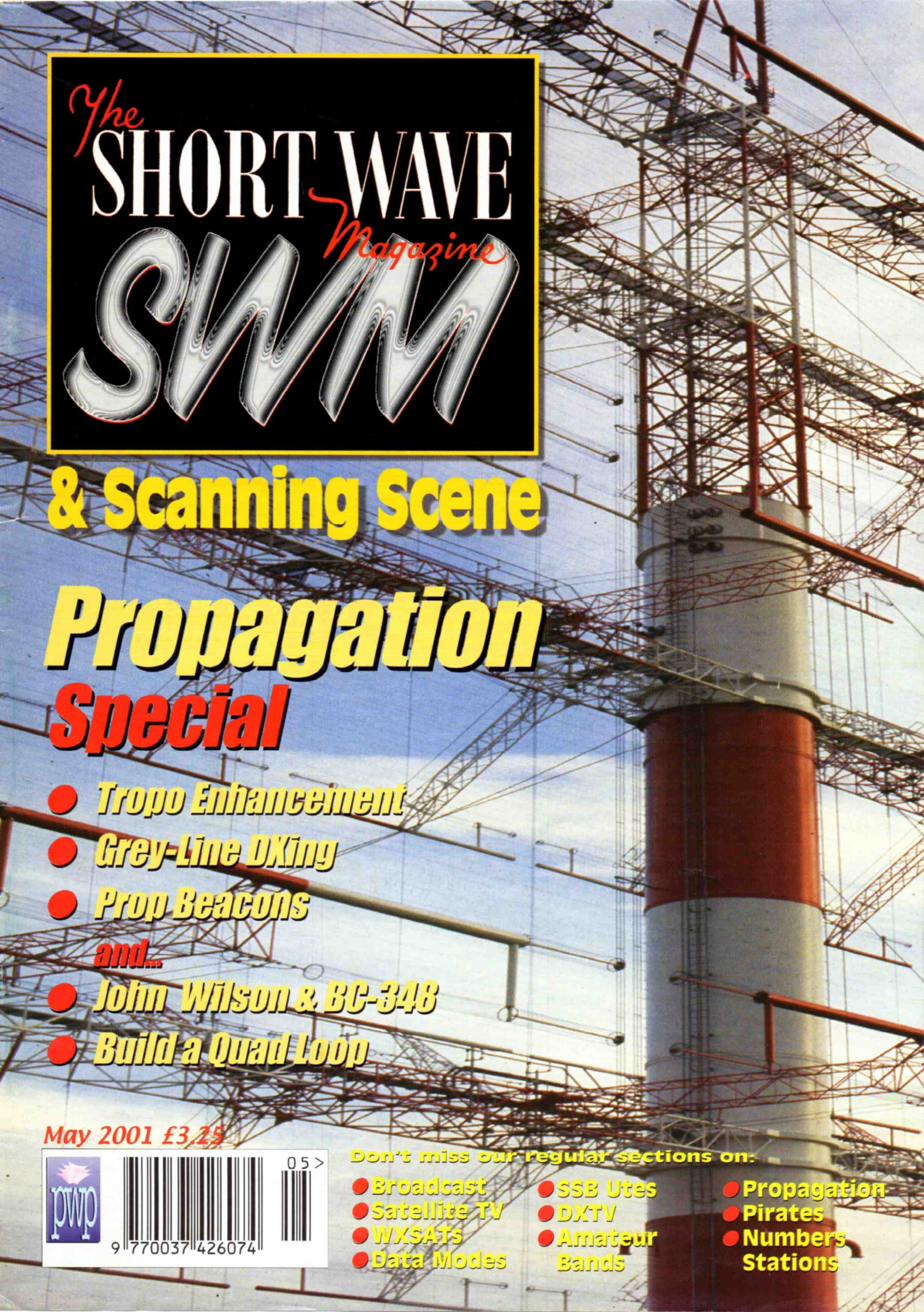

The SHORT WAVE Magazine

SWM

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The SHORT WAVE Magazine contents

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PROPAGATION SPECIAL

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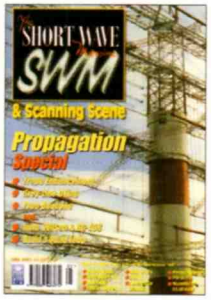
Cover subject: Radio Canada's rotatable curtain array.



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other features

regular columns

COMING NEXT MONTH *contents subject to change

IN JUNE 2001 *SWM*

- **Icom IC-R3 Review**
- **SSB Utilities Special**
- **More Like Old Times with Bob Ellis**
- **Godfrey Manning on GMDSS**
- **JW with Watkins-Johnson**
- **Plus all those regular essentials to keep you updated**

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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 £3.25 each and photocopies are £3.25 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.

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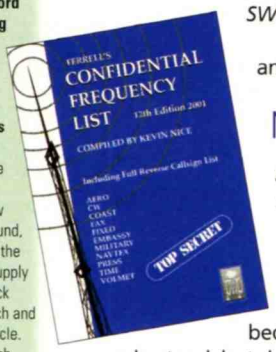
Technical Help
We regret that due to Editorial time scales, replies to technical queries cannot be given over the telephone. Any technical queries by E-mail are very unlikely to receive immediate attention either. So, if you require help with problems relating to topics covered by *SWM*, then please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

ed's comments

I start this month with both a fond farewell and a welcome. We say goodbye to our valued team member, Art Editor of three years, John Kitching. John has decided it's time to both further his career and return to the world of nautical publishing by moving to a new publication (in this country at least) located further down along the coast in Southampton. The new job entails a daily commuting session, but I know John is going to enjoy the change with the 'Pirates'. It has been a real pleasure to work with you John, all the best from all of us here at *SWM*.

John's role has been taken up by Bob Kemp, the astute of you will already have noticed Bob's name on the mast head on page 5. So, a big warm welcome to Bob. I'm looking forward to working together with Bob to provide the same level of co-operation that has brought the look and feel to *SWM* that you all currently enjoy.

Here's hoping that both John and Bob enjoy their new jobs.



New Utility Guide

And so on to radio matters... The new edition of *Ferrell's Confidential Frequency List*, is directly responsible recenty, for much loss of my sleep! Not because I've been restless in bed, worrying about it you understand, but due to my late nights updating of this extensively reworked utility listeners reference. I've been carrying on the excellent work of *CFL*'s previous Editor of long standing, Geoff Halligay, who a while back, decided that the 11th edition would be the last that he produced.

CFL 12th edition contains roughly 16000 updated entries, that reflect the changes in the world of utility signals since the last volume was published. I hope that all of you with any interest in utility listening at all, will enjoy the fruits of my labours. It is an honour and a privilage to be associated with such a prestigous title as *Ferrell's Confidential Frequency List*, especially as it represents the part of the hobby I enjoy most. On reflection, you'd be hard pushed to find me listening to a broadcast station in my shack.

Those of you interested in obtaining a copy can find an order form later in this magazine.

Pirate Nostalgia

Andy Cadier has just let me know the following. For those living within range, there is a pirate nostalgia RSL called Radio Mi Amigo on 1503kHz from the Lightship 18 moored at the railway pier at Harwich docks, Essex. Lightship 18 has also been known as the *Mebo 3* whilst broadcasting as Radio North Sea International.
Mi Amigo will be on until 27 April.

A Radio Northsea International RSL is planned from this same ship for 28 days from 28th May.

A Radio London RSL from Clacton Pier is planned for 28 days from August 4th.

I'll be listening out for the RNI station, as a commited fan of the real thing!

That's it from me this month, happy listening.

Vy 73 Kevin

Met 0 - Navy 1

Recent news of a change to the Bracknell (GFA) meteorological facsimile broadcast. The sevice ceased at 1200UTC on Tuesday 3rd April 2001.

The Royal Navy's needs will continue to be met by the Northwood (RN London GYA) facsimile broadcast and this transmission will be taking over some of the GFA frequencies. For reference, here is a shedule for the new service courtesy of Ary Boender of the Netherlands. It seems that the quality of the FAX images of the new service remains as per the Bracknell run service. It seems likely that the same equipment is being utilised.

Fleet Weather And Oceanographic Centre, Northwood, England.
Schedule effective from 1200UTC 3 April 2001.

GYA FAX Frequencies

MHz	UTC
2.6185	0000-2400
8.040	0000-2400
4.610	0000-2400
11.0865	0000-2400

UTC	Product	
0000	FRONTS CENTRES WINDS T 72	1200
0100	FRONTS CENTRES WINDS T 72	1200
0200	FRONTS CENTRES WINDS T 72	1200
0236	SCHEDULE	
0300	SURFACE ANALYSIS	0000
0324	GALE SUMMARY	0300
0400	SURFACE ANALYSIS	0000
0448	500 1000MB THICKNESS ANALYSIS	0000
0500	SURFACE ANALYSIS	0000
0512	500MB HEIGHT ANALYSIS	0000
0524	SURFACE PROG T 24	0000
0536	SCEXA TAFS SUMMER ONLY	0600
0548	SCEXA TAFS CONTINUED	0600
0600	GALE SUMMARY	0600
0612	500 1000MB THICKNESS T 24	0000
0624	500MB HEIGHT T 24	0000
0636	SCEXA TAFS	0700
0648	SCEXA TAFS CONTINUED	0700
0700	GALE SUMMARY	0600
0712	300MB HEIGHT ANALYSIS	0000
0724	300MB HEIGHT T 24	0000
0736	850MB WBPT T 24	0000
0748	SIG WIND AREAS T 24	0000
0800	SURFACE PROG T 24	0000
0812	SIG WIND AREAS T 48	0000
0824	SIG WIND AREAS T 72	0000
0836	SIG WIND AREAS T 96	0000
0848	FRONTS CENTRES WINDS T 48	0000
0900	SURFACE ANALYSIS	0600
0912	FRONTS CENTRES WINDS T 72	0000
0924	SEA SWELL T 24	0000
0936	SPOT WINDS 850MB T 24	0000
0948	SPOT WINDS 700MB T 24	0000
1000	SURFACE PROG T 24	0600
1012	SPOT WINDS 500MB T 24	0000
1024	SPOT WINDS 400MB T 24	0000
1036	SPOT WINDS 300MB T 24	0000
1048	SPOT WINDS 250MB T 24	0000
1100	SURFACE ANALYSIS	0600
1124	FRONTS CENTRES WINDS T 96	0000
1136	FRONTS CENTRES WINDS T 120	0000
1148	GALE SUMMARY	1200
1200	SURFACE ANALYSIS	0600
1212	SST 10 PERCENT ICE EDGE	Mon Thu
1224	LAYER DEPTH	Tue
1236	CZ POTENTIAL	Tue
1248	MINIMUM SOUND CHANNEL DEPTH	Tue
1300	SURFACE PROG T 24	0600
1312	SHIP ICE ACCRETION	0000
	0 DEG C LEVEL T 24	
1324	POOR VISIBILITY T 24	0000
1400	FRONTS CENTRES WINDS T 72	0000
1424	SCHEDULE	
1436	SCEXA TAFS	1500
1448	SCEXA TAFS CONTINUED	1500
1500	SURFACE ANALYSIS	1200
1536	FRONTAL POSITIONS	Thu
1548	GALE SUMMARY	1600
1600	FRONTS CENTRES WINDS T 48	0000
1700	FRONTS CENTRES WINDS T 48	0000
1724	500 1000MB THICKNESS ANALYSIS	1200
1736	SURFACE PROG T 24	1200
1748	500MB HEIGHT ANALYSIS	1200
1800	SURFACE ANALYSIS	1200
1812	500 1000MB THICKNESS T 24	1200
1824	500MB HEIGHT T 24	1200
1836	300MB HEIGHT ANALYSIS	1200
1848	300MB HEIGHT T 24	1200
1900	GALE SUMMARY	1900
1912	SEA SWELL T 24	1200
1924	850MB WBPT T 24	1200
2000	FRONTS CENTRES WINDS T 48	1200
2012	FRONTS CENTRES WINDS T 72	1200
2024	FRONTS CENTRES WINDS T 96	1200
2036	FRONTS CENTRES WINDS T 120	1200
2100	SURFACE ANALYSIS	1800
2112	SIG WIND AREAS T 24	1200
2124	SIG WIND AREAS T 48	1200
2136	SIG WIND AREAS T 72	1200
2148	SIG WIND AREAS T 96	1200
2200	SURFACE PROG T 24	1800
2212	SPOT WINDS 850MB T 24	1200
2224	SPOT WINDS 700MB T 24	1200
2236	SPOT WINDS 500MB T 24	1200
2248	SPOT WINDS 400MB T 24	1200
2300	SURFACE ANALYSIS	1800
2312	SPOT WINDS 300MB T 24	1200
2324	SPOT WINDS 250MB T 24	1200

Light Reading!

TOP QSL

Dear Sir

Much has been discussed in *SWM* with regard to the '1947 wireless telegraphy act' via regular columns such as 'Scanning'. It dawned on me that we are discussing the use of electromagnetic waves - regardless of frequency.

Over the years I do not recall any reference to legislation with regard to the transmission or reception of light! We all transmit light via vehicle lighting, torches, i.r. diodes on TV remotes, etc. Even by viewing the world with our eyes, we are infringement, by receiving 'transmissions of a radio wave which is not within an amateur or licensed frequency'. The increased use of CCTV video could also be construed as unlawful reception and recording of radio waves with possible prosecutions, unless 'this was the evidence in legal proceedings and could be obtained by no other means'.

Ordinary film camera's would also fall victim of such a ruling. It is about time that technology (since 1947) and its uses should be left with us professional amateurs, to peacefully enjoy, without the fear and constraints of antiquated laws.

M. Greatorex
(self confessed d.c. to X-ray listener!)
Flintshire

You must have terrific patience, as I guess you don't hear much at d.c. As for the Wireless Telegraphy act, it is indeed outdated. I feel that there is a compelling case for the legislation of radio monitoring. Surely the responsibility for secure communications is that of the service user. After all, how much interception of tactical mil traffic is 'in the clear' - watch this space for news of what SWM *thinks of the WT Act!* **- Ed.**

Dear Sir

I recently noticed that a knob on one of my valve communication receivers was cracked and as it was built by one of the large American companies, thought I would look them up on the Internet.

Having found their E-mail address, I contacted the company and was informed that they could send me an old 'new' knob for my receiver for $4 plus postage, I received the knob within a few days, it was not quite the correct one, but probably near enough to use.

The reason behind this letter is the fact that they sent it to me via UPS and I was charged a total of $31.41 ($4 for the knob, $5 handling and $22.41 carriage) for a 50p knob. I hope this cautionary tale will alert anyone else thinking of buying from overseas.

When I questioned them about sending a $4 knob via UPS and not by normal post, I was told that in future I should specify to an overseas supplier the method of shipment! I am seriously considering disposing of their equipment and sticking to good old British built Eddystone and KW Electronics, and the like.

Kind Regards.

C. Paul Earland
W. Yorkshire

I often buy small items from overseas and carriage is without doubt a serious factor to consider. Your example is typical in my experience. **- Ed.**

Dear Sir

In the February edition of *SWM*, B.W. Smithers of Middlesex wrote a letter about receiving European classical music stations via satellite. You commented that you thought they were probably WorldSpace stations, but I have an alternative suggestion.

I am a keen listener to satellite radio, both on my Hitachi WorldSpace receiver and to radio channels broadcast on satellite TV services. WorldSpace has currently one classical station, Maestro, which broadcasts in English, and is a refreshing alternative to Classic FM or Radio 3. As the channels Mr Smithers described were broadcast from all over Europe, I believe he was referring to stations on Astra digital satellites at 19.2°E. This is the position of the old Sky analogue service, so cannot be picked up by an ordinary Sky Digital system (which is directed to 28.2°E).

However, with a dual feed dish (I have it focused at 19.2° and 28.2°E for my ordinary Sky Digital Service) and a basic free to air receiver (I use a PC card that cost about £125) you can receive over 120 radio stations (nine classical) from all over Europe, not to mention 100 TV channels from Astra at 19.2°.

With a movable dish, this variety is multiplied many times by being able to access many other satellites. For readers who are interested in receiving a wide variety of broadcast stations in perfect quality, satellite is a great way of doing it.

Nick Harriss
Lincs

*Nick, some years ago (*SWM *August 1994), we published a guide to analogue satellite radio. This is now rather out-of-date, so time for an update.* **- Ed.**

Dear Sir

I have been an avid reader of your magazine for some three years now and as a result I am also a regular reader of *Practical Wireless* and I am now working my way through an RAE correspondence course and hope to have a license by the end of the year. All thanks to your staff and your articles.

I also love all things to do with aircraft and found the NATS Flightpath UK demo incredible. I don't think I will ever go off-line again. However, does it strike anybody else as odd that we will be able to access all this information and yet it is still strictly speaking illegal to listen to airband transmissions?

The NATS website will provide far more information than can be gleaned from a couple of seconds of radio. Isn't it time the whole radio communication interception law was looked at?

Keep up the good work.

Quentin Cruse
Ceredigion

Dear Sir

I'm afraid I can't agree with your correspondent in the March *SWM*. The front cover is always colourful and attractive, but if, as your correspondent says, you have a more colourful logo, then it would just blend in with the rest of the cover.

I'm sure anyone in advertising will agree that a contrast is needed for the logo and the new design is just that. Your graphics department or whoever designed the new logo has done an excellent job.

As an added bonus, I should imagine *SWM* will be more prominent on the display stands. I haven't missed a copy of *SWM* since I retired in 1986, a great journal - many thanks to all who, over the years, have kept the standard so high, it is much appreciated.

Keith Anderson
Isle of Wight

Dear Sir

Having just read Richard Cooper's letter in the March copy of *SWM*, I have to concur with him on *SWM*'s new logo. I really don't care for it much. In my line of work as a design engineer, we are always changing, developing and improving things, but in this case, I preferred the old logo. Having said that, I must add that it is the content of the mag that is important - 'never judge a book...' and all that.

Following on from 'Ed's Comments' on WHSmith now stocking *SWM*, if some people have difficulty getting *SWM*, **why oh why** don't they take out a subscription **or** place a standing order with their local newsagent? I did the latter back in September 1991 and have not missed an issue since!

Keep up the good work with our mag. It's got just the right balance for all levels of listener. Your staff are to be congratulated on a consistently good product every month.

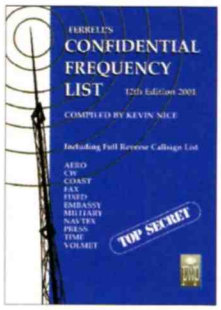
Drew Patton
Senior Design Engineer - Zone Management
Bombardier Aerospace, SHORTS, Belfast

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.

Communiqué

The Ultimate Utility Guide

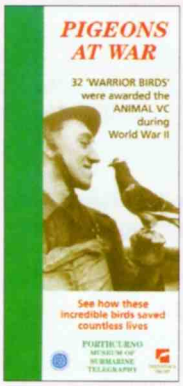


Hot off the press comes the latest issue of *Ferrell's Confidential Frequency List*. This totally updated and expanded h.f. utility 'bible' is packed with the latest info. Now compiled by *SWM* Editor Kevin Nice *Ferrell's Confidential Frequency List* is a must for the utility listener. Featuring a callsign directory section, *Ferrell's Confidential Frequency List* makes it possible to identify additional frequencies in use by a service.

Ferrell's Confidential Frequency List covers Aero stations, both civil and military; ground and aircraft. Maritime, FAX, military networks, Diplomatic transmission and press broadcasts. Time stations, NAVTEX and SAR frequencies go to make up just a selection of the massive coverage. Included for the first time ever are stations using automatic link establishment terminals - ALE.

The 12th Edition of *CFL* contains some 16000 updates. Don't delay, order your copy today by using the priority order form on **page 53** of this issue. The foremost h.f. utility guide - brought to you by the publishers of *Short Wave Magazine*.

Pigeons At War



During the Second World War, 32 'Warrior Birds' were awarded medals for outstanding service. This year's summer exhibition at the **Museum of Submarine Telegraphy** tells the unusual and fascinating story of how these incredible pigeons carried secret communications and saved many lives.

Visitors to 'The Flying Telegraph' can learn the history of pigeon communications in times of war and discover how the secret messages were carried. Hundreds of photographs show how the birds were transported in aircraft and at sea and record the tales of their bravery.

The exhibition is open from 1 April to 26 October 2001 - closed Saturdays, except July and August when open seven days a week. From November, open Mondays only. Admission from 1000 till 1700 (last admission 1600). Admission to the exhibition is included in the standard museum ticket price, which is £4 adults, family £10.50, concessions £3.50, students £2.50 and children £1.80.

For more information on the exhibition and other developments at the museum this summer, such as a new radio display, special events and educational and family activities, please contact **Mary Godwin** on **(01736) 810478** or **Catherine Seigneret** on **(01736) 810811** or visit the web site at **www.porthcurno.org.uk**

WRN Carries Voyager

Contemporary music network Radio Voyager, the only commercial English-language service to broadcast 24/7 from the USA to Europe, has extended its contract with **World Radio Network** (WRN) for stereo transmission via WRN's new DVB channel on the Eutelsat *Hot Bird 5* satellite.

Radio Voyager is a 24-hour a day, seven-day a week audio service that, like WRN, converges Internet broadcasting with traditional radio for global reach. The English-language service - with its contemporary adult music, live news and socially conscious informational programming - reaches its audience via f.m. stations and *Hot Bird 5* in the USA, Europe, Africa and beyond.

WRN's digital radio multiplex on *Hot Bird 5*, launched in September 2000, will eventually carry up to forty national and international stations broadcasting a wide range of news, current affairs, magazine, commercial, classical and specialist music programming in digital quality audio aimed at a potential audience of 81 million homes across Europe, North Africa and the Middle East. All these stations will be easily accessible to listeners via satellite dish and digital receiver.

The Radio Voyager programming reaches London via WRN's 'Atlantic Crossing' service, which is a fibre-optic circuit from one of several hubs in the USA that broadcasters can feed into. This highly cost-effective service provided by WRN is also used by National Public Radio, Voice of America, Radio Canada International (a division of CBC) and Overcomer Ministry.

WRN's multiplex is available via Eutelsat *Hot Bird 5* at 13°E, on transponder 94 (12.597GHz), vertical polarisation.

New Release

Mark Thirkettle of **MGT Publishing** has recently sent in his latest frequency guide (and updated magazine) to *SWM*. ***Military Air Scan 2001 HF/VHF/UHF/SATCOM Frequency Guide, Callsign, Serial & SELCAL Directory*** is the ultimate airband guide.

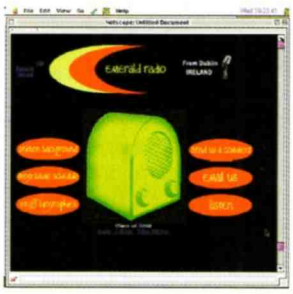
This directory is also the **only** UK guide with access to a regular update, courtesy of MGT Publishing's quarterly journal - ***Military Air Scan Network News*** - which covers all frequency, callsign, serial and SELCAL updates, so monitors are always up-to-date with the latest news concerning the hobby. *MASNN* is not just an update either, all aspects of military monitoring are covered, including, logs, news, radio reviews and aviation/radio related web sites.

Military Air Scan 2001 HF/VHF/UHF/SATCOM Frequency Guide, Callsign, Serial & SELCAL costs £14.99 (UK), £16.99 (Europe/Rest of World). For more information about subscription rates and

Emerald Radio

For the 5th year in a row, **WWCR** is working with Ballyfermot College in Ireland, to broadcast their programs on international short wave radio. Students from Senior College, Ballyfermot, will broadcast to the world on their own radio station, **Emerald Radio**, between Monday 30 April and Friday 4 May 2001. Programs will be relayed from Dublin live via 'phone lines to WWCR in Nashville, Tennessee, USA. These broadcasts will be at 1100 Irish time, 1000UTC. At the same time, programs will be broadcast on the student's own web site **www.emeraldradio.com**

Emerald Radio is a project undertaken by second year radio and journalism students at Senior College, Ballyfermot. All production, presentation and research are undertaken by students as are the financing and the management of the station. Emerald Radio programs will be broadcast on the following schedule:



Date	Time (UTC)	Frequency (MHz)	Notes
30 April - 4 May	1000-1100	9.475	Live
		5.070	Live (simulcast)
5 May	1100-1300	5.070	Recorded broadcast
6 May	1100-1300	5.070	Re-airing of recorded broadcast

WWCR (World Wide Christian Radio) which serves Europe, the Middle East and Africa on short wave, is the sister station to WNQM, 1300-AM, all located in Nashville, Tennessee. More information from **http://www.wwcr.com**

savings, contact **MGT Publishing at PO Box 564, Norwich NR7 8DD** or check out their web site at **www.militaryairscan.com**

New Arrival

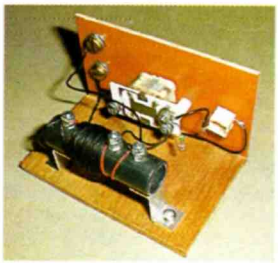
The Saga of Marconi Osram Valve - A History of Valve-Making by Barry Vyse & George Jessop is now stocked by the *SWM* Book Store. The book is extremely well researched, well written and reflects the co authors' interest and dedication to the subject. A must for any valve enthusiast, let alone the amateur historian. You can now purchase this softback version for **£25**.

Lake's Novice Crystal Set

Designed particularly with the youngster (or, come to that, the oldster with a touch of the nostalgics!) in mind, the **Novice Crystal Set** brings back something of the flavour of the 1920s. Unfortunately, original style components can no longer be obtained except as relatively high-priced and rare, vintage items. So Alan is obliged to use their modern counter parts. Nevertheless, there is no need for soldering.

All connections are made to screw terminals. The 3.5mm jack socket has fly-leads already fitted, the tuning capacitor has a small terminal board attached. Instead of a pair of high resistance headphones, a crystal earpiece is used instead. The lump of shiny Galena, with its famous cats-whisker, is replaced by a germanium diode clearly less romantic but more efficient!

All parts of the kit are supplied, including the smart front panel. The only thing you will have to find will be a small piece of wood for the base-board. Don't expect to listen to the world on this receiver, but you will definitely have great fun in building it. You will also be able to tune in a few strong stations, given a reasonable antenna and earth.



Experience some of the fascination of those early days even though 2LO is no longer with us! Treat yourself to a little bit of nostalgia for just £8 plus £1 postage. More details from **Lake Electronics** at **7 Middleton Close, Nuthall, Notts NG16 1BX, Tel: 0115-938 2509.**

Rally & Boot Sale

The **Leeds & District Amateur Radio Society** are holding their twice yearly traditional outdoor rally and car boot sale on **Sunday 17 June** and **Sunday 19 August** at the Yarnbury Rugby Club, Brownberrie Lane, Horsforth, Leeds. Contact **J. Mortimer M0JAM** on **(01943) 874650** for details. Sellers cars (inc. small trailer) will be £5 with vans/large trailers being charged £10. There will be plenty of free parking for buyers.

Callsign 2001

This latest, 7th edition of ***Callsign 2001*** has many changes, in fact, almost 3000 changes have been made to the book since last year, including a significant number of additions and deletions. The military database has been rationalised around the NATO air-arms plus a few other regular visitors to the UK.

For the first time since its inception, *Callsign* has not increased in size this year, not because of a lack of new information, but because parts of the Military database have been extensively reviewed, and obsolete information has been deleted. A definite must for your bookshelf, order your copy now from the *SWM* Book Store for **£9.95**.

Chatham Navy Days

Members of several local radio clubs are uniting to put on an exhibition station at this year's Navy Days. **Navy Days 2001** are being held at the Old Naval Dockyard, Chatham, Kent, during the May Bank Holiday Weekend 26/27/28th.

Members of the following clubs who will assist in running the station are: BAe Systems ARC, Rochester; Bredhurst Receiving & Transmitting Society (BRATS); Medway Amateur Receiving & Transmitting Society (MARTS) and the North Kent ATV Group. Hopefully the callsign **GB0CHD** (Chatham Historic Dockyard) will be in use, and operation will be on all bands and modes wherever possible. More information from **P. Carey G3UXH** on **(01634) 250562**.

CLUB CORNER

The **Bangor & District Amateur Radio Society** meet on the first Wednesday of the month in The Stables, Groomsport, County Down, at 2000. Please note that this is a new venue. On Wednesday 2 May 2001 they are hosting a talk by Peter GI7JYK on '6m - The Magic Band'. This should be an interesting evening and as always, new members and visitors are most welcome. More information from **Mike GI4XSF** on **0284-277 2383** or visit the club's website at **http://welcome.to/bdars**

The **Midland Amateur Radio Society** are holding their **Drayton Manor Radio & Computer Rally** at Drayton Manor Park, Fazeley, Tamworth, Staffs. The main traders will be in four marquees. There will also be a large outside traders flea market, a Bring & Buy, local clubs and societies, special interest stands and much more. Doors open 1000 onwards. Trader information from **Norman G8BHE** on **0121-422 9787** or mobile on **(07730) 132726** or general information from **Peter G6DRN** on **0121-443 1189**.

Members of the **South Bristol Amateur Radio Club** have many meetings planned throughout the year. A few up and coming events planned so far are: May 2 - 20m Activity Evening + CM, May 9 - HF Workshop For Newcomers, May 16 - Annual Maintenance Of Club Antennas and May 23 - On The Air Evening. More information from **Len Baker** on **(01275) 834282** (24 hour answerphone).

The **Wakefield & District Radio Society** meet Tuesdays at 2000 at the Ossett Community Centre, Prospect Road, Ossett, W. Yorks. May 1st is their on the air/natter night, May 8th - AGM, May 15th - Visit (tba), May 22nd - another on the air/natter night. More information from **John G7JTH** on **(01924) 251822** or visit their web page at **http://www.sandalmagna.co.uk/wdrs**

The **Reading & District Amateur Radio Club** meet on the 2nd Thursday of each month. On Thursday 10th May there is a report on the recent DXpedition D68C by Don Field G3XTT - this is being held at the Pavilion Woodford Park, Woodley, Reading, commencing at 2000. More details from **Peter G8FRC** on **0118-969 5697** or visit their web page at **www.radarc.org**

The **Radio Society of Harrow** meet on Fridays at 2000 for 2030 at the Harrow Arts Centre. April 27th there is a debate of the proposed future of amateur radio licensing, May 4th is an informal meeting, May 11th another talk, this time on a history of herbal remedies and on the 18th is the Club Dinner at Vine Taverna. More information from **Jim Ballard G0AOT** on **(01895) 476933** (home) or daytime on **0207-278 6421** or E-mail: **g0aot@thersgb.net**

rallies

April 29: The Lough Erne Amateur Radio Club are holding their rally at the Killyhevlin Hotel, Dublin Road, Enniskillen, Co. Fermanagh from 1200. More information from **Frank GI3ZMX** on **028-6632 9507. Note the change of date.**

April 29: The Cambridgeshire Repeater Group are holding their annual rally at Bottisham Village College, Bottisham, which is six miles east of Cambridge, access is via A14 and A1303. Features include a large hall, car boot sale, Bring & Buy and their renowned auction of radio and electronic equipment. Doors open at 1030 and admission is £1.50. Refreshments will be available as will a talk-in on S22. Details from **Paul Dyke G0LUC** on **(01462) 683574**.

May 7: The Dartmoor Radio Rally is to be held at Pannier Market, Tavistock, Devon - in the same new location as last year, giving plenty of space for traders to display their wares and visitors to see them and talk to old friends. There is access for disabled visitors and plenty of free public car parking within five minutes walking distance. There will be trade stands, a Bring & Buy and refreshments, etc. Doors open 1030 (1015 for disabled visitors). Talk-in on S22. Why not bring the family, there are some lovely views of Dartmoor - ideal for picnics. More information from **Ron G7LLG** on **(01822) 852586**.

May 13: The Dunstable Downs Radio Club will be holding its 18th Annual National Radio Car Boot Sale at Stockwood Country Park, Luton, Bedfordshire. Doors open 0900 'till 1500. Leave M1 at junction J10 and follow signs for 'The Mossman Collection'. Talk-in on S22. More information from **www.ddrcbootsale.freeserve.co.uk** or write to **DDRC, PO Box 4053, Dunstable, Beds LU5 5ZJ** enclosing an s.a.e., FAX enquiries to **(01525) 383898** or E-mail: **ddrc@magstripe.demon.co.uk**

May 20: The Drayton Manor Radio & Computer Rally will take place at Drayton Manor Park, Fazeley, Tamworth, Staffs, on the A4091. Main traders will be in four marquees, there will also be a large outside traders flea market, Bring & Buy stall, local clubs and special interest stands. Doors open from 1000 onwards. Trader information from **Norman** on **0121-422 9787**, other information from **Peter G6DRN** on **0121-443 1189** - evenings please.

May 20: The Mid Ulster Amateur Radio Club are holding their rally at the Silverwood Hotel, Lurgan, Co. Armagh, starting from 12 noon. There will be trade stands, a Bring & Buy plus a talk-in on S22. More details from **Jim GI0OND** on **0283-885 1179**.

June 3: The Mid Lanark Amateur Radio Society are holding a ham radio tram ride event. Taking place at Summerlee Heritage Park, Heritage Road, Coatbridge, North Lanarkshire ML5 1QD, Scotland. Features will include talks on talks, radio traders, bring & buy, catering, parking and talk-in on S22. For table bookings contact **Kate Dargie** on **(01236) 431261** or FAX: (01236) 440429. For more info contact **John Neary GM0XFK** on **(01698) 822860.**

June 10: The Windermere Steamboat Museum Amateur Radio Society are holding a mobile radio meeting. This is a new event celebrating the users of mobile radio in the Lake District, with exhibits by Army, Air Force, Police, Fire, Mountain Rescue Teams and Park Rangers, set against the Museum's exhibits of working steam launches. A great family attraction. All users, or those who have an interest in mobile radio, are invited to attend, bring your radio with you! Gates open 1000 and admission to museum is £3.50. **Roy G0TAK** on **(01253) 862262**.

If you're travelling a long distance to a rally, it could be worth 'phoning the contact number to check all is well, before setting off. The Editorial Staff of *SWM* cannot be held responsible for any information on Rallies, as this is supplied by the organisers and is published in good faith as a service to readers. If you have any queries about a particular event, please contact the organisers direct. Editor

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

LM&S

The prospect of using a home-built crystal set as the main receiver during a medium wave contest would be considered daunting by most competitors these days, but that is exactly what a listener in Walton-on-Thames did during February - see report below.
The construction of crystal sets, also simple regenerative receivers, is almost a forgotten art, but from past experiences I know that such activities can result in a great deal of pleasure at little cost. A book entiled *Crystal Radio History And Design* by P.A. Kinzie can be purchased from the *SWM* Book Store - see 'Book Profiles', page 81 *SWM* April 2001.

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 February.

Favourable conditions for the reception of Rikisutvarpid (RUV) in Reykjavik via their 300kW outlet at Gufuskalar, W.Iceland, on **189kHz** were observed during the early hours of February 5 by **Simon Hockenhull** in E.Bristol. He logged the transmission as SINPO 25342 at 0046UTC.

Reception after midnight of the RUV outlet at Gufuskalar on **189kHz** was also mentioned in the reports from **Eddie McKeown** (Newry) and **Ernie Strong** (Ramsey, Cambs). Their SINPO ratings were respectively 34343 and 22342.

Medium Wave Reports

Listeners who searched the band at night for broadcasts from m.w. stations in E.Canada and E.USA were no doubt disappointed by the poor propagation conditions they encountered. The only report of a definite ident being received came from **Richard Reynolds** in Guildford, who picked up a broadcast from CJYQ in St.John's, NF on **930kHz** at 0010UTC on the 27th. The transmission peaked SINPO 23433. He also heard stations on **590** and **880kHz**, which sounded N.American, but was unable to obtain their ident.

The sky waves from quite a few of the m.w. stations in the Middle East, N.Africa, Europe and Scandinavia were received after dark - see chart. Perhaps the most interesting log was compiled during the period 16th to 24th by **Philip Miller Tate** (Walton-on-Thames) because all of the entries were received on a home-built high performance crystal set plus 40m wire antenna during the third international 'Elmer' crystal radio DX contest! Philip says "Under the contest rules, all stations must be clearly heard on an unaided crystal set, but a superhet may be used to aid station identification. In this case, a Roberts R809 was used for this purpose with either the internal ferrite rod or a small loop aerial". All but seven of the stations in his list were detected with a galena and cat's whisker combination.

During a weekend break at a farm near Coverack on the Lizard peninsular, **Simon Hockenhull** used a battery powered Roberts R617 portable to search the band. Despite interference from electric fences and low energy light bulbs he logged a surprising number of European stations during daylight. Twelve local radio stations were also identified - see charts.

While visiting Messingham, N.Lincolnshire, during the weekend of 24th & 25th, **Brian Keyte** (Gt.Bookham) searched the band with his AOR AR7030 receiver plus home-built loop and logged sixty-four local radio stations during daylight - see chart. He says "I find it is always interesting to test the different reception conditions around the country".

Long Wave Chart

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

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) Eddie McKeown, Newry.
(D) George Millmore, Wootton, IoW.
(E) Fred Pallant, Storrington.
(F) Ernie Strong, Ramsey, Cambs.
(G) Fred Wilmshurst, Northampton.

Short Wave Reports

The broadcasts in the **25MHz (11m)** band from Deutsche Welle (DW) on **25.740** (Ger to S/SE.Asia 0800?-1600?) and R.France International (RFI) on **25.820** (Fr to E/C.Africa 0900-1300) continued during February, but there were no reports to indicate how well they were received in those areas.

The SINPO ratings quoted by listeners in the UK varied considerably. Those for DW were 43333 at 0830 by **Vic Prier** in Colyton; 55544 at 0854 in Guildford; 35522 at 0925 in E.Bristol; 45344 at 0954 in Newry; 25333 at 1028 by **Fred Pallant** in Storrington; 35343 at 1035 by **Fred Wilmshurst** in Northampton; 33222 at 1105 by **Robert Hughes** in Liverpool; 44444 at 1305 by **Robert Connolly** in Kilkeel.

Those for RFI were 42533 at 0900 in Colyton, with loud echo on the 4th; 35522 at 0920 in E.Bristol; 35232 at 0952 in Newry; 55544 at 1015 in Guildford; 25333 at 1029 in Storrington; 33333 at 1105 in Liverpool; 35343 at 1202 in Northampton; 34443 at 1250 in Kilkeel.

Although most broadcasters seem reluctant to take advantage of the propagation conditions in the 11m band, many are making good use of the **21MHz (13m)** band and quite a few of their broadcasts to listeners in selected areas reach our shores. During the early morning R.Australia's transmission from Shepparton on **21.725** (Eng to Pacific areas 0200-0900) may be received here - it was rated 24242 at 0831 in Northampton. From 0900 they beam to Asia on **21.820** (Eng 0900-1400) - rated 22332 at 0910 in Colyton and 24333 at 1202 by **Rhoderick Illman** in Oxted.

Also received here before noon were R.Finland via Pori **21.670** (Eng to Australia, Asia, W.Eur 0730-0800), rated 44433 at 0740 by **Stan Evans** in Herstmonceux; Swiss R.Int via Sottens **21.770** (Eng, It, Ger, Fr to Near East, Africa 0830-1030) 44433 at 0830 by **Sheila Hughes** in Morden; R.Pakistan **21.465** (Ur, Eng to Eur) 33242 at 0845 in Colyton; Vatican R, Italy **21.815** (Eng, during the inauguration of new Cardinals on February 22) 54444 at 0915 in Morden & 45555 at 0955 in Northampton; R.Prague, Czech Rep **21.745** (Eng to E.Africa, S.Asia 1000-1030) 33333 at 1025 by **Thomas Williams** in Truro; VOIRI Tehran **21.470** (Eng to Australia 1100-1230) 43334 at 1100 by **Gerald Guest** in Dudley; Vatican R, Italy **21.850** (Various to Lat.America?) 44444 at 1100 in Truro; R.Portugal Int via Sines? **21.830** (Port to Brazil? 1100?-1300) 54444 at 1115 in Liverpool; HCJB Quito, Ecuador **21.455** (Eng [u.s.b]) 54544 at 1118 in Guildford.

After mid-day the BBC via Ascension Is **21.470** (Eng to E/S.Africa 1300-1900) was 34443 at 1315 in Kilkeel; Channel Africa, Johannesburg **21.725** (Eng to Africa, Eur? 1300?-1455) 44444 at 1315 by **David Hall** in Morpeth; UAER, Dubai on **21.605** (Eng to Eur 1330-1350) 55444 at 1330 in E.Bristol; BBC via Cyprus **21.660** (Eng to Africa 1400-1700) 45554 at 1455 by **David Edwardson** in Wallsend; UAER, Dubai **21.605** (Eng to Eur 1600-1640) 33232 at 1607 in Newry; WYFR via Okeechobee, USA **21.525** (Eng, Fr to Eur, Africa 1600-1900) 43333 at 1610 by **Bernard Curtis** in Stalbridge; WYFR Okeechobee, USA **21.455** (Fr, Ger, Eng to Eur 1600-2100?) 24432 at 2005 by **Peter Pollard** in Rugby.

