaster III

87-0025	(270025)
88-0265 - 88-0266	(280265-280266)
89-1189 - 89-1192	(291189-291192)
90-0532 - 90-0535	(200532-200535)
92-3291 - 92-3294	(223291-223294)
93-0599 - 93-0604	(230599-230604)
94-0065 - 94-0070	(240065-240070)
95-0102 - 95-0107	(250102-250107)
96-0001 - 96-0008	(260001-260008)
97-0041 - 97-0048	(270041-270048)
98-0049 - 98-0057	(280049-280057)
99-0058 - 99-0070	(290058-290070)
00-0071 - 00-0085	(200071-200085)
01-0086 - 01-0100	(210086-210100)
02-0101 - 02-0115	(220101-220115)
03-0116 - 03-0120	(230116-230120)

The C-17A Globemaster III is still in production, and by the start of 2000 McDonnell-Douglas/Boeing were just building aircraft in the block 99-0058-99-0070. Aircraft tail-numbers beyond that point may well change.

Lockheed C-141B Starlifter

61-2775 - 61-2779	(312775-312779)
63-8075 - 63-8090	(338075-338090)
64-0609 - 64-0653	(340609-340653)
65-0217 - 65-0281	(350217-350281)
65-9397 - 65-9414	(359397-359414)
66-0126 - 66-0209	(360126-360209)
66-7944 - 66-7959	(367944-367959)
67-0001 - 67-0031	(370001-370031)
67-0164 - 67-0166	(370164-370166)

The C-141B is now in the twilight of its career, with many aircraft being retired from use. Therefore, don't expect to hear all of the above aircraft on ALE.

McDonnell-Douglas KC-10A Extender

79-0433 - 79-0434	(490433-490434)
79-1710 - 79-1713	(491710-491713)
79-1946 - 79-1951	(491946-491951)
82-0190 - 82-0193	(420190-420193)
83-0075 - 83-0082	(430075-430082)
84-0185 - 84-0192	(440185-440192)
85-0027 - 85-0034	(450027-450034)
86-0027 - 86-0038	(460027-460038)
87-0117 - 87-0124	(470117-470124)

Boeing C-135 Stratotanker
(including KC-135, EC-135, RC-135 variants)

55-3118 - 55-3146	(553118-553146)
56-3591 - 56-3657	(563591-563657)
57-1418 - 57-1514	(571418-571514)
57-2589 - 57-2609	(572589-572609)
58-0001 - 58-0130	(580001-580130)
59-1443 - 59-1523	(591443-591523)
60-0313 - 60-0378	(500313-500378)
61-0261 - 61-0332	(510261-510332)
61-2662 - 61-2674	(512662-512674)
62-3497 - 62-3585	(523497-523585)
62-4125 - 62-4139	(524125-524139)
63-7976 - 63-8061	(537976-538061)
63-8871 - 63-8888	(538871-538888)
63-9792	(539792)
64-14828 - 64-14849	(544828-544849)

There have been many retirements of C-135 aircraft in the past 10 years. Also, there are a large number of 'special mission' aircraft (e.g. the reconnaissance 'RC-135' and the OC-135 'Open Skies' variants) that may not use their expected ALE address - they may not even bother to use ALE at all!

As of April 2000 I have not yet seen any reports of the non-standard aircraft using ALE. Almost all the C-135 aircraft heard using the ALE Net have been 'standard' KC-135 Stratotanker refuelling aircraft.

Commtel COM225

Aimed at scanner users who value ease of use and power above portability, Commtel's COM225 base station scanner is not new to the scanning market. It has dropped significantly in price recently, and its new £200 price tag puts it within the budgets of people new to the hobby as well as those who want to upgrade from a more basic model. Faris Raouf investigates.

The first thing I noticed on taking the Commtel COM225 out of its box was its striking similarity to the Radio Shack PRO-2042 I reviewed here in *SWM* a while ago. After a bit of fact finding, I discovered the reason for this - both are actually made by the same company, GRE. The COM225 is a much more advanced product than the PRO-2042 in terms of features, though, and at £199 costs a bit more than its 'little brother'.

So what do you get for your heard-earned money? Well, in terms of its basic specifications, quite a lot. For a start, the COM225 covers everything from 25MHz all the way up to a useful 1300MHz with **no gaps**. True, it doesn't offer s.s.b. reception, but you do get n.b.f.m., a.m. and w.b.f.m., and no less than 500 scanning memory locations (split into 10 banks of 50), 50 additional 'Monitor' memory locations, 10 Priority memory locations, and 200 lock-out memories. What's more, quoted scan speeds are 40 channels per second, or 75 frequency increments per second, which may not be the fastest you've ever seen, but isn't at all bad.

What's In The Box?

On unpacking the box, which is actually a bit of a brain-teaser thanks to some fiendishly ingenious package design, you'll find the COM225 itself, a telescopic antenna, and a user manual. The scanner's build quality is quite good considering its price, and features a couple of fold-out legs at the front which serve to angle the front panel upwards to enable easier viewing. Just like the one supplied with the '2042, the telescopic antenna fits into a small hole in the top of the COM225's case. As the scanner's manual tells you, because it is telescopic, you can change the antenna's size to offer better reception at the frequencies you are listening to, longer for lower frequencies (which have longer wavelengths), and shorter for higher frequencies (which have shorter wavelengths).

Talking of the scanner's manual, I have to say I was very disappointed with it. True, it tells you everything you need to know about how to use the COM225, but it gives too little detail, very few examples, and makes use of a very small typeface. It isn't quite as small as the dreaded 'small print' you'll find on a typical contract agreement, but it comes close! The manual also lacks any form of index, which can be frustrating when you're trying to find details on a particular feature.

The eagle-eyed amongst you will have noticed that I've not mentioned anything about a p.s.u. This is simply because one isn't required, as this scanner has a built-in mains power supply. It can still be used mobile, though, thanks to it having a standard 12V power input socket on its rear panel. You'll also find a 50Ω BNC external antenna input, a 3.5mm external speaker socket, and sockets labelled 'Tape Out' and 'Tape Remote'. This last socket allows you to connect a tape recorder with an external pause control facility to the COM225 and have it start automatically recording when one of ten user-selectable memory channels is selected. I'd have liked to be able to use this facility with more than just ten out of the 500 channels, but at least it is there.

Front Panel

On to the COM225's front panel now. The vast majority of this is dedicated to the various buttons, volume/off and squelch controls, and a large rotary 'tuning' dial. I won't list each and every control - you can see for yourself what's there from the pictures - but I do want to mention a few things about the controls. For a start, unlike a typical hand-held scanner, there is a dedicated control to access almost every feature on the COM225. Indeed, there are only two real dual-function buttons fitted, the second functions being accessed after pressing the 'FUNC ' button located on the far left of the control panel. Secondly, the buttons feel very pleasant and satisfying to use, and indeed are the kind that you'll be happy to press for hours on end. The same satisfying feel does not extend to the tuning wheel, though. This is mainly used to move through frequencies or memory locations, and although it has a very effective speed-sensing circuit, which steps through frequencies or memories in larger or

COM225 Reviewed

smaller steps depending on how quickly you turn it, it feels rather 'cheap and cheerful' when you turn it. Another thing that annoyed me was the fact that the small dimple in the front of this control, which is designed to let you turn the knob using a single finger, just isn't deep enough to work effectively, my fingers just slipping out every time I tried to use it. I know I don't have dainty fingers by any means, but I'm quite sure they aren't any larger or fatter than a typical radio-addict's fingers either.

The rest of the front panel is dedicated to a very clear backlit liquid crystal display. This incorporates a large, nine-digit frequency display and an eight-bar electronic signal strength meter and indicators to tell you which of the ten memory banks are currently selected. A variety of textual indicators are also present within the display which tell you at a glance things such as the reception mode you are in.

But enough of the physical aspects of the scanner, as I'm sure by now you want to know exactly what you can do with it.

The simplest option available is manually enter and store a frequency. To do this, you just need to press the 'PGM' (Program) button, select which bank and channel you want to store the information into, enter the frequency you want using the numeric keys, and then press the 'Enter' button. You can select which bank and channel you want by either repeatedly pressing 'PGM' to increment channels by one each time, or use the tuning wheel to step through them more quickly.

If you don't have a particular frequency in mind, you can search for interesting transmissions in a number of ways. The most basic of these is using the scanner's Direct mode. This allows you to enter a frequency, then automatically scan up or down from there until you hear something interesting. This is achieved by simply entering the start frequency, then pressing the decimal point button twice (once to actually enter the decimal point, and the second time to activate direct mode). At this point you can press and release the up or down arrow keys to move up manually in small steps, or press and hold the arrow buttons for a second to activate the scanning mode.

An interesting twist to the Direct mode is the ability to limit the scan range between 1 and 10MHz of the starting frequency in increments of 1MHz. You do this by pressing the numbers 1 to 0 before hitting the up or down arrow keys when using the Direct mode described above, the 0 representing 10MHz.

Flexible Limit

For more flexible searches, the COM225 offers a full Limit mode, which allows you to set upper and lower limits, then scan between them. What's more, up to ten of these can be programmed in, and once you've done so, you can have the scanner search through any or all of your pairs of limits, one after another. Again this is easy to set up. You start off by pressing the 'Limit' key, then selecting which of the ten possible limit pairs you want to enter. You then enter the starting frequency followed by the 'Enter' and 'Limit' keys, then enter the ending frequency followed by the 'Enter' key, and finally use one of the arrow keys to search upwards or downwards.

As an alternative to the user-defined limit search mode, you can have the COM225 search through one of its 23 pre-set search limits. This is particularly easy to use, and involves pressing the Band button, followed by the desired band number (0 to 23) using the numeric pad, and then the up or down arrow keys.

No matter which search mode you use, once an interesting frequency has been found, to permanently store it in memory, all you have to do is press the 'Enter' button and the frequency will be saved in the first empty memory location the scanner can find. Very useful indeed, you won't ever find yourself storing duplicate frequencies with this scanner, as it will warn you whenever it already has the frequency you are trying to store in its memory, and refuse to store it unless you press the 'Enter' key again. Incidentally, as an alternative to storing frequencies in the main memory banks, you can store them in one of the COM225's 50 Monitor memories by pressing the 'Mon' button instead of 'Enter'. Monitor memories are similar to standard memory locations except that you cannot scan through them, they are simply there to be used as a sort of temporary storage area. This may sound like a useless concept, but in fact can be very handy indeed.

A further search mode is also offered by the COM225, and this one is arguably the most powerful. Called Auto mode, this is similar to the Limit search mode except that any frequencies found will be automatically stored in memory for you. Very usefully, duplicate frequencies are ignored in this mode, and you have full control of which memory banks the newly found frequencies will be stored in. Activating this mode is almost identical to a starting a standard Limit search, except that you need to start by pressing the 'Auto' button instead of 'Limit'.

Once you've stored some frequencies into the main memory banks, you can scan through them at will with a press of the Scan button, and activate or deactivate banks to be scanned through at will by simply pressing one of the numeric buttons. Unfortunately, you can't scan selectively by receive mode as you can on more advanced scanners. You can program in no less than 10, totally separate, priority channels for the scanner to look through on a priority basis alongside the standard memory

locations, however, something even my £1500 Icom IC-R8500 can't do. You can also lock-out up to 200 individual memory locations, both standard and priority, with a press of a button labelled 'L/OUT'. The 'L/OUT' button also allows you to avoid individual frequencies, which will then be ignored during search operations. With a locked out memory location or frequency selected and displayed on the scanner, a second press of the button removes the lock-out. However, for convenience, you can step through all locked out locations of frequencies by pressing a button labelled 'L/OUT RVW', un-locking each as required using the L/OUT button.

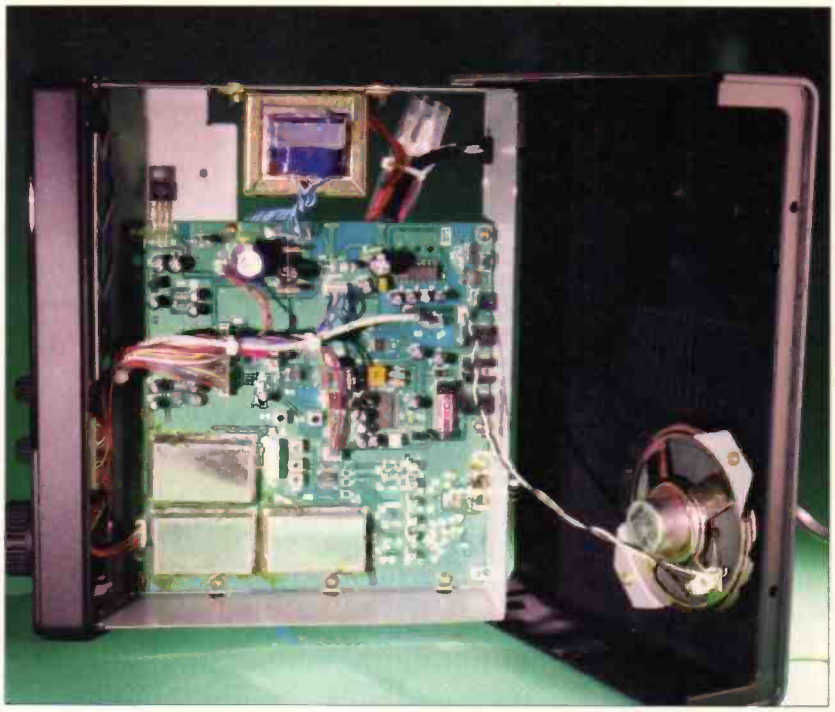
As well as everything I've mentioned so far, the COM225 also offers some useful memory housekeeping functions for you to play with. The most interesting of these is the ability to sort a bank by frequency, automatically delete all locked out channels in a bank, and move channels from one bank to another. You can also move channels from the Monitor bank to one of the main banks, either individually or *en masse*.

What, No Step?

Veteran scanner users amongst you will have noticed that I've not mentioned anything about step sizes yet, and only briefly mentioned receive modes. There is a reason for this though - both are changed automatically for you depending on the frequency being listened to on the basis of a band plan built into the scanner. You can override its receive mode settings with a press or two of a button labelled 'AM/FM/WFM'. Unfortunately, though, other than selecting a 50kHz step size instead of the default step during automatic frequency search operations, step size cannot be altered in the same way. The COM225's built-in band plan is Euro-centric and not American, however, and seems to be as accurate as most users will ever need. Indeed, all but the most advanced scanner users will find this scanner's automatic step and receive mode facility more of a benefit than a drawback.

In Use

Anyway, enough of the theory, what about the practice? Well, I have to say that initially I was rather disappointed, reception being fine for strong local transmissions, but somewhat marginal for more remote ones using the supplied antenna. However, attaching my external Diamond active antenna, which is a good 30m above the ground and clear of any close obstructions, made a great deal of difference and helped the COM225 pull in those weaker signals. Unfortunately, it would seem that the COM225's selectivity isn't as good as I'd have liked a base scanner's to be, as I found harmonics from TV and radio stations, not to mention the odd pager and emergency service, popping up all over the place. Turning down the gain on my antenna helped a little, as did activating the COM225's built-in attenuator circuit, but of course both resulted in a loss of signal quality for weaker signals. In the end, I found that my trusty old indoor DeskScan Discone offered the best compromise between performance and interference, and using this the



COM225 worked very well, offering a signal gathering capability at least as good as my Yupiteru MVT-7100 hand-held when using the same antenna.

The COM225 is a base scanner, though, and so should really be compared to another base scanner. In this respect, its nearest rival would have to be the Uniden Bearcat UBC9000XLT, but although I understand the two are very similar when it comes to performance, as I've never used one myself I can't comment on whether this is true or not. I can compare features, though, and here I think the COM225 just about has the edge - although the Bearcat has a basic alpha-tagging facility for some of its memories, the COM225 offers continuous coverage throughout its frequency range, something the Bearcat cannot boast, and costs less than its rival. At the end of the day, though, the decision will be in your hands, and all I can say is that if you do opt for the Commtel, you are very unlikely to be disappointed.

Thanks to **SRP Trading** at **1686 Bristol Road, Rednal, Birmingham B45 9TZ**. Tel: **0121-457 7788**, FAX: **0121-457 9009** for supplying the review radio. ***SWM***

Specifications

Memories: 500 in 10 banks of 50, plus 50 Monitor memories, 10 Priority memories, 200 lock-out locations and 10 search limit pairs.

Frequency coverage:	25 - 1300MHz
Scan speed:	40 channel per second
Search speed:	75 steps second
Modes:	a.m., n.b.f.m. and w.b.f.m. with automatic selection and manual override.
Architecture:	Triple Conversion.
Intermediate frequencies:	1) 225.4125MHz - 225.5875MHz or 226.4125MHz - 226.5875MHz 2) 45MHz 3) 10.7MHz or 0.455MHz
Sensitivity:	25 - 500MHz a.m. 2.0µV n.b.f.m. 0.5µV w.b.f.m. 3.0µV 500 - 1000MHz a.m. 3.0µV n.b.f.m. 1.0µV w.b.f.m. 3.0µV 1000 - 1300MHz a.m. 5.0µV n.b.f.m. 2.0µV w.b.f.m. 5.0µV
Power:	a.c. 220-240V, 50Hz d.c. 13.8V @ 400mA
Size:	232 x 90 x 210mm (w x h x d)
Weight:	2.0kg

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Gain	5dB +/-0.2dBs
Intercept Point	+45dBm IP 3rd order (10MHz/12V)
DC power supply	11.5-13 volt DC at 70mA typ. (230V mains adaptor for 12V DC is supplied with the antenna)
Mast diameter	30-50mm can be fitted
Dimensions	**ARA40** 115cm total length with glassfibre whip. Antenna tube 40mm x 140mm **ARA40 TEL** 125cm total length with telescopic whip extended. 45cm minmum length. Antenna tube 40mm x 140mm **Ideal for portable radio**

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Technical performance

Frequency range	40kHz-60MHz (full performance) 60-120MHz 2-3dB less gain
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Gain	10dB +/-0.2dBs
Intercept Point	+50dBm IP 3rd order (10MHz/12V)
DC power supply	11.5-13 volt DC at 80mA typ. (230V/12V DC stabilised mains adaptor is supplied with the antenna)
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3rd order IP	+35dB typical
Output impedance	50-75 ohms coaxial
Connector standards	N type connector at the antenna. BNC male connector to the receiver
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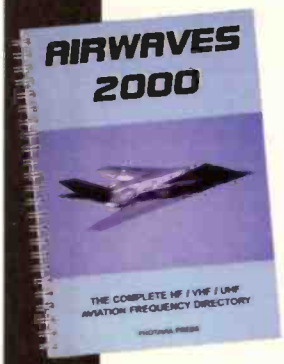

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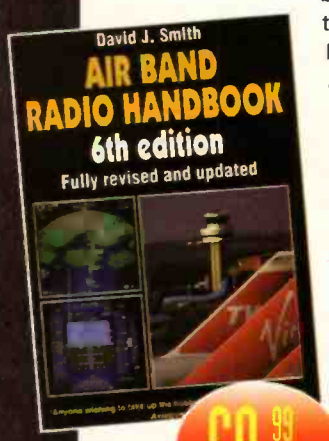

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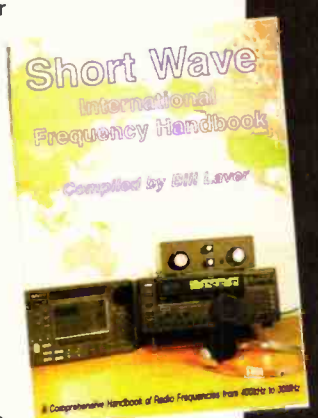

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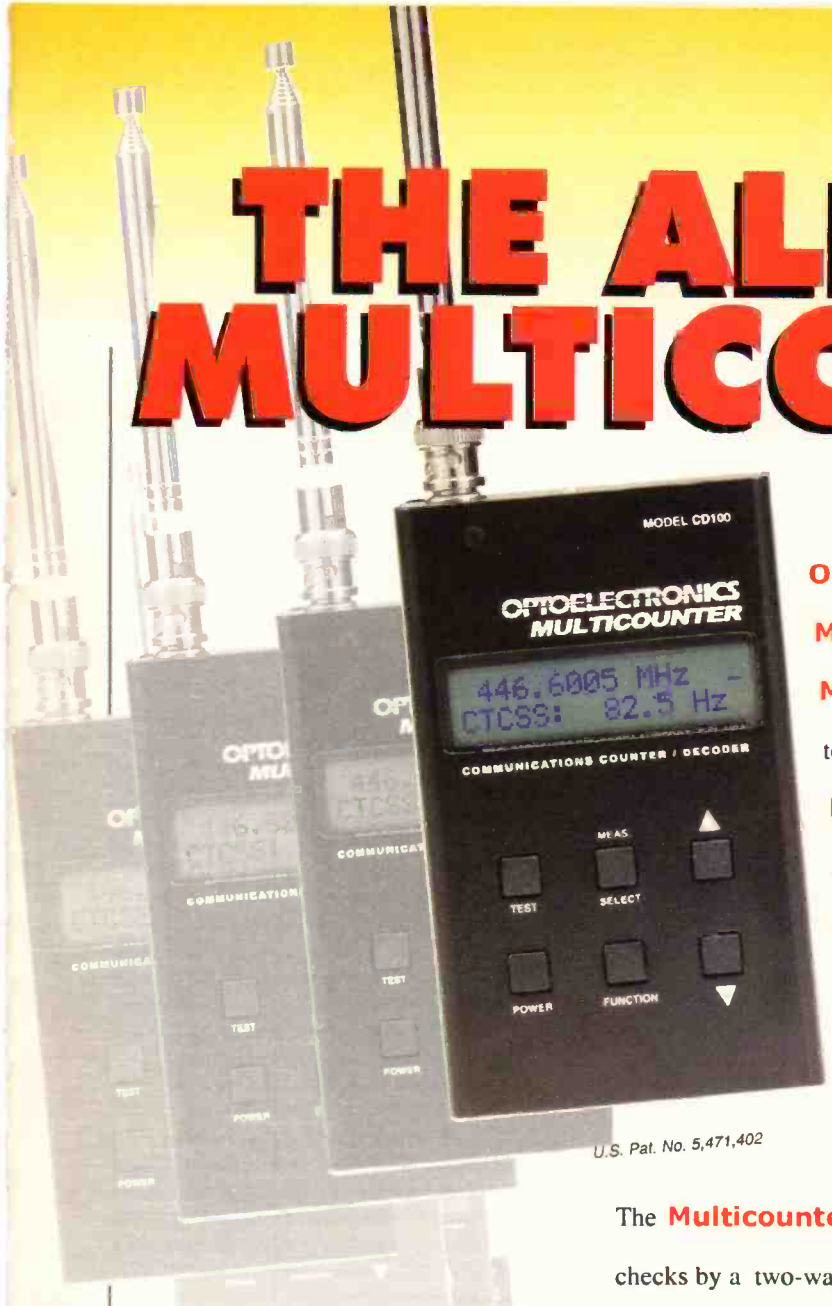

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Ionospheric Research

Paul Beaumont G7VAK takes a whistle stop tour of natural and man-made ionosphere modification.

