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The life and times of this famous radio telescope

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### The latest from the digital radio scene

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- 1000 station memories
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- Modes: AM/FM
- 300 channels
- Close Call

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### EZI-33XLT
Compact handheld - easy to use!

- Covers: 78 MHz-512MHz (w/gaps)
- PMR, Marine, Aircraft, FM, etc.

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### UBC-370CLT
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- Includes VHF FM broadcast radio
- Covers: 25 - 960MHz (w/gaps)
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### Yaesu STA77
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## JIM M75

### Wide Band pre-amp
Low noise pre-amp with 3 band pass filters

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- Variable gain
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**Create Log Periodic Antennas - Japan**
***as used by the 'Professionals'***

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21 Element LPA

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- Gain: 10-12dBi

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17 Element LPA

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8" long c/w all leads - just needs 12V DC!

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### Sirio SD-3000N Discone
High quality stainless steel, chromed brass & anodised aluminium construction

- 300 MHz-3GHz

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- 20dB built-in Pre-amp

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High quality complete kit includes mounting hardware & coax cable

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NEW

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- Use over internet
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3 element Beam

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- Boom: 1.4m

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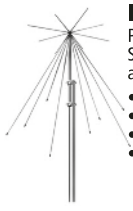
**WY400-10n**10 el 432MHz (wide band) 14.0dBi.**£119.00**

## ICOM



### Icom AH-8000
Professional Discone Antenna Suitable for both Transmit and Receive

- Rx: 100-3,300MHz
- Tx: 144, 430, 1200, 2400MHz
- Height: 936mm
- Supplied c/w 15m cable + N connector & Mounting hardware

**£240**

## SPIDERBEAM MASTS

**Fibreglass Telescopic Poles**

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10 metre Standard .....£299.95
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## SDRplay

NEW

### RSPdx
SDR in metal case
Covers: 1kHz-2GHz

Now with Improved:

- Performance below 2MHz
- Plus more!

**£194.95**

### RSP 1A
Wideband Budget SDR

- Covers: 1 kHz - 2GHz
- Software upgradable
- Good dynamic range

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- Covers: 1 kHz - 2GHz
- Software upgradable

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**Quality Power Supplies 2 YEAR WARRANTY!**

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Switch Mode

- 25-30A supply
- Low noise

2 YEAR WARRANTY

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PL259 connector (part: 7378).....**£5.95**
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per metre.....£2.99 price per 102m drum .....**£269**
PL259 connector (part: 7390).....**£2.65**
N type connector (part: 7392) .....**£5.25**

**Aircell 5**
per metre.....£2.75 price per 102m drum .....**£259**

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**High Performance SSB Shortwave Radio**

£259.95

Considered to be the Tecsun design team's masterpiece!
Uses modern DSP technology to improve performance

- Covers: LW, MW, FM, SW (1.711-29.999) MHz
- MP3 player via SD port
- Memories: 3150
- Synchronous detector
- Local, Medium, DX input selector
- Powered by 18650 Lithium battery
- Bluetooth connectivity
- Optional USB mains supply.....£9.95

£89.95

## Tecsun PL-330
**SSB Shortwave Radio**

- FM stereo, LW/MW/FM/SW
- 650 memories
- DSP technology
- Multi-function display
- Lots more info on our web site
- USB - Rechargeable battery

## AOR AR-5700D
**Digital Communications Receiver**

- 10 digital modes - TETRA, P25(Phase 1), DMR, Mototrbo, dPMR, NXDN, D-CR, D-STAR, Alinco, Yaesu.
- Covers 9kHz - 3,700MHz
- 900kHz wide IQ output

£4595

PRICE MATCH

Now with TETRA!

## AOR AR-DV1
**100kHz-1300MHz Wide band reception**

**New Firmware** - gives TETRA decoding and more!
Decodes virtually ALL popular digital modes: DMR, D-STAR, Yaesu Fusion and lots more!

Supplied with: 4GB SD Card

£1199.95

## AOR AR-8600 MkII
**Communications Receiver**

- Frequency: 530kHz-3000MHz no gaps
- Modes: WFM, NFM, SFM, WAM, AM, NAM, USB, LSB, CW
- Memories: 1000 (20 banks)

£649.95

Optional Mains Power supply .....£25.95

### AOR

LATEST FIRMWARE

## AR-DV10
**Digital Handheld Scanning Receiver**

- 100kHz-1300MHz analogue and digital modes
- TETRA, P25 (Phase 1+2), DMR, Mototrbo, dPMR

~~£999.95~~
£939.95

### ICOM

NEW

## R-30
**Digital & Analogue Multi Mode Scanner**

- With dual watch and dual band recording
- Listen to two signals (analogue + analogue or analogue + digital)
- Decode D-STAR, P25, NXDN and dPMR digital (conventional) modes

£569.95

### ICOM

## IC-R6E
**Pocket sized Wideband Scanner**

- Freq: 100kHz-1309.995MHz
- Modes: AM, FM, WFM
- 1300 memories
- High Speed Scan 100 channels/second
- 15 hours receive capability

**Optional BC-194**
Drop-in charger stand
.....£22.95

£199.95

### ALINCO

## DJ-X11E
**All Mode 1200 Channel**

- Frequency: 0.1-1300MHz
- AM/FM/WFM/SSB/CW
- 1200 memories
- Twin VFO feature
- IQ output for SDR use
- 1800mAh Li-ion inc

£349.95

### BEARCAT

## BCT-15X
**Latest Base Mobile Scanner with 'Close Call'**

- 25-1300MHz (with gaps)
- 9000 memories
- AM/FM/WFM
- Band scope
- CTCSS/DCS decoding
- Alpha-numeric tagging feature
- GPS enabled

Supplied with:
- Mains adaptor
- DC Car Power Plug
- Telescopic Antenna
- Mounting Bracket and Hardware

£249.95

### BEARCAT

NEW

## SDS-100E
**Advanced Digital & Analogue Scanner**

- Frequency: 25-1300MHz (w/gaps)
- Weather Resistant IPX4

**Standard Version**
(licence required to activate DMR, NXDN)
£599.95

**Activated Version**
(DMR, NXDN already activated)
£649.95

### BEARCAT

NEW

## Bearcat SDS-200E
**Digital Scanning Receiver**

- With DMR, NXDN, and ProVoice monitoring modes
- Covers: 25 - 512MHz, 806 - 960MHz, 1240 - 1300MHz
- Too many features to list here - visit our web site for more details!

£779.99

### BEARCAT

## UBCD-3600XLT
**Digital Scanner with 'Close Call' and Analogue AM/FM**

- Receives: 25-1300MHz
- SD card slot

£425

**UBCD-3600XLT - NXDN**
Same specs as above but with NXDN activated NXDN digital protocol is used by Kenwood & Icom

£479.95

### WHISTLER

## Whistler TRX-2
**Digital Scanner**

- Receives 25-1300 MHz (with gaps)
- Covers DMR, MotoTRBO - and more!
- Upgradable CPU, DSP, and library
- Store Scan lists
- EZ Scan PC software
- IF/discriminator output
- Record & save to Windows
- Clock & Calendar function
- Spectrum Sweeper

£479.95

### WHISTLER

## Whistler TRX-1
**Digital Scanner**

- Receives 25-1300 MHz (with gaps)
- Covers DMR, MotoTRBO - and more!
- Upgradable CPU, DSP, and library
- Store Scan lists
- EZ Scan PC software
- IF/discriminator output
- Record & save to Windows
- Clock & Calendar function
- Spectrum Sweeper

£419.95

### BEARCAT

## UBC-125XLT
**500 Channel AM/FM scanner**

Easy to use scanner - our most popular for Civil/Military Airband

- 25-960MHz (w/gaps)
- Includes civil/Military Airbands
- Close call RF capture
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- CTCSS & DCS squelch modes

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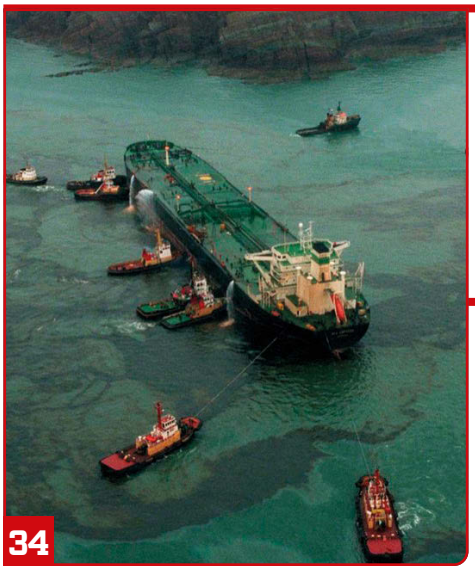


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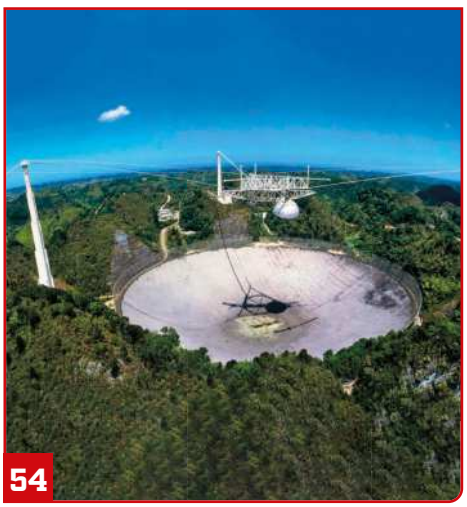

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# Welcome

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# Radio – and the Radio Hobby – in Times of Crisis

Hello and welcome to the March 2021 issue of *RadioUser*. Spring is on its way, but a major lockdown-easing is still not in sight, so we will all continue to spend some significant time with our radios, I guess.

This current issue reflects this, and we have, once again, attempted to put together a diverse magazine, with a good mix, I hope, of regular columns, news, and features.

It has been a very innovative month for smaller developers of radio technology; take a look at our *News Extra* sections on a *Medium Wave Offset* signals analysis, and marvel at the potential of *Carrier Sleuth*.

You might also enjoy Keith Rawlings's review of the *Uniden Bearcat BCD325P2 Trunk Tracker V* scanner from the US, which is loaded with great features.

From this issue onwards, David Harris's *Book Review* section will grow to two pages each month, since there is such a wealth of new publications on radio these days. Plus, I have put in reviews of the new title by my friend and colleague Don Field, and of recent books on QSL cards and Beginners' Radio Astronomy.

If the latter is of interest, don't overlook Tim Kirby's sharply-observed piece about the – now sadly collapsed – Arecibo Radio Telescope in this issue.

The theme of QSL cards appears again too, in Stig Hartvig Nielsen's short feature on how we can make sense of 'Dxing' and 'QSLing', in times of ubiquitous online radio and all too easily-accessible remote SDRs.

In some of our other features this month, Peter Hyams highlights the vital role that the two-way radio hobby, in all its forms, plays in a crisis. Talking about a crisis, I am also offering part

one of an extended investigation into how Coronavirus (Covid-19) is changing, not just our hobby, but also how the radio industry, stations, presenters, and programme-makers now operate under radically-changed conditions.

Among our regular columns this month, you may wish to take a look at our two make-at-home projects in Kevin Ryan's *Digital Radio* column. In other sections of the magazine, you can learn more about the life of the painter and radio pioneer Samuel F.B. Morse, sports programmes on international radio, the latest rules for drones, NAVDAT transmissions in maritime radio, plus much more besides.

Last but not least, my apologies for the mix-up of two photographs on pp. 24/5 in last month's *Radio in History* column. Fig. 1 shows David Sarnoff, and Fig. 2 is Edwin Armstrong.

As ever, happy listening; stay safe and stay in touch.

**Georg Wiessala**
Editor, *Radio User* Magazine
**www.radioenthusiast.co.uk**

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# What's New

Have you got something new to tell our readers about? If so, then drop a line to **wiessala@hotmail.com**

## Medium Wave Offset - Atlas

The 'Atlas' shows screenshots of all **9kHz** channels on Medium Wave within a 50Hz window, sometimes better. It also shows some odd channels plus Time Signal Stations on VLF and all Broadcasting Longwave Channels. You can download it for free to determine accurate and stable offset readings over 24 hours (zoom in by e.g. 400%). With the new Elad FDM-S3 and its OCXO/GNSS-stabilized clock, I did a 24h recording of the whole medium wave band on January 19, 2021, in Northern Germany; plus longwave on 21st January 2021. The free software *SDRC V3* enabled me to make up a spectrogram of each channel within a window of 50Hz width, and at a frequency raster of 9kHz on medium wave. You can easily see phenomena such as sign-on/sign-off; fade-in/fade-out; accurate and stable frequency offset over full 24h down to a millihertz; frequency control of the transmitter's oscillator (stable, drift, sinus, sawtooth…) and propagation effects (doppler, scatter …). The format is PDF, DIN-A4, landscape, resolution 300dpi. This allows you to zoom to a factor of about 400% to search for details and better readout of the time/frequency scale. The program extends to 865MB. You can download it at the website below and open it with your PDF reader (you can also point your mouse cursor onto the link, click right mouse key, and choose *Save under*). Leafing from one page to another offers an interesting overview. A similar Atlas showing a raster of **10kHz** is also available for free. I am also planning to publish a general article about the background of this project, what to do with such a tool, and how to do this by yourself. I am sure that it will open some new horizons on Medium Wave DXing, including accurate offsets over up to 24 hours.
(SOURCE: Nils Schiffhauer DK8OK)
**www.tinyurl.com/11opwk9m**

## RFinder Chilli Peppa

**The *Chilli Peppa* RFinder HCP-1 Portable Battery-Powered Digital Hotspot for DMR, D-Star, and System Fusion is mobile and easy to carry in a shirt pocket. It is built on the *STM32 dual-slot Pi-Hat* controller and works on DMR, D-STAR and Fusion. The model is quad-band for 144, 220, 440, and 800MHz. It has been built on a *Raspberry Pi Zero W* *16GHz single-core CPU* and 512MB RAM with Mini-HDMI and Micro-USB (x2) output, and it sports an internal 3000mAh lithium-ion battery. *Pi-Star* is already loaded on a 16GB SD card. The unit retails for £252.**
**(SOURCE: *RFinder Shop*: Official Shop)**
**info@Network-Radios.com**
**https://tinyurl.com/y4thrjnd**

**RADIOCENTRE RENEWS TENURE:**
*Radiocentre* has renewed Howell James CBE's position as Chair for another three years. James joined Radiocentre in 2018, after stepping down from his role as Chief Executive of the regulatory and corporate affairs consultancy *Quiller*. Commercial radio featured early in his career when he was Head of Promotions at Capital Radio in the late 1970s. He was also later Director of Corporate Affairs at the BBC between 1987 and 1992.
James will be overseeing the appointment of a new CEO, alongside departing CEO Siobhan Kenny and the *Radiocentre* Board.
(SOURCE: *Radiocentre, Industry Press*)
**https://tinyurl.com/y65dakth**

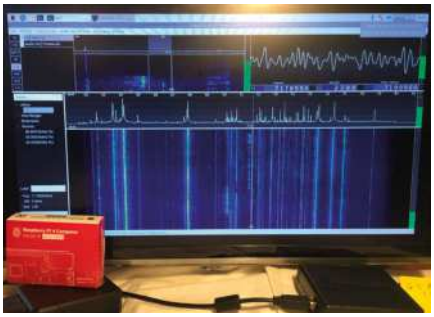
# Network Radios at Moonraker

**A new batch of network radios has just arrived at Moonraker. Chris Taylor would like to draw your attention, in particular to the *Inrico S-100 to S-300* *4G/Wi-Fi Network Handheld Radios*. Prices range from £179,99 to £249.95.**
**https://www.moonraker.eu/**

**RADIO LANCASHIRE ANNIVERSARY:** Lancashire's local BBC station is celebrating 50 years on-air and the launch of its *Make a Difference Awards*. 'BBC Radio Blackburn', as it was originally known, started officially on January 26th, 1971 and expanded to cover the whole county ten years later. And today, key workers from around the area, from doctors and nurses to teachers and bin crews, have come together to form the *Lancashire Heroes Choir*. More than 50 key workers recorded themselves singing to the Cannon and Ball classic *Together We'll Be OK*. The song has been produced by BBC Radio Lancashire and the BBC Philharmonic and the awards will honour those who are truly remarkable – recognising their achievements and contribution to life in Lancashire.
(SOURCE: BBC Radio Lancashire; Radio Today)
**https://tinyurl.com/y5233qn6**
**Picture: Make A Difference**

**BLETCHLEY PODCASTS :** The very interesting *Bletchley Park Podcast No. 98* celebrates 100 years of keeping the country safe. It is well worth watching at the URL below.
Best to watch it while reading the new book by John Ferris, *Behind the Enigma* (Bloomsbury 2020; to be reviewed in the April 2021 issue of RadioUser)
(SOURCE: *K9YA Telegraph*, February 2021, Bob Houlston G4PVB, Volunteer *RadioUser* Correspondent)
**www.tinyurl.com/podcast98**

**SOE & CW DURING WW LL:** *The Gibraltar Diary of Squadron Leader Mallory* is an excellent *BBC Sounds* program well worth a listen, and no you don't need to register and/or log on or accept cookies. Just click through
(SOURCE: 73 Bob Houlston G4PVB)
**www.bbc.co.uk/sounds/play/b09h2vsc**



## Raspberry Pi scripts for SDRplay Software

Jon Hudson, MD of SDRPlay Ltd., has been in touch to report that SDRplay – the makers of the RSP family of SDR receivers – have released some Raspberry Pi installer scripts which allow you to add SDRplay-specific software to your existing Raspberry Pi configuration – and the SDRplay related software will then appear alongside your other applications. For the last couple of years, stand-alone SD card images have been available for SDRplay users. These are downloadable images which allow you to run SDR software on an RSP connected to a Raspberry Pi and they have proved very popular. There are versions for all the RSP models as well as a headless server version for remote operation. These SD Card images, suitable for RPi 3 and 4, were updated in December 2020 to ensure compatibility with the newer RPi 4B+, RPi 4B+ 8GB and the RPi-400 models). However, using one of these ready-made SD Card images means fiddling with the SD card to swap it, whenever you want to switch to or from other software on the same Raspberry Pi. Alternatively, to add those new programmes to your existing Raspberry Pi set-up, you would need to run a long list of commands which would add these programmes. You would then need to tweak the settings for these programmes - to make them compatible with your SDR receiver hardware. All this can be a time consuming and cumbersome process which – unless you are an experienced programmer – can prove to be daunting. The installer script is an executable file that handles all this for you (it will install the software packages and tweak the settings so that everything is ready to run). The new SDRplay installer scripts are available from the first website, below (select your RSP model and choose ARM Raspberry Pi OS – then choose "API" to download them). There is also a YouTube video guide, in which SDRplay shows you how to download, extract and execute installer scripts for the SDRplay API, CubicSDR and RSP_TCP Server. The image shows an SDRplay RSP1A, Raspberry Pi4 and CubicSDR tuned to the 40m amateur band.
**www.SDRplay.com**

# Moonraker Handheld Antenna Analyser

**The new MINI 1300 portable antenna analyser allows you to instantly check and tune any antenna from 0.1-1300MHz. The device is a rugged easy-to-use complete antenna test unit. No more lugging bulky, expensive test equipment to remote antenna sites and hard-to-get-places. Key features and specifications are advertised as follows: Panoramic Scan | Generator | Time Domain | Multi SWR Setup | Find Frequency | Tune SWR/Sound | View Pictures | USB HS card reader | SWR Measurement Range: 1.0-1999 (single-point Mode) and 1.0-20.0 (scan-mode) | Display Modes: Numerical display, curve display, chart | Connector Type: UHF N-type connector | SMA OPEN-SHORT-LOAD Calibration Kit x 1 | LCD size: 480x272 4.3 TFT LCD display | Contact Screen Type: Capacitive:**
**All capacitive touchscreen on the display - no buttons are needed | Power Source: USB or Internal Li-ion | Built-in Li-ion charging circuitry and DC-DC booster | Maximum charging current: 5V/1.5A | External Storage Method: TF card | Weight: 550g**

**Watch out for a forthcoming review of this antenna analyser here in *RadioUser*.**

# Radio News

**THE SKY-TIE :** Sky has agreed to a deal with the BBC to embed the *BBC Sounds* app on its platform, marking the pay-TV giant's latest effort to become a one-stop-shop for streaming services. From January the *BBC Sounds* app will be available to all Sky Q customers in the UK, offering more than 80,000 hours of audio content.
(SOURCE: City AM, BBC, Sky)
**https://tinyurl.com/yxwxyb4k**

**ITU RADIO REGULATIONS 2020 :** The ITU has made the Radio Regulations 2020 available as a free download. The *ITU Radio Regulations* facilitate equitable access to and rational use of the natural resources of the radio-frequency spectrum and geostationary satellite orbits. They also ensure the availability of the frequencies provided for distress and safety purposes and assist in the prevention and resolution of cases of harmful interference between the radio services of different administrations. Further, the regulations facilitate the efficient and effective operation of all radiocommunication services and, where necessary, regulate new applications of radio communication technology.
(Source: ICQ Amateur / Ham Radio Podcast)
**https://tinyurl.com/y25h9y33**

**REPORT ON AMATEUR RADIO :** You can catch up with this interesting and topical BBC report on the rise of amateur radio during the current Coronavirus (Covid-19) pandemic:
(SOURCE: BBC, LAMCO)
**https://tinyurl.com/y4tq9k84**

# LAMCO Morse Keys: Fingers on the Pulse

The range of new Vine Antennas Morse keys, distributed by LAMCO now comprises of the following models:
Vine Antennas RST-TP1
**https://tinyurl.com/3gp68o2l**
Vine Antennas RST-TP2
**https://tinyurl.com/ys526bqz**
Vine Antennas RST-TP3 (shown)
**https://tinyurl.com/4tcfreg7**
Vine Antennas RST-TP4
**https://tinyurl.com/yw3wxw3j**
Vine Antennas RST-TP5
**https://tinyurl.com/yw3wxw3j**
All LAMCO's Vine Antenna Morse Keys are precision-engineered and assembled by hand, for unmatched build quality. Each one has a unique shape to suit users' preferences for the best experience possible.

# New Firmware Updates available from Icom

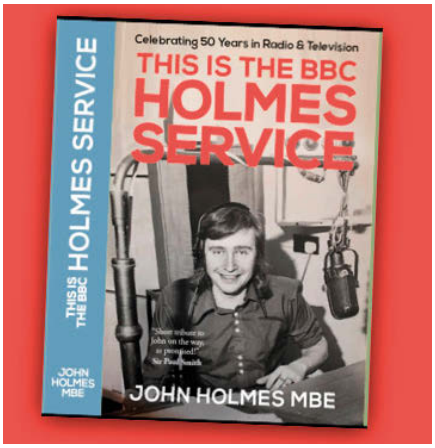
Icom has announced plans to introduce new firmware updates for the IC-705, IC-7300 and IC-9700 transceivers. The updates aim to improve the user experience of data modes such as FT8. The firmware is to be released from the end of January 2021, starting with the IC-705, and then followed by firmware for the IC-7300 and IC-9700. As far as we know here at RadioUser at the moment, the planned new software developments for this radio include:
| One-touch FT8 mode preset. | Scroll mode automatically keeps the operating signal within the scope range. | Multi-function dial items have been improved (New for IC-7300 and IC-9700). | Compatible with the AH-705 antenna tuner (for IC-705). | WLAN (Access point) function is added (for IC-705).| Other updates are planned for each model.
The updates will be available as free downloads from the following web address:
**www.icomjapan.com/support/firmware_driver**

## Nevada: Midland M88 CB Transceiver

Nevada Radio is pleased to introduce a new CB radio from Midland. The Midland M88 is a versatile AM/FM CB transceiver with front-mounted speaker suitable for mounting on any surface or in a DIN compartment. It is multi-band, and therefore capable of adapting to all the European channels when travelling. The transceiver can be powered from either 12V or 24V supplies, and it is ideal for both truck and car alike. With all the accessories included in the package, you can fix it to the windscreen or place it on the dashboard. A large TFT colour display enables both channels, S meter and all other functions to be read easily. The supplied microphone allows control of the radio with up/down channel controls and on/off switch. With a noise blanker and automatic digital squelch, it has all the facilities to allow got clear and long-distance communication. The radio is packed with functions such as PA, 4-channel memory storage, Dual-Watch facility, Roger Beep, and background noise reduction filters. The Midland 88 CB radio is priced at £159.95 and available from UK exclusive distributors NEVADA or their dealers.

**www.nevadaradio.co.uk**

# Radio News




**'HOLMES-SERVICE' BOOK:** John Holmes appears to be throwing down a challenge in his recently published autobiography, *This Is the BBC Holmes Service: "No one could possibly have enjoyed a more varied career in the BBC than me,"* he boasts. Just his production work at BBC Radio 4 shows considerable depth, having worked on such cornerstones of the output as, *Any Questions?, Any Answers? The Natural History Programme* and *Down Your Way*. *This Is the BBC Holmes Service* is available direct from John. It is 340 pages long in the hardback version. (SOURCE: *RadioToday*)

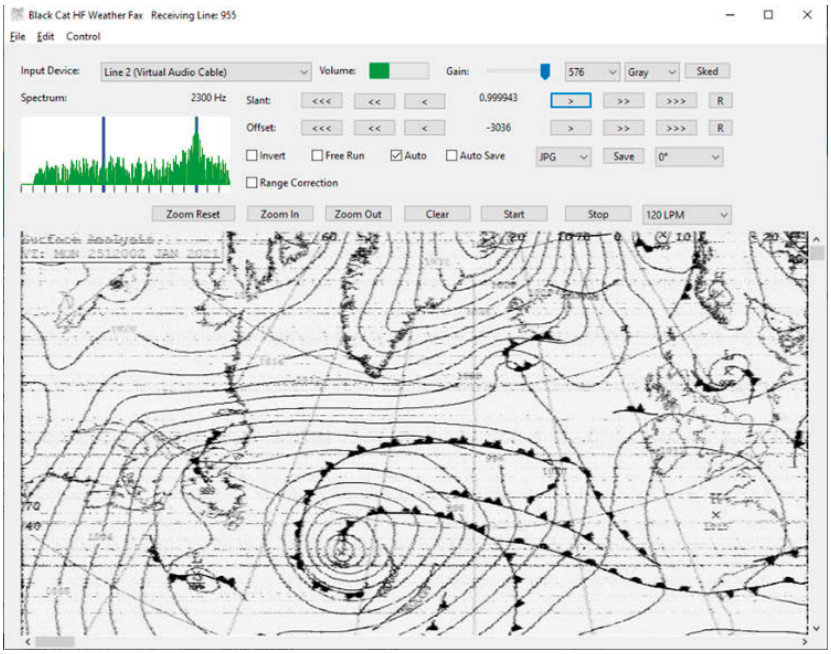
**https://tinyurl.com/y6qjuh5t**

## ML&S: AnyTone 70 MHz FM Transceiver

Our friends at ML&S are pleased to introduce this tiny 15W 70MHz 4m FM transceiver from AnyTone, The AT-779 is a simple entry to 4m operation, includes 199 memories, CTCSS & DCS, selectable power levels 5/10/15W output and a hard-wired DC lead & Fist Mic with up/down buttons. Introductory price of just £79.95, includes PC control cable & free software via website download. Available now from ML&S Ltd.: (SOURCE: ML&S Newsletter)

**www.HamRadio.co.uk/AT779**

Enter our competitions at www.radioenthusiast.co.uk/competitions




# From Black Cats to Carrier Sleuths

**Chris Smolinski**
csmolinski@blackcatsystems.com

For a quarter of a century, *Black Cat Systems* has been creating software for the radio monitoring community. Over a dozen desktop programs, most for both Windows and macOS, are available for download and trial before purchase. Several iOS and Android apps are also available on app stores. Black Cat Systems' owner and 'Chief Bit Wrangler' is **Chris Smolinski, W3HFU**, who has been an SWL and radio hobbyist since the late 1970s.

## Black Cat HF Weather Fax

*Black Cat HF Weather Fax* (Picture) is available for Windows as well as macOS. It decodes and displays both short wave weather fax transmissions as well as 137MHz APT transmissions from orbiting weather satellites.

In addition to still being of importance for mariners, these stations are interesting targets for DXers and short wave radio listeners. There is a built-in schedule of worldwide radio fax transmissions. This updates in real-time, showing the user which stations are currently on the air, and which are coming up.

Most popular SDR programs (currently *SDRuno, SdrSharp, SdrDX* and *Elad SW2*) can be directly tuned to a frequency by double-clicking on the entry, and the 1.9kHz offset is automatically taken care of.

This makes it extremely easy to quickly run through the stations on the air at any given time, and see which are coming in.

You can also request to be alerted in advance when another station is about to come on the air. Audio can be fed into the app via the usual method of virtual sound devices, as well as directly via the free *Black Cat Systems* plugin for *SDRuno*.

The latter also allows sound data transfer and frequency control to be performed over a local area network between two computers. The display can be rotated to make it easier to view images sent sideways.

In case of APT weather satellite reception, the app also integrates with Black Cat System's *DX ToolBox*, which tracks satellites and can adjust the tuned frequency for Doppler Shift, as well as adjust the time of the sound data for the varying distance from the satellite, eliminating the otherwise curved image effect. Satellite elevation can be used to trigger the saving of images for unattended receiving.

## Carrier Sleuth

*Carrier Sleuth* is a tool written primarily for medium wave DXers. It applies high-resolution FFTs to I/Q recording files made by several popular SDR programs (e.g. *Elad SW2, Perseus, SDRuno, Sdr Sharp, SDR Console and SdrDX* are supported) to zoom into MW channels.

This reveals the numerous station carriers that are often visible at the same time, even if audio from the stations cannot be heard.

It is popular among many radio hobbyists to record large sections of the MW band with SDRs and then go back to check for rare DX targets.

But it can be extremely time-consuming to manually check dozens of frequencies over hours of recordings.

Fortunately, most MW stations have small but constant offsets in their carrier frequency, allowing them to be distinguished from each other. Some also have characteristic patterns, making them stand out. Many hours of SDR recording files can be analyzed at the same time, with a waterfall generated for each channel within the recording bandwidth. These waterfalls can then be examined, looking for stations that may have briefly faded in.

The DXer can then go back and listen to the recording at that time, to see what station audio may be present. After generation, these waterfalls are saved, so they can be examined again without the need to re-process the I/Q files.

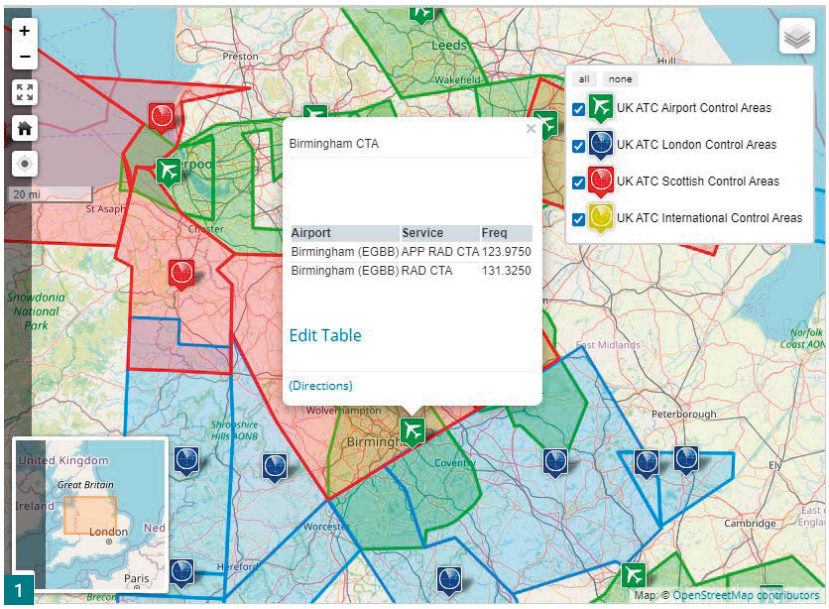
In addition to waterfalls, it is also possible to obtainm signal strength information for a particular carrier frequency saved as a CSV file. This can be imported into a spreadsheet or other program for graphing.