Although the **18MHz (15m)** band is intended for single sideband (s.s.b.) broadcasting in the future almost all of the present occupants are using amplitude modulated (a.m) transmissions. Mentioned in the reports were R.Sweden on **18.960** (Eng, Sw to N.America 1230-1430), rated 55555 at 1240 in Herstmonceux & 55545 at 1346 in E.Bristol; VOA via Greenville, USA **18.275** (Eng [s.s.b.] Sun Only) 54435 at 1415 in Stalbridge; WYFR Okeechobee, USA

Tropical Bands Chart

Freq (MHz)	Station	Country	UTC	DXer
2.310	ABC Alice Springs	Australia	2049	J
2.390	Voz de Atitlan	Guatemala	0055	A
3.240	TWR Shona	Swaziland	1803	M,N
3.255	BBC via Meyerton	S.Africa	2110	I,J,M,N
3.270	Namibian BC,Windhoek	Namibia	1920	A,I,M
3.300	R.Cultural	Guatemala	0236	A,I,N
3.315	AIR Bhopal	India	0055	A
3.316	SLBS Goderich	Sierra Leone	2018	J
3.320	SABC (RSG) Meyerton	S.Africa	1823	A,N
3.335	CBS Taipei	Taiwan	2212	A,H,J,M,N
3.345	AIR Jaipur	India	0100	A
3.356	R.Botswana	Gabarone	2116	I
3.365	GBC R-2	Ghana	2109	A,J,M,N
3.365	AIR Delhi	India	1820	J
3.915	BBC via Kranji	Singapore	2100	A,I,M,N
3.955	R.Taipei via Skelton	England	1800	C,I,L
3.965	RFI Paris	France	2100	B,F,I
3.975	R.Budapest	Hungary	2111	B,H,I
3.975	R Korea via Skelton	England	2200	A,I,L
3.985	Nexus, Milan	Italy	2234	A,H,I
3.985	SRI Beromunster	Switzerland	1953	F
3.995	DW via Julich	Germany	2235	A,H,I
4.035	Xizang PBS, Lhasa	Tibet	0030	E
4.760	AIR Port Blair	India	1750	A,J
4.760	ELWA Monrovia	Liberia	1937	N
4.765	R.Rural, Santarem	Brazil	0811	N
4.770	FRCN Kaduna	Nigeria	2210	H,I,M,N
4.775	AIR Imphal	India	1629	A,N
4.783	RTM Bamako	Mali	2116	A,E,I,J,M,N
4.790	Azad Kashmir R.	Pakistan	1719	F,J,N
4.800	AIR Hyderabad	India	1719	E,F,J,M
4.800	LNBS Maseru	Lesotho	1824	N
4.815	R.diff TV Burkina	Ouagadougou	2345	A
4.820	R.Botswana, Gaberone	Botswana	1955	E,G
4.820	Xizang, Lhasa	China	0020	A
4.820	La Voz Evangelica	Honduras	0233	I
4.820	AIR Calcutta	India	1750	J
4.825	R.Cancao Nova	Brazil	0605	E
4.835	ABC-Alice Springs	Australia	2134	J
4.840	AIR Bombay	India	1718	E,J
4.845	ORTM Nouakchott	Mauritania	2135	A,E,F,G,H,I,J,M,N
4.850	R.Yaounde	Cameroon	1900	E,I,M
4.850	AIR Kohima	India	1617	M,N
4.860	AIR Delhi	India	1818	J,M,N
4.875	R.Roraima, Boa Vista	Brazil	0030	A
4.880	AIR Lucknow	India	0045	A,J,N
4.885	R.Clube do Para	Brazil	0230	E,I,N
4.885	KBC East Sce Nairobi	Kenya	2122	I
4.890	RFI Paris	via Gabon	0400	I
4.895	R.IPB AM C'po Grande	Brazil	0656	N
4.895	AIR Kurseong	India	1549	N
4.895	Pakistan BC	Pakistan	1717	I,J
4.900	Haixia 2,V of Strait	China	2122	H,J
4.900	SLBC Colombo	Sri Lanka	1641	N
4.905	Anhanguera	Brazil	0712	N
4.910	Tennant Creek	Australia	2136	J,N
4.910	AIR Jaipur	India	0037	F,J,N
4.915	R.Difusora, Macapa	Brazil	0805	E
4.915	GBC-1, Accra	Ghana	1920	A,D,E,H,I,J,M,N
4.915	KBC Cent Sce Nairobi	Kenya	0552	N
4.920	R.Quito, Quito	Ecuador	0713	N
4.920	AIR Chennai	India	0040	A,E,F,N
4.925	R.Nacional, Bata	Eq.Guinea	2225	E,N
4.935	KBC Gen Sce Nairobi	Kenya	1751	J
4.940	SLBC (Eng.Comm.Svce)	Sri Lanka	0035	A
4.945	R.Illimani, La Paz	Bolivia	2305	N
4.945	R.Difusora	Brazil	0030	A
4.950	AIR Srinagar	India	1714	J,K
4.950	VOA via Sao Tome	Sao Tome	2116	D,G,I,J,L,M,N
4.960	VOA via Sao Tome	Sao Tome	0259	I,N
4.965	R.Alvorada	Brazil	0035	A
4.965	Christian Voice	Zambia	1612	J
4.970	AIR Shillong	India	1612	A,J
4.975	R.Mundial, Sao Paulo	Brazil	0807	N
4.975	R.Uganda, Kampala	Uganda	1900	D,I,J,M,N
4.980	Ecos del Torbes	Venezuela	0050	A,D,E,F,I,N
4.985	R.Brazil Central	Brazil	0227	I
4.990	Hunan 1, Changsha	China	2213	N
4.990	R.Ancash, Huaraz	Peru	0557	N
5.005	R.Nacional, Bata	Eq.Guinea	2042	J
5.009	R.TV Malagasy	Madagascar	1730	J
5.010	R.Garoua	Cameroon	2138	J,N
5.010	Guangxi 2, Nanning	China	2112	J,N
5.010	AIR Thiru'puram	India	1624	N
5.020	La V du Sahel,Niamey	Niger	2023	I,J,M,N
5.025	ABC Katherine	Australia	2135	J
5.025	R.Parakou	Benin	1817	H,J,N
5.025	R.Rebelde, Habana	Cuba	0339	A,I,N
5.025	R.Uganda, Kampala	Uganda	1905	D,I,J,N
5.030	RTM Kuching	Sarawak	2130	I,J
5.040	PBS Fujian, Fuzhou	China	2313	N
5.047	R.Togo, Lome	Togo	2130	A,H,I,J,M,N
5.050	Haixia 1,V of Strait	China	2111	J,N
5.050	R.Tanzania	Tanzania	0330	I,N
5.055	Faro del Caribe	Costa Rica	0826	N
5.055	RFO Cayenne(Matoury)	French Guiana	0225	A,I
5.060	PBS Xinjiang, Urumqi	China	1517	N
5.100	R.Liberia, Totota	Liberia	1937	M

DXers:-
(A) Robert Connolly, Kilkeel.
(B) Bernard Curtis, Stalbridge.
(C) Stan Evans, Herstmonceux.
(D) Bill Griffith, W.London.
(E) David Hall, Morpeth.
(F) Simon Hockenhull, E.Bristol.
(G) Robert Hughes, Liverpool.
(H) Rhoderick Illman, Oxted.
(I) Eddie McKeown, Newry.
(J) Fred Pallant, Storrington.
(K) John Parry, Larnaca, Cyprus.
(L) Clare Pinder, while in Appleby.
(M) Vic Prier, Colyton.
(N) Richard Reynolds, Guildford.

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

Listeners:-
(A) Alvin Challen, Ashstead, Surrey.
(B) Robert Connolly, Kilkeel.
(C) Simon Hockenhull, E.Bristol.
(D) Simon Hockenhull, while nr Coverack.
(E) Sheila Hughes, Morden.
(F) Rhoderick Illman, Oxted.
(G) Brian Keyte, while in Messingham, N.Lincs.
(H) Philip Miller Tate, Walton-on-Thames.
(I) George Millmore, Wootton, IoW.
(J) Ernie Strong, Ramsey, Cambs.
(K) Fred Wilmshurst, Northampton.

Local Radio Chart

Freq (kHz)	Station	ILR BBC	e.m.r.p (kW)	Listener
558	Spectrum, London	I	0.80	C,G,H*,I,J,K
585	R.Solway	B	2.00	B,G
603	C.G,Litt'brne	I	0.10	E,F,G,H*,I,J,K
630	R.Bedfordshire(3CR)	B	0.20	B,C,G,H,I,J,K
630	R.Cornwall	B	2.00	B,I
657	R.Clwyd	B	2.00	B,G,I,J,K
657	R.Cornwall	B	0.50	B,I
666	Cl.Gold 666, Exeter	I	0.34	C,D,I,J,K
666	R.York	B	0.80	B,G,J
729	BBC Essex	B	0.20	G,I,J,K
738	Hereford/Worcester	B	0.037	C,G,I,J,K
756	R.Cumbria	B	1.00	G,J
756	The Magic 756,Powys	I	0.63	G,I,J,K
765	BBC Essex	B	0.50	C,G,I,J,K
774	R.Kent	B	0.70	G,I,J,K
774	R.Leeds	B	0.50	B,G
774	Cl.Gold 774, Glos	I	0.14	G,I,K
792	Cl.Gold 792,Bedford	I	0.27	F,G,I,J,K
792	R.Foyle	B	1.00	B
801	R.Devon	B	2.00	B,C,D,G,I,J
828	Cl.Gold 828, Luton	I	0.20	C,H,J,K
828	Magic 828, Leeds	I	0.12	G
828	Asian Netwk Sedgley	B	0.20	G
828	2CR Cl.G Bournem'th	I	0.27	C,D,I
837	R.Cumbria/Furness	B	1.50	B
837	Asian Netwk Leics	B	0.45	I,J,K
855	R.Devon	B	1.00	I
855	R.Lancashire	B	1.50	B,J
855	R.Norfolk, Postwick	B	1.50	E,F,G,J
855	Sunshine 855,Ludlow	I	0.15	C,E,G,K
873	R.Norfolk, W.Lynn	B	0.30	E,F,G,I,J,K
936	Brunel CG, W.Wilts	I	0.18	I,J,K
936	Fresh AM, Hawes	I	1.00	B,G
945	Cl.Gold GEM, Derby	I	0.20	B,G,J,K
945	Capital G, Bexhill	I	0.75	B,E,F,I
954	Cl.Gold 954 via ?	I	?	J
954	Cl.Gold 954,Torquay	I	0.32	D,G,I
954	Cl.Gold 954, H'ford	I	0.16	B,C,K
963	Asian Sd, E.Lancs	I	0.80	B,G
963	Liberty R, Hackney	I	1.00	G,H,I,J,K
972	Liberty R, Southall	I	1.00	B,G,H*,I,J,K
990	R.Devon, E.Devon	B	1.00	B,D,I
990	Magic AM,Doncaster	I	0.25	G,J
990	Cl.G, Wolverhampton	I	0.09	J,K
999	C.Gold GEM Nott'ham	I	0.25	G,J,K
999	Magic 9-99 P'stn	I	0.80	B,G
999	R.Solent	B	1.00	D,F,I
1017	Cl.G,WABC,Shr'shire	I	0.70	B,G,J,K
1026	R.Cambridgeshire	B	0.50	E,F,G,J,K
1026	Downtown R, Belfast	I	1.70	B
1026	R.Jersey	B	1.00	D,I
1035	RTL C'try(Ritz)1035	I	1.00	H*,I,J,K
1035	R.Sheffield	B	1.00	J
1035	N.Sound 2, Aberdeen	I	0.78	B
1116	R.Derby	B	1.20	G,J,K
1116	R.Guernsey	B	0.50	D,F,I
1116	Valley R, Ebbw Vale	I	0.50	C
1152	Cl.G Amber, Norwich	I	0.83	G,J
1152	LBC 1152 AM	I	23.50	H*,I,J,K
1152	Pic'ly 1152,Manch'r	I	1.50	B
1152	Cl.G, Plymouth 1152	I	0.32	D
1152	Cl.G, Birmingham	I	3.00	C,G,K
1161	R.Bedfordshire(3CR)	B	0.10	J
1161	Brunel Cl.G,Swindon	I	0.16	K
1161	Magic 1F, Goxhill	I	0.35	B,G
1161	Southern Counties R	B	1.00	F,I,K
1170	Cl.G Amber, Ipswich	I	0.28	J
1170	Magic 1170,Stockton	I	0.32	B,G
1170	Capital G,Portsm'th	I	0.50	B,F,I
1170	Signal 2,Stoke-on-T	I	0.20	G
1170	1170AM,High Wycombe	I	0.25	J,K
1242	Capital G,Maidstone	I	0.32	E,F,I
1251	C.G Amber,Bury StEd	I	0.76	B,F,G,J
1260	Brunel CG, Bristol	I	1.60	I
1260	Marcher G, Wrexham	I	0.64	B
1260	SabrasSnd,Leicester	I	0.29	G,J,K
1260	R.York	B	0.50	G
1278	Cl.Gold 1278 W.York	I	0.43	G,J
1296	Radio XL,Birmingham	I	5.00	B,C,G,I,J,K
1305	Magic AM,Barnsley	I	0.15	B,G
1305	Premier via ?	I	0.50	H*,I,J,K
1323	Capital G,Southwick	I	0.50	E,F,I
1323	SomersetSnd,Bristol	B	0.63	B
1332	Premier, Battersea	I	1.00	I
1332	Cl.Gold 1332,Pt'bo	I	0.60	G,J,K
1332	Wiltshire Sound	B	0.30	I
1359	Breeze, Chelmsford	I	0.28	F
1359	Cl.Gold 1359, C'try	I	0.27	B,E,G,J,K
1359	R.Solent,Bournem'th	B	0.85	I
1368	R.Lincolnshire	B	2.00	G,J,K
1368	Southern Counties R	B	0.50	E,I
1368	Wiltshire Sound	B	0.10	I
1377	Asian Sd, Rochdale	I	0.10	G
1413	R.Gloucester via ?	B	?	G,K
1413	Premier via ?	I	0.50	H*,I,J
1413	Fresh AM, Skipton	I	0.10	B,G,J
1431	Breeze,Southend	I	0.35	F,J
1431	Cl.Gold, Reading	I	0.14	E,I,K
1449	R.Peterboro/Cambs	B	0.15	B,G,J,K
1458	R.Cumbria	B	0.50	B
1458	R.Devon	B	2.00	B,D,I
1458	1458 Lite AM Manch'	I	5.00	G
1458	R.Newcastle	B	2.00	G
1458	Sunrise, London	I	50.00	C,G,H*,I,J,K
1458	Asian Netwk Langley	B	5.00	C,G,K
1485	Cl.Gold, Newbury	I	1.00	C,J,K
1485	R.Humberside (Hull)	B	1.00	G,J
1485	R.Merseyside	B	1.20	B,I
1485	Southern Counties R	B	1.00	D,F,I
1503	R.Stoke-on-Trent	B	1.00	B,G,I*,J,K
1521	Breeze, Reigate	I	0.64	A*,G*,H,I,J,K
1530	R.Essex, Southend	B	0.15	J
1530	Cl.Gold W.Yorks	I	0.74	B,G,J
1530	Cl.Gold Worcester	I	0.52	K
1548	R.Bristol	B	5.00	D,I
1548	Capital G, London	I	97.50	F,H*,I,J
1548	Magic1548,Liverpool	I	4.40	B,G
1557	R.Lancashire	B	0.25	B,G
1557	Cl.Gold C7,N.hant	I	0.76	G,J,K
1557	Capital G, So'ton	I	0.50	F,I
1566	CountySnd,Guildford	I	0.50	F,G,H,I
1584	R.Nottingham	B	1.00	G,J,K
1584	R.Shropshire	B	0.50	B
1602	R.Kent	B	0.25	G,I

18.980 (Eng to Africa, Eur 1600-2200?) 45343 at 1615 in Newry; Christian Science BC via WSHB Cypress Creek **18.910** (Fr, Eng to E/C.Africa 1600-2000) 45343 at 1705 in Northampton; R.Denmark via R.Norway **18.950** (Da to N.America & Caribbean 1730-1800) 44444 at 1740 in Colyton.

Good reception over long distances has been noted in the **17MHz (16m)** band. R.Australia via Shepparton on **17.750** (Eng to Asia 0000-0500, 0600-1100) was rated 44444 at 0730 in Morden. Later, R.New Zealand Int **17.675** (Eng to Pacific areas 1850*-0705*) was 54534 at 2000 in Guildford. [*From March 18 until May 6 the times are 2050-0459UTC].

After mid-day, RAI Rome **17.710** (It to E.Africa 0600?-1300) was 44444 at 1200 in Oxted; R.Bulgaria, Sofia **17.500** (Eng to Eur 1200-1300) 55555 at 1200 in Liverpool; Africa No.1, Gabon **17.630** (Fr to W.Africa 0700-

1600) 34443 at 1325 in Kilkeel; R.Sweden **17.870** (Eng to Eur, N.America 1330-1355) 45533 at 1344 in E.Bristol; Voice of Turkey **17.815** (Eng to Eur 1330-1425) 44444 at 1345 in Newry; R.Austria Int via Sackville? **17.855** (Ger, Eng to NW.America? 1400-1500) 33333 at 1430 in Truro; R.France Int via ? **17.850** (Eng to Africa? 1600-1700), heard at 1600 in Dudley; Vatican R, Italy **17.515** (Eng to Africa 1730-1800?) 54444 at 1737 by **Tony Hall** in Freshwater Bay, IoW; Channel Africa via Meyerton **17.870** (Eng to W.Africa 1800-1830?) 44444 at 1800 by **Vera Brindley** in Woodhall Spa; BBC via Ascension Is **17.830** (Eng to W.Africa 0800-2100) 34433 at 1852 in Colyton; HCJB Quito, Ecuador **17.660** (Eng to Eur 1900-2200) 43433 at 1935 in Herstmonceux & 33333 at 2155 in Stalbridge; R.Nederlands via Bonaire, Ned.Antilles **17.605** (Eng to C/W.Africa 1830-2030, Dut 2030-2125) 44334 at 2030 in Rugby; WHRI via Maine, USA **17.650** (Eng to Eur, M.East, Africa 1600?-2200) 44444 at 2105 in Northampton.

R.New Zealand has also been reaching the UK well in the **15MHz (19m)** band. Their broadcast to Pacific areas on **15.175*** (Eng 0705*-1000*) was rated 44333 at 0945 in Truro. It was followed by a programme for troops in E.Timor (Eng 1000*-1200*), rated 45444 at 1030 in Freshwater Bay, IoW & 44444 at 1045 in Morpeth. [*From March 18 until May 6 their schedule is **15.120** (Eng 0500-0704, 1850-2049); **15.175** (Eng 1105-1305)].

R.Australia's broadcasts via Shepparton have been received in the UK on the following frequencies: **15.240** (Eng to Pacific areas 0000-0900), rated 32422 at 0750 in Colyton; **15.415** (Eng to Asia 0100-0400, 0600-0900) 34343 at 0823 in Rugby.

There is a high level of activity in this band throughout the day. Some of the broadcasts come from R.Kuwait on **15.110** (Eng, Ar to SE.Asia 0500-0930), rated 54544 at 0713 in Guildford; Voice of Armenia, Yerevan **15.260*** (Eng to Eur, M.East 0910*-0930*, Sun) 44444 at 0915 in Morden [Note* From Sunday March 25, Eng 0810-0830 on **15.270**, various 0930-? on **15.260**]; China R.Int via ? **15.210** (Eng to Asia, Australia 0900-1100) 44433 at 1020 in Herstmonceux; Israel R, Jerusalem **15.640** (Eng to Eur, N.America 1130-?) 35553 at 1135 in Wallsend; WEWN via Vandiver, USA **15.745** (Eng to E.USA, Eur 1100-2100) 43443 at 1218 in Oxted; WWCR Nashville, USA **15.685** (Eng to N.America, Eur 1100?-2100) 43343 at 1330 in Liverpool; FEBC Philippines **15.095** (Vernacular 1345-1430) 35443 at 1400 by **John Parry** in Larnaca, Cyprus; Voice of Russia **15.460** (Eng [WS] 1400-1500) 44444 at 1400 in Dudley; R.Oman via Thumrait **15.140** (Eng to M.East 1400-1500) 42333 at 1400 by **Clare Pinder** in Appleby; KTWR Guam **15.330** (Eng to Asia 1600-1630) 32132 at 1600 in Newry; Africa No.1,

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

Listeners:-
(A) Alvin Challen, Ashstead, Surrey.
(B) Bernard Curtis, Stalbridge.
(C) Simon Hockenhull, E.Bristol.
(D) Simon Hockenhull, while near Coverack.
(E) Sheila Hughes, Morden.
(F) Rhoderick Illman, Oxted.
(G) Brian Keyte, while in Messingham, N.Lincs.
(H) Eddie McKeown, Newry.
(I) Philip Miller Tate, Walton-on-Thames.
(J) George Millmore, Wootton IoW.
(K) Clare Pinder, while in Appleby.
(L) Fred Wilmshurst, Northampton.

Medium Wave Chart

Freq (kHz)	Station	Country	Power (kW)	Listener
531	Ain Beida	Algeria	600/300	J*
531	Torshavn	Faeroe Is.	100	174,I*
531	Berg	Germany	20	H*,J
531	RNE5 via ?	Spain	?	J
531	Beromunster	Switzerland	500	H*,I*,J,L*
540	Wavre	Belgium	150/50	D,H*,I,J,L
540	Solt	Hungary	2000	I*
540	Sidi Bennour	Morocco	600	H*,J*
549	Les Trembles	Algeria	600	J*
549	Thurnau (DLF)	Germany	200	J
558	RNE5 via ?	Spain	?	D,H*,J*,L
567	Tullamore(RTE1)	Eire	500	C,D,G,H*,I*,J,L
576	Muhlacker(SDR)	Germany	500	H*,L*
576	Riga	Latvia	500	J*
576	Barcelona(RNE5)	Spain	50	H*,I*
585	Paris(FIP)	France	8	H*,J
585	Madrid(RNE1)	Spain	200	H*,I*,J*,L*
585	Dumfries(BBCScot)	UK	2	G,H
594	Frankfurt(HR)	Germany	1000/400	H*,I*,J*,L*
594	Oujda-1	Morocco	100	J*
603	Lyon	France	300	H*,I*,J
603	Bucharest	Romania	50	J*
603	Sevilla(RNE5)	Spain	50	H*
603	Sousse	Tunisia	10	J*
603	Newcastle(BBC)	UK	2	G,H*
612	Athlone(RTE2)	Eire	100	C,D,G,H*,I*,J,L
612	Sebaa Aioun	Morocco	300	J*
612	RNE1 via ?	Spain	10	J*
621	Wavre	Belgium	80	H*,I*,J,L
621	Barcelona(OCR)	Spain	50	H*,J*,L*
630	Vigra	Norway	100	H*,I*,J*
630	Tunis-Djedeida	Tunisia	600	H*,J*
639	Praha(Liblice)	Czech	1500	H*,J*
639	RNE1 via ?	Spain	?	D,H*,I*,J*
648	RNE1 via ?	Spain	10	H*
648	Orfordness(BBC)	UK	500	G,H*,I,J,L*
657	Napoli	Italy	120	J*,L%
657	Madrid(RNE5)	Spain	20	H*,J*
657	Wrexham(BBCWales)	UK	2	C,G,H*,L
666	MesskirchRohrd(SWF)	Germany	150	H*,I*,L*
666	Sitkunai(R.Vilnius)	Lithuania	500	H*
666	Lisboa	Portugal	135	H*,J*
675	Marseille	France	600	H*
675	R10 FM	Holland	120	C,D,H*,I*,J,L*
684	Sevilla(RNE1)	Spain	500	H*,I*,J*
684	Avala(Beograd-1)	Yugoslavia	2000	H*
693	Droitwich(BBC)	UK	150	I*,J,L*
702	Flensburg(NDR)	Germany	5	H*,J*
702	TWR via Monte Carlo	Monaco	300	H*,J*,L*
711	Rennes 1	France	300	C,D,H*,I*,J,L*
720	Lisnagarvey(BBC4)	N.Ireland	10	D,J*
720	Lots Rd,Ldn(BBC4)	UK	0.5	E,G,I*,J
729	Cork(RTE1)	Eire	10	D,G,H*,J
729	RNE1 via ?	Spain	?	D,H*,J*,L*
738	Paris	France	4	B,H*,J
738	Barcelona(RNE1)	Spain	500	H*,I*,J*
747	Flevo(Hilv2)	Holland	400	C,D,H*,I,J,L*
747	Cadiz(RNE5)	Spain	10	H*
756	Braunschweig(DLF)	Germany	800/200	H*,I*,L*
756	Bilbao(EI)	Spain	5	H*,J*
756	Redruth(BBC)	UK	2	H*
765	Sottens	Switzerland	500	D,H*,I*,J*,L*
774	Enniskillen(BBC)	N.Ireland	1	H*
774	RNE1 via ?	Spain	?	H*,I*,J*,L*
783	Leipzig(MDR)	Germany	100	H*,I*,J*
783	Miramar(R.Porto)	Portugal	100	H*
783	Dammam	Saudi Arabia	100	J*
792	Limoges	France	300	C*,I*,J*
792	Lingen(NDR)	Germany	5	H*
792	Sevilla(SER)	Spain	20	H*
792	Londonderry(BBC)	UK	1	D
801	Munchen-Ismaning	Germany	300	H*,I*
801	RNE1 via ?	Spain	?	H*,J*
810	Volgograd	Russia	150	J*
810	Madrid(SER)	Spain	20	H*,I*
810	Westerglen(BBCScot)	UK	100	G,H*,I*,J*,L*
819	Batra	Egypt	450	H*,J*
819	S.Sebastian(EI)	Spain	5	H*,J*
828	Hannover(NDR)	Germany	100/5	H*
828	Rotterdam	Holland	20	F,H*
837	Nancy	France	200	C*,H*
837	COPE via ?	Spain	?	J*
846	Rome	Italy	1200	H*,I*,J*,L*
855	RNE1 via ?	Spain	?	H*,I*,J*,L*
864	Paris	France	300	C*,D,H*,I*,J,L*
873	Frankfurt(AFN)	Germany	150	I*
873	Zaragoza(SER)	Spain	20	H*,I*,J*
873	Enniskillen(R.UI)	UK	1	H*
882	COPE via ?	Spain	?	H*
882	Washford(BBCWales)	UK	100	D,F,G,H*,I,J,L*
891	Algiers	Algeria	600/300	H*,I*,J*
891	Hulsberg	Netherlands	20	H*
900	Brno(CRo2)	Czech Rep	25	H*,J*
900	Milan	Italy	600	D,H*,I*
900	COPE via ?	Spain	?	H*
909	B'mans Pk(BBC5)	UK	140	I*,J,L
918	Domzale	Slovenia	600/100	E*,H*,I*,J*,L*
918	Madrid(R.Int)	Spain	20	E*,H*
927	Wolvertem	Belgium	300	D,F,H*,I*,J*,L*
936	Bremen	Germany	100	H*,J*
936	RNE5 via ?	Spain	?	H*
945	Toulouse	France	300	C*,H*,I*,J*
954	Brno (CRo2)	Czech Rep.	200	H*,J*
954	Madrid(CI)	Spain	20	H*
963	Pori	Finland	600	H*,J*
963	Tir Chonaill	Eire	10	J*
972	Hamburg(NDR)	Germany	300	H*,J*
972	RNE1 via ?	Spain	?	H*
981	Alger	Algeria	600/300	F,J*
990	Berlin	Germany	300	H*,J*
990	R.Bilbao(SER)	Spain	10	H*,J*
990	Tywyn(BBC)	UK	1	H*
999	Schwerin (RIAS)	Germany	20	H*
999	Madrid(COPE)	Spain	50	H*,I*
1008	SER via ?	Canaries/Spain	?	H*
1008	Flevo(Hilv-5)	Holland	400	D,F,H*,I*,J,L*
1017	Rheinsender(SWF)	Germany	600	D,H*,J*
1017	RNE5 via ?	Spain	?	H*
1026	SER via ?	Spain	?	H*,J*
1035	Lisbon	Portugal	120	H*,J*
1044	Dresden(MDR)	Germany	20	H*
1044	S.Sebastian(SER)	Spain	10	H*,J*
1053	Zarogoza(COPE)	Spain	10	H*
1053	Talk Sport via ?	UK	?	H*,I,J,L*
1062	Kalundborg	Denmark	250	D,H*,I*,J*
1071	Riga	Latvia	50	H*,J*
1071	Talk Sport via ?	UK	?	H*
1080	SER via ?	Spain	?	H*,J*
1089	Talk Sport via ?	UK	?	H*,I*,J,L*
1098	Nitra(Jarok)	Slovakia	1500	D,H*,J*,L*
1098	RNE5 via ?	Spain	?	H*
1107	AFN via ?	Germany	10	H*
1107	Talk Sport via ?	UK	?	?H*,J
1116	Pontevedra(SER)	Spain	5	H*
1125	La Louviere	Belgium	20	H*,J
1125	RNE5 via ?	Spain	?	J*
1134	Zadar(Croatian R)	Croatia	600/1200	H*,I*,J*,L*
1134	COPE via ?	Spain	2	H*,J*
1143	AFN via ?	Germany	1	H*,J*
1143	COPE via ?	Spain	2	H*,L*
1161	Ain-Salah	Algeria	5	J*
1179	Solvesborg	Sweden	600	C*,D,H*,I*,J*,L*
1188	Kuurne	Belgium	5	F,H*,J*
1188	Szolnok	Hungary	135	H*,I*,J*
1197	Munich(VOA)	Germany	300	B*,H*,L*
1197	Virgin via ?	UK	?	H*,J,L
1206	Bordeaux	France	100	C*,H*,I*,J*
1215	Virgin via ?	UK	?	H*,I*,J,L*
1224	Vidin	Bulgaria	500	H*,J*
1224	Lelystad	Holland	50	D,H*,J*
1233	Nitra	Slovakia	40	H*
1233	Virgin via ?	UK	?	H*,I,L*
1242	Marseille	France	150	C*
1242	Virgin via ?	UK	?	H*
1251	Marcali	Hungary	500	H*
1251	Huisberg	Netherlands	10	H*,J*
1260	SER via ?	Spain	?	D,H*,J*
1260	Guildford (V)	UK	0.5	I*
1269	Neumunster(DLF)	Germany	600	D,H*,J*,L*
1269	COPE via ?	Spain	?	H*
1278	Dublin/Cork(RTE2)	Eire	10	G,H*,L*
1287	RFE via ?	Czech Rep.	?	H*,J*
1287	Lerida(SER)	Spain	10	H*,J*
1296	Valencia(COPE)	Spain	10	J*
1305	RNE5 via ?	Spain	?	H*
1314	Kvitsoy	Norway	1200	C*,D,E*,H*,I*,J*,L*
1323	W'brunn (V.Russia)	Germany	1000/150	D,H*,I*,L*
1332	Rome	Italy	300	H*,J*,L*
1341	Lisnagarvey(BBC)	N.Ireland	100	D,E,G,H,I*,J*,L*
1341	Tarrasa(SER)	Spain	2	E*,J*
1350	Cesvaine/Kuldiga	Latvia	50	H*,J*,L*
1359	Madrid(RNE-FS)	Spain	600	H*,J*
1368	Foxdale(Manx R)	Is of Man	20	H*,J*
1377	Lille	France	300	C,D,H*,I*,J*,L*
1386	Bolshakovo	Russia	2500	B*,D,H*,I*,J*,L*
1395	TWR via Fllake	Albania	500	E,H*
1395	Lopic	Netherlands	120/40	F,H,I*,J,L*
1404	Brest	France	20	C*,D,H*,J,L*
1413	RNE5 via ?	Spain	?	H*,J*
1422	Heusweiler(DLF)	Germany	1200/600	E*,H*,J*,L*
1440	Marnach(RTL)	Luxembourg	1200	E*,H*,I*,J*,L*
1440	Damman	Saudi Arabia	1600	H*
1449	Redmoss(BBC)	UK	2	G,H*,J*
1458	Fllake	Albania	500	J*
1467	Monte Carlo(TWR)	Monaco	1000/400	H*,J*
1476	Wien-Bisamberg	Austria	600	H*,J*
1494	Clermont-Ferrand	France	20	H*,L*
1494	St.Petersburg	Russia	1200	H*,J*
1512	Wolvertem	Belgium	300	A*,H*,I*,J*,K,L*
1512	Jeddah	Saudi Arabia	1000	H*
1521	Kosice(Cizatice)	Slovakia	600	H*,J*,L*
1521	R.Manresa(SER)	Spain	2	J*
1530	Vatican R	Italy	150/450	E*,H*,J*,L*
1539	Mainflingen(ERF)	Germany	350(700)	H*,I*,J*,L*
1539	SER via ?	Spain	?	H*
1557	Nice	France	300	H*,I*
1575	Genova	Italy	50	H*,J*,L*
1575	SER via ?	Spain	5	H*,J*,L*
1593	Holzkirchen(VOA)	Germany	150	B*,H*,I*,J*,L*
1602	Vitoria(EI)	Spain	10	H*,I*,J*,L*
1611	Vatican R	Italy	15	G

Gabon **15.475** (Fr to W.Africa 1600-1900) 33343 at 1722 in Storrington; BBC via Meyerton, S.Africa **15.420** (Eng to E/S.Africa 1700-1900) 54445 at 1800 in Stalbridge; KTBN via Salt Lake City, USA **15.590** (Eng to N.America 1600-0000) 34333 at 1805 in Woodhall Spa; VOA via Greenville, USA **15.580** (Eng to Africa 1800-2200), rated 45433 at 2008 in E.Bristol; RAE Buenos Aires, Argentina **15.345** (Ger, Sp to Eur, Africa 2100-0000) 34443 at 2250 in Kilkeel; BBC via Ascension Is **15.400** (Eng to W.Africa 1500-2300) 45343 at 2250 in Northampton.

Radio Australia's broadcasts to Pacific areas may also be heard in the UK in **13MHz (22m)** band. Their transmission from Shepparton on **13.605** (Eng 0800-1200) was rated 43333 at 1055 in Morpeth & 24332 at 1158 in Oxted. In Cyprus it was 34553 at 0810.

Other occupants of this band include R.Austria Int via Moosbrunn **13.730** (Eng to Australia?), rated 45444 at 0928 in Rugby; R.Bulgaria, Sofia **13.600** (Bul to ? 1100-1130) 55544 at 1120 in Northampton; Croatian R, Zargreb **13.830** (Cr, Eng to Eur, N.America) 43443 at 1240 in kilkeel; Vatican R, Italy **13.765** (Chin to E.Asia 1415-1430) 33343 at 1420 in Liverpool; R.Austria Int via Moosbrunn **13.730** (Various to Eur, Africa) 44333 at 1430 in Truro; UAER, Dubai **13.675** (Eng to Eur 1600-1640) 44333 at 1608 in Newry; VOA via Selebi-Phikwe, Botswana **13.710** (Eng to Africa 1600-1700, 1800-2230) 34433 at 1832 in Colyton; R.Nederlands via Flevo **13.700** (Eng to Africa 1830-2025) 45444 at 1940 in E.Bristol; R.Canada Int via Sackville? **13.650** (Fr, Eng to Eur, Africa 2000-2200) 44444 at 2100 in Appleby; R.Havana Cuba **13.750** (Eng to Eur 2030-2130 [best on u.s.b.]) 44333 at 2110 in Morden; WWCR Nashville, USA **13.845** (Eng to Africa 1400-0100) 44444 at 2139 in Freshwater Bay, IoW; WEWN Vandiver, USA **13.615** (Eng to N.America 2000?-0000) 34333 at 2151 in Woodhall Spa; R.Vlaanderen, Belgium via ? 13.660 (Eng to N.America? 2230-2300) 55445 at 2245 in Stalbridge.

Noted in the **11MHz (25m)** band before noon were R.Prague, Czech Rep **11.600** (Eng to Eur 0800-0830), rated 55555 at 0825 in Herstmonceux; R.France Int via Allouis? **11.670** (Fr [RFI Monde] to Eur, M.East, Africa, Asia 0800?-1300) 55444 at 0935 in Rugby; China R.Int via ? **11.730** (Eng to Australia 0900-1057) 33333 at 0953 in Woodhall Spa; R.Nederlands via Irkutsk **12.065** (Eng to Asia, Far East 0930-1125) 22111 at 1032 in Truro; AWR via Agat Guam **11.660** (Eng to NE.Asia 1000-1100) 23232 at 1039 in Oxted; American Forces Network (AFN) via Sicily **10.942** (Eng [u.s.b.] 24hrs?) 45444 at 1100 in Cyprus.

During the afternoon R.Nederlands via Tashkent **12.070** (Eng to S.Asia 1430-1625) was 54444 at 1435 in Liverpool; Swiss R.Int via Singapore **12.010** (Eng, Ger, Fr to Asia 1400-1600) 34333 at 1437 in Colyton; R.Australia via Shepparton **11.660** (Eng to Asia 1430?-1700) 44444 at 1500 in Morpeth; R.Jordan via Al Karanah **11.690** (Eng to W.Eur, E.USA 1530-1730?) 45554 at 1600 in Wallsend; Israel R, Jerusalem **11.605** (Eng to Eur, N.America 1700-1730) 55444 at 1715 in Northampton; R.New Zealand **11.725*** (Eng to Pacific areas 1650*-1750*) was 33433 at 1715 in E.Bristol.* From March 18 until May 6 their schedule is **11.720** (Eng 0705-1104).

Later, R.Nederlands via Flevo **11.655** (Eng to Africa 1730-2025) was 54434 at 1740 in Freshwater Bay, IoW; DW via Rwanda **11.810** (Eng to Africa 1900-1945) 44333 at 1900 in Morden; R.Kuwait via Kabd **11.990** (Eng to Eur, N.America 1800-2100) 54445 at 1945 in Stalbridge; Vatican R, Italy **11.625** (Eng to Africa 2000-2030) 44243 at 2003 in Newry; Voice of Indonesia, Jakarta **11.785** (Eng to Eur? 2000-2100) 54544 at 2013 in Guildford; BBC via Kranji, Singapore **11.955** (Eng to E/SE.Asia 2200-0000) 23322 at 2255 in Kilkeel.

Many broadcasts reach the UK in the **9MHz (31m)** band. Mentioned in the reports were R.Finland via Pori **9.510** (Eng to W.Eur, Australia 0730-0800), rated 55544 at 0734 in Newry; HCJB Quito, Ecuador **9.780** (Eng to Eur 0700-0900) 55433 at 0835 in Herstmonceux; R.Nederlands via Bonaire, Ned.Antilles **9.790** (Eng to Asia, Far East 0930-1125) 35444 at 1050 in Northampton; Voice of Turkey, Ankara **9.460** (Tur to Eur 0800-2200) 44434 at 1232 in Oxted; Swiss R.Int via Julich, Germany **9.535** (Ger, Fr, It, Eng to SW.Eur 1100-1330) 33333 at 1315 in Truro; R.Polonia (Polish R, Warsaw) **9.525** (Eng to Eur 1300-1359) 44333 at 1330 in Morden; R.Pyongyang, Korea **9.335** (Eng to Eur 1500-1600) 34433 at 1500 in Dudley.

Later, R.Thailand via Udon Thani **9.535** (Eng to Eur 1900-2000) was 43443 at 1907 in Colyton; VOIRI Tehran, Iran **9.022** (Eng to W.Eur 1930-2030) 34333 at 1957 in Woodhall Spa; R.Australia via Shepparton **9.500** (Eng to Asia? 2000-?) 33343 at 2057 in Storrington & 34543 at 2115 in Wallsend; also logged in Cyprus as 44454 at 2010; DW via Sines, Portugal **9.725** (Eng to Eur 2000-2045) SIO 333 at 2019 by **Francis Hearne** in N.Bristol; V of Armenia, Yerevan **9.965** (Fr, Eng to Eur, N.America 1940-2100) 54554 at 2100 by **Bill Griffith** in W.London; R.Canada Int via Skelton? UK **9.805** (Eng to Eur 2100-2200) 34433 at 2105 in Rugby; China R.Int via ? **9.840** (Eng to Eur 2000-2200) 53444 at 2110 in Stalbridge; R.Taipei Int via WYFR Okeechobee, USA **9.355** (Eng to Eur 2200-2300) 44444 at 2200 in Appleby; RAE Argentina **9.690** (Sp to Eur, Africa 2200-0000) 54344 at 2213 in Guildford; R.Cairo, Egypt **9.990** (Eng to Eur 2115-2245) 44444 at 2225 in Freshwater Bay, IoW; BBC via Sackville, Canada **9.590** (Eng to N.America 2200-0000) 43443 at 2320 in Kilkeel; BBC via Skelton, UK **9.915** (Eng to S.America 0000-0300) 25422 at 0042 in E.Bristol.

Quite a few of the broadcasts in the **7MHz (41m)** band are intended for European listeners. Those noted in the reports came from WWCR Nashville, USA **7.435** (Eng), rated 35444 at 0950 in Northampton; AIR via Bangalore **7.410** (Eng, Hin 1745-2230) 43433 at 1745 in Colyton; Voice of Vietnam via Russia? **7.440** (Eng 1800-1830, Viet 1830-1930) 54444 at 1850 in Liverpool; Voice of Turkey **7.125** (Eng 1930-2030) 43333 at 1930 in Appleby; R.Budapest, Hungary **7.135** (Eng 2000-2030) 43444 at 2002 in Woodhall Spa; Voice of the Mediterranean, Malta via Russia **7.440** (Eng 2000-2100) 33333 at 2040 in Stalbridge; R.Bulgaria, Sofia **7.500** (Eng 2000-2100) 44434 at 2045 in Rugby; Voice of Russia **7.300** (Eng [WS]) 33333 at 2115 in Truro; R.Bulgaria, Sofia **7.200** (Eng 2000-2200?) 54444 at 2144 in Freshwater Bay, IoW; China R.Int via Skelton? UK **7.170** (Eng 2200-2300) 44333 at 2200 in Morden; R.Bulgaria, Sofia **7.500** (Eng 2200-2300) SIO 333 at 2246 in N.Bristol; R.Romania Int, Bucharest **7.195** (Eng 2300-0000) 54554 at 2350 in W.London.

Also mentioned in the reports were the Voice of Nigeria, Ikorodu **7.255** (Eng to W.Africa) rated 43343 at 2100 in Storrington & 55434 at 2205 in Guildford; WJCR Upton, USA **7.490** (Eng to E.USA 24hrs) 44233 at 0007 in Newry; VOA via Sri Lanka **7.115** (Eng to S.Asia? 0100-0300) 44444 at 0105 in Kilkeel; KTBN via Salt Lake City, USA **7.510** (Eng to N.America 0000-1600) 33433 at 1103 in Morpeth.