The Ionosphere exists at altitudes from around 80km and above to a maximum in excess of 180km. Within the general term 'Ionosphere' the layers termed the D, E, F1 and F2 exist. The ionosphere has the properties of a gas and that of a plasma.

The gaseous nature of the atmosphere is very thin, due to the high altitude, in fact, so thin that free electrons exist for a short time. These free electrons eventually become captured by nearby positive ions. It is the existence of these charged particles that delineate the start of the ionosphere at 80km and its extension to an altitude in excess of 180km.

The formation of the ionosphere is reliant on the incoming solar radiation and it is the sheer intensity of this radiation from the sun at a power density of 1370W per square metre. (This figure is a constant termed 'the solar constant' that promotes ionisation). This emission ranges from the Infra Red (IR) through visible light and Ultra Violet (UV) into the X-Ray.

This radiation at the UV and the shorter wavelengths of X-Rays have the properties of causing the ionisation, since the photons of energy at these wavelengths can displace an electron from a neutral atom (in this case the oxygen atom) as the intense solar radiation is absorbed by the 'affected' atom. This process leads to an ion being formed (positive charge) and a free electron (negative charge).

Recombination Effect

With the formation of ions there is also a recombination effect that occurs as the ions capture passing free electrons. Obviously these processes occur more readily at the lower level where the gas density is greater, whilst this action diminishes as the altitude increases, due to the decrease in gas density. This balance between the action of formation and recombination reach equivalence, with the ionisation rate decreasing as the altitude decreases.

These distinct changes are apparent throughout the altitude of the ionosphere and lead to the formation of the D, E, F1 and F2 layers. These layers are also referred to as Ionisation Peaks, originally termed the Heaviside, Kennelly and Appleton layers after the early participating experimenters.

James Maxwell published his Paper outlining his theory of electromagnetic radiation propagation. His theory discussed the manner in which a wave composed of electric and magnetic fields could be propagated from one place to another. This theory was a mathematically based one and used waves of fantastic, unimaginable high frequency (one hundred million million cycles).

This paper was published in 1864 and around 1881 Hertz, after whom the cycle is now dedicated, proved the theory practically by the transfer of a spark, the frequency being very low and broadband (!), to a spark gap situated nearby. The original set up can be viewed at the Science Museum, London SW7.

This theory and practical experiment were further developed by Marconi who demonstrated 'wireless' across the English Channel in 1899 successfully and again proved the practical applications by the transmission and reception of a signal across the Atlantic in 1901.

Conducting Layers

The two experimenters Heaviside and Kennelly independently proposed the existence of 'Conducting Layers' in the upper atmosphere that would reflect an electromagnetic signal from the layers back to Earth. These proposals in 1902 led to the development in 1922 of the Ionosonde. This development led to the first direct observation and scientific study of the ionosphere and its properties.

This scientific research has carried on throughout the decades and methods to predict propagation, ozone depletion and geomagnetic disturbance, detection of cloud movement have come to the fore.

The early modifications to the ionosphere by radio were perhaps accidental. The first noted effect in 1933 was noticed by Tellegen, who reported that the modulation of the high power Luxembourg Radio station could be heard in the background of the transmission from Beromunster. The effect was received in Eindhoven, Holland.

In 1934 it was suggested that this effect, 'The Luxembourg Effect' was caused by the high power Luxembourg transmitter modifying the radio propagation characteristics of the ionosphere. The signal from Beromunster, passing through the affected region somehow had the propagation of that signal modified. The end result was that the Luxembourg signal was transferred onto the Beromunster signal.

Ionosphere Modified

Scientists began to explore the idea of using high power r.f. in controlled experiments and this heralded the idea of modifying the ionosphere. By 1960, electron temperature control was considered along with other experimentation in the F-layers.

High power r.f. produced only small changes on ionospheric properties. Collision rates were investigated by a comparison of the effect on propagation on low power wireless waves. To enhance electron temperature changes of greater magnitude even higher powers of r.f. were used.

In 1972 measurements were made in conjunction with 40MHz wave emanation from the Arecibo Incoherent Scatter Radar. This one experiment demonstrated, without doubt, that ionospheric modification by heating is possible.

The CIA funded research on Electromagnetic mind control as early as 1960 and a number of

Papers found their way into the public domain, from various sources, including the Defense Intelligence Agency, causing paranoia in certain circles. Such mind control it was said would be by involuntary irradiation of ones enemy by Extra Low Frequency (ELF) r.f., causing effects to confuse the mind and promote general health degradation.

Rumours persisted, in American circles. Boris Spassky claimed loss of the World Chess Championship to Bobby Fischer because, he claimed, he had been bombarded by 'Confusion Rays'.

This type of paranoia became exaggerated. During the US Bicentennial celebrations on 4th July 1976 a rapid pulsed signal rasped its way from 3.260 to 17.540MHz. With a Pulse Repetition Frequency (PRF) of 7Hz it was likened to the noise of a very active Woodpecker. The signal, it was later discovered, was transmitted from Kiev and became known internationally as the Russian Woodpecker. Any station using any particular frequency swept by the Russian Woodpecker was blotted out, including the aviation and maritime service emergency frequencies.

Persistent Complaints

In America, around The State of Oregon and outlying areas into Canada, persistent complaints were made to Doctors of unaccountable symptoms. The symptoms included numbness, fatigue and insomnia. Interestingly (remember Spassky's excuse) further symptoms listed anxiety and pain and pressure in the head.

A high pitched ringing sensation in the ears was also complained of by some persons. It is interesting to note that persons undergoing investigation within the cranial cavity, by ultrasound (1214kHz) are aware of the propagation of the wave which manifests itself as a high pitched buzz.

My own daughter who recently underwent a MRLscan, to investigate her deafness in one ear, also remarked that she could sense a low pitch noise, of variable PRF. She also remarked that she suffered the worst headache after the investigation that she ever had.

Despite the theories of EM ray weapons being laid on the American doorstep by their accepted Communist enemy, a more acceptable theory, and one which was stated by *Electronics + Wireless World* in May 1991, is that the Woodpecker was an Over The Horizon Radar (OTHR) facility with an estimated peak power of 20MW, that was used to search for incoming ballistic Missiles.

It was stated that the antenna used was several miles long. What is known for certain was that the sheer impulse power of the signal caused receiver blocking several thousand miles away. The facility may also have been intended as a long range ionospheric heater.

The medical matters surrounding the 'woodpecker' signals may just be mass paranoia, but may have some basis in fact as an unwanted effect from those transmissions.

Cobra Mist

An OTHR facility was designed in 1967 and built at RAF Orfordness, Suffolk, and operated until 1730 on 29th June 1973 when it was switched off permanently. The facility was termed Cobra Mist and apparently entered service around 1969.

The peak output power was 10MW with an average of 600kW. Frequency coverage was 6 to 40MHz with a PRF that varied between 40 and 160Hz via an directional antenna that had a 25dBi forward gain. (Note the frequency coverage here).

The antenna was beset with arcing and corona problems and trawlermen off the shoreline around Suffolk apparently complained of arcing within the ships rigging, tethers and springers utilised on the nets. On the other hand, the operators within the facility complained of the detection of certain noise levels, the source of which was reportedly discovered but never released. UFO researchers have suggested that they have a theory as to what the facility had detected.

A number of ionospheric heaters now exist in Russia at Nizhny Novgorod, Apadity and Dushanbe Tadzhikstan. Norway too has a facility near Tromso and further sites exist in Arecibo Puerto Rico, Jicamarca, Peru and of course HAARP at Gakona Alaska.

Whilst the Alaskan facility claims that emissions will be within 2.800 to 10.000MHz other systems are not. The Tromso facility emits between 3.850 and 8.000MHz whilst the Arecibo facility boasts a coverage from 3.000 to 15.000MHz with an output power of 200kW. A 403MHz radar facility is also claimed. Documentation of February 1996 from the Alliance for Remote Sensing state in their newsletter *Backscatter* that military OHTR operates on frequencies between 5 to 28MHz.

"...a darker reason may exist for Ionospheric Heating. Enemy communication systems can easily be interfered with, or on the other hand allied transmissions enhanced by the subtle modification of the ionosphere in a specific area."

Referring to the *Enigma Newsletter* articles 'Things that go Buzz in the night' and the frequencies covered there, it can be seen that every frequency stated falls into the frequency ranges stated within this article and that they may feasibly come from different facilities with different modulation types, or perhaps, no modulation at all.

However, a darker reason may exist for Ionospheric Heating. Enemy communication systems can easily be interfered with, or on the other hand allied transmissions enhanced by the subtle modification of the ionosphere in a specific area.

Monitoring stations can also benefit here by modification of the ionosphere over a specific site to allow interception to be carried out efficiently at great ranges and at times when ionospheric propagation may not support wave propagation to the monitoring station at the time it is required to be intercepted.

An article from *Janes Defence Weekly* supports this theory. After a description of the HAARP facility and mention of the Russian and Norwegian sites, reference is made to improved communications on ELF for submarines and the creation of 'mirrors' to enhance long range OTH h.f., v.h.f. and u.h.f. surveillance.

The article, entitled "HF 'Heats' Atmosphere" refers to the subject of heating as though it is something yet to be discovered. Personally I believe it has been here a very long time, having been used for some 25 years. ***SWM***

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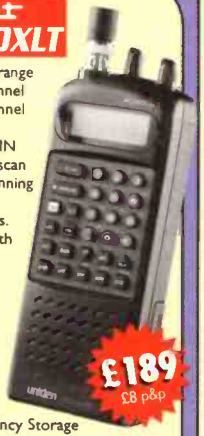

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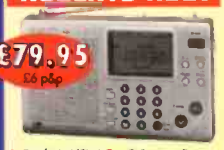

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The Movie Star and the

Joe Pritchard brings us an unbelievable story of actress turned inventor of frequency agile spread spectrum.

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Hedwig To Hedy

Hedy Lamarr was born Hedwig Eva Maria Kiesler on 11 September 1913 in the city of Vienna, Austria, at the time part of the Austro-Hungarian empire. She married an industrialist called Fritz Mandl, and from him this highly intelligent young woman picked up a lot of information and gossip about the armaments industry with which he was involved in.

Unlike her husband, who became enamoured of the Nazi party, Hedwig, who'd already started doing some acting, left for London and then went on to Hollywood to take up acting. A swift name change soon followed and Hedy Lamarr was born. She had starred in some rather 'risqué' movies, particularly *Ecstasy*, by the time that she and her musical arranger, George Antheil, found themselves at a dinner party one evening in 1940 thinking about the unfolding European war.

Guided Weapons

The United States, then neutral, was developing a number of weapons that depended upon radio signals for guidance. Amongst these was a guided torpedo, which could be steered towards it's target by a radio signal.

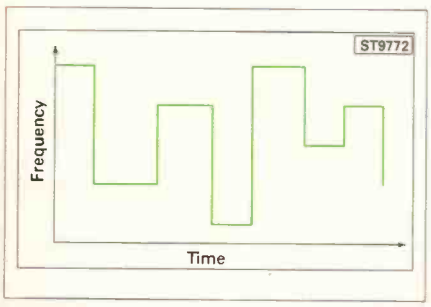


Fig. 1: Required was a random change of frequency with time.

However, there was a problem. Any radio guided missile had a weak link in that given adequate warning that such missiles were in use, Nazi scientists could easily produce a radio receiver that could be used by prospective targets to detect the signals used to control the missile or torpedo and then a transmitter could be used to jam the guidance system.

Indeed, the jamming signal could be very simple - it might be enough to tune a transmitter to the signal frequency and just turn it on. As the missile approached the target, the controlling signal would be weakening with distance from the guiding plane or ship, while the jamming signal on the target would get stronger. Eventually it would overwhelm the guidance signal with the effect that the missile would effectively become a 'dumb' weapon and simply carry on in a straight line past the target.

Frequency Hopping

So, what could you do? Hedy was a smart cookie, as they say. She quickly realised that if it were possible for the guidance signal to randomly change frequency, it would be difficult for the enemy to actually detect the signal in the first place, and virtually impossible for them to then transmit a jamming signal that would follow the guidance signal. This 'frequency hopping' would need to be random and fairly frequent, see **Fig. 1**, to prevent the enemy predicting which frequency would be used next.

Changing the frequency of the transmitted signal on such a basis would be reasonably straightforward to achieve. What was more difficult, Lamarr realised, was making sure that the receiver on the missile or torpedo was able to synchronise itself with the transmitted signal so that as the transmitter changed frequency the receiver would change it's receive frequency at the same time.

Don't forget, by the way, that this was before the invention of the transistor. All radio communications depended upon valves, and the computer, even in it's most rudimentary form, would not appear until three years later and would then occupy a whole room...not the stuff you could fit in the head of a torpedo no more than 600mm in diameter.

Player Piano

The composer George Antheil was a friend and colleague of Lamarr's, and due in part to his background as a composer, he imagined that one possible solution to the problem of synchronising transmitter and receiver would be to incorporate some sort of switching mechanism into the transmitter and receiver that could read a 'tape' of instructions, a little like the punched paper strips read by automatic 'player pianos'. These machines read cards or paper tape similar to what would be later used to program computers, and as the tape was 'read' through the machine, the holes in the tape caused musical notes to be played.

Analogously, thought Antheil, it should be possible for the tape in the transmitter to switch the transmitted frequency as it was slowly unwound through some sort of electronic switch capable of detecting holes in the tape, and similarly an identical tape in the receiver should be able to switch receiver circuits to different frequencies for signal reception, see **Fig. 2**. If you had two identical tapes, unwound at the same rate, one in the transmitter and one in the receiver, you could synchronise the transmitter and receiver to stay in step with each other.

Of course, any mechanical system is prone to slippage and slight losses of synchronisation, but the principle was there. In December 1940, the concept of a communication system based upon 'frequency hopping' was submitted by Hedy Lamarr and George Antheil to the National Inventors Council, a US Government organisation that was co-ordinating technical developments for the war effort.

The patent, number 2,292,387, was eventually filed on 10th June 1941 and was granted over a year later in August 1942, when Britain, the US and the USSR were up to their necks in the series of defeats that would only be

Secret Weapon

halted at El Alamein and Stalingrad. Now would be a very good time for a secret weapon to be developed...

The Practicalities

Unfortunately, the practicalities of setting this up would prove to be too difficult. The synchronising tapes would have to be paper tapes, and the whole technical issue of putting fairly complex electronics and mechanics in to the small and rough environment of a bomb or torpedo was too much.

Lamarr and Antheil gave their Patent to the US Government as part of the war effort, but their creation would have to wait for almost 20 years until the invention of the transistor and other semiconductor devices allowed the construction of practical, if crude, frequency hopping equipment that was based around digital circuits that created a reproducible, but apparently random, string of random electronic impulses that could switch circuitry with no moving parts.

Practical Uses

The patent lapsed in the early 1960s, at the heart of the cold war, and the US Navy immediately put the system to use using semiconductor technology to create a frequency hopping secure communications system. This was the start of the military use of 'spread spectrum' technology, the direct descendant of the Lamarr's invention.

The technology would soon find itself used in a wide range of military communication systems, with frequency switching taking place many times a second making it difficult for an enemy to even detect a signal. A spread spectrum signal heard on a 'normal' radio receiver just sounds like a slightly higher than usual level of noise on the channel. This is shown diagramatically in **Fig. 3**.

The technology was eventually de-classified in the 1980s, just in time for the technology to be used in cellular telephone systems. To see why this technology is useful, one has to consider that a lot of cellular 'phones are in use in the same geographical area. It's not really feasible for a given 'phone to be given it's own frequency, as there just aren't enough frequencies.

Instead, cellular 'phones can transmit on a number of frequencies and the frequency in use will 'switch' as the 'phone call is made and the user moves from one 'cell' on the cellular network to another. The switching from frequency to frequency also reduces the effect of interference on the signal, an interfering signal that is strong on one frequency may be quite weak on another, and so although some of the signal may be lost there is a greater chance for the signal to 'get through'.

In addition to the cellular 'phone, low level spread spectrum transmitters are used in 'wireless' computer networks, where data is sent from portable computers to other computers by u.h.f. or microwave radio signals. Again, single frequencies would not be feasible in a busy office environment or city centre, so the network adapters that allow the computers to talk to one another use spread spectrum techniques to improve reliability and data security. Unless you know a lot about the network, it's quite hard to listen in and detect computer traffic on wireless networks due to the frequency hopping.

The algorithms used to control the frequency hopping in different spread spectrum systems are quite varied, depending upon the job in hand. For example, cellular 'phones and wireless network cards use chips that generate a pseudo random string of pulses. Two devices in communication will initiate the session by exchanging enough information to set the 'start' position for the random pulse chain. Provided the two systems start from the same place, they'll keep in synchrony.

Alternatively, the message to 'change frequency' might be actually transmitted to the receiver as part of the transmitted signal. This approach is also used in cellular 'phones and wireless network cards. Data about when to switch and what frequency to switch to is sent as a data packet. This isn't terribly secure as anyone with patience and the correct equipment can log the data packets and simulate the receiver.

The ultimate in secure spread spectrum probably involves the modern equivalent of the 'one time pad', a CD-ROM or memory chip is used at each end. These devices contain a string of totally random noise pulses from a natural source, like solar radio noise or noise from noise diodes. A CD-ROM might contain enough 'bits' for a few dozen messages, a copy would be made and the copy sent to the receiver site, usually under diplomatic protection.

The CD-ROM would be used for communications, and then after each block of bits is used for a single message it's never used again. Combined with a suitable cipher system, this sort of communication is undetectable (don't forget that the signal sounds like an increase in local noise) and even if it is detected the cipher system ensures that no one else can read the message.