In this way, it is easy to spot transmissions in the waterfall, and then go back and listen to audio from the I/Q recording file.

Various charts can be graphed from a CSV file generated by *Carrier Sleuth*, and running from late morning to early evening.

The increase in signal levels as evening approaches can be easily seen.

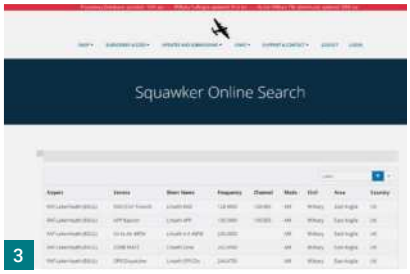
**https://tinyurl.com/5ey5y2ao**




1

**Fig. 1: The Map Feature.**
**Fig. 2: Squawker for PC.**
**Fig. 3: Squawker online.**

2




3

# A Dedication to Airband: Rick King

Rick King has been in touch about his recent products and services for airband enthusiasts. In March of 2018, Rick was talking to Wayne of *WTR Browser*, primarily about development ideas for WTRB. Rick was helping him add Airband-related to the software. Since Wayne's interests at the time lay elsewhere, he suggested to Rick that he might develop his own program. Consequently, Rick and Wayne worked on this together, and *Squawker PC* was born (Figs. 1 to 3).

It was released in May 2018 – initially as a PC program of searchable UK aviation frequencies and squawk codes. The development of *Squawker PC* continued with scanner-linking in early 2019, when it became evident that the squawker community had a large number of military aviation enthusiasts. The Military Airband (230-400MHz) contains a possible 6,800 frequencies. A traditional scanner, usually scanning at 100 channels per second, is quite slow, and – with most transmissions being on the short side – a lot of activity can, therefore, potentially be missed.

With that in mind, *Active Mil* was developed, In an average four-week period, around 250 to 300 frequencies are active in the Military Airband in the UK. Therefore, each week, a set of files for various scanners and SDRs was released, containing the last 4 weeks' worth of *confirmed active* frequencies. Initially, these were sent out by email. However, as this facility became more popular it was evident I needed another solution.

## Creating the UKAFG Website

In December 2019, the *UKAFG website* was launched. It migrated all *Active Mil* file downloads to an online platform, and it allowed the addition of *Squawker Online* – which is accessible from any device with a web browser and an internet connection. Moreover, aviation maps , callsigns and squawk codes were added throughout 2020.

The printed guide, when first mentioned in the relevant airband Facebook groups, received a negative response, along the lines of *"nobody buys books anymore"*. However, over a few weeks, Rick received plenty of messages to the effect that potential customers would love a printed version. Mindful of another comment (*"books are out of date as soon as they are printed"*), the feature of including updates until the start of the following year was added. The first UKAFG guide was released in January 2020, and the second edition followed in December 2020. In January 2021, Rick added a daily 'live-log, for *Active Mil* subscribers, updated in real-time, and a log of active frequencies from the previous day.

Sourcing the information has been a challenge, and some key tasks included gaining copyright releases to use the data commercially; making sure all submitted information is the sender's own content; not just adding frequencies but trying to keep them current and removing old and unused content. In this context, the wider airband listening community has been amazing and is massively appreciated by Rick. Those who submit logs, lists and updates, week-in-week-out, are essential to making all of this possible,

Who is the UKAFG for? A large proportion of the information can be sourced for free. Therefore, if you do have the time you can do it yourself. For those who do not have the time, or do not want to compile data, are new to the hobby or want an additional resource for aviation frequencies, the UKAFG aims to be an essential new resource. As the data changes all the time, there are always improvements to be made, such as adding new content. Overall, Rick's goal is to make the UKAFG the 'go-to' resource for aviation frequencies for the UK.

**rick@ukafg.co.uk**
**https://tinyurl.com/lbnso5sy**
**https://tinyurl.com/1t6l53sx**

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# RADIO ENTHUSIAST BOOKSHOP

## The Magic Bands

Written by the editor of Practical Wireless, Don G3XTT and published by the RSGB. It runs to 224 pages and aims to appeal to all six and four-metre enthusiasts whether they are newcomers or 'old-hands'. The book is a rework of Don's 'Six Metre Handbook' which was first published 12 years ago.

This is an extensive revision, and incorporates useful information on 'digital operating techniques' as well as more traditional operating.

**Words by: Tim Kirby GW4VXE**

SEE THE FULL REVIEW ON PAGE 27

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# Comforting Voices

**Chrissy Brand**
chrissyLB@hotmail.co.uk

**Chrissy Brand** looks at some international broadcasts, which include the return of Media Network. She also takes a brisk run through a selection of sports programmes and podcasts.

There was a time when most short wave listeners tuned with excitement to a number of DX and media programmes. *Sweden Calling DXers, DX Jukebox, DX Partyline, Swiss Shortwave Merry-Go-Round* and *Wavescan* were just a few that spring to mind.

In addition, stations such as Radio Budapest and Radio Berlin International ran listener clubs that were popular around the world. Some such clubs still exist but are mostly in parts of Asia where short wave seems more popular. The Voice of Indonesia and Radio Taiwan International are two stations that retain regular interactive links with their keenest audiences, through contests and meetings.

*Swiss Shortwave Merry-Go-Round* has long gone from the radio, but co-presenter Bob Zanotti maintains the *Switzerland in Sound* programmes and website. This includes all the available episodes of *Swiss Shortwave Merry-Go-Round*, which was on the air for 24 years.

Bob hopes to create more documentaries about Switzerland throughout 2021.
**https://tinyurl.com/11d8otj2**

I think it is great to dip into old programmes for research and a short burst of nostalgia. However, there is so much current-day choice and radio content to consume that looking back is sometimes a luxury we cannot undertake.

## Media Network on Film

It was a pleasant surprise to see that Radio Netherlands' flagship show, *Media Network* returned, online, in January. Although no longer a Radio Netherlands production, Jonathan Marks, who led the programme back in the day, has breathed new life into to it.

The new, second season consists of video documentaries. Thinking to the future, Jonathan always took a video camera on his Radio Netherland assignments – a very wise man!

This series is a mix of previously unseen video from the archive, plus new material.

Jonathan wrote, "*I've reached a point where it is time to release a series of long-form interviews looking back on the colourful history of international radio broadcasting. I often thought I'd love to find out what happened to people and stations after the first series of Media Network concluded in 2000. Zoom, fibre-to-the-home and next-generation 4K webcams make a lot possible.*"

The first two episodes covered visits to the incredible *DocuFunk* archive of QSL cards and memorabilia in Vienna in 2009 and 2018. Jonathan was shown around by curator Professor Wolf Harranth. The archive had moved in between the visits, from its original base near ORF (Österreichischer Rundfunk) in Argentinierstraße, in the outskirts of the city (Fig. 1). *DocuFunk* is the world's largest organisation "*collecting, researching and presenting whatever relates to the history of radio communications, particularly amateur radio and broadcasting.*"

The good news is that previous funding concerns have now been overcome and the *Research and Documentation Center for the History of Radio Communications and the Electronic Media* (to give its full name) now has a team of trustees, archivists and researchers in place for this wonderful work.

In parallel to *Media Network* new videos, audio episodes of the original programme are regularly released. Around one thousand episodes were made. *The Media Network Vintage Vault* of January 2021, for example, featured programmes from 1998 on numbers stations, a report by Elizabeth Fox on broadcasting in Latin America, a short wave receiver survey, and a piece on the UK's Medium Wave Circle club, which is still active today.
**https://jonathanmarks.libsyn.com**
**http://dokufunk.org/index.php?lang=EN**

## Quality Short Wave

*Wavescan* has a huge pedigree and has been a staple programme of Adventist World Radio since 1995. It remains on the air, thanks to relays by IRRS and WRMI.

*Wavescan* can be heard on Saturdays at 1200 UTC on 9510kHz (IRRS) and is also repeated several days a week by WRMI. Dr Adrian Peterson still does the research, while Jeff White produces and presents the programme in the WRMI studios. As we headed into the new year, *Wavescan* carried a feature on whales off Sri Lanka plus a look at the history of short wave relays in Sri Lanka. As well as podcasts of each programme, an archive of transcripts is available at Jerry Berg's *On the Shortwaves* website.
**https://awr.org/program/engmi_wav**
**https://tinyurl.com/3wbbqxrs**

Texas Radio Shortwave rents airtime on Channel 292 in Germany, WRMI in Florida and WBCQ in Maine. Rather excitingly, the station is based in international waters in the Gulf of Mexico. It has been a welcome addition to short wave since its commencement in 2019 (Fig. 2).

E-QSL cards are issued, and there is a good line in commemorative QSLs, for instance at the first anniversary of the stations and for occasions such as Hallowe'en and Christmas (see Table 1 for more details).

Programmes consist of music, often with a Texas connection. In October, a *Ladies of Texas* programme included some familiar artists (Janis Joplin, St. Vincent, Lisa Loeb and Norah Jones) but many musicians that most listeners will not know, two examples being Sunny Sweeny and Lydia Mendoza.

There have also been tribute programmes to Buddy Holly and Willie Nelson. The February broadcasts (each Saturday) carried a theme of 'Texas outlaw music'.

Reception reports should be emailed to
**texasradiosw@gmail.com**

You can also listen, of course, using a remote receiver such as the popular one at Twente in The Netherlands.
**http://websdr.ewi.utwente.nl:8901**

Radio Romania International's annual *Personality of the Year* award is meant to be for the person who had the most positive im-

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**Fig. 1: One of Texas Radio Shortwave's stunning QSL cards.**
**Fig. 2: Vienna has more than one ear on radio, here at ORF and at the *DocuFunk* archive.**

pact on the planet in the previous 12 months. Listeners vote, and the winner is announced during the New Year's Day broadcasts. The deserved 2019 winner was Greta Thunberg; Angela Merkel was successful the year before that; in 2017, tennis star Simona Halep received the accolade. Things went awry in 2016 when, for some bizarre reason, Donald Trump was the winner.

The year just gone has been a strange year for everyone, and I was hoping that the Covid-19 vaccine developers might win. However, just as gratifying, for the first time, the award went to a whole group of people: "*medical workers the world over have been designated the world's best citizens for being in the frontline against the Covid-19 pandemic, which has significantly impacted the life of the entire planet.*"

**https://tinyurl.com/1i01cauj**

Here on the English Southeast coast, I have heard Radio France Musique on 89.4 from Boulogne and 95.6MHz from Caen. In the correct conditions, it has also been heard in the UK on 88.7MHz from Lille, 95.9MHz from Saint-Lo, and 97.0MHz from Le Mans. Last summer, there was a French-speaking station playing jazz music on 92.4MHz, at a time when jazz was scheduled on France Musique; however, I was unable to get an identification.

When I am unable to hear the station on FM, I turn to the station's online stream. On a recent Thursday, Radio France Musique had me enthralled for an entire afternoon and into the evening. Jazz pianist Thelonious Monk's 1957 album, *Thelonious Himself*, was in an edition of the 15-minute programme *Disques de Légende*. A 'legendary' album is featured every weekday at 1500 UTC.

On Saturdays from 1600 to 1700 UTC, I enjoy *Les Légendes du Jazz*. Back on November 15th, a 1974 concert by Panama Francis, American swing jazz drummer, was repeated. At 1700 UTC, *Jazz Club* often showcases an hour of free and experimental jazz.

Another popular French station, FIP, is celebrating its 50th Anniversary. It also airs jazz and other music formats. Check out *Jazzafip Club* online.

**www.francemusique.fr**
**www.fip.fr/emissions**

Meanwhile, Radio OZ Viola, in Hillerød, Denmark, added a *Midnight Jazz* programme in January, on Wednesdays from 2200 to 2300 UTC on 5980 kHz. *Viola* is the station's mascot, based on a fictional character from a computer game (Fig. 3)

**www.ozviola.dk**

TEXAS RADIO SHORTWAVE

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## Sport Casts

Former footballer Peter Crouch surprisingly took sports podcasts to a whole new level of popularity in the UK. This was when the BBC launched *That Peter Crouch Podcast* (Fig. 4). I think that fortuitous timing and the overall rise of podcasts helped its success, coupled with football's enduring popularity. To me, the podcast sounds rambling, uncouth and rather dull, but I appreciate I am not the target audience.

**https://tinyurl.com/5bl4v4v3**

The Beeb has, however, been refreshingly diverse with its *LGBT Sports Podcast*. This gem has been running since 2018, clocking up 150 episodes. It covers LGBTQIA+ issues in sport and is hosted by Jack Murley of BBC Radio Cornwall.

Podcast features have included Caron Morton and Peter Heather talking golf, Cycle Out London, Arsenal and Orient footballer Laura Lee, Daryl Telles on being a gay footballer in the 1970s, Manchester Storm ice hockey player Zach Sullivan and Paralympic basketball couple Laurie Williams and Robyn Love.

**www.bbc.co.uk/programmes/p06m38g1**

*RunPod* has seen broadcaster and jogger Jenni Falconer present over 120 episodes. Guests with a passion for running discuss, "*the challenge, reward and sometimes obsession of pounding the pavement whilst asking what drives us to run, why some catch the bug more than others, and how it can transform the lives of those who do it … top training tips, monumental mistakes and some inspirational stories.*"

**https://uk-podcasts.co.uk/podcast/runpod**

CHRISSY BRAND

2

*Unsportsmanlike Conduct* is a weekday, four-hour extravaganza aired on KZOT The Zone, Omaha in Nebraska. The often bewildering world of US sport is covered by John Bishop and Josh Peterson.

**https://tinyurl.com/zmvm9x45**
**www.1620thezone.com**

An antidote to The Zone can be found in the episodes of US podcast *Just Women's Sport*. Each episode features a different elite athlete, including surfer Stephanie Gilmore and snowboarding legend Chloe Kim.

**www.justwomenssports.com/podcast**

Ice hockey is covered by Chris Gadsby and Oddman Rush on the *Euro-Puck Podcast*, which is part of the Hockey Podcast network. *Euro-Puck* concentrates on European ice hockey but also covers other events, such as the annual *IIHF World Junior Hockey*

| Date | Time (UTC) | Station | Programme | Podcast | URL/ Stream/ Frequency |
|---|---|---|---|---|---|
| Daily | 1330 to 1430<br>1930 to 2030<br>2300 to 0000 | TRT The Voice of Turkey | News, Turkish music | TRT World and Voice of Turkey on Google Podcast app | 12035kHz<br>6050kHz<br>5960kHz www.trtworld.com |
| Tuesday to Friday | 1200 to 1300 | Radio Skye | The Adventures of Captain Bobo (children's stories, from Scotland's west coast, in Gaelic) | https://tinyurl.com/ju9z1gug | https://radioskye.com<br>102.7 and 106.2 MHz |
| Saturday | 1600 to 1700 | BBC Radio 3 | Music Planet (roots music with Lopa Kothari) | BBC Sounds App | www.bbc.co.uk/programmes/m000qbj6<br>DAB and FM |
| Saturday | 1900 to 2100 | LBC | Natasha Devon (body image and mental health campaigner) | www.natashadevon.com/podcasts | www.lbc.co.uk/radio<br>DAB and 97.3MHz |
| Sunday | 0200, 0300,<br>0900, 1800 | Texas Radio Shortwave | Ladies of Texas Music | https://tinyurl.com/6r9khwpw | WRMI 5950kHz, WBCQ 6160,<br>Channel 292 6070, 3955kHz |
| Sunday<br>Friday | 1000 to 1200<br>1300 to 1500 | ALL FM | Charity Shop Classics (tunes and interviews) | https://tinyurl.com/47ee87x5 | https://allfm.org and 96.9 MHz |

RADIO OZ VIOLA

3

CHRISSY BRAND

4

**Table 1. My top listening recommendations for the month ahead in international radio.**
**Fig. 3: Station mascot *Viola* (in the dark) with a *Radio OZ Viola* presenter.**
**Fig. 4: Promoting *That Peter Crouch Podcast* on the *BBC Sounds* app.**

*Championships*, which took place in Canada in December and January.

**https://euro-puck-podcast.pinecast.co**

*The Irish Examiner* newspaper also runs a thought-provoking sports podcast. This year opened with athletes and journalists Louise Galvin, Cliona Foley, Therese O'Callaghan and Eoghan Cormican discussing the progress and problems for women's sport in 2020 and their wishes for women's sport in 2021. Other Irish sports of hurling and Gaelic football are covered regularly in the podcast.

**https://tinyurl.com/58n2y63a**

For a different, more educational approach, head to the Sport New Zealand website and the *More Than Sport* [sic] podcast. It, *"explores the processes and approaches of enhancing quality physical education and physical activity in schools."*

**https://sportnz.org.nz/resources/podcast**

In Canada, CBC ran a podcast series called *The Players Own Voice*, which was enjoyable, and I hope will return for more. Victoria Hayward, captain of the national softball team talked about, "*softball's latest innovation, a 56-player league aiming to revolutionize the sport. Athletes Unlimited combines the best of fantasy leagues and traditional play to build a competition model that's already caught the imagination of investors and fans alike.*

*"Players are drafted into new teams each week, while points are accumulated on an individual basis through personal statistics and team victories. Players get points for hitting singles and stealing bases, and profit-sharing is meted out accordingly. It's a head-spinning plan, but it's working already, and it's brought more money and attention to the game than seen in many years."*

**www.cbc.ca/sports/podcasts**

## A Reader Writes

Graham Smith commented that he often cannot find *RadioUser* in the shops. There is a simple solution to this for all readers: subscribe to the magazine and it will be posted to you each month. Have a look at the subscription offers elsewhere in this magazine. Or you can ask your newsagent to order a copy each month. Many newsagents and other shops do stock *RadioUser* on their shelves. In the past six months, I have seen it for sale in WH Smith in Hastings, Altrincham, Tywyn, Manchester, London and an independent newsagent and toy shop in Rye.

Graham noted that Spanish station Cadena SER still broadcasts on 729kHz, although the station is stronger on other frequencies. He also heard Radio Inter (Spain) back again on 918kHz, but possibly on reduced power, and BBC Radio Ulster on 1341kHz. At 0300 UTC, he regularly hears a long news bulletin in Arabic from Radio Kuwait on 5960kHz.

In addition, Graham often logs Turkey starting up on 954kHz at 0300 UTC. However, this is only possible on Saturday and Sunday mornings, as Czech Radio uses the same frequency at 0300 UTC on Mondays to Fridays. There is an interval signal, and then the news in Turkish.

On 4875kHz he logged a Munich free radio station, Mystery Radio 21, broadcasting pop music through the night. Most of the music is new to him, unlike the UK classic hits stations, where every record is one you have heard several dozen times before.

**www.facebook.com/mysteryradio21**

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- Bluetooth connectivity
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**£259.95**

## New Video Channel

Check out our new video channel.
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Read the comment and join in the fun. It's just another part of the service that we offer all radio enthusiasts around the world.
Peter Waters G3OJV

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**£149.95**

### Tecsun PL-880

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- 3050 station memories
- Low / Mid / High sensitivity switch
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- Built-in charging system

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# Wisdom Across the Airwaves

**Chrissy Brand**
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**Chrissy Brand** looks at the main radio conferences in 2021, re-visits the issue of finding trustworthy news on the radio and listens to those who redefine the power and connectivity that radio can bring to the world.

We are all hopeful that the world can return to a degree of normality this year, and that we can socialise, travel and network with colleagues once again. However, until enough of the world has been vaccinated, that is not going to happen, therefore many professions will continue to hold meetings and conferences online instead of in person.

Usually, each January, the *Salon de Radio/European Radio Show* is held in Paris. This year it took place online instead, from January 18th to 22nd, with sessions in both French and English.

The five-day event consists of exhibitors, presentation sessions and masterclasses, and is of benefit and interest to anyone in the radio or podcast profession, as well as enthusiasts in those fields. I hope that the 2021 highlights will be made available online for all to watch.

## Ideas and Inventiveness

Areas covered at last year's *Salon de Radio* included key innovations and ideas on how to increase audiences (including the premise that 'more video is more audience'), how local radio can attract advertisers, how to internationalise podcasts, and how to better adapt radio for audience consumption on screens (smartphones, tablets, laptops). Software solutions and other platforms were also showcased.

*Groover* was one of these, being a platform where, *"musicians and their representatives can directly and simply send their track to a selection of blogs, radio stations, playlisters, record labels, music pros of their choice."* The dates for 2022 are already set, when the plan is to meet again in person in Paris. What a wonderful thought that is!

I have my fingers crossed that we can attend events that were postponed from 2020 to 2021. Three that spring to mind are *Radiodays Europe*, scheduled for Lisbon on May 2nd to 4th and the *European DX Council Conference* in Bucharest, which should now take place from September 17th to 19th. There could also be a meet up in the East German coastal city of Rostock, where the *Radio GDR* gang hope to gather at some point.

*Radiodays Europe's* movers and shakers convened online in December to share conversation and ideas.

I found the content to be the most inspiring and optimistic that I had heard for a long time. A two-hour recording is at their website and involves contributions from key players in the European radio scene. These included Helen Thomas, Head of BBC Radio 2; Graham Dixon, Head of Radio, EBU; Vassilis Vlachos, Head of Production, Rythmos 949, Greece; and Helena Bremberg, Head of P4 Gotland, SR in Sweden.

Niall Power, host and head of station sound at Beat 102-103 in the Republic of Ireland, neatly summarised radio's impact during the age of Covid-19. He said, "*Covid has strengthened people's relationship with radio across the globe."* Marc Vossen, General Manager, Nostalgie, NRJ, in Belgium, put it more poetically, *"In a period of crisis, radio is essential for the world. The voices are ambassadors of solidarity and love. It is a force for positive change for the world."* Radio stations Nostalgie and NRJ (who are part of the Belgian *N Network*) also deserve plaudits for their reforestation work in Brazil and Burkina Faso plus water filter projects in Eritrea.

Simone Thomas is Head of Organisation, Diversity and Inclusion at Absolute Radio in London. She stated that she learned, "*many years ago that radio is another agency of change, with the ability to affect behaviours, norms and values. With that comes great responsibility. All broadcasters have an opportunity to shift the needle and better represent the audiences and communities they serve, identifying areas where they could do things differently."*

*Radiodays Asia*, meanwhile, will host its conference online this year, in March (Fig. 1). Details of speakers and presentations are being confirmed as I write this. You can visit the *Radiodays Asia* website to view the presentations and slides from the 2019 conference. That event covered some excellent topics, and Sana Rangwala, Creative Head, Radio Mirchi Love, India, explained what to do with the common perception that "*If It didn't happen on social media, it didn't happen*." Joan Warner CEO, Commercial Radio Australia and James Cridland, 'Radiofuturologist', Australia, discussed *Beyond AM and FM - the new normal*.

Amongst the outstanding presentations and topics discussed at the *Radio TechCon* event last November was the *Multitrack Audio Producer Fellowship* (Fig. 2). Its current iteration of this runs for the first three months of 2021. This programme provides opportunities for emerging audio producers, *"while also pushing production companies, broadcasters and the wider audio industry to address issues of accessibility and inclusivity within radio and podcasting."*

Finally, Chloe Fletcher gave an impressive presentation where she discussed the energy footprint of radio (Fig. 3). A 37-page, *Research and Development White Paper (WHP393)* documenting this is available for download. *The Energy Footprint of BBC Radio Services: Now and in the Future* written by Chloe Fletcher and Jigna Chandaria.

## American Views

Radio's heritage is something we can, and should, all celebrate (See also the return of *Media Network* in this month's *International Radio Scene*). It is no surprise that one emerging area for this is in book form.

Ronald W Kenyon is an American author of many books. His most recent tome, *QSL, How I Traveled the World and Never Left Home* will be of interest to DXers of all ages. [I am reviewing this book elsewhere in this issue - **Ed**.]

Ronald had some pertinent points to add to the mix after reading my piece, *How to Find Reliable News on the Radio* (*RadioUser*, December 2020: 20-23). He wrote, "*You note that Sweden and Finland tend to have*

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**Fig. 1: This year, *Radiodays Asia* is meeting online, instead of in Kuala Lumpur (Malaysia). Fig. 2: The *Multitrack Audio Producer Fellowship* inspires new talent. Fig. 3: The energy footprint of radio is a very important consideration. Fig. 4: Garrison Keillor's radio world is populated with cowboys and the prairie.**

1

*objective news programs. That is probably a consequence of their size: the superpowers tend to be hegemons that want to dominate the world so-truth be damned when it threatens their hegemony! As of 2020, six media conglomerates, ATT (including Time Warner), CBS, Comcast, Disney, News Corp (the parent company of Fox News), and Viacom, control 90% of all the media outlets in the United States. Not much effort expended for unbiased or objective news on those networks, whose principal purposes are to stultify their viewers and listeners with a non-stop diet of non-news and to increase their profits."*

*"One solution to finding reliable news on the radio is low-powered (maximum 100W) broadcasting of both radio and TV. In the U.S. it was authorised by law in 2000. Getting back to the subject of reliable news, visit the website called* Ground News*. If you click on '*Publisher Analysis*', you'll get a pop-up categorizing several dozen political publications according to their political orientation, from far-right to far-left. Clicking on one of the icons will open it. Fortunately, most of them are ranked 'Center.' NPR and PBS are supported by grants and donations from subscribers."*

You will already know that Garrison Keillor made his name in the legendary variety radio show, *A Prairie Home Companion*, which graced American Public Radio from the 1970s until 2016. In its last couple of decades, it was broadcast on other radio stations around the world, including BBC Radio 7, which later became BBC Radio 4 Extra. The tales of detective *Guy Noir*, Cowboys *Dusty and Lefty* (Fig. 4) and others live on in book form, but mostly in the huge audio and video archive at the large *A Prairie Home Companion* site. Dipping into past broadcasts always cheers me up at times when I get low.

Keillor and the gang met up online to produce a couple of new versions, on *Zoom* at the start of the first 2020 lockdown, as well as an *End-of-Year-Special* in 2018. He also still writes a weekly monologue and presents a short daily programme called *The Writer's Almanac, which is also available on his website and YouTube channel.* In *Slate* magazine in 2006, Sam Anderson called Keillor, *"very clearly a genius. His range and stamina alone are incredible - after 30 years, he rarely repeats himself and he has the genuine wisdom of … Mark Twain."*

Garrison is a prolific author as well and has published a book of limericks, a volume of memoirs plus a new Lake Wobegon novel last year (*The Lake Wobegon Virus*). All whilst cocooned with wife and daughter in his New York City apartment. I opted for the seven CD, nine-hour reading of *The Lake Wobegon Virus* by Garrison himself (an *mp3* version is also available). A treat for long car journeys.

More generally, archives of radio broadcasts and other memorabilia are a huge legacy for anyone to leave, be they professional or enthusiast.

## New Ways of Information Intake

The ways in which societies in all countries consume news have always evolved with technology. Print media and radio dominated through the first half of the 20th Century, being joined by television for the second half.

Those with access to knowledge about short wave radio could steer clear from the narrow and nationalistic views often espoused by domestic mainstream media. Therefore, international radio listening, along with the increase in international travel for the average person in the western world, enabled a wider world view to be brought home and discussed at the dinner table, in the workplace and down the pub.

The 21st Century has seen the majority of the world drastically change, in terms of how we now consume news. For example, I heard about the attempted *coup d'état* by some of Donald Trump's white supremacists on January 6th, whilst I was on a *Zoom* call with a friend, whose housemate was watching live television.

After the call, rather than turn to the radio for news, I went to Facebook, knowing that some of the hundreds of media outlets in my stream would give me worthwhile options to peruse. A friend and fellow radio enthusiast in Washington DC, Rosemary Kolesar, had posted some photos of the early stages of the riot on her way home. That was hugely interesting, and next up, ABC 7 in Chicago was live streaming from the capital.

I watched coverage straight from the scene with several reports on the ground and experts in the studio, all of whom were well equipped, as American citizens, to explain what was going on. Overnight I listened to podcast and radio programmes from the US giving their take on the developments. We are fortunate to be able to access such a wide range of information.

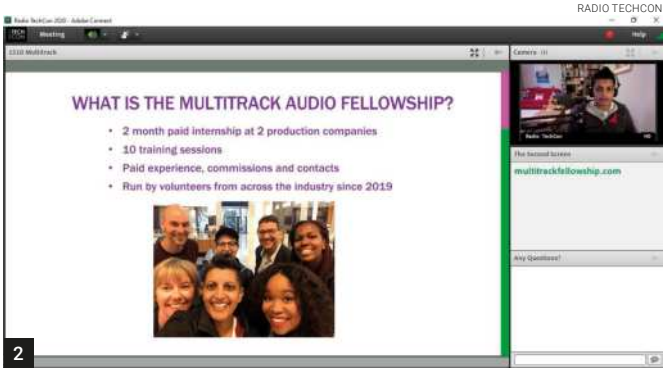
Media is now at the point where radio, television, print and internet all overlap. Individuals and independents can also stream live, and, in theory, the world should therefore be seeing a broader take on news stories as a result, not just the view given by state broadcasters to its populations.

## Changes at the BBC

Richard Sharp was appointed as the chair of the BBC in January. Electoral Commission records showed that Sharp donated more than £400,000 to the Conservative Party since 2001.

Gaby Hinsliff noted, in *The BBC Can Never be the Nation's Voice, The Guardian,* January 8th, 2021, that he is also a Brexit-supporting member of the hard-right thinktank the *Centre for Policy Studies* and an ex-advisor to current Chancellor of the Exchequer, Rishi Sunak.

RADIO TECHCON



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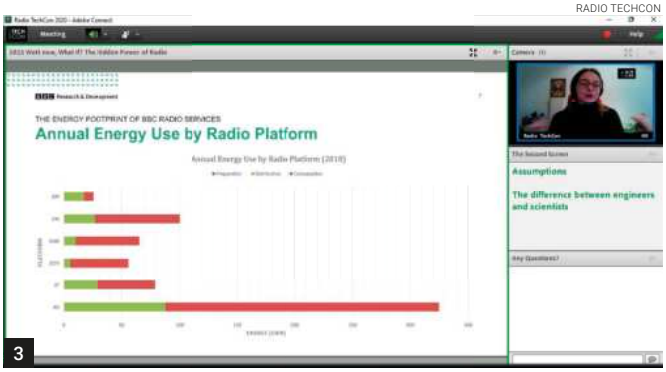
RADIO TECHCON



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TIM SUTTON-BRAND

4

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- Groover, musicians' radio platform **https://groover.co/en/band/homepage**
- Radiodays Europe **www.radiodayseurope.com** **https://tinyurl.com/4rsbuwz3**
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- Radiodays Asia **www.radiodaysasia.com**
- European DX Council **https://edxcnews.wordpress.com**
- Radio TechCon **www.radiotechcon.com**
- Multitrack Audio Producer Fellowship **https://multitrackfellowship.com**
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- Ground News **https://tinyurl.com/g4lbyg99**
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- *The BBC can never be the nation's voice*, by Gaby Hinsliff, The Guardian, January 8th, 2021 in print, and as *How can the BBC be the voice of the nation when no such thing really exists?* Online, January 7th, 2021. **https://tinyurl.com/ilaxt7r7.**


All of us who are employees of all media companies are entitled to personal political views, even reporters, interviewers and correspondents who influence the public in subtle ways through the questions they choose to ask ministers, the tone of voice, the subject and angles that they tweet etc.