There are many more broadcasts to Europe in the **6MHz (49m)** band. Some originate from R.Vlaanderen Int, Belgium **5.985** (Eng 0800-0830), rated 54544 at 0820 in Herstmonceux; Bayerischer Rundfunk, Germany **6.085** (Ger 24hrs) 55544 at 0820 in Colyton; Deutsch Welle (DW) via Julich? **6.140** (Eng Service) 54444 at 1350 in Morden; R.Polonia [Polish R.] Warsaw **5.995** Eng 1800-1900) 33333 at 1810 in Stalbridge; Sri Lanka BC via Skelton, UK **6.010** (Eng 1900-2000 Sun) 54354 at 1928 in Newry; RAI Rome **5.970** (Eng [News] 1935-1955) 42333 at 1945 in Liverpool; China R.Int via ? **5.965** (Eng 2000-2100) 44444 at 2000 in Appleby; BBC via UK **6.195** (Eng 1700-2300) 44444 at 2040 in Rugby; R.Budapest, Hungary **6.025** (Eng 2200-2230) 54544 at 2208 in Northampton; R.Taipei via Skelton? **5.810** (Eng 2200-2300) 33222 at 2225 in Truro; R.Austria Int, via Moosbrunn **5.945** (Eng 2230-2300, also to NW.Africa) SIO 444 at 2252 in N.Bristol.

Some to other areas may also be received here. They include ORTM Bamako, Mali **5.995** (Fr 0555-0748, 1757-0000) rated 55544 at 2305 in Guildford; BBC via Sackville, Canada **6.175** (Eng to USA 2200-0500) 44444 at 2320 in Kilkeel; R.Habana, Cuba **6.000** (Eng to N.America 0100-0500) 44534 at 0135 in E.Bristol; American Forces Network (AFN) via Puerto Rico **6.458** (Eng [u.s.b.]) 43333 at 0705 in Morpeth; WEWN Birmingham, USA **5.825** (Eng to N.America 2200?-1400?) 44344 at 0912 in Oxted; BBC via Singapore **6.195** (Eng to E.Asia 1200-1700) 34453 at 1412 in Cyprus.

The SINPO code is used for broadcast station reports, here is an explanation of the code.

Signal Strength
5 excellent
4 good
3 fair
2 poor
1 barely audible

Interference
5 nil
4 slight
3 moderate
2 severe
1 extreme

Noise
5 nil
4 slight
3 moderate
2 severe
1 extreme

Propagation Disturbance
5 nil
4 slight
3 moderate
2 severe
1 extreme

Overall Merit
5 excellent
4 good
3 fair
2 poor
1 unusable

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Bandscan USA

Argentina is not exactly a centre of bustling broadcast activity on the short wave bands, so it was quite a surprise to learn of a new station on the air from that country. Radio Luz del Mundo is a new Christian station operating on 6.440MHz. It's on the air from 1000 to 0500 with Spanish language programming.

The station has a medium wave outlet on 1130kHz, which the short wave outlet seems to be relaying. The bad news is that they are running with extremely low power - probably in the range of 50W - which is a bit short of the level needed for world coverage. This one certainly qualifies as extreme DX! The address is **Catamarca 2560, 1847 Rafael Calzada (BA), Argentina**.

Meantime, the local relays of various a.m./f.m. stations continue to be carried by the utility transmitters at various times and on various days. The frequency 20.275 u.s.b. has carried Radio Continental, as has 15.820 l.s.b. La Red is sometimes carried on 15.820 l.s.b. and there are others, which make appearances from time to time.

In the Dominican Republic, Radio Barahona is still active, nominally on 4.930, though on some occasions it has appeared on 4.899MHz. Radio Cristal International has returned to the air on slightly variable 5.010MHz. It takes careful listening to be sure this is the one you have, though, because the Ecuadorian (see below) Escules Radiofonicas also uses this spot. To add further confusion, Radio Cristal sometimes relays Radio Pueblo in Santo Domingo!

Radio Mexico International has begun using 11.770, in addition to their regular 9.705 channel. XEQM in Merida, Mexico, has returned to the air on its assigned 6.105 frequency. They are relaying two or three different local stations at various times: XEUL ('Foro 930'), XEMH-970 ('Candela Tropicaliente') and Candela FM. The station's new slogan is RASA Onda Corta. Some years ago it used the slogan 'Tus Panteras'.

New Stations

The extended a.m. band - also known as the X-band - (1610-1700) continues to see new stations come on the air. The new (and not so new) ones being heard lately include:

1.610	KALT, Atlanta, Texas (Fox Sports network)
1.620	KBLI, Blackfoot, Idaho (ESPN network)
1.620	KAZP, Omaha, Nebraska
1.630	KCJJ, Iowa City, Iowa
1.630	WRDW, Augusta, Georgia
1.640	KDIA, Vallejo, California
1.650	KWHN, Ft. Smith, Arkansas
1.650	WHKT, Portsmouth, Virginia
1.650	LBJD, Denver, Colorado
1.660	KAXW, Merced, California
1.660	KXOL, Brigham City, Utah
1.660	KQWB, Fargo, North Dakota
1.660	KRZX, Waco, Texas
1.670	KAZT, Redding, California (ESPN Network)
1.680	KAVT, Fresno, CA (Disney Radio)
1.680	WTIR, Winter Garden, Florida
1.690	KSXX, Roseville, California (Spanish)
1.700	WEUP, Huntsville, Alabama

Ecuadorian short wave stations currently being noted include:

2.280	La Voz del Napo, Tena
3.290	Radio Centro, Ambato
4.770	Radio Centinela del Sur, Loja
4.800	Radio Oriental, Tena
4.840	Radio Interoceanica, Santa Rosa de Quijos
4.960	Radio Federacion, Sucua
5.010	Escuelas Radiofonicas, Riobamba

Radio Litoral, La Ceiba, Honduras, is being heard on variable 4.832MHz. Others active from that country and heard recently include:

3.250	Radio Luz y Vida, San Luis
4.819	La Voz Evangelica, Tegucigalpa
4.930	Radio Costena, San Pedro Sula

Colombia is one of several Latin American countries with far fewer active short wave stations than used to be the case. Stations heard recently include:

4.975	Ondas del Orteguaza, Florencia
5.020	Ecos del Atrato, Quibdo
5.955	Caracol Villavicencio
5.975	Radio Macarana (sometimes IDs as Radio Autentica)
9.635	Radiodifusora Nacional de Colombia, Santa Fe de Bogota

Old Timer

We're not sure what's going on with old timer Ecos del Torbes in Venezuela. Half the time it seems that they are absent from their 4.980 channel. But as soon as you begin to think they've finally given it up, they're back again. The same holds true for the 31m band outlet on 9.640MHz. One day it's there, the next day it isn't!

WWFV, the former WGTG in MaCaysville, Georgia, is using radio teletype mode to air a service for the hearing impaired. You have to have a computer, with the necessary software, hooked to your short wave set in order to make it work. The broadcast (voice only) shows up as a print out on the computer screen. These special transmissions are on the air Sundays through Fridays from 2300-0000 on 5.085, Saturdays and Sundays from 1800-1900 on 12.172 and Sundays from 0500-0600 on 3.270MHz.

Very Unusual

Here's an unusual combination - a Canadian broadcaster, Radio Vancouver International, is now airing on short wave via Radio Taipei International in Taiwan. Radio Vancouver International isn't really even a full-fledged station, just a program aired locally over medium wave CHMB in Vancouver. The broadcasts are 9.735 upper sideband, on Sundays from 1200 to 1400, with the first ten minutes of each hour in English, the rest in Cantonese.

Explanation? It seems Vancouver is home to quite a number of Chinese who have relatives in Hong Kong. So far, all this is just an experiment - it's possible the whole thing could be history by the time you read this.

HCJB has taken another step along the long road that will put them on the air from Australia. They've received a provisional license from the Australian broadcasting authority. But two more licenses are still needed - a 'content license' and a 'content and national interests license'. HCJB will operate from a place called Kununurra, in Western Australia, but it will still be a long while before this one is reality.

Station News

KNLS in Alaska is offering a free cassette tape to listeners. The tape, titled 'DX Definitions' explains the numerous, sometimes strange and confusing abbreviations used by DXers. You can get a copy by writing to **KNLS, PO Box 473, Anchor Point, Alaska 99556** or by E-mailing them at **knls@aol.com**

Radio Canada International's Sackville transmitter site is now carrying a relay of Radio Sweden. This is being aired from 0230 to 0259 on 9.560. The parallel 9.495 is direct from Sweden.

Florida medium wave WFLA in Tampa can sometimes be heard on 25.870MHz. This is a low power transmitter used for 'pre-delay talkback' with the plane they use for providing traffic situation reports.

One of the more intriguing of the Western Hemisphere clandestine stations is La Voz de la Resistencia, run by the narco-guerrillas of the Revolutionary Armed Forces of Colombia (FARC). It is scheduled in Spanish on variable 6.234 at 1130 to 1230 and 2130 to 2230 (the sign on and sign off times vary). Despite the amount of money these people must have, they haven't spent very much of it on the station. The power is low and the reception in North America is spotty, at best.

Radio Difusora Taubate in Sao Paulo, Brazil, has been reactivated on 4.925, relaying is 570kHz medium wave, although later on the short wave may be programmed separately.

Jeff White, owner of Miami's WRMI, hopes to put a low power short wave station on the air from the northern coast of Venezuela. So far, getting all the paperwork and approvals from the Venezuelan government signed, sealed and delivered is proving to be a multi-year task.

That covers the scene for this time. We'll have another look at the Americas in three months. Until then, good listening!

Quad Loop Building Alternatives

The recently belated Joe Carr K4IPV, guides us through the maze that is quad loop antennas and brings us expertly and safely to the terminator.

The quad loop antenna is technically part of a class of antennas called 'large loops', i.e. loops with a perimeter at least half wavelength. They differ considerably from the small loops used for radio direction finding (RDF) and DXing in the m.w. or tropical bands. The principal difference is that the current distribution in the loop is constant for small loops, and varies with length around the perimeter of a large loop. In other words, large loops , like dipoles, have current and voltage nodes and anti-nodes spaced alternately around the perimeter of the loop. They exhibit a 'figure-of-8' azimuthal pattern with the nulls off the sides of the antenna and the maxima perpendicular to the antenna, as shown in **Fig. 2**. The length of each side of the loop is given as 'A' in **Fig. 1**, while the overall perimeter (call it 'L') is 4 x A, and is found from:

$$L = \frac{306}{F_{MHz}} \quad \text{meters} \quad (1)$$

or, for each side

$$A = \frac{76.5}{F_{MHz}} = \frac{L}{4} \quad (2)$$

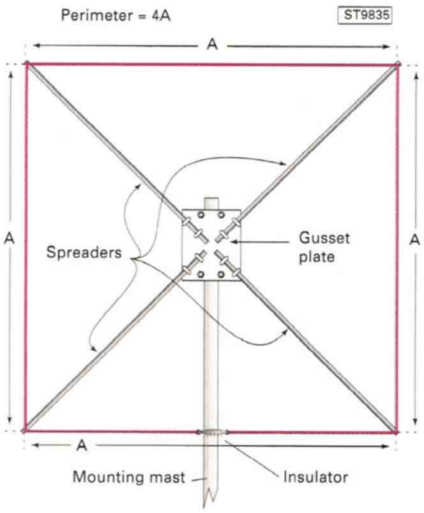

Fig. 1: Standard one wavelength quad loop antenna.

The sizes for these antennas, in 250kHz increments, are shown in **Table 1**.

Quad Loop Construction

Large loop antennas are generally erected out of doors, although I've seen a few designed for the upper h.f. and v.h.f. region installed in attics. Let's take a look at two basic forms of installation. In one case, there are two or more supports, while in the other only a single support is used.

A typical single-mast installation for a quad loop can be seen in **Fig.1**. The assumption here is that the loop is a standard one wavelength square loop, although with suitable modifications the same method also works with other shapes and sizes.

Three different types of support are used for this type of mounting. First, there is a mast mounted out in the yard. The mast might be made of 50 x 100 or 100 x 100mm timber, or it may be a manufactured metal mast. Telescoping stainless steel masts are sold in lengths up to 15m high. Check out advertisers within these very pages that sell amateur radio or television antennas for suitable models.

The second form of mounting is a roof top mast. This type of mast is usually mounted to a TV antenna tripod mount intended for rooftop installation. Make sure that the mounting points are properly water proofed or there will be damage to the roof. Finally, there is a side mount on the vertical wall of the house. In both the roof top and side wall mounting, make certain that the structure will support the antenna. Quad loops have a large sail areas, even in small size h.f. versions, so will do damage if not installed properly.

Details of two different forms of mount are shown in **Fig. 3a** and **Fig. 3b**. A chimney 'strap' mount is shown in Fig. 3a, while a wall mount is shown in **Fig. 3b**. Both of these types of mount are available from television antenna hardware suppliers.

In both cases the upper end of the mast is fitted with a U-bolt or eye-bolt to accommodate the next form of mounting that we will consider. Those use a rope to hold the antenna. Using these fasteners, rather than tying off the rope permanently, allows the antenna to be raised and

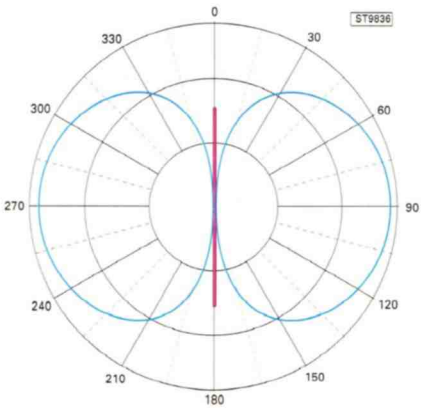

Fig. 2: Quad loop pattern (generated by Nec-Win Basic).

Table 1: Quad loop lengths 5-35MHz.

F (MHz)	L (m)	A (m)	F (MHz)	L (m)	A (m)	F (MHz)	L (m)	A (m)
5.00	61.20	15.30	15.25	20.07	5.02	25.50	12.00	3.00
5.25	58.29	14.57	15.50	19.74	4.94	25.75	11.88	2.97
5.50	55.64	13.91	15.75	19.43	4.86	26.00	11.77	2.94
5.75	53.22	13.30	16.00	19.13	4.78	26.25	11.66	2.91
6.00	51.00	12.75	16.25	18.83	4.71	26.50	11.55	2.89
6.25	48.96	12.24	16.50	18.55	4.64	26.75	11.44	2.86
6.50	47.08	11.77	16.75	18.27	4.57	27.00	11.33	2.83
6.75	45.33	11.33	17.00	18.00	4.50	27.25	11.23	2.81
7.00	43.71	10.93	17.25	17.74	4.43	27.50	11.13	2.78
7.25	42.21	10.55	17.50	17.49	4.37	27.75	11.03	2.76
7.50	40.80	10.20	17.75	17.24	4.31	28.00	10.93	2.73
7.75	39.48	9.87	18.00	17.00	4.25	28.25	10.83	2.71
8.00	38.25	9.56	18.25	16.77	4.19	28.50	10.74	2.68
8.25	37.09	9.27	18.50	16.54	4.14	28.75	10.64	2.66
8.50	36.00	9.00	18.75	16.32	4.08	29.00	10.55	2.64
8.75	34.97	8.74	19.00	16.11	4.03	29.25	10.46	2.62
9.00	34.00	8.50	19.25	15.90	3.97	29.50	10.37	2.59
9.25	33.08	8.27	19.50	15.69	3.92	29.75	10.29	2.57
9.50	32.21	8.05	19.75	15.49	3.87	30.00	10.20	2.55
9.75	31.38	7.85	20.00	15.30	3.83	30.25	10.12	2.53
10.00	30.60	7.65	20.25	15.11	3.78	30.50	10.03	2.51
10.25	29.85	7.46	20.50	14.93	3.73	30.75	9.95	2.49
10.50	29.14	7.29	20.75	14.75	3.69	31.00	9.87	2.47
10.75	28.47	7.12	21.00	14.57	3.64	31.25	9.79	2.45
11.00	27.82	6.95	21.25	14.40	3.60	31.50	9.71	2.43
11.25	27.20	6.80	21.50	14.23	3.56	31.75	9.64	2.41
11.50	26.61	6.65	21.75	14.07	3.52	32.00	9.56	2.39
11.75	26.04	6.51	22.00	13.91	3.48	32.25	9.49	2.37
12.00	25.50	6.38	22.25	13.75	3.44	32.50	9.42	2.35
12.25	24.98	6.24	22.50	13.60	3.40	32.75	9.34	2.34
12.50	24.48	6.12	22.75	13.45	3.36	33.00	9.27	2.32
12.75	24.00	6.00	23.00	13.30	3.33	33.25	9.20	2.30
13.00	23.54	5.88	23.25	13.16	3.29	33.50	9.13	2.28
13.25	23.09	5.77	23.50	13.02	3.26	33.75	9.07	2.27
13.50	22.67	5.67	23.75	12.88	3.22	34.00	9.00	2.25
13.75	22.25	5.56	24.00	12.75	3.19	34.25	8.93	2.23
14.00	21.86	5.46	24.25	12.62	3.15	34.50	8.87	2.22
14.25	21.47	5.37	24.50	12.49	3.12	34.75	8.81	2.20
14.50	21.10	5.28	24.75	12.36	3.09	35.00	8.74	2.19
14.75	20.75	5.19	25.00	12.24	3.06	35.25	8.68	2.17
15.00	20.40	5.10	25.25	12.12	3.03	35.50	8.62	2.15

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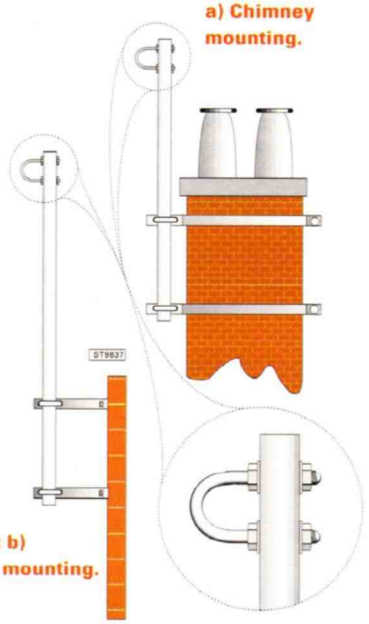

Fig. 3: a) Chimney mounting.

Fig 3: b) Wall mounting.

lowered from the ground. Once the initial installation is done, it is no longer necessary to climb up to the roof or mast.

The single mast form of quad loop has the advantage that it can be rotated to receive signals from different directions. Either an electrical rotator or an 'Armstrong rotator' can be used. So what is an 'Armstrong rotator'? Take a set of vice-grip pliers, grasp the mast, and turn it in the direction desired. I know one fellow who had a mast mounted quad right outside his window, and used the 'Armstrong rotator' for several decades...and had a strong left-arm to show for it!

The nature of rotatable quad loop construction is such that the use of a commercial kit is strongly recommended. This is especially true because of the spreaders required. Most of these are for cubical quad antennas. If you want to make a quad loop, then only one set of spreaders is needed. Perhaps two people can team up to buy a cubical quad spreader and mounting kit, and then share the bits and pieces. Adverts in *SWM* and *PW* can be consulted for suitable commercial examples.

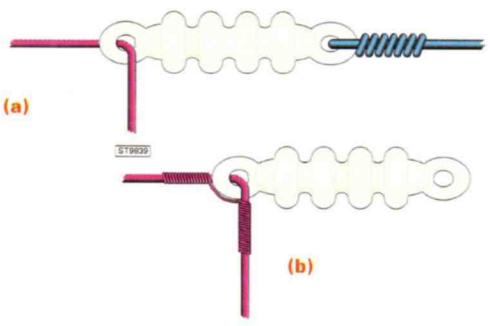

Fig. 5: Wire attachment method.

Fixed Mounted Quad Loops

There are many reasons why one might not want to install a single-mast mounted quad loop. Cost is one of them, of course. The antenna shown in **Fig. 4** is mounted between a house and a mast. The supports could just as easily include a tree or two.

The antenna in **Fig. 4** is held aloft by ropes and end insulators (EI). The rope should be high strength nylon (or other synthetic). Cotton clothes drying line could also be used, but it will sag and break in a relatively short period of time. The end insulators might be made of either glass or ceramic, or, if you spend a bit more money, nylon or some other synthetic material.

Figure 5 shows method of connecting the wire to the end insulators. The simple method of **Fig. 5a** has a certain charm because it is simple. But it also allows the wire to slip around. In **Fig. 5b** a different approach is taken. The wire is slipped through the hole in the insulator as with the previous method, but a tie-wire is added to provide support to the wire. The tie-wire is made of the same type of wire as the antenna. It is wrapped around the antenna wire both before and after the end insulator, and then soldered.

A variation on the theme is shown in **Fig. 6**. This antenna uses the same methods of installation, but is for a triangular (or 'delta') loop instead of a square loop. The delta loop is also a one wavelength perimeter large loop antenna, and each side is one-third wavelength long.

The top insulator in **Fig. 6** is in the shape of a 'tee' (these are available from amateur and s.w.l. stores). The bottom corners are attached to standard end insulators, with a rope sloping down to the ground (or bottom end of the supports). If you secure the ropes to the ground, then use long stakes or metal 'dead man' spikes, these are also available at antenna supply stores.

The methods shown in this article are for explanation and demonstration. You will have to determine the proper method for your specific installation. Keep in mind that the building inspector may have a lot to say about the matter!

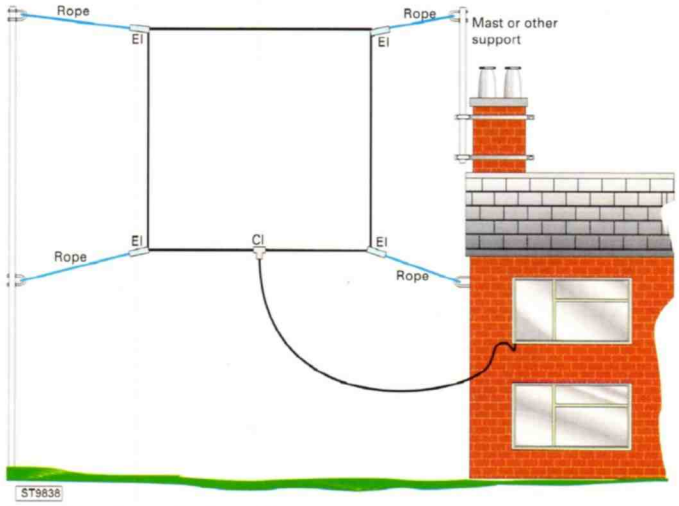

Fig. 4: Fixed mounted quad loop.

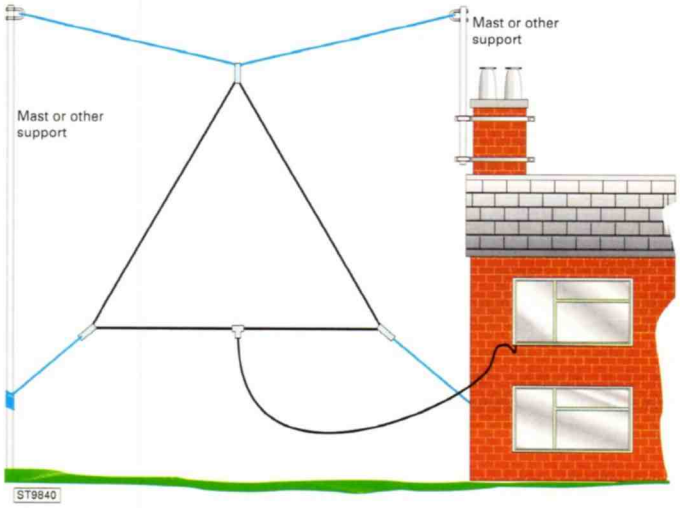

Fig. 6: Delta loop fixed mount.

Ground Mounted Mast

When mounting a mast, whether for rotatable or fixed loops, to the earth always follow local building codes to the letter. A method that is legal in most localities can be seen in **Fig. 7**. Dig a hole with a post hole digger. The hole should have a diameter about three times the diameter of the mounting mast. The depth is usually set by the local codes, but 700 to 1000mm is usual in my locality (the 'freeze line' goes to a bit less than 700mm, and one runs into the damnedest Virginia marine clay you ever saw at about 1000mm...it's impenetrable by ordinary methods!). Some people place a brick or small cinder block at the bottom of the hole in order to support the base of the mast. Above the brick or block, place a layer of gravel, and above that a concrete plug is poured into the hole. Finally, some soil is used to backfill the hole, and sod placed over top.

The Feedline System

The feedpoint impedance of the one wavelength square loop is 105Ω, more or less. If

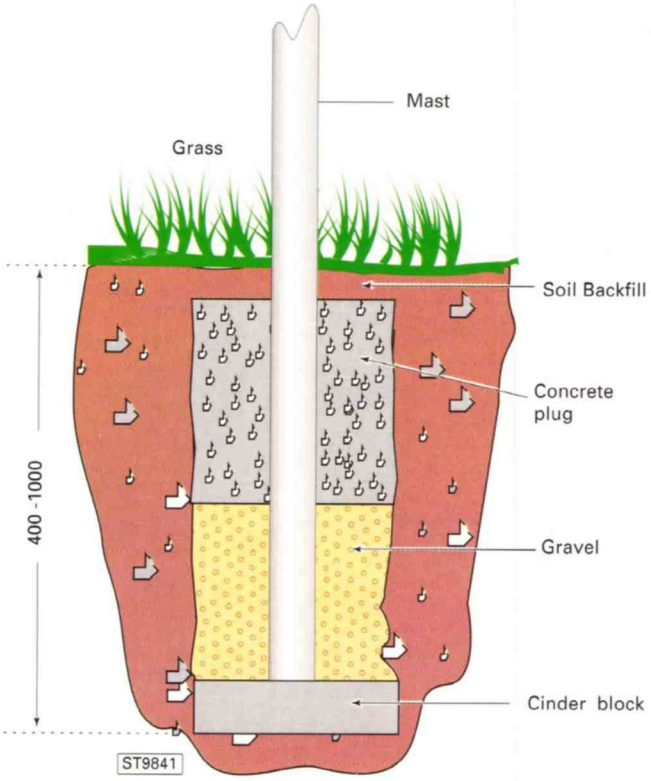

Fig. 7: Base of the mounting mast (see local codes).

you use 75Ω coaxial cable to feed the antenna, then the v.s.w.r. will be (105/75):1 = 1.4:1. This is a reasonable match, especially if you intend transmitting. If any particular transmitter is sensitive to this value it can be tuned out using any standard "line flattener" coax-to-coax antenna tuner. If you use 50Ω coax, the v.s.w.r. goes up to 2.1:1.

If you want to make the impedance match closer, then use the Q-section coaxial cable matching transformer as shown in **Fig. 8**. The value of the Q-section characteristic impedance is 75Ω, and the impedance of the line to the transmitter or receiver is 50Ω. For any Q-section, the value of the impedance required of the coaxial cable is:

$$Z_S = \sqrt{Z_O Z_L} \qquad (3)$$

Where:
Z_S is the impedance of the Q-Section coaxial cable
Z_O is the impedance of the cable to the rig
Z_L is the feed point impedance of the antenna

If you work the numbers with Z_L = 105Ω, and Z_O = 50Ω, then the value required of the Q-section (Z_S) is 72.4Ω, which is close enough to 75Ω to be considered 'right on'.

The electrical length of the Q-section ('Q' in **Fig. 8**) is quarter wavelength. The physical length, however, is a bit less because of the velocity factor of the coaxial cable used for making the Q-section.

The velocity factor of polyethylene dielectric coaxial cable (the oldest form) is 0.66, while for polyfoam dielectric it is 0.80. **Table 2** shows the physical lengths for Q-sections from 5 to 35MHz, for both 0.66 and 0.80 velocity factor coaxial cable. Note that this table can also be used for other cases where the quarter wavelength Q-section is used.

Danger - Wind Load

The 'sail area' of an antenna is the equivalent resistance to wind blowing that the antenna exhibits. The loading forces on the antenna are proportional to the sail area. If the sail area is, say, 10m², then it is equivalent to a sail of that area. Large loop antennas have large sail areas, so will be stressed quite badly by winds of relatively low velocities. Make sure you build it tough!

The sail area has another consequence as well. The higher the sail area, the greater the force on the antenna when the wind blows. Even relatively small quad loops have a high sail area, so handling them becomes a safety issue. Be sure to work with a helper, and follow practices that assume a disaster will occur. Most experienced constructors use gin poles and rope tie-offs to prevent the antenna from going too far when the wind blows...and safety belts for themselves.

More Info

Additional information on wire antennas can be found in my boom *Antenna Toolkit*, published in UK by Newnes, an imprint of Butterworth-Heinemann stocked by the *SWM* Book Store. It comes with a 'free' (i.e. not priced separately) software CD-ROM containing *Windows* antenna software, plus the public domain version of the *miniNEC MS-DOS* antenna modelling software.

SWM

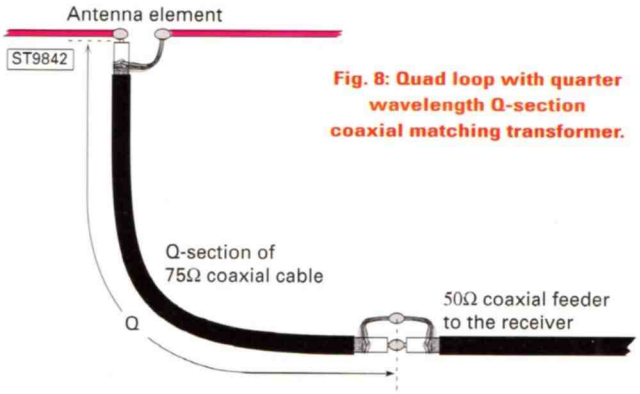

Fig. 8: Quad loop with quarter wavelength Q-section coaxial matching transformer.

F (MHz)	V=0.66	V=0.80	F (MHz)	V=0.66	V=0.80	F (MHz)	V=0.66	V=0.80
5.00	9.90	12.00	15.25	3.25	3.93	25.50	1.94	2.35
5.25	9.43	11.43	15.50	3.19	3.87	25.75	1.92	2.33
5.50	9.00	10.91	15.75	3.14	3.81	26.00	1.90	2.31
5.75	8.61	10.43	16.00	3.09	3.75	26.25	1.89	2.29
6.00	8.25	10.00	16.25	3.05	3.69	26.50	1.87	2.26
6.25	7.92	9.60	16.50	3.00	3.64	26.75	1.85	2.24
6.50	7.62	9.23	16.75	2.96	3.58	27.00	1.83	2.22
6.75	7.33	8.89	17.00	2.91	3.53	27.25	1.82	2.20
7.00	7.07	8.57	17.25	2.87	3.48	27.50	1.80	2.18
7.25	6.83	8.28	17.50	2.83	3.43	27.75	1.78	2.16
7.50	6.60	8.00	17.75	2.79	3.38	28.00	1.77	2.14
7.75	6.39	7.74	18.00	2.75	3.33	28.25	1.75	2.12
8.00	6.19	7.50	18.25	2.71	3.29	28.50	1.74	2.11
8.25	6.00	7.27	18.50	2.68	3.24	28.75	1.72	2.09
8.50	5.82	7.06	18.75	2.64	3.20	29.00	1.71	2.07
8.75	5.66	6.86	19.00	2.61	3.16	29.25	1.69	2.05
9.00	5.50	6.67	19.25	2.57	3.12	29.50	1.68	2.03
9.25	5.35	6.49	19.50	2.54	3.08	29.75	1.66	2.02
9.50	5.21	6.32	19.75	2.51	3.04	30.00	1.65	2.00
9.75	5.08	6.15	20.00	2.48	3.00	30.25	1.64	1.98
10.00	4.95	6.00	20.25	2.44	2.96	30.50	1.62	1.97
10.25	4.83	5.85	20.50	2.41	2.93	30.75	1.61	1.95
10.50	4.71	5.71	20.75	2.39	2.89	31.00	1.60	1.94
10.75	4.60	5.58	21.00	2.36	2.86	31.25	1.58	1.92
11.00	4.50	5.45	21.25	2.33	2.82	31.50	1.57	1.90
11.25	4.40	5.33	21.50	2.30	2.79	31.75	1.56	1.89
11.50	4.30	5.22	21.75	2.28	2.76	32.00	1.55	1.88
11.75	4.21	5.11	22.00	2.25	2.73	32.25	1.53	1.86
12.00	4.13	5.00	22.25	2.22	2.70	32.50	1.52	1.85
12.25	4.04	4.90	22.50	2.20	2.67	32.75	1.51	1.83
12.50	3.96	4.80	22.75	2.18	2.64	33.00	1.50	1.82
12.75	3.88	4.71	23.00	2.15	2.61	33.25	1.49	1.80
13.00	3.81	4.62	23.25	2.13	2.58	33.50	1.48	1.79
13.25	3.74	4.53	23.50	2.11	2.55	33.75	1.47	1.78
13.50	3.67	4.44	23.75	2.08	2.53	34.00	1.46	1.76
13.75	3.60	4.36	24.00	2.06	2.50	34.25	1.45	1.75
14.00	3.54	4.29	24.25	2.04	2.47	34.50	1.43	1.74
14.25	3.47	4.21	24.50	2.02	2.45	34.75	1.42	1.73
14.50	3.41	4.14	24.75	2.00	2.42	35.00	1.41	1.71
14.75	3.36	4.07	25.00	1.98	2.40	35.25	1.40	1.70
15.00	3.30	4.00	25.25	1.96	2.38	35.50	1.39	1.69

ST9844

Table 2: Q-section lengths for 0.66 and 0.80 Velocity Factor coaxial cable.

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INTRO PRICE **£69.95** P&P £8.50

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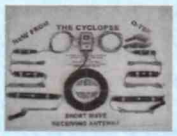

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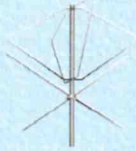

This is a professional wide band receiving antenna with a very high intercept point that ensures a low noise level allowing even the weakest signals to be heard. Constructed of high-impact plastic and aluminium alloy - the amplifier is protected inside a waterproof stainless steel vessel. The unit is supplied complete with mounting hardware and an indoor controller with PSU (coax not supplied). Freq. 20kHz-54MHz. Gain: +6dB (ref dipole). Intercept points: ≥+75dBm (2nd ord), ≥ + 50dBm (3rd ord). (Static protection included). For the true profile.

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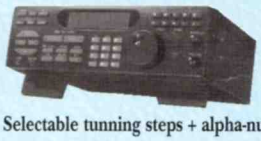

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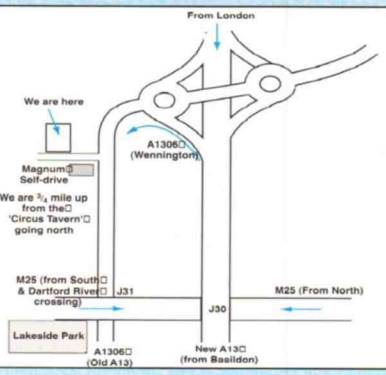

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Glenn Miller, the Andrew

John Wilson recalls the BC-348 with some affection, and finally got the chance to take a look at one, so read on and be transported back in time.

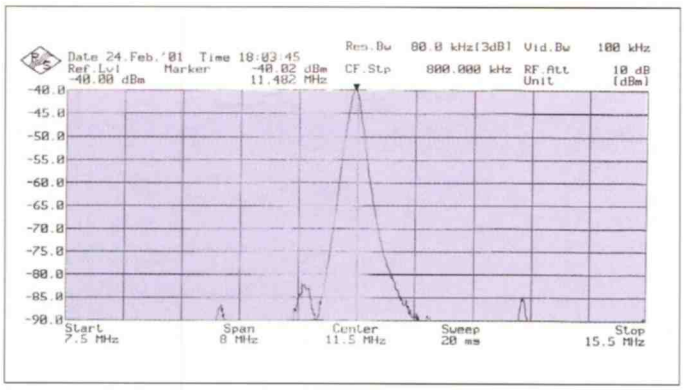


Fig. 1: The BC-348 has excellent preselector performance, here the plot is centred on 11.5MHz which means that there should be no unwanted out of band intermodulation products.

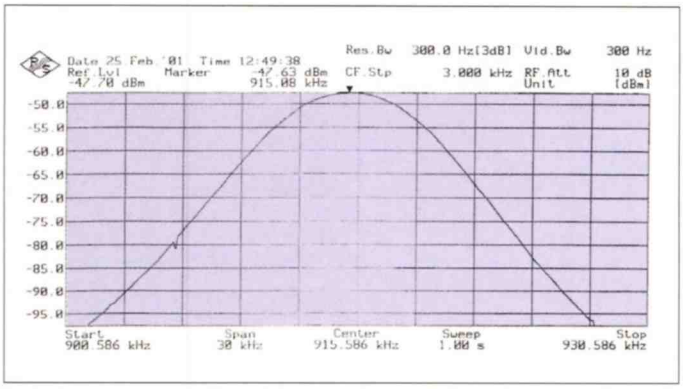


Fig. 2 The BC-348's i.f. nose shape at 915kHz with a 6dB bandwidth of 6.8kHz sloping gently away to a bandwidth of 25kHz at 50dB down.

All at their peak in the 1940s and capable of generating astonishing feelings of nostalgia in gentlemen of a certain age. When the US Army Air Force was mounting daylight bombing raids on Germany flying B-17 bombers, the aircraft were all carrying a BC-348 receiver, usually coupled to a Collins ART-13 transmitter as the main h.f. communications system.

Because I recall the BC-348 with some affection I have been trying to find an unmodified specimen for some time, and one finally arrived from an old and respected friend of mine in Japan, where collectors are very keen on WWII radio gear. When I opened it for the first time and smelt that unmistakable aroma of fungus proofing varnish and wax covered capacitors, I was transported back to the 1950s when as a teenager, I and many others butchered these excellent receivers in mistaken attempts to improve them.

My original intention was to subject an unmodified BC-348 to today's test regime and find out just how much equipment has improved (or not) over the intervening sixty years. However, I did quite a lot of research before testing because I thought that some of you might be interested in a little radio history relating to what was, and is, a truly remarkable receiver. I hope you enjoy the story.

That most excellent authority Raymond Moore reports that the receiver design came out as a result of a Washington conference in 1934 which called for a specification for an h.f. general coverage receiver for long range airborne communications. RCA won a contract to produce a prototype, and they built 650 BC-224s in 1936 and 1937.

The BC-348 is identical to the BC-224 except for the dynamotor h.t. converter which runs from 12V d.c. in the '224 and from 28V d.c. in the '348. With entry of America into the war in December 1941 the demand for military equipment

A well preserved example via Japan. Here sitting comfortably on its mounting tray.

's Sisters and the BC-348

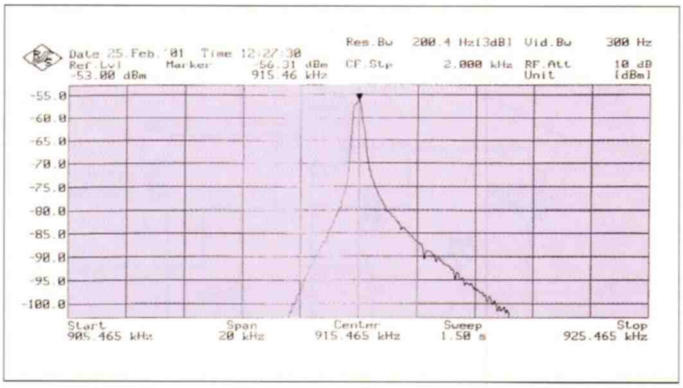


Fig. 3 Narrow i.f. selectivity with the crystal filter switched in, with a 6dB nose bandwidth of 400Hz and the typical peaky shape of the classic single crystal filter.

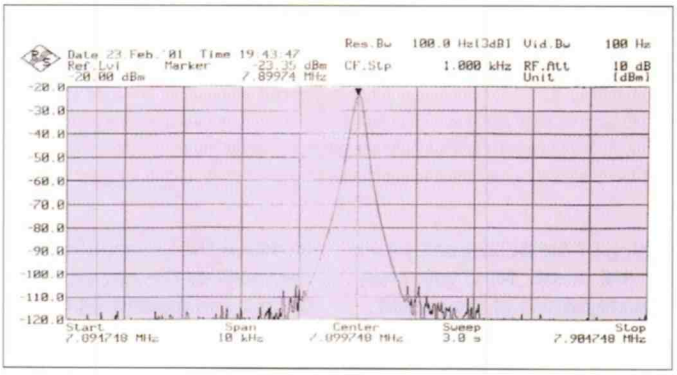


Fig. 4: The conversion oscillator output at 8MHz and you can see that it's free from sproggies such as are generated in almost every synthesised receiver ever made.

The Design

It's a masterpiece compared with the Royal Air Force's R-1155 and embodies the total mechanical and electronic design integration which typified the best of American engineering of the era. The backbone structure is an aluminium diecast frame which carries bolt-on side panels, the front panel, and flat plates which are the sub assemblies for the r.f. and i.f. sections.

The front-end bandswitched tuned circuits are housed in four separate and totally screened boxes, with the band switch shaft passing straight through, but removable via the end panel in exactly the same manner as I described in the Collins 51S-1 review, so Art Collins didn't think of it first.

Access for maintenance is

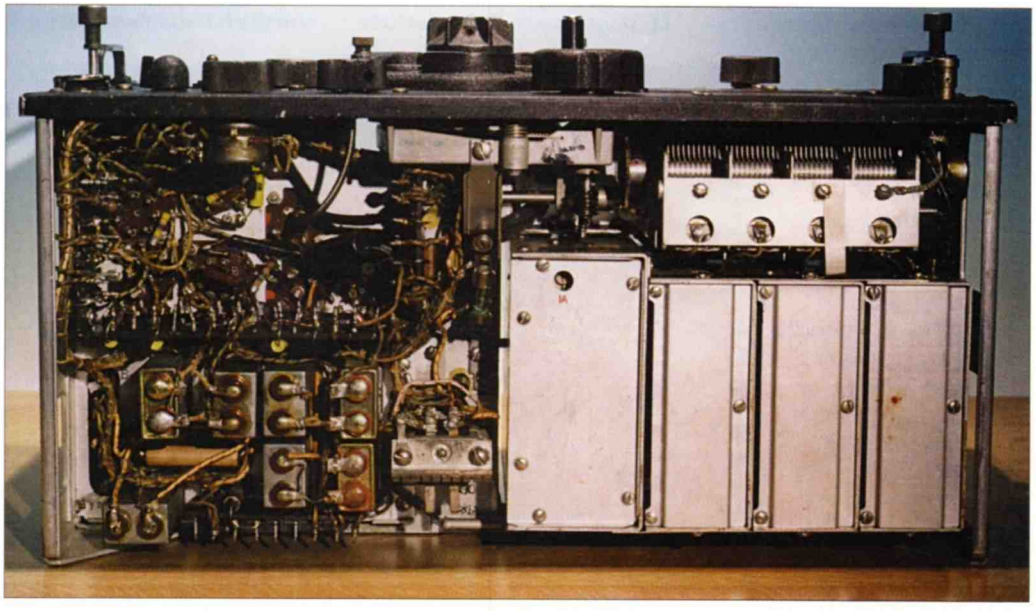
resulted in a huge increase in production, with contracts being awarded to several companies, notably Belmont and Wells-Gardner in Chicago and RCA and Stromberg-Carlson in New York.