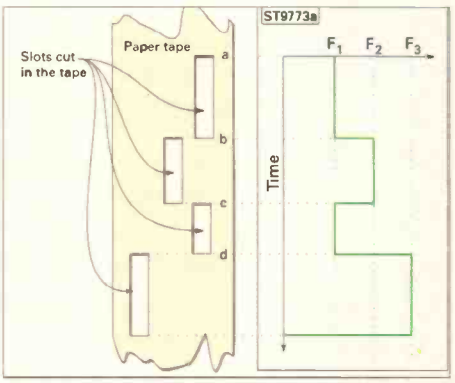


Fig. 2: The solution, as subject to patent 2292387. This example allows the use of three discrete frequencies. The execution of the scheme was beyond the technologies of the day.

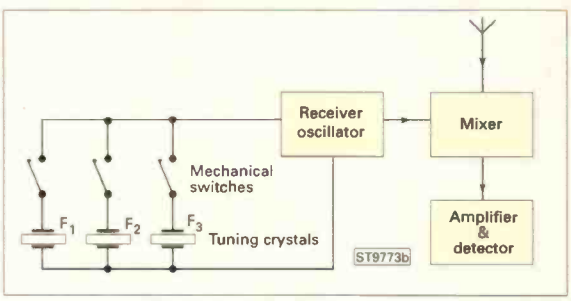
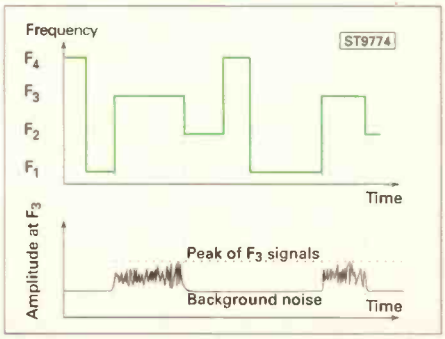


Fig. 3: Spread spectrum in use.

Formal Thanks

And finally, what did Hedy and George get for all their cleverness? Well, until recently not much. Apparently they never even received a formal thank you letter from the US Government. But earlier this year, Hedy Lamarr received an award from the Electronic Frontier Foundation recognising her contributions to modern computer technology, even though it took place 50 years ago. George Antheil died before he could get the award, but at least now the contribution of the composer and the actress to modern communications has finally been recognised. ***SWM***



■ ENIGMA, 17-21 CHAPEL STREET, BRADFORD, WEST YORKSHIRE BD1 5DT FAX: (01274) 77004
■ E-MAIL: enigma@pwpublishing.ltd.uk

Attention-123!

Unbreakable Codes

Readers have often asked how it is that such openly broadcast groups of numbers can be totally unbreakable, even by the world's most powerful computers. Part of their success lies in their simplicity, which even today in an era of Internet encryption we find that the messages sent out by Numbers Stations are far more secure than more sophisticated encryption systems.

How is this possible? There are several types of encryption used such as: Vigenère, 'one-time pad' and 'dictionary code', and we'll briefly cover each of these.

Vigenère codes (of which there are several variants) are based on an alphabetic grid and key word or phrase, and were invented by the 17th century French mathematician of that name. The alphabet is written out 26 times, one beneath the other, each successive line being displaced by one letter. To encrypt, the key word/phrase is written as many times as necessary over the letters of the message, and the message's letters transposed to the key letters. These are then converted by the Vigenère table to a further string of letters of completely random nature. The longer the key, the more secure the final encryption will be. I know of a Vigenère encryption using a key of 128 letters, far more than is necessary for total security. It is likely that Mossad's E10 uses this system, as it consists of letter groups. However, other stations may also use it, by a further stage of conversion to figures. The great advantage of this system is that no incriminating material need be kept by or sent to the agent. All he/she needs is to remember the key, which may be changed at certain times, if regular messages are passed. There are many systems for creating new keys by using innocuous books.

One-Time Pads require the possession of incriminating material - small acetate pads consisting of (usually 50 or 100) random five figure groups listed on each page. The letters of the message are converted to numbers 01-26 and progressively added to the OTP numbers, creating a string of totally random figures, the encrypted text. Providing that a new page is used for each message and that the pad is not discovered, this system will prove totally secure. Decode keys sent by many Numbers Stations sometimes refer to OTP page numbers.

Dictionary Code selects appropriate words from a dictionary, identifying them by line and page number. These are then randomised by means of a key phrase or OTP, as repeated use will compromise the encryption. This system has the advantage of reducing message length when a code book is not available. There are many variations on this method, which make use of any book, not necessarily a dictionary.

In all these cases, obtaining the clear text employs the same process in reverse. Code books are often used which, like OTPs, must be protected from discovery. These enable much shorter messages to be sent, as whole words and phrases are represented by 3-figures only. Usually the code book lists the meanings of 3-figure groups from 001-999, some of which include instructions related to the encryption process itself, making the system very flexible and efficient.

John G from Northants, recently sent us an interesting snippet concerning espionage in the early 80s. "All contact was made using variations on the code of the initial bank-note he had sent us...every time he wanted to speak with us, he used one of several telephone numbers. He worked these out by listening to **coded strings of numbers on his short wave radio** and subtracting from it the number of the bank-note. It would be virtually impossible for anyone else to decipher our communications" (Markus Wolf *Memories of a Spymaster*).

A Few Recent Events

The Russian Ib Family (M12, E7, G7, S7, V7) has this year slightly changed its habits - a change that doesn't help us in our monitoring. For decades, this family has always sent five minute calls, but now they've been cut to a mere two minutes, which means that we must work all the more frantically to catch their IDs! (This probably means that receiver with high frequency resolution have been supplied, obviating the need to 'tune around'). Along with this inconsiderate change, null message transmissions are no longer repeated 10 minutes later on a second frequency, but 20 minutes later. The reason for this is unclear - perhaps too many agents were forgetting to tune in within the first 15 minutes and kept missing transmissions, if so, this may reflect a lapsed discipline since the good old days of the Cold War!

There have been two reported **three**-group S6 (Family Ia Russian Man) 'messages' in recent months. We've heard many two group 'messages' (S6B) before, but never three-group, so we'll call these new ones S6F. Here's an example from Tuesday 28th March at 1810 (an odd time) on 6.815MHz: 624 (ID) - 781 781 3 3 = = 66622 66622 44555 44555 99900 99900 = = 781 781 3 3 00000. I've included the whole transmission as an example of this Family's usual format. As you can see, the 'message' is far from random, but what can it mean? Being so short, it must be a very basic instruction of some kind. Calls last five minutes.

A Non-Event! - so far this year not a single G16/E16 (2-letter call) station has been logged. A few years ago, this German intelligence (BND) network was one of the busiest. Now it is all but extinct. The only hope remaining is that its 'special' AU transmissions may still be active, the commonest frequencies being 4.821//4.888, usually during daylight hours, especially around 0900-1200. Any reports would be very welcome. If the BND has vacated h.f., how are they getting messages to their agents? Internet/E-mail would be out of the question as it would identify the recipients, so would mobile/satellite 'phones.

Frequencies

Readers often ask for frequency lists. This is easier said than done, for most stations, unlike broadcast stations, change their schedules regularly. Few stations are as unchanging as E3, E10 or E23 - most are far more challenging (and interesting) in their habits. Although, in many cases, schedules can be accurately predicted, space prevents us from giving details here. For anybody wanting further information on a station's habits, please send for our two booklets, now £3.50 each *(available from Enigma - **Ed**)* - without these you are lost! Further information on specific schedules may be available on request.

Meanwhile here are some well known frequencies regularly associated with a few particular stations over many years (many stations use too many to list here):

M1 ('A' network only) 4.490, 4.905, 5.017, 5.280, 5.320, 5.465, 5.474, 5.810, 6.262, 6.434, 6.508 and 6.780

M4 - 2nd Sat Mon/Wed/Thu 0957: 7.250, 1157: 8.188 and 1257: 5.478

M23 - many but SN 579 still daily 0800/1400: 9.285//8.307

M45 - 4.555//4.957 (SN 555), 5.074//5.474 (SN 074), ex-6.780

M76 - daily 0450 & 1750: 3.280 (summer), 3.819 (winter)

E3 - 5.422, 5.746, 6.485, 6.900, 6.959, 7.337, 7.755, 8.464, 9.251, 10.426, 11.545, 12.603, 13.375, 14.487, 15.682 and 16.804 always 3//

E15 - 4.130, 5.530, 5.834, 6.715, 11.000, 11.170, 14.000, 17.503, 18.000 and 18.200

E17z - 8.180[v] 9260-9290, now usually 10.240[v] (ID always 274) Good monitoring and keep in touch!

E18 - 6.5??, 7.840, 8.025 (2200 twice monthly)

E23 - 4.832, 5.340, 6.200, 6.507, 7.250 (yes!) 8.188

S10E - always 1300: 10.642 (28-day cycle for six days each time)

S17C - daily 1250: 6.945//8.190 or //9.386

S21 - 3.160, 3.323, 3.821, 4.454, 4.498, 4.832, 4.854, 4.958, 5.075, 5.290, 5.373 and 5.440 (always 2//)

V8 - 1st Saturday of month 6.645[v] or 11.290[v], erratic

[v] = variable

Many more could be listed (see our booklets). That's all for now. Good monitoring and please keep in touch!

■ MIKE RICHARDS G4WNC, PO BOX 1863, RINGWOOD, HANTS BH24 3XD
■ E-MAIL: decode@pwpublishing.ltd.uk ■ Web: http://www.btinternet.com/~mikespage

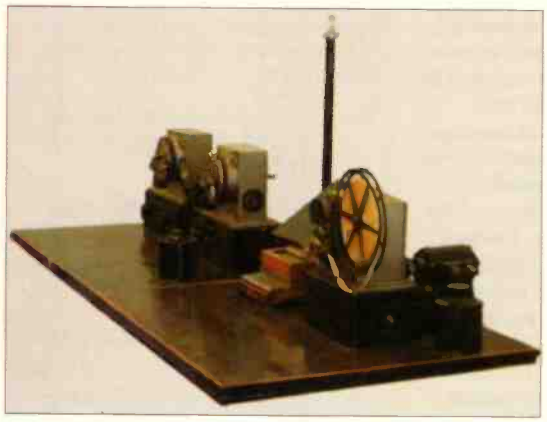
Decode

This month I'm going to take you back in time to the very beginnings of utility signals and along the way try and explain some of the terms that have come into modern use.

Back In Time

To start this journey we have to go right back to the days when signalling over wires was first becoming a possibility. At the very beginning there was lots of competition to make commercial use of the new found ability to send electric current through wires to distant locations.

One of the first to really catch-on was a system using the simple code developed by Samuel Morse that we know as Morse Code. This was basically a simple on/off system that was very easy to implement, but required a skilled operator to make the most of it, especially if you were trying to communicate over long distances near the limits of the system.



Example of an early Baudot Telegraph Machine.

At around the same time there were other inventors that were trying to develop more sophisticated systems that required less training for the operator. There were all manner of bizarre systems around - many of them based around the use of pointer systems to indicate the letters that were being sent.

The real breakthrough came with the development of printing systems that would enable the communications link to be operated by lower skilled people. The most successful of all was the electromechanical Teleprinter that had an extended life right through to the early 1990s.

Of the systems developed, probably the most well known was the Creed 7B. This was a wonderful workhorse that found acceptance in all manner of businesses and was at the very heart of the Telex network that represented the pinnacle of teleprinter utilisation. So let's take a closer look at this system because it was not only an important system in its own right, but was the birthplace of so much that we take for granted in the utility world.

Let's start with the signalling systems - this used the basic five unit code developed by Emile Baudot that survives even today in all RTTY based systems. This is also why RTTY is often called Baudot in some decoder systems.

The transmission speeds used in the systems also survive through to today with 50 baud (that Baudot again) being the standard with 75 baud being regarded as a high-speed link. These speeds were originally linked with the sort of speeds that typists could be expected to enter the messages onto the teleprinters.

Another important feature of Teleprinter based systems was the signalling systems they used. To be able to get a usable range using d.c. signalling, the common standard was to employ a system that used current reversals. In practice, this meant that the signal could either be at +80V or -80V.

Having worked on these land-line based systems myself I can tell you that they gave you quite a belt if you put your hand across the line when the printer was sending - I've still got the scars to prove it! These two d.c. states were known as Mark and Space and you probably will have heard these mentioned in modern systems.

Now we need to move into some of the engineering behind these teleprinter based systems. To get the most range out of a Teleprinter link it was common practice to employ a very sensitive relay at the distant end to pick-up what was left of the original signal and clean it up ready for presentation either to another Teleprinter or to another length of line.

The type of relay most commonly used for this was known as a Carpenter relay, after its inventor. This relay was a precision device with a spring steel paddle that rested between two contacts. The incoming line current would be applied to the relay's coil, which would cause the relay to swing between the two contacts in synchronisation with the signal.

This was an excellent device, but it did require very careful setting-up or it would not respond evenly to the incoming signal. This would then result in distortion, which would lead to errors in the printed text. Setting-up these relays accurately required a specialist Transmission Distortion Measuring Set or TDMS pronounced 'tidums'. This tester would send a precise square-wave and then measure the output from the relay or transmission system and show the amount of distortion.

Using one of these over a transmission link would enable the engineers to get the link just right for best transmission. This process of sending square waves was known in the business as 'Revs' which was short for reversals. One of the problems with this excellent system was that TDMS systems were extremely expensive. As you can imagine, the engineer's soon came up with an ingenious alternative in the form of RYs, which you will no doubt have seen, used copiously in RTTY transmissions.

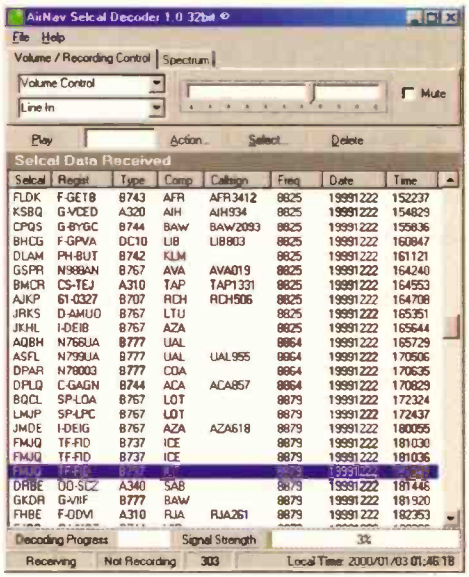
So why use RY? If you were to look at the letter's R and Y in the five unit code along with the start and stop bits you would find that they create a near perfect square-wave - ideal for setting-up a teleprinter link. The simple solution for the distant end was to use a simple panel meter with a centre zero position.

If the + and - parts of the signal were equal, the meter should just flicker but stay in the centre. If it drifted one way or the other you could then just adjust the carpenter relay so that it returned to the centre. This same system is often found on modern RTTY decoders and you can use the RYs that are sent at the start of many transmissions to make sure you have your receiver's tuning spot-on.

Now the next problem that I've avoided so far is how to get this sophisticated ±80V signal to travel over a radio signal! The answer is you can't without some extra work.

One of the first ways of achieving this was to use what's known as frequency shift keying. I know this sounds complicated, but it isn't really. All that happens is that the voltage from the teleprinter is applied to a special transmitter that can operate on two closely spaced frequencies.

When the signal is applied, the transmitter will switch between these two frequencies in-time with the incoming signal. In a typical system the difference between these two frequencies is a mere 400Hz. At the distant end you need a receiver that's capable of receiving s.s.b. signals. This will convert the f.s.k. signal into a pair of audio tones ready for processing.



Screen shot of *AirNav's* excellent aircraft selcal decoder.

This difference between the tones is known as the shift and the most common standards are 170Hz (amateur RTTY), 425, 850 and 400Hz. It's this latter shift that is by far the most common for commercial RTTY stations.

Having got the signal through the receiver and converted into a pair of audio tones something has to be done to get it fit to be presented to a teleprinter. This is the job of the Terminal Unit.

Early versions used high quality filters to separate-out the two tones and apply them to a decoder to get a d.c voltage. This voltage can then be applied to a relay to switch a ±80V supply and so recreate the original signal.

The next development came with the introduction of amateur RTTY systems, most of which were based around the very early home computer systems. Some of the most popular systems used BBC, VIC20s, Commodore C64s to produce some very capable systems.

Now we can move right up-to-date with the *DOS* and *Windows* based systems we know and love. The first successful type of interface that started to threaten the supremacy of the Terminal Unit was known as a Comparator Interface. This was a very simple device that comprised a simple Op-Amp circuit to buffer the audio signal on its way from the receiver to the computer. With the right software these have proved very successful and probably the best exponent is the very reliable and compact units made by Pervisell (see page 79 for more details).

The very latest move is to make use of the sophisticated sound cards that are fitted to most modern PCs. These contain advanced digital signal processing circuits that can handle most of the tone recognition functions that are necessary to start the decoding process.

Shortwave Eavedropper

I recently had the chance to take a look at this excellent CD-ROM from Interproducts. Although at first it looks like a standard h.f. frequency listing, there's more than you think in this package.

First of all the h.f. frequency list has been well put together with a good search engine to help you find just what you want. You can make your own searches on things like mode, country, frequency and callsign.

What's more, you can save your favourite searches to disk. I found this was particularly useful for utility monitoring as you could create separate 'saves' for all the modes you like to monitor. These could then be very quickly loaded so you could just have visibility of the one mode. You could do the same thing for callsigns, countries and lots more.

For the utility listener there was an excellent utility to help identify the mode and user of an unknown signal. All you had to do was first establish the speed of the signal. With this entered, the program automatically suggested the most likely modes and then suggested the users that are known to operate those systems. This was a really neat and logical way to help identify utility signals.

The final gem was a comprehensive set of audio samples of utility signals. These are absolutely essential if you really want to save time when you're listening around. All you have to do is find an unknown station and then run through the samples to find the best match. With a bit of practice you will find you can develop your ear to be as good as the best automatic decoders and it's a lot cheaper to do it this way!

Overall this is a great package for utility fans. For more information take a look at the Interproducts adverts.

The famous Creed 7b teleprinter.

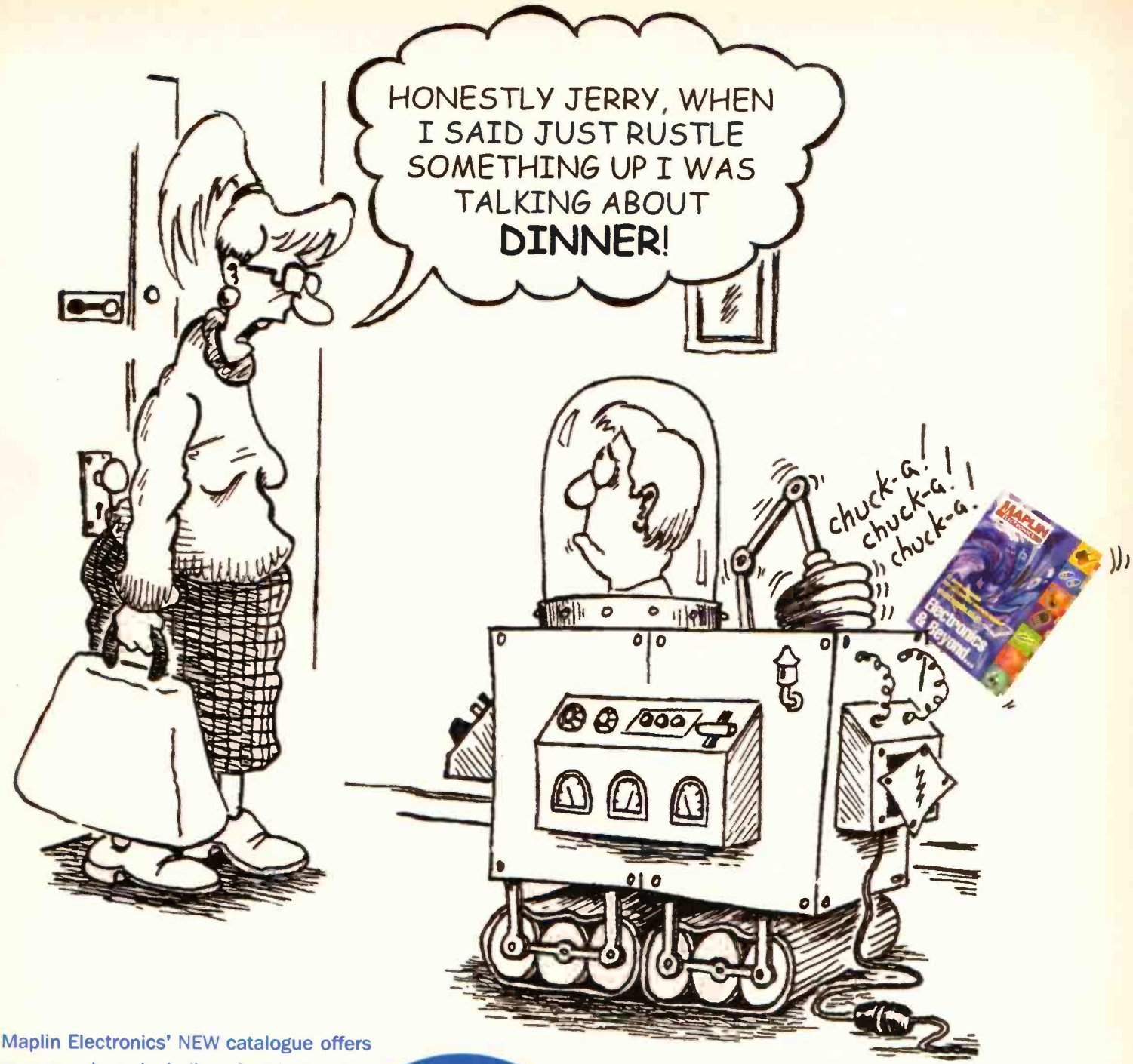
Aeronautical SELCALs

If you've ever listened around on the h.f. airbands you will no doubt have noticed that some aircraft send a sequence of tones at the start of their transmission. This is a very neat SELCAL system that was devised in the sixties to make aircraft identification a bit easier.