However, when the chair of a public broadcasting body that is meant to be impartial, and donates vast sums to a political party, it is a worrying time for democracy. Perhaps another frightening aspect is that the current government and others of its ilk always perceive the BBC as leaning to the left.

I am aware that there is much debate about BBC bias and there is probably a three-way split of public opinion: those that think it is too right-wing, those that feel it is too left-wing and those who feel it is neutral.

That is, of course, a simplistic approach. My own experience is that, concerning news coverage, it tends to be very pro-establishment and leans towards the right-wing. However, when it comes to entertainment and educational programme-making, the BBC tends to sit in the middle ground with a liberal stance.

It may be skating on thin ice to state this but perhaps it is, in general, a result of the backgrounds and outlook of those in each area; senior management and board roles tending to go to those with public school, Oxbridge, conservative attitudes, whilst those working in the arts are, perhaps, more likely to be progressive.

*[The views expressed in this article are solely those of the author – **Ed**.].*

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# Radio News

**FEMALE COMPOSERS ON SCALA RADIO:**

Scala Radio is launching a new series that celebrates some of our greatest living female songwriters and composers.

The new series, She Scores on Scala Radio, will feature composers Pinar Toprak, Jessica Curry, Isobel Waller-Bridge and Nainita Desai guest hosting the programme every Sunday across March from 6-8 pm. Each of them will be playing some of their favourite classical music, from their most loved women composers, the music that's inspired them in their career and some of their own scores. The station is working with the charitable organisation DONNE which promotes and supports women in music. The four guest hosts will select their own music, for example, Pinar Toprak, the first female composer to score a feature film in the Marvel Cinematic Universe, is focusing on the music of superhero movies, including influential scores such as Superman, Batman and new releases like Wonder Woman 1984, along with her work on Captain Marvel. Jessica Curry is celebrating her varied musical influences, including Sinead O'Connor, Bette Midler, Rachel Portman and Enya. Jessica's love of choral music will shine through in her selections by Errollyn Wallen and Hildegard von Bingen, and she'll also select particularly significant tracks from her video game scores to Dear Esther, So Let Us Melt and Everybody's Gone to the Rapture. Ahead of the new series, on Sunday evenings in February, guest host Eddi Reader MBE will present a new series, Eddi Reader's Scala Songbook on classical and folk music. The singer-songwriter, often celebrated as Scotland's greatest living female voice, will be honouring the folk tradition and explore its many similarities with classical music. Programme Manager for Scala Radio, Jenny Nelson said: "We're passionate about celebrating diversity within the classical music world. It's an industry that boasts incredible works from a broad range of artists and composers, yet the perception of classical music is all too often of a musical world that is pale, male and stale. "We know that there is still a lot of work to be done, but in shining a light on these brilliant female talents we hope that we can better level the playing field and begin to work towards a future where women are equally represented." Isobel Waller-Bridge added: "I'm really happy to be invited onto the show to play some of my favourite works by female composers. I've put together a programme of music that unlocked a really important creative space for me in the early years and music that continues to inspire me. "I'm looking forward to spending an evening playing work from these amazing artists and talking a bit about why they mean so much to me and my music."

(SOURCE: Scala Radio, OnTheRadio: admin@ontheradio.co.uk)

**www.tinyurl.com/1mpv1y2a**

# European Private Shortwave Stations

**Stand: February 1st 2021**

Only legal stations are included. Most stations use 100 to 3,000W of power.
D = Germany, DNK = Denmark, FIN = Finland, NL = Netherlands, NOR = Norway, Irr. = irregular, F.pl.: future plan, min. = minutes, Mo = Monday, Tu = Tuesday, We = Wednesday, Th = Thursday, Fr = Friday, Sa = Saturday, Su = Sunday.

| kHz | Country | Name | Transmitter site | Schedule (UTC) |
|---|---|---|---|---|
| 3920 | NL | Radio Piepzender | Zwolle | Mainly weekends |
| 3955 | D | Radio Channel 292 | Rohrbach Waal | 24/7 |
| 3975 | D | AM Shortwave Radio | Winsen | Daily 0700-2300 |
| 3985 | D | Shortwaveservice | Kall-Krekel | Daily 1500-2300 |
| 3995 | D | HCJB | Weenermoor | 24/7 |
| 5810 | NL | Mike Radio | Heerde | Irr. |
| 5895 | NOR | The C / Radio Northern Star | Bergen | Daily 0429-1358 / 1359-2310 |
| 5920 | D | HCJB | Weenermoor | Daily 0600-1700 |
| 5930 | DNK | World Music Radio | Bramming | Daily 0700-1745 |
| 5970 | DNK | Radio208 | Hvidovre | F.pl. (from Feb 5th): Daily 0700-1600 |
| 5980 | DNK | Radio OZ-Viola | Hillerød | We 2200-2300, Sa-Su 1200-1400 |
| 5980 | FIN | Scandinavien Weekend Radio | Virrat | 1stSaturday of the month |
| 6005 | D | Shortwaveservice | Kall-Krekel | Daily 0900-1700 |
| 6005 | NL | Radio Delta International | Elburg | Irr. |
| 6020 | NL | Radio Delta International | Elburg | Sa-Su 0900-1300 |
| 6070 | D | Radio Channel 292 | Rohrbach Waal | Mo-Fr 0600-2200, Sa-Su 0500-0300 |
| 6085 | D | Shortwaveservice | Kall-Krekel | Daily 0800-1700 (Radio MiAmigo) |
| 6115 | D | Radio SE-TA 2 | Hartenstein | Irr. Sa-Su 1000-1200 |
| 6140 | NL | Radio Onda, Belgium | Borculo, NL | Weekends only |
| 6150 | D | Europa 24 | Datteln | Daily 0700-1600 |
| 6160 | D | AM Shortwave Radio | Winsen | Daily 0800-1600 |
| 6170 | FIN | Scandinavian Weekend Radio | Virrat | 1stSaturday of the month |
| 7365 | D | HCJB | Weenermoor | Daily 0900-1400 |
| 9670 | D | Radio Channel 292 | Rohrbach Waal | 24/7 |
| 11690 | FIN | Scandinavian Weekend Radio | Virrat | 1stSaturday of the month |
| 11720 | FIN | Scandinavian Weekend Radio | Virrat | 1stSaturday of the month |
| 15790 | DNK | World Music Radio | Randers | Sa-Su 0700-2000 |
| 15880 | NL | Radio Piepzender | Zwolle | F.pl. |

This list is compiled by Stig Hartvig Nielsen (**shn@wmr.dk**) each first day of the month – and is based on details supplied by the various radio stations, the stations websites and HFCC registrations. The list is not copyrighted and may be published everywhere. Next list will be published on March 1st 2021.

# The Uniden Bearcat BCD325P2 TrunkTracker V Scanner

**Keith Rawlings**
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**Keith Rawlings takes an in-depth look at a lesser-known, but extremely well-equipped, mobile scanner from the USA – the Uniden Bearcat BCD325P2 TrunkTracker V.**

1

The Uniden Bearcat UBC125XLT (henceforth: '125') is quite rightly a popular handheld scanner. It is compact, easy to use, has a reasonably-sized screen which is easy to read, has an ergonomic keypad layout, good audio quality and free software that makes programming the set simple. Moreover, it is reasonably cheap to buy.

I have one and I love it.

While it is ideal for airband and marine band use, being limited to AM and FM, does mean that in today's scanning world it misses out on a lot of transmissions which are now digital.

In the UK, a lot of this form of communication is called Digital Mobile Radio (DMR).

There is, however, a Uniden model that looks identical the 125, is *fairly* simple to use and can receive digital transmissions. This is the Uniden Bearcat BDC325P2 (henceforth: '325').

Unfortunately, although it has been available for some time, it does not seem to be sold in the UK.

During the 'first' lockdown a friend messaged me to say he had bought a 325 directly from the USA. I hinted that I might like to have a 'play' with it sometime. 'Hint taken', it seems, because a couple of months later, and just 'in time' for the 'second' lockdown, it turned up at my door.

What is more, it had the *DMR Upgrade* added.

## The Non-identical Twins.

The 325 has a long feature list: it is a 'Trunk Tracking' radio with 25,000 dynamic memory channels. The set receives within the ranges of 25-512, 758-824, 848-869, and 894-960MHz, Reception modes are AM, FM, NFM, FMB, WFM, and APCO25 (NXDN & DMR optional). The scanner offers a *Close Call* facility (it latches on to nearby channels), optional GPS, location-based scanning, and a neat band scope feature.

Moreover, there are 100 *Quick Keys*, and channels can be 'tagged', for easier access. You can manage memory channels individually, and radio and it can decode DCS/CTCSS tones.

It also has an indicative S meter, while the top-mounted rotary switch acts as a volume, squelch and frequency/memory stepping control.

Without aerial, the scanner measures about 135 x 65 x 40mm, including the belt clip.

As an additional bonus, there is free programming and control software available for this model.

The radio I borrowed for this review had firmware version 1.08.1 installed.

## The 125 and 325 in Comparison

Holding my Bearcat UBC125XLT next to the 325, it was difficult to tell the models apart (Fig. 1). My first note was that the 325 has the same belt clip, or hook, as the 125. I prefer this format to the bulky swivel type fitted to models like the 3600 and 3500 (Fig. 2).

Furthermore, it has that same comfortable fit in the hand and a similar keypad, although, quite naturally, the notation is somewhat different from the 125.

Also included is a handy pocket-sized user guide.

## Setup and Programming

To get going, I connected it to my PC using the supplied lead. Following this, I ran the *FreeSCAN* software (Figs. 3 and 4).

This programming suite enabled me to quickly load some of my local are channels into the radio.

Unlike the 125, which has 'memory-banks', the 325 model employs the format found in other Uniden models, comprising of *Favourites, Systems, Groups*, and *Quick Keys*. This link should help explain the concept: https://tinyurl.com/y6tfv8hq

Because they both share a similar format, by using *FreeSCAN*, I was able to import a stored *Fill* list, compiled for my BCT15X, and upload it to the 325. Within a couple of minutes, I had programmed the scanner.

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ALL PICTURES: KEITH RAWLINGS

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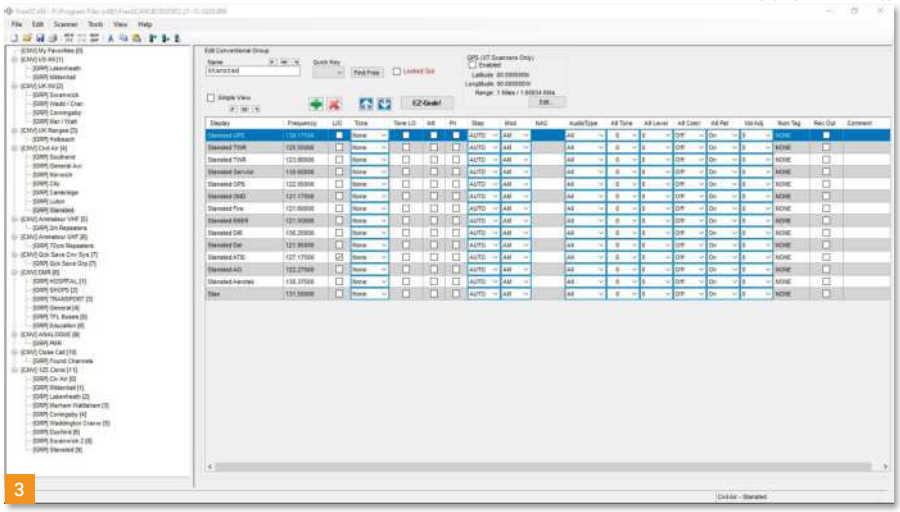
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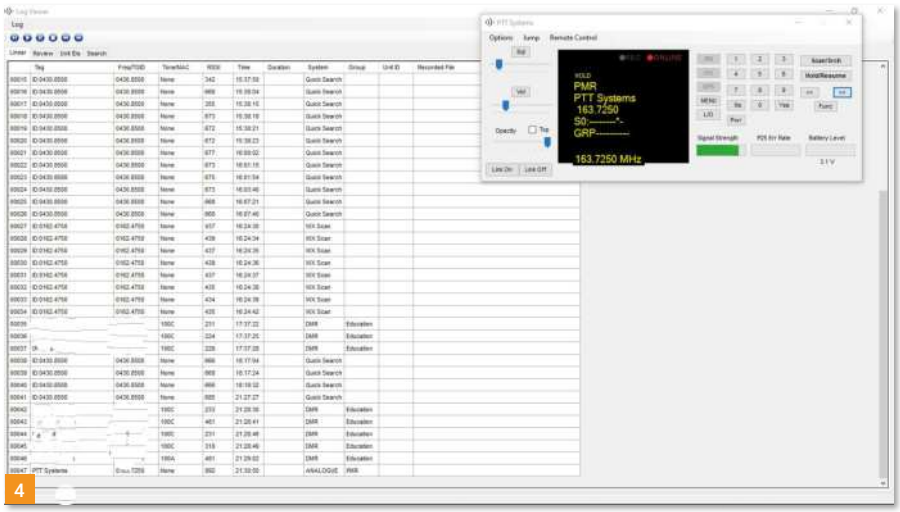

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However, as the 15x is 'analogue', there are, of course, no digital memories programmed into it.

I added a couple of known DMR channels to it and again uploaded it to the radio.

I connected the 325 to my discone aerial and selected one of the channels which I programmed for my local UHF repeater, GB3BZ. This repeater is DMR-enabled; after a short while, I was rewarded with a decode, proving the DMR option worked.

## Close Call and Sensitivity

With the *Close Call* feature selected, the scanner soon captured light aircraft working 130.550MHz going into nearby Andrewsfield, and also the occasional airliner, flying almost overhead, changing frequency from Stansted to London.

I would have liked to have taken the set out on a few 'ferret-run', but with COVID restrictions in place, I could only manage an essential trip locally to a shopping centre which was almost deserted.

Close Call did, however, pick up and decode an already known DMR channel.

The opportunity was taken to use the 325 while out walking. About a quarter of a mile west of here, the land rises significantly, so much so that I can see my house and I stand about level with my aerials.

There is a part of the footpath that is out in the open and is quite a good site for radio, so I spent a bit of time here scanning for signals using a telescopic whip fitted to the 325.

I noted quite a number of active channels on VHF and some UHF transmissions from Stansted some miles to the west. However, in the open, as this space is, and during the winter months, the wind can be quite cold, so I did limit my time here.

But it was long enough to tell me that the 325 does not lack sensitivity.

## Working From Home

Back home, I undertook some more extensive monitoring using my base discone and managed to log some DMR business repeaters on both VHF and UHF. Some of the VHF ones were a surprising distance from here according to *WTR Browser Live View*.

Needless to say that airband reception on both VHF and UHF was good as well.

Sat side by side with my Uniden UBCD3600XLT. When connected to the same aerial via my multi-coupler, I found that both sets were adept with DMR decodes – if there was a signal that one could not decode then the other would also not decode.

A quick check on sensitivity revealed around .4uv for 12 dB SINAD on FM at 455MHz, which is OK.

I did not notice any breakthrough or IMD problems with this receiver.

## Key Operational Details

Getting back to the workings of the 325, memory structure aside, in some ways it operates in a similar way to the 125. Direct frequency entry can be made with *Hold <enter frequency> Hold* as with the 125, and *Mode* and *Priority* may be selected from the keypad. *LockOut* works in the same way also.

Unlike the 125, the 325 has a keypad Menu, and the user is presented with options more similar to a 3500/15X than the 125, such as *Search/Close call options/ Search For*.

On account of its digital capabilities, some of the items will be more familiar to users of the Uniden UBCD3600XLT, such as *Digital Waiting* and *Digital AGC* and so on.

One of the menu options is *Program*

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**Fig. 1: The Uniden Bearcat UBC125XLT and BCD325P2 models side-by-side. Fig. 2: The belt-clip on the Uniden Bearcat BCD325P2. Fig. 3: The *FreeSCAN* software in *Programming* mode. Fig. 4: *FreeSCAN* in *Control* mode. Fig. 5: The *Bandscope* function on the Uniden Bearcat BCD325P2. Fig. 6: The Uniden Bearcat BCD325P2 out of the box.**

*Location*. Here, waypoints may be stored for use with the optional GPS unit. Among the options that have already been pre-set are *POI (Places of Interest), Dangerous Xing (crossing)* and *Dangerous Road*.

As in other Uniden models, there are pre-programmed *Search Banks* and *Custom Search Banks* which may be changed as needed. One option I thought would be of limited use, due to the size of the display, but worked well in use, was the *Band Scope*.

## Band Scope Function and Audio Quality

Accessed by pressing the *Func/3* key, the scanner can display, in real-time, any radio activity within a user- set frequency range. To do this, the radio searches around a frequency previously entered by using *Hold <enter frequency> Hold* and displays busy channels and signal levels on the screen.

The search span and frequency steps can be set, by stepping through the functions using the *.(no)* key. The span parameter can be adjusted from 200kHz to 500MHz(!); by pressing *Hold* the sweep can be stopped, and any signals found can be monitored (Fig. 5).

The audio quality was good for such a small speaker but running at high volume drained the batteries somewhat more quickly.

Battery life varied with use, and I found that about 4 hours could be expected from a pair of 2500 mAh Duracell rechargeable batteries, using an earpiece.

One thing the 325 has inherited from the 125 is that the keypad is not backlit, and I have found this a drawback on some occasions.

For a more extensive list of this scanner's features and functions, you can consult one or more of the weblinks at the end of this article.

## In Conclusion

The 325 was not a disappointment, and it proved to be a very effective and capable scanner. It is similar in operation to the BCX15X/UBC3500XLT with very similar system layouts (Figs. 1, 2, 5, and 6).

It is, however, more complex than the 125. However, if some thought is given when structuring a *Fill* list for programming, then this need not be a problem, and the use of *FreeSCAN* (Figs. 3 and 4) helps with this task.

I think the 325 could best be described as a 3600 (without SD card/Recording features) using a 3500/15X format and built into a 125 case. APCO Project 25 and trunking will be of limited use in the UK, as will be the weather channel features and (Fire) Tone Out.

DMR (Or NXDN) however, is a different story and I found the 325 works very well on this mode. However – as is usually the case – I found that reasonably good signal is needed for a good-quality decode.

Like in other models in the Uniden range, *Close Call* works well capturing nearby transmissions.

This is a great feature to have, especially when 'out of area' or at events such as airshows where the local ATC/ Display frequencies may not be known. Furthermore, *Bandscope* is a great aid to finding signals too.

The scanner has more memory channels that anyone could need, and its size makes it a great scanner for use 'on the go' (when we can do that again). The set is big enough to easily operate but small enough to keep in a pocket. It has a nice bright and clear backlit LCD display.

To sum up, I found the Uniden Bearcat, 325 to be a great little scanning receiver. It is compact, reasonably easy to use, makes a good job of searching for, and monitoring of, signals, and I greatly enjoyed using it.

I know that a few units of this model have found their way into the UK, and I think that, if the set were to be sold in Europe, it would be very popular.

Prospective purchasers would have to shop around, but at the time of writing costs found in the USA were around the $449.99 mark+$75 for the DMR upgrade. So around £390 plus any import costs.

***N.B:*** *The main issue with obtaining this scanner is that it has to be imported and will be liable for import duties, in addition to any 'handling- fees' that may arise. Also, there is the issue of technical support, if the set should develop a fault, as it might not be possible to get a repair done in the UK. Therefore, careful consideration of the likely cost of importing and lack of UK support would have to be undertaken.*

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# There's Magic in the Air Tonight...

**Tim Kirby**
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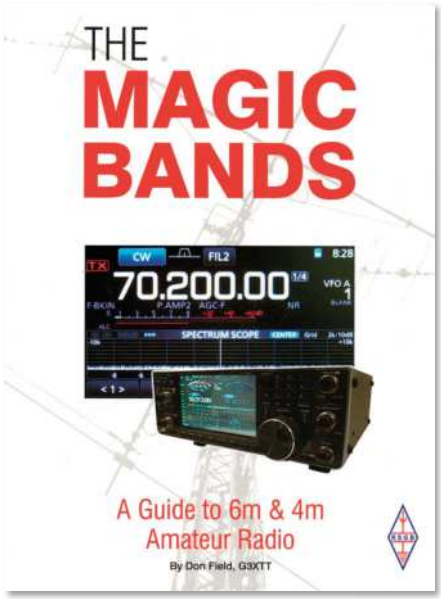
**Tim Kirby takes an in-depth look at an exciting new book written by Don Field G3XTT, the editor of our sister magazine Practical Wireless. The book follows on from Don's former publication Six Metre Handbook.**

A copy of *The Magic Bands – a guide to 6m and 4m Amateur Radio* landed recently on the operating desk here. It is written by the editor of *Practical Wireless*, Don G3XTT and published by the RSGB. It runs to 224 pages and aims to appeal to all six and four-metre enthusiasts whether they are newcomers or 'old-hands'. The book is a reworking of Don's 'Six Metre Handbook' which was first published 12 years ago.

This is an extensive revision, and significantly, in my view, incorporates useful information on 'digital operating techniques' as well as more traditional operating. Justin G0KSC has contributed two new antenna designs (one for each band) to the book, which will be of great interest to many. The propagation chapter is comprehensive, and I was pleased to read a section on Short-Path Summer Solstice Propagation (SSSP) which has only really been recognised in the last 15 years and is responsible, from Europe on 6m, for the early-morning-openings into Japan and the Far East, as well as the afternoon openings into the West Coast of the USA.

It is nice to see 70MHz covered in the book. Despite being 'close' in frequency, six and four metres are two quite different animals, with 'four' being a little more understated than its' showy cousin! So, you'll find quite a lot more in the book about six metres than four, but there is plenty of information about four metres – certainly enough to answer all the question you might have when getting onto the band for the first time or to 're-enthuse' you if you are thinking of returning there.




*The Magic Bands – A Guide to 6m and 4m Amateur Radio.* Don Field G3XTT
Radio Society of Great Britain
ISBN: 9781 9101 9397 6

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See page 15

The book is well-illustrated with many interesting pieces of equipment, and QSLs, expeditions and other graphics are all shown. It is written in an engaging style and I quickly found myself absorbed when I picked it up to flick through for a first impression. Don has done a good job in appealing to both the long-standing VHF operator (I suppose I have to count myself as one) who will enjoy some of the 'nostalgia' about past contacts, 'DXpeditions' and the like, which are all mentioned. However, newcomers to the bands will find plenty to enthuse and inform them about the bands and how to build their station.

If you enjoy 'Six-and-Four', you will love this book, which you can find on the *RadioEnthusiast* website priced £15.99 with £2.99 delivery to the UK and £8 to Europe. The book is also available on Kindle, which is a nice touch.

https://tinyurl.com/kje1cz75

# Radio News

**EARTH'S EVER-SHIFTING MAGNETISM:** On a day-to-day basis, most of us probably take for granted how much Earth's deep inner workings affect some of modern life's conveniences, like the relative ease with which we find our way from place to place by plane, boat, or automobile or on foot. Roughly 2,900 km below the planet's surface, convection of molten iron and nickel in the outer core generates Earth's magnetic field, which guides navigation technology from handheld compasses to complex automated systems. To help these systems make sense of the magnetic field—which constantly shifts about, sometimes gradually and sometimes not—and navigate accurately, they make use of models that provide assessments of the current state of the magnetic field and predictions of how it will change in the future. One such model is the World Magnetic Model (WMM), a geomagnetic reference model representing the main component of the magnetic field—that is, the field produced by Earth's outer core 'Geo-dynamo'. The WMM is widely used by government, industry, and the public for orientation and navigation. For example, the U.S. Federal Aviation Administration relies on the WMM to provide accurate magnetic field referencing in the National Airspace System, including for runway numbering. NOAA uses the WMM in nautical charts and for orienting ocean reference station buoys. It is also used by government and industry in antenna tracking, attitude control of aircraft and spacecraft, surveying, and mapping. And as the WMM is embedded in billions of handheld electronic devices, including in navigation apps on smartphones, it is a truly ubiquitous scientific product. The model – first named the World Magnetic Model in 1990 – is a modern-day successor to magnetic field mapping efforts dating back to 1701, when Edmond Halley first published a magnetic chart. Today's WMM is developed in a partnership between NOAA's National Centres for Environmental Information (NCEI) and the British Geological Survey (BGS) and is a joint product of the U.S. National Geospatial-Intelligence Agency (NGA) and the U.K.'s Defence Geographic Centre. Monitoring the magnetic field and maintaining the WMM to support all these applications is a continuous effort for these agencies and one that occasionally poses unexpected and timely challenges.
(SOURCE: AGU; EoS, January 2021; Chulliat et al (2021) Eos, 102).

https://doi.org/10.1029/2021EO153457
https://tinyurl.com/y6qmub5w

DAVID SMITH

# New Rules for Drone Users & Russian ATC

**David Smith**
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**David Smith explains new rules for drone users and Russian moves to measure aviation altitudes in feet, rather than metres. He also shares Part Two of an overview of ATC operations at London Gatwick Airport.**

New rules on how pilots can operate their drones came into force in December 2020. These align with similar regulations across all EU member states, Norway and Iceland, and will also be mirrored by the UK. The new regulatory framework makes it clear where drones can be flown, as well as making it easier to trace owners. The distinction between *commercial* and *recreational* use has been removed, potentially paving the way for many more drone uses. Up to now, drone legislation has been confusing and varied from nation to nation.

Under the latest rules, even small drones will need to be registered with the relevant aviation authority, which in the UK is the Civil Aviation Authority.

**https://www.caa.co.uk/home**

This will ensure that authorities can trace who owns a drone if they are used irresponsibly or flown somewhere they are not allowed to be used. There will be three new types of drone category: 'high', 'medium' and 'low'. First, 'low-risk' or 'open-category' drones will not require any authorisation but will be subject to strict operational limitations. Second, 'medium-risk' or 'specific-category' drones will have to have authorisation from the national aviation authority, based on a risk assessment. Third, 'high-risk' or 'certified-category' drones will need to follow aviation rules; this will apply to future drone flights with passengers too.

The low-risk category, which accounts for the majority of 'hobbyist' drones, will be managed through the CE mark, which is a process for products sold in Continental Europe to ensure they meet health, safety and environmental standards. However, drones within this category will also have additional rules about where they can be flown. The details are as follows: (1) A1 - drones weighing less than 250g (0.55lb) can be flown over people; (2) A2 - drones weighing more than 250g but less than 2kg must be flown at least 50m (164ft) away from people; and (3) A3 - drones weighing more than 2kg must be flown well away from people.

Besides, UK-based users are still required to have passed the CAA's Official Theory test and to have obtained a *Flyer ID* to be allowed to fly any drone weighing over 250g within 150m of people.

The Covid crisis has seen some places

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## ATC Profiles 28: London Gatwick Airport (Part Two)

*[Part One: RadioUser, February 2021: 30; see also RadioUser, February 2021: 49 – **Ed**.].*

ICAO Code: EGKK IATA Code: LGW

**Frequency Monitoring Code (FMC)**
Pilots operating in the vicinity of – but intending to remain outside – the Gatwick controlled airspace and maintaining a listening watch only on the Gatwick Director frequency (126.825MHz) are encouraged to select SSR code 7012. Selection of '7012' does not imply the receipt of an ATC service. Aircraft displaying the code are not expected to contact ATC under normal circumstances, remain responsible for their own navigation, separation, terrain clearance and are expected to remain clear of the Gatwick controlled airspace at all times. When a pilot ceases to maintain a listening watch, code 7012 must be deselected.

**Ground Movement**
Ground Movement Control is in continuous operation and all surface movement of aircraft, vehicles and personnel on the Manoeuvring Area is subject to ATC authority. Departing aircraft, on first contact with Gatwick ATC, must state aircraft type, stand number and the code letter of the latest ATIS received; they must maintain a listening watch on the appropriate frequency. Pilots of departing aircraft are reminded to contact Gatwick Delivery for clearance 15 minutes before start-up, to allow for departure data to be processed. Pre-departure clearance by datalink is available at Gatwick for suitably equipped aircraft. When entering stand number, any pilots requesting pre-departure clearance by datalink must ensure that flight crew are reminded of the extreme importance of maintaining a careful lookout at all times and are at all times responsible for wingtip clearance. The taxiway lighting system is an aid to pilots when operating on the manoeuvring area during darkness or in poor visibility. Notwithstanding the taxiway lighting system, pilots continue to remain responsible for wingtip clearance. Gatwick Airport is equipped with an advanced surface movement radar utilising Mode-S. Aircraft operators intending to use Gatwick should ensure that Mode-S transponders can operate when the aircraft is on the ground. After parking, the Mode-A code '2000' must be set before selecting OFF or STDBY.

**Helicopter Operations**
All inbound and outbound helicopters must use the runways. Helicopter handling agents are to obtain slot allocation for all flights. Helicopters may not carry out direct approaches to or take-off from apron areas or taxiways. After landing, helicopters will ground taxi or air taxi to an allocated parking area (usually an adjacent stand). A Leader vehicle will normally be in attendance. While helicopters are operating on the manoeuvring area, extreme caution must be exercised regarding wingtip clearance and turbulence. All inbound and outbound helicopters must use the runways. Helicopter handling agents are to obtain slot allocation for all flights. Helicopters may not carry out direct approaches to or take-off from apron areas or taxiways. After landing, helicopters will ground taxi or air taxi to an allocated parking area (usually an adjacent stand). A Leader vehicle will normally be in attendance. While helicopters are operating on the manoeuvring area extreme caution must be exercised regarding wingtip clearance and turbulence.

**Holding**
Aircraft inbound to Gatwick from the Route Network will, after the initial routing, follow the appropriate STAR (Standard Terminal Arrival Route) to the holding fixes TIMBA (LUMBA when MAY VOR or DME not available) or WILLO (ASTRA when MID VOR or DME not available). For aircraft holding below 6000ft altitude, holding will be at Mayfield MAY VOR. (In light traffic conditions aircraft may be routed directly to MAY VOR above 6000ft).
Mayfield VOR/DME Holding Pattern: This procedure will be used by aircraft inbound to London Gatwick from outside controlled airspace after missed approach, via airways when instructed by London Control or when instructed by Gatwick Director.

**Inbound Traffic**
Headings and flight levels at which to leave the holding facility will be passed by ATC. Radar vectors will be given, and descent clearance will include an estimate of track distance to touchdown. Further distance information will be given between initial descent clearance and intercept heading to the ILS. On receipt of descent clearance, the pilot will descend at the rate he judges will be best suited to the achievement of continuous descent, the object being to join the glide path at the appropriate height for the distance without recourse to level flight. During intermediate approach (after leaving the hold until approximately 6nm before turning onto the ILS [Instrument Landing System] intercept heading), aircraft will be instructed to fly in the speed range 210kt – 220kt as required. Thereafter, and until established on final approach, the highest possible speed within the band is 160kt – 180kt. Inbound aircraft must be established at 160kt, on a stable approach at not less than 7nm from touchdown. The system is designed to maximize arrival capacity at Gatwick and to minimize noise disturbance in the areas overflown during the approach and aircraft commanders are requested to conform to low-power, low-drag procedures. The spacing provided between aircraft is designed to achieve maximum runway utilization within the parameters of safe separation minima (including vortex effect) and runway occupancy. It is important to the validity of the separation provided, and to the achievement of optimum runway capacity, that runway occupancy time is kept to a minimum, consistent with prevailing conditions.