As new contracts were awarded, a new suffix letter was allocated to the receivers and there was a complete series from BC-348B to BC-348AL depending on the contract date. This does not necessarily mean that later suffix letters denote later production because there were intermediate contracts for re-working earlier BC-348C receivers to a later specification.

Basically, most BC-348s are virtually identical except for the J, N and Q models which used single ended valves (e.g. 6SK7 instead of 6K7) and a 6SA7 mixer/oscillator instead of the more usual 6J7 mixer with a separate 6C5 local oscillator. The BC-348B and BC-348C covered a tuning range of 1.5 to 18MHz in six bands, whereas all the other models added 200kHz to 500kHz in the first band and compressed the 1.5 to 18MHz over the remaining five bands.

Some writers have put total production at around 90,000 units but my own research into the contract numbers indicates a higher total. For your own record the manufacturers are as follows:

RCA	BC-348B, BC-348C, BC-348O. Total **7,654**
Stromberg-Carlson	BC-348B - no production figure available
Belmont	BC-348E, BC-348M, BC-348P. Total **10,000**
	BC-348H, BC-348K, BC-348L, BC-348R, BC-348S, BC-348AL. Total **73,068**
Wells-Gardner	BC-348J, BC-348N, BC-348Q. Total **38,423**
Grand Total:	More than **129,000** - and that's a lot of receivers! Where are they all now?



The BC-348 underside shows typical RCA construction, this radio has survived remarkably well.

Glenn Miller, the Andrews Sisters and the BC-348

very easy for the i.f. and audio sub chassis, and by tilting the r.f. and mixer stages towards the rear of the receiver, the designers provided a removable plate on the front panel which when removed gives instant access to the underside of the valve bases. It's an easy receiver to work on, as I found out when I did some necessary restoration repairs.

The main tuning control drives a four gang precision tuning capacitor through an anti-backlash split gear train, with the band change mechanism heavily spring loaded so that the band change switch positively locates in the correct position, the actual tuning scales being located behind a rotating shutter arrangement so that only the band in use is shown to the operator.

The scales are not frequency linear, and the calibration intervals are few and far between, so a good deal of tuning around is necessary to find a chosen frequency. It has to be remembered that the BC-348 would normally have been used as a companion to a transmitter, and an operator would normally zero-beat his receiver on his transmitter frequency before operating.

Electronic design follows best practice of the time, the receiver having two tuned r.f. amplifiers, a mixer with a separate local oscillator (except for the BC-348J, N and Q), and three i.f. amplifiers at 915kHz followed by a.m. detection, a.g.c. detection and a good old 6K6 audio power amplifier at the end.

The h.t. was supplied by an internally mounted dynamotor delivering 220V d.c. at about 70mA. Although the BC-224 series of receivers is identical to the BC-348, except for the use of a 12V d.c. dynamotor, use of the wrong dynamotor is prevented by a simple metal dowel pin which prevents the fitting of the BC-224 unit into a BC-348 chassis. Mind you, most private owners of the BC-348 threw away the dynamotor and substituted a mains power supply in the resulting space.

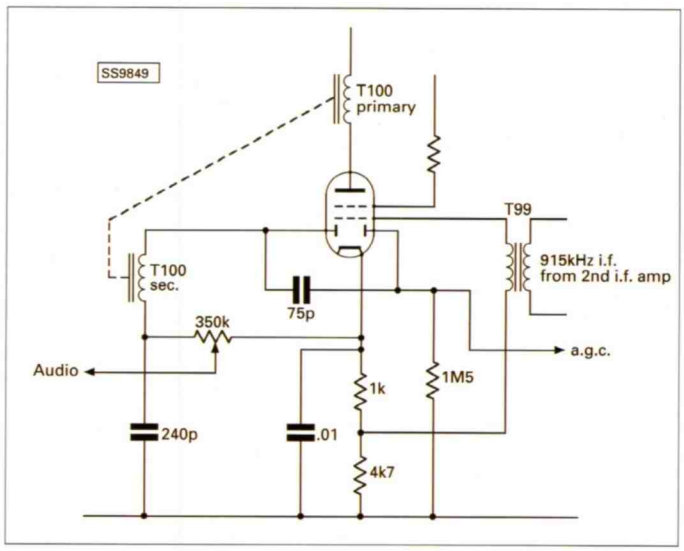


Fig. 5: The a.g.c. performance was interesting because I found that the a.g.c. threshold was set at an antenna input level of about 100µV, far higher than the more usual 1 - 2µV normally encountered. I took a look at the somewhat confusing original circuit drawing in the handbook (without a complete handbook you are lost) and re-drew the a.g.c. system as shown here.

Buried in the circuit were some very clever ideas, such as having a supplementary r.f. gain potentiometer driven from the end of the main tuning capacitor, which equalised the receiver gain when tuning from end to end of any tuning range. Another neat idea was the use of a 6F7 triode-pentode in the second i.f. stage, in which the pentode is used as the i.f. amplifier and the triode as the c.w. oscillator (b.f.o.). This meant that b.f.o. injection was by a mixture of coupling inside the valve augmented by a small amount of capacitive coupling using the old twisted wire technique.

The clever bit is in the feeding of the b.f.o. h.t. supply from the screen voltage of a.g.c. controlled stages in the receiver which means that at low incoming signal levels the a.g.c. is not operating, the valves under a.g.c. control are drawing normal screen current and the h.t. supply to the b.f.o. is low , hence low b.f.o. injection to match the incoming signal.

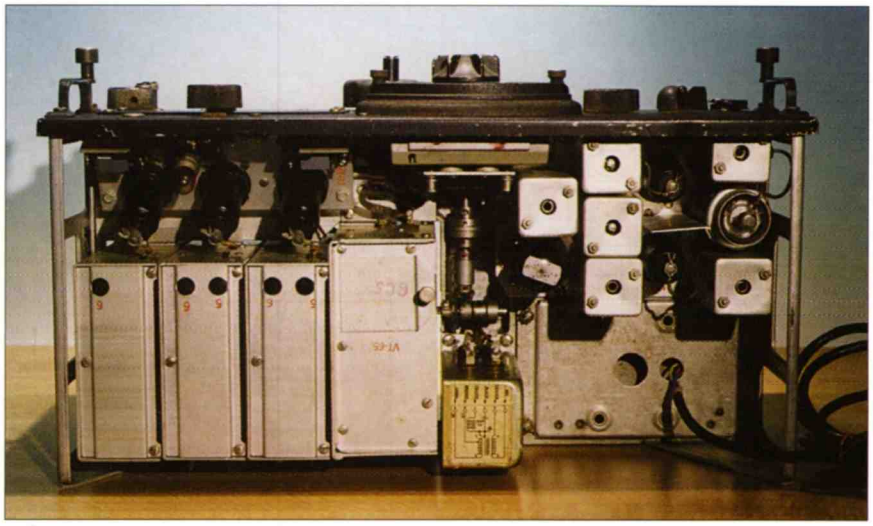
If the incoming signal is high enough to generate a.g.c., the screen current in the controlled valves will drop, thereby increasing the h.t. supply to the b.f.o. and increasing the injection to match the stronger incoming signal. There were some clever people in the design department of RCA in the late 1930s, as can be evidenced by the design of the BC-348 and, of course, the AR88. Q.E.D.

As an aside, I had to explain the behaviour of the screen grid current in tetrode valves to an eminent company in the EMC field who actually supply r.f. power amplifiers using tetrode valves (4CX250B). It seems that one has to be over the age of sixty to know these things, cos they certainly did not understand the finer points of valve characteristics which I grasped as a teenager.

Restoration & Repair

It would be unrealistic to expect a receiver manufactured in 1941 to be in tip-top condition after 60 years, and I knew from experience that there were some components I should look at before embarking on a test session. I was lucky to have located a relatively unmodified BC-348, the only obvious internal modifications being the change of valve heater wiring from the original 28V d.c. aircraft supply to standard 6.3V a.c. input, and the inclusion of cathode bias on the audio output valve instead of the fixed negative bias on the grid, originally derived from the voltage drop across a choke in the negative h.t. feed.

These were modifications which everyone incorporated as a matter of course, and I was relieved that nothing more had been done, until that



Topside, you just don't see mechanical engineering like this in modern radio.

is I found that the dial lamp dimming control had been re-wired to do something else, and the potentiometer was 50kΩ and not the 500Ω original. Well, the 50kΩ value told me that it was probably an r.f. gain control and sure enough the rear section of the original twin gang gain control had been disconnected and re-wired to the pot in place of the dimmer. I restored the wiring to original because I wanted to test the receiver as it had been designed.

Incidentally, using the voltage drop across a negative h.t. feed resistor had two beneficial effects - first there was no need for a large value electrolytic capacitor to bypass a cathode feed resistor at audio frequencies, remembering that electrolytics were far from reliable when these receivers were made, and secondly, the voltage dropped across a cathode resistor is effectively removed from the h.t. supply to the valve which you may not want to happen in service.

I knew that virtually all of the r.f. decoupling capacitors were of the Micamold variety so I turned my attention to these. Sure enough, every single one was leaky, and whilst this may not cause problems when the capacitor was used as cathode bias bypassing across a 220Ω resistor, it would certainly have an effect when decoupling a.g.c. feeds through 470kΩ resistors. I bit the bullet and replaced every one within reasonable reach, but held off diving inside the r.f. coil boxes in my enthusiasm.

Fortunately for me, none of the larger value capacitors of the oil filled variety were leaking either electrically or physically, so they posed no problems. And that was about the end of restoration so I connected a power supply, for which I used a 1937 vintage National 697, and waited for the bang as some unsuspected short circuit capacitor exploded - it didn't, so I let the old dear warm up for a couple of hours before plugging in a pair of headphones and being overcome with nostalgia as I tuned around.

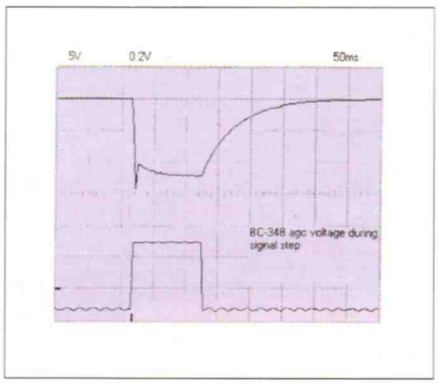


Fig. 6: Here are the BC-348's a.g.c. attack and decay characteristics, with a curious spike at the onset of signal, but with a clean and smooth decay.

What could be simpler than the front panel of a BC-348? The main tuning knob is obvious, and the band change knob is that metal starfish thing immediately below the tuning scale. Because of the serious spring loading and detent mechanism on the band change it is not a knob for the limp wristed, but clangs into place beautifully.

As I mentioned, the tuning scale is calibrated in very large increments, so visual acuity is needed when estimating where you are between the calibration marks. The tuning mechanism itself is wonderfully smooth, driving the four gang tuning capacitor through anti-backlash gearing, although a certain amount of drag has been built in to allow for the fact that these receivers had to be operated whilst bouncing across a flak-littered sky over Germany or Japan.

A large paddle is used to select 'AGC', 'OFF', 'MGC', and in the 'AGC' position the gain control is audio gain only, the r.f. gain being bypassed to maximum. In 'MGC', the gain control adjusts r.f. and a.f. gain simultaneously, with the a.g.c. system being disabled. In practical operating, you would use a.g.c. for a.m. listening and MGC for c.w./s.s.b. listening, although it should be remembered that h.f. s.s.b. was not in use in 1941, although single sideband had been in use for transatlantic telephone traffic since the 1920s, (not many people know that, as Michael Caine used to say).

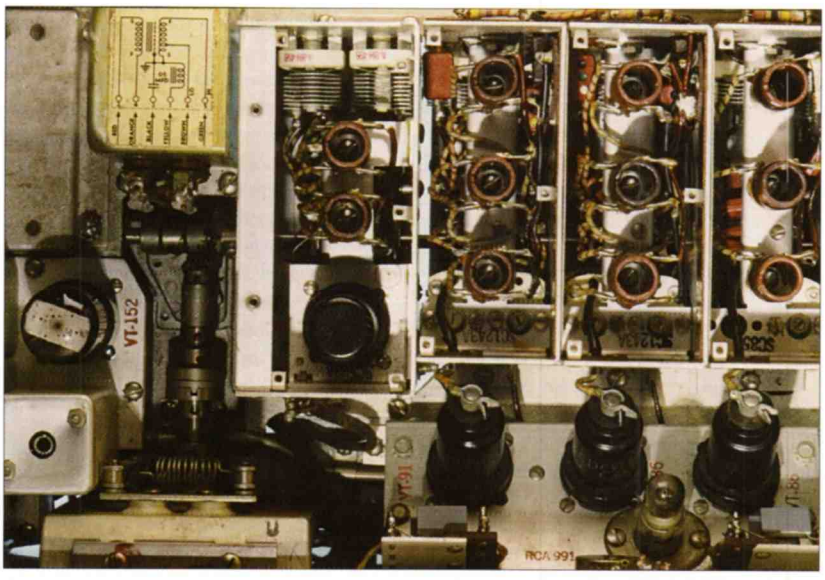
The b.f.o. is fully tunable about 4kHz each side of zero beat, and the on/off switch adds a capacitor across the a.g.c. line to extend the decay time, but by not very much. With an i.f. of 915kHz you can't expect much in the way of razor sharp selectivity, but for c.w. use a crystal filter is provided which is very effective although the available audio gain is barely sufficient to cope with the filter loss, so heaven alone knows how the radio operators of the Eighth Army Air Force managed to hear weak c.w. over the noise of a B-17. Mind you, how did the RAF WOP/AG manage with an R-1155 inside a Lancaster with four Merlins roaring just outside the window? If you don't understand the abbreviations, ask your grandfather.

That's All History - How Does It Perform Today?

By today's standards the BC-348 seems slightly insensitive, measuring s.s.b./c.w. sensitivity for 12dB SINAD ranging from -109dBm at 3.7MHz to -104dBm at 15MHz, in other words about 1μV for 10dB S/N ratio which is nevertheless perfectly adequate for h.f. communications at these frequencies. The noise floor, or minimum discernible signal (MDS) of the receiver ranges from about -120dBm to -122dBm. As far as dynamic range is concerned, I measured it at my usual test frequencies and it came out at 76dB with a third order intercept point of minus 8dB.

Because of the two stages of tuned r.f. amplification the second order intercept point was a highly respectable +78dBm with an equally respectable dynamic range of 100dB. This was measured using signals at 6.5 and 7MHz, resolving the sum product at 13.5MHz. **Figure 1** shows you the now familiar old receiver excellent preselector performance centred on 11.5MHz which means that there should be no unwanted out of band intermodulation products to trouble you in normal listening.

That's front-end selectivity, so what about i.f. selectivity. As I said, with an i.f. at 915kHz you don't expect crystal filter performance and **Fig. 2** shows the nose shape at 915kHz with a 6dB bandwidth of 6.8kHz



The fascinating mechanism for band changing is shown at the bottom left of this shot. The tuning drive is located in the tube that runs under the assembly. look carefully and you'll see it bending 90° to the left.

sloping gently away to a bandwidth of 25kHz at 50dB down. Oddly enough, this doesn't seem to hinder reception of s.s.b. signals and of course provides smooth and pleasant a.m. reception for broadcast listening.

Figure 3 shows the i.f. selectivity with the crystal filter switched in, with a 6dB nose bandwidth of 400Hz and the typical peaky shape of the classic single crystal filter. No external phasing control is provided for the filter, as in the HRO receiver, so the operator can't use the single signal-technique in reception, but c.w. with the BC-348 is as good as it gets and much better than its contemporary, the R-1155.

Figure 4 shows the conversion oscillator output at 8MHz and you can see that it's free from sproggies such as are generated in almost every synthesised receiver ever made. There is a little random noise at 90 to 100dB down and I suspect that there may be a leaky Micamold- decoupling capacitor involved, but I didn't want to tear into the oscillator compartment and risk upsetting the temperature compensation of this very stable unit. In use of course, the receiver is so clean and smooth that the tiny bit of low level oscillator noise is unimportant because the '348 is still better in this respect than many modern receivers.

The a.g.c. performance was interesting because I found that the a.g.c. threshold was set at an antenna input level of about 100µV, far higher than the more usual 1 - 2µV normally encountered. I took a look at the somewhat confusing original circuit drawing in the handbook (without a complete handbook you are lost) and re-drew the a.g.c. system as shown in **Fig. 5**.

The 6B8 valve is used as an i.f. amplifier at 915kHz and also as the a.m. detector and a.g.c. detector. The 6B8 derives its operating bias from current flowing in the two resistors in its cathode, but you will see that the grid is returned via T99 secondary to the junction of the 1kΩ and 4.7kΩ resistors

Not much going on at the back of a BC-348.

which means that the bias for the i.f. amplifier section of the 6B8 is that voltage developed only across the 1kΩ.

The diode a.m. detector is fed from T100 secondary, the diode load being the a.f. volume control which is returned to the 6B8 cathode meaning that the a.m. detector diode operates without any bias, which is correct. By contrast, the a.g.c. diode, fed via a 75pF capacitor from T100 secondary, has its load resistor returned to ground which means that the diode will not conduct until its anode voltage is higher than the voltage developed across both the 1kΩ and 4.7kΩ resistors.

This combined voltage determines the a.g.c. threshold and since it sits at around 30V d.c., you need at least 30V of i.f. signal to make it conduct and generate any a.g.c. control voltage. And that, dear chickens, is why you need 100µV at the antenna to generate any a.g.c.

I decided to modify (Shock, Horror!) the a.g.c. threshold voltage in order to see how the receiver performed at a lower threshold, and simply shunted the 4.7kΩ resistor by an additional 1kΩ to reduce the a.g.c. diode bias. Sure enough the a.g.c. system performed much better under my sudden step r.f. test, and I was mentally patting myself on the back until I switched on the b.f.o., whereupon the receiver went completely dead???

I then realised that the b.f.o. injection into the second i.f. stage meant that the b.f.o. signal by the time it had gone through the 6B8 amplifier was at a high enough level to overwhelm the a.g.c. threshold and generate enough control voltage to completely paralyse the receiver. This was a salutary lesson on the perils of modifications which try to change an already well thought out design, and probably explained why the a.g.c. threshold had been set so high in the first place.

The BC-348 had been designed to operate on c.w. in the manual gain mode and the a.g.c. was only there to be used in a.m., and then at such a level as to make most operation take place at full r.f. gain because of the inherent low level signals coming from a short antenna. So I removed my improved modification and restored the receiver to its original design. **Figure 6** shows the a.g.c. attack and decay characteristics, with a curious spike at the onset of signal, but with a clean and smooth decay - it all works well without any tweaking from me.

As originally designed, the BC-348 is everything a receiver of the period should be. It's out-performed by the AR88 from the same era, but that's no surprise when you compare the two receivers, and only goes to highlight the design strengths in the RCA company which designed them both. The mechanical design makes the BC-348 light but immensely strong, demonstrated by the stability of reception when the receiver is lifted and dropped back on to a bench.

Unlike the R-1155, there is only one connector at the rear of the receiver and this makes the installation look extremely tidy, particularly when seen alongside the Collins ART-13 transmitter or the alternative BC-375 with the plug-in TU series of tuning units. Michael will hate the outward appearance of all this black crackle paint, made even less to his taste by having a black tuning dial as well. And so to the important question; how does the BC-348 stand up in the company of present day receivers?

The greatest advances in receiver design have been concerned with setting accuracy and frequency stability. For serious hobby listening it is a great advantage to be able to key in a number and know that the receiver is spot on frequency (well, not always on frequency). Certainly i.f. selectivity has improved since 1941 by the introduction of crystal and/or mechanical filters, and more latterly Digital Signal Processing, but apart from these two areas nothing much has changed.

Indeed in some receivers of today the audio resulting from the use of d.s.p. has actually deteriorated. The use of non-selective wide open r.f. front-ends has resulted in the re-emergence of second order intermodulation problems which older receivers simply didn't have, so frequency setting accuracy apart there isn't much wrong with 60 year old receivers.

The main difficulty in obtaining a good example of these true classics is that they are now relatively scarce in unmodified form and have become quite valuable collectors' items. The fact that despite searching and asking for a BC-348 for nearly two years I finally located one as far away as Japan is evidence enough of the difficulties likely to be encountered, and the days have certainly gone when you could pick up a working AR88 for fifty quid.

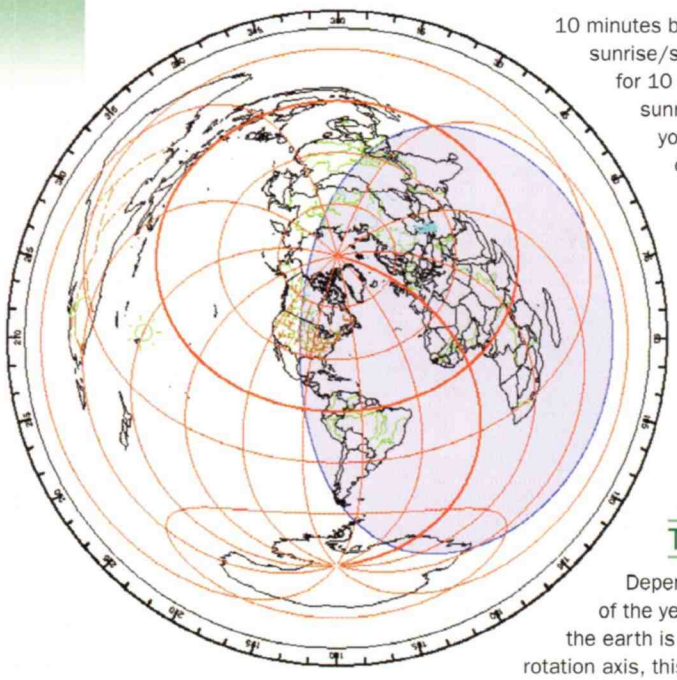
As for the BC-348, it proved to be every bit as good as I remembered from my teens, and I'm now going to put mine away and look after it as though it were expensive Crown Derby china. If I feel inspired, I might just take another look at my ART-13 and see what magic it holds.

Happy listening (on whatever you use). ***SWM***

By huge contrast, join JW next month when he looks at two very modern offerings from Watkins-Johnson.

Propagation Special

Grey-line Propagation



The grey-line viewed on a great circle projection.

There is a propagation phenomenon or mode that is still not very well understood, but that appears twice a day and is used by DXers to log very distant and low powered stations operating mostly in the low tropical bands. Jacques d'Avignon looks at this phenomenon, otherwise called the 'grey-line propagation mode'.

The so-called grey-line is the transition region between day and night and vice versa. This transition zone travels around the globe as the earth rotates on its axis. This grey-line zone starts approximately 10 minutes before actual sunrise/sunset and lasts for 10 minutes after the sunrise/sunset. Thus you have a window of about 20 minutes to try and hear that elusive low power station on the other side of the world located in the same grey-line zone passing over you.

Time Of Year

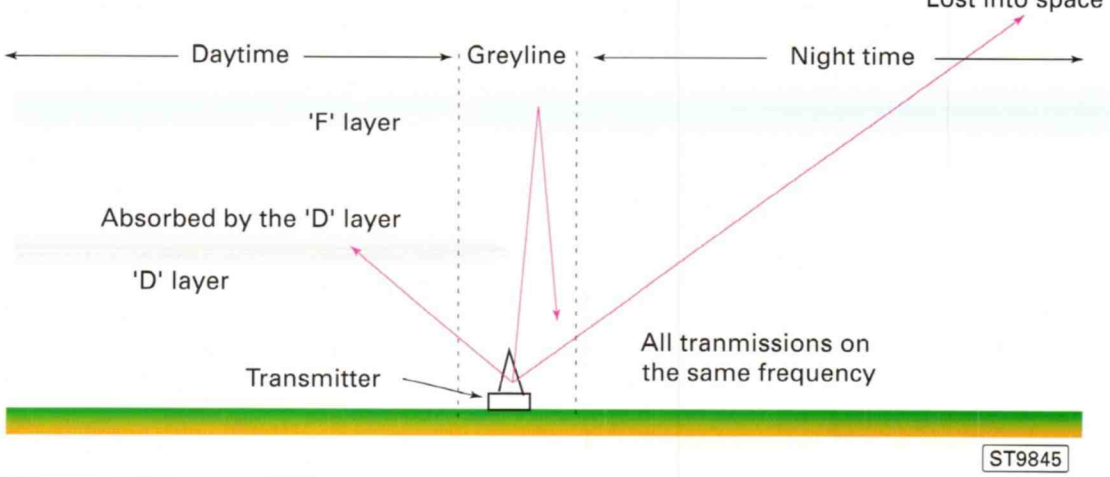
Depending on the time of the year, and because the earth is tilted on its rotation axis, this zone will not always cover the same stations everyday. So you should be listening to some unusual stations at sunrise and sunset as often as possible, typically you should be listening to tropical stations in the 2, 3 and 4MHz during the short period of the passage of grey-line. In North America, this propagation mode allows us to hear Indonesian, Indian and African stations on these frequencies when normal propagation mode would not normally allow us to do so.

At the equinox, the grey-line phenomenon is normally more pronounced and should be fully explored to listen for that unusual and/or low powered station. Look for that station in the tropical bands that you know is there but that you have never heard, you may just hear it during the grey-line period of the day. If you check the tropical frequencies at grey-line time for a full year, you should log some very unusual stations.

For those of you that live far North, inside or very close to the Arctic Circle, in the Scandinavian countries for example, listen to signals in the **520 to 1700kHz** band, the North American broadcast band, you may be able to hear some fairly strong signals over the North Pole during the passage of the grey-line zone signals from Canada or the United States. Remember that the North American broadcast stations are spaced every 10kHz and not 9kHz like in Europe.

SWM

The ionospheric mechanism that causes the 'grey-line' effect.



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also receives 23cm amateur FM-TV

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Plus £7.50 Carr.

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- Modes: AM, USB, LSB, FM (AM synchronous, AM air band, FM broadcast)
- Tuning: Direct keyboard entry & manual rotary knob tuning · Memories: 70
- Separate volume, bass, treble & air squelch controls
- Supply: 6 x D cells (Not supplied), 230V mains adaptor included · Size: 535 x 234 x 215mm · Weight: 6.6kg
- Supplied Accessories: Headphones, 1/4in to 3.5mm adaptor, Handbook

New for the Millennium is the Satellite 800 Millennium receiver. Designed for ease of use, it has many features normally found on communication receivers Superb sound through its 4in speaker or headphones. It has a choice of bandwidths 2.3, 4.0 & 6.0kHz, normal AM or synchronous AM modes available as well as airband AM. FM stereo through headphones (supplied) or phono connectors on rear. Large LCD with informative displays, large direct entry keyboard, as well as analogue S meter. The Satellit 800 is ideal for both the newcomer to radio or the experienced SWL and will give years of pleasure.

IC-R75 Receiver 30kHz - 60MHz

ICOM

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 * Altenuator * 2-level Pre-Amp * Scanning.

£595
Plus £7.50 Carr.

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.

VR-120

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* 100kHz - 1300MHz * AM, FM, WFM
* 12 Channel steps * 640 Memory Channels
* 64 frequency skip channels
* 21 Smart Search * 8 Search bands
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0kHz - 32MHz AOR-7030 Receiver

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.

Phone

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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 50,000 memories with 20 Alphanumeric Characters * Noise Blanker * Text Search * Pass Band Tuning * Stereo CW Reception * Notch & Peak Filter etc.

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Roberts R-827

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* 8.33kHz airband spacing
* 12V DC/230V AC mains

UBC - 220XLT
HANDHELD SCANNER

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.

£149.95 Plus £6.00 Carr.

Yupiteru MVT-7100EX
100kHz - 1.65GHz

Phone Plus £6.00 Carr.

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.

UBC - 120XLT
HANDHELD SCANNER

The Uniden UBC120XLT Handheld Scanner is ideal for the listener who does not want to have the expense of one of the more complex scanners. It covers with some gaps from 66 to 512MHz, AM and NFM preselected for the band in use.

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WS-Mobile Antenna

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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.

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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.

£259 Plus £7.50 Carr.

IC-R2
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.

£149 Plus £7.50 Carr.

VR-500

This lovely little scanner from Yaesu offers superb performance.
* 100kHz - 1300MHz
* 1000 Memories
* 100 Skip channels 10 Search bands
* 8 Character alphanumeric display
* Band scope Priority monitoring
* PC programmable
* Smart search feature
* Alpha numeric recall
* Size 58 x 95 x 24mm 220g

£199 Plus £7.50 Carr.

YAESU Choice of the World's top DX'ers

NEW

VR-5000

Phone Plus £7.50 Carr.

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* Modes: CW, LSB, USB, AM, AM-N,WAM, FM-N,WFM
* 27 mode steps available (Main band)
* 18 mode steps available (Sub band)
* 2,000 Memory Channels
* Real-Time Band Scope
* DSP Bandpass, Notch & NR Filters (optional)
* World ClockDigital
* Voice Recorder (optional)
* Audio 1W into 8 Ohms
* Supply: 13.5V Current: 0.7A @ 1W audio output
* Size: 180 x 70 x 203mm
* Weight: 1.9kg (approx)

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Catch all the action with the VR-5000's extensive scanning capabilities. Lightning fast scanning and band sweep with Smart Search for automatic loading of up to 100 channels. View on the incredibly large blue backlit LCD the Graphical Memory Display (PMR) for monitoring activity patterns on up to 50 channels, or the Real-Time Spectrum Scope for visual activity on the bands. Features a preset SW broadcast Station memory bank with a handy World map showing the station's location. Includes VOA, BBC, Radio Japan, Voice of Russia, etc.
When monitoring on the main displayed frequency, simultaneously listen to a second station operating within 20MHz of the main frequency on AM or FMN modes. A powerful memory system provides 2,000 channels which can be arranged in up to 100 memory groups with alpha-numeric labels attached.

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HF Propagation

Propagation Special

For many listeners, the propagation conditions, how they vary and how they affect the quality of your reception are still mysteries. You hear an interesting station and a few hours (minutes) later you don't! What happened? You know from the schedule on your desk that the station is still transmitting, but it has disappeared from your dial! So, what's the cause? Jacques d'Avignon explains.

The cause is by the vagaries of the propagation conditions on the path between your receiving site and the transmitter. The amount of ultra-violet radiation from the sun is the main factor on determining the height of the main ionised reflecting layers (D, E, F1 and F2) that allow us to receive transmissions from half way around the world and in some cases around the world.

The sunspot number and/or the 10.7cm radio flux of the sun, the season of the year are also contributing factors to the refractive quality of the various layers of the ionosphere. In addition, propagation is also influenced by many other factors such as: the time of day, daylight or night time, (not only at your receiving site but along the path and at the transmitting site), the season of the year (more or less ultra-violet radiation reaching the ionosphere), the state of restlessness of the sun, the land, sea or ice surface that reflects the waves on their travel from the transmitter to your receiver. The height and also the presence of the D, E, F1 and F2 layers varies daily and hourly according to the season and all factors alluded above.

Cyclical Phenomenon

The average sunspot number is a very cyclical phenomenon, and the cycle pattern is well defined. Since 1749, records of the sunspot numbers have been accurately kept and it is possible to look back and review the pattern of the various cycles. Thus it is possible to extrapolate what the monthly numbers for the next cycle should be. We also know that the average length of each solar cycle is about 11 years, well almost.

Because of the length of these historical records, the quality of the extrapolation, forecasting the monthly sunspot number, is very good, not exact yet, but good enough for radio propagation forecasting use. But...nature being what it is, there are always discrepancies between the actual and the forecasted sunspot numbers. The sunspot number used for forecasting propagation is not the actual 'number', but an average number derived from the previous cycles.

The sunspot numbers broadcasted hourly by WWV and WWVH are solar radio flux value measured at a wavelength of 10.7cm. There are well-defined correlations between the sunspot number and the 10.7cm flux value to convert sunspot number to solar flux.

Figure 1 shows the relationship between sunspot number and 10cm solar flux.

As the height and the ionisation density of the layers vary according to the sunspot number and the season of the year, the value of the frequency that will be refracted by the various layers will also vary. If the transmitted frequency is too high, the signal will pass through the layers, if the frequency is too low the signal will be absorbed by one or more of the layers and very little signal will be refracted back to the ground.

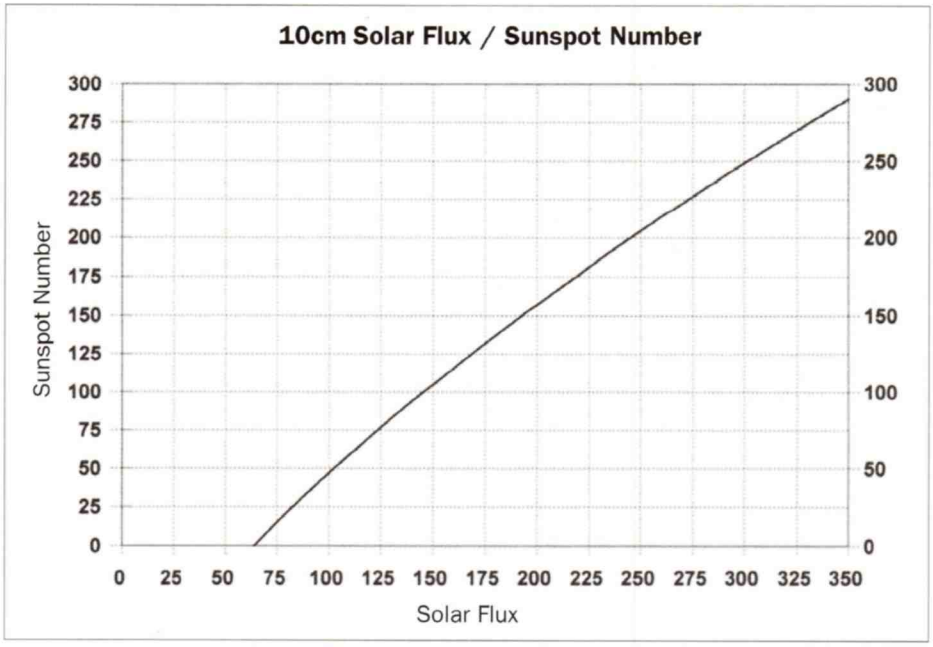

Fig. 1: The relationship between 10cm Solar Flux and Sunspot Number.

Extreme Frequencies

We now have just defined the Highest Possible Frequency (HPF), which will not be reflected at all, and the Lowest Usable Frequency (LUF), which will be totally absorbed, for a circuit at a specific time of day and at a specific time of the year.

Between these two extreme frequencies, HPF and LUF, communications are possible, but with varying degrees of success.

Between these two frequency extremes: HPF and LUF, we find another alphabet soup of acronyms: MUF and OWF being the most important to the s.w.l. The MUF (Maximum Usable Frequency) is the frequency that could be used for communication between two points if you do not require more than about 50% reliability.

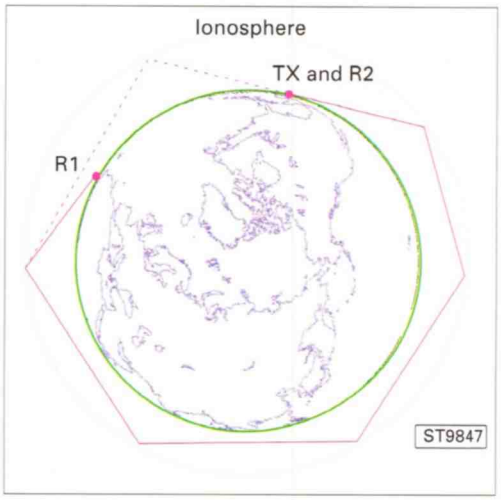

Fig. 2a: The signal transmitted from 'T' can be received at 'R' without a single bounce off the earth. The same signal can also be received at 'R2' after a trip around the world. At 'R2' the reception delay was measured at 138ms. If there had been 35 hops, the delay would have been measured at 160ms.

The most interesting and important frequency for the short wave broadcasters and listeners is the OWF (Optimum Working Frequency sometime called the FOT (Frequence Optimal de Travail)). At that frequency, and within plus or minus 10% of the OWF, the chances of receiving an excellent signal, on a particular circuit, are better then 90%.

As the frequency increases and reaches the MUF, the chances are now only about 50% of receiving a good signal. The OWF can be calculated as being about 80 to 85% of the MUF calculated/forecasted for that circuit at that particular time.

Establishing Communications

Now we will look at the extreme forecasted frequencies that have been discussed previously. At the high end of the scale, the HPF, the chances of establishing communications have now diminished to less then 10%!

At the low end of the scale, as the frequency decreases, on a specific circuit, and reaches the LUF, most of the signal is now absorbed and not refracted by the ionospheric layers and the chances are minimal of receiving a detectable signal. Frequency trolling/lurking around the HPF can sometimes bring some interesting intercepts, but do not count on that to fill your evenings and log books.

Under certain conditions, it is possible for the LUF to be higher than OWF, in the *SWM* monthly graphs - this fact is indicated by the dashed line depicting the LUF merging with the grey line of the OWF. This does not mean that no signal can be heard, but the chances are minimal. The signal would have to be very powerful so as to reach your receiving site.

We all know that today, many broadcasting and utility stations will use enough power to 'punch' a signal under the worst conditions. I have heard the powerful signals of certain broadcasters being received with the antenna of my receiver actually grounded!

If you feed 500kW in a curtain antenna having a 20dB gain, chances are that you will be heard using a paper clip as an antenna at the receiving end of the circuit, specially if you are located at the first hop of the wave on its way to the intended target.

Reason One

Everything that I have described above would happen as scripted if all conditions were 'ideal', and we all know that is a rare occasion. Let's review situations where the signal does not reach your receiving site or arrives very attenuated and try to understand why.

A transmitted signal could be weak at the receiver because of one of the following reasons: 1) the transmitter is low powered and/or 2) the signal suffers from further attenuation along the way. The first reason is easily explainable, some utility stations do not have a very powerful transmitter, their signals are not designed to be received at distant stations, similarly some short wave broadcasters, more specifically in the tropics, are operating as local stations and are not transmitting a powerful signal to be received in distant locations.

See *SWM* May 1998, page 39, 'NVIS Propagation' and 'The Tropical Bands', *SWM* May 2000, page 33, for a description of a propagation mode that is made specifically for local tropical broadcasting in the s.w. part of the spectrum.

Reason Two

Next, look at the second reason. It is the present theory that in the 'normal' type of propagation mode the signal along a circuit will bounce, sometimes more then once, between the ionosphere and the surface of the earth before arriving at your receiving site. The condition and texture of the earth surface where this signal bounces, will also affect the propagation.

The amount of absorption of the signal at each bounce is determined by the reflecting surface: ice, water or land. When making a forecast of the signal strength, it is thus necessary to consider if the bounces are from the ocean, the earth or an ice covered region.

In the chordal or trapped modes of propagation, the signal does not reflect from the earth surface between the transmitter and the receiver, see **Fig. 2a** and **Fig. 2b**. These two modes are infrequently present and it is impossible to predict their occurrence. Needless to say that when these two modes are present, the attenuation due to ground reflections is minimal.

If the signal crosses one or the

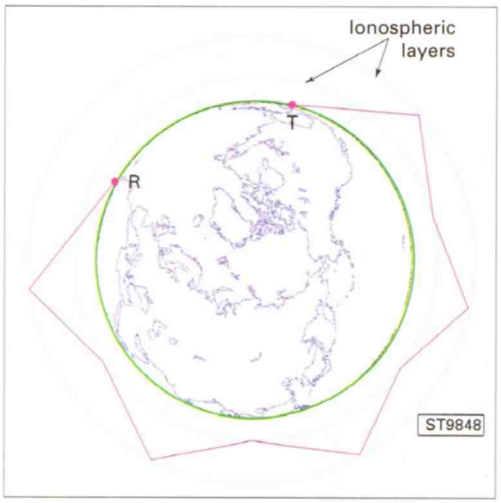

Fig. 2b:The signal will bounce between various layers of the ionosphere and within the layers. No known commercial use for this type of propagation. Difficult to achieve and to predict, but does occur regularly. Little attenuation measured between 'T' and 'R'.

other auroral zones around the geomagnetic poles of the earth, there is a possibility that the signal can be severely degraded when the geomagnetic conditions are disturbed. Flutter, resembling very rapid, and sometimes deep, fading will be heard on the signal.

On the *SWM* propagation forecast page, the following circuits can be affected by the auroral flutter: 'North America (E)', 'Japan', 'Pacific' and 'Australia'. All these circuits traverse or skirt the Boreal auroral zone. Surprised? I knew you would be!

At certain times, the signal may be reaching your receiving site by more then one path. Two different types of conditions can cause this situation and the effect on the received signal will be similar but noticeably different, look at **Fig. 3**.

The first condition is caused by the same signal, on the same frequency, arriving at your receiver after having been reflected by two different layers or two different parts of the same layer. If you are listening to a broadcast transmission, the effect can be annoying, a slight delay in the signals' arrival time will produce a sound similar to an echo, but if you are a utility listener, FAX or RTTY, the effect of this short delay can be devastating on the quality of your intercept. If you look at **Fig. 3** it is obvious that the one hop path is shorter in time than the two-hop path, thus there will be a time delay of varying length between the arrival of the two signals.