The sequence of tones actually comprises two groups of two tones each, which are decoded to make a four letter SELCAL to identify the aircraft. Whilst I was searching the Net recently I came across a neat package that can not only decode the SELCAL, but tell you lots of other information as well.

The program is produced by AirNav Systems in the US and is available in Demo form to download from their Internet site. Once you've installed the program (around 1Mb) you just need to connect an audio lead from the line-out on the radio to the line-in on your computer's soundcard.

With the program running, you will see a spectrum display when a tone set is received and the SELCAL itself will appear in the main listing. Where the program really excels is the way in which it will then search it's database and give you more information about the aircraft. This was great fun and really easy to use. To download your copy just visit AirNav Systems at **http://www.airnavsystems.com**



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MilAir

Having covered quite a lot of frequency news over the past few months, I thought for this month's column I would catch up on a couple of other MilAir related subjects with the emphasis on recent questions from readers who are new to the hobby.

Our photo is from the archives this month - a former resident of Scampton, the Vulcan B.2, seen in 1981.

Squawk Codes

Two relative newcomers to MilAir listening, **Dave** from Ayr and **Martin** from Woking both ask for more information regarding the subject of Squawk Codes and whether they are of use to the Military Airband listener. It must be a couple of years since I have included this subject in the column, so I thought I would take some time to explain how the system works.

The listener will hear Air Traffic Control ask an aircraft to squawk a four figure code, say for example 3331. These codes are allocated either singly or in blocks to most of the primary civil and military Air Traffic Control units around the UK. They can also be issued for a variety of special tasks purposes such as by Police Helicopters or the Red Arrows.

The largest batches are allocated to the UK area radar units, London Control, London Military, Scottish Control, etc. There are approximately 250 current code allocations available to UK operators including those used by surrounding European Airspace. It has to be mentioned that there can be fairly regular changes to these allocations, especially to the single codes or smaller blocks.

Due to the workings of the binary system only the numbers from 0 to 7 are available, 8 and 9 are redundant and are not used. (Please don't ask me to explain it in detail, it's a long time since I did A-Level Maths!). The first two digits in the squawk code indicate the operator to which it is assigned, the **33** (31) code given as an example is used by London Military for airspace in the Southwest of the UK.

The second two digits within a block identify each different aircraft to which they have a code allocated. The example given comes from a London Military block 3310 - 3377.

Unlike primary radar which provides a return on a radar screen to indicate the presence of an aircraft, (the blip), a different form of radar is used for squawk codes. Secondary Surveillance Radar, (SSR), is transmitted from a ground radar station and activates a device in the aircraft called a transponder.

With the pilot having entered the squawk code passed by Air Traffic, the ground radar interrogates the transponder and the four figure code is transmitted back to the ground station. This code can then be displayed on the radar screen and can be used to identify the radar return of each individual aircraft which is transponder equipped.

With modern signal processing this code can be linked to the Air Traffic computer and via code callsign conversion much more information than just the squawk code can be displayed on the radar screen. This can include such information as the aircraft callsign, a height readout and the destination airfield.

An understanding of the principals of SSR is in my opinion quite relevant to MilAir listening. Whenever you hear an aircraft allocated a new code then you can be fairly certain that a change of Sector or ATC unit is about to take place and consequently a change of frequency. With an advance knowledge of the code allocations you can predict which ATC unit the aircraft is about to be transferred to and thereby make an educated guess at the next frequency before it is passed by ATC.

Shadow?

Ron W lives near Valley and wants to identify the US aircraft he has heard at night talking to RAF Valley using the callsign SHADOW. This is the regular callsign of the MC-130s from the 352 Special Operations Group based at Mildenhall. They regularly use several UK airfields for nightime training, making 'blind' tactical approaches to the runway often without the use of aircraft or airfield lighting!

It is sometimes difficult not to repeat information in this column when the same question come up regularly from readers. Ron's other question is possibly the one I am most often asked about radio equipment - what is the best antenna to use?

Ron has been listening for about 18 months and uses an Icom PCR1000 with a 30m long wire antenna with a balun. As **Melvin S** and **Tel** from Tonbridge have also asked similar questions in the past months, I shall repeat some previous advice.

The longwire Ron has connected is ideal for h.f. and will give limited performance on v.h.f./u.h.f., but as he suggests in his E-mail, the introduction of a good discone will make all the difference. I use a stainless steel double discone mounted as high as possible, (preferably rooftop), and connected to the radio with a good quality low loss cable. Whilst they are slightly more expensive, my experience has shown that stainless is better than aluminium as they are more weather durable over a long period of time.

Please don't forget that good distance reception on the airbands is very much reliant on line of sight with v.h.f. being slightly better than u.h.f. Even the best antenna and radio in the world will not pull in distant signals if your location is at the bottom of a valley or a city centre surrounded by high-rise buildings!

Red Arrows

It was recently announced that the Red Arrows are to return to their former base at RAF Scampton on an as yet undecided date. Although they currently operate out of RAF Cranwell, most of their display practice displays actually take place in the airspace over Scampton. This is going to produce a unique situation as Scampton actually closed to air traffic on the 24th November 1995.

It was stated that although the Red Arrows will be present at the airfield, it will not be re-opened? They are to operate from a ramp which has been kept serviceable since the closure and will have access to the runway only, (Runway 05/23). If the airfield has not re-opened, does that mean that any equipment, etc. will be flown to Waddington and then transported by road?

As to whether any form of air traffic is to be re-instated is as yet unknown, but I would have thought it unlikely. As they are to be the only residents, my guess is that they will operate an air/ground frequency controlled by their own team which will be made operational as required.

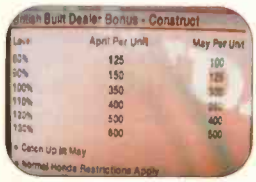
■ ROGER BUNNEY, 35 GRAYLING MEAD, FISHLAKE, ROMSEY, HANTS SO51 7RU

Satellite TV News

The live launch *Ariane 505* from Kourou via Astra @ 19°E.

The rocket on the launch pad, Kourou at 6m in 35 secs to launch.

Kourou control room view at 6 mins 18 secs to launch.



Car pricing and bonus structures seen on a Honda corporate via *Eutelsat* 36°East, digital.

A Meridian OB from Cheltenham for into *Meridian Tonight*.

Digital test card via *NSS-K* @ 21.5°W.

March into April produced an active if not very spectacular period for satellite monitoring. March 26th and the Russian election, Mr. Putin not unsurprisingly was elected, being the chosen one by the retiring Mr. Yeltsin!

Several west bound contribution feeds were noted via *Eutelsat 2F3* @ 36°E, mainly feeding European networks both on 'the day' and on the 27th after the count had established the successful candidate. 'APTN PATH 1' were running in the clear at 11.687GHz-H with an unusual service ident 'MSC11 MOSCOW ch.9'.

However, I found the actual programme output of the PTP network, carried via *Gorizont 31*, @ 40.5°E - 3.675GHz-RHC analogue - worth watching. The evening of the 26th featured their election programming for the domestic viewers and oddly during a background history of Russian politics, Stalin was painted as a friendly grandfatherly sort of character!

Though the computer graphics were similar to the 'West', certain of the production finesse left much to be desired, an example being a round table discussion in which a single radio mic. was passed hand to hand!

One interesting programme insert however was a live OB offering from inside the outgoing Mr. Yeltsin's flat (or house?). It appears that once you leave a position of power you return to the grass roots, judging from his rather modest front room as he toasted Mr. Putin.

Odd to relate that a few days earlier Mr. Yeltsin's predecessor - Michal Gorbachov - was seen speaking at an African water irrigation conference in the Netherlands, carried via *2F3*, 36°E, March 20th @ 11.675GHz-V (SR 5632; FEC 3/4). The service ident was an unusual 'UNITED HOL 75A'.

Around this period the satellite bands were fairly humming with activity. The Pope went on his famed tour of the Holy Land, the first time that a serving Pope has travelled the routes of Jesus and the testaments. The 22nd March was perhaps the momentous day with his visit to Bethlehem and the birthplace of Christ, thence to a public mass in Manger Square.

A major OB (outside broadcast) event was organised for the BBC to cover the Manger Square/Palestine visit that day with the main feed carried over *2F3* @ 11.582GHz-H from 0800 onwards. The 23rd and more coverage, the evening provided several UK bound feeds with highlights of day edited VTR packages sent back, exampled by the 11.684GHz-H 'APTN PATH 2 JERUSALEM' carrier, interesting when the service ident was checked 'STLINK MILLENIUM' suggesting that it hadn't been changed since January 1st!

The 26th ended the Pope's visit marking his return to the Vatican and 'DIGITAL VIDEO' were running more edited highlights of the whole tour, this on 11.123GHz-H, SR 5632; FEC 3/4 on *Eutelsat W2* @ 16°E.

Meanwhile, another Middle East event was taking place in Geneva when President Clinton met President Assad of Syria, the occasion were talks to end the frictional stalemate between the Syrians and Israelis over the Golan Heights occupation (during the six Day War). The attempts of President Clinton to mark a final success to his outgoing presidency was not to be and both personalities returned to respective homes with no progress achieved.

The 'US TV POOL GENEVA, PATH 2' was established as an NTSC carrier on 36°E, 11.064GHz-H whilst 'SISLink 29 UKI 418B' was active with their 'PATH 1 CNN' @ 11.055GHz-H also NTSC on the same bird. The Arabic community obviously followed the Geneva talks with great interest and on *Arabsat 2B* @ 30.5°E a news contribution feed ex Qatar featured the conference in detail at 1930.

This specific news feed provided an unusual technical curiosity, the signal level suffered a cyclic fade with the signal rising to minimal noise and then slowly fading into sparklies and then up again. Terminating the contribution was the Qatar test card, the common Philips PM5544 card with 'Qatar' ident, then cutting to an EBU/Clinton unilateral with ident 'GENEVA +PATH 4'. Somewhere there must have been a 'PATH 3' uplink! The Qatar/EBU feed was analogue C-Band, 3.963GHz-RHC via 30.5°E.

'APTN LISBON EU SUMMIT' was also indicative of political

The signal here is just at digital threshold with initial breakup of the picture.

activity around March 23rd, 11.675GHz-H - 5632+3/4 on *2F3* with other activity monitored on *W2*, 16°E, 12.564GHz-H over this same period.

Considerable industrial emotion mid-month with the news of the BMW/Rover sell-off resulted in many SNG uplinks from the Midlands reviewing both the events of the sale and future thoughts of the UK car industry and local (un)employment. UKI-507 was running 36°E with live news/interview inserts from outside of the Rover factory at Longbridge for the Central TV evening magazine programme - 11.071GHz-H.

This contrasted rather with the ongoing 'Cheltenham Race Festival' OB circuits over several days featuring racing from the famous circuit. Interesting that considerable regional interest was generated by this meeting, the 15th included a Meridian presence via 36°E on SISLink 17 -11.669GHz-H; even *W2* - 11.015GHz-H was fired up for Cheltenham coverage.

Roy Carman found 'Stryder 1' at Abingdon carrying race meeting VTRs (Abingdon is the Central-South studio). Interesting that Roy also saw Channel 4 racing on the same bird during the afternoon - 11.138GHz-H, all these race feeds SR 5632; FEC 3/4.

2F3 @ 36°E maintains a regional flavour most days, cue the UK budget on April 21st, 11.078; 11.163; 11.583 and 11.670GHz during the day carried various coverages which made for a very active satellite since Pope-action was still ongoing ex Jerusalem on the same bird. *Kurdsat* has been on 'TEST' transmissions on 36°E with their own unique blend of programming - 11.015GHz-H with the usual digital 5632+3/4 parameters.

Test pattern via *NSS-K*.

Satellite reception isn't all DX hunting. The early hours of March 22nd and the launch of *Ariane-505* ex Kourou on flight V128 was carried live on the Bayerische Fernsehen transponder in the *Astra-1* slot at 19.2°E - 11.141GHz-H analogue. The successful launch of both *Insat-3B* and *Asiastar* were shown in the control room and transmission from Kourou ended about 0200.

This transponder carries the 'Space Night' programme from about midnight (every night of the week) including various NASA and other recordings, lunar landings, etc. and if there is a co-incident launch at the Ariane facility then this is always transmitted.

The *Asiastar* satellite will provide high quality radio programmes across SE Asia, this a similar craft to *Afristar* that offers similar programming across Africa and the Middle east in L-Band - 1.5GHz. Has anyone actually received this transmission yet?

March 29th and the Team Philips catarmaran whilst on test off Lands End lost about 13m of the port hull, the craft now listing heavily was found by the St.

View from the Reuters office window in Moscow prior to news report re: Russian elections.

Mary's lifeboat and towed slowly back to the Scilly Islands for further damage assessment. Brightstar fired up the 11.50GHz-H frequency on *NSS-K* @ 21.5°W satellite and offered back to the UK networks dramatic pictures plus playouts of edited VT packages showing spectacular shots of Team Philips from a helicopter heavy in the water under tow early evening - a digital feed with SR 5632; FEC 3/4. Interesting a few days later when Anglia TV were using the same *NSS-K* digital frequency with colour bars and superimposed 'ANGLIA N5 W5' ident, though nothing developed other than the test card.

An unusual sighting on *NSS-K* however was an analogue transmission on March 31st @ 11.676GHz, audio 6.60MHz from 1800. This the basic Italian white square test card on a black background with an ident 'I-63 AREZZO', usually Italy opts for the 18°W *Intelsat 705* satellite for OB linkups. Nothing however developed from this test pattern, but, next afternoon, the same transponder was fired up and an outside broadcast was in progress, a fashion/jewellery show set in the courtyard of a stately home and dialogue/commentary in English. Very odd!

One of our readers noted on April 4th, *Intelsat 801* @ 31.5°W a dancing 'extravaganza' in a language similar to, but not Spanish, the digital offering using SR 6116; FEC 3/4 - 11.502GHz-H carrying a service ident 'service 1'. The event appeared to be held in an Iberian version of a village hall and rather amateurish.

Intelsat 801 is a good hunting ground for sports feeds with frequencies at the l.f. end of Ku-band used for inbound ITV sports circuits. Check out 10.962GHz and around this part of the band, BT often seems to be active. The 24th March for example carried 'TES 42 ANGLIA TV' which carried an early evening magazine programme into their local programming in clear digital - 11.997GHz-V with the usual 5632+3/4.

Whilst checking out *Eutelsat W2* @ 16°E for NTL Crawley Court uplinks I found a new channel. Calling itself 'obn' it appeared to be a Balkans offering with commercials for Sarajeve companies. It's a digital offering, in the clear at 11.019GHz-H and with unusual parameters SR 3123 and FEC 3/4, the service ident has a mere 'OBNBiH'.

I have subsequently found from Stefan Hagedorn's Internet newsletter that this is 'Open Broadcast Network' and is tied up with NTV Montena in the Bosnian/Herzegovinan region. This channel seems to be on-air 24-hours a day and is a very strong signal, easily seen on a 900mm dish in the South UK.

We've received a very comprehensive and detailed logging from **Roy Carman** covering each day of the last month! For a real DX capture, check out *Eutelsat 2F1* at 48°E. Roy has seen them on several occasions during the period at 11.548GHz-H using SR 30000 FEC 3/4 with both video activity (a video looping CD of tropical fish) and radio programming.

'Sicilia International', a digital offering has also been received on 2F1 - 11.110GHz-H with SR 2293; FEC 2/3 - an unusual set of parameters. And an even more vintage bird - *Eutelsat IF4* has been seen at 33°E with programming Digitally 11.509 and Fashion TV 11.565GHz-H - I have no further details on this one.

Roy Carman again...15°W and *Telstar-12*, Globecast Miami was caught using 11.534GHz-V (15000+3/4). Even more important, Reuters TV have been found using 11.534GHz-H (SR 14999+3/4) on *Telstar-12*, perhaps it's a cheaper hire than *NSS-K* @ 21.5°W!

If you're checking out *Telstar-12* move East a little to Eutelsat's 'Atlantic Gate' and *2F2* @ 12.5°W may be found on-air. It's a not an active bird at this time, in fact, elusive to find, but Roy found them with an American puppet programme (ex PBS, the Public Broadcasting Service) on March 17 @ 11.186GHz-V with unique digital parameters of SR 9179; FEC 0.5 using NTSC.

Whilst scanning across *2F3*, 36°E it was noticed that the analogue Iraqi TV Space Channel programming has ceased, for Iraqi viewers checkout the Arabsat slot on the Eutelsat *Hot Bird* 13°E slot at 12.564GHz-H where they'll be found amongst other offerings from Saudi-1; Sudan, Oman, Kuwait and others. The technical standard of the Iraq channel can vary between good to often chronic quality audio and one evening the Libyan signal displayed very murky low level video images - tap in SR 27500; FEC 3/4 for the Arabsat package.

Iraq are also lurking on *Arabsat 3A* @ 26°E - 12.034GHz-H with similar parameters to above. We have numerous Pakistani readers and for them - or their parents from that same country - *Hot Bird* carries Pakistan TV News (in English) at 12.581GHz-H, 5632+3/4. If your preference is Iran rather than Iraq, then the NITV is also available at 13°E -12.460GHz-V using apparently SR 14999; FEC 3/4.

French football anoraks, the 'Supafoot' league were found in March using *Telecom 2c* @ 3°E on six frequencies between 12.529-12.697GHz-H - all with SR 6289; FEC 7/8. Dutch 'trotting' also appeared amongst the football using SR 6000; FEC 3/4.

And finally for golfing enthusiasts, Roy Carman 'found' a new digital package, at least it carried golf on three channels March 27 -11.502GHz-H, SR 6111; FEC 3/4 VPID 1160; APID 1120 on the 21.5°W NSS-K satellite.

As mentioned perhaps 12 months ago, the transition into digital satellite links has rapidly overtaken that of analogue the past year and we are now seeing very few analogue circuits used for outside broadcasts and news inserts. We still have to locate an ideal 'enthusiasts satellite receiver' - both from performance, ease of operation and price. Hopefully the UK trade Satellite Show mid May at Earls Court may provide the answer.

Election day news report via 36°E - the view behind is live and not an inlay from a still-store.

Orbital News

The French national broadcaster TF1 is organising another two channels to air within its current digital package - most likely on TPS. A financial content channel should hit the air waves early 2001, whilst a women's lifestyle daytime channel should be on-air later in 2000. Content will be magazine type chat shows, sitcoms and more serious drama offerings.

The Italian digital pay-TV operator 'Stream' has just relaunched its digital operation with extra channels plus a hike in subscription charges of about 20% for the basic 17 channels package - now 24,000 lire. A rather startling item in the Financial Mail, March 26th, "Last week, Motorola announced that Iridium's satellites will be crashed into the oceans in a £6.3 billion series of fireballs because no buyer can be found for the system".

The Iridium LEO system of 63 orbiting satellites should have created a fully global mobile 'phone/data network. Unfortunately, the customer takeup was nominal, handsets difficult to obtain and charges high. Bankruptcy was declared some months ago and with no interest in taking up the idle system Motorola have closed it down.