**Mode S Barometric Pressure Setting Data**
London Terminal Control can downlink Mode S Barometric Pressure Setting (BPS) data. Therefore, if the downlinked pressure data is at variance with the BPS expected by ATC, pilots can expect an additional challenge. When ATC pass a reminder of the appropriate BPS, it is anticipated that the aircrew will cross check the altimeter settings and confirm set.

**Navaids**
When Runway 08L/26R is in use the only navigational aids available are surveillance radar and DME.

**Remote Holding Procedures**
Gatwick has a remote holding capacity to maintain the flow of aircraft by releasing occupied stands and pushback crews. Pilots are encouraged to request remote holding where departure restrictions, e.g. slot time would result in push back delay.

**Special VFR Flights**
The use of Special VFR clearances is intended to be confined to the following types of flight: Light aircraft which cannot comply with full IFR requirements and wish to proceed to or from London Gatwick Airport; light aircraft which cannot comply with full IFR requirements and wish to transit the Gatwick Control Zone. Special VFR [Visual Flight Rules] clearances to operate within Gatwick airspace, for proceedings to or from the airport, will not be granted to fixed-wing aircraft, if the reported visibility at the Airport is less than 3km, or if the reported cloud ceiling is less than 1000ft. Aircraft may be given a radar service whilst within the zone if, due to the traffic situation, ATC considers it advisable. It will remain the responsibility of the pilot to remain at all times in flight conditions which will enable him to determine his flight path and to keep clear of obstacles.

**Speed Limitation**
Departure Speed Restriction: To optimise the departure flow and assist in the separation between successive departing aircraft, a speed limit of 250kts Indicated Air Speed (IAS) below FL100 is applicable until removed by ATC. ATC may remove the speed restriction by using the phrase "No ATC Speed Restriction". Pilots are reminded that this phrase does not relieve the pilot of the responsibility to adhere to the ground track of the Noise Preferential Route, which may require a speed/power limitation. If for any reason pilots are unable to comply with the 250kts IAS speed restriction, the pilot should immediately advise ATC and state the minimum speed acceptable. If a pilot anticipates before departure that they will be unable to comply with the speed restriction, they should inform ATC when requesting start-up clearance, stating the minimum speed acceptable. In this case, the pilot will be informed before the take-off of any higher speed limits.

**Use of Runway 08L/26R**
Runway 08L/26R is a non-instrument runway and will only be used when Runway 08R/26L is temporarily non-operational, for reasons of maintenance or an incident. Runway 08R/26L is closed regularly to allow maintenance to take place. Runway 08L/26R cannot be used simultaneously with Runway 08R/26L, because of insufficient separation between the two. For this reason, extensive safeguarding procedures are required before Runway 08L/26R can be activated, and the runway is not available on request by pilots. Lighting for the closed runway and parallel taxiway will not be visible on approach.

**Visual Reference Points (VRPs)**
Billingshurst; Dorking; Guildford; Handcross; Haywards Heath; Tunbridge Wells.

**Warnings**
In low visibility at night, the apron and car park's floodlighting may be seen before approach lights on 26L and 26R approaches. Pilots are warned, when landing on Runway 26L/R in strong southerly/south-westerly winds, of the possibility of building induced turbulence and wind shear effects. Arrivals: due to disruption to the ILS signal during Airbus A380 operations, pilots can expect late notification of only RNAV approach availability.

relax regulations to allow drones to be used to fly medical supplies, with a recent test from Cornwall to the Isles of Scilly carried out. Meanwhile, the Royal Mail tested drone deliveries for the first time in December 2020, with a parcel drop to a remote lighthouse on the Isle of Mull.

## Russian ATC Developments

Russia has never been in much of a rush to join (most) of the rest of the world, in terms of using metres (rather than feet) to measure height in aviation, but they are slowly getting there! Way back in 2011, Russian aviation authorities decided that they would start using feet instead of metres above 'Transition Altitude'. So, traffic over-flying the country did not have to worry about sudden changes to metric levels, but any crews descending into Russian airports still needed to refer to conversion tables once they went below the transition.

Briefly, *Transition Altitude* is the altitude at (or below) which the vertical position of an aircraft is controlled by reference to altitudes. The *Transition Level* is the lowest available flight level available for use above the Transition Altitude. Flight Levels are based on a standard barometric pressure setting of 1013.2 hectopascals (hPa) so that en-route variations in pressure can be ignored.

The only other countries still retaining metric levels are China, Mongolia, North Korea, and certain former Central Asian Member States of the Soviet Union.

N.B.: This month's aircraft photographs show a *P-3 Orion* of the German Navy (*Bundesmarine*) at Cosford Airshow 2018 and a *Beech 18* at Duxford.

**https://tinyurl.com/1qcc0acw**

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# Early Wireless Equipment and the Final Years of Paul Nipkow

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**Keith Hamer and Garry Smith look at early radio pioneers, follow the invention of the coherer, look at early wireless equipment, and close their mini-series on television pioneer Paul Nipkow.**

Guglielmo Marconi (1874-1937) is often regarded by many people as the 'inventor' of wireless. He was the first person to put wireless into the realm of a practical means of communication, rather than a laboratory experiment. However, many other inventors are also associated with the earlier development of the theory of communication without wires.

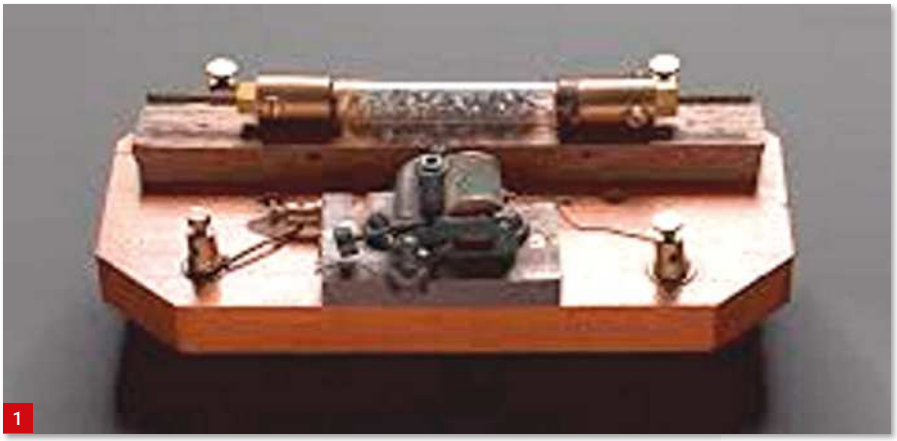
One of the early pioneers was James Clerk Maxwell (1831-1879). Basing his theories on the experimental research work of Michael Faraday (1791-1867) he gave to the World his *Dynamical Theory of the Electromagnetic Field*, in 1864. He supported his findings with mathematical proofs, and so paved the way for numerous subsequent investigations.

However, it was not until twenty-four years after James Clerk Maxwell had predicted the possibility of producing ether waves that they were produced experimentally by the German physicist, Heinrich Rudolph Hertz (1857-1894). Hertz succeeded in creating electric waves, and in detecting their presence, thus confirming James Clerk Maxwell's predictions.

At that time, practical wireless communication over any distances had not been achieved, nor had *tuning* been discovered; it was not possible to pick out a particular wireless transmission from any number of those that were being made on different frequencies.

## Discovery of the Coherer

In the following ten years, great advances were made - particularly in the discovery of various devices which would respond to the 'Hertzian Waves' and thus indicate their presence at a distance.



1

The inventor and spiritualist Oliver Lodge (1851-1940) invented his first *coherer* in 1889, for which he used two metal spheres separated only by a minute air-gap.

A coherer was a primitive form of radio signal detector used in the first radio receivers during the wireless telegraphy era. It consisted of a tube containing loosely packed metal particles. The waves caused the particles to 'cohere' (or form a mass), resulting in a change in the current through the circuit.

In 1894, Professor Édouard Eugène Désiré Branly (1844-1940) found that metal filings would *cohere* if Hertzian waves were produced in their vicinity (Fig. 1). In 1896, Guglielmo Marconi applied for his first patent for a coherer and de-cohering circuits intended for the reception of wireless signals.

During naval manoeuvres in 1898, wireless telegraphy was carried out up to a distance of 60 miles when Captain Jackson, R.N. (later to be promoted as Admiral of the Fleet Sir Henry Jackson) collaborated with Marconi and the British Post Office.

## Early Wireless Equipment

It is interesting to peruse magazines and newspapers from the early days of radio to marvel at some of the equipment offered to would-be listeners of the wireless.

One example which caught our attention was the *Neutrosonic Seven Radio Receiver*. This was produced by the *Igranic Electric Co. Ltd.*, based in London, and made available in 1928.

This is their advertisement from 1928: *"The Igranic Neutrosonic - the portable set that makes distant radio reception so good as to be almost incredible. Compact, needing no outside aerial or earth, it may be taken and used anywhere. It becomes an accessory of your car - a companion of your travel. But you must see it, operate it, hear it, to appreciate fully its unique qualities. Write for a free copy of "The Giant Stride " - a fascinating account of extraordinary radio development. Igranic Radio devices put life into a circuit - life in the zest and virility they give to results - life in the extraordinary length of time they continue to give such complete satisfaction. Write for lists describing our latest range of components. Dept. J273, Igranic Electric Co. Ltd., 149 Queen Victoria Street, LONDON."*

It is very tempting to try and order one but, alas, the *Igranic Electric Company* is no more. The company was formed on August 14th, 1913. The name *Igranic* was chosen because some of the early products the company manufactured were motor starters. These were built on bases of slate, which looked like granite with resistances, wound with iron wire, hence the name 'Igranic' was coined.

In 1959, the firm joined forces with *Brookhirst Switchgear Limited* to form *Brookhirst Igranic Limited*. In 1971, the American firm of *Cutler-Hammer* of Milwaukee bought the company for 6-million dollars. By 1978, the firm was known as *Cutler-Hammer Europa* and became part of the *Eaton Corporation*.

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**Fig. 1: Branly's coherer of 1894; it used metal filings, activated by 'Hertzian waves' and was improved by Sir Oliver Lodge. Fig. 2: The German 'Third Reich' television station headquarters at the *Reichs-Rundfunk-Gesellschaft* in Berlin. Fig. 3: One of the TV cameras used for the 1936 Summer Olympic Games in Berlin. Fig. 4: Paul Nipkow.**

In the 1980s, the name was changed to *Eaton Limited*. In 1996, *Eaton Engineering* announced that the Cutler-Hammer Sports ground was to close as the number of workers employed by the company had gone from over 2,000 to less than 70. In 1999, 38 jobs were lost leaving the number of people at the Bedford factory at just 71. Shortly afterwards, the factory finally closed.

## Early Television Pioneers: Paul Nipkow - Part 4

We conclude our series about Paul Nipkow (Parts 1-3 and Further Reading: are in *RadioUser*, September 2020: 57-58; November 2020: 25-27; and January 2021: 60-61; see also July 2020: 28) with a final look at Nipkow's work, some of which, made it possible for Germany's 'Third Reich' (1933-1945) to air its first propaganda television broadcasts.

The station's headquarters were located at the *Reichs-Rundfunk-Gesellschaft* (Fig. 2), and the station could only be received in the vicinity of Berlin. It became very popular when it broadcast the 1936 Summer Olympic Games held in that city (Fig. 3). Approximately 160,000 viewers watched the events unfold on relatively scarce private televisions, and in public television booths, which had been specially installed.

Between 1942 and 1944, the Third Reich also opened a television station in Paris with the transmitter atop the Eiffel Tower to broadcast programmes in German and French. In 1944, the station was closed

down (as were most other cultural events) as a consequence of the approach of the Allied Armies in the Normandy Campaign.

Following extensive experimentation by Manfred von Ardenne in the early 1930s, electronic picture scanning techniques became increasingly prevalent and Nipkow's disc system became virtually redundant.

Nipkow became honorary president of the *Television Council* of the *Reich Broadcasting Chamber* and in 1937, he appeared on German television. During the War, Nipkow was, purportedly, responsible for the installation of closed-circuit television surveillance cameras and monitors at Gestapo headquarters in Brussels.

Paul Julius Gottlieb Nipkow died in Berlin on August 24th, 1940, two days after his 80th birthday. By government decree, he was given a state funeral.

## Resources


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- Gorton, K., and Garde-Hansen, J. (2019) *Remembering British Television: Audience, Archive and Industry* (BFI)
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- Norman, P. (2016) *A History of TV in 100 Programmes* (William The 4th)
- Wiessala, G. (2020) Demons, Fields and the 'Great Unifier': James Clerk Maxwell (1831-1879): *The Spectrum Monitor,* December 2020: 18
- Paul Nipkow and John Baird: **https://tinyurl.com/3wazvb2t**
- 'TV under the Swastika' (Video): **https://tinyurl.com/y6mbxrt4**
- 'Secret Broadcasters' (*Geheime Sender*): (Radio Resistance in Nazi Germany): **https://tinyurl.com/y2hur6gm.**


## DX-TV & FM News

For details of DX reception covering November and December 2020, plus the latest news about changes to television and radio services, please check out the *Radio Enthusiast* website: www.radioenthusiast.co.uk

## Stay Tuned!

Please send archive photographs, information, news, or suggestions for future topics to: Garry Smith, 17 Collingham Gardens, Derby DE22 4FS or contact us via the e-mail addresses at the top of this column.

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## ICOM

Icom have been building radio receivers and scanners for a variety of applications for many years, enabling professionals and Amateur enthusiasts to monitor an increasing number of broadcasts. Icom's receiver and scanner range includes models that connect to your home PC, desktop or base-station receivers,

### Handheld

**IC-R6** 100 kHz–1300 MHz AM/FM/WFM 1300 memory analogue scanner ..... **£199.95**
**IC-R30** 100 kHz-3300 MHz All mode professional digital scanner ..... **£569.95**

### Base

**IC-R8600** is a super wideband communication receiver that covers the radio spectrum from 10 kHz to 3 GHz. It also has the capability to decode selected digital communication signals including, D-STAR, NXDN, dPMR and P25 ..... **£2499.95**

### Accessories

**BC-194** drop in charger for IC-R6 ..... **£21.95**
**CP-18E** cigar lighter cable ..... **£24.95**
**CS-R6** cloning software for IC-R6 ..... **£34.99**
**SP-27** clear acoustic earpiece ..... **£24.95**
**BC-223** rapid charger for IC-R30 ..... **£59.95**
**BP-287** hi capacity 3280 mAh replacement battery for IC-R30 ..... **£74.95**
**BP-293** dry cell case (3x AA) for IC-R30 ..... **£34.99**
**CS-R30** programming software for IC-R30 ..... **£59.95**
**LC-189** soft case for IC-R30 ..... **£24.95**
**CS-R8600** software for IC-R8600 ..... **£69.95**
**RS-R8600** remote control software for IC-R8600 ..... **£99.95**
**RC-28** remote control system for IC-R8600 ..... **£279.95**
**SP-38** desk top speaker for IC-R8600 ..... **£149.95**
**SP-39AD** external speaker with DC power supply for IC-R8600 ..... **£199.99**
**AH-8000** 100-3300 MHz professional discone receiving antenna ..... **£209.95**

## bhi Noise Cancellation Products

bhi design & manufacture a range of DSP noise cancelling products that remove unwanted background noise & interference from noisy voice & radio communication channels to leave clear speech. Aimed at a number of different radio related & voice communication markets, our products incorporate unique Digital Signal Processing technology to enable clear communications from within noisy environments.

**NES10-2 MK4** Noise Eliminating Speaker replaces the MK3 version and removes unwanted background noise, hiss, hash, QRM, QRN, computer hash, plasma TV interference, white noise etc from speech, so that you can hear more clearly and listen stress free. Works across all radio bands and is also suitable for shortwave listening and for use in radio base stations. ..... **£119.95**

## Uniden

Uniden is the best known manufacturer of scanner radios in the world. Under its renowned "Bearcat" brand name, Uniden scanners are at the cutting edge of design and technology. Their high-end scanner radios, while complex, are used by radio hobbyists, media, businesses and at all levels of government and there lower end versions are beautifully designed and easy-to-use

**PRE-LOADED UBC-125 DELUXE AIR BAND KIT WITH ACCESSORIES JUST £219.95**

### Handheld

**EZI-33XLT** 78-174/406-512 MHz 180 channel analogue scanner ..... **£64.99**
**UBC-75XLT** 25-512 MHz 300 channel analogue scanner ..... **£99.95**
**UBC-125XLT** (best seller) 25-960 MHz 500 channel analogue scanner ..... **£139.95**
**UBCD-3600XLT** (NXDN Version) 25-1300 MHz Digital & Analogue scanner ..... **£479.99**
**SDS-100** Advanced 25-1300 MHz Digital & Analogue scanner ..... **£589.95**

### Mobile/Base

**UCB-355CLT** 25-960 MHz 300 channel analogue scanner ..... **£89.99**
**UBC-370CLT** 25-960 MHz 500 channel analogue scanner ..... **£119.95**
**BCT-15X** GPS enabled 25-1300 MHz 9000 channel analogue scanner ..... **£249.95**
**SDS-200E** Activated DMR+NXDN+ProVoice 25-1300 MHz Digital & Analogue ..... **£749.99**

### Accessories

**UBCD3600XLT** soft leather case ..... **£29.95**
**UBC-125/75** soft leather case ..... **£24.95**
**ARC-536** pro software for UBCD-3600XLT ..... **£49.99**
**ARC-536** basic software for UBCD-3600XLT ..... **£29.99**
**ARC-370** software for UBC-370CLT ..... **£24.95**

## DIAMOND ANTENNA

Based in Japan, Diamond Antenna manufactures a wide range of antennas and accessories for both hobby radio and commercial use. They are well known products that meet the highest standards in quality.

### Scanner Antennas

**D777** is a VHF/UHF civilian and Military air band receiving antenna. It has a gain of 3.4dB on VHF (120MHz) and 5.5 dB UHF (300MHz) with a length of 1.7m and SO239 socket for easy connection ..... **£64.99**

**D-190** is a high performance wideband discone antenna covering 100-1500 MHz including 10m RG58 terminated in PL259 ..... **£99.95**

**D-130M** is a Discone antenna with wide frequency coverage on receive 25 to 1300MHz and covers 6m (20W) and 2m (200W) when used with a transmitter. This model is supplied with 15m RG58A/U and 2 x PL259 plugs ..... **£129.95**

## WHISTLER

The Whistlers Scanners are USA designed and built to last – The TRX-1 & TRX-2 are our best-selling digital versions with sales 10-1 against any other brand. We have worked with Whistler to customise a UK band plan for these scanners! This ensures the radios cover UK bands in the correct steps and the correct mode. When a user does a service scan it will search in the correct steps for the selected band ensuring maximum received stations.

### Handheld

**WS1010** 25-512MHz 200 channel analogue scanner ..... **£89.95**
**WS1040** 25-1300 MHz storage for 1800 frequencies analogue scanner ..... **£299.95**
**TRX-1E** 25-1300 MHz best-selling Digital & Analogue scanner ..... **£419.95**

### Mobile/Base

**WS1025** 29-512 MHz 200 channel analogue scanner ..... **£99.95**
**WS1065** 25-1300 MHz storage for 1800 frequencies analogue scanner ..... **£279.95**
**TRX-2E** 25-1300 MHz best-selling Digital & Analogue scanner ..... **£499.95**

### Accessories

**TRX-1** leather case ..... **£29.99**
**MRW-TRX3** Triple hand held replacement antenna pack to increase performance ..... **£39.95**
**TRX-1 or TRX-2** SD Card – preprogramed with Airband, Marine, 446, FM/DMR/NXDN/25 Repeaters + FM/DMR simplex ..... **£19.99**

**LEATHER CASE for TRX-1 £29.95**

## FlightAware

Live Flight Tracking

FlightAware has revolutionized the world of USB SDR ADS-B Receivers with the FlightAware Pro Stick and Pro Stick Plus, high-performance USB R820T2 software defined radios (SDR) with a built-in RF amp for maximum ADS-B/MLAT performance. The first of its kind, FlightAware's Pro Stick is compatible with PiAware or any other device that supports USB RTLSDR receivers, and is less expensive than any other RTLSDR USB receiver in the world. The Pro Stick Plus adds a built-in 1090 MHz bandpass filter for increased performance and range of reception in areas with moderate RF noise as is typically experienced in most urban areas.

**Flightaware** Prostick Plus ..... **£29.99**
**Flightaware** Prostick ..... **£24.95**
**FlightAware ADSB** 1090MHz Band-pass SMA Filter ..... **£17.99**

## AIRSPY

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Airspy is a line of super popular Software-Defined Radio (SDR) receivers developed to achieve high performance at an affordable price using innovative combinations of DSP and RF techniques. The goal is to satisfy the most demanding telecommunications professionals and radio enthusiasts while being a serious alternative to both cost sensitive and higher end receivers. Airspy Radios feature world class reception quality and ease of use thanks to the tight integration with the de facto standard free SDR# software for signal acquisition, analysis and demodulation.

**HF+ Discovery** 0.5kHz – 31MHz VHF 60-260MHz SDR receiver ..... **£199.95**
**R2** VHF/UHF 24-1800MHz SDR receiver ..... **£209.95**
**MINI** VHF/UHF 24-1700MHz SDR dongle..... **£119.95**
**Spyverter R2** extend your AIRSPY coverage ..... **£59.99**
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## TECSUN

Tecsun is a world famous manufacturer of AM,FM and shortwave radios. They offer a great range of portable options from just £44.95

### Portable

**PL-360** This pocket world band radio, with AM & FM reception, keeps you in with the action from Long Wave , Shortwave(2.3-21.95MHz), FM (87-108MHz)..... **£49.99**
**PL-606** is a DSP-based portable LW/MW/FM/SW (2.3-21.95MHz) shortwave radio..... **44.95**
**PL-310ET** is a portable multi band radio covering FM 76-108 AM 522-1620 kHz SW 2300-21950 kHz LW 153-513 kHz..... **£49.99**
**PL-680** is a fully featured world band portable radio with SSB covering FM 87–108 MHz MW 522-1620 kHz SW 1711-29999kHz LW 100-519 kHz AIR 118-137 MHz..... **£149.95**
**PL-880** is the flagship portable radio fitted with analogue Hi-IF circuit, multi conversion , & DSP decoding technology, which greatly enhances the sensitivity, selectivity and reduces interference from close by stations. Covering FM 87-108 MHz, SW 1.711 – 29.999 MHz, MW 522 – 1620 kHz, LW 100 – 519 kHz..... **£189.95**

## MFJ

MFJ Enterprises, founded in 1972 by Martin F. Jue, is a manufacturer of a broad range of products for the hobby radio market. They specialise in station accessories, such as antenna tuners and antenna accessories. MFJ manufactures more amateur radio products than any other company in the world.

### Receiving Products

**MFJ-1022** 300 kHz – 200 MHz active antenna covers the HF to VHF bands. It easily plugs into your general coverage receiver or scanner ..... **£94.95**
**MFJ-1020C** 300kHz to 30 MHz tuned indoor active antenna system performs as well if not better than a long wire ten metres long. Tuned circuitry minimises intermod, improves selectivity and reduces noise. You can also use it as a tuned preselector with an external antenna ..... **£129.95**
**MFJ-1024** 50 kHz – 30 MHz active antenna complete with control unit, 15m coax and external antenna ..... **£197.99**
**MFJ-1025** 1.5-30 MHz noise canceller (alternative to the MFJ-1026) without the built-in Active Antenna. Plug your station antenna into the MFJ-1025 and your antenna system turns into a directional receiving array! ..... **£269.99**
**MFJ-1026** This unit is designed to eliminate local electrical noise even before it reaches the antenna socket of the receiver – it covers 1.8-30MHz – great just to only here the wanted signal in the clear. ..... **£279.95**

## Bonito

The Bonito brand defines over 38 years of reliable software in the field of worldwide weather data reception on board and of course Ham radio. Bonito is one of the leading software manufacturers for receiving weather information via shortwave radio, such as WeatherFax, Navtex, RTTY, CW and Synop as well as Satellite Fax Images from NOAA, Goes, ESA / EUMETSAT Meteosat. As well in Ham radio Software, SDR-Receiver and active Antennas and many more ham radio and DXer products.

**Boni-Whip** 20 kHz-300 MHz portable (17cm length) active wideband antenna..... **£109.95**
**MA305FT** MegActiv 9 kHz -300 MHz portable (30cm length) active wideband antenna..... **£179.95**
**POLORAN** 200 9kHz – 200 MHz broadband passive loop antenna. ..... **£179.95**
**GA3005** GigActiv 9 kHz–3000 MHz portable (19cm length) active wideband antenna..... **£379.95**
**MEGALOOP** FX 9 kHz – 180 MHz indoor/outdoor flexible loop antenna..... **£349.95**
**MD3000X** Mega Dipole 9 kHz–180 MHz active wire antenna..... **£389.95**

## ALINCO

Alinco is a Japanese manufacturer of radio equipment, established in 1938 in Osaka, Japan and has been a trusted source for radio scanners for years.

### Handheld

**DJ-X3ED** 100 kHz – 1300 MHz AM/FM/WFM 700 channel analogue scanner..... **£119.95**
**DJ-X11E** 500 kHz – 1300 MHz All mode 1200 channel analogue scanner ..... **£349.95**

### Base

**DX-R8E** 150 kHz – 35 Hz all mode 600 channel receiver..**£469.95**

### Accessories

**ERW-7** USB computer interface cable for DX-R8E..... **£39.95**
**ERW-8** USB Interface cable for DJ-X11scanner..... **£39.95**
**ESC-50** soft case for DJ-X11 scanner ..... **£23.95**
**EBP-74** replacement 1800mAh battery for DJ-X11 ..... **£34.95**
**EDH-36** spare dry cell case for DJ-x11 ..... **£17.95**
**EME-26** curly cord earphone..... **£10.95**
**EME-6** straight cord earphone ..... **£10.95**
**EPB-54N** high power battery for DJ-x3..... **£29.95**
**EDC-105** drop in charger for DJ-X3..... **£14.95**
**EDC-43** DC power cable for DJ-X3..... **£14.99**
**EDC-37** 12v DC cable for Alinco scanners..... **£9.95**
**EDS-17** remote head fitting for DX-SR8 ..... **£49.95**

## SDRplay

The people behind SDRplay are a small group of engineers based in the UK with strong connections to the UK Wireless Chip Industry. They have both software and hardware expertise and the RSP was designed by them here in the UK.

**RSPDUO** is a dual-tuner wideband full featured 14-bit SDR which covers the entire RF spectrum from 1kHz to 2GHz giving 10MHz of spectrum visibility..... **£239.99**
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**RSP-1A** it is a powerful wideband full featured 14-bit SDR which covers the RF spectrum from 1kHz to 2GHz. All it needs is a PC and an antenna to provide excellent communications receiver functionality..... **£99.95**

## AOR

AOR, LTD is a renowned Japanese communications equipment manufacturer established in 1978, headquartered in Tokyo, Japan, serves the monitoring enthusiasts, communication professionals, amateur radio operators and electronics industries throughout the world

### Handheld

**AR-8200MK3** super wide band 100 kHz-3000 MHz 1000 channels analogue scanner..... **£459.95**
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**AR-DV10** 100 kHz-1300 MHz Digital scanner with TETRA DMR. NXDN. dPMR. APCO25. D-STAR ..... **£939.95**

### Mobile/Base

**AR-8600** MKII 100 kHz-3000 MHz all mode analogue scanner..... . ..... **£649.95**
**AR-DV1** 100 kHz -1300MHz Multi mode digital base scanner..... . ..... **£1199.00**
**AR-5700D** 9 kHz – 3700 MHz Advanced digital communications receiver ..... **£4595.00**

### Accessories

**DA-3200** 25-3000 MHz professional discone antenna ..... **£169.95**
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WALES ONLINE

# Hobby Radio in Emergencies

**Peter Hyams GW4OZU**
gw4ozu@btinternet.com

**Peter Hyams**, RAYNET Controller for Pembrokeshire, looks at how vital Amateur Radio, CB and Network Radio can be in the context of emergencies, disasters, heavy weather, and event marshalling.

Way back in 1980, after studying at a south London technical college for my radio amateur's exam one evening a week for 8 months, I had to wait for two months for the exam results.

At last, one morning, a brown envelope dropped onto the front door mat – I had passed! In fact, there were four of us (all friends) who had enrolled on the course, and we all had passed.

Even after getting our licences, we continued to support the ever-growing CB radio movement of that time. In this period, many people were using illegally-imported AM sets; these could be easily monitored on any short wave receiver that covered 27MHz. That was in itself illegal. The GPO TV and radio licence only permitted members of the public to listen to the BBC, commercial broadcast stations and radio amateurs.

There were many amusing stories of 'shenanigans' involving GPO radio enforcement officers and ensuing police chases. I heard of one licensed amateur who spent the night in the cells after being stopped and arrested by the police until he could prove that he had an amateur radio licence.

It appears that many in the police did not understand the difference – and who could blame them – and I gather the amateur received an apology from the chief constable for wrongful arrest!

## Beginnings: The Rationale for Making CB Legal

I had never been quite so excited at passing the *Radio Amateur's Exam*; and to think that I could then join the amateur radio fraternity, purchase a radio, and start chatting (nervously) on the air! We all bought new VHF sets; without passing the 12wpm Morse code test, it was 144MHz and above in those days. I applied for, and quickly received, my new callsign: G8XXH.

A couple of months later we moved to rural Pembrokeshire in south-west Wales, so I became GW8XXH. I took the 12wpm Morse test in 1982 and was given GW4OZU.

The movement to legalise CB radio was becoming very large at that time, with rallies in Trafalgar Square, and people worrying the life out of their MPs to allow the American-style system here in the UK.

One of the arguments for making CB legal was that it could be used in an

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emergency to summon help.

All this lobbying worked because in November 1981 the UK was granted 40 channels of 27MHz FM at 4W.

New CB sets and antennas sold like hot-cakes, with dealers running out of stock and people having to wait for deliveries.

## Radio Excitement, RAYNET and CERT

It was then that I bought a Fidelity 1000 40-channel 4W FM mobile set (Fig. 2) and a Eurosonic 4W 40-channel handheld (Fig. 4). I still have them, and they still work well.

In addition to these, I now have a modern Midland Alan 48 Excel Multi (Fig. 3).

The airwaves quickly started to fill with CB operators calling 19 for a copy, and many nets and clubs started to appear. Some nets lasted all night long!

Some groups formed with a primary interest in the emergency use of this new hobby, and it was agreed that channel 9 would be reserved for this purpose. Consequently, anyone who started to chat on this channel was asked politely to move so that it could be kept clear.

You have to remember this was before the introduction of mobile phones and the internet, and with only GPO telephones available in most homes.

I had recently joined the Pembrokeshire Radio Amateurs Emergency Network (RAYNET). As a newly licensed radio amateur, I was learning all the procedures of an organisation that was formed back in 1953 after the devastating East Coast floods of that year. We were approached by one of the newly-formed local CB emergency groups called CERT (Community Emergency Radio Team). After some discussion about our different roles, we formed a working relationship. The group was run by a retired ambulance officer, so we had confidence in them.

## Extreme Weather in 1982

Little did we know that we would soon be put to the test. The January weather of 1982 was very severe in Pembrokeshire, with heavy snow starting to fall on the night of Thursday, January the 7th and not stopping until the Saturday afternoon of the 9th. We lost our electricity supply on Thursday night, due to snow causing short circuits on the overhead lines.

However, worse was to come: A warm front crept in and, on the 10th, it started to rain – and this was freezing rain. I clearly remember that night when the sky was full of bright flashes from arcing transformers, insulators and switchgear that were failing due to the ice. The main 400kV Supergrid pylons from Pembroke power station had collapsed at the substation, and they had pulled the insulators out of the wall. I was later told that there was 1 inch of radial ice on each cable, resulting in no less than12 tons of ice per span.