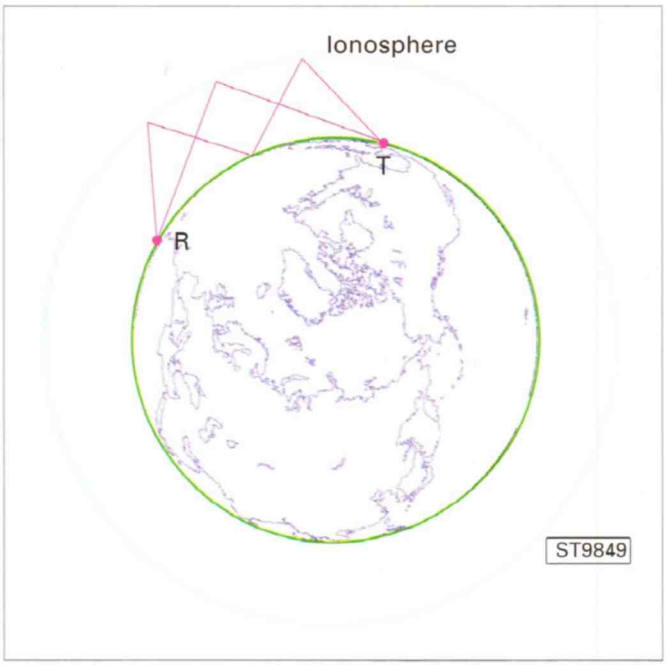

Fig. 3: Both signals will sometimes add and sometimes subtract. This will cause degraded quality of the signal at the receiver.

Pixel Components

In FAX reception, each 'pixel' will now have two or more components to it, each component being produced by the individual received signal. The clear and crisp lines on the original map will become very fuzzy and barely readable. In fact, it is possible to measure the delay between the arrival of the various signals from a FAX chart received under these conditions.

While receiving RTTY, the signal can be so badly distorted as to make the intercept impossible, even if the signal looks fairly good on the scope, the delay introduced by the receptions of the two or more signals will introduce a distortion in the final signal fed to the demodulator. Look at **Fig. 4** - you will note the badly distorted FAX reception caused by multipath propagation when the signal was received at 4MHz.

The conditions are much better on the 6MHz signal and finally the 10MHz signal does not exhibit any multipath degradation. Anyone wishing to read more about this phenomenon should consult:

d'Avignon J., VE3VIA, 'Effects of the Ionosphere' *QEX*, January 1995, pp 22-25.

Multipath Reception

The second type of multipath reception is seldom encountered, but can produce some startling sounds. When this happens, it is virtually impossible to have a good FAX or RTTY intercept. This second type of multipath distortion is caused by the arrival of two signals each following a totally different path from the transmitter to your receiver. The first path is along the shortest great circle route from the transmitter to you and the second path goes around the globe before it reaches your receiver or from a patch of E-layer located of the normal transmission path.

Admittedly the second signal should be weaker and barely audible, but under certain conditions of chordal or trapped propagation mode, and on certain frequencies the second signal will be heard quite clearly. The effect of this is for the listener to hear an echo in the received signal, this echo being very pronounced and clear. The delay time introduced by this multipath situation can be calculated using the speed of the radio wave and the distance from the transmitting path around the world from the transmitter to your receiver.

It is also necessary to add the additional path length introduced by the various bounces of the wavefront between the reflecting layer and the ground. If these conditions are encountered, change frequency or wait till tomorrow! The disgruntled listener could also put the coffee pot on and do some mathematics to calculate the length of the long path and the time delay introduced by this phenomenon in the received signal.

No Signal

Many listeners have complained that at certain times the conditions were 'forecasted' to be good over a certain path and for a certain time period, but no signal was received. This situation is very frustrating and merits some explanations.

The receiving conditions are forecasted for 'normal' conditions of the sun and we all know that this is not the regular situation of the sun. The ionosphere can be disturbed by sudden solar flares and other sun related vagaries.

Solar flares and resulting magnetic storms are not easy to forecast and when they happen they cause major disruption in the h.f. communication circuits. Matter of fact, magnetic storms can also produce major disruptions in the high voltage distribution system of your power company.

The major power disruption that occurred in the north eastern electric grid of North America on March 9th, 1989, was caused by a significant magnetic storm inducing an additional d.c. voltage on the a.c. high voltage transmission lines across the northern part of North America. If you live in Eastern North America and are interested in this occurrence, talk to your power company engineer. He will remember vividly the events of that particular night and the following days: power blackouts, exploded transformers, disrupted power transfer between power producers, etc. It was not pretty!

continued on page 36

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- BAND MEMORIES: 10 (user re-programmable)
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- SCAN/SEARCH SPEED: 30/sec
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- Steps 50Hz, 100Hz for tuning LSB & USB
- 155H x 64.4W x 32Dmm
- Weight - 320g
- Supplied with NiCads, mains charger, 12VDC cigar lead, belt clip, carry strap

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YUPITERU MVT 7300

- 520kHz -1.32GHz
- 1000 Memories
- 8.83kHz Airband
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- Clock timer
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- **Frequency:** 100kHz-30MHz
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24 Hour Forecast

The short wave listener that can listen, or has access via the Internet, to the WWV or WWVH broadcasts giving the actual ionospheric and geomagnetic conditions and a forecast for the next 24 hours. The 'A' index value broadcasted during the time slot allocated to this data (H+18 for WWV and H+48 for WWVH) is a good indication of the present conditions. The higher the value of the 'A' index, the more disturbance you can expect to have on any circuits.

If the forecast transmitted by NOAA talks about geomagnetic storm and/or ionospheric disturbances, and gives an 'a' index value in the 25 to 50 range or above, do not expect very good reception conditions.

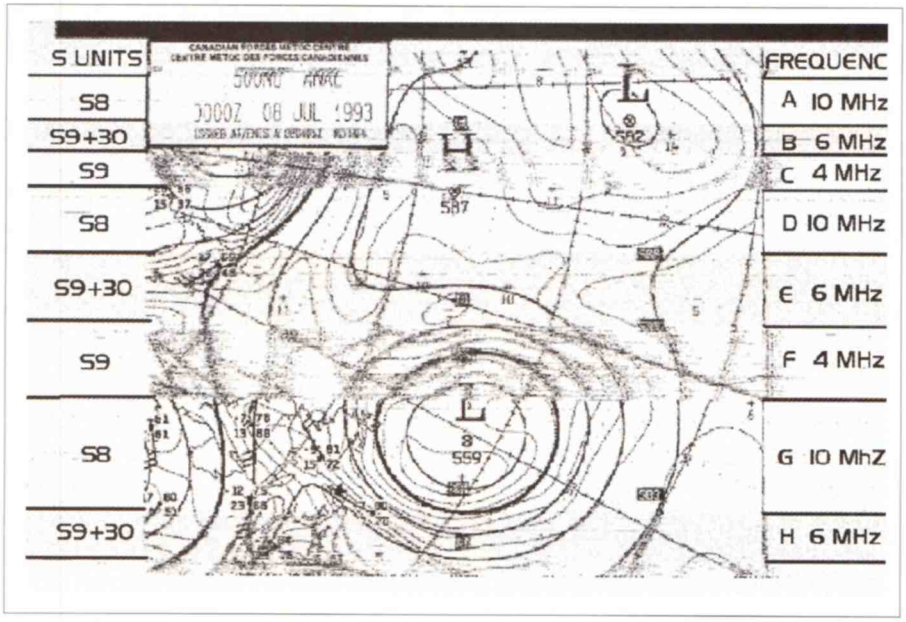


Fig. 4: A badly distorted FAX reception caused by multipath propagation when the signal was received at 4MHz.

Highest Frequency

Finally, as a rule of thumb, if you have the choice of more then one frequency to receive a station, broadcast or utility, use the highest possible frequency - as close as possible to the OWF, see **Fig. 4** as a good example. This is where you have your best chance to intercept a very good to excellent signal. This will not insure that you will not be receiving the signal on more than one path, but chances are that the signal from the second path could be so attenuated as not to interfere with your intercept. Good listening!

SWM

Propagation Special

HF Propagation Beacons

Propagation forecasting is like weather forecasting, says Jacques d'Avignon - there are many variables that have to be accounted for. Over the years the computer programs and forecasting methods have been greatly improved, but there are always more improvements possible.

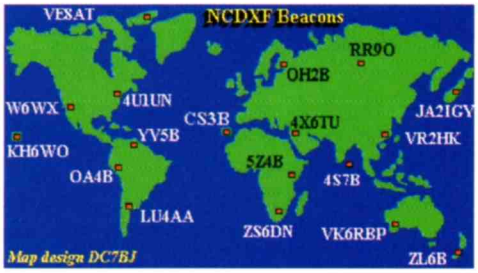
The ionosphere refraction qualities vary constantly and in order to follow as accurately as possible the changes, amateur and scientific h.f. beacons have been installed around the world. These beacons transmit on a tight schedule a signal of varying power. Thus by listening from your own location to these beacons, you can get a very good feeling of the quality of the refraction path to the location of the beacons.

There are presently two main series of beacons being operated. The first one is a joint NCDXF/IARU operation and is responsible for 18 beacons around the world. These beacons operate in the amateur bands and they all are equipped with the same type of equipment. Check **http://ncdxf.org/** for more information on these beacons.

The beacons are located in about every region of the world, so by listening to their signals on one frequency, you can visualise very rapidly what the conditions are around the globe. What is interesting with these beacons is the fact that they transmit a signal of decreasing power: 100, 10, 1 and 0.1W, and you can hear the signal getting fainter and fainter 'till it is finally lost in the noise.

The transmissions are continuous, on schedule, around the clock. The total transmission time during one cycle on each frequency is only 10 seconds. The timing at all stations is accurately maintained by using a GPS receiver as the basic clock.

Here is a partial list of the locations: United Nations HQ, USA, Canada, Venezuela, Sri Lanka, Australia and Japan. Eleven more sites are presently operational or are scheduled to become operational in the near future. The frequencies used are: 14.100, 18.110, 21.150, 24.930 and 28.200MHz.



Second Series

A second series of beacons is being installed and operated under the aegis of the ITU (International Telecommunications Union) by at least two countries. The original intent of the ITU experiment was to have as many countries as possible install propagation beacons and gather as much information as possible from automatic receivers. The signal transmitted by these beacons is a fairly complex one, but was designed so that it would be possible to gather as much information as possible and the information could be computer analysed.

This ITU field-strength measuring campaign will eventually produce the necessary data to help improve even more the propagation forecasting techniques and software. The specifications for the transmitting and receiving equipment to be used are very stringent, making it possible to compare the results between all stations.

The transmitted signal format is a complex one using a combination of c.w. (continuous wave) and f.s.k. (frequency shift keying) modulation methods. The signal contains all the information necessary to help the automatic extraction of the data required to obtain the hourly field strength at the receiving site.

Only Two

To date, only two countries have installed transmitters for this campaign: Norway with station LN2A, and Australia with station VL8IPS. The transmitters and antennas used at these stations are completely dissimilar, but these two stations use the same set of frequencies: 5.470, 7.870, 10.407, 14.405 and 20.945MHz. As more transmitters are added to this chain, it will become necessary to find additional frequencies, this will become necessary as the transmission cycle of these two stations is four minutes on each frequency compared to 10 seconds for the NCDXF/IARU beacons.

The frequencies presently used by the ITU beacons are not protected, so at night on the 7MHz frequency there is serious QRM by a FAX station. Maybe when more stations are added to the network, the frequencies used by these beacons will be protected from interfering signals. If you want to learn more about the ITU beacon operated by IPS in Australia, check the following web page:
http://www.ips.gov.au/beacon

Other Beacons

There are also other beacons used to check the propagation, they are mostly operating in the amateur bands. If you perform a search on the 'net, you will find many lists of such beacons. The information gathered from all these beacons will, over time, help improve the quality of the radio propagation forecasting. As a weather forecaster in a previous incarnation, I compare these beacons to new weather stations that help fill the gaps in your knowledge of a specific territory.

SWM

Slot	DX Entity	Call	Location	Latitude	Longitude
1	United Nations	4U1UN	New York City	40° 45'N	73° 58'W
2	Canada	VE8AT	Eureka, Nunavut	79° 59'N	85° 57'W
3	United States	W6WX	Mt. Umunhum	37° 09'N	121° 54'W
4	Hawaii	KH6WO	Laie	21° 38'N	157° 55'W
5	New Zealand	ZL6B	Masterton	41° 03'S	175° 36'E
6	Australia	VK6RBP	Rolystone	32° 06'S	116° 03'E
7	Japan	JA2IGY	Mt. Asama	34° 27'N	136° 47'E
8	Russia	RR9O	Novosibirsk	54° 59'N	82° 54'E
9	Hong Kong	VR2HK	Hong Kong	22° 16'N	114° 11'E
10	Sri Lanka	4S7B	Colombo	6° 54'N	79° 52'E
11	South Africa	ZS6DN	Pretoria	25° 54'S	28° 16'E
12	Kenya	5Z4B	Kilifi	3° 37'S	39° 50'E
13	Israel	4X6TU	Tel Aviv	32° 06'N	34° 48'E
14	Finland	OH2B	Karkkila	60° 32'N	24° 06'E
15	Madeira	CS3B	Santo da Serra	32° 43'N	16° 48'W
16	Argentina	LU4AA	Buenos Aires	34° 37'S	58° 21'W
17	Peru	OA4B	Lima	12° 04'S	76° 57'W
18	Venezuela	YV5B	Caracas	10° 25'N	66° 51'W

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AOR

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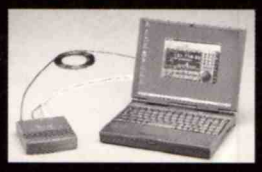
AR3000A

ICOM

PCR1000



PCR100

Model	Description	£ RRP inc VAT
AR5000	High performance full featured wide band all mode base receiver 10kHz - 2600 Mhz. IF selection as standard 220kHz, 110kHz, 30kHz, 15kHz, 6kHz, 3kHz (500Hz optional). Supplied with mains power supply.	£1295.00
AR5000+3	High performance base receiver with three enhanced options factory fitted: noise blanker, synchronous AM, automatic frequency control.	£1449.00
AR3000A	Unique all mode extremely wide band base-mobile receiver 100kHz - 2036mhz with no gaps. RS232 port fitted.	£699.00
AR3000A +(plus)	Customised AR3000A with switchable narrow SM & SAT filters, Tape relay, SDU ready and discriminator output.	£799.00
AR8200 Series 2	New advanced wide band all mode hand-held receiver with enhanced microprocessor facilities, slot card options available, multi-function display.	£395.00
AR8000	The New Concept. Wide band all mode hand-held receiver with many microprocessor facilities, dot matrix display and computer compatibility.	£296.00
ICOM R2	0.1300mhz Handie. Fits in the palm of your hand. AM/FM, FM Narrow - 450 memory channels	£139.00
IC R8500	100kHz - 2GHz Continuous. All mode no gaps.1000 Memories. 4IF band widths Excellent all round for the professional listener	£1440.00
IC-R75E	0-60MHz. High Stability receiver circuit 100 DB Dynamic range. Twin bandpass Tuning. Optional digital processor. Best selling receiver	£629.00

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- MEMORIES: 200
- BAND MEMORIES: 10 (user re-programmable)
- PRIORITY CHANNELS: 10
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DIAWA	ROTATOR MR-750U HEAVY DUTY	£250.00
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Propagation Special

Tropospheric Enhancement

Gordon J King G4VFV explains just how we can receive distant stations utilising enhanced tropospheric conditions.

While low, medium and high frequency electromagnetic (EM) radio waves of long, medium and short wavelengths, below about 30MHz or 10m, propagate over substantial distances by the sky waves bouncing round the planet between the ionosphere and earth, shorter wavelength waves are not so readily mirrored back to earth.

Waves of very high frequency (v.h.f.), ultra high frequency (u.h.f.), super high frequency (s.h.f.) and extremely high frequency (e.h.f.), in the respective ranges of 30 to 300MHz, 300MHz to 3GHz, 3 to 30GHz and 30 to 300GHz (1000MHz = 1GHz), tend to penetrate the ionosphere with minimal attenuation and hence continue on their way through light years of space!

This is just as well when you come to think of it, for otherwise such things as satellite radio and television (TV) and microwave communication systems would not be possible. The microwave spectrum is generally regarded as occupying the frequency range of 300MHz to 300GHz, with corresponding wavelengths of 1m to1mm (mm = 10^{-3} m).

Neither would we be able to see the planets and stars thousands of light years away in space, for after all, light itself and all the other cosmic radiations are of the EM wave family, and differ from radio waves only by their incredibly high frequencies and diminutive wavelengths.

The wavelengths of waves in this part of the spectrum are measured in micrometres (μm = 10^{-6}) and nanometres (nm =10^{-9} m), which are a one millionth and a thousand millionth of a metre respectively. So short as to be virtually impossible to visualise.

Wave Velocity

The connection between frequency and wavelength of an EM wave is related to the velocity (c) at which the waves travel through free space. All EM waves travel very close to 300m per millionth of a second (ms) or 300,000,000 (300x10^6)m per second, which is mighty fast. The fastest, so it is said, anything physical can travel!

This means that in free space, the wavelength is equal to the velocity divided by the frequency (λ=c/f) and the frequency equal to the velocity divided by the wavelength (f=c/λ). The wavelength of a 150MHz (150x10^6 Hz) radio wave, therefore, corresponds to 2m (300x10^6/150x10^6), and the frequency of a 70cm (0.7m) radio wave to 428.57MHz (300x10^6/0.7).

That's all there is to it really, but we must have in mind that the velocity is reduced when radio waves pass through a medium other than free-space. When fed along coaxial

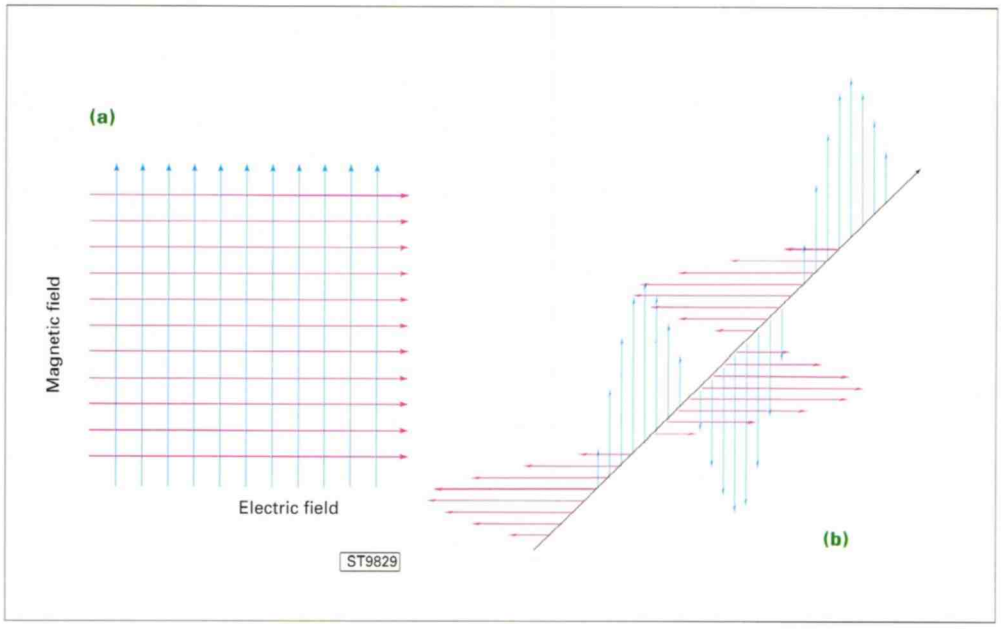

Fig. 1: Diagrammatic representation on an approaching EM wave front composed of the electric field (E) and the magnetic field (H) at right angles to each other (a). The waves travel in straight lines at right-angles to the fields. One cycle of a passing EM wave is shown at (b) where the vertical lines represent the E field and the red lines the H field.

feeder, for example, the velocity reduces to around 70% of the free-space value, depending upon the velocity factor of the feeder. This means that the wavelength of the cable is shorter than the free-space wavelength or fraction thereof.

Plane Waves

Before focusing closer towards tropospheric propagation, it's worthwhile to consider the basic propagation of radio waves in free-space. After their launching from the transmitting antenna they become self-supporting plane waves, composed of magnetic (H) and electric (E) fields at right-angles to each other, as revealed at (a) and (b) in **Fig. 1**. Hence the term EM waves.

The waves travel in straight lines at right angles to the H and E fields, and radiate skywards and along the ground at effective intensities determined not only by the power of the transmitter, but also by the gain, design and directionality of the antenna.

At frequencies below about 30MHz the sky-going waves pass through the troposphere and continue on up to the ionosphere, reducing in strength due to spreading (1/d). Space itself is virtually lossless at such frequencies. At an altitude around 50km, up to several thousand kilometres, exist electrified layers collectively called the ionosphere.

The ionosphere consists of free electrons and positive and negative ions born in the rarefied atmosphere, essentially above the ozonosphere (which is between 15 and 30km in altitude), by radiations from the sun. Now, while the ionised layers bend or refract sky waves back to earth over significant distances, ground waves tend to hug the earth's surface, but relatively quickly diminish in intensity depending upon their wavelength and the nature of the surface over which they pass. The longer the wavelength, the less quickly they weaken. The general scheme of things is revealed in **Fig. 2**.

It's also noteworthy that a lower section of the ionosphere (the E-region) sometimes becomes so highly 'electrified' during intense activity on the sun that even lower-v.h.f. radio waves are refracted back to earth. This is known as sporadic-E, because the strong ionisation occurs in relatively short or sporadic bursts.

Because the troposphere is considerably below the altitude of the upper layers of the ionosphere, distance enhancement resulting from refraction of radio waves passing through it is significantly less than that provided by the ionosphere. Moreover, the troposphere is less effective in bending longer wave radio waves back to earth. So what, then, is the troposphere?

Troposphere

Well, it's nothing more that the earth's 'local' atmosphere with a ceiling altitude around 10km. It's the lowest region of the atmosphere between the earth's surface and the tropopause, and is characterised by the temperature decreasing at increasing altitude at a rate of around 6°C per km, down to about -55°C.

This happens because the air near the earth is not so much heated by the sun directly, but more by convection currents from the heated earth. The normally linear decrease in temperature stems from the adiabatic expansion of the air as it passes into decreasing pressure with increasing altitude. It is within the troposphere from where our weather conditions stem.

Refraction

Because of variations in temperature, air pressure and moisture content with altitude, ultra short wave radio waves, from higher h.f. upwards, passing through the troposphere are refracted so that they propagate slightly around the curved Earth to cover distances greater than that defined by the optical horizon. The illustrations in **Fig. 3** show at (a) the optical horizon distance and at (b) the greater distance radio path resulting from the refraction.

Refraction of radio waves is akin to that at the wavelength of light as seen by the apparent bending of a rod inserted into a bowl of water when viewed from the water's surface. It results from the difference in refractive index at the interface between the air and water.

Under standard atmospheric conditions corresponding to normal propagation, known as the standard M-gradient, the refractive index of the troposphere decreases linearly by about 40 parts in 10^6 with altitude in the first kilometre, and it is this which subjects appropriate wavelength radio waves to incremental bending, resulting in the progressive curvature of the signal path shown at (b) in **Fig. 3**.

Propagation of ultra short wave radio waves beyond the optical horizon is thus a function of the troposphere's refractive index. Antenna heights also play a significant part, as we shall see, but in the absence of refraction, the transmitting and receiving antennas would need to be almost in 'line of sight' of each other. A little enhancement beyond the optical horizon would result from *diffraction* around the curved earth, but as well we know, perfectly reliable reception of ultra short wave signals is possible well in advance of the optical horizon.

Optical & Radio Horizons

The optical horizon distance (d) can be found from the simple expression

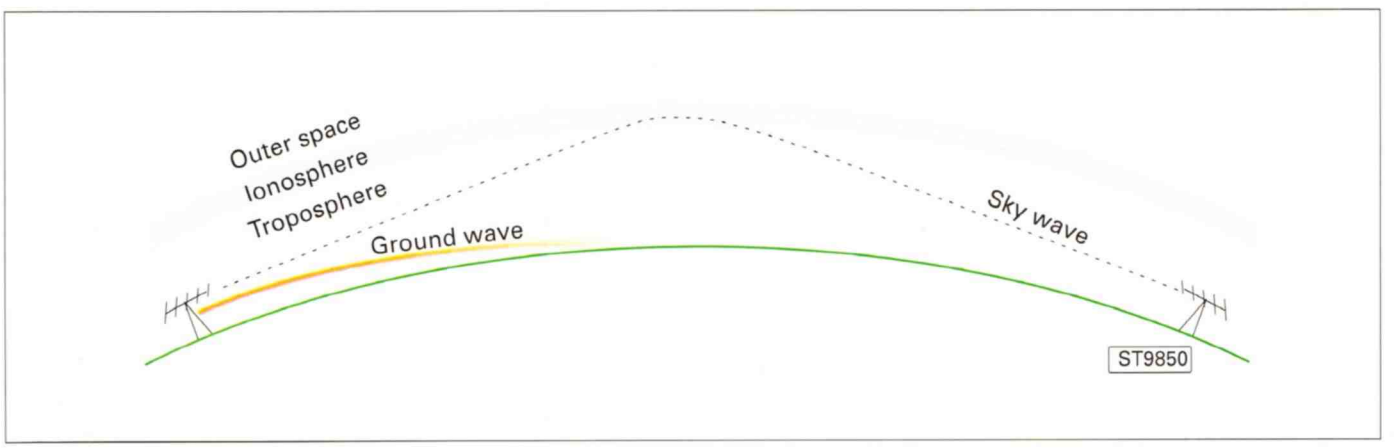

Fig. 2: An ionospheric-bound sky wave and a ground wave, the latter being mainly involved in the propagation of lower frequency radio signals.

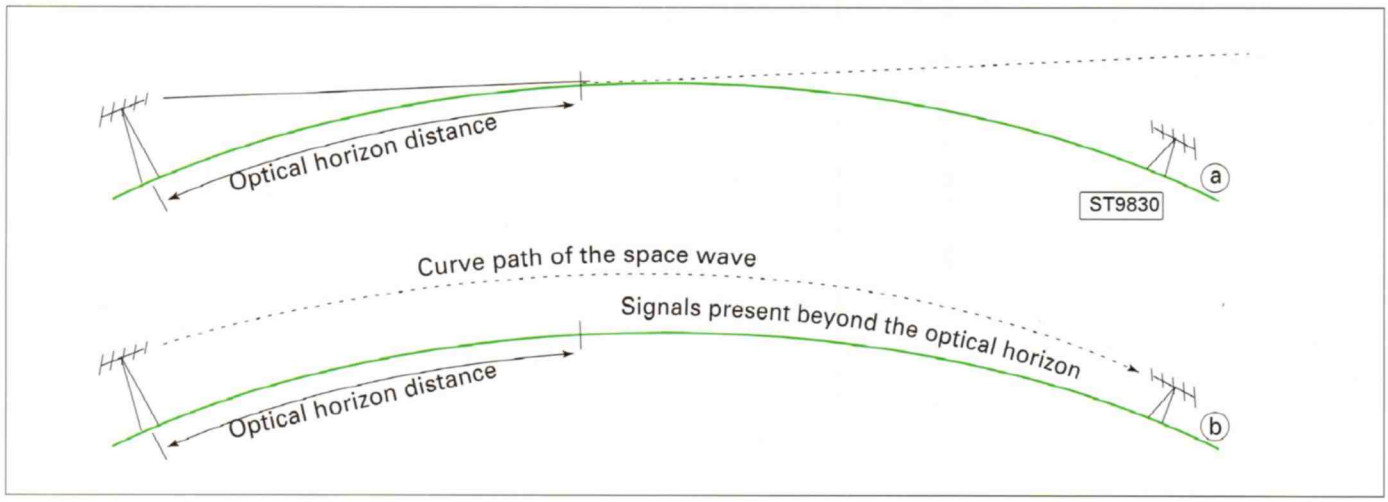

Fig. 3: The optical horizon distance (a) of radio waves above about 30MHz is enhanced by tropospheric refraction (b).

$(2rh)^{0.5}$, where r is the earth's radius (close to 6357km) and h the height above earth, where d, r and h are all in km. At a height of, say, 30m d works out close to 19.53km, so the total range between two 30m heights would be about 39km.

However, because of refraction the radio distance (radio horizon) is enhanced beyond the optical horizon by an amount tantamount to the earth's radius increasing by around 33% (to about 8455km). At 30m height, therefore, the radio horizon occurs at 22.52km, giving a total range between two 30m heights of 45km, which is about 15% in advance of the optical horizon.

Ground-Reflected Wave

Communication over the greatest distance, therefore, requires both receiving and transmitting antennas to be mounted as high as possible. However, there's another factor involved with terrestrial ultra short wave propagation. This is shown in **Fig. 4**, which reveals that the net signal at the receiving antenna comprises not only the signal of the direct wave, but also that of the wave reflected from the ground, called the ground-reflected wave.

This isn't as beneficial as may first appear because its phase is opposite to that of the direct wave, which means that the two signals don't just add together so as to increase the total signal! Happily, neither do they completely cancel each other out because the longer path of the ground-reflected wave ensures that under normal reception conditions they never differ by exactly 180°.

Nevertheless, with increasing distance in close proximity to the transmitting antenna, the field strength can go through a series of maxima and minima. The combination of the direct and ground-reflected waves is known as the space wave because of its travel in the space close to the earth.

Field Strength

The strength in volts (V) of the E field measured over a metre distance in free space (V/m) of a direct wave, where it is not affected by a ground-reflected wave, is $7W^{0.5}/d$, and for a space wave $88W^{0.5}\ h_t\ h_r)/\lambda d^2$, where W is the effective radiated power (e.r.p.) in watts, h_t and h_r the heights in metres of the transmitting and receiving antennas respectively, λ the signal wavelength in metres and d the distance between the transmitting and receiving antennas also in metres.

These little equations reveal that each time distance (d) doubles, the field strength of the first halves (1/d)

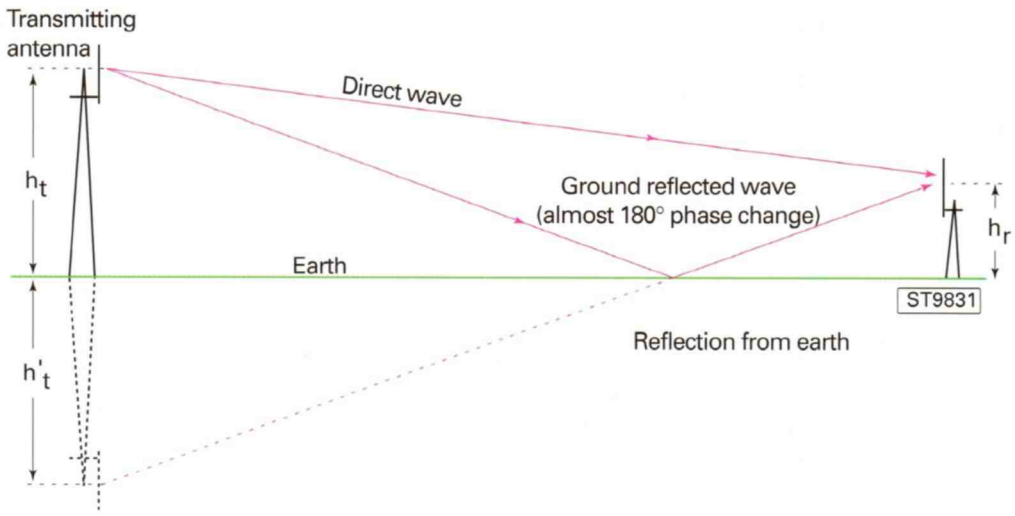

Fig. 4: At small grazing angles the virtual 180° phase shift of the ground-reflected wave has a detractive influence on the direct wave, but because of its longer path length and imperfect reflection, total cancellation does not occur. Increasing height of the receiving antenna results in the signal strength rising to maximum when the difference in path length reaches a half wavelength, thereafter falling to zero when the difference reaches a full wavelength.

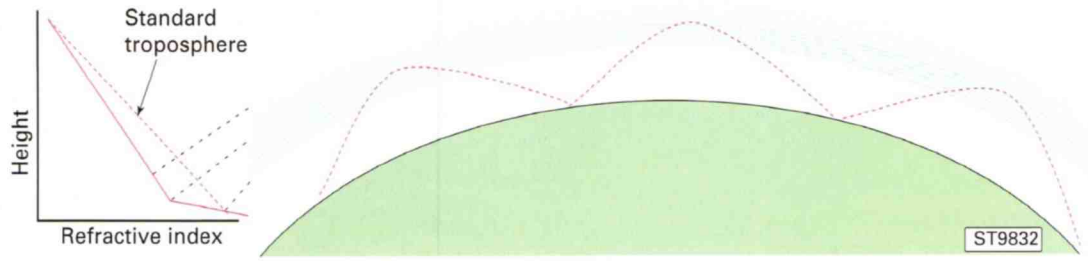

Fig. 5: A sudden change in the standard refractive index of the troposphere with increasing height, as shown, can produce conditions for super refraction and enhanced propagation, sometimes well beyond the radio horizon.

and of the second quarters ($1/d^2$). The second equation also shows that the field strength increases with reducing wavelength, and that the range of the space wave is substantially improved with increasing height of the transmitting and receiving antennas.

Because the path length of the ground-reflected wave increases with increasing height of the receiving antenna, so the phase difference between the direct and ground-reflected waves changes in the direction which enhances the net signal strength. This enhancement continues until the difference in path lengths corresponds to the signal half wavelength. With further increase in height the strength of the signal then starts to decrease, falling to zero when the difference in path lengths correspond to the full wavelength of the signal.

Enhancement

Reception doesn't suddenly come to an end at distances beyond the radio horizon, of course, but it does become somewhat less reliable and more affected by the weather and by changes in the standard refractive index. Indeed, it is quite exciting to scan the v.h.f. and u.h.f. bands after a stretch of anticyclonic weather when the barometer indicates the start of a fall in pressure. Even tuning over the v.h.f. frequency modulated (f.m.) spectrum in Band II can bring forth previously unheard stations many kilometres distance by this kind of tropospheric enhancement.

The same applies to the television bands, and it's interesting to use an early receiver capable of reception in Bands I and III for such exploits. The reception of stations at u.h.f. in Bands IV and V will indicate how high up the frequency spectrum the enhancement has reached. At the higher frequencies, freak refraction is sometimes less apparent, but it's interesting to discover the distance over which such short wavelength signals can be propagated in an enhanced troposphere!

Stratification

The occurrence of an abrupt rise in the standard M-gradient of the atmosphere, especially during the summer months, is not uncommonly responsible for propagating v.h.f. signals in particular well in advance of the 'free-space' range. A model of such a happening resulting in so-called 'super refraction' is shown in **Fig. 5**. As already intimated, this is quite likely to happen towards the end of a spell of fine weather when the air pressure starts a downward slide. In addition to enhanced propagation distance, tropospheric conditions like this can also significantly increase signal levels within the normally accepted working distance.

Another tropospheric enhancement can happen when there's a sudden discontinuity in the normally occurring temperature decrease with altitude. Instead of the temperature continuing to fall, it may suddenly start to rise over a certain elevation before decreasing with elevation in the more usual way. Temperature inversion effects of this kind are not all that rare during the summer months, especially, in fact, such stratification in the troposphere is more frequent than was once realised.

Tropospheric undulations like these generally affect v.h.f., u.h.f. and higher frequency signals more than lower frequency ones, but they have been noted to some degree below 10m, including 20 and the 27MHz CB frequencies. There have even been reports of possible

Continued on page 46

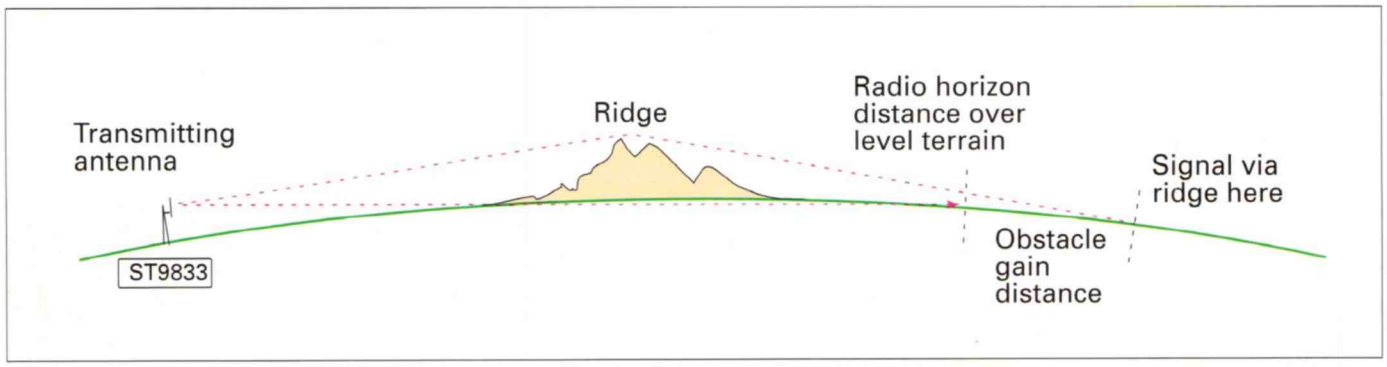

Fig. 6: Ultra short wavelength signals above 30MHz can appear behind an obstruction in the signal path by diffraction. The diagram shows how propagation may then exceed the radio horizon distance. This increase in distance is known as 'obstacle gain'.

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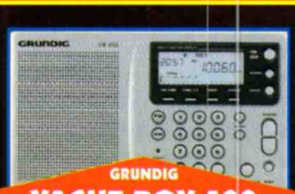

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Continued from page 43

Propagation Special

enhancement in the 80m band along sea paths during weather conditions supporting tropospheric ducting at v.h.f.

Ducting

Ducting in this context is somewhat akin to waveguide propagation, but where the waves are propagated between stratifications following the earth's curvature, over distance sometimes well in advance of 1000km. This mode of propagation rarely happens below v.h.f., and it is more common at higher frequencies. In temperate or low latitudes, the mode has been known to propagate v.h.f. and u.h.f. signals over path distances up to 4000km!

At my Brixham location by the sea, I have experienced particularly exciting v.h.f. tropospheric propagation over the years which has often dramatically extended the normally-expected v.h.f. coverage with my roof space 7-element ZL Special beam antenna (house 10m a.g.l. and site 100m a.s.l.) During certain summers past, the late Fred Judd G2BCX located in East Anglia and I (path length circa 450km) experienced very interesting contacts on 2m with my station producing little more than 10W r.f. to the antenna (yielding less than 100W e.r.p. from the beam antenna in Fred's direction). Oh happy days!

I've also detected that the height of the tide (in Lyme Bay) at the time of such DX contacts sometimes had an influence on the path attenuation. This could possibly have been a function of the path length of the ground (sea) reflected wave changing with respect to the phase of the direct wave owing to the changing height of the sea, thereby affecting the strength of the received signal!

From Brixham I've also worked 2m into GM (Scotland) land and well into Europe on enhanced tropospheric paths. Tropospheric working is certainly a very interesting part of our hobby, whether we are transmitting or ultra short wave listening enthusiasts.

Obstacle Gain

Before putting this little tropo' article to bed though, there are a couple more aspects I should like to mention. So far we have assumed smooth terrain over which the space wave propagates, which is rarely the case! Irregular terrain which is more the norm can, in fact, enhance the propagation by shadowing the destructive ground-reflected wave from the direct wave.

Moreover, there can be an actual distance gain resulting from an obstruction as shown in **Fig. 6**. Provided the obstruction is a fair distance from the transmitting antenna the wave is not completely blocked, but is instead 'bent' or *diffracted* over the surface of the obstruction, the wave thereby being propagating beyond the radio horizon distance. This is called obstacle gain distance.

Scatter

The u.h.f. and microwave signals in particular can be propagated well beyond the normal radio horizon, as well as over obstacles which might otherwise completely shadow the receiving antenna, by a mode known as tropospheric scatter, the basic features of which are shown in **Fig. 7**. The scatter occurs as the result of point to point variations in atmospheric temperature, pressure and water vapour which give rise to irregular fluctuations in the refractive index.

The use of powerful transmitters and high gain antennas are used to establish reasonably reliable links at u.h.f. and s.h.f. Strong launching field strengths are necessary to help combat the relatively high path losses involved.

Into Space

The troposphere also comes into play, of course, with the up and down links of space-bound satellite communication systems. The diminutive-wavelength waves involved, generally well into the GHz realm, are influenced by refraction, particularly in the lower altitudes. The wave is then caused to follow a slightly curved path. This calls for correction of the high-gain beam antenna at the ground station to ensure that the signals arrive on target at the satellite's antenna!

The waves also suffer attenuation owing to an interaction resulting from tropospheric molecules of oxygen and water vapour resonating at the frequency of the space-bound waves, this being particularly apparent at a wavelength around 13.5mm.

Further attenuation stems from precipitation where the raindrops along the wave path partly absorb the EM wave energy and partly scatter the energy away from the path of propagation. Precipitation can also cause a change in the polarisation of the EM wave. Tropospheric loss totals little more than 4 to 5dB, most of this being caused by rain. Free-space loss is more jolting, being around 200dB over some 35,404km.

Lot's more interesting things could be said about space-bound propagation, antenna gains, wavelengths, transmitter powers and problems involved, but that would be another story. Anyway, it's hoped that I've shown that there's a deal more to tropospheric propagation than may have first been realised!