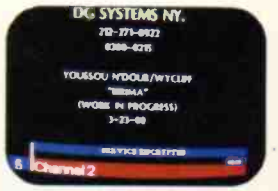
At the time of writing, Eutelsat's 'SESAT' satellite is about to be launched from the Baikonur rocket site and hopefully lofting into orbit their new craft. SESAT - Siberia Europe Satellite - has 18 Ku-band transponders and will slot at the 36°E 'hotspot' providing coverage of Europe, North Africa and western Siberia (widebeam @ 47dBW) and spot coverage on a steerable beam (49dBW) into India - the latter spot able to take six Ku transponders of the on-board load. Traffic will be video, data, corporate, internet, etc. If SESAT launches OK April 17, it'll be in service early June - check out the downlink bands of 10.95-11.20; 11.45-11.70; 12.50-12.75GHz.

The famed Chaparral C/Ku-band Corotor feed horn system has suffered piracy of its design. A Korean made copy is apparently on sale across SE Asia at prices about 35% of the genuine Chaparral selling price.

The main broadcasters of Spain, France and Italy (TVE, France Television, RAI) are forming their own TV channel 'co-operative' to provide a platform for cultural films, family entertainment, lifestyle and a Mediterranean themed programming content under the EBU umbrella. The emphasis will be on 'good quality programming' for the large population of these three countries.

The EBU are seeking a common scrambling system for use across all EBU members, thus easing the exchange and transmission of programming across boundaries. They are seeking manufacturers to research and create the new encryption standard which will then be freely available commercially rather than the present system of encryption dedicated to specific companies.

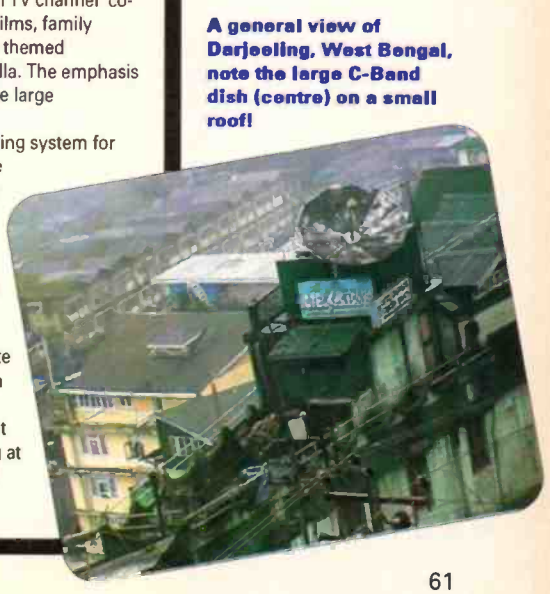
Eutelsat denied that the *Hot Bird 2* satellite at 13°E was knocked off-air by a meteorite on March 21st. Rumours suggested that a meteorite zapped the craft at 1800 on the 21st putting it out of action until the next morning at 0500. The cause of the blackout is still 'under investigation'.



This caption appeared on the Globecast North Atlantic lease - the 'Channel 2@ and 'Service Encrypted' are service idents and not on the original picture.

C-Band (4GHz) dish on the Nirvana Hotel, Pokhara, Nepal.

A general view of Darjeeling, West Bengal, note the large C-Band dish (centre) on a small roof!



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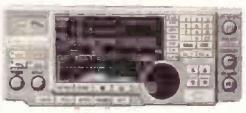

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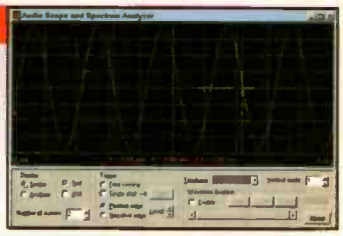

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Construction of externals	WR-1000e/WR-1550e - 3100e - external RS232/PCMCIA (optional)		
Frequency range	0.5-1300 MHz	0.15-1500 MHz	0.15-1500 MHz
Modes	AM,SSB/CW,FM-N,FM-W	AM,LSB,USB,CW,FM-N,FM-W	AM,LSB,USB,CW,FM-N,FM-W
Tuning resolution	100 Hz (5 Hz BFO)	10 Hz (1Hz for SSB and CW)	10 Hz (1Hz for SSB and CW)
IF bandwidths	6 kHz (AM/SSB), 17 kHz (FM-N), 230 kHz (W)	2.5 kHz(SSB/CW), 6 kHz (AM) 17 kHz (FM-N), 230 kHz (W)	2.5 kHz(SSB/CW), 6 kHz (AM) 17 kHz (FM-N), 230 kHz (W)
Receiver type	PLL-based triple-conv. superhet		
Scanning speed	10 ch/sec (AM), 50 ch/sec (FM)		
Audio output on card	200mW	200mW	200mW
Max on one motherboard	8 cards	8 cards	6-8 cards (please ask)
Dynamic range	65 dB	70 dB	85dB
IF shift (passband tuning)	no	±2 kHz	±2 kHz
DSP in hardware	no - use optional DS software		YES (ISA card ONLY)
IRQ required	no	no	yes (for ISA card)
Spectrum Scope	yes	yes	yes
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■ DAVE ROBERTS c/o *SWM* EDITORIAL OFFICES, BROADSTONE
■ E-MAIL: scanning@pwpublishing.ltd.uk

Scanning

Hi there. Back again for the June edition of *SWM*. Firstly, thanks for all the letters and E-mails and even one 'phone call to the *SWM* Editorial Offices at PW Publishing. It really is most interesting to get your views and comments and, of course, additional information and snippets of news which are of great interest, I assure you. I always try to reply individually to E-mails and, as and when I can, to postal mail.

I received an intriguing letter from a reader near Swansea who requires anonymity. He regularly listens to low v.h.f. activity on his scanner and over the last two years has been hearing narrow f.m. transmissions on frequencies between 40.0625 and 40.9375MHz. These signals appear to be seasonal, being received at his location between the months of August and October.

The signals, of reasonable strength, appear at about 1100 and disappear at about 1630. Eighteen different frequencies have been heard including 40.200MHz. This frequency is one which, in the UK, is allocated to RAF cadets, but to these users it seems to be their main channel. The voices heard on these frequencies seem to be using either Russian or a similar Eastern European language.

On 40.225 and 40.5626MHz the language used sounds more Spanish or Italian. The usage may well be marine in origin, thinks our correspondent, as in the background he can hear bells ringing, the sounds of machinery and the voices seem to have a hollow metallic ring as if they are, perhaps, on a ship.

At 1400 a hooter sounds which seems to indicate a meal time. Forty five minutes of comparative quiet ensues then, presumably full of borscht, black bread, caviar and vodka, then they are all back at work again and on the radio.

Some of the users are female and on some frequencies both sides of the conversation are audible. These signals have been received for two years now. I have a list of all the frequencies heard thanks to our scanner man from Swansea, but they are all in 40MHz, so if you just search between 40 and 40.9875MHz, you may hear them.

I have not heard them myself, but I live at a high latitude and I could well be in the wrong location. Currently they are being received near Swansea using a Realistic 2006 and a discone in the attic (very discrete - this chap) at 29m a.s.l. Any ideas anyone? Have any of you RAF types heard them using your frequency as a calling channel?

Low VHF Traffic

Also a call to the office from **Mr Wintle** of Evesham on 17th March (*SWM* has roughly an eight week lead time on submissions) who was hearing US low v.h.f. traffic on 31 and 33MHz. The folks in the office let me know straight away and I was able to listen myself. I heard a heating and ventilating company and other utilities. He also heard the W1OJ amateur repeater on 29.620MHz n.b.f.m. which is always a good indicator of openings to the USA and Canada in this frequency region.

Emergency Services

Michael Jones has written asking for specific frequencies for listening to the US Emergency services. Difficult one that, Mike. The problem is that loads of different departments use the same frequencies and the fact is that when propagation is good we could probably hear a few of them on one channel over here.

Also, you may well listen for ages on a few selected frequencies and hear nothing while a few kilohertz away stuff is booming in. For example, New York City Police (NYPD) mostly use u.h.f. systems, but do have 39.900MHz n.b.f.m. as one frequency.

You could listen for decades and not hear them while a few 'megs' away on 45 and 46MHz every few kilohertz you would be hearing New York State Fire Departments. Recently there has been a lot of traffic audible from the States including weather broadcasts to farmers in Onslow County, North Carolina and a military range control in the same region.

Castaway Taransay

Now the Castaways. You may be aware that the BBC invested a considerable amount of licence money in what is now called a docu-soap, the scenario of which involved selecting a group of ill matched people, marooning them on a privately owned island called Taransay in the Western Isles of Scotland and filming the subsequent disputes. Well they have been left there with a mass of hardware including a satellite 'phone and of course, a marine v.h.f. radio.

Should you be anywhere in the region it may well be worth listening to marine v.h.f. Channel 16 (156.800MHz f.m.) as every so often they call up Stornoway Coastguard. I have heard the callsign 'Castaway 1' used to contact them and a rather well spoken English male voice asking for the weather forecast for the forthcoming week. They will always change frequency to another channel to pass traffic. But you never know, if you listen at 1200 local on a Saturday you may hear them getting their weather for the week or you may hear why one of them had to leave the island!

Remember!

From the 1st January 1991 Section 79 of the Telecommunications Act 1984 permits seizure of a scanner upon suspicion of the commission of an offence under Section 5(b) of the Wireless Telegraphy Act 1949. This means if any police officer or RA officer thinks that you are using one for anything other than licensed broadcast receiving or amateur radio reception then they can seize the set and get you in trouble **big style**. That's it in a nutshell.

Good Luck.

TETRA Cost

On the subject of police radio in the UK and as an update to the information I wrote regarding TETRA, **James** from Keighley, Yorkshire, sent me a press cutting from his local paper, the *Telegraph* and *Argus*, which reports that the West Yorkshire Police Authority are currently refusing to sign up to TETRA due to it's cost. The authority maintain that they would have to cut 400 officers posts to finance their new radios.

Cleveland, West Midlands and Merseyside have also refused to sign up citing system costs as a reason. The Police Authorities believe that a cheaper system may be available elsewhere.

Now a cynics view may be that the main reason that the government want all forces to use TETRA is due to it's frequency efficiency thus releasing the myriad of frequencies in police use at the moment for sale to commercial users at great profit to government. Police authorities presumably realise that secure traffic and data communications can be achieved using the same frequencies that they have at the moment simply by upgrading and renewing equipment as and when necessary on a piecemeal basis.

It will be interesting to see whether the Home Secretary ends up using his executive powers to impose TETRA on all police forces. And as we are on the subject of government, I read in a US magazine that under new 'anti - terrorism' laws planned by our government it will become illegal to 'collect' or 'possess' information 'likely to be useful to terrorists' unless you can prove that you were not planning to use it for purposes of terrorism. This could encompass anything. Is *The Encyclopaedia Britannica* still published, I wonder?

Codeword?

Thank you, **Costas** in Athens, for the additional information regarding Mould (which he thinks may be a codeword as opposed to an acronym) regarding the number of repeaters and the fact that it was installed as a command and control system for each of the British Army Defence Regions between 1981 and 1983. He says that it includes a hundred or more v.h.f. and u.h.f. repeaters, some of which are true repeaters and others are cross band access points. There were also mobile units in Land Rovers which could be deployed as and when necessary to enhance coverage.

■ PAUL ESSERY GW3KFE, PO BOX 4, NEWTOWN, POWYS SY16 1ZZ

Amateur Bands

It's been a while now since we ran a competitive Set Listening Period, so I've decided on another one. The objective will be to listen for four hours on the WRC bands - 10, 18 and 24MHz - between 1900 and 2300UTC, that should keep mealtimes out of your hair!, on Wednesday June 14. The WRC bands and mid-week option were chosen deliberately to see if they are more popular than weekends, which cut into summer leisure time and are often cluttered up with contests.

The aim is to log as many amateur stations as possible, giving date, time (UTC), frequency, callsign of station logged, who he is calling (or a CQ). To complete the story, please indicate your receiver and antenna and how you feel the conditions were, plus any other comments, grave or humorous, you may have. Oh yes, if an entry is from the user of home-brew gear, we'll double the points for that entry!

News

We start with a gentle warning, we can't mention the majority of events, because they don't give enough notice! First though, a new DXCC by way of 4W6 East Timor for stations in the UN-administered area, but UN stations will be given 4U1-series calls. Possibly another new DXCC to come is Chesterfield Is, TX0DX - if it meets the requirements.

We hear PA3AXU has cancelled Niue from his schedule; South Cooks - July 3-7 from Rarotonga, N Cooks - July 8-15, back to Rarotonga July 15-20. 9U5D found the first 9U licence since 1994 was expensive - $575!

FT5WI is on Crozet until November; FW5ZL is ex-FR7ZL and The Royal Omani RS hope to be on Toten Is July 2-12 with three stations.

Letters

A warm welcome to **Richard Kirkcaldy** who comes in since he got a Yaesu FRG-100 and started to keep a log which already has some 47 countries booked in. Richard asks about DXCC - it's for transmitting amateurs and requires verified (QSLed) contacts with 100 different DXCC countries. A variant, 5BDXCC, requires QSLs from 100 countries on each of the five bands - 3.5, 7, 14, 21 & 28MHz - a real toughie! The cards have to be mailed off for inspection too. However, I don't know of a listener version - perhaps ILA or ISWL have one?

On a different theme, Richard has a home-brew active antenna which isn't, he feels, performing too well. Since Richard covers other bands, my personal feeling on this would be to use a random wire, fed against some above-ground radials (as many as possible!) and optimised by way of an antenna tuner.

A few years ago there was a fad for 'silent tuning' gadgets to present a true 50Ω to the rig. Here, I tend either to put a carrier up and tune for unity s.w.r. or to use my MFJ Antenna Analyser at the a.t.u. receiver socket.

However, there is some maximum signal a 'practical' receiver can accept, and it is often necessary to attenuate signals at the input. A quick check involves reducing the r.f. gain slowly - if the receiver was overloaded there will be a sudden drop in noise at some point and signals will pop up.

Incidentally, the offending Big 'Un is usually not even in the band - a tuned circuit damped by 50Ω isn't very high-*Q*! Richard's active antenna may itself be the overloading stage. Personally, on 160-80-40, I always use the attenuator.

Look at it this way, you need enough gain properly distributed to take your specified weakest signal to your specified output volume and not one decibel more. Add gain and you don't improve the minimum discernable signal (MDS) - that's defined by the noise - but you **do** make sure that you reduce the range between MDS and the onset of overload which is what you **don't** want!

All CW

A list from **Ted Trowell,** all c.w., and Ted sadly comments that he's never heard such appalling behaviour, with deliberate jamming on callers to the various expedition stations. Ted looked at 7MHz to find VK6VZ and 3W5OK while 10MHz produced JA7IC, 6W6/K3IPK, JA7BXS, DS5USH (S. Korea), JA0MGR, JA7AXN and BD4ED (Chongming Is).

At 14MHz Ted noted VK7CW, VR2GY, VK6VZ, ZL1MH, TX0DX, XU2AC, E21EJC, CX3EU, VK4WIA, ZF2NT, VP9C, VK6AJ, 9G5VJ, 4W6MM and DS5UEH while 18MHz 'gave' by way of 9M2TO, 701W, JY8FX, 3V8BB, 3B8MM, 8Q7KK, 6W6/K3IPK, G3XTT/VP9, 5H3RK, JA7XBS and ZM2AGY.

Up again, and 21MHz yielded 5B4AGC, ZB2EO, VP5C, VK2BJ, XE2/N7RO, ZF2NT, VE7NH, LU8XWX, PZ5RA, ZF2LH, V51AS and ZP6CW. On 24MHz A45XR, JQ3UDL, HF0POL, 8P6DR, 5N3PCR, OD5NA, VQ9GB, W7CT, 9M2TO, FG5XC, OD5NJ, FO0AAA, CE0ZY and CE0/OH3JF went in the bag, leaving 28MHz to account for JA7AMK, VQ9GB, 9G5VJ, ZP6CW, 9J2BO, ZB2EO, ZS6AL, BV7FF, OA/DL3GA, HF0POL, XW2A, 3XY1BO, ZP5KO, 3W5OK, PY2OW, FO0AAA, YB0AVK, CE0ZY, CE0Y/UA6AF, TG9/IK2NCJ, AC8W/C6A, KP2/K3VA, XF4LWY, ZF2NT and PJ8/W1HL. Incidentally, at the time Ted wrote, the static on Top Band was up to S8.

Other Modes

A note from BARTG says that, sadly, there will not be a BARTG rally in 2000. Perhaps by next year they will have found a venue which meets their financial and space needs for a rally devoted to datacoms and home-brew. Meantime, they can be contacted at: **BARTG, Freepost NEA763, Rotherham S66 7BR.**

A familiar hand next - **John Collins**, who heard over the air that G3MWF bought my TS-830S when I took on the '440! John stuck to 7MHz and found GM3POI, GB2NSW, GB2SET, GB4RAF - cards via G0DBX, MW5AGS, GX0UEW, 3A2MW, 4U1ITU with IT9ESV driving, SM3AC, LX1TA, LX2RH, V31JP and VP5/W5AO. On the 'Gotaway' front, a station from St. Kitts Nevis was totally destroyed by a contest pile-up.

From **Emrys Griffiths** (Caernarfon) a letter enclosing one from **Bruce Salt ZD7VC.** Bruce is seeking details of waterproof cases for radio gear possibly under the trade name 'Pelican'. So far Emrys and I have both drawn a blank on this, so any helpful ideas to me please, and I'll see the details reach Bruce ZD7VC as quickly as possible.

The **Goodhalls**, father and son, both seem to be 'in the wars' in Oxford - and of course it's a time of year when Paul has to work many extra hours. The log goes on filling though, so they've 'pruned' it for me. On 28MHz we see A71ZZ (c.w.), CE0Y/G0KBD (Easter Is), CX1EH, J73AB, R1AND, TG9/IK2NRJ, VP6BR (Pitcairn), ZF2NT, XE2MX, P49V, HF-POL, LU3CT (s.s.b.) ZS1LG, PY6JJ, KC0FQO, 7X4AN, KC2F, CE0Y/UA7AF, ET3AA, FO0AAA, 4J4K, ZF2JC/ZF8, while 24MHz VQ9NB, TG9/IK2NRJ, AL7O, FO0AAA and OY3DN.

At 21MHz we see ET3AA, VY1JA, TJ1PO, 8J1RL, TU2DP and KZ5RO in QSO, S21AR, plus TX0DX under the usual pile-up. Now it's 18MHz for 5H3RK, FO0AAA, VK2AMD and VP6BR. 14MHz saw KL7HF, AP2AGJ, FW5ZL, AP2MOL, 5R8FV, PZ1AL, ZK1XXC, CO6DE, N9NS/MM *en route* to Clipperton, VU2RTF, JA4NTE, ZL1BEG, FO0AAA, VK7LB, which leaves us 3.5MHz for VK3ATN, VK5MS, PY7ZY, NA4L and KF4TP. How nice to see a mixture of modes in one list!

Now **Colin Dean** in Barnsley, and 7MHz for BV2RS, JA2, JA4, OD5RU, UK8/DF3DS, UN8GF, UP0L, VR2MY, 5A23PA and 6W6/K3IPK. Next 18MHz for BV5BG, C36HK, JA8LNA, OD5NJ, OH0RJ, TA4/LA9FB, VK7CK, VK9XT, YB1FCC, ZS6AVM and PA3DJT/MM east of 8P6. At 21MHz AP2JZB, BV2FT, BV4VE, DS1-2-4, DU1HU,DU1LKY, ET3AA, ET3KV, HL0XIQ, HS0/G0HHF, JD1BKR, JW5NM, J28NH, OH0JTU, S21AR, VP5/K4ISV, VU2ABE, V44KMC, YB1-2-4-7-8-9-0, 4K0TM, 4L1DA and 6W1RD. Finally, 28MHz and AP2JKZB, A41LZ, BV4VE, BX5AA, CE0Z/OH2MXS, CO5GV, CP6EY, DU3SV, EK4JJ, EX2T, EY8MM, E41/OK1DTP, FG/F5BOY, FO8CJO, FY5HY, J37K, J73AB, NH0F, PZ1CU, P40B, P43E, SU9ZZ, SV2ASP/A, VK6APZ, VP9IX, V47KD, YB8HZ, ZD7VC, Z21KF, 4J4K, 4K9C, 4L5O, 5A1A, 5H3TL, 6V6U, 6W6/K3IPK, 6W6/N3NS, 9G5XO, 9G5ZW, 9J2AB, 9K2SH and EM1KY/MM near 9L1.