A large number of wooden poles that carry 11kV overhead supplies to customers had snapped under the weight of the ice, making quick repairs difficult as an old pamphlet of the time depicts (Fig. 5).

The photo on this leaflet was taken about a mile from our house. Note the road full of snow from hedge to hedge and our supply lying on the ground.

PETER HYAMS

**Fig. 1: The *Sea Empress* Disaster of 1996. Fig. 2: My trusty old Fidelity CB 1000 FM. Fig. 3: My dependable Midland Alan 48 Excel Multi CB Transceiver. Fig. 4: The Eurosonic 4W 40-channel handheld. Fig. 5: A South Wales Electricity Form ESF1 advice leaflet of the time. Fig. 6: Beach patrol with handhelds.**

## Emergency Responses

By the following morning, most of South Pembrokeshire was without power! The warm front receded leaving maximum daytime temperatures of -4C. This resulted in the water supply failing, due to the dead pumping stations freezing and cracking the pipes. Road transport was only possible by some 4X4 vehicles and tractors.

However, with 18ft snowdrifts, and lanes full of snow from hedge to hedge, outlying communities were unreachable.

As if this was not enough, large numbers of rural telephone exchanges failed due to their 48V battery banks going flat; many lines were down. Failure of the rural mobile phone network could even happen today, so I am reliably informed, since only a few bases have generator backup, and the rest has just a 3-hour battery backup.

This is where hobby radio communications in general – and CB radio in particular – came into its own.

## The Value of RAYNET

At the time, RAYNET had about 6 operators locally. They were able to get in touch with CERT who had about 10 plus members. The main idea was to get some idea of numbers of affected people, communities and areas requiring help. RAYNET was then able to relay this information, via VHF links, to the Dyfed County Emergency Planning Officer (CEPO) in Carmarthen, some 35 miles away.

The CEPO, along with Pembrokeshire County Council, were, in some cases, able to organise helicopter- food and fuel drops to outlying areas, whilst JCBs got underway digging out the roads. The RAF airlifted a pregnant woman to a hospital, along with a farmer who had fallen and broken his leg. Furthermore, coastal communities were supplied by boat from Milford Haven.

We were able to relay information regarding people requiring urgent medication to the authorities so that deliveries could be arranged.

There were also concerns for the elderly suffering from hypothermia. At the time, we were very thinly spread out indeed, but glad to be able to help where possible. Most of us spent all day on our radios – and also all night in some cases, on an arranged-shift-basis.

Radio propagation was quite difficult on 27MHz CB at times, owing to long-dis-

PETER HYAMS

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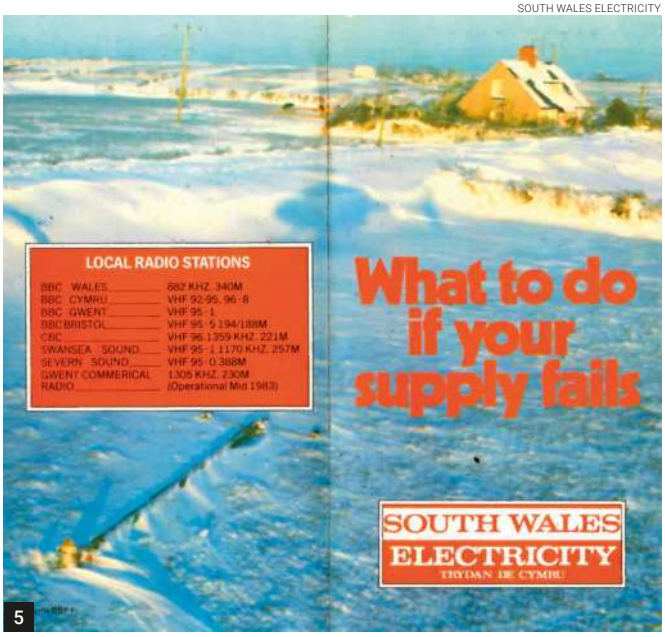
SOUTH WALES ELECTRICITY

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tance-skip blocking local communication. However, we persisted and managed to get the job done.

## A Snow BBQ & a Tall Ships Race

We were without power for a week at home, but I had a small 600W 240VAC generator, which gave me enough power to keep the fridge and freezer working and recharge my radio backup supply. The latter consisted of a 40aH car battery. After a few days, I started syphoning petrol out of the cars to keep the generator running.

We did have a nice BBQ in the garden on top of a snowdrift and watched as it slowly sunk into the snow. We used the old village pump for water as there was no mains water supply.

It took about three weeks to get most things back to normal.

It has to be said, looking back, that CB and amateur radio provided a vital service at that time of need.

Afterwards, CERT was written into Pembrokeshire's emergency plans, along with RAYNET. Therefore, we had regular meetings with the CEPO thereafter.

A few years later, Pembrokeshire RAYNET was asked to provide communications for the *Cutty Sark Tall Ships Race* in 1991 where we assisted the Police and ambulance service. That event took months of planning, because, given the crowds that swamped the area, the roads were impassable for the Emergency Services at some locations. Therefore, we relayed any emergencies to their control centre.

Once again, we employed CB radio and VHF amateur radio transmitters to pass messages. As an aside, I did get a good view of the Royal Yacht Britannia from the high ground at Angle Bay.

## The Sea Empress Disaster

The next major emergency we were all involved in was when the *Sea Empress* oil tanker ran aground on the 15th of February 1996 on rocks in the entrance to Milford Haven waterway, tearing a large hole in the hull and dumping 72,000 tons of crude oil into the sea (Fig. 1).

This was a major incident involving many agencies. Our RAYNET controller at the time was John Jones GW3IGG (SK 2007). John was a chemical engineer who worked for one of the oil companies in Milford Haven.

We couldn't have asked for someone better qualified to liaise with the authorities. After being contacted by the CEPO to mobilise, we called on CERT again to assist.

However, we found they did not exist anymore to any great degree, as numbers had declined in line with most CB activities of that time. We did, however, find a few enthusiasts with CB equipment to help. Our role was to report to the Milford Haven Port Authority HQ with the information they requested and to pass on requests from the beach masters for equipment and supplies to our operators on the beaches.

One of the most important jobs at the start of every day was to relay to the Red Cross and the Council how many bacon rolls and flasks of tea would be required!

As mobile phone coverage at the time was not very good, they relied on our operators with either CB or amateur VHF handhelds down onto the beaches for the main point contact (Fig. 6).

We used a VHF-to-UHF / UHF-to-VHF talk-through repeater with the UHF link to their HQ and VHF and CB to the beaches. This was all linked through a very well-equipped Land Rover parked high on a hill near Tenby.

Naturally, we had to work around the tides and could only access some beaches at low tide. We sent one operator with a CB handheld to Caldy Island (just off Tenby) by boat. He was to walk the entire coast path and report his findings so that we could pass them onto our RAYNET operator in their HQ.

In total, four CB operators and around 39 radio amateurs helped out during the emergency; some had travelled a considerable distance to assist over the three weeks it took to get on top of the mess.

We were then stood down.

## Other Major Emergencies

Since the time of our direct involvement with the *Cutty Sark Tall Ships Race* in 1991 and the *Sea Empress* oil tanker disaster in 1996, we have continued to assist with local events, having been requested so to do by various organisations.

These included a diversity of events, such as fun runs, horse riding events and Remembrance Sundays, during which I also ran my Public Address (PA) system. This requires a different set of skills and it can be quite stressful, especially when someone put a heel through a microphone cable, and it all went dead.

On another occasion, someone accidentally pulled on the speaker cable, which sent

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the stand crashing to the ground.

Mishaps aside, however, RAYNET Pembrokeshire, as we are now known, continues to hold exercises (as do most RAYNET groups). These involve map reading and sending data over radio links and so on, to keep to a high level of professionalism and preparedness.

Some of our current members are ex-military, and we are lucky to be able to draw on their skills.

Unfortunately, given the decline in CB radio, there are now sadly no longer clubs, organisations or individuals able to assist us if required.

*[If there is anyone out there, please contact either the author or the editor – **Ed**.].*

## Preparedness and Resilience

The last meeting (more than three years ago) I had with the Pembrokeshire CEPO was a training evening at the town hall and was open to interested organisations like the Police, Ambulance, RAYNET, HM Coastguard, as well as local council members.

At the time, the emphasis was very much on resilience and self-reliance in the community. The advice discussed at the gathering included having torches ready, having one wired telephone running off the exchange power, knowing who your local old and vulnerable neighbours are, and being aware of how to contact them, if the power should fail for extended periods, or in severe weather.

Alas, there are now very few CB enthusiasts dotted around in most towns and villages as they once were, although the current lockdown is leading to somewhat of a 'CB-Renaissance'.

Let us hope that mobile phones and the internet continue to work in similar severe weather events.

## PMR446, Zello and Broadnet

We have been off-supply twice in the last year for longer than six hours, due to faults and a very local lightning strike that badly damaged a neighbour's house and blew the top off the supply transformer.

RAYNET Pembrokeshire does, however, have a supply of PMR446 radios that we can hand out to helpers to establish local links if required. We have found this to be very effective and their range is quite good in open countryside.

Our group also uses *Zello* and *Broadnet* network radio channels. These offer good coverage but are, of course, internet/4G dependent. CB at 27MHz works quite well in rural settings as it had good groundwave characteristics compared to 145MHz. CB can be susceptible to continental interference at times.

CB and amateur radio have seen a significant increase in popularity as a way of keeping in touch, due to the Covid-19 lockdowns.

In addition to this, online amateur radio courses are available by contacting the RSGB.

You can even take the foundation exam online, and the RSGB reports in December's *Radcom* that, in October 2020, 2,000 candidates passed their foundation exam via remote invigilation. Sales of equipment have also seen a moderate increase along with people renewing their old amateur callsigns.

Against the background of an increased risk of severe weather events like flooding and storms in the UK, it could be a good time to have a radio and antenna setup ready, at home or mobile, to use when the need arises. And of course to have friendly chats to people around you. I know of one friend found a partner this way!

So, why not get that old radio set down from the attic, get on the air and see who is around. You might be pleasantly surprised.

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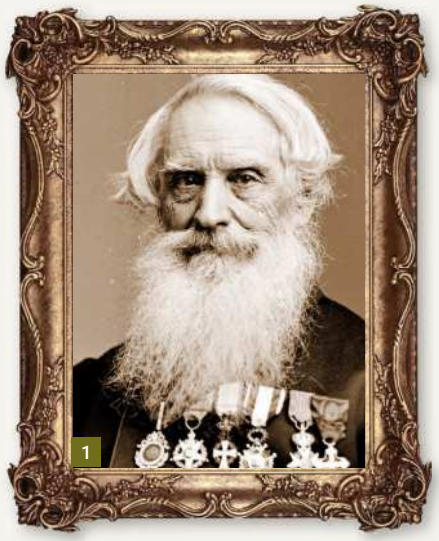
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# The Controversial Lightning Man

**Scott Caldwell** reviews the life and achievements of the American painter and radio pioneer Samuel Finley Breese Morse and looks at the development of his eponymous code.

**Scott Caldwell**
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The word 'telegraph' is derived from Greek (τῆλε [têle], *'at a distance'*, and γράφειν [gráphein], *'to write'*). The phrase thus translates into English as 'to write far'. This is quite apt in describing what a telegraph system enables people to do. Samuel Finley Breese Morse (Fig. 1, 1791 – 1872) was an American painter and inventor who is best remembered by history for connecting all four corners of the Earth, under the unified language of Morse code, and through his American electromagnetic telegraph.

His system would become the world standard and it was extensively utilised by *Western Union*.

Today, Morse code is still utilised in various areas of radio communication, such as Long Wave NDBs and amateur operators. Many historians regard Morse code as an expression of the '*Internet of the Victorian Age*', laying the groundwork for the communication revolution experienced in the late 20th century.

## Early Life

Morse was born on Wednesday 27th April 1791, in Charlestown, Massachusetts (USA). He was the first child of geographer and Pastor of the First Congregational Church, Jedidiah Morse (1761 – 1826) and Elizabeth Ann Finley Breese of New Jersey (1766 – 1828).

Jedidiah Morse connected with prominent members of society, most noticeably the first American President George Washington (1732 – 1799). He once sent the President a sermon on the duties of the citizens of the United States, and Washington wrote him a pleasant letter of thanks. Distinguished foreign visitors to the US often brought letters of introduction and were entertained at the Morse family home.

Elizabeth Ann Finley Breese also had distinguished roots, her father was a judge and her grandfather had once been elected as the President of Princeton College.

## Formal Education

Morse's formal education commenced when he turned nine years old. He was enrolled at the Phillips Academy in Andover, Massachusetts. Remarkably, his academic progress at the Phillips Academy was recorded as "*mediocre*". His main passion was directed towards the arts; much to his parent's *chagrin*; they would always continue to encourage him to embark on a stronger academic direction.

Many family members regarded the young Morse as rather 'fickle' in his interests. These ranged from fine art and photography to politics and physics. Morse's father was a great and often domineering presence. He was always providing instruction and advice. This would stand well for the future, and, tellingly, Morse kept his father's letters for the rest of his life.

## An Academic Career

Morse's academic run had a rather slow start at the Phillips Academy, and his best performance – pardon the pun – was always reserved for the arts. Despite his 'mediocre' academic performance his parents managed to secure a place at Yale College. This helped him to broaden his academ-

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ic horizons and develop an interest in the emerging scientific discipline of electricity.

The President of Yale at the time was Dr Timothy Wright, a close friend of Morse's father. When Morse first attended the college, his father requested that Dr Wright would give some attention to the youth. Whilst, at Yale, Morse was taught by his role-models, Professor Benjamin Silliman (1816 – 1885) who specialised in Chemistry and Professor Jeremiah Day (1773 – 1867) who focused on 'Natural Philosophy' ('Science').

## Artistic Achievements

However, to appease his parents, Morse obtained employment as a clerk in Daniel Mallory, a Charlestown bookstore. His father eventually reversed his position concerning his son's potential career in the arts and he allowed Morse to travel to England, where he worked at the Royal Academy of Arts, learning from such luminaries as the renowned American artist Benjamin West (1738 – 1820).

He also found the time to network and socialise and cultivated friendships with accomplished artists, poets, and actors. Based on his experiences and influences, he adopted a 'romantic' painting style, depicting heroic characters and epic historical events, in grand poses and vibrant colours. In 1812, his plaster statuette *The Dying Hercules* was awarded a prestigious gold medal from the *Adelphi Society of Arts* in London. His follow-up painting that depicted the same subject matter was also critically acclaimed by the Royal Academy.

On Tuesday, September 29th, 1818, Morse married Lucretia Pickering Walker (1799 – 1825) in Concord, New Hampshire. His professional life was initially contented. In 1821, Morse's standing was further enhanced when he was commissioned to paint portraits of distinguished members of American society, including cotton gin creator Eli Whitney (1765 – 1825) and English dictionary editor Noah Webster (1758 – 1843).

## Tragedy Strikes

In 1825, Morse was in Washington DC painting a portrait of the Marquis de Lafayette when a messenger delivered a letter informing him that Lucretia had tragically died at the young age of just 25 years old. Morse immediately returned to the family home to discover that Lucretia had already been laid to rest.

Morse hoped one day to remarry and had several potential love interests. On Thursday 10th August 1848, he eventually married Sarah Elizabeth Griswold (1822 – 1901), who was 26 years old.

They subsequently had four children, one daughter and three sons.

However, the next year, his father died; his mother passed on three years later. These deeply tragic experiences would have a profound impact on his future career, leaving Morse with renewed determination to perfect the technology of long-distance communication.

## Art or Science

Whilst, travelling to the US in 1832, Morse met fellow inventor Charles Thomas Jackson (1805 – 1880). They discussed how an electronic impulse could be carried on a wire for a considerable distance. This intrigued Morse: in his mind's eye, he could see the device required to turn his dream into reality. He also made some preliminary sketches to document the visions that had formed in his mind. When working at the New York *Athenaeum*, Morse cultivated a friendship with Professor James Freeman Dana, who was lecturing on the emerging disciplines of electricity and electromagnetism. To make ends meet, and financially look after his three children as a sole parent, Morse began offering tuition to some would-be artists.

## The Emerging Code

By November 1932, Morse faced the greatest dilemma of his life: Should he give up his profession as a semi-successful artist and pursue his emerging passion for the idea of electric telegraphy? A career change would result in no regular income, a pressing concern for a family man. He concluded that it was for the best to carry on painting full-time and develop and research his telegraph system in his spare time.

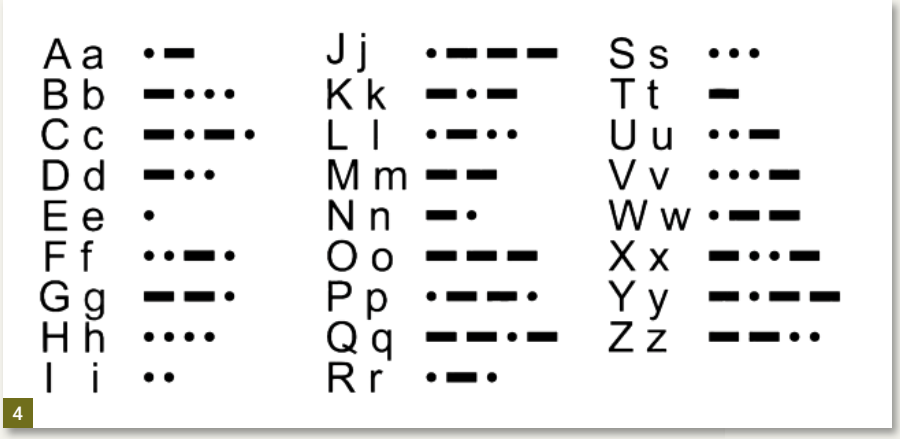


**Fig. 1: Samuel Morse: Radio Pioneer and Artist. Fig. 2: Alessandro Volta (1745 – 1827) The Inventor of the battery ('Voltaic Pile'). Fig. 3: The Danish Physicist Hans Christen Ørsted (1777 – 1851). Fig. 4: A beautifully simple language.**

At this time, working on the staff of New York University, he lectured students in the art of painting, while his mind was turning towards electromagnetism and the revolution of long-distance communication.

Morse revealed to Professor Leonard Gale (1800 – 1883), who assisted him in perfecting his telegraphy system that he had formulated the structure of the telegraphic alphabet. He was now in a position to take the next step of testing his invention. On Saturday, 2nd September 1837, Morse was finally successful in an experiment involving 1,700 ft of copper wire that was coiled around a room.

## Politically-Warped

Morse had a lifelong interest in politics, and some have regarded him as an 'ultra-cultural nationalist'. Like his father, he idolised George Washington and Lafayette. Morse made two unsuccessful attempts to gain election as the mayor of New York, in 1836 and 1841.

Where he was unsuccessful, issues often related to his more extreme political views. For example, Morse held that both Monarchy and Catholicism were undermining the American concept of democracy and he campaigned for reductions in the number of immigrants.

He was also pro-slavery and he considered it to be sanctioned by God, especially in a publication entitled *"An Argument on*

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*the Ethical Position of Slavery"*. Moreover, he wrote under the pen name 'Brutus', with some articles published in the *New York Observer*: His articles were subsequently compiled into a book with the dramatic title *Foreign Conspiracy Against the Liberties of the United States"*.

### In Pursuit of Electro-Magnetism

In 1800, the Italian physicist Alessandro Volta (Fig. 2, 1745-1827) invented the battery. His 'Voltaic pile' enabled the reliable storage of electrical current in a safe and controlled operating environment.

In addition to this, in 1820, the Danish physicist, Hans Christian Oersted (Ørsted, Fig. 3, 1777-1851) added to the body of disciplinary knowledge by demonstrating the close correlation between electricity and magnetism.

Morse would later utilise the research of both men in his own quest to develop a working telegraph system.

In 1838, Morse formed a business partnership with Alfred Vail (1807 – 1859), who provided urgently needed financial support and assisted in the formulation of the 'dots and dashes', which would eventually become known as the universal language of Morse code. Many have subsequently claimed that Vail is the real inventor of 'Morse' code (see Tony Smith: *RadioUser*, October 2020: 57; December 2020: 40).

In December 1842, a breakthrough came, when Morse's research gained the attention of the Maine Congressman Francis Ormand Jonathan Smith (1806 – 1876). Aided by this patronage, Morse could demonstrate the works of his telegraph system to Congress. He received a *Congressional Appropriation* to develop an experimental 38-mile telegraph wire between Washington DC and Baltimore, Maryland.

On 24th May 1844 at 08:45 hrs, Morse opened the world's first electric telegraph line, sending a message to his business partner in Baltimore from the Old Supreme Court chamber in the Capitol.

The context of the message was selected by Annie Ellsworth, a young daughter of a friend, - *"What hath God wrought?"* from the biblical Book of Numbers.

### A Breakthrough

It was this very demonstration that is often remembered as the catalyst for the revolution of long-distance communication. Public interest in the telegraph system reached fever pitch a few days later when the Democratic National Convention being held in Baltimore become deadlocked and hundreds eagerly gathered around the telegraph in Washington waiting for the instantaneous news to arrive from the floor of the convention.

Moreover, in Paris, an English language newspaper reported that the utilisation of the telegraph in sending the news instantaneously from Baltimore was akin to *"the annihilation of space"*.

After a protracted legal battle that was finally settled by the Supreme Court ruling in *O'Reilly v Morse (1854)*, Morse secured the right to be recognised as the *"inventor of the telegraph system"*. In 1847, Morse had already achieved some significant success with a patent and secured the tender for a telegraph system in Istanbul. The main backing for this came from Sultan Abdülmecid (1823 – 1861), who greatly admired his pioneering work.

One may question, however, whether people remembered Morse's more controversial political views and wished to keep him out of the national political limelight.

That notwithstanding, by 1867, the Morse telegraph had become part of the fabric of modern society both nationally and internationally.

### Competitors and Rivals

During Morse's lifetime, several other scientists were conducting their own experimental research into the potential of commercial electromagnetic telegraphs. For example, the German mathematician, Carl Friedrich Gauss (1777 – 1855) and the physicist Wilhelm Eduard Weber (1804 – 1891) developed an electro-magnetic telegraph in 1833 – one year before Morse devised his prototype.

What is more, English inventors William Fothergill Cooke (1806 – 1879) and Professor Charles Wheatstone (1802 – 1875) commenced with their research four years after the publication of Morse's research. Their access to financial support enabled them to devise a working prototype fast. Remarkably, it was operational after only three weeks of sustained work. Initially, their single battery was limited in terms of its range.

However, after combining their research in 1837, Wheatstone and Cooke managed to devise a multi-wire network that connected two train stations in England (a 13-mile wire that transited part of the *Great Western Railway*).

### In Conclusion

Morse faced many obstacles in pursuit of his dream of reliable and efficient long-distance communication. His determination to succeed has secured his place in history as a pioneer. Morse died of Pneumonia in New York on Tuesday 2nd April 1872, and he was interred at Green-Wood Cemetery in Brooklyn, New York. His estate was valued at $500,000, a significant sum, which is calculated at $10.7 million in today's money.

Morse was seen as a philanthropist, and he shared his considerable wealth through charitable grants to colleges, such as Yale and Vassar.

Morse also remembered his roots and contributed to charities that supported emerging artists. In 1982, the *Terra Foundation for American Art*, in Chicago, purchased Morse's painting *Gallery of the Louvre* (now in the Seattle Art Museum) for $3.25 million – the highest amount paid at the time for a work by an American painter. **https://tinyurl.com/y3ywhwsj**

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**RADIO EMISSIONS VIA GANYMEDE:** There have been exciting new observations of radio emissions on Jupiter from the NASA Juno spacecraft – the first direct detection of Jovian decametric radio emissions induced by the interaction between Jupiter and the moon Ganymede. These observations were made as Juno crossed a polar region of the Giant Planet where the magnetic field lines are connected to Ganymede. The radio emissions were produced by electrons at relativistic energy (a few thousand electron volts) in a region where the electron's oscillation frequency (plasma frequency) is much lower than its gyration frequency (cyclotron frequency). Such electrons can amplify radio waves very close to the electron cyclotron frequency very rapidly, via a physical process called electron cyclotron maser instability (CMI). They can as well produce aurora in the far-ultraviolet – which was also observed by the camera on Juno. Juno was travelling at a speed of approximately 50 km per second, and it spent at least about 5 seconds crossing the source region of the emission, which was therefore at least about 250 km in size. The observed decametric radiation on Jupiter is the 'shorter cousin' (in wavelength) of the auroral kilometric radiation on both Earth and Saturn: the CMI being responsible for their production on the three planets.
(SOURCE: EoS: Geophysical Research Letters, 47, e2020GL090021)
**https://tinyurl.com/1rnyba7o**
**https://doi.org/10.1029/2020GL090021**

**WSJT – NEW MODE:** WSJT-X 2.4.0 will introduce Q65, a digital protocol designed for minimal two-way QSOs over especially difficult propagation paths. On paths with Doppler spread more than a few Hz, the weak-signal performance of Q65 is the best among all WSJT-X modes. Q65 is particularly effective for tropospheric scatter, ionospheric scatter, and EME on VHF and higher bands, as well as other types of fast-fading signals. Q65 uses 65-tone frequency-shift keying and builds on the demonstrated weak-signal strengths of QRA64, a mode introduced to WSJT-X in 2016. Q65 differs from QRA64 in the following important ways: (1) A new low-rate Q-ary Repeat Accumulate code for FEC (Forward Error Correction); and (2) User messages and sequencing identical to those in FT4, FT8, FST4, and MSK144. A unique tone for time and frequency synchronization. As with JT65, this 'sync tone' is readily visible on the waterfall spectral display. Unlike JT65, synchronization and decoding are effective even when meteor pings or other short signal enhancements are present. Optional sub-modes with T/R sequence lengths 15, 30, 60, 120, and 300 s. A new, highly reliable list-decoding technique for messages that contain previously copied fragments.
(SOURCE: ICQ Amateur / Colin Butler)
**https://tinyurl.com/11erk4s8**

**CHARTING SATELLITE COURSES IN A CROWDED THERMOSPHERE:** Satellites play important roles in our daily lives, providing navigation, data, and communications solutions, as well as Earth observations to monitor weather, climate, and natural resources. All of this information is vital for policymakers, businesses, and consumers. However, increasing demand for the services that satellites provide has also created an increasingly crowded environment in the low–Earth orbit (LEO) region where many of these satellites operate. Unlike automobiles on crowded city streets, satellites lack onboard drivers who can steer around obstacles at a moment's notice. To avoid collisions and plan evasive manoeuvres, satellite operators predict orbits and account for accurately known gravitational forces; they must also account for trajectory changes brought about by atmospheric drag on the craft, a far more difficult task. The potential addition of tens of thousands of objects to low Earth orbit will escalate the risk of catastrophic, and cascading, collisions. Approximately 1,800 active satellites currently operate below 1,000 km in altitude, where air resistance, or drag, is large enough to significantly affect satellite orbital trajectories. These active spacecraft share this region with more than 10,000 inert satellites and pieces of debris. The construction of very large constellations of commercial LEO satellites began in about 2018 when the private company SpaceX launched its first Starlink satellite prototypes; other companies (e.g., OneWeb, Amazon, Telesat) have followed suit or are preparing their own constellations. Adding to the congestion is a rapidly increasing number of low-cost small satellites, which can now be built using largely off-the-shelf components. The potential addition of tens of thousands of objects to LEO will escalate the risk of catastrophic, and cascading, collisions. Read the full story about this growing issue at the URL below:
(SOURCE: AGU; EoS, January 2021; Bruinsma et al [2021]; Eos, 102).
**https://tinyurl.com/4az635bc**

**David Harris**
mydogisfinn@gmail.com

**David Harris will be reviewing more than one radio book from now on. He begins his extended column by looking at a new book on digital radio and a radio presenter's biographical take on the industry.**

# A DAB Primer and a Personal Scrapbook

The Digital Audio Broadcasting (DAB) format has been with us for over 25 years, but this book is the first general-interest publication on DAB radio that I have seen. Paul is no stranger to Radio User readers as he is the author of several books I previously reviewed in *RadioUser*, including *Radio Caroline Bible* (*RadioUser*, December 2019: 18), *Radio Formats* (August 2020: **14**) and *Radio Adventures of MV Communicator* (January 2017: 36).

Paul is a broadcast consultant who has worked with many major media organisations. He begins by stating that DAB and DAB+ are simply standards of digital broadcasting which have been adopted by certain countries. In other parts of the world, Digital Radio Mondial (DRM) and HD Radio are preferred digital formats.

To begin with, the author gives us a very simple guide to the radio spectrum and its varied propagation properties. DAB has been allocated frequencies in the former VHF TV band III (174-240 MHz). When DAB was launched in 1995, it used MP2 compression; but in 2006, DAB+, which uses the more efficient AAC+ compression, became the preferred standard.

This has now been adopted by virtually all countries, apart from the UK which employs both standards. Paul gives a very clear explanation of DRM, HD radio (used mainly in the USA), DSR satellite radio and digital TV platforms that can carry radio signals.

Over the last 20 years, there has been a concerted campaign to promote DAB radio and switch off-off the FM and AM frequencies. For many, DAB was seriously 'mis-sold', with often spurious claims about its features and audio quality. Paul adopts a very sensible approach by neither being an evangelist for digital broadcasting, nor a stern critic. He lists the advantages of DAB as being free, allowing more stations than FM and providing more RDS data. He also registers the disadvantages which are a high battery drain, weak signal, sound fidelity, and the high cost of access to transmitters.

The author explains how the greater efficiency of DAB+ means that high-quality audio can be transmitted using lower bitrates than those used for DAB. For DAB to achieve FM stereo sound quality, bitrates need to be in the region of 160-192; however, for DAB+ the bitrates can be reduced to 40-64.

In practice, many digital stations broadcast in mono at very low bitrates. Most commercial broadcasters are interested in promoting their presenters and content, rather than their audio quality. Many people listen on mono radios and devices that have poor audio quality.

The book offers a brief history of the development of radio broadcasting, from the first AM medium and long wave broadcasts in the 1920s to the development of FM in the 1940s. FM had a very slow period of gestation in the UK, with the first broadcasts starting in 1956; it took over 30 years for the BBC to have a national FM network for its key stations.

DAB began as a research project in Germany back in 1980 and was first demonstrated in 1985. The BBC inaugurated DAB broadcasts in 1995. However, it was not until 1999 that the first, very expensive, DAB portable radio was launched.

The book's scope is such that it delivers an overview of DAB broadcasting worldwide. DAB, the author argues, could never become a global force, since large countries such as the USA have gone down the satellite and HD radio road. States such as China and Russia, where the media are state-controlled, are hardly likely to need huge numbers of different stations.

The high cost of DAB radios and high battery drain also makes digital radio a non–starter in most Third World countries. Some countries including Canada, Ireland, Finland, Portugal, New Zealand, and Hong Kong have set up pilots and closed them down again, due to lack of interest. It seems that only some Western European countries and Australia are likely to fully adopt DAB+ radio. Norway is the only country to have switched of FM, with Switzerland likely to follow in 2022.