SWM

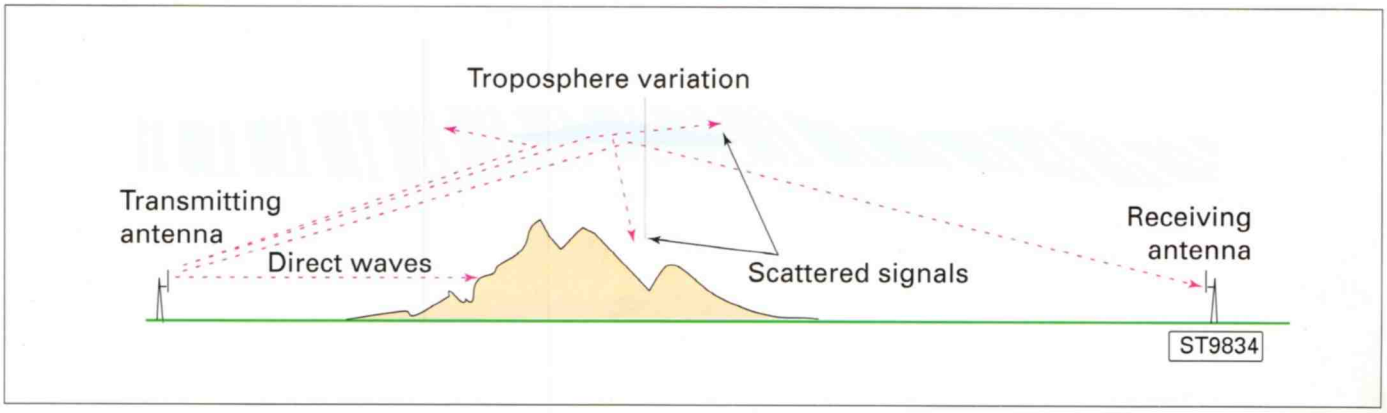

Fig. 7: The principle of tropospheric scatter. With this mode of propagation the rays of direct waves are effectively 'scattered' over remarkable distances by irregularities in the troposphere, but as path losses can be high, powerful transmitters and high gain antennas are required for reasonably reliable communication circuits.

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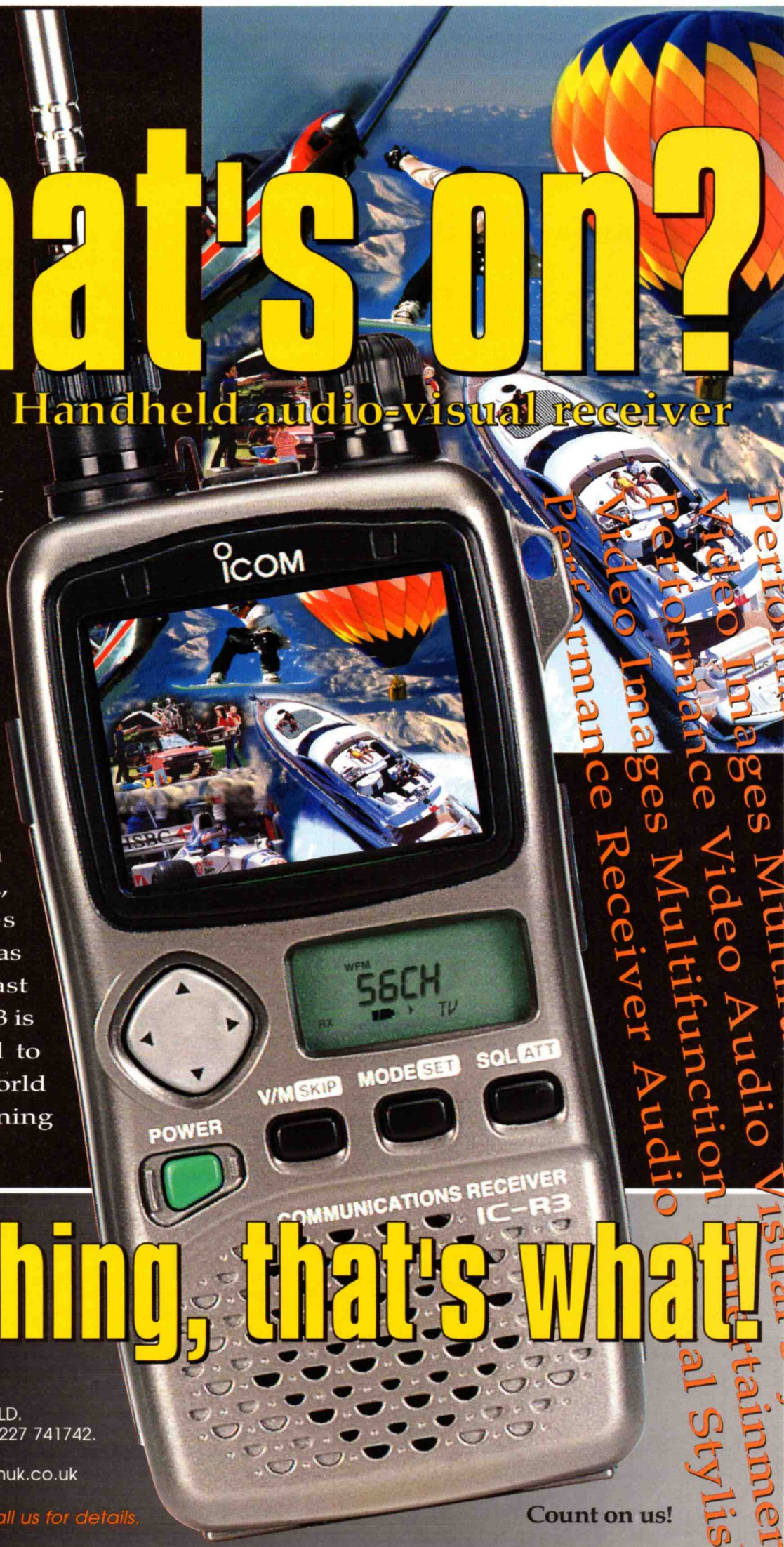

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Propagation Special

Slewing

A SW Broadcast Antenna

When you read the title of this article, you wonder what does antenna slewing have to do with the propagation. What is slewing and why use it in s.w. broadcasting? Take it away Jacques...

Antennas needed to broadcast on short wave are not small structures that you erect on a whim! Some of the antennas offered today on the market cost over £700,000 and that is before installation! Till the early 1980s the s.w. broadcasting antennas used were large fixed curtains that could not be moved after their installation. Like the name implies, a 'curtain antenna' is a curtain of wire stretched between two or more high towers.

Vertically, as many as four sets of broadband horizontal dipoles stacked one over the other are part of one bay of this curtain; horizontally you could also have as many as four sets of the same type of broadband dipoles stretching across the structure forming the four bays of the final curtain.

The vertical and horizontal spacing between the dipoles are calculated to maximise the radiation pattern in the desired direction. For example, you could have a '4x4x0.5, 6 to 18MHz curtain'. In plain language, that means that you have four bays of four vertically stacked broadband horizontal dipoles, the last row of broadband dipoles being located half of a wavelength above the ground. Finally, in this case, the curtain has been optimised to cover a frequency range of 6 to 18MHz at maximum efficiency.

These fixed structures contain not only the antenna, but also a set of reflectors, the reflectors were mounted behind the front antenna - the reflector assembly is another set of similar dipoles. These curtains are normally bi-directional, by reversing the role of the reflector side of the curtain to become the antenna and the antenna becoming the reflector. But this type of curtain arrangement can only transmit in two main directions.

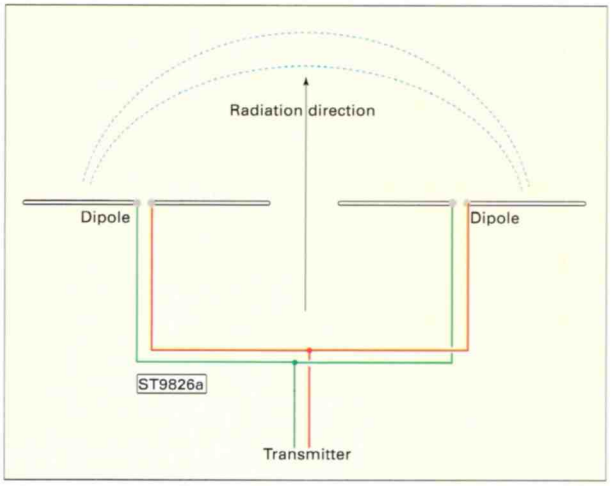


Fig. 1a: Normal radiation perpendicular to the array.

Different Targets

It may become necessary to change the main azimuth (boresight) of the maximum radiation of such an antenna to reach different targets. Today it is possible to construct curtain arrays that can be mechanically turned around in azimuth. But before these new rotatable curtains were designed and constructed, the large curtains were fixed and if it became necessary to change the azimuth of the radiation, the engineers used an electrical technique called 'slewing' to accomplish this task. The maximum slewing angle normally possible without having to derate the power handling of the curtain is about 30° on each side of the original designed and built boresight azimuth of the fixed curtain.

To slew the antenna pattern, it is only necessary to introduce a device to slow down the progress of the radio waves in one part (one bay or more) of the antenna and leave the rest of the antenna structures to radiate without any impediment. To slow down the radiation on one side, you introduce an electrically longer feed line in one section of the antenna feeding system - see **Fig.1a.** Very simple!

The wave then takes more time to reach that specific part of the curtain and the radiation pattern is slewed. Try to visualise a car on a slippery road when one wheel runs over an ice patch and loses traction, the power is delayed in reaching this wheel contact point with the pavement and the car swerves (slews!), the same thing happens to the radio wave in a curtain antenna when you introduce some delay in one part of the antenna system.

Horizontal Slewing

Broadcasters to reach various targets around the world, normally use the horizontal slewing of the signal when normal fixed curtain antennas are already installed. Since the advent of rotatable curtains like the ones installed by Radio France International in the late 1980s early 1990s in various sites, it is now possible to rotate the complete curtain assembly to direct your signal where you intend it to be heard.

Such rotatable curtains contain two separate sets of antenna: one on each side of the curtain. Each set is calculated to operate on a different set of frequencies. No! They cannot transmit from both sides at the same time.

This type of new antenna system not only contains the antenna array. Additionally the transmitter is built in the base of the antenna, and it becomes possible to dispense with the long feedlines between the transmitter and the antenna and some of the losses attributed to long feedlines are no longer present. The central mast of these assemblies contain the very short feedlines.

But it is still necessary to slew the antenna pattern in the vertical plane. Slewing is not only used in the horizontal axis of a curtain antenna, the same principle can also be applied to the vertical radiation angle component of the curtain. In this axis it is not necessary to modify the angle very much to obtain some drastic changes in which target is being reached: a change of less than 5° is sometimes all that is

necessary to change your target area.

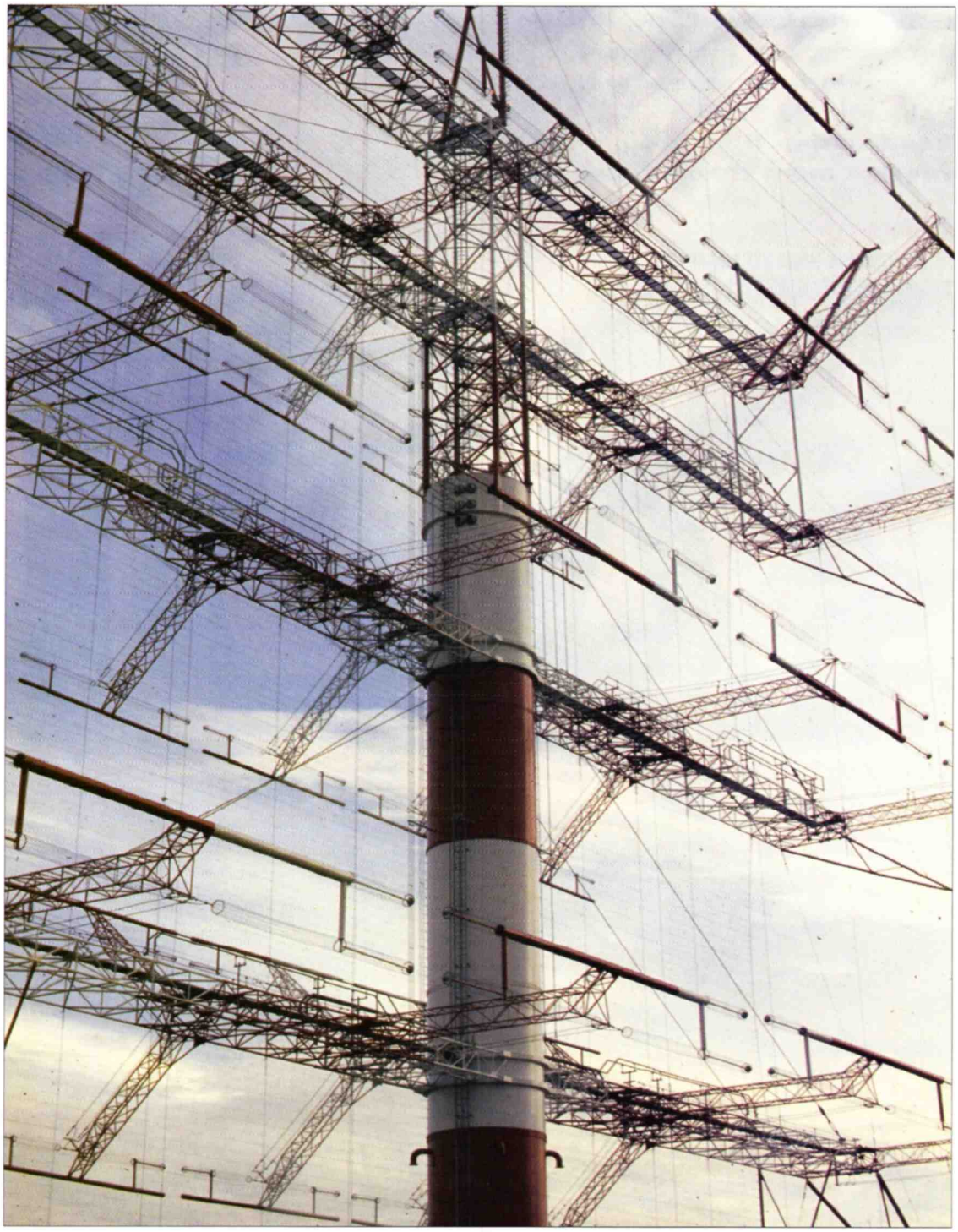
By introducing a delay in the feedlines of a vertical set of dipoles, it is possible to change the shape of the vertical radiation pattern and thus the vertical angle of maximum radiation in relation to the ground. The angle of the optimum vertical take off angle having been previously computed by referring to the propagation forecasting done for this transmitter site in relation to the intended target areas.

Summary

By introducing delays in the various feedlines of the antenna, you can change the azimuth of the maximum radiation pattern of fixed curtain antennas and the elevation angle of the maximum radiation vertical pattern.

Often, when a station is 'slewing' it's pattern, it will be transmitting the musical ID signal of the station. Listen for this signal on the hour and the half hour and you might hear a change in the intensity of the signal on that frequency as the maximum signal is moving away or towards you, or the vertical take off angle of the radiation pattern is being modified, according to the results of the propagation forecasts, to maximise the signal strength of the transmitter in a specific target area. In some cases, the musical ID signal of a station is referred to as the slewing signal.

Under normal operations, a broadcaster will transmit his signal along the short path to the target, along the most direct path between the transmitter and the receiver. But in certain circumstances, some broadcasters have been known to transmit their signal over the long path to the intended target, turning the antenna around or slewing the curtain, in order to avoid interference with other broadcasters' signals, on the same frequency, transmitting along the short path. Propagation forecasting used as a frequency management tool now becomes invaluable in this type of decision. ***SWM***



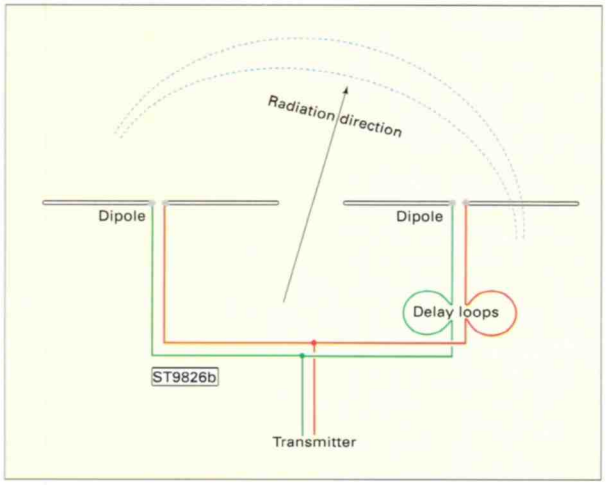


Fig. 1b: The addition of delay to the right hand element provides slew to that side.

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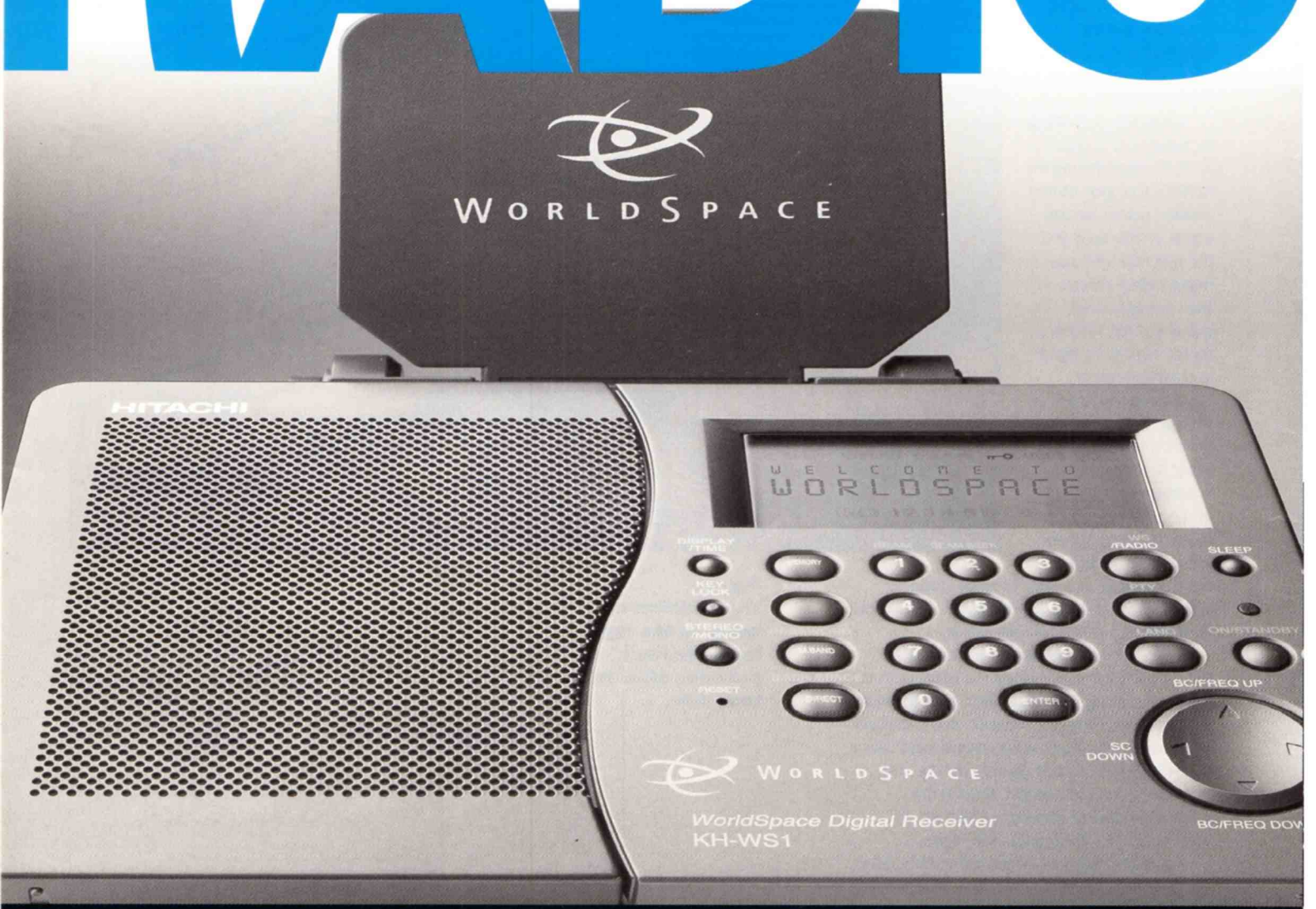

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Never discount unusual propagation modes, especially in the v.h.f./u.h.f. part of the spectrum, says Jacques d'Avignon, there is sometimes a major difference between the theory and the real-life situation.

An unusual propagation mode for v.h.f. propagation relies on the knife-edge diffraction phenomena for the signal to reach receivers much further than the theory will forecast or reach receivers behind an obstacle.

If you recall your high school physics laboratory, the rays of a point light source located slightly below and perpendicular behind a very sharp knife-edge, such as a straight razor blade, will be diffracted downward after being grazing the horizontal knife-edge. If you replace the source of light by a source of v.h.f. radiation, and the knife-edge by an isolated mountain range slightly higher than the transmitter, the same phenomenon will occur causing interference, unusual v.h.f. coverage and even having international implications!

In Operation

In North America a Weather Radio Service was planned by Canada and the USA, and put in operation many years ago. This service has been assigned seven discrete n.b.f.m. frequencies in the 162MHz band.

These frequencies are totally dedicated to broadcasting regular weather forecasts, severe storm warnings and other forecasts such as farming, driving, boating and sailing forecasts. This service is on air around the clock and the forecasters or the authorities have the possibility to trigger an alarm in your weather radio via a special transmitted tone.

This alarm system is used to advise you to listen to the audio of these special radios so that you can be advised of heavy summer storms developing, tornado sightings, flash flood danger, unusual and/or dangerous weather or other environmental incidents/accidents occurring or forecasted in or for your area.

When this v.h.f. Weather Radio service was introduced in North America, some co-ordination had to be done between Canada and the United States in order to use the same frequencies. Due to the proximity of these two countries, co-ordination is essential not only for this service, but for most or all of the radio spectrum usage.

In the case of the Weather Radio Service, it was essential that the co-ordination be done correctly so that the US residents did not hear and/or rely on the Canadian Weather Office forecasts and vice versa. (It is a well-known and well-documented fact that all the bad winter weather always originates in Canada and slides down into the USA, and all the summer bad weather moves up from the USA and causes havoc in Canada!).

To Be Effective

For the weather radio system to be effective, transmitter sites were chosen on high building or high mountains in both countries. In Burlington, Vermont, just south of the Canadian border, the US National Weather Service chose a site on top of Mount Mansfield (altitude 1500m) to install the weather radio transmitter. This mountaintop was already the site of many other transmitters: TV, f.m., amateur repeaters, etc., so it was a logical choice.

As far as the frequency co-ordination issue was concerned, the US Weather Bureau transmissions would be faintly heard in the Montreal area across the border, but there would be a much stronger source of Canadian weather information available on a different frequency when the Canadian Weather Services installation of their system was completed in the Montreal area, so the Mt. Mansfield signal spilling over into Canada was not an issue.

Finally Installed

The network of Weather Radio transmitters was finally installed in Canada and started transmitting on

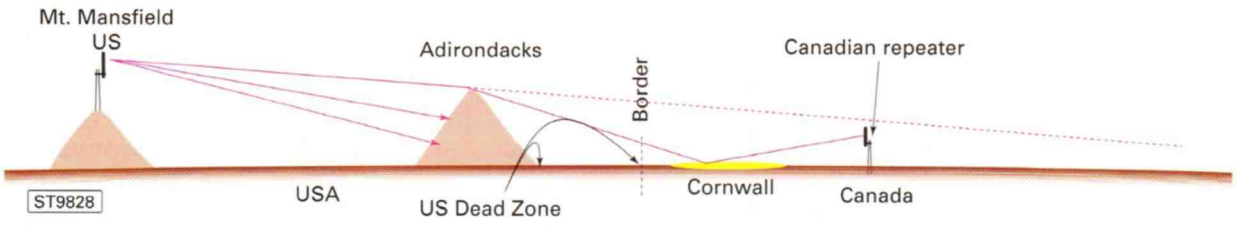

Fig. 1: Knife-edge refraction at work. Confusion in Cornwall is the result.

the co-ordinated frequencies, but in addition, many low power repeaters had to be installed to insure proper extended coverage in less populated areas outside the main transmitters pattern. One such repeater for the Ottawa main weather radio was constructed about 32km northwest from the town of Cornwall, Ontario, to serve the population along the St. Lawrence River. The co-ordinated frequency chosen for this repeater was the same as the frequency used by the transmitter on Mt. Mansfield located 150km away. At that distance you would not think that it would cause any problems. Well...

From Cornwall, Mt. Mansfield is not visible even on a clear day. But between these two points there is a mountain range with a sharp ridge, the Adirondacks. It would appear that these mountains were acting as a knife edge and diffracting the signals in certain parts of Cornwall and not in others.

The American station signal strength in certain areas of the town of Cornwall was high enough to override the signal transmitted from the Canadian transmitter located only 35km away! Driving around town with a v.h.f. radio, depending on what street you were driving and on what side of the street you were driving on, you would get the Canadian or the American weather forecast! See **Fig. 1**.

If was also possible to duplicate this phenomenon in reverse by using a high power v.h.f. amateur transmitter. It is possible to key up the amateur repeater, in the 144MHz band, located on Mt. Mansfield by pointing your antenna towards the mountaintops across the St. Lawrence River. Again the location of the amateur transmitter on the Canadian side is crucial to the success of this experiment.

It was an interesting situation where on the Canadian side of the river you could listen to the US forecast, and on the US side of the river, the Americans had to listen (not by choice) to the Canadian repeater about 48km away broadcasting the Canadian weather forecasts. Mount Mansfield's transmissions were being totally blocked by the shadow of the same mountain ridge that was helping the US transmissions reach Canadian soil!

Ducting

What is ducting - what causes this phenomenon and how does it influence the propagation of radio waves?

So, what is ducting? Ducting is an atmospheric pipe or conduit that carries radio waves, like in a physical pipe or duct, in the radio spectrum in and above the v.h.f. band. The radio waves that become trapped in such a duct are bounced inside between the bottom and the top of this pipe and can be carried very long distance without losing much of their energy.

What causes ducting? Ducting is a naturally occurring atmospheric phenomenon caused by colder air overrunning a warmer water surface. The elevated top boundary between the cold air above and the warmer air below, because of the different refraction index of the two layers, acts as a mirror bouncing the waves between this boundary and the water surface that forms the bottom of this duct.

In some cases, elevated ducts have been detected, where the bottom of the duct is above the water surface. Ducting can be forecasted using aerological soundings and many studies of this phenomenon have been made since the 1940s when this unusual propagation was noted while operating the radars in the low v.h.f. part of the spectrum.

What influences does ducting have on radio propagation? The line of sight limitation of v.h.f. transmissions no longer exists under ducting conditions; the v.h.f./u.h.f. transmissions start acting in a very peculiar fashion.

When ducting occurs it becomes possible to trigger an amateur v.h.f. repeater 3 to 500km away using a hand-held transmitter with only 2W of output. In one case on the shores of Lake Ontario, along the Canada/USA border, a repeater in Rochester, NY, had the same input frequency as a repeater across the lake located in Kingston, ON. In the fall it was possible for an amateur in the Rochester to key up his hand-held unit and get both repeaters activated and vice versa!

Lake Ontario being a large body of water, remained warm in relation to the air for weeks even after the snow had started to fly, the lake never freezes over completely. The only solution to the ducting caused problems was to change the input/output frequency pair on one of the repeater.

Another Case

Another interesting case has to do with a long privately owned v.h.f. repeater system. The circuit was over 900km long, but was broken into four or five segments so that the same repeater input/output frequency pairs could be re-used along the line. In the fall again, two or three segments of the circuit would enter into a self-perpetuating locked-up stage because repeaters within the same v.h.f. atmospheric duct along the line would trigger each other and the carriers would remain on air.

It was real chaos when the whole system got locked-up: no one could use the system. The only remedy to this situation was to send a technician up a mountain to pull the main switch on one of the offending repeater. This solution was the only one that could possibly be used until tone control actuated squelch units were finally installed on the receivers!

Dramatic Case

One of the more dramatic cases of ducting happened when two ships collided in fog with their radar fully operational not having detected each

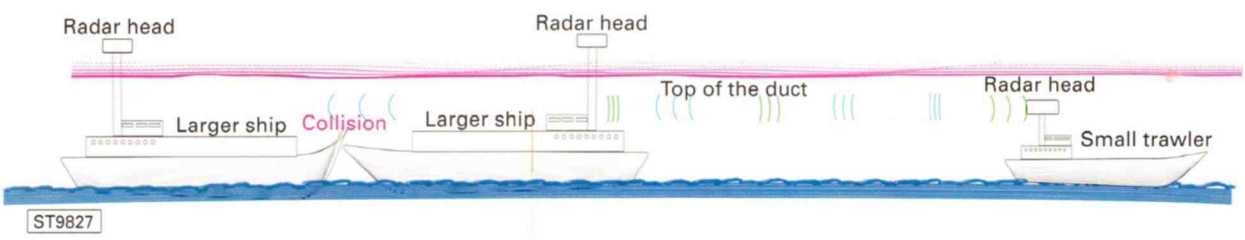

Fig. 2: Marine ducting and a potential serious problem.

other. The radar antenna on these ships was located about 20 to 25m feet above the water. When the distress signal was transmitted, a small trawler, about 20km away, on its way to answer the call, could clearly see the echoes of the ships on his very simple low-power radar. What was the difference? The small trawler had his radar antenna about 10m above the water line!

The antennas located at 25m above the water were located **above** the inversion boundary, above the duct, and the radar signals being transmitted were being reflected by the topside of the duct and could not penetrate down the boundary layer to see the other vessel that was located inside the duct. The small trawler had it's radar antenna located **in** the duct and could see all around with no impediment - see **Fig. 2**.

Ducting normally occurs over a body of water, some rare cases have been reported over land. In the Northern Hemisphere, Autumn is the season of choice for this phenomenon when ducting will affect the transmissions of f.m. and TV broadcasting. This phenomenon probably explains some to the DXTV and f.m. reported in Coastal Europe: UK, France, The Netherlands, Belgium, etc.

Never discount unusual propagation modes, especially in the v.h.f./u.h.f. part of the spectrum, there is sometime a major difference between the theory and real-life situation.

By the way, I have mentioned earlier in this article about the necessity of co-ordinating frequencies usage between countries. In North America it is necessary to co-ordinate the use of the m.w. frequencies with the following countries: Canada, United States, Mexico, Cuba, France and Norway.

The Question

I can hear the question from across the Atlantic: 'What do France and Norway have to do with MW usage in North America?'. Norway is involved with the frequency usage in Greenland and France has to be consulted because of the islands of St. Pierre and Miquelon (a French Department) located in the Gulf of St. Lawrence on Canada's East Coast! ***SWM***

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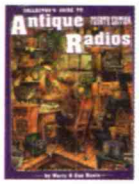

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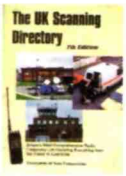

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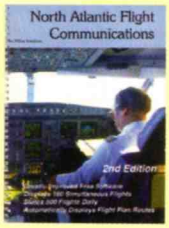

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Amateur Bands

Proportions

A sense of proportion is a great help. Three times in the past month I've been told bluntly that person X or Y has the only true opinion and that **all** GWs agree 100%. In fact, of about 60,000 UK licensed radio amateurs, no two have precisely the same view, as any survey will make clear. It's called 'democracy' - 60,000 bees in the hive, all bombinating in a vacuum. All but a few waiting for someone else to act so they can disagree with the decision and get it deferred! When it has become too late for any useful action, then another source of complaint opens up!

By contrast, a lovely letter and telephone chat with a real listener and his son doing a bit of listening and logging - father and son both good for Field Day at 30w.p.m., which is a bit above the 5w.p.m.!

Next a letter from a one-valve operator from Suffolk. This one wrote to me saying he didn't like a *Short Wave Magazine* full of commercial kit and - this was the comic bit - asking me to give him the circuit and values of my one-JFET receiver. The last paragraph was a fulmination about editorial disregard of his letters.

I wrote a reply pointing out the factors which must be taken into account if any magazine is to survive. That in turn netted a letter saying he would stop *SWM* - and if the letters I've seen emanating from that address are anything to go by - Kevin has been very polite in simply not answering them! One expects the occasional one like this, but three in a month!

The Mail

Let's make a start with **Paul Goodhall** and son **Peter** who hail from Holywell, near the centre of Oxford. Peter's eye has now undergone four unsuccessful tries - something that **must** be overcome before the exercise can be repeated on the other one. So near and yet so far...Christmas Day, all looking good, a week later back to Square One.

Peter logs on a laptop, but both of them copy their c.w. by ear - and 30w.p.m. is somewhere very close to the upper limit set by writing speed. To get above this requires one to use the brain as storage. They took Peter's gear to the local 'Guides Thinking Day on the Air' so the youngsters could qualify for their badges.

As for the logs, they usually manage to turn up an odd call - this time VO1WIZ working HC8N on sideband - which brought on thoughts of Merlin and TH White's Once and Future King. A brace of others included NA1NI and G3AOG - not to forget the finest crop of VK/ZL/JA seen in a log for years and D68C logged Top Band to 28MHz on c.w., all but Top Band on s.s.b., plus RTTY and p.s.k. Sloping dipoles as suggested in *Radcom* covered 21, 24 and 28MHz and down the garden they have full-size G5RV antennas, one each.

Going back to that 'AOG', the letters were used in my s.w.l. days to refer to an antenna generally known as an 'Act of God'. It used to be claimed that no two such skywires would perform the same!

Now **Colin Dean** from Barnsley - he made a start on 7MHz where he noted EK3GM, EK3WY, UT1FG/MM off EL2, HL6BLI, HS0/K4MRH, a goodly crop of JAs, SU1GS, TA3D, TF3A, UA0BA, VK1, VK4, BR, VK7TS, VO1WIZ, VU2WAP, YC3OX, YK9A, 4L1/LZ1BG and 8Q 7MHz. On 14MHz D68C, on 18MHz A41LZ, D68C, NP2BT, PW0S, WA0VOM/SU, SU1SK, SU3AM, TF3A, VK2TX, YB0A, 5A1A and 5N2BHF.

At 21MHz we see A43D, BD7NQ, D68C, EL2ZA, FG5FC, G0WHZ//mm in the Med, J6TN, J28VS, 1B1/OE5GML, 7Z1ZZ, 9K2MU and 9V1JA, while on 24MHz we see CO8LY, D68C, FM/F2JD, KP2/K4UP, KP2/K8NI, PZ1RA, P49RA, P49MR, SU3AM, XE1RBV, YB0A and 5A1A. Finally Ten where Colin noted CM6UV, CP6XE, CX3EL, D2YY, D68C, EK6YL, FM5GU, FM5WE, FY5LS, HC8N, HH2SJR, JW9DL, J28FF, KP4/JA2ED, OD5NJ, PJ5/UA1ACX,P49MR, TG9GI, W5AA/TI8, VP2VF, VP5/ AK9F, V44NE, XE2DN, Z21KF, 4K5CW, 5A1A, 8R1AK, 9K2ZZ and 9Y4JA.

Next a query from a letter from **Owen G4VPF** in Burton-on-Trent who wants to know where I picked up on R1ANC and R1AND in Antarctica. Probably from the 599 DX Report, which this week announces it has gone QRT and sold the mailing list to: **Bernie McClenny, W3UR, c/o Box 73, NY 14140**. As to the questions involved in hearing them, a pot of analysis might help. If we speak of, say VK or ZL, we pick times when there is propagation and minimal QRM, which says either long-path first thing in the morning or short-path rather later. While the same paths may open in the evenings, long odds they'll be buried under European QRM.

For Antarctica there is a further complication - are the operators working? If they are at leisure are they playing with their wireless, eating, indulging in other hobbies or even sleeping? After all, no-one lives in Antarctica purely for pleasure. This sort of argument applies even with the Ws - you don't expect to hear them in our mornings on 21MHz simply because most of them are still in bed or getting ready for work. I suspect that picking the right time is more important than anything else. Perhaps the final complication is 'conditions' - is that particular band open or dead?

On a different tack, Owen is making a sloper dipole and says he'll have to send away for some 72Ω twin feeder. Personally I'd prefer to feed it with 50Ω coaxial cable - but whichever way is chosen, waterproofing is far more important. Bear in mind that losses mount alarmingly once water has penetrated, to be far more than the difference between this or that type of feeder. And, dare we say so, if you find a perfect sealing system, please share it by way of an article.

Here & There

Look out for ZD8 by the Barry Group - March 19-27 and N6TJ will be there - May 7-17. The Barry crowd will go on to ZD7 for a week. Also in April, Mellish Reef is due under the call VK9ML. The D68C Comoros Group is running down as of early March, and we hear they have put some 142 thousand contacts in the log. QSLs go to G3SWH - or for the s.w.l.s BRS32525.

Jammers

On the QRM front, jammers cause some horrendous QRM. The QRM was multiplied by the fact that D68C was meant to give the weaker stations a chance and said so. Why don't the authorities jump on these characters on a world-wide basis? Far from growing our society, these goons are putting potential s.w.l.s and amateurs off.

Talking of jammers, **Ted Trowell** at Sheerness notes how they always come out when there is anything interesting to jam or to annoy more proplr. On Top Band Ted noted D68C, EA9LZ, 4X3A. On 3.5MHz YK9A and D68C while on 7MHz HL1AQ, YK9A, 7X4AN, JY9NX, D68C, VU2TS, YK1AH, HL1DH, 9M2RTO, FG/F6HMJ, JW3FL, DU/G4ZVY and P4/K2LE. 10MHz yielded JX7DFA, 4S7NE, D68C, ZL1MH, OY3QN, 9M3TO, EA6ZY, VK4SS, VU2RBQ, D2BB, TA2AH, J3DJ7RJ and PT2/KC2BAA while at 14MHz Ted noted YB0GJS, VU2TS, YK9A, R1FJL (Franz Josef Land), ZD7JC, D2BB, VE6KG, YV1NK - leading to D68C and CO8LY.

On 18MHz at 21MHz 4JT9H, JA3BCC, D68C, 7J6CEQ (Okinawa), VK6VZ, A45XR, VP5U, T32RD, PY5BAZ, W7/DL3OI, ZF2NT, 9G5XA. For 24MHz Ted noted R1FJL, VP5/N2GA, V31YN, D68C, VP2VI, FG5FR and lastly 28MHz for V51AS, D68C, DU3/G4ZVJ, ZS6/G3MXJ, V26EW, JT1CS, XX9G, PW0S, LU2WT, ZF2CM, HC5AI, C56/DL2OE, XE1YJL,V31SN, XE2BSS, A92GM, CX3EU, CE0YEH and C6AKP. As for QSL addresses, Ted offers PT2/KC2BAA to go viaOK1FWQ, VU2TS via I1YRL, V31YN via DJ4KW and JT1CS via JR0CGJ.

The idea of telephoning me seemed popular, conclusion though is that if you have a log, please put it in the post, 'cos sure as God made little apples I'll be away from a 'phone! **Harry Richards** and Paul Goodhall both called - thank you both.

That's it again. Deadline as usual, the first of the month, addressed as always to me at Box 4, Newtown SY16 1ZZ.

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Info in Orbit

It was the number of large weather satellite (WXSAT) image files that finally prompted me to upgrade the hard drive on my computer. I have retained far too many images from my WXSAT set-up, and deleting more than one at a time is a skill that I have yet to acquire! So with 6Gb of files taking up half the drive's capacity, I decided to buy a larger one. I settled on a 30Gb drive, installation, formatting, new operating system - no problem.

Fig. 1: *RESURS 01-N4* 1218UTC 10 March.

The process of re-installing some of the programs was time-consuming and tedious, but after the most important ones were installed, I moved the 6Gb of raw and processed files on to the new hard drive. Then it happened. After barely two or three hours of use, the drive suddenly developed a loud, high pitched noise, and the computer had to be powered down immediately. I tried powering it back up a little later, but the drive sounded even worse and could neither be written to nor read.

It was returned to the supplier and the order cancelled. A new drive from a different manufacturer was ordered from a new supplier, and so far - three weeks later - it has worked fine.

Fig. 2: *METEOR 3-5* on 3 March from Dolan Morrison.

Be cautious when installing a new drive - do not transfer irreplaceable files until the drive has been operating normally for a few days. I cannot believe the hours of lost work that went into those processed image files.

That was not the end of my computer problems. I installed the Internet software and mail programs to ensure I could get back online. I collected mail and downloaded system upgrades for my re-installed operating system. The next day, I remembered that I had not re-installed my anti-virus software, so I did that and then updated the signature file. I did a full system sweep - and to my horror - it detected a virus!

Fig. 3: *METEOR 3-5* image from John Swindlehurst.

Careful and very time-consuming analysis showed that the virus had managed to enter my computer because I had forgotten to un-share the hard drive. This particular virus was classed as having a low probability of infection (!) and turns your computer into a virtual server when you are online.

After considerable checking and discovery of the extent of virus penetration, I decided to format the drive (again) and re-install the entire program suites. Time was the main casualty. Everything is finally back to normal and I have sorted out my WXSAT images. Do remember to set your hard drives to **not shared** (check under properties of c:) before going online.

RESURS - Maybe!

Three or four weeks of a virulent chest infection kept me away from the WXSATs for longish periods, and during brief visits to the receivers I decided to move things around. Testing a re-configured WXSAT receiver on the next available satellite would normally be OK, but on this occasion, the next pass was *RESURS 01-N4* - and by an unfortunate coincidence the satellite was not transmitting a.p.t. I did not know this, so more time was spent checking the connectors. A later pass by *NOAA-14* came in loud and clear.

Meanwhile, official word is that *NOAA-16* will be the operational afternoon satellite from 23 March, replacing *NOAA-14*. As at mid-March, *NOAA-15* h.r.p.t. has been largely re-synchronised due to the work of the backroom people at NOAA, as at mid-March we are receiving excellent a.p.t.

METEOR Images

Dolan Morrison GM0LZE of Stornoway on Isle of Lewis sent me an image received from *METEOR 3-5* on 3 March. I have been waiting for a cloud-free opportunity to get an image of Norway and Sweden to reveal the ice cover in the Gulf of Bothnia and Dolan's image shows this very well.

John Swindlehurst of Cheltenham told me of his early experiments at decoding WXSAT signals in the 1970s, and they were very similar to my

Fig. 4: *METEOR 3-5* image from 5 March from Kevin Hughes.

Fig. 5: *OKEAN-O* oceanographic satellite image received 26 December 2000 from Stu Nesling.

own. He describes the equipment: "Back in the 1970s I remember trying to decode WXSAT signals in the lunch hour at work, using a Tektronix storage-scope with timebases on both the X and Y axes, and a receiver feeding the brightness mod. It worked, after a fashion, but in those days there was no easy access to computer power, or indeed current Kepler elements, so prediction of passes was pure luck, and image storage was by Polaroid photo!".