Safety

By the time you read this, it'll be the season for thunder and lightning. Please remember, if the storm is near enough to be audible, then it is dangerously late to be disconnecting antennas - they may already have acquired a stiff static charge. The safest way is firstly to connect up only when listening and secondly to have a permanent d.c. path from antenna to earth, a 1MΩ resistor between the two may serve well enough.

Finis

As usual, the deadline is the first of the month, addressed to me at Box 4, Newtown, Powys SY16 1ZZ or to the *SWM* E-mail address.

■ GODFREY MANNING G4GLM , C/O THE GODFREY MANNING AIRCRAFT MUSEUM, 63 THE DRIVE, EDGWARE, MIDDLESEX HA8 8PS

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I am pleased to be able to repeat the offer of charts and information, just the same as last year. Send me a pre-paid self-addressed envelope. As a guide, a *Supplement* and a chart weigh 600g in their envelope, that's £1.52 second class post. Ensure that the envelope, at least A4 capacity, is sturdy enough! The gusset/expanding type is a good idea. If you add extra postage, I'll try to fill your envelope, depending on demand.

It's first-come, first-served and my decision as to who gets what is final. No other correspondence will be entered into in connection with this offer. If stocks are exhausted, I will have to return your empty envelope. If you successfully received what you wanted in last year's offer, be thoughtful and delay your request by a couple of weeks from when you read this - let someone else have first pick this time round.

All the information is recently out-of-date, so must not be used for operational purposes. You implicitly agree to this by taking up my offer. While you're about it, why not write in with some suitable aeronautical topic to discuss or have answered in this column? That way, you'll really earn your free gifts!

Abbreviations

AIC	*Aeronautical Information Circular*
AIP	*Aeronautical Information Publication*
CAA	Civil Aviation Authority
d.m.e.	distance measuring equipment
FL	flight level
g	grams
h.f.	high frequency
kHz	kilohertz
LATCC	London Area & Terminal Control Centre
MHz	megahertz
r.f.	radio frequency
STAR	Standard Terminal Arrival Route
u.h.f.	ultra high frequency
v.h.f.	very high frequency
v.o.r.	very high frequency omni-directional radio range

Receiver Hardware

I had the chance to try three v.h.f. scanning receivers side-by-side. They represent different generations or developments of equipment.

The Sony Air-7 offered what was, at the time (mid-1980s), full civil airband coverage plus other useful allocations such as long/medium wave broadcasts. While on holiday on the Brittany coast in France, Chris and I can listen to BBC Radio 4 news on 198kHz over breakfast with clear loudspeaker volume. Unfortunately, the airband was extended to 137MHz after the set was made and few Air-8 receivers (which include the extra 1MHz and were meant for the USA) were imported.

Next came the early wideband scanners and I tried the Yupiteru MVT-5000. Actually, it has a gap in its coverage and does not go down to the medium wave. It does provide full military airband coverage (at the new 12.5kHz spacing) plus some less obvious beacons such as d.m.e. and markers.

Finally, the AOR AR8200 represents the current wideband offering with no gaps. Although it tunes the long wave, it's too insensitive to pick up over here - let alone abroad. It has the one major benefit of correctly tuning the new 8.33kHz civil airband channels. I'm still not aware of any other enthusiast's set that does this.

How did they perform? On the one hand, the specification on paper shows ever-wider coverage. There are also more scanning features on the newer sets. Conversely, the radios are bought for receiving signals rather than showing off their fancy displays. I found the r.f. performance decreases as the coverage widens.

Two quick tests are as follows. First, find a weak v.h.f. signal. The Air-7 wins here, even through the loss of an antenna splitter (used to enable all three sets to listen to the same transmission simultaneously). The other two simply can't hear weak signals that are still there on the Air-7.

Secondly, see what happens when a nearby strong but unwanted signal appears. I don't need any test gear, paging transmissions around the 137MHz mark do the job for me! They can't be heard on the Air-7, but the other two sets are plagued by them and sometimes there is even broadcast cross-modulation, presumably from the 88-108MHz Band II. I must say that it's not immediately obvious to me why this is as none of the third-order products appear in the airband. I conclude that these receivers really are wide-open!

The problem is not one of sophisticated micro-electronics. I'm sure the latest computer-controlled chip can be programmed to scan in a multitude of modes and show elaborate spectrum displays. These are techniques that modern electronics is capable of *par excellence*. It's the good old radio-frequency front-end that lets you down.

To prevent unwanted signals from causing interference, they must be kept out of the radio in the first place and that requires pre-mixer selectivity. My old HRO 'single-signal' h.f. receiver was a wartime design and full of valves, but in those days they hadn't forgotten multi-ganged tuning which included the first r.f. stage. Even the Yaesu FRG-100 h.f. receiver (some would regard it as humble) does contain several bandpass filters to reduce these effects.

As for wide-coverage scanners, they cover all the bands, they perform gymnastic feats such as hopping at high speed through 8.33kHz steps, but they suffer from poorer reception than older, cheaper sets. I suppose the manufacturers will tell me that I can't have front-end selectivity on a wideband scanner at the sort of price an enthusiast will pay. Bits and bytes are cheap, filters aren't.

Can I recommend a scanner then? No chance! It's a compromise. Older sets have restricted coverage and few facilities but, chosen wisely, might yield good r.f. performance. As receivers become more advanced, certainly as their coverage expands, the r.f. capabilities seem to me to lessen. Decide what you want, it's your choice, but try the set out at a reputable dealer prior to parting with precious funds.

Remember The Antenna

No matter how expensive, the receiver won't work without an antenna. **George Jacob** (Rhondda) wonders about a discone and I must say it seems a good idea. Wideband, omnidirectional and vertically polarised, it's a good compromise but I have found the gain to be lacking at u.h.f. Nonetheless, I believe your Signal R535 is a dedicated set and so might give a good account of itself with this antenna. You'll need to try it to know, unfortunately. I can't recommend what's best for you, George, see the adverts in *SWM*.

When putting up an antenna, remember that it will give most signal and least interference if outdoors. Make sure that neither it nor you fall ungracefully to the ground at any time. Avoid sites where the antenna could fall on overhead cables. Make sure the mast is secure (guyed if necessary), insured, and well away from other obstructions (even other antennas) that could block those precious signals.

Cessna 340. *Christine Mlynek.*

Continued on page 71

KEITH HAMER & GARRY SMITH, 17 COLLINGHAM GARDENS, DERBY DE22 4FS

DX Television

Well, it's that time of the year again. Sporadic-E exotics will be raining down on us before we know it. Having said that, at the time of writing this column, we have had snow, it feels like winter and there's precious little sign of any DXTV activity!

Looking back, March was somewhat of a non-event with only one small Sporadic-E opening witnessed by **Simon Hockenhull** on the 5th. Much of the other DX was via Meteor-Shower with a few tropospheric lifts for good measure.

What 'exotics' do we need to look out for this season? Well, if you have a scanner, we would suggest regular monitoring of Australian ChA0 at 46.25MHz. Look to the north-east and particularly check to see if there is an opening to Norway, especially between 0700 and 0900UTC.

European and Middle East transmitters have been identified in Australia during their summer, so F2 reception could take place here during ours once again. Don't forget, time is running out regarding the reception of Channel A0 - its closure is imminent!

Reception Reports

"F2 struggled to reach 35MHz during March", writes **Simon Hockenhull** (Bristol). Looking back through the logs and notes of other equinoxes, Simon wonders if we have passed the sunspot maximum! Below is his log for February and March. Over in Essex, **Tom Crane** has heard lots of Russian and Middle East f.m. traffic.

Conditions were better in Finland according to **Pertti Salonen**. He tells us that a fellow DXer successfully resolved F2 reception on Channel E2 in Lahti on March 8th between 0800 and 0845UTC. There was an Arabic logo in the top-right of the picture and the signal is thought to have originated in Dubai.

The measured frequency was 48.250MHz. The signal was observed again on the 13th between 0800 and 0825. Later, a short opening materialised at 0845 with signals on Channel R1/C1, possibly originating in Russia or China.

Peter Barber (Coventry) uses a telescope on sunny days to project the sun's image onto a screen for sunspot observation. At this stage of the 11-year solar cycle the 'active' side of the sun is noticeably different from the 'quiet' side as those DX buffs who plot 27-day observations will have already noticed.

Incidentally, **never** look at the sun directly, or through a telescope, etc. Always project the image safely onto a piece of white card (taking care not to set the card ablaze!).

We have only one report of Sporadic-E reception during the month and that comes from Simon Hockenhull (Bristol) who saw an unidentified cat cartoon on Channel E2 at 1030UTC on the 5th. Meteor-Shower DX has been reasonably active. Peter Barber (Coventry) identified RAIUNO (Italy) on IB on the 2nd while **Stephen Michie** (Bristol) continued to log the Danish PM5534 test card between 0700 and 0800UTC.

Band I Intruders

Several times over the last couple of months, Tom Crane (Hawkwell, Essex) has noticed another Channel E4 video carrier, very close to the NED-1 Lopik frequency. The audio which they produce together is almost a warbling sound on the scanner which has a resolution of 50Hz, so it is less than 50Hz away from Lopik with its large negative offset.

Calum MacLeod (Isle of Lewis) says he is fortunate that Bands I, II and III are, at the moment, free from all types of interference, adding that the bands are also often free of DX stations!

March DXTV Log

The following log is a compilation of reception reports supplied by Simon Hockenhull, Stephen Michie and Peter Barber. All times are shown in UTC.

Day	Log
2	0911 IB RAIUNO (Italy) wide-screen film via Meteor-Shower.
4	1450 p.m.r., possibly Russian, between 34 and 35MHz up to S2.
5	1030 E2 Unidentified cat cartoon (suspect TVE-1) via Sporadic-E; 1230 p.m.r., possibly Russian, between 34 and 35MHz up to S2.
7	0910 E4 TVE-1 (Spain) programme via Meteor-Shower.
8	0732 and 0749 E3 DR-TV (Denmark) PM5534 via Meteor-Shower.
10	0706 and 0709 E3 DR-TV PM5534 via Meteor-Shower; 1437 E4 Unidentified programme via Meteor-Shower.
16	Canal Plus (France) L5 via tropospheric reception.
17	1025 E2, E3 and E4 Prolonged Meteor-Shower signals.
18	0751 E3 Unidentified PM5534 and cartoons via Meteor-Shower.
19	0700 and 0703 E3 Unidentified programmes via Meteor-Shower.
20	Canal Plus L5 via tropospheric reception.
22	1300-1400 p.m.r. possibly Russia. Also, data heard between 40-41MHz.
24	1300-1400 p.m.r., possibly Russia, between 34-35MHz up to S3.
25	1150-1200 p.m.r., possibly Russia, between 34-35MHz.

FM DXing

Receiving DX stations on the same frequency as your local can be quite a challenge but it can be done, advises **George Garden** (Edinburgh). The Ceefax Engineering pages (BBC-2, page 698) on March 28th indicated that the Chatton f.m. transmitter would be off-air between 1300 and 1400UTC, thus freeing the BBC Radio 4 frequency of 94.5MHz.

Armed with this information, George swung his four-element array towards the 250kW Divis transmitter in Northern Ireland to attempt the reception of BBC Radio Ulster. The signal was immediately audible and became strong at times. It was easily identified by local reports about Belfast.

George used a NAD414 RDS Stereo Tuner with its narrow-bandwidth i.f. selected. It had to be set to 94.550MHz to reduce the splash from BBC Radio Scotland.

Earlier in the month, George visited Cairn O'Mounth for a spot of mobile DXing using a Panasonic car radio. On 101.4MHz, 'Today FM' was successfully identified from the 100kW Mt. Leinster outlet in the south-east of Éire. The station is one of five radiated by RTE.

Calum MacLeod reminisces about the good old days of 1996 when, on May 27th, he logged over 50 f.m. stations during a Sporadic-E opening lasting almost five

Fig. 1: The new and very unusual test card radiated by Fönix TV in Budapest. This was kindly sent to us on video tape by László Kozári in Hungary.

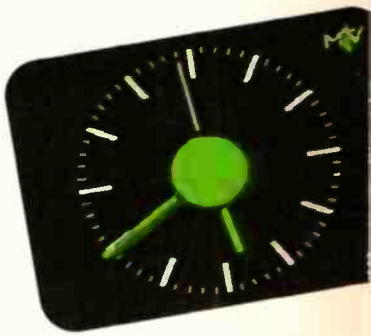

Fig. 2: László has also sent a recording of the new Clock radiated by MTV-1 in Hungary.

Fig. 3: Slow-scan TV (SSTV) reception by Cliff Dowding from G4RVC.

Fig. 4: Another example of SSTV noted by Cliff in Birmingham.

Fig. 5: Logo used by the new local TV channel 'Edinburgh Television Channel 6 Scotland'. Photo supplied by George Garden.

hours. Most of the stations were identified by the RDS codes.

For f.m. DXing, a Sony ST-S370 RDS tuner is used, fed from a three-element loft antenna. Countries identified since 1996 include Italy, Spain, Germany, France, Éire, Austria and Switzerland. Some unknown RDS identifications logged include:- S2 Kultur, St. Delta, R. City, RETE 96, Orion, R. Base, Allouette, Lugo, AWN, 272727 Nettuno and VEGA.

Perhaps this summer's Sporadic-E logs might include US/Canadian reception. Keep a check on TV ChA6 vision sound frequency at 87.75MHz.

DAB

Andrew Howlett (Dukinfield, Cheshire) feels that the great British public are being brainwashed into believing that all things digital are good and all analogue is old-fashioned rubbish. The sound quality of the existing analogue broadcasts is excellent and even the BBC's text pages tell us that f.m. radio provides 'near CD quality'! The frequency response as broadcast is flat from 30Hz to 16kHz, and a good tuner can achieve a signal/noise ratio of over 70dB. What more could one ask for?

Fig. 6: In this month's 'Down Memory Lane' corner we feature the logo used by London Weekend Television towards the end of the last Century.

Slow-Scan TV

Cliff Dowding (Birmingham) has kindly sent further examples of SSTV pictures received on 15m and 20m (21.335-21.345MHz and 14.225-14.235MHz). The exception is G4RVC which was captured on 80m (3.730-3.740MHz). Anyone interested in the hobby should tune into 80m about mid-morning where there are frequent discussions by amateurs sending SSTV signals.

Service Information

Hungary: According to **László Kozári** (Hungary), all v.h.f. transmitters will remain in operation until at least 2002. The Channel R1 Nagykanizsa MTV-1 transmitter is still on-air and so is the Budapest R1 outlet. This has recently been identified via TEP (Trans-equatorial Propagation) in South Africa. The commercial RTL Klub TV broadcasts on Ch. R2 originate from Pecs/Misina-Teto. Many v.h.f. transmitters operate in parallel with u.h.f. outlets.

MTV-1 has been renamed Magyar-1 (m-1). Unfortunately, since March 20th, the PM5544 test card is no longer radiated.

United Kingdom: Confirmation has been received from **George Garden** (Edinburgh) that the RSL TV station 'Edinburgh Television Channel 6 Scotland' is now operating from Craigkelly on Channel 52, with an e.r.p. of 3.5kW. Horizontal polarisation is used.

Finland: "Digital TV is to be gradually introduced throughout the country", writes Pertti Salonen. Initially, digital broadcasts will co-exist with the current analogue TV channels. YLE is planning a 24-hour digital news/culture/education/science channel and also a Swedish-language service.

Keep On Writing!

Please send your DXTV, slow-scan TV and f.m. reception reports, news, off-screen photographs and information to arrive by the first of the month to:- **Garry Smith, 17 Collingham Gardens, Derby DE22 4FS.** We can also use off-air pictures stored as JPG files on PC disks and good-quality video recordings.

Airband

Continued from page 69

Robin DR400-160. *Christine Mlynek.*

For safety, it must be earthed when not in use so as to prevent static build-up that could otherwise attract lightning. An external earth, though, could be dangerous if your house is wired with Protective Multiple Earthing (PME), so seek expert advice if in doubt. Waterproof all connections as moisture inside a coaxial cable will ruin it. You did buy the best low-loss cable, didn't you?

The new 8.33kHz spacing will not be available on an old set as the frequency steps need to be adjusted in firmware and the filtering won't be adequate. If anyone knows how to convert the Signal or other older receivers, write in to let us all know.

Frequency & Operational News

AIP amendments are from **Martin Sutton** (CAA), with thanks from us all. Just east of the Barkway v.o.r., the reporting point TOAKS is deleted from Luton STARs. A new reporting point is TABIS (sorry, no further details to hand at present).

Luton's LOREL 1D & 4E STARs are withdrawn and LOREL 1R introduced. Aircraft in the vicinity of Jersey might work Brest Information 134.2MHz. There's a new Scottish Airways frequency of 135.85MHz.

AIC 7/2000 from the CAA explains that airspace above FL200 over the Irish Sea and part of northern England will be re-allocated between LATCC and the Manchester sub-centre. The split is at FL245, the conventional lower/upper airspace boundary, over the sea, and FL275 over the land. Manchester control the lower sectors, often on 133.05, with LATCC working the upper airspace, usually 135.575MHz.

At Manchester Airport itself, the new parallel second runway is on schedule for operations later this year and so *AIC* 8/2000 tells us that the Low Level Route, allowing passage through the Control Zone, has been realigned.

I also see that the Decca Navigator system has been removed from the *AIP*. This is no surprise at it is no longer popular with aviators, but still used at sea. However, GPS looks like taking over the monopoly position even here. I have some examples of Decometer instruments in my Museum, write to me (with your 'phone number) if you want to come and see them.

Information Sources

Individual copies of *AICs* are available from the CAA and the address appears on my *Airband Factsheet*. For your free copy of the *Factsheet* send a self-addressed pre-paid reply envelope (to hold two A4 sheets and marked '*Airband Factsheet* Request') to the Broadstone editorial offices (**not** to me!).

Airtime Publishing Ltd. produces five volumes annually. Twice a year, *Airport Timetables UK* appears and, three times each year, *Airport Timetables Heathrow & Gatwick*. A subscription for the lot costs £40.00 but, alternatively, you can buy only those editions that you want. Send a reply envelope with your request for the latest prices to **7 Steven Close, Toton, Nottingham NG9 6JX.**

Next month I'll reply to **Paul Fineman** and **Mike Riach**. All other letters received up to April 13 have been answered. The next three deadlines (for topical information) are June 5, July 10 and August 7. Replies always appear in this column and it is regretted that no direct correspondence is possible.

ICOM

IC-R10 IC-R2

Get to Grips with...

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IC-R10 Receiver

The ICOM IC-R10 handheld receiver covers 0.5MHz~1300MHz in all-modes. It also boasts a real-time bandscope function, making it easy to find busy frequencies and observe the receiving frequency band conditions. Also, the passband width of the scope is selectable. Voice-scan function (VSC) pauses scan, but only when modulated signals are received.

Other IC-R10 functions and features include;

Bank and memory functions plus new SIGNAVI function; this additional feature speeds up scanning and adds to the already impressive range of scan modes available in this power-packed ICOM handheld. Optional CS-R10 P.C. software allows you to edit and load memory data from your computer. The IC-R10 has proved that it has 'Rx appeal', so why not see for yourself just how appealing this handful can be!