The book also contains short chapters on DAB radios, aerials, sales figures, UK DAB stations, trade organisations and equipment suppliers. The author concludes

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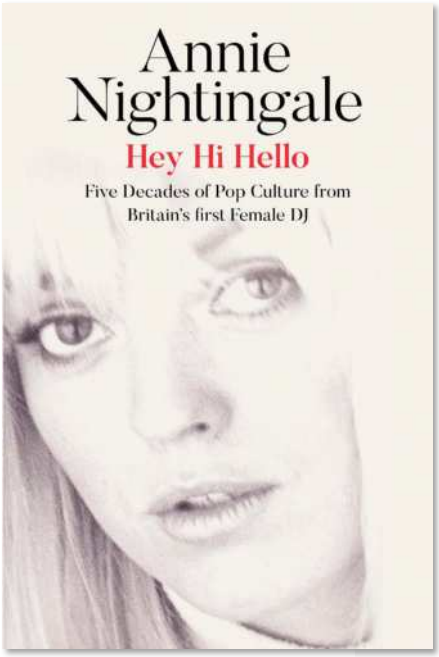
*DAB & DAB+. The Future of Radio*
Rusling, Paul (2020)
World of Radio. 123 pp. Pbk. £12.95.
ISBN 9781900401241
**www.worldofradio.co.uk**




*Hey Hi Hello. Five Decades of Pop Culture from Britain's First Female DJ;* Nightingale, Annie (2020)
White Rabbit/Orion. 388 pp. Hbk. £20.
ISBN 9871474616683
**www.whiterabbitbooks.co.uk**

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See page 15

on an optimistic note, by stating that small-scale DAB (SSDAB) trials, which began in the UK in 2015, have shown that it is possible to have a variety of stations that are not just run by *Bauer* and *Global*.

I feel that Paul Rusling has written a very clear and well-researched book, which gives some basic technical explanation of digital broadcasting but never overwhelms the reader with complex mathematics or electronics.

I cannot praise this book highly enough. It is an excellent overview of digital radio developments in the UK over the last 20 years. A must for anyone who has any interest in radio broadcasting.

## Hey Hi Hello

Annie Nightingale (b.1940) was the first female presenter on BBC Radio 1 and is now that station's longest-serving broadcaster. She is also a club DJ, journalist and television presenter. *Hey Hi Hello*, is not an autobiography or even a memoir of her life in the music industry. Rather it is more like a scrapbook with 39 rather uneven chapters giving brief insights into different musicians, events, places and personalities that she encountered over her working life.

I am not familiar with her previous books, *Chase the Fade (1982) and Wicked Speed (2000)* but they may have followed a more conventional biographical approach. By contrast, *Hey Hi Hello* adopts a roughly chronological approach beginning in the 1960s and ending at present. The overall effect can be rather like reading a book of collected press articles that have been published over the last 50 years. However, with a couple of exceptions, this is not the case and the book appears to have been constructed from tapes, notebooks, press cuttings and diaries.

It is worth examining the context in which Annie arrived at the BBC in 1970. Radio 1 was established in 1967 as the UK's first legal pop music station and aimed to be a substitute for the now-banned offshore stations which had proved to be so popular in the period 1964-1967. Radio 1, which was staffed mainly by ex-pirate DJs, was a huge success with millions of listeners throughout the UK. The BBC had employed female presenters and women in senior management positions in the pre-war period. The books *Behind the Wireless*, by Kate Murphy (*RadioUser*, September 2016: 47) and *This New Noise*, by Charlotte Higgins (November 2015: 15) contain a lot of information about the role of women during the early years of the BBC and its relatively liberal attitude to female employment. It was therefore surprising that there were no female presenters when Radio 1 started in 1967.

Annie Nightingale trained as a journalist; by the mid-1960s, she was writing about pop music in the national press and appearing on youth TV programmes. She lobbied for some time to join Radio 1 and eventually was given her own programme in 1970. It is hard to understand today why Radio 1 was so reluctant to have female presenters. Yet it was not until 1982 that Janice Long (b. 1955) became the second female presenter on Radio 1 and in 1984 Rankin Miss P (Margaret Anderson b. 1959) became the first black woman on Radio 1.

Annie attributes this to sexism amongst management, and I would have liked more discussion on this subject. The book is sometimes rather unevenly written for the work of an experienced journalist. Some early chapters are written in a 'tabloid' style with very short 'staccato' sentences. Annie keeps making the point throughout the book that she has always been her own person and enjoyed the freedom of being able to play her own choice of music on the radio.

This meant that she tended to have late-night programmes and did not achieve the celebrity status of many of the male presenters who appeared during the day on Radio 1.

A substantial part of the book is taking up with transcripts of interviews with musicians including Marc Bolan, Bob Marley, Keith Moon, Elvis Costello, Andrew Innes (Primal Scream), Dusty Springfield and Billie Eilish. There are also chapters on places she has visited including Monserrat, Los Angeles, Shanghai and Paris. Annie presented the BBC television rock music show *Old Grey Whistle Test* from 1978–1982.

However, we are sadly being given just a few pages on what must have been one of her most high-profile jobs with the BBC. I would have liked more on OGWT rather than giving 18 pages to an interview with Andrew Innes, for example; however, this reflects my taste.

I feel that this could have been a much better book if there had been more editorial intervention, especially in tidying up some of her prose, and in adding some more meaningful photographs. This title might also work as a larger-format illustrated book focusing on some of the more interesting chapters.

*[Over the next few months, we will carry two book reviews in each issue of* RadioUser *– **Ed**.].*

HEALTH INFO RADIO

1

# Waves and the Virus

**Georg Wiessala**
wiessala@hotmail.co.uk

In a two-part article, the editor explores how the ongoing Covid-19 (Coronavirus) pandemic is beginning to re-shape the wider radio landscape - with lasting consequences for the future.

As I am writing this, in the Northwest of the UK, in February 2021, we are still experiencing *Lockdown 3.0* here. The North West of the UK (Lancashire and Cumbria) is not the worst-hit part of the UK any more when it comes to new infections; and, at the time of writing, the infamous 'R-number' is going down.

Still, though, the grim news of infections and deaths hits the headlines every day, and this affects many hobby friends too, who have gone SK, as it were. Losing friends and relatives to the virus has become a bleak routine world-wide. However, now there is also good news: at least four different vaccines are currently being developed in the UK and elsewhere, and, at last, it appears there is light at the end of the tunnel.

By the time you read this, let us hope that the world is over the worst and that people stop squabbling over the vaccine.

## Covid and Radio

During the challenging year of 2020, the pandemic has impacted on our radio hobby. I have already mentioned this elsewhere (*The Spectrum Monitor*, September 2020: 13). That piece was primarily about how parents and teachers can use radio (and radios) to teach about science, art, design, and other subjects.

However, Covid-19 (Figs. 1-3) has brought up other challenges too: how, for example, can radio help to sort the wheat from the chaff, and separate reliable news about Covid from misinformation and conspiracy theory?

Moreover, does this crisis show that radio, in all its forms, is a suitable vehicle for science communication in general, and are there any specific channels and stations to fulfil this task?

You may also think about the enhanced role of community radio stations, many of which have become involved in grass-roots work, such as sharing local information, distributing food parcels or helping businesses.

Last but not least, two-way radio and amateur radio have, for many, been a way

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RADIOTODAY

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forward, in these times of self-isolation and social distancing.

Sales of all kinds of two-way radios, amateur transceivers – and even that old stalwart, CB radio – have gone through the roof in the UK and elsewhere. Evidence, surely, that people are helping and connecting in this way – and good news for publishers of radio magazines, like The *Spectrum Monitor* or *RadioUser*.

When talking about two-way radio, there is perhaps one underrated aspect of the virus, which is only now receiving some closer attention. The impact of lockdowns and tiered systems on national economies may be well covered. But what about business/emergency communications during periods of enforced downtime?

What benefits can two-way communications deliver, for example, before, during and after lockdown procedures in our schools, academies and universities?

Last but not least, how are broadcasters, presenters and listeners coping with the virus, and is there any evidence of a new 'wireless internationalism', where radio brings together people of different backgrounds, in the face of a truly global challenge?

## Broadcast-Bias, Fact-Finding, and Fake News

The pandemic – of that there can be little doubt – has been both a challenge and a litmus test for objective news reporting. Ofcom, the UK Regulator has recognised this by publishing its *White Paper on Broadcast Standards during the Coronavirus Pandemic* in July 2020. In a similar vein, the US FCC has initiated the *Keep Americans Connected* pledge and the *Covid-19 Telehealth Program.*

https://tinyurl.com/y2d2pqso
https://www.fcc.gov/coronavirus

It seems that much disinformation has infected the minds of listeners regarding such issues as nature, severity, origins and spread of the disease and the rationale of inoculation initiatives.

The traditional adage has proved to be true once again – you just cannot believe everything you read (Fig. 4). Furthermore, in an age where many derive at least some of their worldviews from social media, it is little wonder that hard facts are hard to come by. This, of course, benefits those who wish to destabilise and divide communities, rather than provide strength through unity.

Many international broadcasters have addressed this issue head-on. NPR, for example, has offered *Listener-Q&A Sessions* and a much-noticed podcast series on Covid-19 (Fig. 5). Germany's *Deutsche Welle* – inexcusably invisible on the short waves now – has, nevertheless, weighed in with articles on how Coronavirus is used to disseminate disinformation internationally.

The upshot is that 'fake news' spreads faster than the virus.

www.tinyurl.com/czje5r7e

To combat this in the UK, GCHQ has now launched an operation to tackle anti-vaccine propaganda being spread online, amid a breakthrough in the search for an effective jab. The UK spy agency is now using tools developed to stop material created by suspected terrorists from spreading.

https://tinyurl.com/y54e4mfo

Naturally, radio plays a key part, on both

IRRS

3

sides of any argument. And, given that any severe crisis brings out the best in people overwhelmingly more so than it brings out the worst, the pandemic has led to a host of initiatives seeking to provide fact-based information. This development has brought a range of responses from radio stations, for instance:

- Dedicated Coronavirus stations and more 'breaking-news' coverage.
- Broadcasts, podcasts (newscasts), live-streamed repots, and daily updates.
- Frequent radio interviews with public health experts and politicians.
- Changes in coverage in the schedules of mainstream radio, such as the BBC.
- Public service announcements on (TV and) Radio to educate people about hygiene.
- A much-enhanced public discourse and debate of the role of radio in times of a global health crisis.

The *NPR* initiative , *Coronaradio*, the *IRRS Global Daily Short Wave Broadcast* and *Health Info Radio* were, arguably, amongst the more informative and widely-noticed resources in this area (e.g.: Figs. 1, 3, 5).

Take a look at Chrissy Brand's recent article in this magazine (*RadioUser*, December

**Fig. 1: Covid-19 and Radio.**
**Fig. 2: Coronavirus looms large, on-air.**
**Fig. 3: IRRS Global Daily Short Wave Broadcast.**
**Fig. 4: Much news is just 'Hot Air'**
**Fig. 5: The NPR podcasts made an impression**
**Fig. 6: One of Many: CORONARADIO**
**Fig. 7: Amateur Radion on the Ball**
**Fig. 8: A Fantastic RSGB Initiative.**

## Resources

ABC 'Coronacast':
**https://tinyurl.com/1c8r9yh6**
Advice for BBC Staff (*myRisks*):
**https://tinyurl.com/r3echtye**
AMSAT UK:
**https://tinyurl.com/1x2cihzk**
BBC Coronavirus Newscast:
**https://tinyurl.com/a3wvf9sj**
BBFC Radio 4:
**https://tinyurl.com/z4terkr6**
Coleman, J.F. (2020) *UK Community Radio Production Responses to COOVID-19*:
**https://tinyurl.com/y4xvjhe3**
Community Media Association:
**https://tinyurl.com/yhdjq4ex**
Coronavirus and Radio: Stronger Than Ever:
**https://tinyurl.com/ybjqlhn8**
DigitallComms:
**https://tinyurl.com/1xin9hah**
EU: Fighting Dis-information:
**https://tinyurl.com/1dogml9j**
Health Information Radio:
**https://www.healthinforadio.co.uk**
IRRS Global Daily Short Wave Broadcasts:
**https://www.nexus.org/Coronavirus-qsl**
Ofcom: 5-G Myths:
**https://tinyurl.com/ybmcx2ug**
Power of Radio in Times of Pandemic:
**https://tinyurl.com/yatbxg9z**
Radio News Hub:
**https://www.radionewshub.com**
RADIOCENTRE:
**https://www.radiocentre.org/Coronavirus**
RadioUser:
**https://tinyurl.com/gcwopqgm**
Rescue Remedy
(Help for Businesses):
**https://tinyurl.com/y9thz3qn**
RSGB:
**https://tinyurl.com/iawilp1n**
UN Covid-19 Response:
**https://tinyurl.com/yxrvf9eo**
UNESCO Resources Against Disinformation:
**https://tinyurl.com/y76nmpax**
mediatel news:
**https://tinyurl.com/y448o6td**

**Table 1: Coronavirus (Covid-19) Resources Related to Radio**

CHRISSY BRAND

4

CORONARADIO

5

CORONARADIO

6

2020: 20-24) to find out more about general international news coverage, broadcast-bias, state-objectives and establishment-viewpoints. More generally, Table 2 shows a selection of international radio news sources and state broadcasters you might wish to try. True 'wireless internationalism' is multi-faceted, of course; for us listeners, there are many alternatives to mainstream-viewpoints explore: It has been refreshing, for instance, in times of Coronavirus, to delve into the coverage of some of the stations listed in Stig Hartvig Nielsen's monthly table of *European Private Short Wave Stations (EPSWS)*, or to explore the lesser-known corners of the world, through the pages of the *75th Anniversary Edition* of the *World Radio TV Handbook*.

www.tinyurl.com/vq5ktsk8

In the world of commercial radio, the Association of European Radios (AER) best sums up these complex issues, by stating, *"[…] Media, and in particular commercial radios, have an important role to play in these difficult moments. Not only is radio the most trusted medium in Europe, but it also supports local employment, the dissemination of cultural content and contributes to a diversified European media landscape. Radio informs and entertains, and it has reacted to the crisis by changing its programmes; offering more specialised content, news for children, many relief actions across Europe."*

I will revisit this issue briefly in the context of local radio stations, below.

https://www.aereurope.org/coronavirus

## Science on the Airwaves: Radio and Science Communication

The wider issue behind the challenge of finding reliable information about public health issues, including the Coronavirus crisis, is the role that radio can play in communicating scientific research to a wider audience.

There are now many some dedicated Covid radio stations, which have sprung up and gone again during the crisis, and

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whose main rationale is to connect listeners with facts. An outstanding example of this is *Health Information Radio*, on-air until 1st June 2020. Others come and go, but many of them are invariably called '*Radio Corona*' or '*Coronaradio*' (e.g. Fig. 6).

https://tinyurl.com/t8mnqxz

Many Amateur Radio Clubs have taken up the science-baton too and are providing up-to-date Covid-19 information. What began as an 'ad-hoc channel of communication', when almost all radio shows have been cancelled, has taken on a much wider significance, especially in the case of such groups as *RAYNET, AMSAT*, the *RSGB*, and, across the Pond, the *ARRL* (Figs. 7-8).

To place this into context, radio has, of course, a long history as a vehicle for research communication, with countless 'science-slots' on a myriad of stations globally. Just think of the BBC Radio 4 programme *Inside Science* or the many podcasts on science and nature now freely available on *BBC Sounds*.

https://tinyurl.com/35kvplpf

Beyond the UK, the EU too is devoting substantial amounts of funding to promoting the links between science communication and radio, for instance through the *SCIRAB* (*Science in Radio Broadcasting*) project.

https://cordis.europa.eu/project/id/3191

## International Radio and the Virus

Following the emergence of dedicated stations and podcasts (e.g. Figs. 3-6), Coronavirus led to a wider listening-boost and has made radio stronger than ever. Many brand-new stations are now on the air, and many others are offering special programmes (BBC, Radio Australia). Moreover, some very special and noteworthy transnational collaborations emerged, such as the USA-Algeria initiative *Radio Corona Internationale*.

https://tinyurl.com/36eghhvl

Moreover, a recent *MIT Technology Report* offered several podcasts, under the label *Radio Corona*, which dealt, at least in part, with the crisis.

https://tinyurl.com/52wuhefy

Nearly all radio stations have increased their listenership figures significantly, and in some cases by up to 50% (*MediaTel News*; *RadioToday*, December 2020), and 'lockdown' has led to changing patterns of radio consumption and engagement.

https://tinyurl.com/ybjqlhn8
https://tinyurl.com/cdbpa8t2

This is reflected in the resources, policies and strategies offered by relevant bodies world-wide, many of whom have produced a wealth of material on Covering the Coronavirus Pandemic.

AMSAT INDIA

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RSGB

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## The On-Air Power of Research

On top of this, there is a growing body of academic, 'media-studies' type of literature, which analyses the rationale and impact of radio in communicating scientific facts. In this context, the key advantages of radio are often seen to lie in a reduction of language barriers and 'jargon', and of intellectual 'distance', between scientists and the public. *"Improving communication between professionals and the community is where the art of radio comes into play"* argues Mark Kesling in his *Radio Conversations* blog.

Other observers have pointed to the issue of pedagogy; many of us are 'audio-learners', i.e. we learn best through listening to something. And the history of the *School of the Air*, especially in the Outback of Australia or the mountains of Canada, is documented, especially in terms of health matters (see below).

https://tinyurl.com/yxbdpgnx

Others link the role of radio in the current crisis to wider socio-economic and cultural aims, arguing that the medium of radio achieves mass empowerment. This has been examined in much detail for the Global South, for example in India and parts of Africa (Jayaprakash, 2018).

However, one of the best contemporary examples of the power of radio to educate and spread Covid-19 and other public health knowledge is the Lorna Young Foundation's *Farmers Voices Radio* initia-

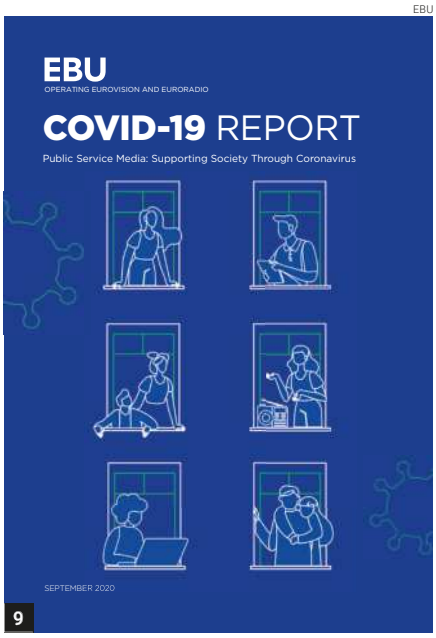


**Fig. 9: The European Broadcasting Union (EBU) *Covid-19 Report*.**

## State Broadcasters in English

- All India Radio
- Angolan National Radio
- Bangladesh Betar
- BBC World Service
- • Bhutan Broadcasting Service
- CBC Canada Radio International
- China Radio International
- China Tibet Radio Holy Tibet
- IRIB Voice of the Islamic Republic of Iran
- KBS World, South Korea
- Kyrgyz Radio 1, Bishkek
- Lao National Radio
- Myanmar Radio
- NHK World Radio Japan
- Polish Radio 1
- Radio Afghanistan
- Radio Argentina al Exterior, Argentina to the World
- Radio Belarus
- Radio Cairo
- Radio Exterior de España
- Radio Havana Cuba
- Radio Guinee
- Radio Kuwait  Radio New Zealand
- Radio Poland International Service+
- Radio Prague International*
- Radio Romania International
- Radio Slovakia International*
- Radio Sultanate of Oman
- Radio Taiwan International
- Radio Thailand
- Radio Tirana
- Radio Ukraine International
- Radio Vanuatu
- Vatican Radio
- Voice of America
- Voice of Indonesia
- Voice of Korea, North Korea
- Voice of Mongolia
- Voice of Nigeria
- Voice of Turkey
- Voice of Vietnam
- Zanzibar Broadcasting Corporation
- ZNBC Radio 1, Lusaka

**Table 1: Selection of State Broadcasters in English on Short Wave (see also WRTH 2021).**

tive. In Canada, *Farm Radio International* operates along similar lines. And last, but certainly not least, *the UN Radio Programme* is delivering public pandemic education through its outreach programme.

**https://www.farmersvoiceradio.org**
**https://farmradio.org**
**https://tinyurl.com/yxrvf9eo**

It is, perhaps, no surprise then that one analyst has described the role of radio in science broadcasting like this: *"However, we can metaphorically state that the greater innovation in the radio realm is not the Internet, podcasting, or DAB, but the winding handle: this old yet innovative tool that allows to self-power radios so that they can reach every remote corner in the world, where science communication – in particular on health or environmental issues – can have a dramatic impact."* (Merzagora et al, 2006).

## Beyond the Hamfest: Radio in Lockdown

Meanwhile, many forms of two-way hobby communication have experienced a real renaissance in this year of lockdowns and restricted movement. CB has resurfaced, and Amateur Radio has emerged as a means of keeping in touch in local communities. Many hobbyists have dug out their PMR446 sets to get on the air.

Ham radio, in general, is thriving, and interest in both transmitting and listening is soaring, according to the *SWLing Post*. The RSGB, ARRL and a host of national amateur radio associations throughout the world are reporting an unprecedented growth in new licensees, members, and newcomers to the hobby. Importantly, there are stories on both sides of the Atlantic, of youngsters reaching out.

Notably, the ARRL, ARISS, the RSGB and many others have taken the opportunity to put on Covid-19 advice resources. AMSAT India has even used the crisis as a means to popularise amateur radio (cf. Fig. 7).

**https://tinyurl.com/32toebde**
**https://www.ariss.org**
**https://tinyurl.com/1tcmks4a**

In the meantime, the President of The European Amateur Radio Association (EURA) has pointed out that, *"we need to help each other and cement the concept of 'Ham-Spirit', as we learned it when we discovered Ham radio as beginners. It is time for the contests' managers to open their eyes and to re-define the concept of what 'team' and 'multi operators' means. Working at a distance is one of the concepts that already replace the idea of a team placed in one single place."*

**https://www.eurao.org/en/node/1121**

Significantly, the very *modus operandi* of both large and small Amateur Radio Associations has also changed, possibly for good. In the absence of physical 'DXpeditions', radio shows and rallies, *Zoom* meetings and remotely-administered amateur radio exams and invigilation are now the new norms, in the 'new normal'.

Consequently, clubs and associations are now getting large, international audiences, through 'webinars' and larger online conventions.

Many are 'going the extra mile' during the Pandemic to reach out to people, and operators, who may be vulnerable, lonely or depressed. Notably, the RSGB has come up with two initiatives called *Get on the Air to Care* and *Get on the Air for Christmas* (GOTA2C and GOTA4C) to mitigate the effects of enforced isolation (Fig. 8).

Moreover, the RSGB's *Hope QSO Parties*, are a series of 90-minute daytime contests. They were introduced to help radio amateurs who are isolated at home and appreciate contact with other people.

**https://tinyurl.com/3xlmhnws**
**https://tinyurl.com/26tq8xmo**

In Part Two of this article, next month, I will be investigating the effect that the Coronavirus crisis has had on two-way emergency and business Communications, local and community radio, the radio industry, radio stations in general, and on us hobbyists.

So, please join me again next month.

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# A DRM+ Decoder for Windows and a Raspberry Pi DAB Radio

**Kevin Ryan**
kevin@radio-digital.co.uk

**In a column dedicated to two practical projects, Kevin Ryan tests the Windows version of a DRM decoder developed for Android, before evaluating a DAB board designed with the Raspberry Pi computer in mind.**

I originally started using a PC to decode a DRM signal by modifying a Tatung TMR7602 analogue receiver (a Sangean ATS803 'clone') to provide a 12 kHz IF output for a PC's soundcard. That was in 2004, and it involved adding a 455kHz-to-12kHz IF down-converter to the main board of the radio and putting an extra audio socket on the back panel.

The only commercial decoder available at the time was the *DRM Software Radio* decoder, which I still use very occasionally. The *DReaM* software suite became available soon after. This had to be managed by the user to work on Linux, and I never mastered that task. Eventually, a pre-compiled version for Windows appeared, and it was warmly welcomed by DRM enthusiasts.

Later versions of *DReaM* added functionality, until recently, when updates first started failing to display a slideshow and then to process audio encoded with the xHE-AAC codec. The DRM extension for the Kiwi-SDR based on the *DReaM* code handles xHE-AAC audio but does not display multimedia elements attached to a broadcast. I have a version of *DReaM* that works on Windows 10.

However, it only decodes the xHE-AAC audio and is not very stable.

## DRM Decoder

Therefore, I was quite excited when news of a possible replacement for *DReaM* appeared on the KTWR blog.

Algorkorea released a Windows version of the DRM decoder they created for Android, alongside software to generate a DRM signal. I downloaded both ZIP files and a third file called *MAC Generator*. The latter has nothing to do with Apple but is used to create a licence file. There is a detailed interview with – and a short biography of – the helpful inventor Dr Soon Jaeng, on the *drminfo blog*.
**https://tinyurl.com/1ny7qyve**

## The DRM4WIN Software

*DRM+ MSI for Windows* works with either an MSi, SDR or RTL-SDR receiver-dongle connected to a PC via a USB cable. The software can decode DRM30 signals using HE-AAC, OPUS and xHE-AAC encodings. It also decodes sound, metadata, slideshow, and web pages; it displays those on the built-in web browser.

The downloaded files are password-protected, and I contacted the designer to give me access. There is additional protection, in that both the TX and RX require licence files tied to the MAC hardware address of your PC.

The installation of the transmitter software is easy in that you simply need the *licence.dat* file.
**https://tinyurl.com/16x4klvm**

The receiver or decoder needs at least three other files in addition to the *licence.dat* file. The *DRM4WIN* app expects to use either an RTL-SDR or an MSi.SDR (e.g. SDRplay, Fig. 1). Error messages appear, if the *rtlsdr.dll, libsub-1.0.dll* and *mir_sdr_api.dll* files are not found in the installation directory.

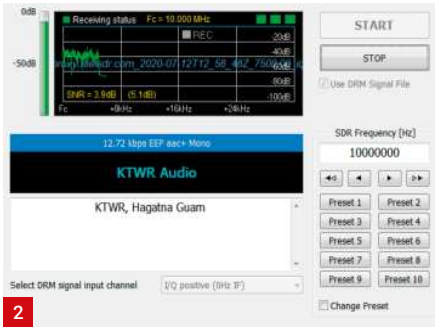
One Windows 7 PC needed just these three files, while a second PC reported that two other files (*.dll*) were required. Those files are used by other digital radio decoders.

The generally helpful tutorial.pdf file provides the URLs for the *RTL_SDR .dll* files. Unless you have previously installed the API files for an SDRPlay receiver, you will need to run the API installer found on the SDRPlay website.
**https://www.sdrplay.com/downloads**

## Using Saved I/Q Files

I decided to test the app using some I/Q files saved on my PC (Fig. 2). Being particularly interested in Multimedia files I opened a *KTWR .wav* file. *DRM4WIN* played the audio and displayed the MOT website. A recording of the BBC World Service played audio but the *Journaline* data did not decode. I think this might be because I only had a portion of the transmission and missed both the initial and repeat setup of the *Journaline* structure. Finally, I successfully played back a recording of an xHE-AAC transmission from China National Radio (CNR).

1



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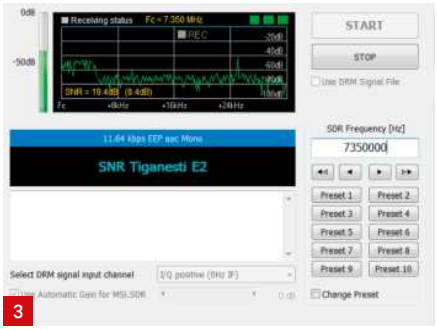

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## Using an RTL-SDR

Trying to use the app in 'live' operation with my HF dongle and the *HDSDR* console software just caused *DRM4WIN* to crash. The documentation says that if the software doesn't connect to the RTL-SDR it issues an error message and closes. However, on my PC there was no error message that I could see.

The first thing I found out is that the app connects directly to the USB stream from the dongle. I had tried to connect it using the same techniques that I use with *DReaM* by employing a virtual cable to feed the I/Q signal to the decoder. This limits the app to local use with an SDR, and it dented my hopes of getting signals in real-time from the Kiwi-SDR

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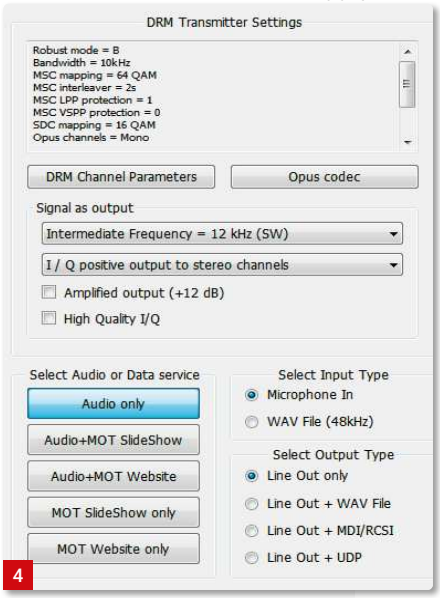
ALL PICTURES: KEVIN RYAN



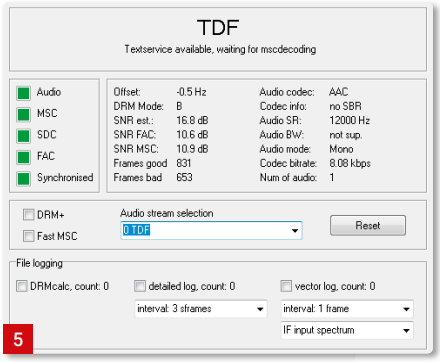




**Fig. 1: The opening screen of the *DRM4WIN* app. Choosing a receiver option opens the next screen to either connect to a USB data stream or play a saved I/Q data file. Fig. 2: The *DRM4WIN* app playing a saved file and showing the 10 presets, SDR tuning frequency in Hz, and the DRM input channel. The other half of the screen displays any multimedia included in the broadcast. Fig. 3: *DRM4WIN* is decoding Radio Romania International from Țigănești on 7350kHz and is connected to the *RSP1A* SDR. Fig. 4: Part of the configuration screen to set up a DRM data stream, showing many of the available options. The transmitter works best with *DRM4WIN*, probably due to the low output level. Fig. 5: The *DRM Decoder* option in *Sodira*, supporting the use of a virtual cable. A Kiwi SDR tuned to 3965kHz provided the TDF France DRM signal. Fig. 6: DAB Radio installed on a Raspberry Pi, with a hardwired antenna option, instead of the SMC connector I ordered. However, SMC-to-F adaptors are readily available. Fig. 7: The DAB board tuned into BBC Radio Oxford, using the *DABBoardRadio* program provide by *uGreen*.**

network. However, I am quite happy to have a working decoder, even if it means working from saved files.

## Digging Deeper

Next, I checked that the Windows PC 'recognized' the RTL-SDR dongle but still the app crashed when I started decoding. Digging into both the PC's settings and the *DRM4Win* documentation, I began to wonder if Windows had a standard driver loaded rather than the one that *Zadig* utility installs. The RTL-SDR dongles were invented as TV tuners, and if you want to use them to tune in other signals the standard Windows driver must be replaced by using the *Zadig* utility. On another PC, the RTL-SDR dongle I use with DAB software had the same Windows driver but *DRM4WIN* still crashed. If there is a problem, it might stem from my attempts to connect *more than one* RTL-SDR dongle to the same PC and the USB drivers are in a bit of a muddle.

## The SDRPlay RSP1A

I have an RSP1A from SDRPlay that uses the MSI.RTL API file (*mir_sdr_api.dll*) to provide access for third-party apps. Happily, that worked well, and I enjoyed a great reception of Radio Romania International on 7350kHz in English at 18.00 UTC (Fig. 3).