During the early 1970s, my friend John Williams (no, not that one!) and I set up a modified f.m. receiver to pick up the early NOAA WXSATs, but time was limited to lunch hours, and despite having one of the country's most powerful computers (at the Radio and Space Research Station, as it then was), we had no programs for predicting satellite passes. We never managed to hear a satellite, but I believe that this was due to the time limits. Fortunately, John S. had better luck.

A rather more recent image was received from *METEOR 3-5* in early March - clearly showing the snow lying in Scotland and north-east England. John wondered what might have caused the curved trail running roughly North-South, just to the East of Scotland? It appears to me to be just part of a weather system.

John's equipment now consists of a home-made crossed-dipole antenna in the loft, an RX2 (a receiver produced by the Remote Imaging Group, and which John describes as 'excellent'), captured on a 486DX66 PC running WXSAT. The recorded WAV file was then processed using *SatSignal* on a faster PC. No enhancements were done on the image.

Kevin Hughes of Tamworth came back from Norway and E-mailed me "I can certainly verify that the clouds over Norway are genuine, as I was lucky enough to watch them approaching from a ski slope in Norway - in the resort of Geilo, between Oslo and Bergen on Saturday afternoon - prior to returning to dreary Britain on Sunday!". Kevin collected **Fig. 4**, an image of *METEOR 3-5* during the morning pass on 5 March.

Weather Satellite Launches

Several are scheduled to take place during the next two years. *NOAA-M* (which will become *NOAA-17* after injection into orbit) is currently scheduled for launch at Vandenburg Air Force Base by a Titan II rocket in March 2002. *NOAA-N* is now scheduled for launch in January 2003 aboard a Boeing Delta 2 rocket, also from Vandenberg Air Force Base. The next GOES (geostationary) WXSAT launch is *GOES-M*, scheduled for 12 July 2001.

METEOR 3M-N1

We originally expected this satellite to carry a.p.t. hardware (to provide transmissions in the 137MHz band) but recent information from ScanEx (a Russian company that supplies reception hardware) indicates that it will not be carried after all. Launch is scheduled for June 2001, and further information about *METEOR 3M-N1* is available on the SAGE website **http://www-sage3.larc.nasa.gov/missions/** as of 8 February 2001.

Various categories of satellite launch are listed on NASA's Kennedy Space Centre site: **http://www-pao.ksc.nasa.gov/kscpao/schedule/mixfleet.htm**

Brian's Station

A glimpse at other people's WXSAT stations starts with a look at Brian Dudman's base in Harrow. Brian first contacted me many years ago when he became interested in monitoring weather satellites. He developed his station rather more quickly than most people usually do, perhaps the fact that he had retired offered an opportunity.

From left to right, Brian's computer suite starts with an old 486 machine, a Pentium 133, a Mesh with Athlon processor, a 233MHz Pentium and a 333MHz Pentium. Feeding these are a home-made Dartcom 137MHz band WXSAT receiver, an Icom general purpose communications receiver, an Icom PCR1000 receiver with Global a.t.u., Timestep h.r.p.t. receiver and tracking unit, a Timestep 137MHz band receiver and serial interface, a Timestep PDUS receiver and second Timestep 137MHz band receiver used with Orbit software. In addition, a Quorum/QFAX integral professional receiver and some miscellaneous equipment is available. With one of the most comprehensive stations imaginable, I presume that Brian does not watch many weather forecasts!

Brian Dudman's computer suite, dishes and the man himself.

Currently, his h.r.p.t. system has been dismantled pending re-installation in a different location. My thanks to Brian for providing background information and pictures.

Encryption - NOAA Comments

I have recently been in touch with several international organisations concerning the future of WXSAT transmissions. My aim was to find out how different organisations viewed the idea of encryption - the deliberate coding of transmitted imagery to prevent people from producing images from satellite transmissions. The question of encryption is a vitally important one to everyone involved in WXSAT monitoring, so in view of the future plan for Eumetsat and NOAA to jointly provide a combined WXSAT constellation, enquiries of NOAA seemed appropriate.

Wayne Winston is the Direct Readout Co-ordinator at NOAA/NESDIS in Suitland, Maryland (USA), and a regular 'voice of NOAA' contributor to the Internet WXSAT lists. He explained that we should appreciate that NOAA's official policies have yet to be defined. Wayne 'opened the door' to allow us to see current thoughts - a glimpse of what the future might bring.

"NOAA will have four more polar orbiters of the current 'family' to launch, from *NOAA-L* through *NOAA-N* in early 2008. Given a design life of two to three years, *NOAA-N* should continue to operate into 2010 or beyond. All these satellites are similar, and will have the present analogue a.p.t. and digital h.r.p.t., and everything will be un-encrypted. There is no encryption capability built into these satellites.

In 2009, NOAA will begin launching the NPOESS series of satellites. These will introduce great changes into direct readout as a consequence of all new instruments and much higher data rates. Everything will be digital and packetised to CCSDS standards. NPOESS is still very much in the development stage, but it is taking shape along these lines. High Rate Data (new h.r.p.t.) will be transmitted at 20Mbps and have to be moved to the X-band. Low Rate Data (new digital a.p.t.) will carry much more than two channels of imagery. There will probably be at least three channels, at higher resolution, and vertical temperature/humidity profile information from some of the sounding instruments. Data rate will be 230kbps, and the transmission frequency will be moved to around 400MHz. This still makes some sort of omni-directional antenna usable. The data will be packetised to CCSDS standards.

Normally the data will be un-encrypted and available to all. For some exceptions, see below. The NPOESS satellites are the result of the new US joint polar satellite program that combines the civilian NOAA program and the Defence Department DMSP programs. As such, capabilities, instrumentation, and direct readout capabilities (high and low data rates) and content must meet the requirements of both the US civilian and military users.

My understanding is that NPOESS will have the ability to encrypt some or all of these data. This falls under the heading of 'national security', given that these are joint civil/military satellites. However, the encryption capability would only be used selectively, for instance in times of national emergency - military conflict - where US forces are involved, and it is deemed in US interest to deny the satellite data to hostile forces over the impacted region. So, encryption would be used sparingly and regionally, if at all. That is my understanding of how the policy is evolving".

More about encryption: the METOP satellites will be part of a joint EUMETSAT/NOAA program. METOP satellites will now be put into the 'morning' orbit, while NOAA will have responsibility for the 'afternoon' orbit - where *NOAA-L* will be launched. *NOAA-M* will be launched into a 'mid/late-morning' orbit, not an exact replacement for *NOAA-15*.

NOAA is supplying the AVHRR and some of the sounder instrumentation for the METOP satellites. They also carry instruments that have been developed by EUMETSAT (IASI, GRAS, ASCAT, etc.). Of course, EUMETSAT will officially put forth their encryption policies at an appropriate time. However, my present understanding is that NOAA and EUMETSAT have reached agreement that the NOAA-provided instruments will 'carry' the NOAA policy of data access with them. That is, the AVHRR data on METOP l.r.p.t. and h.r.p.t. will not be encrypted. But data from EUMETSAT instruments will be encrypted. Since METOP does carry encryption capability, AVHRR data could be encrypted if the US Dept of Defence or State Dept determined in was in the national interest to invoke data denial - very similar to situations I noted in the paragraphs above concerning encryption on NPOESS. Possible, not probable, and not part of any fee-based licensing program.

Returning to the technical aspects of NPOESS, you can see nothing about the low and high data rate services will resemble what they are today. Totally new hardware and software will be required. I don't think we can predict what hardware might be available to users a decade from now to be used as the basis of NPOESS LRD receivers. Look where PCs have come in a decade! But it is quite possible that this could mark the end of the home-brew, parts box receiver hobbyist. Commercial receivers may well carry a price tag where they cannot be justified by casual users, hobbyists, and schools for occasional use, and there is no meaningful cost-to-benefit ratio.

The remaining part of Wayne's comments will be published next month. My thanks to Wayne for this insight into NOAA's current thinking. In the next few years we can expect many of these points to be firmly clarified.

Frequencies

NOAA-12 transmits a.p.t. on 137.50MHz.
NOAA-14 transmits a.p.t. on 137.62MHz.
NOAA-15 and *NOAA-16* have a.p.t. subject to problems.
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.

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*High sensitivity design

NEW AR8600

MOBILE - BASE - TRANS-PORTABLE

The AR8600 is an extremely versatile **all mode** receiver (**530kHz - 2040MHz**) which can be used virtually anywhere, mobile, base or trans-portable... powered from an external 12V d.c. power supply, optional d.c. lead from a 12V vehicle or from an optional internally fitted NiCad battery pack. A strong twin metal case with die cast front panel characterises the multi-purpose role. All mode receive capability is provided including Single Side Band with programmable tuning steps down to a resolution of 50Hz with the frequency established by a highly accurate Temperature Compensated Crystal Oscillator (TCXO). An RS232 port further extends the capabilities with free supporting control software available from the AOR web sites.

Although many microprocessor features have been adopted from the trendsetting AR8200 Series-2 hand portable receiver, **the AR8600 RF front-end is an all new (*high sensitivity) design with a first rate switched attenuator and preselection around VHF to ensure the highest levels of adjacent channel rejection with software spurii cancellation**. In addition to a hinged telescopic whip aerial, the AR8600 is supplied with a **detachable plug in medium wave bar aerial** which locates on the rear chassis of the receiver for localised medium wave monitoring. An additional BNC socket is mounted on the rear chassis so that **10.7MHz i.f. output** may be extracted for use with external spectrum display and vector analyser units such as the AOR SDU5500. The TCXO ensures **high stability** with **minimal internal spurii** and is usually only seen in top of the range (more expensive) models such as the AR5000 and AR7030.

The chassis is manufactured from two metal compartments, effectively a **metal chassis inside a metal cabinet...** this provides excellent screening characteristics and great robustness highlighting its multi application role. The **front panel** is also manufactured from **die-cast aluminium**. Size is 155(W) x 57(H) x 195(D) excl. projections, weight less than 2kg.

The all important **8.33 kHz airband channel step is *correctly implemented.* Computer control** is available via a standard 9-pin RS232 D-type connector on the rear chassis, just a standard RS232 cable is required for connection to a PC, the extensive RS232 command list is printed in the operating manual. In addition, **'optional internal SLOT CARDS'** (which fit into the rear chassis of the AR8600) extend the capabilities even further, five cards may be fitted with two operational simultaneously. **Supplied with:** Swivel base telescopic whip aerial, MW bar, comprehensive illustrated operating manual with RS232 listing, d.c. lead.

AR8200 SERIES-2

NEVER BEFORE HAS ONE HAND PORTABLE OFFERED SO MUCH

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 **AR8200 SERIES-2**, this ensures **high stability** with **minimal internal spurii**. 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, 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 (CTCSS, tone eliminator, record / playback, external memories, voice inversion).

'REAL' SHORT WAVE LISTENING

Due to huge commercial success overseas, the AR7030 has been out of stock for a couple of months, new stock will be available from the end of May'01.

Despite being over five years old, the AR7030 is tremendously popular **still beating off the competition**. AR7030, **the professional choice**.

Excellent strong signal handling, low noise local oscillator (producing extremely low reciprocal mixing figures) and excellent audio fidelity demonstrates the attention to detail carried through design and into manufacture... the analogue circuits of the AR7030 exhibit none of the strange AGC and poor audio characteristics found in other 'higher priced' DSP competitors. Many feel that the AR7030 is the best short wave analogue receiver ever. Receiver of the Year 1996/97 WRTH, 5-star award and editors choice Passport to World Band Radio for several successive years. Designed and built in the UK as a collaborative project between internationally acclaimed designer John Thorpe and AOR.

John Wilson (author of the *SWM* series "Commercially Speaking" "In My Experience" etc) often makes comparative references between high priced commercial receivers and the AR7030 demonstrating the foresight and high technology features provided by the AR7030, unique in the consumer market. Examples include:

Collins 95S-1A *SWM* June'2000 P24: speaking of excellent AGC characteristics ..."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."

Collins 95S-1A *SWM* June'2000 P24: speaking of independent squelch for each memory channel and attention to detail: ..."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?"

★★★★☆ AR5000+3 awarded four stars 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** frequency cherent version for commercial applications, special order.

Commercial & government operators have selected the AR5000, AR5000+3 and AR5000c in great numbers over recent years resulting in the model being recognised within their organisations in the same manner as many household brand names & products. For counterintelligence surveillance, the AR5000 (often partnered with the SDU5500) forms the cornerstone of modern day monitoring. System training often revolves around the AR5000 which leads to even wider implementation across departments. Transform ***your*** hobby to a commercial grade listening post with the AR5000, **the professional choice**.

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.

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

SDU5500 - SPECTRUM DISPLAY UNIT

The SDU5500 is a Spectrum Display Unit providing practical and cost effective spectral monitoring for band occupancy and identification of new transmissions. Coupled to the AR5000 receiver, it provides a spectrum display of 10MHz bandwidth anywhere between 10kHz and 2600MHz.

■ PETER BOND c/o EDITORIAL OFFICES, BROADSTONE
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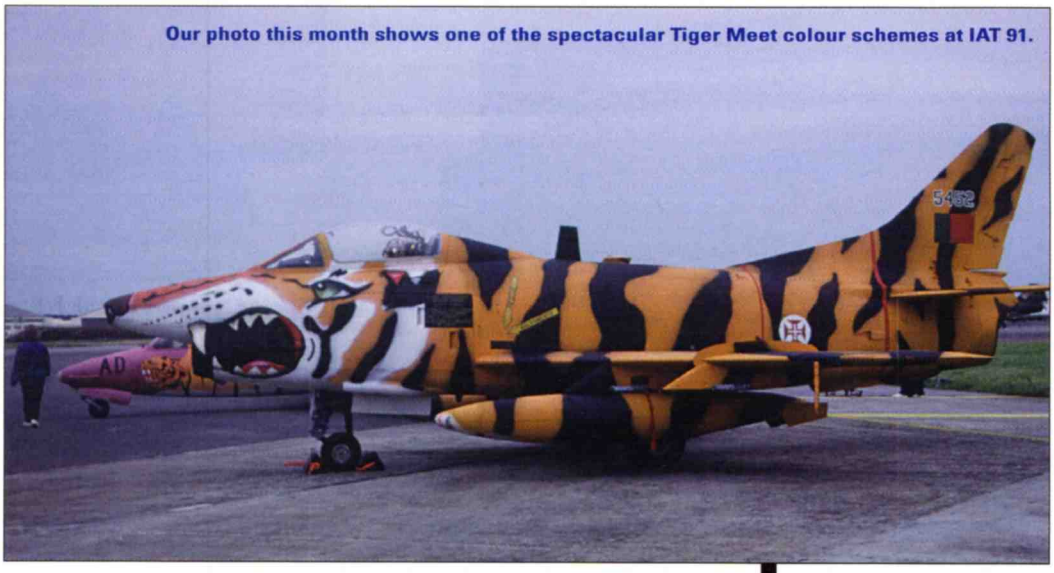

Our photo this month shows one of the spectacular Tiger Meet colour schemes at IAT 91.

Oh Dear!

As I write this the Foot and Mouth outbreak is almost four weeks old and despite government assurances that it is under control, yesterday appeared to be one of the worst days so far with total cases now well over 300 and rising. There is already speculation that some early season Air Shows may be postponed or more likely cancelled, (presumably if they are close to an affected area?).

As horse racing and other large public events are still currently taking place, hopefully the major Air Shows will remain unaffected - but with many Military airfields being located in the centre of farming areas, a big question mark remains over what may happen.

On the subject of Air Shows, this year's event at RNAS Yeovilton has unfortunately been cancelled. I understand that there was a problem with funding the event this year, but it should definitely take place in 2002.

Fairford

Following on from my comments about Fairford in the February *SWM*, I am grateful to an anonymous reader who sent me the following information, much of which he comments came from a RIAT meeting. The airfield is now expected to re-open in May 2002, (allowing plenty of time to set up the Air Tattoo in July). Shortly after opening, it is planned that there will be an exercise held at the airfield to evaluate its role as a contingency base. This presumably will involve B-1s, B-2s and B-52s, and so after a long period of quiet over the Gloucestershire countryside, it looks as though MilAir enthusiasts could be in for a few days of serious entertainment!

The on-going work at Fairford when finished will increase the hard standing areas by a significant percentage. This has apparently prompted a statement from a RIAT source that this increase in available surface area will allow for the parking of a much larger number of aircraft than before. Consequently, with the main theme for 2002 being fighter orientated, (including a Tiger Meet), then in theory it could be possible to have aircraft participation at RIAT 2002, well over 500 and possibly as many as 600! (That should make anyone with shares in Kodak or Fuji fairly happy!).

If this increase in aircraft should happen, then the arrival days for RIAT 2002 may have to be extended with inbounds starting on the Tuesday or possibly even the Monday! Departures will also be spread over a longer period with a percentage of aircraft scheduled to leave on the Tuesday. It looks like it could be quite a show in 2002, especially if the Tiger Meet brings some of the spectacular colour schemes seen in the past. The only problem I can see is that you may end up taking almost two weeks leave from work, to go to just one air show!

Mobile Antennas

My request for information regarding different personal antenna set-up's for mobile airband listening has brought a few interesting replies, so here is the first idea. **Brian** from Newbury has come up with an ingenious and perhaps obvious solution - not necessarily a new idea admittedly, but one that you might not immediately think of and well worth a mention.

Incidentally, Brian lives on the road which leads from Newbury Rugby Club down to the old North side of RAF Greenham Common. Those with good memories will remember that this road lead past the lane to crash Gate A, which everyone walked down and under the Approach to Runway 11 to set up camp on the Southside to photograph IAT arrivals. Sigh - happy days. Anyway, leaving nostalgia mode!

Brian drives a 1988 VW Campervan, but the principles of this antenna installation could apply to many different vehicles. The stereo radio antenna is located at the top of the pillar to the right of the windscreen, (offside), and consequently Brian had the idea to 'mirror' this installation on the nearside. VW had discontinued the antenna for the 1988 campervan so Brian bought a very similar antenna, mount and cable for £11 from a car audio shop.

Having first checked to see if any cables, etc., ran through the metal pillar, and with the help of a friend who is a mechanic, they drilled the holes on the pillar to take the cable and the self tapping screws. The holes were rust-proofed using two coats of a metal sealant applied with a cheap art paintbrush, each coat was allowed to cure for 24 hours. The push in type antenna plug was cut off and the cable was then fed through to the intended radio location, (apparently, not without a fair amount of cursing).

Brian uses an AOR AR3000A and this was held in place under the dashboard by some straps made from 20mm wide elastic with 50mm lengths of Velcro stitched on the ends. (A clever idea which I have also now used successfully for a similar purpose). A BNC plug was fitted to the cable and the installation was ready to be evaluated.

Brian regularly goes camping with the family in the Savernake Forest, near Marlborough, the site is quite high up and consequently provides some good MilAir listening. So last September, on one of the few dry weekends, he set up camp and put the antenna through its paces. Using the transmissions from London Control/Military, plus several ATIS weather broadcasts, he moved the telescopic antenna in and out to get the best reception on both v.h.f. and u.h.f. airbands.

The optimum positions were highlighted using a permanent marker pen. The outcome was that he reports that reception was as good as if not better than Mag or gutter mounts he has used in the past. The ability to move the telescopic antenna to the best position for u.h.f. listening made just that extra bit of difference to MilAir listening.

Now I realise that not everyone will want two antennas fitted or will want to start drilling holes in their precious cars, but it is a very neat solution the to the mobile antenna problem. (No scratches from Mag mounts, etc.). To get main dealers to fit the antenna will not be cheap, with labour costing anything up to about £40 per hour! The cheapest quote I could find for the job was £18 plus VAT from a local specialist car electrical workshop.

■ **DAVE ROBERTS c/o *SWM* EDITORIAL OFFICES, BROADSTONE**
■ **E-MAIL:** scanning@pwpublishing.ltd.uk

Has anyone else heard of this? On Saturday 3rd March I received a routine marine safety broadcast from a coastguard station. Nothing odd about that I hear you mutter. For many of us these transmissions are the most reliable way of picking up a local weather forecast. What was unusual this time? Well, part of the broadcast referred to GPS 'jamming trials' which were due to take place between 1st and 8th March in the area of the north west coast of Scotland within 160km of 59°20' north and 006°30' west.

Now, peering myopically through my magnifying lens I reckon that this puts the jamming transmitter on or about a location known as the 'Butt of Lewis' which is at the north end of the Isle of Lewis in the Western Isles. Clearly GPS jamming is going to be an important tool for aggressor military forces in any armed conflict and no doubt it's essential to confuse the enemy. Should you be sailing off the north west coast of Scotland and your GPS tells you that you are on the M6 northbound near Tebay services, get out the sextant!

Countdown

In the March *SWM* I asked if anyone had information on the London Transport 'Countdown' bus information system. I have received two replies, both very informative. One from **Paul Beaumont** who sourced a London Transport document on the system. Thanks Paul.

Also thank you **Tony Garnett** who has specialist technical knowledge of 'Countdown'. At the start of each journey the driver keys in a code which represents the destination of his bus. The countdown system then calculates which bus stops will be on the route. If the destination has to be changed en-route then the driver just keys in the new one.

Small battery powered beacons are attached to lamp posts on the bus route. They respond to a 'wake-up' signal transmitted in bursts from a matching unit mounted on the bus which is termed a transponder. They only pick up buses passing in a particular direction. The beacons have a long battery life as they only operate for very short periods. The beacons work on a frequency of 24.3GHz and are simply pulse modulated. The bus mounted unit, that picks up the signals from the beacons, passes the data via a data bus (not a double decker) which is known as 'World FIP', to a modem. The beacon's identity has therefore identified the location of the vehicle at a point in time.

In addition to this information, the bus transponder also takes an input from an odometer mounted on the bus's rear axle. This provides data on the number of wheel rotations since the last beacon and therefore indicates an estimate of the distance covered since the last waypoint. These details and the beacon location are transmitted via the London Transport's band III trunked radio system (base 201/202/203MHz - mobiles 193/194/195MHz) to one of the base stations around London at Brixton Hill, Guy's Hospital, Alexandra Palace, Shooter's Hill and Telstar House in Paddington. The transmissions take place at regular intervals over the trunked system together with the identity code of each bus.

The radio on the vehicle momentarily switching to a data channel every 30 seconds to send the data. The switch is so rapid that any disruption to voice comms is barely discernible. The base stations are linked to a trunk controller and a computer which calculates the bus's location and updates the bus stop 'Countdown' signs by multipoint leased line.

To save bandwidth on the lines the signs are only sent update information when data is available and the actual sign unit at the stop contains a processor which works out the time to the bus's arrival. It counts down, based on the last update and is able to indicate clear information to waiting passengers. It shows the order in which the buses will arrive at the stop and the number of each bus and the destination of the bus which has been derived from the input keyed in by the driver.

The ETA of the bus at the stop is indicated, based on it's location and the time it has taken the three previous buses to get there. Also text messages can be sent to the bus stop display which can scroll messages across the screen every 90 seconds. These messages can convey information on any aspect of the service.

An audio unit is currently being tested to provide an audible version of the displayed information. The data being drawn from a computer held stock of messages. For people who hoped that they may be able to pick up the data sent to the bus stops this is a big disappointment as it's sent on land line.

Tony believes that the local bus company in Ipswich were running an experiment, together with BT, whereby bus locations were obtained by using GPS and passed to a control, the information on bus locations being posted on the Internet. GPS has also been used for bus location in other parts of the UK. It used to be so simple. Do you remember the sign, 'To stop the bus please raise your hand. The driver then will understand'. (Understand he might, the cuss. But will the driver stop the bus).

Fire Frequencies

Further on Lancashire fire frequencies mentioned in the February column I have had a reply from another **Tony**. This Tony has knowledge of the Lancs fire channels and tells me that the direct simplex channel is 80.0125 n.f.m. This is used to talk between appliances without going through the base station. It seems that this frequency is known as channel 9 in Lancs, but nationally seems to be known as channel 21 and some brigades use it in a.m. mode.

Likewise, 80.075 being known as channel 22 to the fire and rescue service. I know that these services used to have 451.400 and 451.450 n.f.m. as simplex frequencies using Burndept BE470 radios, but I believe that this use may have declined. I purchased some surplus units and converted them to u.h.f. amateur band some years ago and they had been on these frequencies.

Maxview Antenna

Moving on to comment on the first rate February contribution by **Paul Unwin** on converting the Maxview active antenna for scanner use. **Steve Hughes** from South Wales has completed his conversion thanks to Paul's article. Steve in the past was involved in the security industry and he used sticky backed burglar alarm foil available from either Gardner's Security or CSD Security Supplies.

Steve says that for around £3 he was able to buy a roll of tape 55m long by 9mm wide. Instead of rivets used as interface connectors, Steve utilised foil take off blocks with screw terminals also available from the same suppliers. Steve has kindly sent me a large list of suppliers of this kit which I can pass on if required.

Strange Transmissions

Summat's up...I have picked up information via the Internet from a very reliable source that he heard strange transmissions on PMR446 channel 7 (446.08125 n.f.m.) on 27th February. He was in the South Wales/Avonmouth area and he says that the signals were simplex and the language was possibly Ukrainian. They seemed to be using breathing apparatus and the signals were not long distance 'skip'. They lasted about 25 minutes and seemed to be airborne. No CTCSS was in use.

This was heard via several different receivers and the conclusion must be that someone was in an aircraft using this frequency on f.m. Has anyone else heard them? I realise that most readers do not have Internet access so this is why I mention this occurrence here.

Also it seems that v.h.f. and u.h.f. amateur bands are being used by commercial operators in roughly the same area. Some sort of security company seems to be operating on 430.2125 f.m. and some other people are using 144.475 and 144.500 f.m. for business use too. If you are a licensed amateur, a nice long CQ call on the frequency or a lengthy QSO with a friend may be in order.

Finally, thanks to everyone who has written and E-mailed me. Your information is always of interest and gratefully received.

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DX Television

Like the February weather, Band I was extremely bleak with no signs of F2 activity, leading to speculation that its peak has passed. Areas of high pressure created frosts and foggy conditions, which produced some intense lift conditions in Band III and at u.h.f., particularly on the 14th, St. Valentine's Day.

The Big Tropo Opening

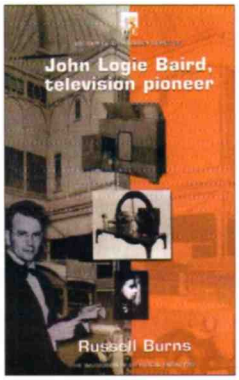
After the dreadful tropospheric conditions of last summer, **Ian Milton** (Ryton) began to think that many u.h.f. channels were blocked by digital multiplexes. It was a great relief when signals began to emerge around 1800UTC on the 14th from Norway, Denmark and Germany. At 2030 Ian became aware of a station with 6.5MHz sound spacing, i.e. Eastern Europe, on Channel R30. A white '2' logo featured top-right which was later identified as Poland from the 700kW Szczecin mast.

From 1830 **Stephen Michie** (Bristol) logged the Danish DR-TV Soenderjylland outlet on Channel E7, showing *Keeping Up Appearances*. By 2300 RTV Oost was strong on E22 with a news programme and *Het Weer*. At 2343 Dutch regional TV Noord (E36) closed, going onto a blank raster, while on E28 TV Frysan was showing text pages.

Peter Barber (Coventry) identified Denmark on E7 and E10 on the 15th and possibly the previous evening at 2330 with a subtitled programme.

In Derby, the local ITV from Sutton Coldfield on Channel 43 was taking a battering towards dark, with co-channel line-paring from the BRT-1 outlet at Egem, Belgium. Although pictures could not be resolved, the 5.5MHz sound channel could be clearly heard.

During the evening, the local Waltham pictures became extremely snowy, with pictures, normally P5 in quality reduced to a pitiful P1. This was caused by co-channel digital multiplexes causing serious degradation. Sandy Heath, Tacolneston and Sudbury broadcasts were the only pictures watchable!



Towards midnight Meridian TV from Dover appeared on Channel 66 in colour with readable teletext. French pictures from the 100kW Boulogne transmitter were resolved on L29 (tf1) and L34 (France-2). All this using a wideband u.h.f. grid and single-stage amplifier, atop a temporary 6m pole!

DXTV Log For February

Reports from Ian Milton, Stephen Michie and Peter Barber.

14	Norway:	NRK-1 E5 E6, E7 and E8; TV-2 E44, E47; TV-Norge E34 and E57.
	Denmark:	DR-TV E7; TV-2 E35 and E40.
	Germany:	ARD-1 E50; N3 E28, E34, E60; ZDF E34 and E35; SAT-1 E49.
	Poland:	TVP-2 R30.
	Belgium:	RTBF-1 E8; VRT TV1 E10
	Netherlands:	NED-1 E4, E6 and E7; NED-2 E27; TV Oost E22; TV Noord E36; TV Frysan E28.
	France:	Canal Plus L5 and L9.
15	Belgium:	RTBF-1 E8; VRT TV1 E10.
	Netherlands:	NED-1 E4; NED-2 E27 and E32.
	Denmark:	E7 and E10.

FM Reports

Joy FM on 87.7MHz, based in the Edinburgh area, seems to have ceased broadcasting according to **George Garden**, who thinks it may have been operating illegally, jamming RNA (Brechin, Angus) on the same frequency.

During the tropospheric opening on the14th, George heard a strong station on 91.8MHz, possibly Denmark, with lots of speech, reggae music and news on the hour.

Simon Hockenhull (Bristol) logged transmitters in south and east England between the 13th and 18th. A French station on 87.7MHz was resolved on the 14th, its origin unknown.

Dave Phillpotts (West Looe) queries 'BL AMORE' and 'BL NORM' RDS identifications on the 14th, possibly both French stations.

Iain Menzies (Aberdeen) caught a small midday Sporadic-E opening on the 23rd while mobile. On 87.7MHz a Spanish voice broke through for a couple of minutes with references to Gran Canaria (Canary Islands), although the signal is unlikely to have originated there!

Fig.1: Test Card 'G' used by Hungary.

Fig. 2: Hungarian News programme introduction used in the Sixties and early Seventies.

New Baird Book

A biography of John Logie Baird has recently been published to commemorate the 75th anniversary of the inventor's first public demonstration of a rudimentary television system. *John Logie Baird, Television Pioneer* (ISBN 0 85296 797 7), written by Russell Burns, runs to over 400 pages and includes a number of rare photographs. It costs £55 and is published by The Institution Of Electrical Engineers.

Other News

There was a massive F2 opening experienced in South Africa on the 25th with the reception of most E2 transmitters extending right across Europe and into the Middle East. A new E2 transmitter is operating in the Middle East, its location is thought to be Iraq or Iran.

Fig. 3: TVP-2 from Szczecin on R30, received by Ian Milton on February 14th.

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.

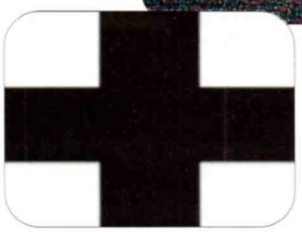


Fig. 4: This month's trip 'Down Memory Lane'. This electronically-generated test signal was known as the 'Art Bars' and was first transmitted by the BBC on February 1st, 1946.

Service Information

Hungary: MTV-1 is currently broadcast from two R1 outlets: Budapest (150kW horizontal polarisation) and Nagykanizsa (50kW vertical). The former MTV-1 R2 60kW outlet at Pecs relays RTL KLUB programmes. The MTV-1 Tokaj R4 transmitter is no longer operative. Transmissions moved to u.h.f. to enable the greater use of the CCIR f.m. band.

In the early Sixties, Hungarian TV used Test Card 'G' (see **Fig. 1**) and until the mid-Seventies, there were no programmes on Mondays!

Russia: There is an NTV transmitter in Khabarovsk (Far Eastern Russia) using Channel R1 (2kW t.r.p.). From the same tower, ORT is broadcast on R3 and the national TV6 network on R5. In Magadan TV6 is aired on R1 (15kW e.r.p.), with zero offset. The 250kW R3 transmitter in the Uzbeki capital Tashkent broadcasts Uzbek TV4, and some relays from Russia of ORT and the RTR 'Vesti' news.

The reconstruction of the destroyed TV tower north of Groznyy should be nearing completion. Currently the area is served by temporary low-power transmitters using channels R2, R3 and R7.

Denmark: v.h.f. transmitters currently in use, which are receivable in the UK: Fyn E3 10kW, Copenhagen E4 50kW, Aalborg E5 50kW, Bornholm E5 10kW, Sydvestjylland E5 5kW, Sydsjaelland E6 60kW, Soenderjylland E7 60kW, Aarhus E8 60kW and Vestylland E10 60kW.

At u.h.f. there is a network of high-power TV-2 transmitters operating plus many local and private stations.

This month's Service Information was supplied by **Tim Bucknall** (Congleton) and **Gösta van der Linden** (Netherlands).

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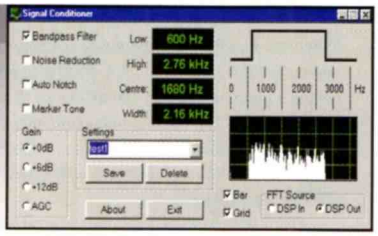

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Construction of externals	WR-1550e/WR-3150e/3500e/3700e - external RS232/PCMCIA (optional)		
Frequency range	0.15-1500 MHz	0.15-1500 MHz	0.15-2.5GHz
Modes	AM,LSB,USB,CW,FM-N,FM-W	AM,LSB,USB,CW,FM-N,FM-W	AM,LSB,USB,CW,FM-N,FM-W
Tuning step size	100 Hz (1 Hz for SSB and CW)	100 Hz (1 Hz for SSB and CW)	100 Hz (1 Hz for SSB and CW)
IF bandwidths	2.5 kHz(SSB/CW), 9 kHz (AM) 17 kHz (FM-N), 230 kHz (W)	2.5 kHz(SSB/CW), 9 kHz (AM) 17 kHz (FM-N), 230 kHz (W)	2.5 kHz(SSB/CW), 9 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	3-8 cards (pse ask)
Dynamic range	65 dB	65 dB	85dB
IF shift (passband tuning)	±2 kHz	±2 kHz	±2 kHz
DSP in hardware	no - use optional DS software	YES (ISA card ONLY)	YES (ISA card ONLY)
IRQ required	no	no	yes (for ISA card)
Spectrum Scope	yes	yes	yes
Visitune	yes	yes	yes
Published software API	yes	yes	yes (also DSP)
Internal ISA cards	£369 inc vat	£1169.13 inc	£1589.78 inc vat
External units	£429 inc vat	£1169.13 inc	£1589.78 inc vat

PCMCIA Adapter (external):	£69.00 inc when bought with 'e' series unit (otherwise: £99 inc)
PPS NiMH 12v Battery Pack and Charger:	£99 inc when purchased with 'e' series unit (otherwise: £139 inc)
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■ E-MAIL: shackware@pwpublishing.ltd.uk

Shackware

Hello and welcome to 'ShackWare'. Many thanks for all your kind comments (and constructive criticism!) about the recent 'ShackWare Special' which, as always, I thoroughly enjoyed putting together. This time, we've got a largely Mac-centric instalment, so without further ado, let's press on to the mailbag.

Your Letters

Mike Evans - **bbms4ozone@compuserve.com** - lives not too far away from me here in beautiful Norfolk. He was prompted to write after spotting a picture of a machine featured in the 'ShackWare Special', exactly like the one he'd recently acquired...

"I've been trying to track down all the bits that go with a vintage Mac Plus (Mike had just bought for £4) and today I see in the latest edition of *SWM* my model staring me in the face from your column, and I read your comments with great interest. Before the magazine arrived, I bought MacUser which cost £3.10 to look at the adverts, but what a waste of money! I found one page advertising under the trade name of 'Mad-Macs'.

I sent them an E-mail, as on their page it said 'pre-loved Macs - we have them all'. Being too late on Saturday to have a chat over the 'phone, we visited their web site, which opened with a picture of a Mac Plus! Great I thought, so we sent them an E-mail asking about the Mac Plus, but it would seem no help from them at all. I've been running around in circles trying to get the 800K discs, I can't get the leads, can't get the handbook or copy of same, I have been running around in so many circles that I am now thinking of binning this machine.

Yesterday I was looking in some old *Passport to World Band Radio Handbooks* from 1990-1993 and about eight pages in there once again was the Mac Plus with all its variant model numbers, these were started as SE-SE30-II-IIx, etc. Please help in pointing me in some direction, in obtaining something, be it a source of 800K discs, leads or a copy of the handbook, I don't know how you stay sane your end, trying to get these old machines running again as I'm about to give up!

All I can say is reading your column is very interesting, but trying to get these old machines up and running is a nightmare, please, please put some help my way, otherwise reading your column to my mind is a waste of time".

Gulp! I hope all my readers realise that attempting to get some value from old computers is a bit of a labour of love and that no-one should assume that that their few-quid boot-sale find is going to provide them with a passport to silicon heaven! The Mac Plus was (is) a lovely machine, but without a hard drive it has limited value in the shack or anywhere else. But let's press on to Mike's questions.

First, the mysterious 800K disks are nothing more than 'standard' 720K PC disks, but formatted on a Mac with a method known as GCR or Group Code Recording (the Mac speeds up and slows down the disk depending upon where the heads are sitting in relation to the hub). Formatted in this way a PC floppy (i.e. not a 3.5in 'HD' floppy disk which holds 1.3Mb, but the earlier first incarnation of the 3.5in floppy) will hold 800K of data (by the way, the very first Mac - the 128K - had a single-sided drive providing just 400K of formatted data on a 3.5in disk). *(BTW - if you can't find 720kb disks, you can use HD ones wtih the extra hole obscured with tape - **Ed.**).*

So that's mystery number one out of the way. Two, before you can format floppies or indeed do anything useful, you need a copy of the operating system which, for the Mac Plus, must be System 7.0 or earlier and fortunately, I have lots of Mac operating systems going right back to 2.x. Though technically these are copyright, given that I'd be passing on necessary system software to another Apple owner and that Apple released many of the OS versions as freebie updates anyway, there shouldn't really be a problem (and anyway, does anyone really care about 10 year old system software for an obsolete computer?).

At the moment, I'm afraid I can't let you have a copy of the OS because most of my stuff is still packed (and I don't even know which box it's in) but as soon as I'm able, I'll send you a suitable boot disk which will enable you to create a RAM disk (in lieu of a hard drive) and actually use the machine to some purpose!

Three, you need a hard drive. You require a standard external SCSI drive with a suitable cable (which is easy to make: two IDC plugs from Maplin and a length of ribbon cable). Small SCSI external drives aren't widely available, but they can be found at computer jumbles (look in the free papers for coming local events). If you can't find a proper hard drive you can use an external SCSI Zip drive (about £70) which is slower, but you won't notice on a Mac Plus! Check out the advertisers in your copy of *MacUser* magazine.

Finally, I'm only responsible for drumming up enthusiasm, it's you who must provide the endless searching at boot sales and the like! Ah, the joys of old computers...

Mac News

A couple of other Mac-related snippets wouldn't go amiss here. **Chris Smolinski** (he of Mac Multimode fame) has an updated web site at **www.blackcatsystems.com** featuring lots of radio-oriented Mac software including the latest version (3.9.0 released January 28, 2001) of data modes decoder *Multimode*, a fantastic Lowe receiver controller and lots more. Most of the Black Cat Systems software is freeware or reasonably-priced shareware and for those with access to the US, you can acquire all the programs in one simple go by buying Chris's CD for just $5.

Z88 Drawings

Previous correspondent **Nigel Dunn** popped in recently only to find me out at work (yes, I have to earn the money to support my computer addiction somehow!). Though he missed me, he very kindly left behind the Z88 schematics as mentioned in the November instalment. These provide a detailed insight into the inner workings of the machine and could be invaluable for anyone currently tinkering with a Z88 - contact me for further details should you require them.

Amiga Updates

Though universally acknowledged as a fine computer, Commodore's Amiga suffers from a lack of quality radio-oriented software - there's stuff out there but finding it is next to impossible! At least, it was next to impossible. An FTP site at **ftp.qsl.net/pub/aarug** sports dozens of disk images packed full of files devoted to making an Amiga useful about the shack. On the web, point your browser at **http://www.bobshack.demon.co.uk/amiga/amiga.htm** which details two useful interfaces designed by Peter Lockwood G8SLB - one of which provides access to SSTV and FAX decoding (software to drive the devices is available from the ftp site). Finally, don't miss a visit to the Amiga Amateur Radio User Group's web pages at **www.qsl.net/aarug/** which features masses of invaluable Amiga-radio oriented information.

And Finally

That's it for this instalment. I'm gradually (very gradually!) unpacking and locating long 'lost' receivers, computers, software and the like and I've yet to make a permanent home for them - the builders arrive soon - but do keep your letters coming and I'll endeavour to answer your questions wherever possible. Until next time, good listening.

■ GRAHAM TANNER, 64 ATTLEE ROAD, HAYES, MIDDLESEX UB4 9JE
■ E-MAIL: ssb.utils@pwpublishing.ltd.uk

SSB Utilities

"The 2001 edition of *Military Air Scan* has now arrived, and features a large number of changes and improvements".

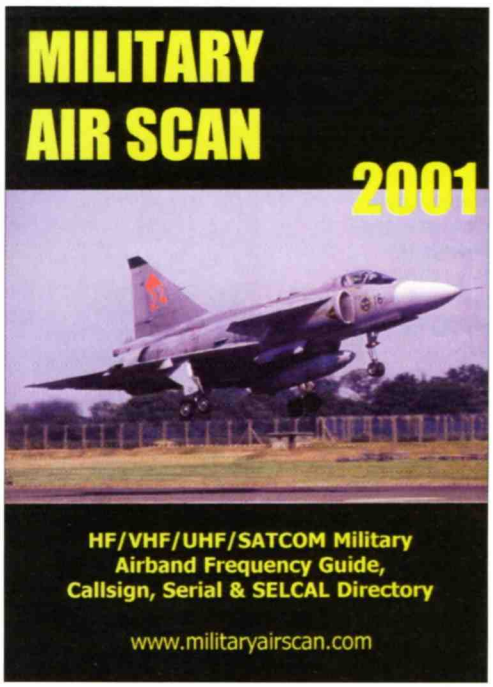
This month's column is a bit more 'rough and ready' than usual, due to computer problems. During the middle of March, right in the middle of the period when I send this column off to the Editorial offices, I found that the power-supply on my PC had expired. This could not have happened at a worse moment, as the completed column was almost ready to send, but without a PC I was unable to make the last few amendments before E-mailing to the Editor.