IC-R2 Receiver

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IC-R2 functions and features include;

- Wide frequency range easily receives 0.495~1309.995MHz
- Economical to run - only 2 x AA (R6) alkaline or Ni-Cd batteries needed
- Ultra-compact body 58(W)x86(H)x27(D) mm. Fits in your pocket
- Receives most AM, FM, TV broadcasting and public communications using the AM, FM and WFM modes
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■ BRIAN ODDY G3FEX, THREE CORNERS, MERRYFIELD WAY, STORRINGTON, WEST SUSSEX RH20 4NS

Maritime Beacons

Freq (kHz)	C/S	Station Name	Location	DXer
215.0	EM	Egedsmind	Greenland	A*
284.0	VN	Capo Vaticano	S.Italy	A*
284.5	MA	Cabo Machichaco	NE.Spain	A,B,C,D,E*,F,G*,H*,I*
284.5	PR	Porkkala	Finland	I*
285.0	NO	Cabo de la Nao Lt	S.Spain	C
285.0	NP	Nieupoort W.Pier	Belgium	G*
286.5	FI	Cala Figuera	Majorca	A*,B,C*,D,F*,G*,I*
286.5	FT	[C]Cap Ferret Lt	SW.France	A,F*,G*
287.3	IB	I.Berlenga	Portugal	G*
287.5	CV	Cabo Carvoeiro Lt	Portugal	F*
287.5	DO	[C] Rosedo Lt	France	G*
287.5	MD	Cabo Mondego	Portugal	G*
288.0	HH	[C]Hoek Holland	Holland	G*
288.5	CT	Pt de Combrit Lt	France	G*
288.5	FI	Cabo Finisterre Lt	N.W.Spain	A,B,C*,D,E*,F,G*,I*
288.5	UD	Cabo Salou	S.Spain	A*,B*,G*
288.5	YM	[C]Ijmuiden Lt	Holland	B,G*,I
289.5	NP	Punta Carena	Italy	A*,B*
289.5	SN	Ile de Sein NW Lt	France	B,G*
290.0	MR	Montedor	Portugal	B*
290.5	VI	Cabo Villano Lt	N.Spain	A,B,C,D,E*,F,G*,H*,I*
291.0	SM	[C]Pt.St.Mathieu	France	G*
291.0	SN	Cabo San Sebastian	S.Spain	C*
291.9	LT	La Isleta	Canaries	A*
292.0	MH	Mahon, Minorca	Balearic Is	A*,B*,F*,I*
293.5	RO	Cabo Silleiro Lt	N.Spain	A*,G*
294.0	PH	[C]Cap d'Alprech	France	A,B,G*,H*
294.6	NO	Cabo de la Nao	Spain	A*
295.5	CB	La Corbiere Lt	Jersey C.I.	A,B,C,G*,I*
295.5	CR	Cap Couronne	France	G*
295.5	RE	[C]La Rochelle	France	A
296.0	GR	[C]Goeree Lt	Holland	B,G*
296.0	KN	Skrova Lt	Norway	A*,C,F*
297.0	B	Cabo Trafalgar	SW.Spain	A*,C
297.0	FG	[C]Pt de Barfleur	France	G*
297.5	MA	Mantyluoto	Finland	A*,B*
297.5	PS	Cabo Penas Lt	N.Spain	A,G*
298.0	GX	[C]Ile de Groix	France	G*
298.0	TA	Cabo Gata	S.Spain	A*,G*
299.0	AD	[C]Ameland Lt	Holland	G*
299.0	BN	Les Baleines	W.France	G*
299.0	O	Tarifa	S.Spain	A*
299.5	VS	Vieste Lt	Italy	A*
300.0	TI	Cap d'Antifer Lt	N.France	G*
301.0	CA	[C]Pt de Creach	France	A,B*,H*
301.0	ER	[C]Eierland Lt	Holland	A,G*
301.5	L	Torre de Hercules	N.Spain	A*,B*,C,D,E*,F*,G*,I*
302.0	RB	[C]Cherbourg Ft W	France	A,G*
303.0	D	Rota	SW.Spain	A*,B*,C,E*
303.0	YE	[C]Ile d'Yeu Lt	W.France	G*
303.4	VC	Cape St.Vincent	Portugal	G*
303.5	OR	Punta de Llobregat	S.Spain	A*,C,D
303.5	VL	[C]Vlieland Lt	Holland	A*,G*
304.0	BR	Cap Bear	France	A*,G*
304.5	MY	Cabo Mayor Lt	N.Spain	A,B*,C,D,E*,F,H*,I*
305.0	GA	Malaga	S.Spain	G*
305.5	SW	Ouessant SW Lanby	France	G*
305.7	DA	Dalatangi Lt	Iceland	A*,C*,F*
306.5	H	Hel Lt	Poland	A*,B*,C*,I*
307.5	RS	Ristna	Estonia	A*,B*,C,D,F*,I*
308.0	PI	Cabo Espichel	Portugal	G*
308.0	RD	[C]Roches Douvres	France	G*
308.5	NZ	[C]St Nazaire	France	G*
309.0	CI	San Benedetto Lt	Italy	A*
309.5	AL	Algiers	Algeria	A*
309.5	BA	Punta Estaca Bares	N.Spain	A,B*,C,D,E*,F*,G*,H*,I*
309.5	SW	M.Khersonesskiy	Ukraine	A*
309.5	TR	M.Tarkhankutskiy	Ukraine	A*
310.0	ER	[C]Pt de Ver Lt	N.France	A*,G*
310.0	IP	Capo Sandalo Lt	Sardinia	D
310.5	BR	El Burullus	Egypt	A*
310.5	DA	Damietta Mouth	Egypt	A*
311.5	SA	Senigallia	Italy	A*,I*
312.0	OE	Oostende	Belgium	A*,F,G*,H*
312.5	AK	Akmenrags	Latvia	A*
312.5	BK	Baltijsk	Russia	C*
312.5	BT	Mys Taran Lt	Russia	A*,C*
312.5	CS	[C]Calais Main Lt	France	B,G*
312.5	DB	Doobskiy	Ukraine	A*
312.5	KA	Klaipeda Rear Lt	Lithuania	A*
312.5	LB	Liepaja	Latvia	A*
312.5	VS	Cabo Estay Lt	N.Spain	G*
313.0	PA	Cabo de Palos Lt	S.Spain	A*,F*,G*
314.0	PQ	Porquerolles	S.France	G*
314.0	VG	[C]Ile Vierge Lt	France	A,G*,H*
314.5	SK	Strandhofn	Iceland	A*
314.5	TL	Punta D.Penna	Italy	A*,I*
315.5	ND	Nida	Lithuania	A*
316.0	IN	Ingolfshofdhi Lt	Iceland	A*
337.0	MY	Myggenaes	Faeroe Is	A*,C,F,G*,I*
367.0	JV	Jakobshavn	Greenland	A*
372.0	OZN	Prins Chris's Sund	Greenland	A*,C,F*,G*,I*
381.0	AB	Akraberg	Faeroe Is	A*,C,F,G*,I*
404.0	NL	Nolso	Faeroe Is	A*,C,F,G*,I*
404.0	NS	Narssaq	Greenland	A*

DXers:-

(A) Robert Connolly, Kilkeel.
(B) Brian Heath, Stapleton.
(C) Brian Keyte, Gt.Bookham.
(D) Albert Moore, Douglas, IoM.
(E) Fred Pallant, Storrington.
(F) Victor Robb, Belfast.
(G) Peter Rycraft, Wickham Market.
(H) Tom Smyth, Co.Fermanagh.
(I) Fred Wilmshurst, Northampton.

Note:
Beacons marked [C] have been, or soon will be, closed down.
Entries marked * were logged during darkness.
All other entries were logged during daylight or at dawn/dusk.

If you tuned down to the beacon band in January, February or March, you were in for a big surprise, because most of those along the coast of France had been closed down. The absence of their familiar sounds left an eerie silence on some channels. From early in January a number of the Dutch and German beacons were also being closed. Several listeners were fortunate to receive some of them just before they were taken out of service - see chart. No doubt their closure will be a major disappointment to the UK DXers who have hitherto enjoyed logging them.

Fortunately there is still much of interest in this band, especially after dark when the sky waves from more distant beacons reach our shores. Over in Co.Down **Robert Connolly** (Kilkeel) found that their closure has left some frequencies open for the reception of beacons from further afield. He logged at night three which he had not heard before: Cabo Vaticano, Italy (VN) **284.0**; Cabo Trafalga, Spain (B) **297.0**; San Benedeito, Italy (CI) **309.0**. On February 15 **Brian Heath** (Stapleton) heard for the first time the beacons at Mahon, Minorca (MH) on **292.0** at 0411UTC and Hel Lt, Poland on **306.5** at 0511UTC.

At the beginning of March **Peter Rycraft** (Wickham Market) heard at night the beacon at Ouessant Lanby, France (SW) on **305.5** for the first time; also two which are rare for him - Malaga Lt, Spain (GA) on **305.0** and Cabo Espichel Lt, Portugal (PI) on **308.0**. At 0015UTC on March 9 **Fred Wilmshurst** (Northampton) heard for the first time the beacon at Punta D Penna, Italy (T) on **314.5**. He compiled an interesting list at night but he was disappointed to find that he could not log at any time the beacons which he would normally expect to receive via ground wave paths during daylight.

Quite distant beacons were received during daylight by some listeners. In Belfast **Victor Robb** added Cabo Finisterre, NW.Spain (FI) on **288.5** to his all time list. **Albert Moore** (Douglas, IoM) heard Capo Sandalo, Sardinia (IP) on **310.0** at the exceptionally early time of 1815 on January 20. He says "I have received it before, but much later at night". He was able to confirm Brian Heath's logging of Mantyluoto, Finland (MA) on **297.5**, sending MAA (*see LW Beacon text, March 2000* SWM), which he pointed out is not a keying fault but an accented letter A as used in Finnish.

The Faeroe Is beacons at Akraberg (AB) **381.0** and Noslo (NL) **404.0** were heard at 1420UTC on March 8 by **Brian Keyte** (Gt.Bookham). Soon after sunrise on the 14th he logged Myggenaes, Faeroes (MY) on **337.0**. On the 16th he followed for well over an hour the slow decline of the signal from Prins Christian Sund, S.Greenland (OZN) on **372.0** until its sudden disappearance 15 minutes after sunrise!

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Info in Orbit

While searching the Internet for some specific information about satellites, I was amused to find a NOAA site that posts many of the images received by those monitoring *GOES-8*. I say 'amused' because on the one hand you can collect noise-free, perfect images via the web, or we can collect less-than-perfect images directly from the satellite, assuming that you can receive *GOES-8* telemetry from your part of the world.

Here in Plymouth (UK), *GOES-8* is barely three and a half degrees above the western horizon. So why do I do it? Connecting to the Internet is easy. I have free access during the evening and weekend, and limited free access during the day.

Would I want to leave my computer downloading images from the web all day even if I had free unmetered access? No! Just as I have a domestic radio to listen to selected programmes, and a television for other selected programmes (currently very few!), I use my telephone for selected calls and I access the Internet for selected data.

My computer and WEFAX receiving system periodically collect *GOES-8* images and that is how I like it. Even if I had (or when I have) free, continuous access on a second telephone line, I would not wish to listen to the radio, nor any similar type of transmission via the Internet.

I am glad to see the data available for others in this way, because schools all over the world can use it for educational purposes. Let me know if you see things differently.

Current WXSATs

To my amazement, around 9 April I heard transmissions, apparently coming once more from *NOAA-9*, on my utility scanner. Telemetry on 136.77 and 137.50MHz came in strongly and an E-mail from **Martin Ellis** in the 'rig-l' mailing list confirmed my observation. The National Oceanographic and Atmospheric Administration (NOAA) has gone to some effort to switch the satellite off, following reports from a number of us when transmissions were heard some weeks ago. It all adds to the interest!

The dramatic phenomena known as sun glint once more graced my *NOAA-15* images in early April.

Figure 1 shows the raw image in which the solar reflection off the sea on the east coast of Spain can be seen in several places, as well as a reflection off the sea near the coast of north Africa. Enhancing this image using contrast expansion brings out considerably more detail - see **Fig. 2**. During the summer months, with the sun much higher, solar reflections are seen much further north - including Britain - as seen in this image from **Brian Powell**.

METEOR 3-5 images were showing signs of degraded quality after transmissions resumed in late March. **Figure 4** shows the right-hand side of the image received on 12 April at 1456UTC. The grey scale is clearly decoded and perfectly aligned, though individual scan lines have differing lengths - a problem sometimes referred to as line jitter.

Starting Out On WXSAT Operations

Amongst a number of E-mails and letters received during the last few weeks was one from a reader in Old Goole, East Yorkshire, asking the $64,000 question - how do I set up a WXSAT station in the cheapest possible way?

Frankly, I don't think that there is one, assuming you wish to see good quality images. With so many pit-falls along the route, any compromise is likely to result in disappointment. Getting the cheapest antenna or receiver could turn out to be an expensive mistake.

One useful route starts with your computer. If you have a PC available, and they are becoming increasingly cheap, then you can start at absolutely minimal cost by acquiring a satellite tracking program. First the PC. A decent computer - one arbitrarily having a 486 or better processor, and some space on the hard drive - has loads of potential.

If you don't have a computer, try a visit to some local second-hand computer shops, or ask around your circle of friends. You should find it possible to pick up a basic machine - desk-top, mouse, monitor and keyboard for within about £100.

It was the realisation of just how low second-hand prices had fallen that persuaded me to keep my old computer 'just in case', and I now use it (them!) for storing backup data and running programs to lighten the load on the main hi-spec machine. A new hard drive having several gigabytes of storage space costs within about £100. Within this price range you can get a usable machine.

The next stage is getting a good satellite tracking program. Several free programs are available, as well as a selection of shareware. You are unlikely to find these programs on the CD-ROMs given away with computer magazines, but if you get access to the Internet, many are available free of charge.

The remaining necessity is to collect an updated set of Kepler elements - the latest measurements of the orbits of the satellites that we wish to 'track'. If you are unable to locate either software or elements, you can write to me enclosing a disk and return envelope and I will provide both.

Some site addresses for software are: **http://www.amsat.org/** (and take the option for software) or **http://www.davidtaylor.freeserve.co.uk/wxsat/** Address for Kepler elements (Orbital Information Group) is: **http://oig1.gsfc.nasa.gov/scripts/**

With your new software and elements, you can install the program and optimise it to display your preferred satellites. During the course of the next few hours, you can watch the displayed 'footprints' as each of the weather satellites rises above your horizon and then sets some minutes later. Within a few hours you can see what is going on and get a real 'feel' for WXSAT predictions.

The next stage is one that you take only if you have the funds available to do it correctly. Let us consider

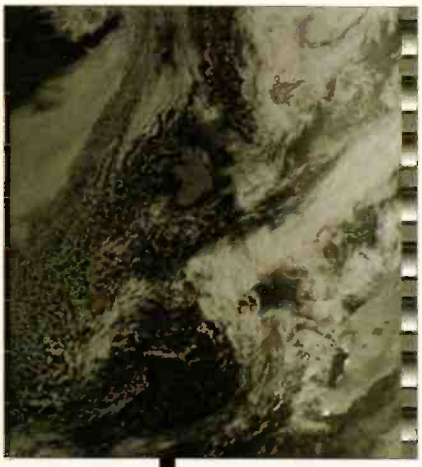


Fig. 1: Sun glint *NOAA-15* 0837UTC 14 April - raw image.

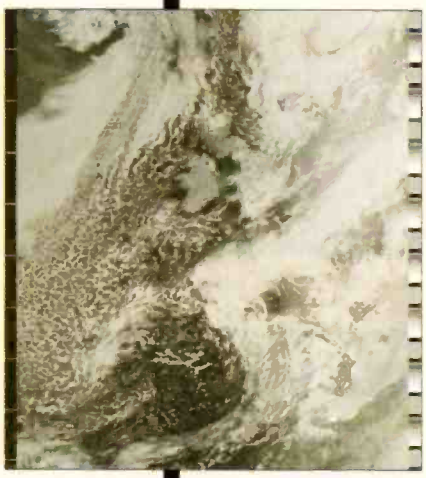


Fig. 2: Enhanced (contrast expanded) version of Fig. 1.

Fig. 3: *NOAA-15* image 25 June 1999 from Brian Powell showing sun glint.

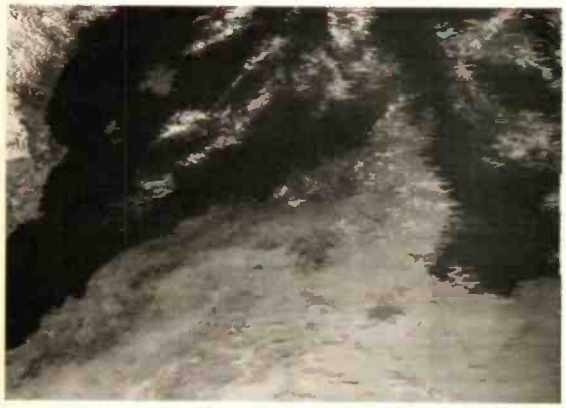


Fig. 4: *METEOR 3-5* 1456UTC 12 April close-up showing line defects.

two possibilities. You can set up a simple 'monitoring' station consisting of a receiver fed by an antenna. Almost any antenna type will do. A length of wire will pick up enough signal to 'hear' several satellites and a general purpose scanner should have the WXSAT 137MHz (v.h.f.) band available.

This basic system should let you hear the 'clip-clop' sound of each WXSAT. It will be very muffled, but if you are a beginner, you may not realise that. It could seem very loud for a minute or so at a time. This is a fairly effective monitoring station, and with a good tracking program, you should be able to hear and identify many satellites, including all the polar orbiters routinely mentioned in this column.

No matter what software and hardware you add to this set-up, it will not provide good pictures. Over the years, I have had many letters from people using this type of monitoring equipment, asking what other hardware is required to 'get pictures'. Unfortunately, you really have to start from scratch.

For picture perfection, everything has to be right, and even then you may be only partly successful. The antenna must be right for the job. If you are into long distance radio reception and communication, you would not use a 'random wire'. Similarly, the WXSATs transmit telemetry in a form that requires attention to detail with both antenna and receiver.

The NOAA WXSATs transmit right-circularly polarised signals in two frequency bands, including v.h.f. – 137.62 and 137.50MHz. You have a choice of antenna. **Paul Hayes** is a WXSAT hobbyist who has put much effort into designing his version of the quadrifilar helix antenna for WXSAT reception, and many have had success with this type - see **Fig. 6**.

Paul has produced a number of QFH versions, including a new small portable version - called Zebedy - seen between its larger relatives in this picture. The METEOR WXSATs (including *RESURS 01-N4*) can also be received efficiently on these antennas. A crossed dipole, correctly phased for r.h.c.p. signals is one alternative.

Your antenna must be connected to an impedance matched, low-loss cable. The most commonly used form is 50Ω low-loss, and a run of up to 20m should transfer adequate signal to the receiver. Experiment with a WXSAT pre-amp, if you wish. Avoid general purpose v.h.f.-band pre-amps as these may pass many interfering signals through to the receiver.

Ah! The receiver! You have a choice. You can get a proper one, or a cheap one. The cheap one may prove expensive if it does not work very well. If you are experienced at soldering and general electronic construction, I would strongly recommend considering the RIG RX2 kit, a receiver that I reviewed some time ago, supplied by the Remote Imaging Group. Alternatively, study the advertisements from those companies that manufacture and retail WXSAT receivers, taking care to enquire about their operation.

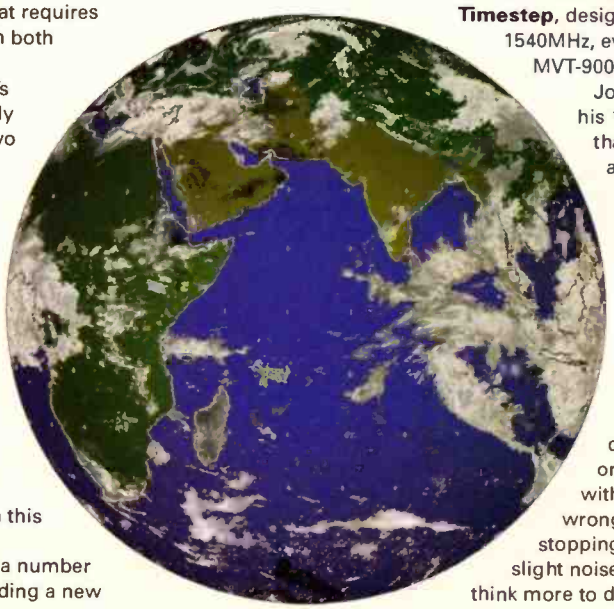
In Britain, we suffer from numerous interfering transmissions, not only from ORBCOMM and other satellites transmitting in the 137MHz band, but also from terrestrial interference, such as pager transmitter sites. I expect that pagers might be 'on the way out' soon, given the popularity of the mobile telephone, but if they disappear, something possibly even worse might be allocated to 'our' 137MHz band.

Fig. 5: *METEOR 3-5* 1503UTC 15 April - north Africa to Scandinavia.

Fig. 6: Comparison QFH antennas under test by Paul Hayes.

METEOSAT Reception

John Locker is a freelance contributor to satellite magazines and does some experimental work on satellite reception. He recently obtained an INMARSAT antenna with S-band dipole and pre-amp from **Timestep**, designed to work at 1540MHz, even when using his MVT-9000 scanner.



John fitted the system on his 1.8m dish and found that the antenna received a good signal from *METEOSAT-7* with no bandwidth problem. Using *wxsat*, (a WXSAT sound-file decoder program) he also received a clear image - see **Fig. 7**.