## DRMTX4WIN

The companion *DRM Content Server* (Fig. 4) is a great educational tool to learn about how a DRM signal is generated. The developer wants it to be used as an alternative encoder, avoiding the licence payments that stack up if a broadcaster uses the AAC family of audio codecs. The audio encoder is the open-source *OPUS* module that *DReaM* also uses for its content server/transmitter.

**https://tinyurl.com/n5wzp1g1**

DRM4WIN supports two robustness-for-DRM30-modes, and output bandwidths from 4.5 kHz to 20kHz. It contains other options to tailor signal parameters. The output options are *line out*, *.wav file*, *MDI* and *UDP*. The latter two are not mentioned in the tutorial file but, no doubt, a new version will be created to catch up with the software development. 'MDI' stands for Multiplex Distribution Interface and puts each DRM transmission frame into a data packet for transmission over the internet to the transmitter site.

I am not entirely sure that my understanding is correct about UDP, but I suspect it is a method of reliably distributing or multicasting DRM application data from a central server to several receivers.

I opted for *line out* plus *.wav*. This allowed me to test both the *DReaM* and *DRM4WIN* software apps. Even after I added a 12dB boost to the output level, the signal that *DReaM* displayed was too low, at -80dB peak, to get the decoder to work. *DRM4WIN* had no such problems and it read the signal as -20dB.

*DRMTX4WIN* creates two separate services, one for audio and the other for data such as a slideshow or MOT broadcast website and you set how the overall channel capacity is split between audio and data.

I had a lot of fun configuring the content server that is much easier to understand that *Spark* and has more features than *DReaM* that to be fair was never finished off.

## Sodira Update

*Sodira* is a software-defined radio for analogue and digital demodulation, and it includes DRM. The software connects to RTL-SDR, SDRPlay and HackRF dongles. It is very versatile. I also connected it to a virtual cable output, where it worked very well. I use the software in its simplest mode (Fig. 5). It offers plenty of other features, including a frequency manager using sources like *EiBi*, a measurement module and an FFT spectrograph. The latest software release still only decodes AAC signals – no multimedia content.

**http://www.dsp4swls.de/sodirasdr**

## All India Radio (AIR)

All India Radio installed a network of DRM-capable medium wave transmitters a few years ago. They operate mostly in AM, with a set period each day, during which the transmitter shifts down a channel and operates in pure DRM. Three transmitters operate in pure DRM only, located at Mumbai, Kolkata, and Delhi, usually between 1130 and 0930 UTC.

## An 18kHz DRM Signal

I tuned into AIR Delhi (1368kHz) on a remote Kiwi SDR and found they were testing a DRM configuration with the usual three audio channels at 18kHz bandwidth. This is a 'permitted option' in DRM Modes A and B, but I have never come across a broadcaster using it. So far as I could tell, the spectrum was not spread symmetrically around 1368kHz as I expected but stretched from 1363.5 to 1381.5kHz approximately.

I wondered if the AIR engineers had also applied an offset to minimize interference to other stations.

However, I could not get the Kiwi SDR's integrated DRM decoder extension to work. When that happens, I normally use the I/Q option on the Kiwi-SDR and then feed the output into *DReaM* via a virtual cable. Unfortunately, the I/Q output is just 10kHz wide, which lead to a strange listening experience.

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A DRM signal using this configuration transmits data on 412 data carriers, some of which are reference carriers: These are located in exact positions from the centre frequency, which the receiver has to find for synchronization to begin. The receiver should then find the configuration of the DRM signal located in the Fast Access Channel (FAC) and the Service Description Channel (SDC). These are always located in the 4.5kHz of bandwidth above the centre frequency. The rest of the bandwidth is used by the Main Service Channel (MSC) for both audio and data. For the AIR signal, the FAC/SDC data should be found between 1368 and 1372.5kHz.

However, I now effectively had a bandpass filter. By tuning the Kiwi-SDR across the transmission bandwidth, I managed to get *DReaM* 'locked' onto the signal. I received the audio, but this went silent periodically.

This happened because the missing 8kHz contained the audio data packets that just did not get decoded. The audio breaks were very clean without the usual distortion to the sound output that tells you that the decoding is about to collapse. My tuning method only worked on a strong signal and I could not seem to find that 'sweet spot' once the background noise increased.

## DRM News

KTWR in Guam transmitted DRM programmes on their usual weekend frequencies during all of Christmas week. I always find it enjoyable tuning into their broadcasts and watching the MOT Broadcast website taking shape. In January KTWR went back to including just a slideshow in its regular weekend broadcasts.

The DRM tests from Hungary appeared for few days in December, transmitting audio, multimedia slideshow and *Journaline*. These broadcasts are an ideal test for the *DRM4WIN* app. Unfortunately, they stopped again as quickly as they started.

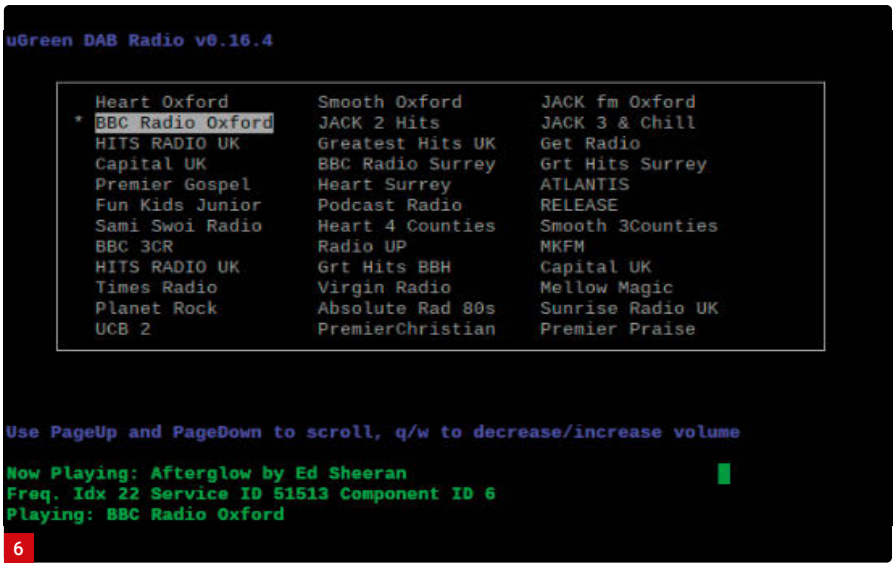
## Raspberry Pi DAB Radio

One of the recent ideas I have turned over in my mind is to create a receiver that can flag up possible DAB DX openings to the continent. I seem to remember an old device; it was essentially a Band I receiver tuned to 48MHz or so. Its output was a simple meter, and the dial displayed the signal strength once it peaked above a threshold level.

I have a Raspberry Pi mini-computer I purchased as part of a potential radio-related project using *GNURadio* open-source software.

I also found a DAB board made by a company called *uGreen*. It fits inside the Pi on the GPIO board (Fig. 7). Finally, I am taking this forward as a 'lockdown' project.

https://tinyurl.com/1hmeq5lr



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The heart of the board is a Silicon Labs Si4684 DAB+ and FM/RDS receiver. The chip supports AM and HDRadio, but these are not implemented in the firmware that is integrated into the terminal software. The board has the option for either a wire antenna or an SMC connector.

https://tinyurl.com/ygpsdn4m

## Installation with a Raspberry Pi

I have no experience of using the Raspberry Pi, so I knew I had much to learn. Nevertheless, I made my life as easy as possible by buying a ready-built operating system.

After hooking up the various cables and devices, I soon had a working Raspberry Pi. Armed with the documentation and files downloaded from the *uGreen* website, I felt confident to get the DAB radio up and running.

The documentation wasn't very useful; in the end, I bought a copy of a helpful article recommended by the *uGreen* website. After a translation from German, I found that it detailed the step-by-step processes, from downloading the necessary files to scanning the band for DAB stations.

https://tinyurl.com/3tlo44ns

## The Pi Radio in Use

If you are familiar with the Pi, I think you will find it a lot easier to set up the DAB board and get it working. There is a full scan of the DAB band during the installation process.

If you power down the Pi, each time you want to use the DAB radio you need to reload the DAB firmware using the *radio_cli* command in the terminal software. It is essential to shut down the DAB board correctly before switching off the Raspberry Pi – otherwise, the Si4684 chip may be damaged.

7

The latest version of the board has an LED that is on when the chip is activated.

Another command called *DABBoardRadio* (Fig. 6) reads the station list files and provides a simple graphical interface to play a list of DAB services. It is possible to play a station directly if you know the service ID. For example, to play Heart Oxford the Raspberry Pi command would be:

*sudo ./DABBoardRADIO –S 50785* ('50785' is the service ID).

The board is very sensitive and found 10 multiplexes. I obtained audio from most of the stations – unlike some receivers I connected to the same antenna. I listened comfortably to the audio on headphones, although it might be too low for other people.

The documentation details how to add an amplifier to stream the digital audio signal without loss of quality.

The DAB board is aimed at experimenters, but it might be an interesting use for a surplus Raspberry Pi. I am not sure if it will help me create my DAB alert system, but I am hopeful that it will.

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# Where Radio and Space Intersect

**Georg Wiessala**
wiessala@hotmail.com

**The editor takes a closer look at the second edition of a popular title on radio astronomy for beginners and discovers a beautiful book on the history, art and meaning of QSL cards.**

Quite a few books have been published in the last five years or so on amateur radio astronomy The title under review here, *Radio and Radar Astronomy Projects for Beginners*, by Steven Arnold (Fig. 1) replaces the first edition, called *Getting Started in Radio Astronomy: Beginner Projects for the Amateur*, by the same author.

It is part of the *Patrick Moore Practical Astronomy* Series by Springer, a publisher specialising in books on, radio astronomy, space weather, atmospheric physics, and related sciences.

This new version addresses the non-specialist and begins with a history of radio and radio astronomy. Unusually, the author also covers those prominent figures in this field, male and female, who are sometimes left out of host of other radio astronomy books, such as the Australian pioneer Ruby Payne-Scott (1912-1981, *RadioUser*, September 2019: 42).

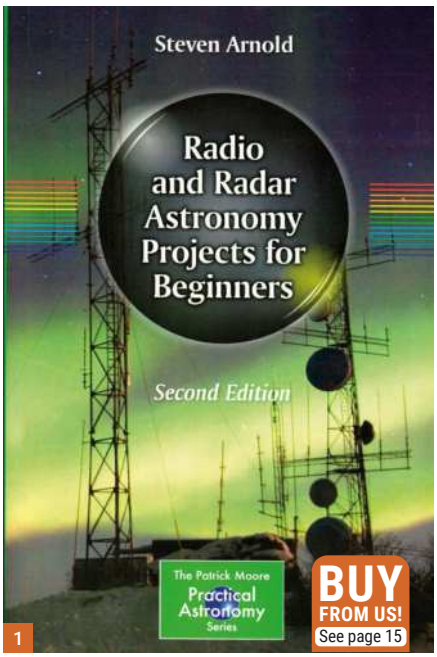
**https://tinyurl.com/322zehkr**

Part One (pp. 1-121) consists entirely of this general and historical introduction. The author begins with some of the founders of the discipline, Karl Jansky (1905-1950) and Grote Reber (1911-2002) and takes in, among other topics, the situation after World War II, early telescopes, the story of the Jodrell Bank observatory, and the remarkable achievements of physicist Sir Bernhard Lovell (1913-2012).

Following this, Arnold leads us into some of the key areas of the discipline, such as the 21-cm Hydrogen Line, radio emissions from Jupiter and the Sun, SETI, Quasars, the Cosmic Background Radiation (CMR), and much more. However, on the pages that follow in Part One, the wider history of cosmology and space exploration are also included – from the satellite *Sputnik* and space-dog *Laika* (Лайка) onwards to the Moon landings, robotic probes, radio stars and the *Big Bang* versus *Steady State* theories.

In addition to this, radio hobbyists will learn about Dame Jocelyn Bell Burnell ( b. 1943; *RadioUser*, July 2019: 47) and her 'Little Green Men' (LGM) signals, the famous 1977 'WOW' signal, and much more.

In fact, all the major debates and phenomena necessary for a basic understanding of radio astronomy are discussed here, written up in an authoritative and accessible manner.




1

*Radio and Radar Astronomy Projects for Beginners*
The Patrick Moore Practical Astronomy Series
Arnold, S. (2021) 2nd. Ed., Springer; pbk., 310 pp.
ISBN 978-3-030-54905-3
£18.81 (Amazon)

As if that were not enough, Arnold also keeps us regular radio users in mind. There are broad chapters on the electromagnetic and audio spectra, the Earth, electrical components, aerial types, cables and connections, types of modulation and polarisation, and on a satisfying range of other subjects. If you are not quite firm in telling your amplitude from your wavelength and frequency, or if you struggle to tell your thermal from your synchrotron radiation, then this section of the book is for you.

Other topics of interest for the radio hobby community include space weather and the Earth's magnetic field.

In my opinion, the real bonus of this book comes in Part Two (pp. 125-217), where some tried-and-tested radio astronomy projects are introduced, relating, for example, to such activities as monitoring the ISS, Moon-bounce, meteor-spotting, Aurora-detection, and NASA's *INSPIRE* and *Radio Jove Projects*.

COURTESY OF ISWL / SCOTT CALDWELL

2

In practical terms, all the projects introduced here are well known, tried-and-tested activities, for which the acquisition of the necessary materials and software is fast and easy.

The *Stanford Solar Centre SuperSID Monitor*, for instance, will enable you to monitor and analyse Sudden Ionospheric Disturbances (SID), with the help of your PC and software. *SuperSID* has been running in this editor's shack for some years now, without a glitch, monitoring radio weather and solar activities.

Another design introduced here is the *NASA INSPIRE Very Low Frequency (VLF) Receiver*. It can be used to study 'natural' radio from 0Hz to 10kHz, i.e. atmospheric sounds and noises (*RadioUser*, October 2018: 60)

**https://theinspireproject.org**

Other projects introduced in Steven Arnold's text in great detail include *Moon-Bounce, Radar Detection of the Aurora, Radar Detection of Meteors*, picking up the *International Space Station (ISS)* (*RadioUser*, November 2020: 14; January 2021: 38).

There is material too about NASA's *Radio Jove Project* and radio emissions from

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**Fig. 1: Steven Arnold's new edition.**
**Fig. 2: The ISWL *Monitor,* Vol. 70; No. 1/ 2021.**
**Fig. 3: R. W. Kenyon's inspired collection**
**Figs. 4a and 4b: QSL card from the old GDR.**

Jupiter and the Sun (*RadioUser*, September 2009: 32; October 2009: 34; March 2010: 34).

As in the case of the previous projects, the relevant chapters extend to useful descriptions of the types of aerials required, the software needed (e.g. *Radio-Sky Pipe*) and instructions on how to put together your own radio astronomy kit at home. Many websites will lead you to further background information and videos.

**https://radiojove.gsfc.nasa.gov**
**https://tinyurl.com/jwk3um5z**

The one recent project not covered here – and which I would have liked to have seen included – is the UK Radio Astronomy Association (UKRAA) with its proprietary VLF receivers and magnetometers, which we looked at here last month (*RadioUser*, February 2021: 34).

Last but certainly not least, from pp. 221 onwards, this book also covers, in some depth, hints and tips on how you can pursue the radio astronomy hobby with a Software-Defined Radio (SDR) – and how you can spot 'real' from 'fake' SDRs.

However, this is really just a short – and at times a little outdated – primer on SDRs for absolute beginners.

From p. 289, some very useful resources, such as a glossary, and a list of protected radio astronomy frequencies round off this volume.

As you will have seen from my numerous references in this review to former features in *RadioUser*, we have covered many of the subject areas treated in this book in these pages too, there is a significant overlap in interest here.

Therefore, Steven Arnold's book can be wholeheartedly recommended for the novice to this fascinating area. It benefits from an index, many further website recommendations and further online resources throughout the chapters.

Given the book's scope and breadth, I feel that this is the only radio astronomy title you will need for the foreseeable future. It has become my new 'go-to' reference text in this field.

*[If you fancy having a go at writing about beginners' level radio astronomy yourself, please get in touch with the editor – **Ed**.].*

## Imagined Communities

Many magazines, *RadioUser* and *Practical Wireless* included, have featured articles about QSLing before, and the buying and selling of whole or partial collections of these little gems used to be one of the major reasons to come to swap meets, ham fairs and other such radio hobbyist events. Many collections of QSL cards are large enough to be passed on through inheritance, exhibited, auctioned, bought and sold at considerable expense.

*QSL – How I Traveled the World and Never Left Home*
Kenyon, Ronald W. (2020)
Kindle Direct Publishing
ISBN: 9798686214170
**rwkenyon@gmail.com**

Furthermore, QSL cards – and the issue of extending one's collection of them systematically – frequently features prominently in dedicated hobbyist publications, such as the International Short Wave League (ISWL) *Monitor* (e.g. Vol. 70; No. 1, January 2021: 21-28, cf. Fig. 2).

I know of at least one radio magazine – the *Radio Kurier* in Germany of the ADDX – whose editors have hit upon the idea of producing an annual QSL Calendar and sell it to the readership as a highly desirable (and collectable) '*Kultobjekt*'.

**https://www.addx-verlag.de/kalender.php**

Now, Ronald W. Kenyon has taken his love for these amazing works of art – because that is what they are – a step further and published his collection in book format (Fig. 3). The result is a rich panorama of international relations, foreign policy, radio hobby and art, witnessed through the lens these QSL and greeting cards.

The title benefits from a short introduction, aimed at beginners, to short wave and amateur radio, propagation, logging, monitoring techniques, and further resources

The main part falls into four main sections, offering vintage QSL cards from international radio stations (1956-1961, pp. 24-118), and from amateur radio operators and short wave listeners (1950s and 1960s, pp. 119-139). There are also examples of greeting cards for special occasions from several short wave radio stations (pp. 141-151). The book finishes with an intriguing taste of 'personal history', and with Antarctica.

COURTESY OF RONALD W. KENYON

This selection is fascinating because it demonstrates just how much of a political and propaganda medium short wave radio has always been, especially in the 'Cold-War' period mainly covered here. The example of the Radio Prague May Day Greetings Card is a prime example here – and just look at the QSLs of the two Germanys (German Democratic Republic [GDR, East Germany, Fig. 2] and the Federal Republic of Germany {FRG], West Germany, Figs. 4a and 4b), presented here side-by-side. More than 50 years of history are encapsulated in them.

It was Benedict Anderson who famously argued that any country, nation or empire is, in the end, nothing more than an 'imagined community'. The ways countries wished – and continue to wish – to 'spin' images of themselves is witnessed by these revealing remainders of a largely bygone age, whose traces we can still hear today.

Fascinating too, to see QSL cards from countries that simply are no longer here, and whose QSL cards are echoes of their former ideologies, ambitions and dreams.

Nevertheless, this book is not just about nostalgia, history and politics. Art is represented here too; just take in the beauty of a Japanese woodblock print of the Edo Period, the elaborate wood carvings from Indonesia, the Christmas cards, and the diverse 'map-art' QSLs illustrated here to good effect.

In conclusion, this is a wonderful compendium that will help you to while away many hours behind your radio. Buy it and be prepared to be swept away …

1

# From Globular Clusters to GoldenEye: the iconic Arecibo Radio Telescope

**Tim Kirby**
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**This month Tim Kirby looks at the life and times of one of the most iconic radio telescopes in the world, the Arecibo Telescope in Puerto Rico. Many ground-breaking discoveries were made here.**

Many readers may have noted the recent news about the collapse of the Arecibo telescope in Puerto Rico. Against this background, I was inspired to look into the history of this fascinating telescope. I hope you will find it as interesting as I did.

Initial discussions about the telescope date back to the late 1950s when anti-ballistic missile defences were perceived to be an urgent priority. Several observatories were used to investigate how this might best be achieved.

Arecibo in Puerto Rico started with a dual purpose, looking at the ionosphere's F-layer, and also providing a 'general-purpose' scientific radio observatory.

## Origins of a Giant

The William E. Gordon (Arecibo, Fig. 1) was built between 1960 and 1963, with both Gordon and George Peter of Cornell University overseeing the design, planned to study the ionosphere. The idea was to use the sinkholes in the karst (limestone) of Puerto Rico, for the construction of a 'perfect' dish inside one of the cavities.

The original plan was for a fixed parabolic reflector, pointing in a fixed direction, with a 150m tower to hold the equipment at the focus of the dish (Graham-Smith, 2013: 189; Plate 5). Of course, this places some substantial limits on the use of the dish because it could not be used outside of this narrow direction.

The shortcomings of this approach were soon realised by Ward Low of the *Advanced Research Projects Agency (ARPA)* and the project was re-imagined as a design with a feed which would move along a spherical reflector 133 metres above the stationary reflector. A Wikipedia article describes what happened next:

*"George Doundoulakis [...] received the RFP from Cornell University for the antenna design and studied the idea of suspending the feed with his brother, Helias Doundoulakis, a civil engineer.*

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COURTESY: PROFESSOR JOE TAYLOR

2

**Fig. 1: The Arecibo Telescope is very large. Fig. 2: A close-up image of the telescope's feed-cabin. Fig. 3: The *Arecibo Message* – a binary graphic famously transmitted into Space in 1974. Fig. 4: In this image, the significant damage to the surface of the dish is visible. Fig. 5: A very brief survey of the history of telescopes, both optical and radio. Fig. 6: This is an easily-accessible hobby book on radio astronomy (reviewed elsewhere in this issue).**

*Doundoulakis identified the problem that a tower or tripod would have presented around the centre (the most important area of the reflector) and devised a better design by suspending the feed.*

*He presented his proposal to Cornell University for a doughnut or torus-type truss, suspended by four cables from four towers above the reflector, having along its edge a rail track for the azimuthal truss positioning. This second truss, in the form of an arc, or arch, was to be suspended below, which would rotate on the rails through 360 degrees.*

*The arc also had rails on which the unit supporting the feed would move for the feed's elevational positioning. A counterweight would move symmetrically opposite to the feed for stability and, if a hurricane struck, the whole feed could be raised and lowered. Helias Doundoulakis designed the cable suspension system which was finally adopted."*

## Antennas and Frequencies

The antenna is a bowl-shaped reflector with a diameter of 304.8m (1,000 feet) and a radius of curvature of 265m (870 feet). The reflecting surface of the dish is made of 39,000 perforated aluminium panels which can be individually adjusted, suspended from catenary cables and tied to concrete anchors in the ground.

The surface of the dish confirms to the desired spherical shape with a root-mean-square accuracy of 2.2mm.

Originally, when the telescope was built, a maximum frequency of around 500MHz was envisaged, but as time went on, researchers wanted to use the dish well into the gigahertz (GHz) region, so the accuracy of the surface of the dish had to be improved as described above.

To steer a fixed dish, you have to move the feed point (Fig. 2). This is done using a feed support system comprising a circular azimuth track and a banana-shaped 100m (328 feet) long azimuth arm, fixed to a central pivot. The steering in elevation is achieved by moving the feed antennas along a track on the underside of the azimuth arm. The feed antennas are enclosed within a geodesic radome. Switchable feedhorns are obtainable to cover 1 to 10GHz, with some lower frequencies down to 327MHz also available.

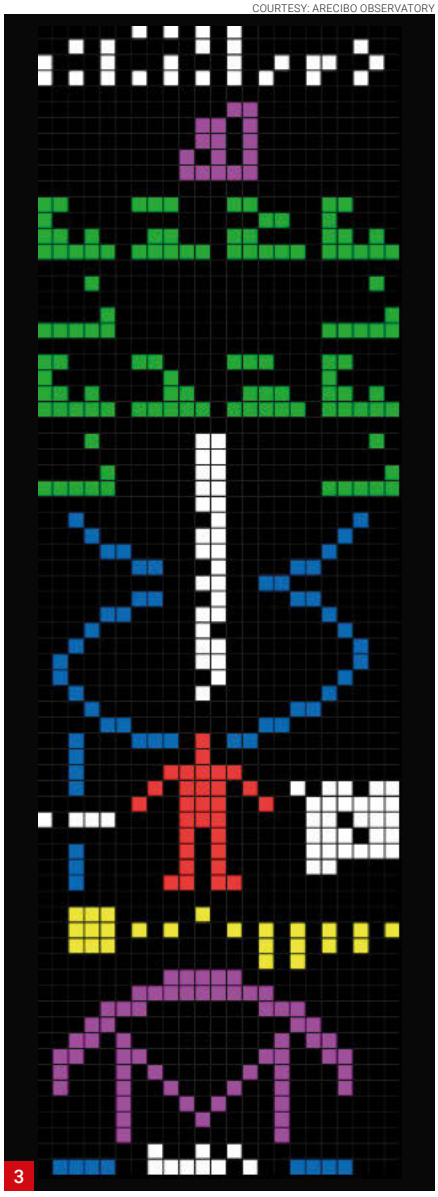
The use of the system was not just restricted to the microwave spectrum, but extended to HF, where ionospheric research was conducted using 100kW transmitters and six foldable crossed dipoles located in the main dish.

The Arecibo was instrumental (pardon the pun) in a wide range of discoveries and developments, and the following is just

| |
|---|
| The numbers one (1) to ten (10) (white) |
| The atomic numbers of hydrogen, carbon, nitrogen, oxygen, and phosphorus – constituents of DNA (purple) |
| The formulas for the chemical compounds that make up the nucleotides of DNA (green) |
| The estimated number of DNA nucleotides in the human genome, and a graphic of the double helix structure of DNA (white and blue, respectively) |
| The dimension (physical height) of an average man (blue/white), a graphic figure of a human being (red), and the human population of Earth (white) |
| Graphic of the Solar System, indicating which of the planets the message is coming from (yellow) |
| Graphic of the Arecibo telescope and the physical diameter of the transmitting |

**Table 2: The 1974 Arecibo Message to the Globular Star Cluster M13.**

COURTESY: ARECIBO OBSERVATORY



3

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TIM KIRBY COURTESY: ARECIBO OBSERVATORY

4

**1967** Arecibo discovered that the rotation rate of Mercury is 59 days, not the previously estimated 88 days.
**1972** Arecibo was used to simultaneously heat and observe the D- and E- regions of the ionosphere.
**1974** Arecibo discovered the first-ever binary pulsar. 1993 Nobel Prize in physics was awarded to Russell A. Hulse and Joseph H. Taylor for this discovery.
**1975** Arecibo made S-band radar observations of Mars to support NASA's Viking mission.
**1981** Arecibo produced the first radar maps of the surface of Venus.
**1992** Arecibo discovered the first-ever exoplanet: In subsequent observations, an entire planetary system was found around the pulsar PSR 1257+12.
**1994** Arecibo mapped the distribution of polar ice on Mercury.
**1996** Detection of ionized helium layer in the ionosphere made by Arecibo.
**2006** Arecibo used to make observations of ionospheric perturbations driven by a tropical storm.
**2008** Astronomers use Arecibo to detect for the first time, methenamine and hydrogen cyanide molecules ( two organic molecules that are key ingredients in forming amino acids) — in a galaxy 250 million light-years away.
**2016** Arecibo discovered the first-ever repeating fast radio burst. These are millisecond-duration radio pulses which appear to be extragalactic.
**2017** Arecibo discovered two pulsars that seem to vanish and reappear intermittently, upending the widely held view that all pulsars are the orderly ticking clocks of the universe.

**Table 1: Examples of Discoveries at Arecibo (National Science Foundation, USA).**

a short overview of the most significant achievements.

On April 7, 1964, soon after the telescope began operating, Gordon Pettengill's team used it to determine that the rotation period of Mercury was not 88 days, as formerly thought, but only 59 days. In 1968, the discovery of the periodicity of the *Crab Pulsar* (33 milliseconds) by Richard V. E. Lovelace and others provided the first solid evidence that neutron stars exist.

In 1974, Hulse and Taylor discovered the first binary *Pulsar PSR B1913+16*, an accomplishment for which they later received the Nobel Prize in Physics. In 1982, the first 'millisecond-pulsar', *PSR B1937+21*, was discovered by Donald C. Backer, Shrinivas Kulkarni, Carl Heiles, Michael Davis, and Miller Goss (Verschuur, 2015: 110/1). This object spins 642 times per second and, until the discovery of *PSR J1748-2446ad* in 2005, it was identified as the fastest-spinning pulsar, once every 0.0015578064488724 seconds.

In 1980, Arecibo made the first radar observation of a comet when it successfully detected *Comet Encke*. In August 1989, the observatory directly imaged an asteroid for the first time in history: *4769 Castalia*. The following year, Polish astronomer Aleksander Wolszczan discovered *Pulsar PSR B1257+12*, which later led him to discover its three orbiting planets. These were the first extrasolar planets discovered.

Moreover, in 1994, John Harmon used the Radio Telescope to map the distribution of ice in the polar regions of Mercury; and in January 2008, detection of prebiotic molecules methenamine and hydrogen cyanide were reported from the observatory radio spectroscopy measurements of the distant starburst galaxy *Arp 220*.

From January 2010 to February 2011, Matthew Route and Aleksander Wolszczan detected bursts of radio emission from the *T6.5 Brown Dwarf 2MASS J10475385+2124234*. This was the first time that radio emission had been detected from a T dwarf, which has methane absorption lines in its atmosphere. It is also the coolest brown dwarf (at a temperature of ~900K) from which radio emission has been observed.

The highly polarized and highly energetic radio bursts indicated that the object has a >1.7 kG-strength magnetic field and magnetic activity similar to both the planet Jupiter and the Sun.

Table 1 contains some examples of key discoveries made with the help of the Arecibo telescope (Source: NSF).

## A Message to the Stars

Last but not least, in 1974, the dish was used to transmit the 'Arecibo Message' (Fig. 3) towards the globular star cluster *Messier 13*, which is around 25,000 light-years away in the constellation of *Hercules*.

The message was a 23x73 pixel bitmap image which included numbers, stick figures (in our image), chemical formulae and a simple image of the telescope. Although the image reproduced here has colour, this was not in the original transmission but has been later added to show the different constituent parts.

Table 2 details the content of the *Arecibo Message*.

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**'The dish also had some military intelligence uses, including detecting Soviet radar installations from their signals reflected from the Moon!'**

The entire message consisted of 1679 binary digits, approximately 210 bytes. It was transmitted at a frequency of 2380MHz and modulated by shifting the frequency by 10Hz. The power of the transmission was 450kW. The whole transmission took less than 3 minutes to send – and it will take 25,000 years to arrive.

When it does arrive, Messier 13 will not be in the same place as it was when the transmission was made, but it is hoped that it will be close enough! Whether or not there is anyone there to receive it, we may never know, or at least, not in this lifetime!

## Other Uses and Collapse

Originally, the dish also had some military intelligence uses, including detecting Soviet radar installations from their signals reflected from the Moon! I wonder how much useful information could have been gleaned by this method, other than the fact that the radars were present.

More memorably, perhaps, the telescope became well-known world-wide, for its use in movies, including the 1995 James Bond movie *GoldenEye* and the 1997 sci-fi film *Contact*, with Matthew McConaughey, based on Carl Sagan's mind-blowing novel of the same name.

More recently, severe Hurricanes had raised serious concerns about the stability of the observatory, and several storms had caused significant damage.

Finally, in November 2020, some of the support cables from a tower broke before it could be replaced. In so doing, they shattered parts of the dish surface. This weakened the structure and placed a load on other parts of the structure. By the end of November, the wire strands in the receiver's supporting platform were snapping. This caused the complete collapse of the receiver platform at 1055 UTC on December 1st, 2020.

This collapse, in turn, caused other parts of the system to fail structurally (Fig. 4). It was widely reported that the Arecibo Observatory was closed for good and would have to be dismantled.