As a result, this month's column has had to be completely re-written from scratch, and without the benefit of various files of information and E-mails from readers. Hopefully the situation will be back to normal for next month. This month's column has been compiled using a variety of systems, including a Psion 3A organiser and a loaned laptop.

Military Air Scan 2001

Last year I mentioned this book and suggested that it might be of interest to readers as it contained a very good listing of military frequencies, including a number in the h.f. spectrum. Soon after that article appeared in print, I was contacted by the publishers who explained that the 2000 edition had just gone out of print, but they did mention that the 2001 edition would be produced during early 2001.

The 2001 edition of *Military Air Scan* has now arrived, and features a large number of changes and improvements over the previous year's edition. The 2000 edition was just over 100 pages long, and covered just military frequencies and some associated data. The 2001 edition is over 260 pages long, and the book is obviously about three times thicker!



The 2001 edition continues the format of previous editions by covering military frequencies used in and around the UK by MoD, USAF and other NATO forces. This year's major changes are extensive listings of various aircraft tail-numbers, and a large listing of military selcalls. More on those sections later.

The first/main part of the book is taken up by a long listing of frequencies arranged in alphabetical location order. Within each location, all the frequencies are listed in ascending order, and it is very easy to see at a glance which frequencies you should be listening to for any given airfield or location. This section is primarily aimed at the scanner user, and principally those who listen to the military of v.h.f. and u.h.f. airband, but some locations also include frequencies for various ground services.

For h.f. listeners, the main interest will be on the few pages which list h.f. frequencies for various military users. In the 'British' section this covers all the three main Services and also the various Cadet forces. The RAF section also includes a long listing of STCICS frequencies, and the book is worth its price for just this listing - this single listing is probably the most requested item that I receive.

Another section for h.f. listeners is the listing of all the major world air-routes, and this includes the often missed 'EA-1' and 'EA-2' networks in eastern Asia. Once again there is nothing really new about this section, but it is very nice to see it combined with all the other h.f. information.

The h.f. listings are completed with extensive listing of military h.f. frequencies for various countries around the world, including another oft-requested section, the 'Mystic Star' network. There is also a listing of NASA h.f. frequencies, very handy for the next few launches later this year!.

Following-on from all that frequency information is a long listing of military callsigns which can be used to tie-up an aircraft type and user from a callsign. This must be used very carefully, and ideally used to cross check with other information such as actual sightings. It is all too easy to hear a callsign, look it up in such a callsign listing and simply quote the information from the listing without checking facts.

During 2000 I heard a flight with the callsign 'Boxer 22' working Croughton on h.f. requesting a weather report for Shannon. I later saw reports of this flight being a RAF Jaguar! This seems to indicate that whoever else heard this flight simply looked-up the 'Boxer' callsign somewhere, saw it listed as a RAF Jaguar, and put two and two together. A bit more research would have revealed that RAF Jaguars don't have h.f. radios, and is very unlikely to be landing at Shannon in the Irish Republic.

The American accent on 'Boxer 22' should have been a giveaway, and the other listener should have identified the flight as being a USAF aircraft. However, this is just one simple example of how such callsigns lists can be easily mis-used. I have no real complaints about the callsign list in *Military Air Scan 2001*, but it is only ever as good as your other information, and such lists should not be the 'final word' on callsigns.

After the callsigns list comes a long listing of British Military and selected USAF aircraft tail-numbers. Although I had a hand in preparing this section of the book, I am still not convinced that it has its place in a 'frequency book'. There are better suited publications for this kind of information, and they seem to spend all their time simply trying to keep up-to-date with the numerous changes that occur, and I feel that this kind of effort is a bit wasted in *Military Air Scan 2001*.

It is always a difficult decision trying to decide what to include and what to leave out, and you can never please everyone. Such listings of aircraft are inevitably out-of-date by

the time the finished book reaches the readers, and although it will give clues to readers and users about the aircraft concerned, the casual reader may not realise that aircraft markings change often and things may not be all they seem.

The final section with an interest for h.f. listeners is a long listing of military aircraft equipped with selcalls. For a book with the aim of covering military frequencies and what might be heard on them, the selcall listing contains a number of aircraft which are plainly not military owned or operated. The listing contains a large number of entries for aircraft operated by various US cargo airlines. If you are interested in selcalls, then you probably have your own listing, or maybe one of the other commercial or Internet offerings.

All in all, I would certainly recommend this book for dedicated military listeners. There is a lot of very useful information contained in this book and it is a pleasant surprise to see it all in one place and so well presented. I am still not convinced that all the sections of the book are completely necessary, but I am prepared to wait until I hear other opinions.

The book costs **£14.99** and is available from **MGT Publishing, PO Box 564, Norwich, NR7 8DD, England**. There is a web-site which contains more information about *Military Air Scan 2001* - **http://www.mgtpublishing.com**

Letters & E-mails

I managed to capture one E-mail before my PC problems happened. **Steve Jerome** wrote to ask some questions about listening to h.f. stations using his Yupiteru MVT-7100. Steve says that he has only just started dabbling in h.f. listening and uses a simple antenna made from about 8m of plastic coated bell wire attached to the middle connection of a dismantled BNC socket. Steve comments that since the '7100 is not a true h.f. receiver, he doesn't feel there is any point in buying an expensive antenna at the moment.

Firstly, I must say I quite agree with Steve and his choice of antenna. I also faced a similar dilemma when I started out with h.f. listening in the mid 1980s. Until I was completely sure that I wanted to continue listening to h.f. signals, I used a similar simple antenna - mine was 10m long - and once I had caught the bug, I moved on to bigger and better antennas.

A simple and cheap antenna also allows you to experiment with height and direction, and the way that the antenna is connected to your receiver. If you make a mess of the antenna, you have only lost a few pounds of material, and a replacement is equally as cheap.

Steve continues to say that he can hear the various VOLMET frequencies fine, especially with the 'ATT' function on. You will find that the 'ATT' function (attenuator) is usually required for h.f. listening as the relatively huge signals received on a large antenna can easily swamp the front-end circuitry of a h.f.-capable scanner like the MVT-7100. It is very surprising just how much you can still hear when using an attenuator. Larger receivers often have an r.f. gain control which allows you to vary front-end gain of the receiver.

Steve reports some success listening to a Shanwick frequency, 6.622MHz, but actually has the scanner tuned to 6.6237MHz! This is normal for MVT-7100s and possibly other h.f. capable scanners also. At such low frequencies and small step sizes the internal circuits will have trouble resolving a signal accurately enough, and it is often necessary to tune away several kilohertz to get the signal into a readable state.

If you eventually upgrade to a dedicated h.f. receiver you will find that the frequency display (especially those with digital displays) is 'spot on' when compared to a scanner. This is something which you will have to get used to, but once you are aware of the offset required, you will find that you can automatically 'adjust' yourself to read the frequency correctly.

Steve says that on 6.622MHz he cannot hear any aircraft, except very faintly now and then, and asks if this usual? Well Steve, you have just encountered one of the conditions associated with h.f. listening. At times you will be able to hear both sides of a contact loudly and clearly, at other times only one side will be clear while the other is barely audible, finally there will be times when both stations are just detectable. This is all caused by propagation, which is why so many h.f. stations have so many different frequencies to chose from, it allows them to change to other frequencies more suitable to them.

You also have to remember that just because you are hearing both stations poorly, that they may be hearing each other very clearly. A radio signal travels along many different paths, so the path between them may be almost perfect, but the paths between you and each of the other stations could be quite poor.

Still more questions from Steve, who is getting his money's worth this month! He asks about the 'bing, bong' that he hears on Shanwick frequencies, and wonders if this is a controller contacting an aircraft? Yes Steve, that's correct - the 'bing, bong' chimes are selcall tones being transmitted by Shanwick when they wish to speak with a flight. Each aircraft is allocated a 4-letter code, and the chimes are the four letters being sent as two pairs of letters. This makes an indication in the cockpit so that the crew know they are being called by the ATC agency.

As far as I am aware, selcall tones are only transmitted by ground stations, and I have never heard of any aircraft sending them to alert a ground station. This would require the ground stations to be allocated selcall codes, and I am sure that they would have been heard by now.

I have filled-up my page now, so the final few questions from Steve will have to be held over until next month. Hopefully all will be back to normal with my computer by then, and I will be able to tackle some of the letters and E-mails missed this month.

■ MIKE RICHARDS G4WNC, 49 CLOUGHS ROAD, RINGWOOD, HANTS BH24 1UU
■ E-MAIL: decode@pwpublishing.ltd.uk ■ Web: http://www.mikespage.btinternet.co.uk

Decode

Press Frequencies

A few years ago one of the great fascinations for utility enthusiasts was to tune in to one of the many press agencies and watch the news develop in front of you. It was also interesting to see the very different slant applied by the news agencies in different countries.

Sadly the growth of the Internet and the increased availability of satellite communications has led to a rapid decline in the number of RTTY Press Agencies over the past few years. It's now got to the point where they may have all gone, that is unless you know differently! If you have information on active press frequencies using RTTY or any other data mode, please E-mail or write and I'll publish the data in the column.

Decoder Testing

If you're new to decoding or just got your hands on a new decoder, the first thing you need to do is learn how to use it. Whilst you can sit and read the manual, few of us do, and if you're anything like me, you tend to get on-air and start fiddling until you get something sensible on the screen - manuals are for reading when you get stuck!

If you're trying to use a new decoder with unfamiliar modes, this technique starts to lose its attraction and you very quickly reach the point where the decoder ends-up out the nearest window. One of the best solutions to this problem is to make sure you practice with known signals.

However, the problem is finding a good signal of known type, which can be a bit tricky. One solution is to use a recorded sample of a decent signal. Most modern decoders have the facility to decode a .wav file, so this is a really easy option.

If you're using the excellent *MMTTY* software I reviewed recently you will find comprehensive record and playback facilities built into the program. This facility uses *MMTTY*s own recording format that creates .mmv files. To use this, just tune into the good signal you want to record and go to the File menu and choose Record WAVE (mmv) file as. This gives you the option to name the sound file and to start recording to hard disk.

There are options to pause/rewind and stop the recording all from the File menu. When you've captured your signal, you use the File menu again to choose Play WAVE file. Its all really easy to do and is not only great for getting used to your decoder, but it can prove invaluable if you need to analyse a relatively short transmission.

If you don't have *MMTTY*, you can use the excellent *RecAll* utility to make digital audio recordings from your receiver to your hard drive. Just follow the help screens in *RecAll* - it really is easy. When you have your .wav file recorded, just go to the File menu of your decoder and you will usually find the option to play back a .wav file.

If you're really stumped and don't know where to find a good example of the type of signal you want to decode, help is at hand. Thanks to some excellent work from our good friends at the World Utility Network (WUN) you can download a comprehensive range of pre-recorded .wav files from their Internet site. The address to go to is:
http://www.wunclub.com/sounds/index.html

Just to tempt you, here's the latest list of sounds that are stored on the site: ACARS, ANDVT, ARQ-M2, ARQ-E3, CLOVER, DCF77, DECCA, DGPS-MSK, DGPS-QPSK, GMDSS, GWEN, HYPER-FIX, ICAO-SELCAL, LINK11, LORAN-C, MORSE, NDB, OTHR, PACTOR, PACKET, RAC-ARQ, RTTY, SELSCAN, SITOR-A, SITOR-A-MKR, SITOR-B, SSTV, SWED-ARQ, VFT, VFT-USAF, WEFAX.

If you want to record your own signals for testing, pay a visit to this site **http://www.sagebrush.com/recall.htm** to pick-up the latest version of *RecAll*.

Sky Sweeper 2.2

This wonderfully sophisticated decoder and filter system has just undergone a series of improvements to bring it up to version 2.2. The good news is that upgrade from version 2.0 or 2.1 is free and you should automatically receive a new activation code. If you want to try the new version before uninstalling the old you can, you just need to make sure you install the new version to a different directory.

The new version is a worthwhile upgrade with lots of goodies to play with. For a start, there are a host of improvements to the c.w., p.s.k., RTTY SITOR-A decoders. Plus SITOR-A now includes SELCALL support for 4/7 character and 4/5 digit modes. They have also improved the user interface for these modes.

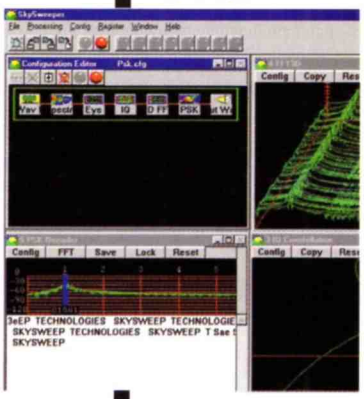
Perhaps the most significant change for 'Decode' readers is that the demo mode has been greatly enhanced. In the original versions you could only try the decoders with signals that had been recorded to a .wav file, there was no facility to monitor off-air. This has now been up rated and the demo mode allows full use of all modes.

To encourage you to buy, there's a 10-minute time limit. If you have a transmitting licence you'll really like the fact that *Skysweeper* now includes full transmit capabilities on c.w., PSK31/QPSK and RTTY with transmitter control via the serial port. Even if you're not able to transmit, you can record the transmit audio tones to make your own test signals. All you have to do for this is to set the output to go to a .wav file - it really is dead easy. You also have the opportunity to use *Skysweeper* as a measurement tool by using the new signal generator function.

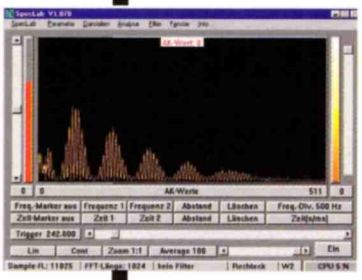
This is a very powerful extra that includes a fully adjustable sine wave tone generator along with noise generators that can supply White, Pink and Gaussian noise. Just to round it off, there's a bug fix to overcome a problem with reading .wav files.

I've shown a few screen shots of the new features and I would suggest you go hot-foot to the *Skysweeper* web site and try a copy. Here's the link:
www.skysweep.com

Morse decoding with *Skysweeper*.



***Skysweeper* decoding a PSK signal.**



***SpecLab*'s Autocorrelation Display.**

***SpecLab* analysing a RTTY signal.**

Deep Analysis!

I know many of you like to hear about new analysis tools, so the latest one to come my way may stir some interest! There's an added twist just to make it a bit of a challenge, all the controls and operating instructions are in German!

SpecLab looks to be a really powerful analysis tool that's been designed with the radio enthusiast in mind. The range of displays available is truly amazing and the processing seems very well designed. As a result, the display was very responsive and included a very wide range of analysis tools.

I've shown a few examples of how you can use the program to take a close look at signals. What we really need is someone to produce a translation table so we can work out what all the controls do! You can probably do this using one of the many on-line translators that are available on the Internet.

If you fancy having a go at the translation, please drop me an E-mail with the results. You can get your copy of the program from the following site:
http://people.freenet.de/dl5ndh/SpecLab.html

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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.

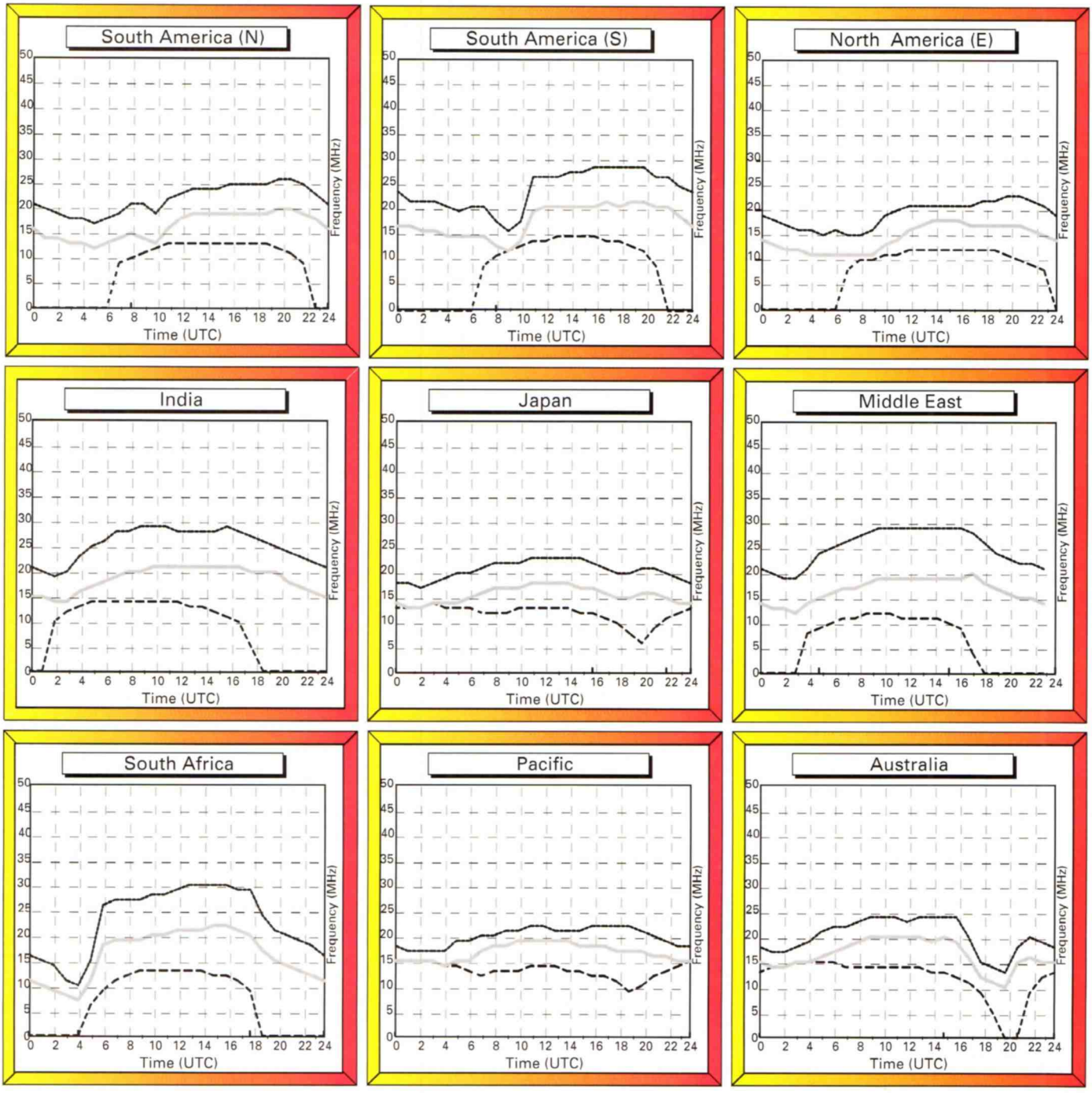
The middle line indicates the optimum working frequency (OWF) with a 90% probability of success for the particular path and time.

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.

May 2001
Circuits to London

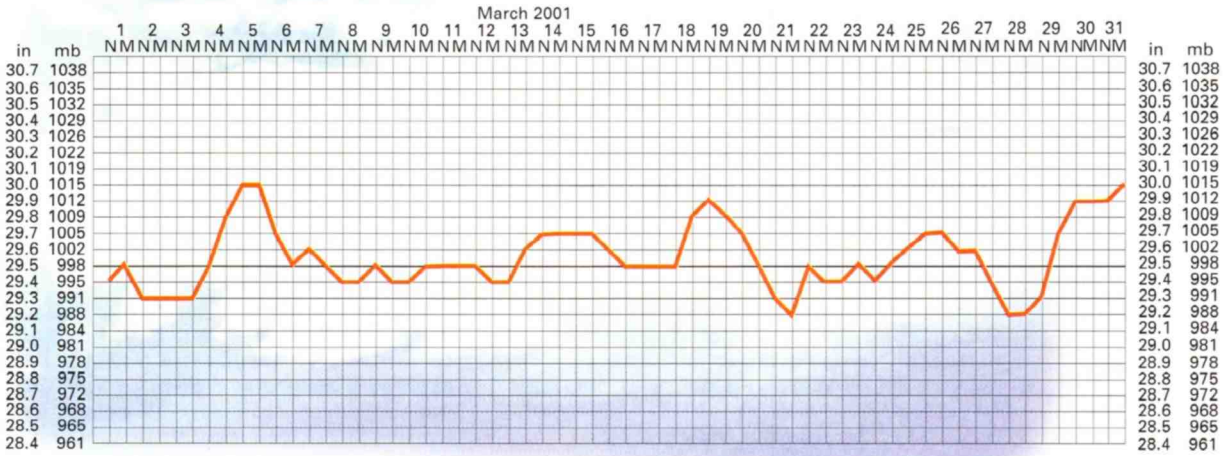


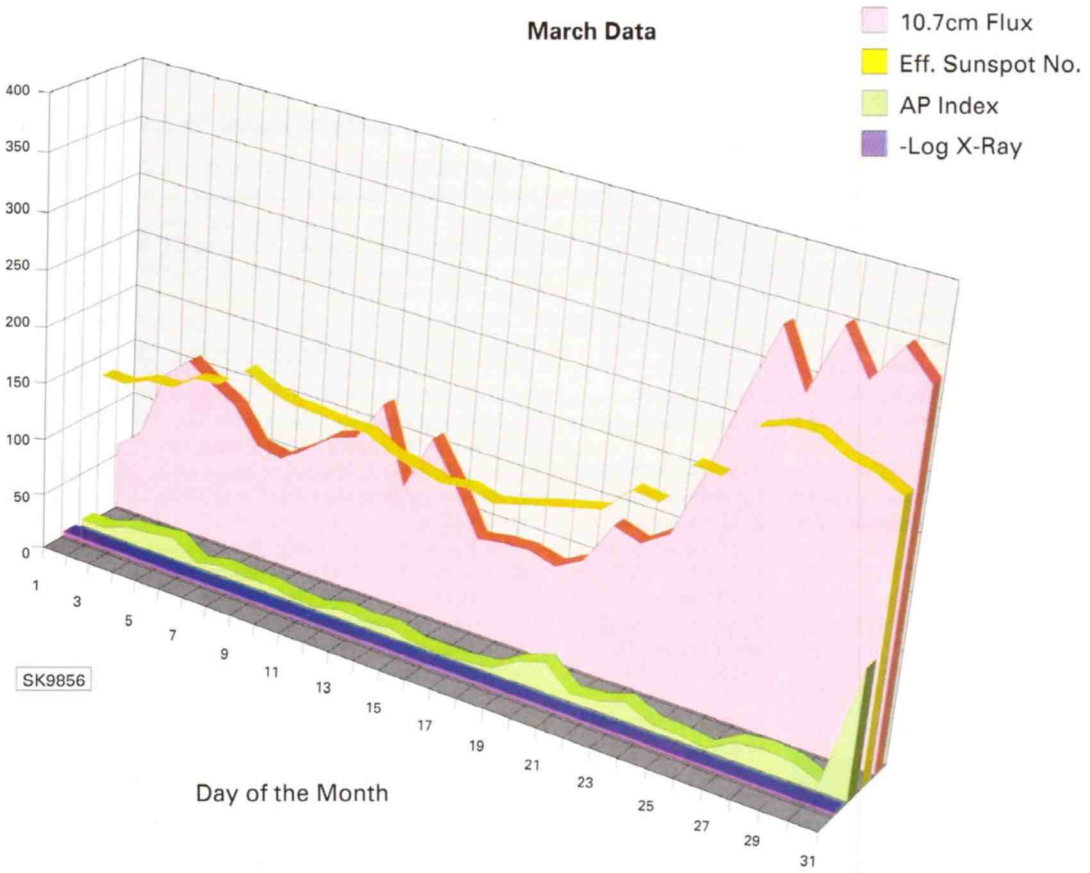
SK9855

■ 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, March 2001.





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.

■ GODFREY MANNING G4GLM, C/O THE GODFREY MANNING AIRCRAFT MUSEUM, 63 THE DRIVE, EDGWARE, MIDDLESEX HA8 8PS
■ **Airband factsheet on-line:** www.pwpublishing.ltd.uk/swm/airbandfactsheet.html

Airband

Abbreviations

A.	Airbus
AAIB	Air Accidents Investigation Branch
AIC	*Aeronautical Information Circular*
AIP	*Aeronautical Information Publication*
ATIS	Automatic Terminal Information Service
ATZ	Aerodrome Traffic Zone
CAA	Civil Aviation Authority
CD-ROM	Compact Disc - Read Only Memory
ft	feet
GASIL	*General Aviation Safety Information Leaflet*
GPS	Global Positioning System
LARS	Lower Airspace Radar Service
MHz	megahertz
SID	Standard Instrument Departure
STAR	Standard Terminal Arrival Route

I'm sure that many sources of up-to-date aeronautical information are available to readers. So why, after 14 years, am I still bothering to write a column in a magazine? Internet information seems immediate, periodicals have perhaps a six-week lead time! Is it wasted effort?

Not at all. I'm convinced that there's plenty of unmet need among readers. Of course I tell you about major frequency changes when I am notified of them, but this column has an even more important duty to perform. You can obtain the information, but are you sure that you fully understand how it is applied in practice? Do you know exactly why pilots and controllers tell each other the things that they do?

How about beginners? Are you confused by what goes on in the air and what all the information means? My computer dealer visited the other day and saw me working on the *AIP*. "Not for laymen!" he declared. On the contrary, easily understood once I'd had the chance to explain some background knowledge.

The main reason for this column is to explain. I can't do that unless you tell me what it is that you are unsure about! Even if you're a tentative beginner to the hobby, don't be ashamed to write in - even if you think that your question must seem 'obvious' to the experts. There'll be plenty of other beginners, all reading this, who might be glad to see my answer in print for all to share.

Information Sources

Another shared resource is the radio spectrum itself. A transmitter could block that frequency for all receivers in range, so a free-for-all would lead to anarchy and there has to be regulation. Airband radio is safety-critical and interference cannot be tolerated, yet the authorities are forever seeking to 'sell off' parts of the spectrum to the highest bidder. Flavour of the month is digital cellular telephones.

International decisions are made at each World Radio Conference and I see from *The Log* (February 2001 page 4) that the next review will be in 2003. Until then, magnanimously, the aeronautical bands remain unmolested. What's the next plan? Will 'mobile telecommunications' bring in more revenue than aeronautical allocations? I can't believe they expect pilots to share their frequencies with cellular 'phones!

The Log is a bimonthly publication from **British Air Line Pilots' Association, 81 New Road, Harlington, Middlesex UB3 5BG** and annual subscriptions are £18 (UK) or £28 (Overseas). Birthday coming up? Well worth dropping a hint that this would make an interesting present.

Monsun. *Christine Mlynek.*

Manchester Sub-Centre

The February *Log* (page 14) carried a detailed article on air traffic control in the Manchester area. You'd need to read the original to appreciate the full picture (subscription address given above) but I was interested in some of the salient features. Four airways sectors are worked from the control tower building itself and two of those can each be split in two when things get busy. Traffic serving Birmingham, East Midlands and Isle of Man join or leave the airways system under Manchester sub-centre's control.

They also handle Pennine Radar (128.675MHz) which enables flights serving Aberdeen, Humberside, Newcastle, Norwich and Teesside to operate without the protection of controlled airspace and yet be advised by a radar operator.

There are potential conflicts with military traffic involved with Otterburn and Spadeadam ranges and Leeming and Linton-on-Ouse. However, part of the airspace is designated the Northern Off-Route Co-ordination Area (NORCA). Here, military traffic working any of their usual frequencies will be co-ordinated with civil flights because the military and Pennine Radar controllers can communicate by dedicated 'phone.

There's a fuller description of NORCA in the RAF *En Route Supplement* British Isles and North Atlantic, for mail order sales to the public see my *Airband Factsheet*. For a copy of the *Factsheet* send a reply-paid self-addressed envelope, capacity of two A4 sheets, to the editorial office at Broadstone, **not** to me! (Also available via the *SWM* website, see column header). I also still have aeronautical documents (only a few charts, though) to give away if you send a well-endowed reply envelope direct to my Museum address (see also March 'Airband').

Frequency & Operational News

The London Centre actually handles radar approaches for Gatwick, Heathrow, Luton and Stansted. Of these, Luton has just been transferred (according to *AIC* 14/2001 from the CAA). I wonder if this has displaced radar controllers from Luton, hence the inability to continue to provide the LARS?

Aeronautical information changes are from *GASIL* 6 of 2000 and **Martin Sutton** (both from the CAA). Cosford is on 135.875 (was 128.825MHz). Edinburgh has new ATIS frequency 123.9 instead of 132.075 and Exeter's new ATIS is on 119.325MHz. Farnborough runway 11/29 is now relegated to taxiway B. Redhill is now 119.6 (was 120.275MHz). Southampton's new ground frequency is 120.275MHz.

Plymouth Military Radar (LARS East 124.15 or LARS West 121.25MHz) covers military exercises in the area and provides information on local Danger Area activity. New hang gliding site is Bloreheath Farm, Almington (any readers live near there?) and the ATZ has been withdrawn at Newton. Danger Areas D303 & 708 are withdrawn.

Frequencies (MHz) for procedures change as follows. Manchester MONTY/NOKIN SIDs are 128.05 (were 125.1), Honiley SIDs have new frequency 124.2. Northolt SIDs have new frequencies: Clacton/Dover/Detling 118.825, Compton 121.275, BUZAD 119.775.

A new Royal Flight callsign, 'Sparrowhawk,' applies to chartered civilian aircraft carrying royalty or other important persons.

Tomahawk Special Edition. *Christine Mlynek.*

Did anyone notice GPS jamming during the trials from March 1 to 8 inclusive? According to *AIC* 13/2001 the effects were mainly confined near the north-west Scottish coast. Notification was too late to alert readers prior to the event. Write in if your GPS receiver was affected.

Follow-Ups

In March I pointed out that reduced vertical separation would increase not only airspace capacity but also the chance of a nuisance wake turbulence encounter. This view is confirmed in *AAIB Bulletin* 2/2001 page 6 when analysing a disturbance to an A.300. Another factor mentioned is the extremely accurate track following of which modern navigation equipment is capable. If one aircraft is instructed to follow another, even 1000ft below, it might still be hit by the wake if the air is still.

I correctly worked out the location of **Andrew Green** (Barnsley) in the February 'Airband' and Manchester is his local airport. Andrew will be pleased to know that current Manchester SIDs are CONGA, Honiley, MONTY, NOKIN, Pole Hill, STOCK and Wallasey while STARs are DALEY, DAYNE, MIRSI and ROSUN. This means that none spell out offensive five-letter words, contrary to any reports in Andrew's local press! I gave the newer frequencies for these above, write in for details of the others. By convention, five-letter words (all upper case) represent reporting points, ordinary-looking place-names are beacons.

Andrew notes certain frequencies in the area and I can tell him what they are used for (all MHz). 119.4 is Manchester Approach Radar. 126.65 covers A1 from LAKEY to abeam STAFA. 126.775 and 128.125 (which are band-boxed (that is, operated together by a single controller) at quiet times, both cover B1.

Another convert to the benefits of the *AIP* on CD-ROM, Andrew points out that (for UK civil information) this official source is bound to be more comprehensive than typical frequency guides. If you want one, see my *Airband Factsheet* (described above) for the source of supply. Remember that a trial CD-ROM is available if you don't want to pay for a whole-year subscription.

Background Information

One source of aeronautical charts is the Jeppesen brand, now a Boeing company. Both the Boeing and Jeppesen names came to prominence in aviation in the 1930s in the USA. The story of Elrey Jeppesen's early attempts to document aeronautical information is relayed to me by **Roy Smart** (Dalkeith). 'Jepp' eventually retired from flying for United and continued to produce the charts that carry his name today.

Suppliers, as ever, are listed on my *Airband Factsheet* (see above). The rival British product comes from RACAL Aerad and I find these slightly easier to read, they also have the advantage of being printed on tougher paper than the Jeppesen Sanderson offerings. Over to you to choose.

Chris is not only our 'Airband' photographer but also an artist and took me to specialist aviation art gallery *Aces High* (**The Old Post Office, 25 The High Street, Wendover, Buckinghamshire HP22 6DU, (01296) 625681**). Images of their wares may be seen on **www.aceshighgallery.co.uk** and range from cheap prints to full-price originals.

All letters received up to March 7 have been answered. The next three deadlines (for topical information) are May 4, June 11 and July 9. Replies always appear in this column and it is regretted that **no** direct correspondence is possible.

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Satellite TV News

The past few weeks have certainly had their moments - foot and mouth, Ellen Macarthur, *International Space Station*, Iraqi air strikes, San Diego school shootings - and yours truly in dispute with the planners - yes, the dishes once more! I've used precious column space to highlight facts on satellite dishes.

March 5th and the Santana High School on North Magnolia in San Diego County. Suddenly at 1740 the Reuters 11.462GHz-V (SR 5632+FEC 3/4) lease on the *NSS-K* sat @ 21.5°W comes up with live footage from the local NBC affiliate TV station (ch7/39). Their airborn news chopper is sending pictures of the school, kids running and police surrounding, reports of shooting and children down, not a good start to their school day at 0900PST. Another ground report confirms stretcher cases being carried out, two are dead and many injured.

'Yachtgirl of the month' Ellen Macarthur successfully sailed the world single handed in the Vendee Globe Race and returned to France and a mega welcome. First shots of her home passage up-Channel were on February 10th from the air and the rapturous arrival into North France on the 11th produced extensive TV coverage from the French and UK TV channels.

With the demise of the *MIR* space station, from the ashes rose the shape of the *International Space Station* and February 10th saw the first crew take occupation for an extended stay, once more Reuters *NSS-K* 11.462 feeder carried live pictures from the orbiting station interspersed with action ex NASA/Johnson Space Control Centre, Houston, and an occasional (live) insert from the Korolev Space Control Centre in Russia - there's a Russian astronaut on board.

The above events tends to make President Bush's trip to Camp David, New Hampshire, positively geriatric by comparison - amidst the snow and the trees, various reporters queued up to present 'lives' into their respective networks, wrapped up against the winter chill with earpieces pressed to their ears! Picture quality was stunning, Reuters lease again. The Globecast 11.590GHz-V bouquet on *NSS-K* has confirmed their threat and many of the sporting events, e.g. PGA golf, etc. have gone down the encryption route and are now visible to only PowerVu receivers.

My own satellite monitoring has been severely limited this month, February 14 onwards after changing my dish from 1.2m prime focus to a 1.2m offset dish, and now to 450mm jack arm traction (reed pulses). The lack of analogue signals has taken much longer to search out the new satellite settings, fortunately the dish was set up by an experienced dish engineer and aligned at 42°E, 1°W, 43°W on his spectrum analyser.

Initially all was well, but two local planning enforcement officers appeared, a complaint from an overlooking house (same one that complained in 1997!). I have unconditional permission for the 1.2m and another 1.5m dish 'in storage' that I had subsequently connected for C-Band was no longer 'in storage', but now active and required permission.

Having intended to sell off the dish, I opted to return to storage status by removing the motor and LNB. Enforcement officers still seek removal of 1.5m within 90 days despite having permission, a very odd situation and moves continue, the RSGB has an involvement due to wider implications, I will report on progress...

To summarise the dish situation. A UK house can erect up to a 900mm max diameter dish without planning permission (unless area of outstanding beauty, national park or conservation area). A Sky 'digi-dish' @ 350mm uses up your permitted dish allocation, a second dish in use requires planning permission. So, if you have a Sky dish and also a Meteosat dish then the latter requires permission, currently in Test Valley Council area the application will cost £95!

A second dish that is 'in storage' doesn't need permission until it's in use, i.e. connected. Check with DOE booklet *The Householders Planning Guide to installation of Satellite Television Dishes*. Planners will probably argue that Meteosat dishes are within the satellite dish umbrella, though it's not really for 'television' use...that's why the situation needs to be resolved.

Despite being 'off the air' there have been some interesting reception reports received. **Dave Gilory** (St. Albans) is using a new Strong SRT-4375 receiver with his 1.2m IRTE dish and universal LNB, he's received signals from the inclined orbiting *Eutelsat 2F1* @ 48°E with four Italian cable channels around 1500 several afternoons, but by 2130 the signals have faded due to the *2F1*'s unstable orbit.

Better though to the West and *PAS-9*, 58°W produced a very strong British Telecom digital bouquet @ 11.477GHz-H, (26463+3/4) this included a BT promo, test card, DD World (!) and three other channels. Dave suggested checking out **www.lyngsat.com** for updated sat info.

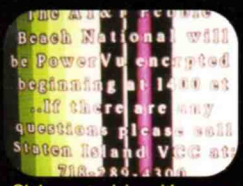
Nick of Sutton watched APTN fire up via *Hot Bird*, 13°E with Iraqi TV pictures @ 12.581GHz-H (5632+3/4) on the 16th, this after the US/UK airplanes had struck onto various military targets. Shots of 'planes, tanks, soldiers and Sadam Hussein in upbeat propaganda footage. The feed was linked in PAL and then NTSC for the Americas.

Hardly satellite TV, but satellite for scanning enthusiast **Hugh Cocks** (Algarve) is receiving Colombian Spanish Radio on 269.740MHz n.b.f.m., he thinks from a Fleetsatcom bird around 15°W, it's strong enough to be received indoors on a dipole. Brazilian 'pirates' can be heard around 260.528MHz in the evenings using the US sat capacity for their own 'phone thru-put!

Roy Carman (Dorking) early February watched as live surgery was carried out at the Pasteur Institute, Paris, together with live camera pictures from inside the body of the victim, all this on *Intelsat 801*, 10.983GHz-V (6111+3/4). And at last the arrest of a murder suspect in the Sarah Payne killing, *Eutelsat 2F3* @ 21.5°E carried uplinks from outside Bognor Regis police station - 11.072GHz-H and also 11.692GHz-H with a similar content news item for Sky News, both with 5632+3/4.

February 28th - Selby - another train crash almost resembling a fictional disaster movie, heavy media coverage and the satellite trucks converge with at least four uplinks running via *2F3*. Unfortunately, disasters make news.

Another ident slide, this time C-Band from Saudi.



Globecast advises it's users that they're encrypting using PowerVu via *NSS-K*.

Ellen Macarthur sails up-Channel to home via an *Intelsat 801* news feed.

Ellen is seen in the cockpit as a mass of boats welcome her home - live.

President Bush at Camp David, via *NSS-K*, pictures via the White House news pool.

More mud-slides in El Salvador uplinked into Europe from a Miami teleport.

One of the French Telecom birds with the Lille switching centre ident.

News packages arrive from Honolulu after an American sub sinks a Japanese fishing boat, *NSS-K*.

C-Band ident slide prior to a news exchange.

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LOWE ELECTRONICS LTD

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JRC NRD545

A superlative short-wave receiver, designed to fulfil the needs of professional monitoring stations, the NRD545 is equally at home with the serious hobby listener.

The DSP implementation starts at IF frequencies so don't confuse this with lesser DSP receivers that simply process the recovered audio. You can therefore control the IF bandwidth from 10kHz down to just 40Hz allowing total control for AM, SSB, CW or data signals, really helping to reduce interference. Heterodynes and noise can also be removed and the notch filter will automatically track changes in the frequency of the interfering tone. As you would expect from a top-flight receiver, computer control is fully integrated and there are 1000 memory channels, with memory and and programmable scan features.

SPECIAL OFFER
Genuine UK Stock.
Full Manufacturers Warranty.

Ordering Information
Product Code: NRD545

Lowe Price £1195

Carriage: £10.00 by Courier

HF350

The new Lowe HF350 is a simple to operate receiver with excellent performance. The result is a receiver with very good strong signal handling capabilities using high performance ceramic filters to achieve selectivity.

The tuning control changes speed as the knob is rotated faster, also pushing the control in changes between fast and slow tuning speed. There are 100 memories available which hold all settings. The receiver has been designed with the requirements of operating in Europe in an environment of high powered broadcast stations in mind.

All external connections needed are available on the rear panel, and the receiver can be run from internal batteries or an external 12V DC power source. It is ready for an active antenna, with a DC feed already available at the antenna socket.

Ordering Information Product Code: HF-350

Lowe Price £375.00

Carriage: £10.00 by Courier

MVT-7300

● Full coverage from 531kHz to 1320Mhz ● Wide FM ● Narrow FM, AM ● Narrow AM, LSB and USB

● 8.33kHz channel steps are correctly implemented ● 1000 memories ● Supplied with belt clip, wrist loop, flexible antenna. ● Optional accessories include NiMh batteries at £8.95 and matching charger at £9.95

Ordering Information
Product Code: MVT-7300

Lowe Price £289.00

Carriage: £10.00 by Courier

MVT7100

In our view...simply the best!

This is the scanner of choice for many of our serious users. If a radio is transmitting and you are close enough you will hear it on the MVT7100. Superb for monitoring military and civil airband channels - also allows you to listen to ground crews and base security. Its shortwave coverage with SSB offers opportunities for monitoring Shanwick and the trans-Atlantic routes!

- LSB/USB/AM/WBFM/NBFM Reception
- 1000 memory channels
- High sensitivity
- Signal Strength Meter
- Illuminated keypad
- High speed search & scan functions
- User friendly
- Battery save function
- Priority function
- Individual power/volume and
- Tuning dial
- Channel pass function on memory

Ordering Information
Product Code: MVT7100

Lowe Price £229.00

Carriage: £10.00 by Courier

Ordering Information
Product Code: IC-R2E

Lowe Price £149.00

Carriage: £10.00 by Courier

IC-R2

Our lowest priced full coverage scanner also happens to be our smallest! The frequency coverage is from 0.495MHz to 1309.995MHz with NO GAPS making it ideal for monitoring military airband channels.

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www.lowe.co.uk

Send us four first-class stamps for our latest full colour catalogue, full of receivers, antennas, books, accessories, nightvision and GPS receivers and more!