John tells me "The dipole would be better further from the dish face. I'm working on that, however even with the focal length wrong, I am getting end-stopping signal strength. The slight noise on the headers is I think more to do with the filters in the

Fig. 7: Image from *METEOSAT-7* from John Locker.

Fig. 8: John's dish antenna and fittings.

Fig. 9: Britain in March - h.r.p.t. image from Roger Ray.

receiver". This particular image originates from *METEOSAT-5*, located over the Indian ocean as part of the Indoex (Indian ocean experiment) project.

Give Me More!

At the end of March I surprised myself. It is 15 years since I received my first weather satellite picture - a *NOAA-9* image I vaguely recall. I had a Cirkit receiver and a (largely) home-built framestore. The receiver was of limited usability and was replaced by a commercial unit.

Then, shortly after, I upgraded this simple system just by adding a down-converter to receive METEOSAT's WEFAX transmissions. In the early 1990s I bought a PDUS system, only to be 'caught out' by EUMETSAT's decision to encrypt nearly all METEOSAT's home-produced images.

At the beginning of April this year, I ordered an h.r.p.t. system - yes, I finally did it! I have long been impressed by the quality of h.r.p.t. images - occasionally receiving them on disk or E-mail from readers all over the world. The result of this new addition to the Harris household means that from next month, I shall be able to regularly incorporate sections on all four modes of WXSAT transmission!

To reflect the quality of h.r.p.t. imagery, I hope to have some of the images reproduced in a larger-than-normal format. My aim, as always, is to provide readers of this column with comprehensive coverage of the WXSAT scene. It is worth mentioning that my own 'horizon' here at Peverell is about as limited as one could get - and still see some sky!

There will not be any dramatic pictures of eastern Europe from my backyard! I can only track satellites from near-overhead to fairly high in the west. Coverage of the south is quite good, as is the north-west. I welcome any h.r.p.t. images from readers anywhere, for inclusion here.

AV - A Rarity!

On rare occasions, home-produced images from *METEOSAT-7* are transmitted without encryption, enabling us to see the real quality that is there every day, but hidden by EUMETSAT. I do not have my PDUS equipment operating every day, so when a message was posted in the 'rig-l' (Remote Imaging Group mailing list) mentioning that PDUS images were currently not encrypted, I jumped to attention. **Figure 10** shows the maximum resolution visible-light image transmitted at 1134UTC each day, in the clear for once!

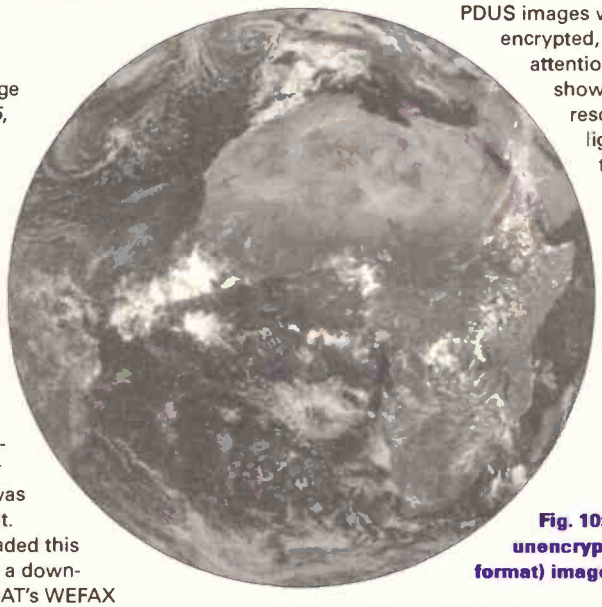


Fig. 10: Britain in April - unencrypted PDUS (AV format) image of 16 April.

Shuttle Launch Schedule

STS-92 *Discovery* - 5th ISS Flight (3A). Launch date 21 September for 10-day mission with orbital inclination 51.6: payload Z-1 Truss, PMA-3.

STS-97 *Endeavour* - 6th ISS Flight (4A). Launch date currently 30 November for 9-day mission with orbital inclination 51.6.

A comprehensive listing of all Shuttle flights and payloads, together with associated information is available from me, at the address at the head of the column, as the *Shuttle Pack*. Please include £1.50 and stamped s.a.e. for the A4 booklet.

Autumn WXSAT Special Edition

I am currently planning the content of the autumn WXSAT Special, and a complete guide to all four types of WXSAT image reception is a definite. I welcome suggestions from readers for special coverage of other topics.

Frequencies

NOAA-14 transmits a.p.t. on 137.62MHz.
NOAA-15 transmits a.p.t. on 137.50MHz.
NOAAs transmit beacon data on 137.77 or 136.77MHz.
METEOR 3-5 uses 137.30MHz.
OKEAN-4 and *SICH-1* use 137.40MHz for brief transmissions.
RESURS 01#4 transmits a.p.t. on 137.85MHz.
METEOSAT-7 (geostationary) uses 1691 and 1694.5MHz for WEFAX.
GOES-8 (western horizon) uses 1691MHz for WEFAX.

■ JACQUES D'AVIGNON VE3VIA ■ E-MAIL: jacques@pwpublishing.ltd.uk

Propagation Forecasts

How to use the Propagation Charts

The charts contain three plots. The lower dashed line represents the lowest usable frequency (LUF), or ALF (Absorption Limiting Frequency). The chances of success below this frequency are very slim.

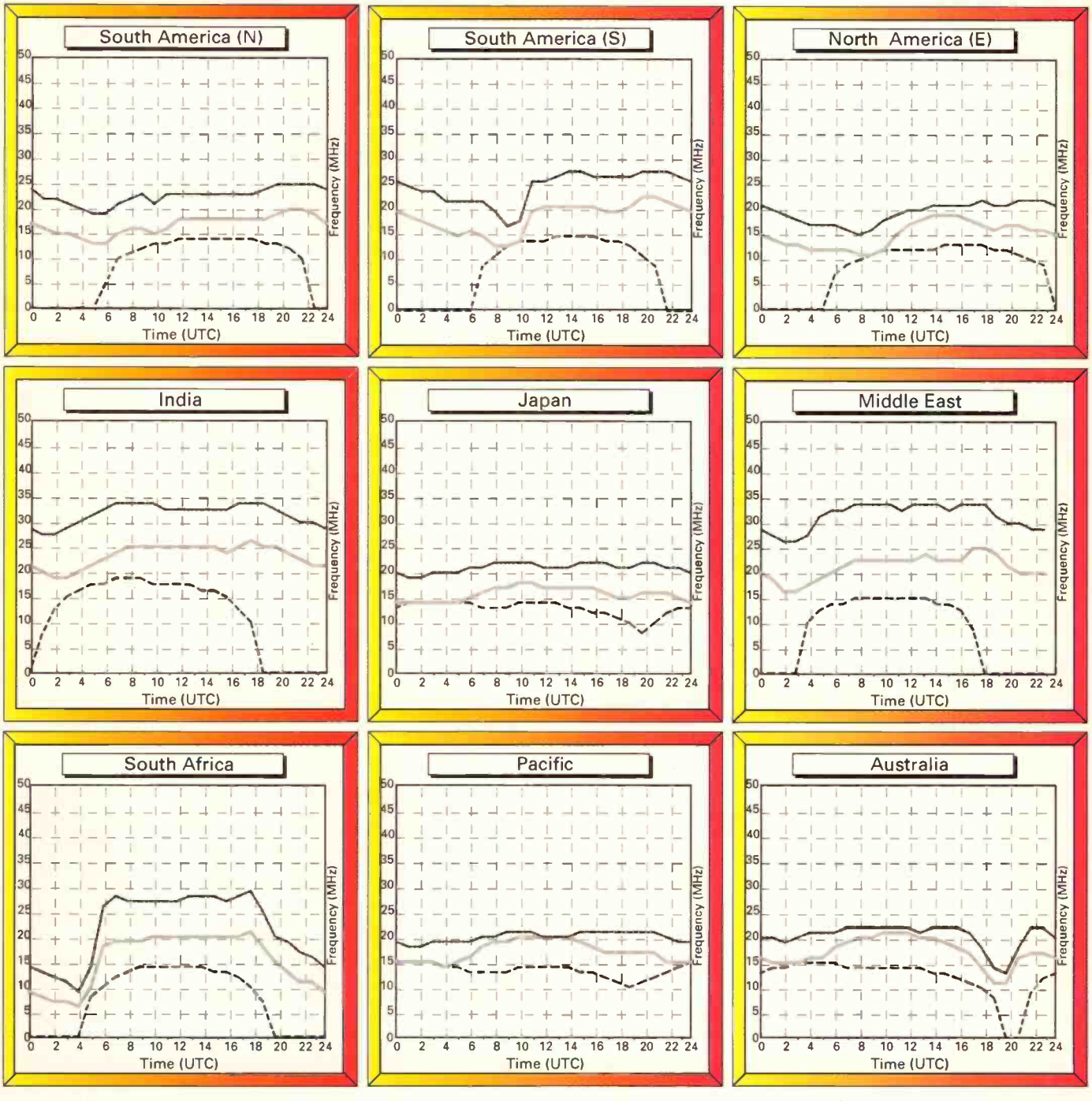
The middle line indicates the optimum working frequency (OWF) with a 90% probability of success for the particular path and time.

Lastly, the upper dashed line represents the maximum usable frequency (MUF), a 50% probability of success for the path and time.

To make use of the charts you must select the chart most closely located to the region containing the station that you wish to hear. By selecting the time chosen for listening on the horizontal axis, the best frequencies for listening can be determined by the values of the intersections of the plots against frequency.

Good luck and happy listening.

June 2000
Circuits to London

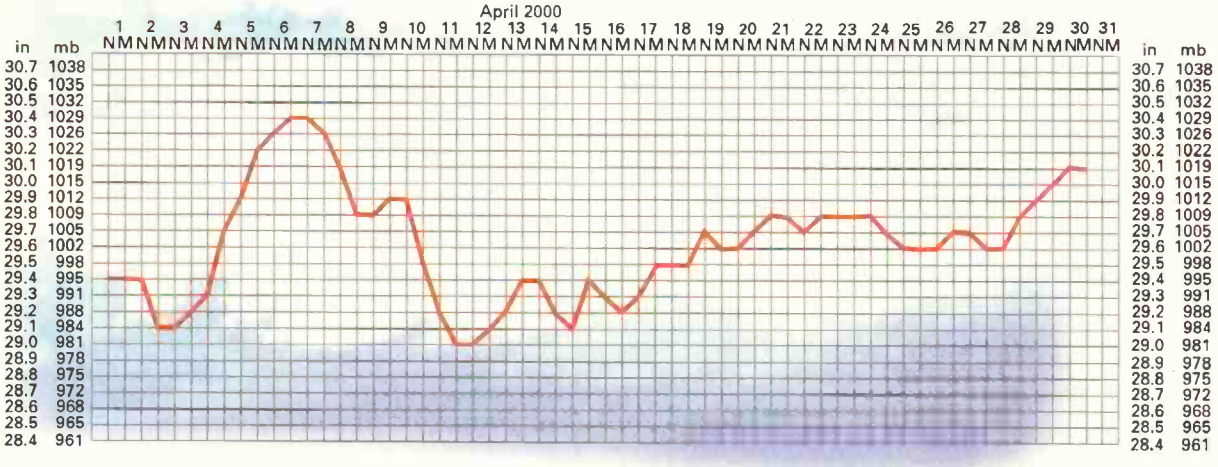


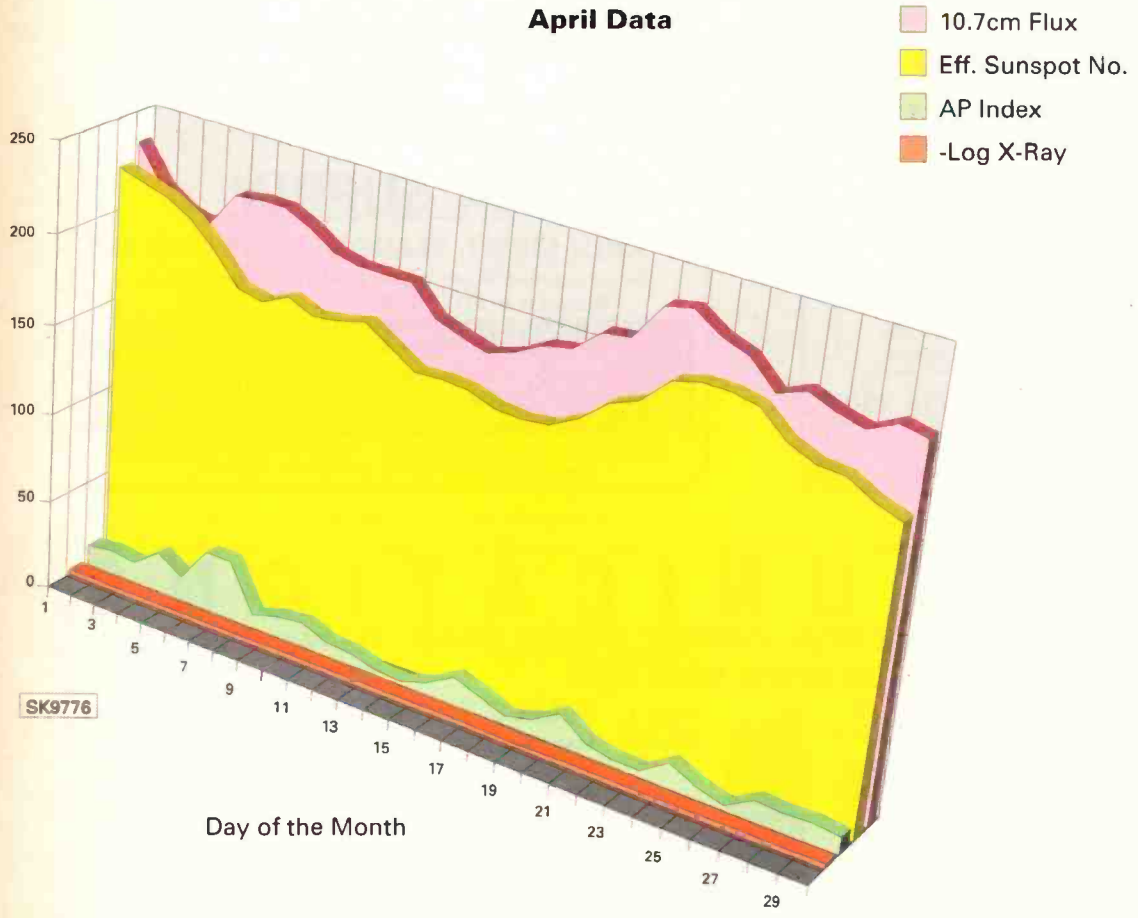
SK9775

■ KEVIN NICE G7TZC, SWM EDITORIAL OFFICES, BROADSTONE ■ E-MAIL: kevin@pwpublishing.ltd.uk

Propagation Extra

Ron Ham's barometric pressure chart, taken at Storrington, W. Sussex, April 2000.





guide to the chart

The 10.7cm solar radio flux is used as an indicator of the general level of solar activity.

The K and AP indices are measures of geomagnetic activity.

The K index ranges from zero (very quiet) to nine (severely disturbed).

K values of five or greater correspond to geomagnetic storm conditions that can relate to poor propagation conditions.

The AP index ranges from 0 to 400. An AP of 30 is the threshold for geomagnetic storm conditions.

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AOR AR8200, case, boxed, p.s.u., etc., hardly used, mint, as new, £250. Tel: Norwich (01603) 406025.

Demodulator for *JVFAX*, ACARS, Packet, SSTV, Skyspy, NAVTEX, FAX, etc., £25. Colour monitor, only, £20. Tel: (01608) 662488.

ERA Microreader MkII, R4.2, good condition, boxed, £95. Crossed dipoles, 137MHz antenna with brackets, etc., unused, £25. Redifon R500N receiver, good condition with users and repair manuals, offers or exchange. Tel: (01342) 810812 or mobile (07973) 819923 or E-mail: br-fsl@lineone.net

Fairhaven RD-500, 0-1750MHz all-mode receiver, as new, includes PC remote cable and software, also included mini keyboard for easy control of radio, 10 months old, £570 o.n.o. Tel: Somerset (01963) 370279 or E-mail: pah999@aol.com

Free scanner Commtel 202 plus extra, when you buy my data decoder MFJ-462B multi reader with receive cable and manual, unwanted, unused, £85, half current retail price plus postage. Peter, Nr. Sheffield. Tel: (01246) 413597.

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Icom IC-R8500 wideband base receiver, little use, mint condition, boxed, £650. AOR AR8200 hand-held receiver, excellent condition, boxed as new, £250. Dave on (01637) 872426.

Icom R71E first class radio and condition + f.m., £400. AR1000 hand-held scanner, u.h.f.-v.h.f., £95. Grundig Satellit 2000 multi-band, looks like new, £150. Lowe HF-225 Europa, keypad, a.m.s., f.m., excellent radio, manual, boxed, £250 postage paid. Tel: Middlesex 0208-813 9193.

JRC NRD-525, extra filters, little use, mint boxed condition, £450. Redifon R551N digital, ideal for v.l.f. 10kHz to 30MHz, all filters, buyer tests and collects, £285. Tel: Wiltshire (01225) 753166.

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Kenwood R-5000 with v.h.f. and MCL1100 Easy Reader, £300. Buyer collects. Tel: Tavistock, Devon (01822) 614082.

Kenwood TS-50 mobile h.f. TX/RX + matching auto a.t.u., all leads, manuals, boxes + large 12V battery, £550 o.v.n.o. Tel: Lancs (01995) 61612.

Lowe HF-225 receiver with keypad and p.s.u., £280. Tel: Reading 0118-947 7263.

Lowe HF-250 a.m./f.m./c.w., remote control, £275. Datong FL3 filter, £50. Both for £300. Clark 12m pump-up mast, ex. WD, all fittings, £225. TS-130V narrow s.s.b./c.w. filters, £225. FT7B with YC7B, £150. Tel: W. Yorks (01977) 668170.

Lowe PR-150 pre-selector, £160. Brookes and Gatehouse K3 homer marine receiver, offers. Both v.g.c. and full working order. Tel: Devon (01297) 553523 evenings and weekends.

Maycom AR108 latest mini airband scanner, 108-137, 137-180MHz, boxed as new, plus BNC adapter, high gain flexible antenna, stereo headphones, £40, includes P&P. Tel: (01983) 811672.

MVT-7100EU, mint condition, boxed, £190 o.n.o. Tel: Warwicks (01926) 859697.

Realistic DX-394 receiver, bought new, little used, boxed, manual, condition as new, no mods, Internet has info. and mods, see Haydon's ad, page 20 May *SWM*, £85 o.v.n.o., excellent value. Tel: Hampshire (01256) 465340, ask for Wayne, not after 2100 please.

Scancat Gold for Windows, version 7.50 software with full manual, £65. Tel: (01204) 701417 anytime.

Watson W-MM1 multi-mode modem with software, MFJ-462B Multi Reader with manual, plus Uni1200R mains adapter with voltage change switch. Compaq notebook, carry holdall, £100 complete. Buyer collects. Tel: Ashford, Kent (01233) 206105 (work) or (01233) 632449 (home).

WXSAT/SW digital receiving and decoding equipment, v.g.c., Martelec v.h.f. receiver, £250. MSQ20 quadrafilar antenna, £30. GOES/WEFAX s.w.l. software, £50. 286 PC 1Mb RAM, 40Mb HD VGA, DOS 5.0, exc. monitor, £50. Tel: (01392) 273714 evenings.

Yaesu FRG-100 with f.m. module, power supply and manual, plus Datong AD370 active antenna, £300. Tel: (01875) 853543 or E-mail: weidpath@lineone.net

Yaesu FT-290R all-mode 2m transceiver, £170 o.n.o. Lance M1BKB on (07715) 732038 day or (01524) 422282 evenings.

Yupiteru MVT-225 scanner, v.h.f. and u.h.f. air, also marine band, all accessories, excellent condition, £150. Also Sangean ATS-803A world/short wave receiver in good condition with mains adapter, £60. Tel: (01235) 200471 evenings.

Yupiteru MVT-9000 scanner, c/w manual, £115 o.n.o. Tel: South Lincs (01778) 571315.

Wanted

Eddystone receiver, model EC958 or EC958/7 or EC958/7E in good working order. Tony, Chesham. Tel: (01494) 778352.

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