## Further Resources

- Arecibo's Key Discoveries: **https://tinyurl.com/y4rco27o**
- Arnold, S. (2nd ed., 2021) *Radio and Radar Astronomy Projects for Beginners* (Springer, formerly: *Getting Started in Radio Astronomy*)
- Britannica: **https://tinyurl.com/sphjvdhy**
- *Cornell Chronicle*: **https://tinyurl.com/yz22vdnt**
- Cottrell, J. (2016) Telescopes. A Very Short Introduction (OUP)
- Factsheet (NSF): **https://tinyurl.com/1nrku6mr** (see main text)
- Graham-Smith, F. (2013) *Unseen Cosmos. The Universe in Radio* (OUP).
- *Nature*: **https://tinyurl.com/5fh98ljw**
- *The Economist*: **https://tinyurl.com/y3u48kap**
- Verschuur, G. (3rd. ed., 2015) *The Invisible Universe. The Story of Radio Astronomy* (Springer)
- Wikipedia: **https://tinyurl.com/4g59d5a6**
- Wilson, T. L., Rohlfs, K., Hüttemeister, S. (2013) *Tools of Radio Astronomy* (Springer; professional-level)

However, since then, the then governor of Puerto Rico has committed $8 million for the removal of debris and for the design of a new observatory to be built in its place. It will be interesting to see what emerges from this project.

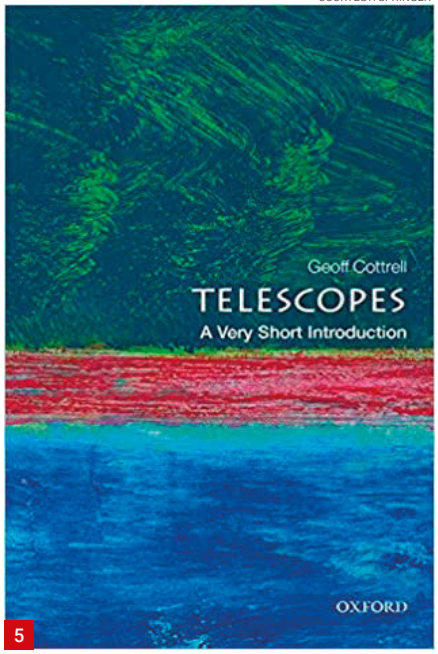
Arecibo has a rich heritage, and it would be sad to see its' name consigned to the history books. Figs. 5 and 6 show two recent recommendations for introductory reading to both telescopes and general radio astronomy.

## Meteor Scatter

There is just enough space left to mention that I recently discovered a very useful website if you are interested in meteor scatter propagation. The *Sodankylä Geophysical Observatory,* part of the University of Oulu in Sweden hosts a meteor radar which offers real-time information on the number of meteors detected.

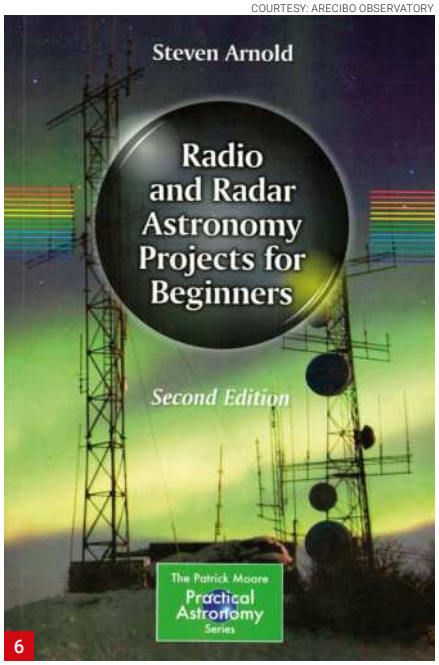
This can be useful if you wish to compare this with your own results, or at least, work out whether it is a good time to try some meteor scatter experiments! The site can be found at this URL:

COURTESY: SPRINGER




5

COURTESY: ARECIBO OBSERVATORY




6

**https://tinyurl.com/oxpnvscx**

I watched this site during the recent *Quadrantids* meteor shower at the start of January 2021, and I found that it was very accurate in pinpointing the peak of the shower. The site will also be useful in highlighting the best times of day to try meteor scatter experiments (06-07) with a dip in meteor activity from 1430 or so until around 1900 UTC. You get a good idea too, of how the current meteor conditions compare with the long-term mean of meteor reflections.

That's it for this month! See you next time.

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CHRISSY BRAND

# Reception Reports and QSLs in the Age of Remote SDR

**Stig Hartvig Nielsen**
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**Stig Hartvig Nielsen** takes a look at the issues raised by the use of an increasing number of remote, web-based SDR receivers. Does this still constitute 'Dxing', and what may be its long-term effects?

In the past - some may say in the 'good old days' - things were a bit simpler. Short wave listeners (SWLs) and DXers would buy a radio receiver, hang up an aerial, connect and then start chasing those rare radio stations in faraway countries or just enjoy listening to their favourite radio stations abroad.

Many a short wave – or medium wave – enthusiast would send reception reports to the station they heard. DXers would send reports to those seldom heard tropical stations in Indonesia or Peru. Short wave listeners would send reports to the foreign service of Radio Budapest or Radio Canada International.

These reports were sent in the hope of getting a well-designed, pretty-looking QSL card and perhaps even a pennant, a sticker, and a friendly letter. By ordinary snail-mail, of course.

Some foreign services which did not have monitors abroad were happy to learn from their listeners how good, or otherwise, the reception was.

Other stations – and probably a lot of them – were also pleased to receive any kind of mail.

## Life and Death of Stations

This would show how popular this or that foreign service was to those who had to decide life or death for these external services.

It would also give Radio Pyongyang or Radio Portugal the opportunity of treating the listeners to a bunch of leaflets, brochures, magazines and so on about North Korea and Portugal – besides, of course, the much-desired QSL card. The smaller private stations in the Andes and South East Asia were usually also thrilled to receive these reports from far away listeners and fans.

They were impressed by the fact that some enthusiasts in Europe were able to pick up the signals from their old, worn-out 1kW shortwave transmitter connected to a simple dipole. Some of these local stations would spend a lot of time and money sending friendly replies.

Others simply could not find the time to

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reply, due to the many reports received.

But then something changed. One day the internet appeared. And suddenly we found ourselves surrounded by remote SDR receivers. In the meantime, SWLing and DXing in most built-up areas were becoming increasingly difficult, due to man-made noise from anything, such as lamps, power supplies, routers, and TV sets.

Therefore, the arrival of technology enabling us to listen (and DX) via the internet using a receiver located at an entirely different place to your own noisy environment was welcomed by many.

## A Roundabout Way?

In the past no one would never have thought about picking up the phone, calling your auntie in St. Lucia, and then asking her to place the phone in front of a medium wave radio and then asking her to tune into the frequencies of the medium stations in the East Caribbean –to enable you to write reception reports to these exotic radio stations asking for a QSL.

But now it is 2021, and many things have changed, not least in the area of sending out reception reports asking for a QSL. Now it is common practice to sit in your living room in Argentina and Japan, switch on the PC and listen to European radio stations via a remote receiver in Twente, The Netherlands, or elsewhere in Europe. Then these listeners send reception reports to the European radio stations asking for a QSL.

Many 'remote' listeners, perhaps, do not even own their own short wave receiver or an external aerial; they are, therefore, just utilizing someone else's equipment on the far side of the globe.

This might raise a question or two, and we might well speculate about what exactly a 'QSL' is.

Technically-speaking, this is easy to describe. A QSL is a radio station confirming that you have picked it up on this or that particular frequency at a specific time, listening to your *radio* and using your *own aerial* – not your neighbour's.

But then what if you did not listen from your home, and you were not using your own receiver or aerial? Instead, you used somebody else's equipment at another location.

Or is a QSL just what you put in it. It is just a gesture from the radio station as a 'thank you' for listening and writing in.

Radio stations disagree on this. Many stations take the latter position. With the decline in short wave listening, you need to appreciate what little response you

**Fig. 1: Many radio stations worldwide issue QSL-cards. These are proof of reception, public 'shopwindows' for countries, works of art and reflections of 'imagined identities'.**
**Fig. 2: The author, Stig Hartvig Nielsen.**
**Fig. 3: Ronald W. Kenyon's recent title on QSL cards shows them as akin to art objects. They can also reflect current affairs and politics.**

are getting as a broadcaster. Other radio stations are annoyed with the increasing number of 'remote' reports. They take a more old-fashioned stand and point to the fact that they already know very well how their radio station can be heard in Twente and the various other sites with remote SDR receivers. It costs a lot of time and (if sending printed QSL cards out) money to reply to these distant listeners.

One may also fear that, in the future, exotic, low powered radio stations in Africa or the Pacific may end up getting so tired of dozens and dozens of reception reports from European listeners, who listen in to these far-away stations using remote receivers in Africa and the Pacific, that they would eventually give up sending out any QSLs at all.

And then, when someone in Europe actually *does* succeed in catching one of these rare radio stations in Africa or the Pacific using their top-end receiver, using a highly directional beverage aerial and after putting endless of hours of patience and listening into catching this particular station – then the rare station may not believe this and immediately throw the report into the dust bin, or push the *delete* button.

[**Stig Hartvig Nielsen**, from Denmark, has been an active DXer and shortwave listener since the beginning of the 1970s. He has also been working in broadcasting most of his life: As pirate radio operator of *Radio Viking*, manager of local stations *Radio Viborg and Radio ABC/Radio Alfa*, as a member of the board of directors of national *Danmarks Radio*, as head of *Danmarks Radio P4*, and more recently running the private AM stations *World Music Radio* and *Radio208*.

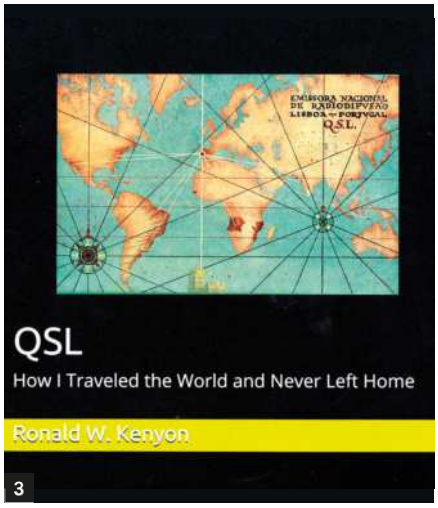
*[Ronald W. Kenyon's book,* QSL – How I Traveled the World and Never Left Home, *is reviewed elsewhere in this issue – **Ed**.].*

## How to Write A Reception Report

A reception report should - to qualify for a QSL – contain the following information:

- Date, time, and frequency of listening.
- Your listening location.
- A description of the reception quality (SINPO code can be used for international broadcasters).

2




3

- Some programme details, so that the station in question can verify that it was this particular station you heard.
- Details of which radio receiver and aerial you used for listening, and
- Your name and address.

If sending the report by email, many stations appreciate a short mp3-clip with a recording of your reception. Many smaller stations welcome return postage if you are sending the report via 'snail-mail'. If sending the report by email, most stations would send an e-QSL, instead of a printed QSL card.

## Further Resources

Kenyon, Ronald W. (2020): QSL – *How I Traveled the World and Never Left Home* (Kindle Direct Publishing)

Online QSL Cards

**www.bclnews.it/qsl/**

For the latest news and product reviews, visit www.radioenthusiast.co.uk

COURTESY: MOURNE MRT

1

# Introduction to the NAVDAT System

**Robert Connolly**
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**Robert Connolly takes a look at the NAVDAT transmissions, which will soon be a part of the Global Maritime Distress and Safety System (GMDSS), shares some NAVTEX updates and addresses licensing matters.**

NAVDAT (Navigational Data) is a French maritime digital data broadcasting system that the International Maritime Organization (IMO) decided to integrate into the Global Maritime Distress and Safety System electronic infrastructure. NAVDAT operates in FM and on HF.

More contemporary GMDSS equipment has to have an upgraded capacity to receive Maritime Safety Information (MSI) via HF. This is easier to process onboard ship and provides shore-based organisations with a more flexible array of MSI distribution options.

As a result, future receivers will have to combine NAVTEX/NAVDAT capabilities, enabling the reception of messages in the 490, 500 and 518kHz bands as well as in the decametric wave ranges designated for MSI. NAVDAT aims to provide digital broadcasting of safety and security-related information from shore to ships by supplementing the existing NAVTEX system, and maybe in years to come replacing its use.

In November 2018, the ITU produced a comprehensive report on NAVDAT guidelines. The relevant document (*ITU-R M.2443-0*) provides detailed information on the technical aspects of NATDAT and makes an interesting read. This report describes the use of NAVDAT system operating in the mobile maritime service to provide digital broadcasting of safety and security-related information from shore to ships. It also provides information on the implementation of the radio parts of the NAVDAT system and its overall understanding.

## Frequency Matters

These guidelines will be supplemented by the results of future installations of the NAVDAT system. It indicates NAVDAT will use two frequency bands – medium frequency on the MF frequency band (500kHz) and six channels on the high frequency (HF) frequency bands (CH1: 4226kHz; CH2: 6337.5kHz; CH3: 8443kHz; CH4: 12663.5kHz; CH5: 16909.5kHz, and CH6: 22450.5kHz).

The document also describes the electrical radio components of the system, as well as the parameters used for coverage calculations, but it does not address digital modulation, coding parts or server system.

The report may be downloaded from this URL: https://tinyurl.com/a25uqvwd

The World Radiocommunication Conference in 2012 (WRC-12) allocated the MF frequency of 500kHz, with a 10kHz radio frequency (RF) channel, for the exclusive use of NAVDAT. But in the future, any frequency in the maritime frequency band of 479-526.5 kHz could be used, after a validation by the administrations concerned. Overall, the NAVDAT system is a digital file broadcasting system for ships at sea, for navigation, safety and security.

The modulation is orthogonal frequency division multiplexing (OFDM, 47.4kBd),

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**Fig. 1: Mountain Rescue Teams risk life and limb – often for emergencies that could easily have been avoided. Fig. 2: The *Garda Cósta na hÉireann* (Irish Coast Guard) Rescue Helicopter EI-ICD in action. Fig. 3: The author's *Restricted Certificate of Competence in Radio Telephony – VHF-Only*.**

with multi-carriers in a 10kHz channel maximum. The subcarriers are orthogonal and modulated in amplitude and phase (QAM). This modulation can be 4, 16 or 64 QAM, with a bandwidth from 1 to 10kHz. Each shore station would have a 3-minute time slot every hour on a standard shared frequency, similar to the current NAVTEX system, which has 10-minute time slots. Tuning in this mode would require a receiver with 12kHz bandwidth capability.

## Message Types and Equipment

NAVDAT message types fall into two main categories, Priority Messages and Information for Navigation.

Priority Messages; these can be broadcast at a reduced rate (4 or 16 QUAM) to ensure a high signal-to-noise-ratio (SNR) and large coverage. Messages may include navigational and meteorological warnings, search and rescue data, piracy-warnings, ice-warnings, and distress and emergency information.

Information for Navigation. This message group may include meteorological forecasts, local meteorological information, details on tides and currents, VTS traffic information, cartography data for ice and icebergs, and aids to navigation information. Wider services could include cartography updates and information for fishermen. Besides, there is the possibility of encryption for confidential information.

The components of a NAVDAT transmitting site may include a digital modulator, a transmitter with RF amplifier, an aerial impedance adapter, an aerial system with an artificial ground plane, and some monitoring equipment. The aerial for data transmission might well be a top-loaded T-type or a vertical monopole with an artificial ground plane.

NAVDAT reception on ships requires just an aerial and a receiver with a demodulator. To be compatible with the majority of ships, these aerials are often 4- or 8-metre passive vertical whip aerials with wideband impedance-matching for connection to coaxial cable.

The main difficulty for this type of aerial lies in maintaining a good impedance matching over the entire frequency band (400kHz to 30MHz). An active vertical

2

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3

antenna with a vertical whip from 1 to 1.5 metre can also be used. An active antenna comprises a very short vertical monopole connected to an impedance adapter and followed by an amplifier.

Other aerial options for this type of transmission may comprise of a loop, a ferrite or an active ferrite. A loop might have two crossed loops with a diameter of 0.5 to 1 m, making it possible to obtain a quasi-omnidirectional diagram. The preamplifier must meet the same specifications as those required for the active antenna.

A passive ferrite may consist of two crossed, wound, ferrites with a low impedance output, while an active ferrite aerial would be similar to the cross-frame but using wound ferrites coupled to a preamplifier.

## Experimental NAVDAT

An experimental NAVDAT station has been operating from Brest, in NAVAREA II, for several years on 500kHz, while the system was being developed. More recently, another experimental NAVDAT station has commenced operating from Shanghai, China, also on 500kHz.

More information regarding the integration of NAVDAT into the Global Maritime Distress Safety System (GMDSS) can be found by visiting this website:
**https://tinyurl.com/y4vs3thk**

## MSI Updates

Many of you are probably aware of the Maritime Safety Information (MIS) types of broadcast currently transmitted by NAVTEX, voice and the official *Notices to Mariners* published by the UK Admiralty.

However, you may not be aware that notices to mariners are also issued by other maritime agencies, for example, Trinity House, or their equivalents in Scotland and Ireland, along with many ports specific to their own area of operations on a national or local base.
**https://tinyurl.com/ycjoeeht**
**https://www.trinityhouse.co.uk**

Some years ago, when NAVDAT was in an earlier stage of development, I recall reading that, in the long term, it was likely that additional transmitting stations would be

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located around costs to facilitate the transmission of more localised MSI) data. These were planned to transmit *local* maritime navigation information. At the time it was believed that those new stations would also operate on 500kHz.

The VHF Data Exchange System (VDES) encompasses different communications subsystems, and one of them is AIS. The second subsystem of VDES consists of dedicated AMS channels, whose purpose is to decrease the load of AIS ones. Furthermore, VDES offers a third subsystem, called VDE, which allows higher rate communications, and is highly flexible to be able to support a variety of services in the future.

It looks as if local NAVDAT information could be transmitted as part of the current VDES. If this happens, any information transmitted should be of a format that would enable, not just commercial vessels, but also the small craft of inshore fishermen or leisure craft users to receive the information easily and affordably.

## NAVTEX

While I am on the subject of marine data transmission, it has been a while since I looked at the provisions and functioning of the current NAVTEX system. I normally use an old laptop and SeaTTY, along with my JRC NRD525 receiver. I deploy my PA0RDT MiniWhip antenna for decoding NAVTEX signals on a 24/7-basis, over several days, or longer. This method allows for propagation changes and also retains constant reception during daylight as well as darkness. Daylight reception on 518kHz is fairly standard with the reception of most stations located in NAVAREA I (UK, Ireland, Belgium, Germany, Southern Norway, and NAVAREA II station Corsen, in France.

Often, before dusk, the Italian stations of La Maddalena and Mondolfo, both in NAVAREA III, start to come in here.

Later in the evening, during darkness, most stations in NAVAREA III, including Sellia Marina Radio (Italy) and the Black Sea station Astrakhan (time slot W) are received at my QTH, along with some stations in NAVAREA II: Coruna (Spain), Monsanto (Portugal), Las Palmas (Canary Islands), and Porto Santo (Madeira).

However, it is only in the wee small hours of the morning when the really interesting signals can be received. These include North American transatlantic stations from NAVAREA IV – Labrador and Sept-Îles (Canada) and Simiutaq Island (Greenland), along with Miami, Boston (USA) and Bermuda. These were all received while I was writing this column in early January 2021. I also received were NAVAREA IX stations of Bahrain and Ismailia (Egypt), and the Norwegian stations of Bodø and Vardø in NAVAREA IXX. Moreover, I was able to log Murmansk and Arkhangelsk in NAVAREA XX.

Moving further up the frequency spectrum, Buenos Aires is often receivable here on 8416.5, 12579 and 16806.5kHz at around 1000 UTC. Their MSI transmission is extensive, with Spanish used at 0000 UTC, followed by English at 1200 UTC.

While there are no changes to NAVAREA I stations, there are some to other areas. In NAVAREA II, two new stations are planned for 490kHz. Lagos (time slot L) and Port Harcourt (time slot O), both in Nigeria, as well as São Vicente (time slot P) are currently believed to be out of service.

A new station is planned for Monrovia, but it has not been allocated a time slot. In NAVAREA III, on 490kHz, a new Russian station Taganrog with a time slot U is operational. On 518kHz, Malta is operating temporarily, using time slot T. In NAVAREA IX, Jeddah is on 490kHz and time slot O and appears on 518kHz in time slot H.

In NAVAREA XX, three new Russian stations are planned: Mys Sterlegova (time slot N), Ostrov Andreya (time slot O), and Ostrov Bolshoy Begichev (time slot P). William Hepburn runs an excellent website, containing information on, not only current NAVTEX stations and schedules but also other aspects of marine radio and much more.

**www.dxinfocentre.com**

For information on the UK and Ireland VHF and MF coastguard broadcasts, along with MF and VHF frequency lists, Robert Maskill's website, is the place to visit.

**www.coastalradio.org.uk**

## Unnecessary Emergencies

During the various Covid lock-downs, exercise has played an important role. During the Christmas break, many people headed to the mountains around the British Isles for their permitted exercise. Unfortunately, due to increased numbers in the mountains, combined with winter weather, mountain rescue teams were busy.

On one afternoon during the festive period, our local mountain rescue team attended numerous incidents and were so busy that, not only were they moving from incident to incident, but they also had to get support from the Police Service of Northern Ireland mountain rescue team. I saw a report indicating that a rescue team in the Republic of Ireland was under similar pressure, and I am sure this also applied to teams in Mainland GB. Post-incident reports indicate that many of those having to seek assistance from the mountain rescue team were either inexperienced, ill-equipped, or both.

The members of mountain rescue teams (Fig. 1) are volunteers leaving their family or work to respond to callouts. Although they are fit and well trained every callout produces an element of risk where team members could become a casualty themselves. Having numerous tasking on the same callout greatly increases the risk to team members due to fatigue. Many mountain rescue tasks also require the assistance of either an air ambulance or coastguard rescue helicopter (Fig. 2) to evacuate the casualty.

Hiking in the mountains during winter months is not for beginners, and conditions on the mountain can change rapidly. Therefore, inexperienced or ill-prepared hikers are not only placing themselves at risk but also mountain rescue team members deployed to assist them when things go wrong.

## Licensing Matters and Reminiscences

As a follow up to the recent review I offered on the Moonraker MHR100 (*RadioUser*, December 2020: 30), reader Geoff Searle contacted me to remind me that operators of marine transceivers have to hold a VHF Short Range Certificate (SRC). The Short Range Certificate (SRC) is the minimum qualification required by law to control the operation of VHF and VHF Digital Selective Calling (DSC) equipment on any British flagged vessel voluntarily fitted with a radio. This includes both fixed and hand-held equipment using International channels. Details are available on the RYA website:

**https://tinyurl.com/ah9hmapz**

Incidentally, when I did mine in 1990 – through self-study and long before the introduction of DSC — it was referred to as the *Restricted Certificate of Competence in Radio Telephony – VHF-Only* (Fig. 3). I remember two of the other candidates very well, and I sat and passed the practical and theory exam at the University of Ulster outside Belfast – Thank goodness it was not a navigation exam as it took us almost 30 minutes to find our way out of the university afterwards!

Until next time, *Fair Winds*.

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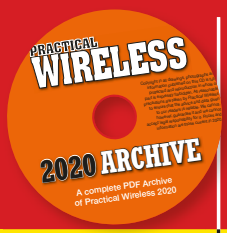


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THE BATTLE OF BRITAIN IN COLOUR

The Battle Looms

The Battle of Britain was one of the most iconic battles of the Second World War, embedding itself indelibly into the nation's consciousness. Earlier, the Battle of France could easily have spelled defeat before the air battles got underway in July 1940.

After the outbreak of war in September 1939, there followed eight months of what became known as the 'Phoney War'. However, it was clear that large-scale fighting would ultimately follow, and a British Expeditionary Force was sent to France before the end of that year. As part of that BEF, a large Air Component was supplemented by an Advanced Air Striking Force. In total, these air forces amounted to 25 squadrons, six of which were Hawker Hurricane-equipped fighter squadrons. The remainder of the RAF force in France comprised largely light bombers and Army Co-Operation squadrons. Eventually, however, the 'Stukageig' became the 'Blitzkrieg'

On 10 May 1940, German forces launched their all-out assault on France and the Low Countries and what followed in Belgium, the Netherlands etc. was the complete collapse of those countries under the overwhelming might of German military power. Across France, German forces rolled inexorably onwards towards the English Channel and while the French and British tried desperately to stem the advance, so the situation became ever more hopeless.

**Predicted Catastrophe**

When the fighting had broken out in earnest on 10 May 1940, aircraft of the Air Component were in almost constant combat, and losses had to continually be made good from squadrons based in Britain. The Commander-in-Chief of RAF Fighter Command, Air Chief Marshal Hugh Dowding, had already stated as early as September 1939, that if he was expected to defend Britain's skies, then he would need 52 fighter squadrons. At that time, he had only 32 under his command and was told it would be impossible to produce the number he required. However, efforts would be made to provide him with a further eight.

During the fighting in France, increasing numbers of fighter squadrons were sent across the Channel, urged on by desperate appeals from the French Prime Minister, Paul Reynaud. Dowding saw his resources 'slipping away like

— 6 —

BACKGROUND TO BATTLE

**Left** A Hurricane of 501 Squadron starts-up for an operational sortie at Bethenville, France, May 1940. Air Chief Marshal Hugh Dowding argued successfully against further wastage of the home-based RAF fighter force by sending yet more fighters to France to bolster a futile defence.

**Right** As the unstoppable juggernaut of German military might advanced across Europe, the deadly Junkers 87 Stuka dive-bomber came into its own. However, the RAF quickly learned how aircraft, and this stood t when facing the Stuka a Britain.

**Below right** Panzer IV t France in May 1940. Th was rapid and overwhel weeks France had colla were evacuating from D

THE RAF FIGHTER PILOT

were not afraid that they were either liars or foolish. However, a strident jangling of the telephone could mean several things. Sometimes, to intense relief, it could send a message to 'Stand Down'. Other times, it called pilots to readiness, and then to the heart-pounding order: 'SCRAMBLE!'

Years afterwards, veterans of the Battle of Britain told how they hated the sound of a ringing telephone.

On the order to scramble, there was a mad rush by pilots to their allotted aircraft where the fitter and rigger were ready and waiting: the rigger on the wing ready to help in his pilot, and the fitter standing by with the starter plugged in on the starboard side of the engine. Heaving himself into the cockpit, the pilot went through a number of tasks: helmet pulled on, oxygen plugged in, radio jack-plug in its socket, magneto switches 'on', Ki-Gas cylinder priming pump given a couple of brief strokes and thumb ready on the starter. Meanwhile, leaning into the cockpit, the Fitter helped the pilot with his parachute harness straps, then his Sutton seat harness.

By this time, the starter button was pushed after a thumbs-up from the fitter, who unplugged the starter trolley, ensuring it was clear of the aircraft. Unable to communicate over the roar of the Merlin engine, the pilot and rigger exchanged thumbs up signals, the rigger slapping his pilot on the shoulder to convey reassurance and good-luck as he leapt from the wing. As he jumped, the aircraft was already rolling, and the rigger dodged out of the way of the tail-plane, buffeted by the slipstream which was kicking up dust and grass. Getting out of the way, he was hit by a blast of hot exhaust gasses. Now, the aircraft gathered speed ahead, into wind, bouncing and rocking across the grass airfield. Others careered along around it, in the organised chaos that was a squadron scramble.

Getting airborne, the pilots concentrated on keeping station as they selected 'Gear Up', closing the cockpit canopy while listening out for instructions from the CO or flight commander who was talking to the Sector Operations Room and garnering instructions as to heading, altitude and

**Facing page** Pilots of 19 Squadron are delivered to their dispersal point at RAF Duxford ready for operations early one morning during the summer of 1940.

**Above** Their relaxed look perhaps concealing the tension, these Hurricane pilots of 501 Squadron pose for the camera during the summer of 1940. All of them saw action. Several of them shot down enemy aircraft and some of them were killed.

what it was they were intercepting. It may have been an instruction along the lines of: "MITOR Squadron, ANGELS 18, Vector Two-three-zero, Fifty Plus. BUSTER." Listening in, the other pilots could interpret these coded instructions: "40 Squadron to climb to 18,000 ft on a heading of 230 degrees. Fifty plus enemy aircraft. Maximum cruising speed".

**Mentally and Physically Draining**

Settling into the climb, the pilots automatically slid into section order and the preferred squadron formation. Meanwhile, the CO or flight commander concentrated on setting course as the

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other pilots concentrated on what was going on in their cockpits: oil temperatures and pressures, fuel state, oxygen contents checked and selected to 'On', microphone not on 'Transmit' (this could effectively block all other transmissions), straps tight, gun-sight 'On' and illuminated, straps tight and canopy firmly shut. A surprising number could carry out a little good luck routine – the feeling for a lucky charm, or even crossing themselves.

Now, the workload was high, and still they needed to concentrate on formation keeping while permanently keeping a wary eye open for the enemy and quartering the sky in a relentless search. A moment of relapse could literally spell death. The squadron 'Weaves', winding from side to side, kept a rather more wary eye open than the rest, as the squadron got closer by the second to their quarry. Brief instructions might crackle through the headphones: 'Close up Red 2' or, on receipt of further instructions from the Fighter Controller: 'Turning to Port, Go!'

Meanwhile, pilots fiddled with the radio tuner, struggling to tune and re-tune their wireless sets in a constant battle to receive and properly understand the messages. Sometimes, a squawk of static drowned out everything, sometimes resulting in one section

having off suddenly, upwards or downwards, the rest of the squadron watching in bemusement and puzzled because they received no transmission, or else just couldn't understand what had been said. Meanwhile, constant juggling of the throttle setting with the left hand, and judicious adjustment of position through the control column and rudder pedal inputs, were all necessary just to keep station. It was incredibly hard work, and mentally and physically draining.

By now, the squadron was 'on oxygen', masks clamped securely to pilot's faces as cold began to permeate the cockpits. Now, with all the hard work of take-off, formation flying and getting to altitude, came further nervous tension with realisation that the enemy were near. Then, a tight knot of fear returned as the gunsight was checked and the SAFE and FIRE ring on the gun button turned, ready, to the FIRE position. Goggles pulled down. And then the shout:

'BANDITS! Ten o'clock, above. Coming down now! Break, break, break...'

**Chatter Of Gunfire**

Suddenly, to avoid the 'bounce' of fighters coming out of the sun, the squadron had dispersed in a pre-ordered plan. Now, the enemy fighters were among them. This time, there was no

**Facing page** Although posed for a news cameraman, the squadron telephone orderly shouts instructions for a 'scramble' as pilots lounge in the dispersal hut. The smartly dressed officer is Duty Pilot – the pilot rostered for ground-admin tasks such as recording take-off and landing times etc.

**Above** It was not unusual for aircraft to return damaged after an engagement and with pilots wounded. This brand-new Spitfire had just been delivered to 602 Squadron at RAF Westhampnett when it was hit by cannon shells from a Messerschmitt 109 in a combat on 18 August 1940. The aircraft was written off and Flight Lieutenant Dunlop Urie wounded in his feet.

chance of a well-ordered textbook 'Number One Attack'. Instead, it was every man for himself, but with 'wing men' desperately trying to maintain station and protect their section leader.

Now, the pilots were climbing and hanging on their props, the sun glaring and blinding as they turned, all the while listening out and looking out. Now, there were shouts: "Behind you Blue 3!", permeated by chattering gunfire. A cacophony of shouts and static made communication unintelligible. One pilot may be drawing a bead on a

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